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DIRECCIÓN DE NUEVAS CREACIONES
Procedimiento acelerado de exámenes de patente (PPH)

1	NÚMERO DE SOLICITUD ANTE LA SIC NC2019/0008582		
2	GLOBAL - PPH ☐ PAÍS	3	PCT – PPH ☒ PAÍS Europa
4	PROSUR ☐ PAÍS	5	Alianza del Pacífico (AdP) ☐ PAÍS
6	OFICINA DE PRIMERA PRESENTACIÓN (OPP) ☐	7	OFICINA DE EXAMEN ANTERIOR (OEA) ☐
8	NÚMERO DE SOLICITUD O PUBLICACIÓN DE LA SOLICITUD (OPP) ☐ NÚMERO DE SOLICITUD EN OFICINA DE EXAMEN ANTERIOR (OEA): ☐ NÚMERO DE SOLICITUD PCT: ☒		1. PCT/IB2018/050684
9	☐ REPRESENTANTE LEGAL ☒ APODERADO		
APELLIDOS DAZA MONTALVO		NOMBRES CAROLINA MERCEDES	IDENTIFICACIÓN C.C. 66.783.790 T.P. 141.563 CSJ
DIRECCIÓN	Carrera 11 No. 86-53, Piso 3		No. TELÉFONO 6181088
CIUDAD	Bogotá		CORREO ELECTRÓNICO notificaciones@clarke modet.com.co
PAÍS	Colombia		No. RADICACIÓN O PROTOCOLO DE PODER GENERAL
10	CONDICIONES PARA ACCEDER A ESTE PROCESO:		
10.1. DATOS DE PRIORIDAD ☒ SI ☐ NO			
(33) PAÍS DE ORIGEN		CÓDIGO PAÍS	(31) NÚMERO
1. Estados Unidos de América		US	62/453,843
2. Estados Unidos de América		US	62/456,991
3. Estados Unidos de América		US	15/886,616
4. Estados Unidos de América		US	15/886,727
(32) FECHA (AAAA/MM/DD)			
2017/02/02			
2017/02/09			
2018/02/01			
2018/02/01			
10.2. DATOS SOLICITUD INTERNACIONAL PCT ☒ SI ☐ NO			
Solicitud Internacional No. PCT/IB2018/050684		Fecha 2018/02/02	
Publicación Internacional No. WO/2018/142352		Fecha 2018/08/09	
* El solicitante presenta una copia de la(s) reivindicación(es) patentable(s) u otorgable(s) de la solicitud de la Oficina de Primera Presentación que profirió el examen de patentabilidad, junto con una traducción al castellano. ☒ SI ☐ NO			
* El solicitante presenta los resultados de búsqueda de la Oficina de Examen Anterior, junto con una traducción al castellano. ☒ SI ☐ NO			
REQUISITOS PARA EL RECONOCIMIENTO DE LOS RESULTADOS DE EXÁMENES DE PATENTABILIDAD EFECTUADOS A SOLICITUDES EXTRANJERAS			
Para que la Superintendencia de Industria y Comercio pueda reconocer los resultados de exámenes de patentabilidad producidos por otras Oficinas de Propiedad Industrial se debe cumplir con las siguientes condiciones:			
(a) Al momento de solicitar el examen de patentabilidad, si el solicitante pide que se reconozcan exámenes de patentabilidad de otras oficinas extranjeras, deberá aportar junto con el pago de la tasa correspondiente, los siguientes anexos:			
(i) Copia de las resoluciones, fallos o decisiones que han sido relevantes para la determinación de la patentabilidad de la(s) solicitud(es) en la Oficina que haya proferido el examen de patentabilidad que contienen reivindicaciones patentables u otorgables que son la base de la petición, y si es del caso, su traducción al castellano. ☒ SI ☐ NO			
(ii) Copia de todas las reivindicaciones determinadas como patentables u otorgables en la Oficina que profirió el examen de patentabilidad y, si es del caso, su traducción al castellano. ☒ SI ☐ NO			
(iii) Copia de los antecedentes, información o documentos citados por el examinador de la Oficina de Primera Presentación del examen de patentabilidad, en las resoluciones, fallos o decisiones correspondientes, incluyendo la literatura no patente. Los documentos de patente deberán presentarse siempre y cuando no estén disponibles para la Superintendencia de Industria y Comercio mediante el simple acceso a bases de datos gratuitas. ☒ SI ☐ NO			
(iv) Una tabla de correspondencias de las reivindicaciones que han sido determinadas como patentables u otorgables en la solicitud de la Oficina que haya proferido el examen de patentabilidad. ☒ SI ☐ NO			
11	FIRMA DEL SOLICITANTE, DEL APODERADO O DEL REPRESENTANTE LEGAL Junto a cada firma, indicar el nombre del firmante y su calidad (si tal calidad no es obvia al leer el petitorio)		
 CAROLINA DAZA MONTALVO			

10 (iv)	TABLA DE CORRESPONDENCIA DE REIVINDICACIONES		
Reivindicaciones en la solicitud en Colombia (NOTA. LAS REIVINDICACIONES ACÁ INDICADAS CORRESPONDEN A AQUELLAS PRESENTADAS EL 6 DE AGOSTO DEL 2019 BAJO EL CAPITULO I DEL PCT)		Reivindicaciones otorgables en la Solicitud PCT/IB2018/050684	Explicación sobre la suficiente correspondencia ó Comentarios que explican la correspondencia
1. Un Nodo de Soporte del GPRS de Servicio (SGSN) (307) configurado para interactuar con un Subsistema de la Estación de Base (BSS) (302 ₂), en donde el SGSN comprende: un procesador (346), y una memoria (348) que almacena instrucciones ejecutables por procesador, en donde el procesador hace interfase con la memoria para ejecutar las instrucciones ejecutables por procesador, por lo que SGSN es operativo para: recibir (1102) del BSS una Unidad de Datos de Paquete (PDU) (400) de COMANDO DE POSICIÓN del Protocolo del Servicio General de Radiocomunicaciones por Paquetes (GPRS) del BSS (BSSGP) que incluye (i) una (PDU) (402) del Protocolo de Servicios de Localización de Recursos Radioeléctricos (RRLP) en donde PDU de RRLP incluye un mensaje (404) de Solicitud de Avance de Temporización de Multilateración (MTA) de RRLP destinado para un dispositivo inalámbrico (304 ₃) blanco,		1. Un Nodo de Soporte del GPRS de Servicio (SGSN) (307) configurado para interactuar con un Subsistema de la Estación de Base (BSS) (302 ₂), en donde el SGSN comprende: un procesador (346), y una memoria (348) que almacena instrucciones ejecutables por procesador, en donde el procesador hace interfase con la memoria para ejecutar las instrucciones ejecutables por procesador, por lo que SGSN es operativo para: recibir (1102) del BSS una Unidad de Datos de Paquete (PDU) (400) de COMANDO DE POSICIÓN del Protocolo del Servicio General de Radiocomunicaciones por Paquetes (GPRS) del BSS (BSSGP) que incluye (i) una (PDU) (402) del Protocolo de Servicios de Localización de Recursos Radioeléctricos (RRLP) en donde PDU de RRLP incluye un mensaje (404) de Solicitud de Avance de Temporización de Multilateración (MTA) de RRLP destinado para un dispositivo inalámbrico (304 ₃) blanco,	<i>Igual</i>

y (ii) un indicador (520, 535) de que el dispositivo inalámbrico blanco está por realizar un procedimiento de MTA, y transmitir (1104) al BSS una PDU (410) de DATO UNIDAD de Enlace Descendente DL de BSSGP que incluye una PDU (406) de Control de Enlace Lógico (LLC) destinada al dispositivo inalámbrico blanco, en donde PDU de LLC incluye PDU de RRLP. en donde PDU de RRLP además incluye el mensaje de Solicitud de MTA de RRLP y en donde PDU de DATO UNIDAD de DL de BSSGP además incluye una bandera (420) que indica al BSS la necesidad de estimar la información de Avance de Temporización (413) cuando recibe un acuse de recibo (422) del Canal de Control Asociado al Paquete (PACCH) del dispositivo inalámbrico blanco.	y (ii) un indicador (520, 535) de que el dispositivo inalámbrico blanco está por realizar un procedimiento de MTA, y transmitir (1104) al BSS una PDU (410) de DATO UNIDAD de Enlace Descendente DL de BSSGP que incluye una PDU (406) de Control de Enlace Lógico (LLC) destinada al dispositivo inalámbrico blanco, en donde PDU de LLC incluye PDU de RRLP. en donde PDU de RRLP además incluye el mensaje de Solicitud de MTA de RRLP y en donde PDU de DATO UNIDAD de DL de BSSGP además incluye una bandera (420) que indica al BSS la necesidad de estimar la información de Avance de Temporización (413) cuando recibe un acuse de recibo (422) del Canal de Control Asociado al Paquete (PACCH) del dispositivo inalámbrico blanco.	
2. El SGSN de acuerdo con la reivindicación 1, en donde el indicador es un Elemento de Información del Temporizador de Multilateración (720) que incluye un valor (509) del temporizador indicando una duración que el dispositivo inalámbrico blanco está por realizar el procedimiento MTA.	2. El SGSN de acuerdo con la reivindicación 1, en donde el indicador es un Elemento de Información del Temporizador de Multilateración (720) que incluye un valor (509) del temporizador indicando una duración que el dispositivo inalámbrico blanco está por realizar el procedimiento MTA.	<i>Iguales</i>

3. El SGSN de acuerdo con la reivindicación 1, en donde la bandera es un elemento de información (420a).	3. El SGSN de acuerdo con la reivindicación 1, en donde la bandera es un elemento de información (420a).	<i>Igual</i>
4. El SGSN de acuerdo con la reivindicación 1, en donde el acuse de recibo PACCH es un acuse de recibo de Enlace Descendente de Paquete PACCH de Cobertura Extendida (EC).	4. El SGSN de acuerdo con la reivindicación 1, en donde el acuse de recibo PACCH es un acuse de recibo de Enlace Descendente de Paquete PACCH de Cobertura Extendida (EC).	<i>Igual</i>
5. Un método (1100) implementado en un Nodo de Soporte del GPRS de Servicio (SGSN) (307) configurado para interactuar con un Subsistema de la Estación de Base (BSS) (302 ₂), en donde el método comprende: recibir (1102) del BSS una Unidad de Datos de Paquete (PDU) (400) de COMANDO DE POSICIÓN del Protocolo del Servicio General de Radiocomunicaciones por Paquetes (GPRS) del BSS (BSSGP) que incluye (i) una (PDU) (402) del Protocolo de Servicios de Localización de Recursos Radioeléctricos (RRLP) en donde PDU de RRLP incluye un mensaje (404) de Solicitud de Avance de Temporización de Multilateración (MTA) de RRLP destinado para un dispositivo inalámbrico (304 ₃) blanco, y (ii) un indicador (520, 535) de que el dispositivo	5. Un método (1100) implementado en un Nodo de Soporte del GPRS de Servicio (SGSN) (307) configurado para interactuar con un Subsistema de la Estación de Base (BSS) (302 ₂), en donde el método comprende: recibir (1102) del BSS una Unidad de Datos de Paquete (PDU) (400) de COMANDO DE POSICIÓN del Protocolo del Servicio General de Radiocomunicaciones por Paquetes (GPRS) del BSS (BSSGP) que incluye (i) una (PDU) (402) del Protocolo de Servicios de Localización de Recursos Radioeléctricos (RRLP) en donde PDU de RRLP incluye un mensaje (404) de Solicitud de Avance de Temporización de Multilateración (MTA) de RRLP destinado para un dispositivo inalámbrico (304 ₃) blanco, y (ii) un indicador (520, 535) de que el dispositivo	<i>Igual</i>

inalámbrico blanco está por realizar un procedimiento de MTA, y transmitir (1104) al BSS una PDU (410) de DATO UNIDAD de Enlace Descendente DL de BSSGP que incluye una PDU (406) de Control de Enlace Lógico (LLC) destinada al dispositivo inalámbrico blanco, en donde PDU de LLC incluye PDU de RRLP, en donde PDU de RRLP además incluye el mensaje de Solicitud de MTA de RRLP y en donde PDU de DATO UNIDAD de DL de BSSGP además incluye una bandera (420) que indica al BSS la necesidad de estimar la información de Avance de Temporización (413) cuando recibe un acuse de recibo (422) del Canal de Control Asociado al Paquete (PACCH) del dispositivo inalámbrico blanco.	inalámbrico blanco está por realizar un procedimiento de MTA, y transmitir (1104) al BSS una PDU (410) de DATO UNIDAD de Enlace Descendente DL de BSSGP que incluye una PDU (406) de Control de Enlace Lógico (LLC) destinada al dispositivo inalámbrico blanco, en donde PDU de LLC incluye PDU de RRLP, en donde PDU de RRLP además incluye el mensaje de Solicitud de MTA de RRLP y en donde PDU de DATO UNIDAD de DL de BSSGP además incluye una bandera (420) que indica al BSS la necesidad de estimar la información de Avance de Temporización (413) cuando recibe un acuse de recibo (422) del Canal de Control Asociado al Paquete (PACCH) del dispositivo inalámbrico blanco.	
6. El método de acuerdo con la reivindicación 5, en donde el indicador es un Elemento de Información (520) del Temporizador de Multilateración que incluye un valor (509) del temporizador indicando una duración que el dispositivo inalámbrico blanco está por realizar el procedimiento MTA.	6. El método de acuerdo con la reivindicación 5, en donde el indicador es un Elemento de Información (520) del Temporizador de Multilateración que incluye un valor (509) del temporizador indicando una duración que el dispositivo inalámbrico blanco está por realizar el procedimiento MTA.	<i>Iguales</i>

7. El método de acuerdo con la reivindicación 5, en donde la bandera es un elemento de información (420a).	7. El método de acuerdo con la reivindicación 5, en donde la bandera es un elemento de información (420a).	<i>Igual</i>
8. El método de acuerdo con la reivindicación 5, en donde el acuse de recibo PACCH es un acuse de recibo de Enlace Descendente de Paquete PACCH de Cobertura Extendida (EC).	8. El método de acuerdo con la reivindicación 5, en donde el acuse de recibo PACCH es un acuse de recibo de Enlace Descendente de Paquete PACCH de Cobertura Extendida (EC).	<i>Igual</i>
9. Un Subsistema de la Estación de Base (BSS) (302 ₂) configurado para interactuar con un Nodo de Soporte del GPRS de Servicio (SGSN) (607) y un dispositivo inalámbrico (304 ₃), en donde BSS comprende: un procesador (332 ₂), y una memoria (334 ₂) que almacena instrucciones ejecutables por procesador, en donde el procesador hace interfase con la memoria para ejecutar las instrucciones ejecutables por procesador, por lo que BSS es operativo para: transmitir (1302) al SGSN una Unidad de Datos de Paquete (PDU) (400) de COMANDO DE POSICIÓN del Protocolo del Servicio General de Radiocomunicaciones por Paquetes (GPRS) del BSS (BSSGP) que incluye (i) una (PDU) (402) del Protocolo	9. Un Subsistema de la Estación de Base (BSS) (302 ₂) configurado para interactuar con un Nodo de Soporte del GPRS de Servicio (SGSN) (607) y un dispositivo inalámbrico (304 ₃), en donde BSS comprende: un procesador (332 ₂), y una memoria (334 ₂) que almacena instrucciones ejecutables por procesador, en donde el procesador hace interfase con la memoria para ejecutar las instrucciones ejecutables por procesador, por lo que BSS es operativo para: transmitir (1302) al SGSN una Unidad de Datos de Paquete (PDU) (400) de COMANDO DE POSICIÓN del Protocolo del Servicio General de Radiocomunicaciones por Paquetes (GPRS) del BSS (BSSGP) que incluye (i) una (PDU) (402) del Protocolo	<i>Igual</i>

de Servicios de Localización de Recursos Radioeléctricos (RRLP) en donde PDU de RRLP incluye un mensaje (404) de Solicitud de Avance de Temporización de Multilateración (MTA) de RRLP destinado para un dispositivo inalámbrico blanco, y (ii) un indicador (520, 535) de que el dispositivo inalámbrico blanco está por realizar un procedimiento de MTA, recibir (1304) del SGSN una PDU (410) de DATO UNIDAD de Enlace Descendente DL de BSSGP que incluye una PDU (406) de Control de Enlace Lógico (LLC) destinada al dispositivo inalámbrico blanco, en donde PDU de LLC incluye PDU de RRLP, en donde PDU de RRLP además incluye el mensaje de Solicitud de MTA de RRLP, transmitir (1306) al dispositivo inalámbrico blanco PDU de LLC que incluye PDU de RRLP, en donde PDU de RRLP además incluye el mensaje de Solicitud de MTA de RRLP, en respuesta a la transmisión de PDU de LLC, recibe (1308) un acuse de recibo (422) del Canal de Control Asociado al Paquete (PACCH) del dispositivo inalámbrico blanco, y	de Servicios de Localización de Recursos Radioeléctricos (RRLP) en donde PDU de RRLP incluye un mensaje (404) de Solicitud de Avance de Temporización de Multilateración (MTA) de RRLP destinado para un dispositivo inalámbrico blanco, y (ii) un indicador (520, 535) de que el dispositivo inalámbrico blanco está por realizar un procedimiento de MTA, recibir (1304) del SGSN una PDU (410) de DATO UNIDAD de Enlace Descendente DL de BSSGP que incluye una PDU (406) de Control de Enlace Lógico (LLC) destinada al dispositivo inalámbrico blanco, en donde PDU de LLC incluye PDU de RRLP, en donde PDU de RRLP además incluye el mensaje de Solicitud de MTA de RRLP, transmitir (1306) al dispositivo inalámbrico blanco PDU de LLC que incluye PDU de RRLP, en donde PDU de RRLP además incluye el mensaje de Solicitud de MTA de RRLP, en respuesta a la transmisión de PDU de LLC, recibe (1308) un acuse de recibo (422) del Canal de Control Asociado al Paquete (PACCH) del dispositivo inalámbrico blanco, y	
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cuando recibe el acuse de recibo PACCH, estima (1310) la información de Avance de Temporización (413) asociada con el acuse de recibo PACCH, en donde se informa al BSS de la necesidad de estimar la información de Avance de Temporización cuando recibe el acuse de recibo PACCH mediante una bandera (420) dentro del PDU de DATO UNIDAD de DL de BSSGP.	cuando recibe el acuse de recibo PACCH, estima (1310) la información de Avance de Temporización (413) asociada con el acuse de recibo PACCH, en donde se informa al BSS de la necesidad de estimar la información de Avance de Temporización cuando recibe el acuse de recibo PACCH mediante una bandera (420) dentro del PDU de DATO UNIDAD de DL de BSSGP.	
10. BSS de acuerdo con la reivindicación 9, en donde el indicador es un Elemento de Información del Temporizador de Multilateración (520) que incluye un valor (509) del temporizador indicando una duración que el dispositivo inalámbrico blanco está por realizar el procedimiento MTA.	10. BSS de acuerdo con la reivindicación 9, en donde el indicador es un Elemento de Información del Temporizador de Multilateración (520) que incluye un valor (509) del temporizador indicando una duración que el dispositivo inalámbrico blanco está por realizar el procedimiento MTA.	<i>Igual</i>
11. BSS de acuerdo con la reivindicación 9, en donde la bandera es un elemento de información (420a).	11. BSS de acuerdo con la reivindicación 9, en donde la bandera es un elemento de información (420a).	<i>Igual</i>
12. BSS de acuerdo con la reivindicación 9, en donde el acuse de recibo PACCH es un acuse de recibo de Enlace Descendente de Paquete PACCH de Cobertura Extendida (EC).	12. BSS de acuerdo con la reivindicación 9, en donde el acuse de recibo PACCH es un acuse de recibo de Enlace Descendente de Paquete PACCH de Cobertura Extendida (EC).	<i>Igual</i>

13. BSS de acuerdo con la reivindicación 9, en donde BSS cuando realiza la operación de estimación es además operativo para usar al menos uno de un proceso de sobremuestreo y un proceso de interpolación cuando recibe el acuse de recibo PACCH para estimar la información de avance de temporización.	13. BSS de acuerdo con la reivindicación 9, en donde BSS cuando realiza la operación de estimación es además operativo para usar al menos uno de un proceso de sobremuestreo y un proceso de interpolación cuando recibe el acuse de recibo PACCH para estimar la información de avance de temporización.	<i>Igual</i>
14. BSS de acuerdo con la reivindicación 9, en donde BSS es además operativo para transmitir a un Centro de Localización Móvil de Servicio (SMLC) (311), un Mensaje Orientado a la Conexión (424) de BSSMAP que incluye (i) la información de Avance de Temporización estimado, y (ii) la información de precisión (415) asociada con el dispositivo inalámbrico blanco.	14. BSS de acuerdo con la reivindicación 9, en donde BSS es además operativo para transmitir a un Centro de Localización Móvil de Servicio (SMLC) (311), un Mensaje Orientado a la Conexión (424) de BSSMAP que incluye (i) la información de Avance de Temporización estimado, y (ii) la información de precisión (415) asociada con el dispositivo inalámbrico blanco.	<i>Igual</i>
15. Un método (1300) implementado en un Subsistema de la Estación de Base (BSS) (302 ₂) configurado para interactuar con un Nodo de Soporte del GPRS de Servicio (SGSN) (307) y un dispositivo inalámbrico blanco (304 ₃), en donde el método comprende: transmitir (1302) al SGSN una Unidad de Datos de Paquete (PDU) (400) de COMANDO DE POSICIÓN del Protocolo del Servicio General de Radiocomunicaciones por Paquetes (GPRS) del BSS	15. Un método (1300) implementado en un Subsistema de la Estación de Base (BSS) (302 ₂) configurado para interactuar con un Nodo de Soporte del GPRS de Servicio (SGSN) (307) y un dispositivo inalámbrico blanco (304 ₃), en donde el método comprende: transmitir (1302) al SGSN una Unidad de Datos de Paquete (PDU) (400) de COMANDO DE POSICIÓN del Protocolo del Servicio General de Radiocomunicaciones por Paquetes (GPRS) del BSS	<i>Igual</i>

(BSSGP) que incluye (i) una (PDU) (402) del Protocolo de Servicios de Localización de Recursos Radioeléctricos (RRLP) en donde PDU de RRLP incluye un mensaje (404) de Solicitud de Avance de Temporización de Multilateración (MTA) de RRLP destinado para un dispositivo inalámbrico blanco, y (ii) un indicador (520, 535) de que el dispositivo inalámbrico blanco está por realizar un procedimiento de MTA, recibir (1304) del SGSN una PDU (410) de DATO UNIDAD de Enlace Descendente DL de BSSGP que incluye una PDU (406) de Control de Enlace Lógico (LLC) destinada al dispositivo inalámbrico blanco, en donde PDU de LLC incluye PDU de RRLP, en donde PDU de RRLP además incluye el mensaje de Solicitud de MTA de RRLP, transmitir (1306) al dispositivo inalámbrico blanco PDU de LLC que incluye PDU de RRLP, en donde PDU de RRLP además incluye el mensaje de Solicitud de MTA de RRLP, en respuesta a la transmisión de PDU de LLC, recibe (1308) un acuse de recibo (422) del Canal de Control Asociado al Paquete (PACCH) del dispositivo inalámbrico blanco, y	(BSSGP) que incluye (i) una (PDU) (402) del Protocolo de Servicios de Localización de Recursos Radioeléctricos (RRLP) en donde PDU de RRLP incluye un mensaje (404) de Solicitud de Avance de Temporización de Multilateración (MTA) de RRLP destinado para un dispositivo inalámbrico blanco, y (ii) un indicador (520, 535) de que el dispositivo inalámbrico blanco está por realizar un procedimiento de MTA, recibir (1304) del SGSN una PDU (410) de DATO UNIDAD de Enlace Descendente DL de BSSGP que incluye una PDU (406) de Control de Enlace Lógico (LLC) destinada al dispositivo inalámbrico blanco, en donde PDU de LLC incluye PDU de RRLP, en donde PDU de RRLP además incluye el mensaje de Solicitud de MTA de RRLP, transmitir (1306) al dispositivo inalámbrico blanco PDU de LLC que incluye PDU de RRLP, en donde PDU de RRLP además incluye el mensaje de Solicitud de MTA de RRLP, en respuesta a la transmisión de PDU de LLC, recibe (1308) un acuse de recibo (422) del Canal de Control Asociado al Paquete (PACCH) del dispositivo inalámbrico blanco, y	
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cuando recibe el acuse de recibo PACCH, estima (1310) la información de Avance de Temporización (413) asociada con el acuse de recibo PACCH, en donde se informa al BSS de la necesidad de estimar la información de Avance de Temporización cuando recibe el acuse de recibo PACCH mediante una bandera (420) dentro del PDU de DATO UNIDAD de DL de BSSGP.	cuando recibe el acuse de recibo PACCH, estima (1310) la información de Avance de Temporización (413) asociada con el acuse de recibo PACCH, en donde se informa al BSS de la necesidad de estimar la información de Avance de Temporización cuando recibe el acuse de recibo PACCH mediante una bandera (420) dentro del PDU de DATO UNIDAD de DL de BSSGP.	
16. El método de acuerdo con la reivindicación 15, en donde el indicador es un Elemento de Información (520) del Temporizador de Multilateración que incluye un valor (509) del temporizador indicando una duración que el dispositivo inalámbrico blanco está por realizar el procedimiento MTA.	16. El método de acuerdo con la reivindicación 15, en donde el indicador es un Elemento de Información (520) del Temporizador de Multilateración que incluye un valor (509) del temporizador indicando una duración que el dispositivo inalámbrico blanco está por realizar el procedimiento MTA.	<i>Igual</i>
17. El método de acuerdo con la reivindicación 15, en donde la bandera es un elemento de información (420a).	17. El método de acuerdo con la reivindicación 15, en donde la bandera es un elemento de información (420a).	<i>Igual</i>
18. El método de acuerdo con la reivindicación 15, en donde el acuse de recibo PACCH es un acuse de recibo de Enlace Descendente de Paquete PACCH de Cobertura Extendida (EC).	18. El método de acuerdo con la reivindicación 15, en donde el acuse de recibo PACCH es un acuse de recibo de Enlace Descendente de Paquete PACCH de Cobertura Extendida (EC).	<i>Igual</i>
19. El método de acuerdo con la reivindicación 15, en donde el paso de estimación además comprende un paso para usar al menos uno de un proceso de sobremuestreo y un proceso de interpolación cuando recibe el acuse de	19. El método de acuerdo con la reivindicación 15, en donde el paso de estimación además comprende un paso para usar al menos uno de un proceso de sobremuestreo y un proceso de interpolación cuando recibe el acuse de	<i>Igual</i>

recibo PACCH para estimar la información de avance de temporización.	recibo PACCH para estimar la información de avance de temporización.	
20. El método de acuerdo con la reivindicación 15, que además comprende un paso de transmisión (1312) a un Centro de Localización Móvil de Servicio (SMLC) (311), un Mensaje Orientado a la Conexión (424) de BSSMAP que incluye (i) la información de Avance de Temporización estimado, y (ii) la información de precisión (415) asociada con el dispositivo inalámbrico blanco.	20. El método de acuerdo con la reivindicación 15, que además comprende un paso de transmisión (1312) a un Centro de Localización Móvil de Servicio (SMLC) (311), un Mensaje Orientado a la Conexión (424) de BSSMAP que incluye (i) la información de Avance de Temporización estimado, y (ii) la información de precisión (415) asociada con el dispositivo inalámbrico blanco.	<i>Igual</i>
21. Un dispositivo inalámbrico (3043) configurado para interactuar con un Subsistema de la Estación de Base (BSS) (302), en donde el dispositivo inalámbrico comprende: un procesador (318), y una memoria (320) que almacena instrucciones ejecutables por procesador, en donde el procesador hace interfase con la memoria para ejecutar las instrucciones ejecutables por procesador, por lo que dispositivo inalámbrico es operativo para: recibir (1502) del BSS una Unidad de Datos de Paquete (PDU) (406) del Control de Enlace Lógico (LLC), en donde PDU de LLC incluye una PDU (402) del	21. Un dispositivo inalámbrico (3043) configurado para interactuar con un Subsistema de la Estación de Base (BSS) (302), en donde el dispositivo inalámbrico comprende: un procesador (318), y una memoria (320) que almacena instrucciones ejecutables por procesador, en donde el procesador hace interfase con la memoria para ejecutar las instrucciones ejecutables por procesador, por lo que dispositivo inalámbrico es operativo para: recibir (1502) del BSS una Unidad de Datos de Paquete (PDU) (406) del Control de Enlace Lógico (LLC), en donde PDU de LLC incluye una PDU (402) del	<i>Igual</i>

Protocolo de Servicios de Localización de Recursos Radioeléctricos (RRLP), en donde PDU de RRLP además incluye un Mensaje (404) de Solicitud de Avance de Temporización de Multilateración de RRLP que indica que el dispositivo inalámbrico no necesita realizar un procedimiento de Avance de Temporización de Multilateración en una celda de servicio, y en respuesta a la recepción de PDU de LLC, transmite (1504) un acuse de recibo (422) del Canal de Control Asociado al Paquete (PACCH) al BSS.	Protocolo de Servicios de Localización de Recursos Radioeléctricos (RRLP), en donde PDU de RRLP además incluye un Mensaje (404) de Solicitud de Avance de Temporización de Multilateración de RRLP que indica que el dispositivo inalámbrico no necesita realizar un procedimiento de Avance de Temporización de Multilateración en una celda de servicio, y en respuesta a la recepción de PDU de LLC, transmite (1504) un acuse de recibo (422) del Canal de Control Asociado al Paquete (PACCH) al BSS.	
22. El dispositivo inalámbrico de acuerdo con la reivindicación 21, en donde el acuse de recibo PACCH es un acuse de recibo de Enlace Descendente de Paquete PACCH de Cobertura Extendida (EC).	22. El dispositivo inalámbrico de acuerdo con la reivindicación 21, en donde el acuse de recibo PACCH es un acuse de recibo de Enlace Descendente de Paquete PACCH de Cobertura Extendida (EC).	<i>Igual</i>
23. Un método (1500) implementado en un dispositivo inalámbrico (304₃) configurado para interactuar con un Subsistema de la Estación de Base (BSS) (302₂), en donde el método comprende: recibir (1502) del BSS una Unidad de Datos de Paquete (PDU) (406) del Control de Enlace Lógico (LLC), en donde PDU de LLC incluye una PDU (402) del Protocolo de Servicios de Localización de Recursos Radioeléctricos (RRLP), en donde PDU de RRLP además incluye un	23. Un método (1500) implementado en un dispositivo inalámbrico (304₃) configurado para interactuar con un Subsistema de la Estación de Base (BSS) (302₂), en donde el método comprende: recibir (1502) del BSS una Unidad de Datos de Paquete (PDU) (406) del Control de Enlace Lógico (LLC), en donde PDU de LLC incluye una PDU (402) del Protocolo de Servicios de Localización de Recursos Radioeléctricos (RRLP), en donde PDU de RRLP además incluye un	<i>Igual</i>

Mensaje (404) de Solicitud de Avance de Temporización de Multilateración de RRLP que indica que el dispositivo inalámbrico no necesita realizar un procedimiento de Avance de Temporización de Multilateración en una celda de servicio, y en respuesta a la recepción de PDU de LLC, transmite (1504) un acuse de recibo (422) del Canal de Control Asociado al Paquete (PACCH) al BSS.	Mensaje (404) de Solicitud de Avance de Temporización de Multilateración de RRLP que indica que el dispositivo inalámbrico no necesita realizar un procedimiento de Avance de Temporización de Multilateración en una celda de servicio, y en respuesta a la recepción de PDU de LLC, transmite (1504) un acuse de recibo (422) del Canal de Control Asociado al Paquete (PACCH) al BSS.	
24. El método de acuerdo con la reivindicación 23, en donde el acuse de recibo PACCH es un acuse de recibo de Enlace Descendente de Paquete PACCH de Cobertura Extendida (EC).	24. El método de acuerdo con la reivindicación 23, en donde el acuse de recibo PACCH es un acuse de recibo de Enlace Descendente de Paquete PACCH de Cobertura Extendida (EC).	<i>Igual</i>

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

PCT

To:

Henderson, Mymy
HENDERSON, Mymy
2755 Augustine Drive
Santa Clara CA 95054
ETATS-UNIS D'AMERIQUE

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL SEARCH REPORT AND
THE WRITTEN OPINION OF THE INTERNATIONAL
SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

Applicant's or agent's file reference P71354-WO1	Date of mailing (day/month/year) 29 March 2018 (29-03-2018)
International application No. PCT/IB2018/050684	International filing date (day/month/year) 2 February 2018 (02-02-2018)
Applicant TELEFONAKTIEBOLAGET L M ERICSSON (PUBL)	

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

Filing of amendments and statement under Article 19:

The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

When? The time limit for filing such amendments is normally two months from the date of transmittal of the International Search Report.

How? Directly to the International Bureau of WIPO, 34 chemin des Colombettes
1211 Geneva 20, Switzerland, Facsimile No.: (41-22) 338.82.70

For more detailed instructions, see *PCT Applicant's Guide*, International Phase, paragraphs 9.004 - 9.011.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.
3. ☐ **With regard to any protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:
- ☐ the protest together with the decision thereon has been transmitted to the International Bureau together with any applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.
- ☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. Reminders

The applicant may **submit comments on an informal basis on the written opinion of the International Searching Authority** to the International Bureau. These comments will be made available to the public after international publication. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established.

Shortly after the expiration of **18 months from the priority date, the international application will be published** by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before the completion of the technical preparations for international publication (Rules 90*bis*.1 and 90*bis*.3).

Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for **entry into the national phase** before those designated Offices. In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months. For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide*, National Chapters.

Within **22 months from the priority date, the applicant may request that a supplementary international search be carried out** by a different International Searching Authority that offers this service (Rule 45*bis*.1). The procedure for requesting supplementary international search is described in the *PCT Applicant's Guide*, International Phase, paragraphs 8.006-8.032.

Name and mailing address of the International Searching Authority



European Patent Office, P.B. 5818 Patentlaan 2
NL-2280 HV Rijswijk
Tel. (+31-70) 340-2040
Fax: (+31-70) 340-3016

Authorized officer

SCHUR, Marlene
Tel: +49 (0)30 25901-717

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference P71354-WO1	FOR FURTHER ACTION see Form PCT/ISA/220 as well as, where applicable, item 5 below.	
International application No. PCT/IB2018/050684	International filing date (<i>day/month/year</i>) 2 February 2018 (02-02-2018)	(Earliest) Priority Date (<i>day/month/year</i>) 2 February 2017 (02-02-2017)
Applicant TELEFONAKTIEBOLAGET L M ERICSSON (PUBL)		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 4 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of:

- ☒ the international application in the language in which it was filed
☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6**bis**(a)).

c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (See Box No. II)

3. ☐ **Unity of invention is lacking** (see Box No III)

4. With regard to the **title**,

- ☒ the text is approved as submitted by the applicant
☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

- ☒ the text is approved as submitted by the applicant
☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority

6. With regard to the **drawings**,

a. the figure of the **drawings** to be published with the abstract is Figure No. 3

- ☒ as suggested by the applicant
☐ as selected by this Authority, because the applicant failed to suggest a figure
☐ as selected by this Authority, because this figure better characterizes the invention

b. ☐ none of the figures is to be published with the abstract

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2018/050684

A. CLASSIFICATION OF SUBJECT MATTER

INV. H04W64/00

ADD. H04W68/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H04W

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	LM ERICSSON: "Multilateration Procedure - TA Only", 3GPP DRAFT; R6-160273 - MULTILATERATION PROCEDURE - TA ONLY (WAS R6-160261), 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CE , no. Reno, Nevada USA; 20161114 - 20161118 18 November 2016 (2016-11-18), XP051198955, Retrieved from the Internet: URL:http://www.3gpp.org/ftp/tsg_ran/WG6_levacyRAN/TSGR6_02/Docs/ [retrieved on 2016-11-18] page 17 - page 18 ----- -/--	1-24

Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

21 March 2018

Date of mailing of the international search report

29/03/2018

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Eraso Helguera, J

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2018/050684

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	ERICSSON LM: "Introduction of Multilateration", 3GPP DRAFT; R6-160274 CR 43.059 INTRODUCTION OF MULTILATERATION USING TIMING ADVANCE, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANT , vol. TSG RAN, no. Reno, Nevada USA; 20161114 - 20161118 18 November 2016 (2016-11-18), XP051198956, Retrieved from the Internet: URL:http://www.3gpp.org/ftp/tsg_ran/WG6_legacyRAN/TSGR6_02/Docs/ [retrieved on 2016-11-18] the whole document -----	1-24
A	ERICSSON: "Positioning enhancements for GERAN - introducing Timing Advance trilateration", 3GPP DRAFT; RP-161034 - POSITIONING ENHANCEMENTS FOR GERAN - INTRODUCING TA TRILATERATION, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHI , vol. TSG RAN, no. Busan, Korea; 20160613 - 20160616 12 June 2016 (2016-06-12), XP051103882, Retrieved from the Internet: URL:http://www.3gpp.org/ftp/Meetings_3GPP_SYNC/RAN/Docs/ [retrieved on 2016-06-12] cited in the application the whole document -----	1-24
A	ERICSSON: "On timing advance based multi-leg positioning for NB-IoT", 3GPP DRAFT; R1-167426 - ON TIMING ADVANCE BASED MULTI-LEG POSITIONING FOR NB-IOT, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOL , vol. RAN WG1, no. Gothenburg, Sweden; 20160822 - 20160826 21 August 2016 (2016-08-21), XP051125896, Retrieved from the Internet: URL:http://www.3gpp.org/ftp/Meetings_3GPP_SYNC/RAN1/Docs/ [retrieved on 2016-08-21] cited in the application the whole document -----	1-24
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INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2018/050684

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P	NOKIA: "Serving Cell TA Estimation for Multilateration Positioning", 3GPP DRAFT; R6-170045 SERVING CELL TA ESTIMATION FOR MULTILATERATION POSITIONING, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOL , vol. TSG RAN, no. Athens, Greece; 20170213 - 20170217 3 February 2017 (2017-02-03), XP051227257, Retrieved from the Internet: URL:http://www.3gpp.org/ftp/tsg_ran/WG6_legacyRAN/TSGR6_03/Docs/ [retrieved on 2017-02-03] the whole document -----	1-24

TITLE: NOTIFICATION OF DELIVERY OF A RRLP MULTILATERATION TIMNG ADVANCE REQUEST
MESSAGE TO A BASE STATION SUBSYSTEM (BSS)

APPLICANT: TELEFONAKTIEBOLAGET L M ERICSSON (PUBL)

IPC CLASSIFICATION: H04W64/00, H04W68/00

EXAMINER: Eraso Helguera, J

CONSULTED DATABASES: NPL, EPODOC, WPI, XP3GPP

CLASSIFICATION SYMBOLS DEFINING EXTENT OF THE SEARCH:

IPC:

CPC: H04W64/00, H04W68/00

FI/F-TERMS:

KEYWORDS OR OTHER ELEMENTS FEATURING THE INVENTION:

multilateration_timing_advance, MTA, BSSGP, POSITION_COMMAND, timer, flag[,s],
SGSN, BSS, RRLP, request, DL_UNITDATA, PACCH_acknowledgement, serving_cell,
estimation

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

To:

see form PCT/ISA/220

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/IB2018/050684

International filing date (day/month/year)
02.02.2018

Priority date (day/month/year)
02.02.2017

International Patent Classification (IPC) or both national classification and IPC
INV. H04W64/00 ADD. H04W68/00

Applicant
TELEFONAKTIEBOLAGET L M ERICSSON (PUBL)

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☒ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☒ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA:



European Patent Office
Gitschiner Str. 103
D-10958 Berlin
Tel. +49 30 25901 - 0
Fax: +49 30 25901 - 840

Date of completion of
this opinion

see form
PCT/ISA/210

Authorized Officer

Eraso Helguera, J

Telephone No. +49 30 25901-0



Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - ☒ the international application in the language in which it was filed.
 - ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).
2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))
3. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:
 - a. ☐ forming part of the international application as filed:
 - ☐ in the form of an Annex C/ST.25 text file.
 - ☐ on paper or in the form of an image file.
 - b. ☐ furnished together with the international application under PCT Rule 13ter.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.
 - c. ☐ furnished subsequent to the international filing date for the purposes of international search only:
 - ☐ in the form of an Annex C/ST.25 text file (Rule 13ter.1(a)).
 - ☐ on paper or in the form of an image file (Rule 13ter.1(b) and Administrative Instructions, Section 713).
4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

Box No. II Priority

1. ☒ The validity of the priority claim has not been considered because the International Searching Authority does not have in its possession a copy of the earlier application whose priority has been claimed or, where required, a translation of that earlier application. This opinion has nevertheless been established on the assumption that the relevant date (Rules 43bis.1 and 64.1) is the claimed priority date.
2. ☐ This opinion has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rules 43bis.1 and 64.1). Thus for the purposes of this opinion, the international filing date indicated above is considered to be the relevant date.
3. Additional observations, if necessary:

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	<u>1-24</u>
	No: Claims	
Inventive step (IS)	Yes: Claims	<u>1-24</u>
	No: Claims	
Industrial applicability (IA)	Yes: Claims	<u>1-24</u>
	No: Claims	

2. Citations and explanations

see separate sheet

Box No. VI Certain documents cited

1. Certain published documents (Rules 43bis.1 and 70.10)

and / or

2. Non-written disclosures (Rules 43bis.1 and 70.9)

see form 210

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

- D1 LM ERICSSON: "Multilateration Procedure - TA Only",
3GPP DRAFT; R6-160273 - MULTILATERATION PROCEDURE
- TA ONLY (WAS R6-160261), 3RD GENERATION
PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE
CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-
ANTIPOLIS CE
,
no. Reno, Nevada USA; 20161114 - 20161118 18 November
2016 (2016-11-18), XP051198955,
Retrieved from the Internet:
URL:[http://www.3gpp.org/ftp/tsg_ran/WG6_legacyRAN/
TSGR6_02/Docs/](http://www.3gpp.org/ftp/tsg_ran/WG6_legacyRAN/TSGR6_02/Docs/)
[retrieved on 2016-11-18]
- D2 ERICSSON LM: "Introduction of Multilateration",
3GPP DRAFT; R6-160274 CR 43.059 INTRODUCTION OF
MULTILATERATION USING TIMING ADVANCE, 3RD
GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE
COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ;
F-06921 SOPHIA-ANT
,
vol. TSG RAN, no. Reno, Nevada USA; 20161114 - 20161118
18 November 2016 (2016-11-18), XP051198956,
Retrieved from the Internet:
URL:[http://www.3gpp.org/ftp/tsg_ran/WG6_legacyRAN/
TSGR6_02/Docs/](http://www.3gpp.org/ftp/tsg_ran/WG6_legacyRAN/TSGR6_02/Docs/)
[retrieved on 2016-11-18]
- D3 ERICSSON: "Positioning enhancements for GERAN -
introducing Timing Advance trilateration",
3GPP DRAFT; RP-161034 - POSITIONING ENHANCEMENTS
FOR GERAN - INTRODUCING TA TRILATERATION, 3RD
GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE
COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ;

F-06921 SOPHI

,
vol. TSG RAN, no. Busan, Korea; 20160613 - 20160616 12 June
2016 (2016-06-12), XP051103882,
Retrieved from the Internet:
URL:http://www.3gpp.org/ftp/Meetings_3GPP_SYNC/RAN/Docs/
[retrieved on 2016-06-12]
cited in the application

D4 ERICSSON: "On timing advance based multi-leg positioning for
NB-IoT",
3GPP DRAFT; R1-167426 - ON TIMING ADVANCE BASED
MULTI-LEG POSITIONING FOR NB-IOT, 3RD GENERATION
PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE
CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-
ANTIPOL
,
vol. RAN WG1, no. Gothenburg, Sweden; 20160822 - 20160826
21 August 2016 (2016-08-21), XP051125896,
Retrieved from the Internet:
URL:[http://www.3gpp.org/ftp/Meetings_3GPP_SYNC/RAN1/](http://www.3gpp.org/ftp/Meetings_3GPP_SYNC/RAN1/Docs/)
Docs/
[retrieved on 2016-08-21]
cited in the application

- 1 D1 is regarded as being the prior art closest to the subject-matter of claim 1,
and discloses:
- 1.1 A Serving GPRS Support Node, SGSN, (see paragraph 6: *SGSN*) configured
to interact with a Base Station Subsystem, BSS, (see paragraph 5: *BSS*), the
SGSN comprising:
a processor; and,
a memory that stores processor-executable instructions, wherein the
processor interfaces with the memory to execute the processor-executable
instructions, whereby the SGSN is operable to:
receive (see paragraph 6: *The BSSGP entity in the SGSN extracts the
embedded RRLP message (i.e. the "Multilateration Request" component)*
from the "RRLP APDU" IE received in the "BSSGP POSITION-COMMAND
PDU" and sends it to the TOM protocol entity), from the BSS, a BSS General

Packet Radio Service, GPRS, Protocol, BSSGP, POSITION-COMMAND Packet Data Unit, PDU, (see paragraph 10.5.4: *POSITION-COMMAND PDU*) which includes (i) a Radio Resource Location Services Protocol, RRLP, PDU (see paragraph 11.3.49: *RRLP APDU*), wherein the RRLP PDU includes a RRLP Multilateration Timing Advance, MTA. Request message (see paragraph 6: *embedded RRLP message*) intended for a target wireless device (see paragraph 6: *MS*), and (ii) an indicator (see paragraph 4.8: *MTAO Multilateration Request*) that the target wireless device is to perform a MTA procedure;

transmit (see paragraph 6: *The LLC PDU is sent to the serving BSS*), to the BSS, a BSSGP Down Link, DL, -UNITDATA PDU which includes a Logical Link Control, LLC, PDU (see paragraph 6: *The LLC entity generates an LLC PDU (containing the TOM PDU)*) intended for the target wireless device, wherein the LLC PDU includes the RRLP PDU, wherein the RRLP PDU further includes the RRLP MTA Request Message (see paragraph 6: *The BSSGP entity in the SGSN extracts the embedded RRLP message (i.e. the "Multilateration Request" component) from the "RRLP APDU" IE received in the "BSSGP POSITION-COMMAND PDU" and sends it to the TOM protocol entity. The TOM protocol entity prepends the TOM protocol header (1 octet) to the embedded RRLP message and sends the resulting TOM PDU to the LLC entity using the TOM SAP.*

The subject-matter of claim 1 therefore differs from this known SGSN in that , the BSSGP DL-UNITDATA PDU further includes a flag which indicates to the BSS a need to estimate timing advance information when receiving a Packet Associated Control Channel, PACCH, acknowledgement from the target wireless device, and is therefore new (Article 33(2) PCT).

The problem to be solved by the present invention may be regarded as how to have the BSS estimate a "Timing Advance" (see Working Assumption 12).

The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

No other document in the prior art teaches or suggests the use of the distinguishing feature above for this purpose. The straightforward solution starting from D1 for the skilled person would consider would be to either to re-use a BSSGP PDU type known to be used for signalling purposes, or to create a new signalling BSSGP PDU type, but, in any case, the straightforward solution would be to use a signalling BSSGP PDU sent by the

SGSN to the BSS on a signalling BVC to inform the BSS that it needs to estimate timing advance information when receiving a Packet Associated Control Channel, PACCH, acknowledgement from the target wireless device, rather than a flag on the BSSGP DL-UNITDATA PDU as specified above, which is sent on a Cell BVC. None of the documents D2, D3 and D4 discloses or hints at the distinguishing features either.

1.2 The same reasoning above applies correspondingly to the method of claim 5, which is therefore considered new (Article 33(2) PCT) and as involving an inventive step (Article 33(3) PCT).

2 D1 is regarded as being the prior art closest to the subject-matter of claim 9, and discloses:

2.1 A Base Station Subsystem, BSS, (see paragraph 5: *BSS*) configured to interact with a Serving GPRS Support Node, SGSN, (see paragraph 6: *SGSN*) and a target wireless device (see paragraph 6: *MS*), the BSS comprising:
a processor; and,
a memory that stores processor-executable instructions, wherein the processor interfaces with the memory to execute the processor-executable instructions, whereby the BSS is operable to:
transmit (see paragraph 5: *The BSSGP entity in the BSS sends the SGSN a "BSSGP POSITION-COMMAND PDU" (see Step 6 in Figure 1) and includes the embedded RRLP message (i.e. the "Multilateration Request" component) received from the LCS entity in the BSS as the embedded RRLP message within the "RRLP APDU" IE of the "BSSGP POSITION-COMMAND PDU"*), to the SGSN, a BSS General Packet Radio Service, GPRS, Protocol, BSSGP, POSITION-COMMAND Packet Data Unit, PDU, (see paragraph 10.5.4: *POSITION-COMMAND PDU*) which includes (i) a Radio Resource Location Services Protocol, RRLP, PDU (see paragraph 11.3.49: *RRLP APDU*), wherein the RRLP PDU includes a RRLP Multilateration Timing Advance, MTA. Request message (see paragraph 6: *embedded RRLP message*) intended for the target wireless device (see paragraph 6: *MS*), and (ii) an indicator (see paragraph 4.8: *MTAO Multilateration Request*) that the target wireless device is to perform a MTA procedure;
receive (see paragraph 6: *The LLC PDU is sent to the serving BSS*), from the SGSN, a BSSGP Down Link, DL, -UNITDATA PDU which includes a Logical Link Control, LLC, PDU (see paragraph 6: *The LLC entity generates an LLC PDU (containing the TOM PDU)*) intended for the target wireless device,

wherein the LLC PDU includes the RRLP PDU, wherein the RRLP PDU further includes the RRLP MTA Request Message (see paragraph 6: *The BSSGP entity in the SGSN extracts the embedded RRLP message (i.e. the "Multilateration Request" component) from the "RRLP APDU" IE received in the "BSSGP POSITION-COMMAND PDU" and sends it to the TOM protocol entity. The TOM protocol entity prepends the TOM protocol header (1 octet) to the embedded RRLP message and sends the resulting TOM PDU to the LLC entity using the TOM SAP.*

The subject-matter of claim 9 therefore differs from this known BSS in that in response to transmitting the LLC PDU, it receives a Packet Associated Control Channel, PACCH, acknowledgement, from the target wireless device; and,

when receiving the PACCH acknowledgement, it estimates timing advance information associated with the PACCH acknowledgement, wherein the BSS is informed of a need to estimate the timing advance information when receiving the PACCH acknowledgement by a flag within the BSSGP DL-UNITDATA PDU, and is therefore new (Article 33(2) PCT).

The problem to be solved by the present invention may be regarded as how to have the BSS estimate a "Timing Advance" (see Working Assumption 12).

The solution to this problem proposed in claim 9 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

No other document in the prior art teaches or suggests the use of the distinguishing feature above for this purpose. The straightforward solution starting from D1 for the skilled person would consider would be either to re-use a BSSGP PDU type known to be used for signalling purposes, or to create a new signalling BSSGP PDU type, but, in any case, the straightforward solution would be to use a signalling BSSGP PDU sent by the SGSN to the BSS on a signalling BVC, rather than a flag on the BSSGP DL-UNITDATA PDU specified above, which is sent on a Cell BVC. Besides, D1 does not hint at the use of PACCH acknowledgement received from the MS to perform the estimate. None of the documents D2, D3 and D4 discloses or hints at the distinguishing features either.

- 2.2 The same reasoning above applies correspondingly to the method of claim 15, which is therefore considered new (Article 33(2) PCT) and as involving an inventive step (Article 33(3) PCT).

3 D1 is regarded as being the prior art closest to the subject-matter of claim 21, and discloses:

3.1 A wireless device (see paragraph 6: *MS*) configured to interact with a Base Station Subsystem, BSS, (see paragraph 5: *BSS*), the wireless device comprising:
a processor; and,
a memory that stores processor-executable instructions, wherein the processor interfaces with the memory to execute the processor-executable instructions, whereby the wireless device is operable to:
receive (see paragraph 6: *The LLC PDU is sent to the serving BSS which establishes a downlink TBF and delivers the LLC*), from the BSS, a LLC, PDU (see paragraph 6: *The LLC entity generates an LLC PDU (containing the TOM PDU)*), wherein the LLC PDU includes a Radio Resource Location Service Protocol, RRLP, PDU, wherein the RRLP PDU further includes a RRLP Multilateration Timing Advance Request Message (see paragraph 6: *The BSSGP entity in the SGSN extracts the embedded RRLP message (i.e. the "Multilateration Request" component) from the "RRLP APDU" IE received in the "BSSGP POSITION-COMMAND PDU" and sends it to the TOM protocol entity. The TOM protocol entity prepends the TOM protocol header (1 octet) to the embedded RRLP message and sends the resulting TOM PDU to the LLC entity using the TOM SAP*).

The subject-matter of claim 21 therefore differs from this known wireless device in that the RRLP MTA Request Message indicates that the wireless device does not need to perform a Multilateration Timing Advance procedure in a serving cell, and in response to receiving the LLC PDU, it transmits a Packet Associated Control Channel, PACCH, acknowledgement to the BSS. and is therefore new (Article 33(2) PCT).

The problem to be solved by the present invention may be regarded as how to have the BSS estimate a "Timing Advance" (see Working Assumption 12).

The solution to this problem proposed in claim 21 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

No other document in the prior art teaches or suggests the use of the distinguishing feature above for this purpose. The skilled person starting from D1 would arrive at modifying the RRLP:MTA Request so as to prevent the wireless device from performing multilateration TA access attempts also

towards the serving cell. However, further transmitting a Packet Associated Control Channel, PACCH, acknowledgement to the BSS, which enables the BSS to perform the estimate, cannot be derived in a straightforward manner from D1 and it would require the use of hindsight. None of the documents D2, D3 and D4 discloses or hints at the distinguishing features either.

- 3.2 The same reasoning above applies correspondingly to the method of claim 23, which is therefore considered new (Article 33(2) PCT) and as involving an inventive step (Article 33(3) PCT).
- 4 Claims 2-4, 6-8, 10-14, 16-20, 22, 24 are dependent on one or more independent claims whose subject-matter is considered as being new and inventive, as discussed above, and as such said dependent claims also meet the requirements of the PCT with respect to novelty and inventive step.

Re Item VI

Certain documents cited

- D5 NOKIA: "Serving Cell TA Estimation for Multilateration Positioning", 3GPP DRAFT; R6-170045 SERVING CELL TA ESTIMATION FOR MULTILATERATION POSITIONING, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOL
- ,
- vol. TSG RAN, no. Athens, Greece; 20170213 - 20170217 3 February 2017 (2017-02-03), XP051227257,
- Retrieved from the Internet:
- URL:http://www.3gpp.org/ftp/tsg_ran/WG6_legacyRAN/TSGR6_03/Docs/ [retrieved on 2017-02-03]

Possible steps after receipt of the international search report (ISR) and written opinion of the International Searching Authority (WO/ISA)

General information

For all international applications, the competent International Searching Authority (ISA) will establish an international search report (ISR) accompanied by a written opinion of the International Searching Authority (WO/ISA). The WO/ISA may be responded to by

- filing informal comments with the International Bureau of WIPO (IB) (where no demand for international preliminary examination (**demand**) is filed)
- filing amendments under Art. 19 PCT (this can be done whether or not a **demand** is filed)
- filing amendments under Art. 34 PCT and/or formal observations in response to objections raised in the WO/ISA (where a **demand** is actually filed)

This document explains these possibilities.

Filing informal comments

After receipt of the ISR and WO/ISA, the applicant may file informal comments on the WO/ISA, directly with the IB (see International Search and Preliminary Examination Guidelines 2.15). These will be communicated to the designated/elected Offices, together with the International Preliminary Report on Patentability (IPRP) at 30 months from the priority date.

Amending claims under Art. 19 PCT

The applicant may file amended claims under Art. 19 PCT, directly with the IB by the later of the following dates:

- 2 months from the date of mailing of the ISR and the WO/ISA
- 16 months from the priority date

However, any such amendment received by the IB after the expiration of the applicable time limit shall be **considered to have been received on time** by the IB, if it reaches it **before** the technical preparations for international publication have been completed (the 15th day prior to the date of publication, see PCT Applicant's Guide, International Phase, 9.013).

For further information, please see Rule 46 PCT as well as form PCT/ISA/220.

Please also note that, when filing amended claims under Art. 19 PCT, such amendments shall be **accompanied by a letter** identifying the amendments made and also the basis for the amendments in the application as originally filed (Rule 46.5(b) PCT). Where a **demand** is filed, failure to comply with this requirement may result in the amendments being ignored in the International Preliminary Examination Report (IPER), see Rule 70.2(c-bis) PCT.

**Filing a demand
for international
preliminary
examination**

In principle, the **WO/ISA** will be considered to be the written opinion of the International Preliminary Examining Authority (IPEA). Where the **WO/ISA** issued by the **EPO** as **ISA** gives a positive opinion on the international application and the invention to which it relates, filing a **demand** with the **EPO** as **IPEA** would normally be unnecessary, since a positive IPRP would anyway be established by the **IB** based on the **WO/ISA** (see also further below).

If the applicant wishes to file a **demand** (for example, to allow him to argue his case in international preliminary examination with regard to objections raised in a negative **WO/ISA** before the **IPEA** issues an **IPER**), this must be done before expiration of **3 months after the date of mailing of the ISR and WO/ISA or 22 months after priority date**, whichever expires later (Rule 54*bis* PCT). Amendments under Art. 34 PCT can be filed with the **IPEA**, normally at the same time as filing the demand (Rule 66.1(b) PCT) or within the time limit set for reply to any written opinion issued during international preliminary examination by the **IPEA**.

If a **demand** is filed at the **EPO** as **IPEA** and no comments/amendments have been received by the time the **EPO** starts drawing up the **IPER** (Rule 66.4*bis* PCT), the **WO/ISA** will be transformed by the **IPEA** into an **IPER** (also called the **IPRP (Chapter II)** which would merely reflect the content of the **WO/ISA** (OJ 10/2011, 532). The **demand** can still be withdrawn (Art. 37 PCT).

Please also note that, when filing amendments under Art. 34 PCT, such amendments shall be accompanied by a letter which identifies the amendments made and also the basis for the amendments in the application as originally filed (Rule 66.8(a) PCT). Failure to comply with this requirement may result in the amendments being ignored in the **IPER (IPRP (Chapter II))**, see Rule 70.2(c-*bis*) PCT.

**Filing a request
for supplementary
international
search**

The applicant may, with the **IB**, file a request for **supplementary international search** under Rule 45*bis*.1 PCT. The present **ISR** and **WO/ISA** may also be taken into account in the execution of that supplementary international search, provided that these are available to the Authority charged with this task before it starts the supplementary search (Rule 45*bis*.5 PCT).

This kind of request **cannot be filed specifying the ISA** who did the **international search**.

More information on this topic can be found in the **PCT Applicant's Guide**, Chapter 8 (<http://www.wipo.int/pct/en/guide/ip08.html>).

**End of the
international
phase**

Where no **demand** is filed, at the end of the international phase, the **IB** will transform the **WO/ISA** into the **IPRP (PCT Chapter I)** (Rule 44*bis* PCT), which will then be transmitted together with possible informal comments to the designated Offices. Where a demand is filed, the **WO/ISA** is not transformed into an **IPRP (Chapter I)** by the **IB**, but rather the **IPEA** will establish an **IPER**, (the **IPER** is the same as the **IPRP (PCT Chapter II)**, see Rule 70.15 PCT).

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CLAIMS:

1. A Serving GPRS Support Node (SGSN) (307) configured to interact with a Base Station Subsystem (BSS) (302₂), the SGSN comprising:
 - 5 a processor (346); and,
 - a memory (348) that stores processor-executable instructions, wherein the processor interfaces with the memory to execute the processor-executable instructions, whereby the SGSN is operable to:
 - receive (1102), from the BSS, a BSS General Packet Radio Service (GPRS) Protocol (BSSGP) POSITION-COMMAND Packet Data Unit (PDU) (400) which includes
 - 10 (i) a Radio Resource Location Services Protocol (RRLP) PDU (402), wherein the RRLP PDU includes a RRLP Multilateration Timing Advance (MTA) Request message (404) intended for a target wireless device (304₃), and (ii) an indicator (520, 535) that the target wireless device is to perform a MTA procedure;
 - 15 transmit (1104), to the BSS, a BSSGP Down Link (DL)-UNITDATA PDU (410) which includes a Logical Link Control (LLC) PDU (406) intended for the target wireless device, wherein the LLC PDU includes the RRLP PDU, wherein the RRLP PDU further includes the RRLP MTA Request Message, wherein the BSSGP DL-UNITDATA PDU further includes a flag (420) which indicates to the BSS a need to estimate timing advance
 - 20 information (413) when receiving a Packet Associated Control Channel (PACCH) acknowledgment (422) from the target wireless device.
2. The SGSN of claim 1, wherein the indicator is a Multilateration Timer Information Element (520) that includes a timer value (509) indicating a duration that the
- 25 target wireless device is to perform the MTA procedure.
3. The SGSN of claim 1, wherein the flag is an information element (420a).
4. The SGSN of claim 1, wherein the Packet Associated Control Channel (PACCH) Packet Downlink acknowledgment is an Extended Coverage (EC) PACCH Packet
- 30 Downlink acknowledgment.

5. A method (1100) implemented in a Serving GPRS Support Node (SGSN) (307) configured to interact with a Base Station Subsystem (BSS) (302₂), the method comprising:

receiving (1102), from the BSS, a BSS General Packet Radio Service (GPRS) Protocol (BSSGP) POSITION-COMMAND Packet Data Unit (PDU) (400) which includes

5 (i) a Radio Resource Location Services Protocol (RRLP) PDU (402), wherein the RRLP PDU includes a RRLP Multilateration Timing Advance (MTA) Request message (404) intended for a target wireless device (304₃), and (ii) an indicator (520, 535) that the target wireless device is to perform a MTA procedure;

transmitting (1104), to the BSS, a BSSGP Down Link (DL)-UNITDATA PDU (410)
10 which includes a Logical Link Control (LLC) PDU (406) intended for the target wireless device, wherein the LLC PDU includes the RRLP PDU, wherein the RRLP PDU further includes the RRLP MTA Request Message, wherein the BSSGP DL-UNITDATA PDU further includes a flag (420) which indicates to the BSS a need to estimate timing advance information (413) when receiving a Packet Associated Control Channel (PACCH)
15 acknowledgment (422) from the target wireless device.

6. The method of claim 5, wherein the indicator is an Multilateration Timer Information Element (520) that includes a timer value (509) indicating a duration that the
20 target wireless device is to perform the MTA procedure.

7. The method of claim 5, wherein the flag is an information element (420a).

8. The method of claim 5, wherein the Packet Associated Control Channel (PACCH) Packet Downlink acknowledgment is an Extended Coverage (EC) PACCH Packet
25 Downlink acknowledgment.

9. A Base Station Subsystem (BSS) (302₂) configured to interact with a Serving GPRS Support Node (SGSN) (307) and a target wireless device (304₃), the BSS comprising:

30 a processor (332₂) ; and,

a memory (334₂) that stores processor-executable instructions, wherein the processor interfaces with the memory to execute the processor-executable instructions, whereby the BSS is operable to:

transmit (1302), to the SGSN, a BSS General Packet Radio Service (GPRS) Protocol (BSSGP) POSITION-COMMAND Packet Data Unit (PDU) (400) which (i) includes a Radio Resource Location Services Protocol (RRLP) PDU (402), wherein the RRLP PDU includes a RRLP Multilateration Timing Advance (MTA) Request message (404) intended for the target wireless device, and (ii) an indicator (520, 535) that the target wireless device is to perform a MTA procedure;

receive (1304), from the SGSN, a BSSGP Down Link (DL)-UNITDATA PDU (410) which includes a Logical Link Control (LLC) PDU (406) intended for the target wireless device, wherein the LLC PDU includes the RRLP PDU, wherein the RRLP PDU further includes the RRLP MTA Request Message;

transmit (1306), to the target wireless device, the LLC PDU which includes the RRLP PDU, wherein the RRLP PDU further includes the RRLP MTA Request Message;

in response to transmitting the LLC PDU, receive (1308) a Packet Associated Control Channel (PACCH) acknowledgment (422) from the target wireless device; and,

when receiving the PACCH acknowledgment, estimate (1310) timing advance information (413) associated with the PACCH acknowledgment, wherein the BSS is informed of a need to estimate the timing advance information when receiving the PACCH acknowledgment by a flag (420) within the BSSGP DL-UNITDATA PDU.

10. The BSS of claim 9, wherein the indicator is an Multilateration Timer Information Element (520) that includes a timer value (509) indicating a duration that the target wireless device is to perform the MTA procedure.

11. The BSS of claim 9, wherein the flag is an information element (420a).

12. The BSS of claim 9, wherein the Packet Associated Control Channel (PACCH) Packet Downlink acknowledgment is an Extended Coverage (EC) PACCH Packet Downlink acknowledgment.

13. The BSS of claim 9, wherein the BSS when performing the estimate operation is further operable to use at least one of an oversampling process and an interpolation process when receiving the PACCH acknowledgment to estimate the timing advance information.

5 14. The BSS of claim 9, wherein the BSS is further operable to transmit (1312), to a Serving Mobile Location Center (SMLC), a BSSMAP Connection Oriented Message (424) which includes (i) the estimated timing advance information; and (ii) accuracy information (415) associated with the target wireless device.

10 15. A method (1300) implemented in a Base Station Subsystem (BSS) (302₂) configured to interact with a Serving GPRS Support Node (SGSN) (307) and a target wireless device (304₃), the method comprising:

transmitting (1302), to the SGSN, a BSS General Packet Radio Service (GPRS) Protocol (BSSGP) POSITION-COMMAND Packet Data Unit (PDU) (400) which includes
15 (i) a Radio Resource Location Services Protocol (RRLP) PDU (402), wherein the RRLP PDU includes a RRLP Multilateration Timing Advance (MTA) Request message (404) intended for the target wireless device, and (ii) an indicator (520, 535) that the target wireless device is to perform a MTA procedure;

receiving (1304), from the SGSN, a BSSGP Down Link (DL)-UNITDATA PDU
20 (410) which includes a Logical Link Control (LLC) PDU (406) intended for the target wireless device, wherein the LLC PDU includes the RRLP PDU, wherein the RRLP PDU further includes the RRLP MTA Request Message;

transmitting (1306), to the target wireless device, the LLC PDU includes the RRLP PDU, wherein the RRLP PDU further includes the RRLP MTA Request Message;

25 in response to transmitting the LLC PDU, receiving (1308) a Packet Associated Control Channel (PACCH) acknowledgment (422) from the target wireless device; and,

when receiving the PACCH acknowledgment, estimating (1310) timing advance information (413) associated with the PACCH acknowledgment, wherein the BSS is informed of a need to estimate the timing advance information when receiving the PACCH
30 acknowledgment by a flag (420) within the BSSGP DL-UNITDATA PDU.

16. The method of claim 15, wherein the indicator is an Multilateration Timer Information Element (520) that includes a timer value (509) indicating a duration that the target wireless device is to perform the MTA procedure.

5 17. The method of claim 15, wherein the flag is an information element (420a).

18. The method of claim 15, wherein the Packet Associated Control Channel (PACCH) Packet Downlink acknowledgment is an Extended Coverage (EC) PACCH Packet Downlink acknowledgment.

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19. The method of claim 15, wherein the step of estimating further comprises a step of using at least one of an oversampling process and an interpolation process when receiving the PACCH acknowledgment to estimate the timing advance information.

15 20. The method of claim 15, further comprising a step of transmitting (1012), to a Serving Mobile Location Center (SMLC), a BSSMAP Connection Oriented Message (424) which includes (i) the estimated timing advance information; and (ii) accuracy information (415) associated with the target wireless device.

20 21. A wireless device (304₃) configured to interact with a Base Station Subsystem (BSS) (302₂), the wireless device comprising:

a processor (318₃); and,

a memory (320₃) that stores processor-executable instructions, wherein the processor interfaces with the memory to execute the processor-executable instructions, whereby the
25 wireless device is operable to:

receive (1502), from the BSS, a Logical Link Control (LLC) Packet Data Unit (PDU) (406), wherein the LLC PDU includes a Radio Resource Location Service Protocol (RRLP) PDU (402), wherein the RRLP PDU further includes a RRLP Multilateration Timing Advance Request Message (404) which indicates that the wireless device does not
30 need to perform a Multilateration Timing Advance procedure in a serving cell; and,

in response to receiving the LLC PDU, transmit (1504) a Packet Associated Control Channel (PACCH) acknowledgment (422) to the BSS.

22. The wireless device of claim 21, wherein the Packet Associated Control Channel (PACCH) Packet Downlink acknowledgment is an Extended Coverage (EC) PACCH Packet Downlink acknowledgment.

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23. A method (1500) implanted in a wireless device (304₃) configured to interact with a Base Station Subsystem (BSS) (302₂), the method comprising:

receiving (1502), from the BSS, a Logical Link Control (LLC) Packet Data Unit (PDU) (406), wherein the LLC PDU includes a Radio Resource Location Service Protocol (RRLP) PDU (402), wherein the RRLP PDU further includes a RRLP Multilateration Timing Advance Request Message (404) which indicates that the wireless device does not need to perform a Multilateration Timing Advance procedure in a serving cell; and,

in response to receiving the LLC PDU, transmitting (1504) a Packet Associated Control Channel (PACCH) acknowledgment (422) to the BSS.

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24. The method of claim 23, wherein the Packet Associated Control Channel (PACCH) Packet Downlink acknowledgment is an Extended Coverage (EC) PACCH Packet Downlink acknowledgment.

Recuadro No. V Declaración razonada bajo el Artículo 35(2) con relación a la novedad, nivel inventivo o aplicación industrial; citaciones y explicaciones que soportan dicha declaración

1. Declaración

Novedad (N)	Sí:	Reivindicaciones	<u>1-24</u>
	No:	Reivindicaciones	
Nivel inventivo (NI)	Sí:	Reivindicaciones	<u>1-24</u>
	No:	Reivindicaciones	
Aplicación industrial (AI)	Sí:	Reivindicaciones	<u>1-24</u>
	No:	Reivindicaciones	

2. Citaciones y explicaciones (Regla 70.7):

ver hoja separada

Recuadro No. VI Ciertos documentos citados

1. Ciertos documentos publicados (Reglas 43bis.1 y 70.10)

y/o

2. Divulgaciones no escritas (Reglas 43bis.1 y 70.9)

ver formulario 210

(HOJA SEPARADA)

Re Ítem V

Declaración razonada con relación a la novedad, nivel inventivo o aplicación industrial; citaciones y explicaciones que soportan dicha declaración

Se hace referencia a los siguientes documentos:

- D1 LM ERICSSON: “Procedimiento de Multilateración – Sólo TA”, 3GPP DRAFT; R6-160273 – PROCEDIMIENTO DE MULTILATERACION – SOLO TA (ERA R6-160261), PROYECTO DE ASOCIACION DE 3ª GENERACION (3GPP), CENTRO DE COMPETENCIA MOVIL; 650, ROUTE DES LUCIOLES; F-06921 SOPHIA-ANTIPOLIS CE, No. Reno, Nevada, EE.UU.; 20161114 – 20161118 18 de noviembre de 2016 (2016-11-18), XP051198955, Recuperado del Internet: [URL:http://www.3gpp.org/ftp/tsg_ran/WG6_legacyRAN/TSGR6_02/Docs/](http://www.3gpp.org/ftp/tsg_ran/WG6_legacyRAN/TSGR6_02/Docs/) [recuperado en 2016-11-18]
- D2 ERICSSON LM: “Introducción de Multilateración”, 3GPP DRAFT; R6-160274 CR 43.059 INTRODUCCION DE MULTILATERACION USANDO AVANCE EN TIEMPO, PROYECTO DE ASOCIACION DE 3ª GENERACION (3GPP), CENTRO DE COMPETENCIA MOVIL; 650, ROUTE DES LUCIOLES; F-06921 SOPHIA-ANTIPOL, vol. TSG RAN, no. Reno, Nevada EE.UU.; 20161114 – 20161118 18 de noviembre de 2016 (2016-11-18), XP051198956, Recuperado de internet: [URL:http://www.3gpp.org/ftp/tsg_ran/WG6_legacyRAN/TSGR6-02/Docs/](http://www.3gpp.org/ftp/tsg_ran/WG6_legacyRAN/TSGR6-02/Docs/) [recuperado en 2016-11-18] citado en la solicitud
- D3 ERICSSON: “Mejoras de posicionamiento para GERAN – introducción a trilateración Avanzada en Tiempo”, 3GPP DRAFT; RP-161034 – MEJORAS DE POSICIONAMIENTO PARA GERAN – INTRODUCCION A TRILATERACION TA, PROYECTO DE ASOCIACION DE 3ª
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GENERACION (3GPP), CENTRO DE COMPETENCIA MOVIL; 650, ROUTE DES LUCIOLES; F-06921 SOPHI, vol. TSG RAN, No. Busan, Corea; 20160613 – 20160616 12 de junio de 2016 (2016-06-12), XP051103882, Recuperado de Internet:

[URL:http://www.3gpp.org/ftp/Meetings_3GPP_SYNC/RAN/Docs/](http://www.3gpp.org/ftp/Meetings_3GPP_SYNC/RAN/Docs/)

[recuperado en 2016-06-12] citado en la solicitud

D4 ERICSSON: “Posicionamiento de múltiples ramas a base de tiempo avanzado para NB-IoT”, 3GPP DRAFT; R1-167426 – POSICIONAMIENTO DE MULTIPLES RAMAS A BASE DE TIEMPO AVANZADO PARA NB-IOT, PROYECTO DE ASOCIACION DE 3ª GENERACION (3GPP), CENTRO DE COMPETENCIA MOVIL; 650, ROUTE DES LUCIOLES; F-06921 SOPHIA-ANTIPOL, vol. RAN WG1, no. Gothenburg, Suecia; 20160822 – 20160826 21 de agosto de 2016 (2016-08-21), XP051125896, Recuperado de internet:

[URL:http://www.3gpp.org/ftp/Meetings_3GPP_SYNC/RAN1/Docs/](http://www.3gpp.org/ftp/Meetings_3GPP_SYNC/RAN1/Docs/)

[recuperado en 2016-08-21] citado en la solicitud

1 D1 es considerado como el más cercano en el arte previo a la materia objeto de la reivindicación 1, y divulga:

1.1 Un Nodo de Soporte de Servicio GPRS, SGSN, (ver párrafo 6: SGSN) configurado para interactuar con un Subsistema de Estación Base, BSS (ver párrafo 5: BSS), el SGSN comprende:

un procesador; y

una memoria que almacena instrucciones ejecutables por procesador, en donde el procesador interactúa con la memoria para ejecutar las instrucciones ejecutables por procesador, por lo cual el SGSN es operable para:

recibir (ver párrafo 6: *La entidad BSSGP en el SGSN extrae el mensaje RRLP embebido (es decir, el componente de “Solicitud de Multilateración”) del IE “RRLP APDU” recibido en el “PDU DE POSICION-COMANDO BSSGP” y lo envía a la entidad de protocolo TOM*), del BSS, una Unidad de Datos de Protocolo PDU de Servicio de Radio de Paquete General BSS, GPRS, Protocolo, BSSGP, POSICION-COMANDO (ver párrafo 10.5.4: *PDU DE POSICION-COMANDO*) que incluye (i) una PDU de Servicios de Ubicación de Recurso de Radio, RRLP (ver párrafo 11.3.49: *APDU RRLP*), en donde la PDU RRLP incluye un Avance de Tiempo de Multilateración, MTA, de RRLP (ver párrafo 6: *mensaje RRLP embebido*) destinado para un dispositivo inalámbrico objetivo (ver párrafo 6: *MS*), y (ii) un indicador (ver párrafo 4.8: *Solicitud de Multilateración MTAO*) que el dispositivo inalámbrico objetivo va a realizar un procedimiento MTA;

transmitir (ver párrafo 6: *La PDU LLC es enviada al BSS en servicio*), al BSS; una PDU BSSGO de Enlace Descendente, -UNITDATA que incluye una PDU de Control de Enlace Lógico, LLC (ver párrafo 6: *La entidad LLC genera una PDU LLC (que contiene la PDU TOM)*) destinada para el dispositivo inalámbrico objetivo, en donde la PDU LLC incluye la PDU RRLP, en donde al PDU RRLP además incluye un Mensaje de Solicitud MTA RRLP (ver párrafo 6: *La entidad BSSGP en el SGSN extrae el mensaje RRLP embebido (es decir, el componente de “Solicitud de Multilateración”) del IE “APDU RRLP” recibido en el “PDU BSSGP POSICION-COMANDO” y lo envía a la entidad de protocolo TOM. La entidad de protocolo TOM antepone el encabezado de protocolo TOM (1 octeto) al mensaje RRLP embebido y envía la PDU TOM resultante a la entidad LLC usando el SAP TOM*).

La materia objeto de la reivindicación 1, por lo tanto, difiere de este SGSN conocido en que la PDU BSSGP DL-UNITDATA además incluye una

bandera que indica al BSS una necesidad de calcular la información de avance de tiempo cuando recibe un reconocimiento de Canal de Control Asociado de Paquete, PACCH, del dispositivo inalámbrico objetivo, y, por lo tanto, es novedosa (Artículo 33(2) del PCT).

El problema a resolver por la presente invención puede ser considerado en como tener al BSS que calcule un “Avance de Tiempo” (ser Suposición de Trabajo 12)

La solución a este problema propuesta en la reivindicación 1 de la presente solicitud se considera que involucra un nivel inventivo (Artículo 33(3) del PCT) por las siguientes razones:

Ningún otro documento en el arte previo enseña o sugiere el uso de la característica distinguible anterior para este propósito. La solución directa partiendo de D1 que consideraría el experto en la materia sería reutilizar un tipo PDU BSSGP conocido por ser usado para propósitos de señalización, o crear un nuevo tipo PDU BSSGP de señalización, pero, en cualquier caso, la solución directa sería usar una PDU BSSGP de señalización enviada por el SGSN al BSS en un BVC de señalización para informar al BSS que necesita calcular la información de avance de tiempo cuando recibe un reconocimiento de Canal de Control Asociado de Paquete, PACCH, del dispositivo inalámbrico objetivo, en lugar de una bandera en la PDU BSSGP DL-UNITDATA como se especificó anteriormente, el cual es enviado en un BVC de Celda. Ninguno de los documentos D2, D3 y D4 tampoco divulga o sugiere las características distinguibles.

- 1.2 El mismo razonamiento anterior aplica de forma correspondiente al método de la reivindicación 5, el cual, por lo tanto, es considerado como novedoso (Artículo 33(2) del PCT) e involucra un nivel inventivo (Artículo 33(3) del PCT).
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- 2 D1 es considerado que es el más cercano en el estado del arte a la materia objeto de la reivindicación 9, y divulga:
- 2.1 Un Subsistema de Estación Base, BSS (ver párrafo 5: *BSS*) configurado para interactuar con un Nodo de Soporte de Servicio GPRS, SGSN, (ver párrafo 6: *SGSN*) y un dispositivo inalámbrico objetivo (ver párrafo 6: *MS*), el BSS comprende:
- un procesador; y
- una memoria que almacena instrucciones ejecutables por procesador, en donde el procesador interactúa con la memoria para ejecutar las instrucciones ejecutables por procesador, por lo cual el BSS es operable para:
- transmitir (ver párrafo 5: *La entidad BSSGP en el BSS envía al SGSN un "PDU BSSGP POSICION-COMANDO" (ver Paso 6 en Figura 1) e incluye el mensaje RRLP embebido (es decir, el componente de "Solicitud de Multilateración") recibido de la entidad LCS en el BSS como el mensaje RRLP embebido dentro del IE "RRLP APDU" del "PDU BSSGP POSICION-COMANDO"*), al SGSN, una Unidad de Datos de Paquete, PDU, de Protocolo BSSGP de Servicio de Radio de Paquete General, GPRS, BSS POSICION-COMANDO (ver párrafo 10.5.4: *PDU POSICION-COMANDO*) el cual incluye (i) una PDU de Servicios de Ubicación de Recurso de Radio, RRLP (ver párrafo 11.3.49: *APDU RRLP*), en donde la PDU RRLP incluye un Avance de Tiempo de Multilateración, MTA, de RRLP. El mensaje de solicitud (ver párrafo 6: *mensaje RRLP embebido*) está destinado para el dispositivo inalámbrico objetivo (ver párrafo 6: *MS*), y (ii) un indicador (ver párrafo 4.8: *Solicitud de Multilateración MTAO*) que el dispositivo inalámbrico objetivo va a realizar un procedimiento MTA; recibir (ver párrafo 6: *La PDU LLC es enviada al BSS en servicio*), del SGSN, una PDU BSSGP de Enlace Descendente, -UNITDATA que incluye
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una PDU de Control de Enlace Lógico, LLC (ver párrafo 6: *La entidad LLC genera una PDU LLC (que contiene la PDU TOM)*) destinada para el dispositivo inalámbrico objetivo, en donde la PDU LLC incluye la PDU RRLP, en donde la PDU RRLP además incluye un Mensaje de Solicitud MTA RRLP (ver párrafo 6: *La entidad BSSGP en el SGSN extrae el mensaje RRLP embebido (es decir, el componente de “Solicitud de Multilateración”) del IE “APDU RRLP” recibido en el “PDU BSSGP POSICION-COMANDO” y lo envía a la entidad de protocolo TOM. La entidad de protocolo TOM antepone el encabezado de protocolo TOM (1 octeto) al mensaje RRLP embebido y envía la PDU TOM resultante a la entidad LLC usando el SAP TOM*).

La materia objeto de la reivindicación 9, por lo tanto, difiere de este BSS conocido en que en respuesta a transmitir la PDU LLC, este recibe un reconocimiento de Canal de Control Asociado de Paquete, PACCH, del dispositivo inalámbrico objetivo; y

cuando recibe el reconocimiento PACCH, este calcula la información de avance de tiempo asociada con el reconocimiento PACCH, en donde el BSS es informado de una necesidad de calcular la información de avance de tiempo cuando se recibe el reconocimiento PACCH por medio de una bandera dentro de la PDU BSSGP DL-UNITDATA, y por lo tanto, es novedosa (Artículo 33(2) del PCT).

El problema a resolver por la presente invención puede ser considerado en como tener al BSS que calcule un “Avance de Tiempo” (ser Suposición de Trabajo 12).

La solución a este problema propuesta en la reivindicación 9 de la presente solicitud se considera que involucra un nivel inventivo (Artículo 33(3) del PCT) por las siguientes razones:

Ningún otro documento en el arte previo enseña o sugiere el uso de la característica distinguible anterior para este propósito. La solución directa partiendo de D1 que consideraría el experto en la materia sería reutilizar un tipo PDU BSSGP conocido por ser usado para propósitos de señalización, o crear un nuevo tipo PDU BSSGP de señalización, pero, en cualquier caso, la solución directa sería usar una PDU BSSGP de señalización enviada por el SGSN al BSS en un BVC de señalización, en lugar de una bandera en la PDU BSSGP DL-UNITDATA como se especificó anteriormente, el cual es enviado en un BVC de Celda. Además, D1 no sugiere el uso del reconocimiento PACCH recibido del MS para realizar el cálculo. Ninguno de los documentos D2, D3 y D4 tampoco divulga o sugiere las características distinguibles.

2.2 El mismo razonamiento anterior aplica de forma correspondiente al método de la reivindicación 15, el cual, por lo tanto, es considerado novedoso (Artículo 33(2) del PCT) y que involucra un nivel inventivo (Artículo 33(3) del PCT).

3 D1 es considerado como el más cercano en el arte previo a la materia objeto de la reivindicación 21, y divulga:

3.1 Un dispositivo inalámbrico (ver párrafo: *MS*) configurado para interactuar con un Subsistema de Estación Base, BSS (ver párrafo 5: *BSS*), el dispositivo inalámbrico comprende:

un procesador; y

una memoria que almacena instrucciones ejecutables por procesador, en donde el procesador interactúa con la memoria para ejecutar las instrucciones ejecutables por procesador, por lo cual el dispositivo inalámbrico es operable para:

recibir (ver párrafo 6: *La PDU LLC es enviada al BSS en servicio el cual establece un TBF de enlace descendente y entrega el LLC*), del BSS, una

LLC, PDU (ver párrafo 6: *La entidad LLC genera una PDU LLC (que contiene la PDU TOM)*), en donde la PDU LLC incluye una PDU de Protocolo de Localización de Recurso de Radio, RRLP, en donde la PDU RRLP además incluye un Mensaje de Solicitud de Avance de Tiempo de Multilateración RRLP (ver párrafo 6: *La entidad BSSGP en el SGSN extrae el mensaje RRLP embebido (es decir, el componente de “Solicitud de Multilateración”) del IE “APDU RRLP” recibido en el “PDU BSSGP POSICION-COMANDO” y lo envía a la entidad de protocolo TOM. La entidad de protocolo TOM antepone el encabezado de protocolo TOM (1 octeto) al mensaje RRLP embebido y envía la PDU TOM resultante a la entidad LLC usando el SAP TOM*).

La materia objeto de la reivindicación 21, por lo tanto, difiere de este dispositivo inalámbrico conocido en que el Mensaje de Solicitud MTA RRLP indica que el dispositivo inalámbrico no necesita realizar un procedimiento de Avance de Tiempo de Multilateración en una celda en servicio, y en respuesta a recibir la PDU LLC, transmite un reconocimiento de Canal de Control Asociado de Paquete, PACCH, al BSS, y, por lo tanto, es novedosa (Artículo 33(2) del PCT).

El problema a resolver por la presente invención puede ser considerado en como tener al BSS que calcule un “Avance de Tiempo” (ser Suposición de Trabajo 12).

La solución a este problema propuesta en la reivindicación 21 de la presente solicitud se considera que involucra un nivel inventivo (Artículo 33(3) del PCT) por las siguientes razones:

Ningún otro documento en el arte previo enseña o sugiere el uso de la característica distinguible anterior para este propósito. El experto en la materia partiendo de D1 llegaría a modificar la Solicitud RRLP:MTA con el fin de prevenir que el dispositivo inalámbrico realice intentos de acceso a

TA de multilateración también hacia la celda en servicio. Sin embargo, transmitir además un reconocimiento de Canal de Control Asociado con Paquete, PACCH, al BSS, lo cual permite que el BSS realice el cálculo, no puede ser entregado en una forma directa a partir de D1 y requeriría el uso de comprensión retrospectiva. Ninguno de los documentos D2, D3 y D4 tampoco divulga o sugiere las características distinguibles.

- 3.2 El mismo razonamiento anterior aplica de forma correspondiente al método de la reivindicación 23, el cual, por lo tanto, es considerado como novedoso (Artículo 33(2) del PCT) e involucra un nivel inventivo (Artículo 33(3) del PCT).
- 4 Las reivindicaciones 2-4, 6-8, 10-14, 16-20, 22, 24 son dependientes de una o más reivindicaciones independientes cuya materia objeto es considerada que es novedosa e inventiva, como se indicó anteriormente, y como tal dichas reivindicaciones dependientes también cumplen los requerimientos del PCT con respecto a novedad y nivel inventivo.

Re Ítem VI

Ciertos documentos citados

- D5 NOKIA: "Estimación TA de Celda en Servicio para Posicionamiento de Multilateración", 3GPP DRAFT; R6-170045 ESTIMACION TA DE CELDA EN SERVICIO PARA POSICIONAMIENTO DE MULTILATERACION, PROYECTO DE ASOCIACION DE 3ª GENERACION (3GPP), CENTRO DE COMPETENCIA MOVIL; 650, ROUTE DES LUCIOLES; F-06921 SOPHIA-ANTIPOL, vol. TSG RAN, no. Atenas, Grecia; 20170213 – 20170217 3 de febrero de 2017 (2017-02-03), XP051227257, Recuperado del Internet:
[URL:http://www.3gpp.org/ftp/tsg_ran/WG6_legacyRAN/TSGR6_03/Docs/](http://www.3gpp.org/ftp/tsg_ran/WG6_legacyRAN/TSGR6_03/Docs/)
[recuperado en 2017-02-03]
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REIVINDICACIONES

1. Un Nodo de Soporte del GPRS de Servicio (SGSN) (307) configurado para interactuar con un Subsistema de la Estación de Base (BSS) (302₂), en donde el SGSN comprende:

un procesador (346), y

una memoria (348) que almacena instrucciones ejecutables por procesador, en donde el procesador hace interfase con la memoria para ejecutar las instrucciones ejecutables por procesador, por lo que SGSN es operativo para:

recibir (1102) del BSS una Unidad de Datos de Paquete (PDU) (400) de COMANDO DE POSICIÓN del Protocolo del Servicio General de Radiocomunicaciones por Paquetes (GPRS) del BSS (BSSGP) que incluye (i) una (PDU) (402) del Protocolo de Servicios de Localización de Recursos Radioeléctricos (RRLP) en donde PDU de RRLP incluye un mensaje (404) de Solicitud de Avance de Temporización de Multilateración (MTA) de RRLP destinado para un dispositivo inalámbrico (304₃) blanco, y (ii) un indicador (520, 535) de que el dispositivo inalámbrico blanco está por realizar un procedimiento de MTA, y

transmitir (1104) al BSS una PDU (410) de DATO UNIDAD de Enlace Descendente DL de BSSGP que incluye una PDU (406) de Control de Enlace Lógico (LLC) destinada al dispositivo inalámbrico blanco, en donde PDU de LLC incluye PDU de RRLP. en donde PDU de RRLP además incluye el mensaje de Solicitud de MTA de RRLP y en donde PDU de DATO UNIDAD de DL de BSSGP además incluye una bandera (420) que indica al BSS la necesidad de estimar la información de Avance de Temporización (413) cuando recibe un acuse de recibo (422) del Canal de Control Asociado al Paquete (PACCH) del dispositivo inalámbrico blanco.

2. El SGSN de acuerdo con la reivindicación 1, en donde el indicador es un Elemento de Información del Temporizador de Multilateración (720) que incluye un valor (509) del temporizador indicando una duración que el dispositivo inalámbrico blanco está por realizar el procedimiento MTA.

3. El SGSN de acuerdo con la reivindicación 1, en donde la bandera es un elemento de información (420a).

4. El SGSN de acuerdo con la reivindicación 1, en donde el acuse de recibo PACCH es un acuse de recibo de Enlace Descendente de Paquete PACCH de Cobertura Extendida (EC).

5. Un método (1100) implementado en un Nodo de Soporte del GPRS de Servicio (SGSN) (307) configurado para interactuar con un Subsistema de la Estación de Base (BSS) (302₂), en donde el método comprende:

recibir (1102) del BSS una Unidad de Datos de Paquete (PDU) (400) de COMANDO DE POSICIÓN del Protocolo del Servicio General de Radiocomunicaciones por Paquetes (GPRS) del BSS (BSSGP) que incluye (i) una (PDU) (402) del Protocolo de Servicios de Localización de Recursos Radioeléctricos (RRLP) en donde PDU de RRLP incluye un mensaje (404) de Solicitud de Avance de Temporización de Multilateración (MTA) de RRLP destinado para un dispositivo inalámbrico (304₃) blanco, y (ii) un indicador (520, 535) de que el dispositivo inalámbrico blanco está por realizar un procedimiento de MTA, y

transmitir (1104) al BSS una PDU (410) de DATO UNIDAD de Enlace Descendente DL de BSSGP que incluye una PDU (406) de Control de Enlace Lógico (LLC) destinada al dispositivo inalámbrico blanco, en donde PDU de LLC incluye PDU de RRLP, en donde PDU de RRLP además incluye el mensaje de Solicitud de MTA de RRLP y en donde PDU de DATO UNIDAD de DL de BSSGP además incluye una bandera (420) que indica al BSS la necesidad de estimar la

información de Avance de Temporización (413) cuando recibe un acuse de recibo (422) del Canal de Control Asociado al Paquete (PACCH) del dispositivo inalámbrico blanco.

6. El método de acuerdo con la reivindicación 5, en donde el indicador es un Elemento de Información (520) del Temporizador de Multilateración que incluye un valor (509) del temporizador indicando una duración que el dispositivo inalámbrico blanco está por realizar el procedimiento MTA.

7. El método de acuerdo con la reivindicación 5, en donde la bandera es un elemento de información (420a).

8. El método de acuerdo con la reivindicación 5, en donde el acuse de recibo PACCH es un acuse de recibo de Enlace Descendente de Paquete PACCH de Cobertura Extendida (EC).

9. Un Subsistema de la Estación de Base (BSS) (302₂) configurado para interactuar con un Nodo de Soporte del GPRS de Servicio (SGSN) (607) y un dispositivo inalámbrico (304₃), en donde BSS comprende:

un procesador (332₂), y

una memoria (334₂) que almacena instrucciones ejecutables por procesador, en donde el procesador hace interfase con la memoria para ejecutar las instrucciones ejecutables por procesador, por lo que BSS es operativo para:

transmitir (1302) al SGSN una Unidad de Datos de Paquete (PDU) (400) de COMANDO DE POSICIÓN del Protocolo del Servicio General de Radiocomunicaciones por Paquetes (GPRS) del BSS (BSSGP) que incluye (i) una (PDU) (402) del Protocolo de Servicios de Localización de Recursos Radioeléctricos (RRLP) en donde PDU de RRLP incluye un mensaje (404) de Solicitud de Avance de Temporización de Multilateración (MTA) de RRLP destinado para un dispositivo inalámbrico blanco, y (ii) un indicador (520, 535) de que el dispositivo inalámbrico blanco está por realizar un procedimiento de MTA,

recibir (1304) del SGSN una PDU (410) de DATO UNIDAD de Enlace Descendente DL de BSSGP que incluye una PDU (406) de Control de Enlace Lógico (LLC) destinada al dispositivo inalámbrico blanco, en donde PDU de LLC incluye PDU de RRLP, en donde PDU de RRLP además incluye el mensaje de Solicitud de MTA de RRLP,

transmitir (1306) al dispositivo inalámbrico blanco PDU de LLC que incluye PDU de RRLP, en donde PDU de RRLP además incluye el mensaje de Solicitud de MTA de RRLP,

en respuesta a la transmisión de PDU de LLC, recibe (1308) un acuse de recibo (422) del Canal de Control Asociado al Paquete (PACCH) del dispositivo inalámbrico blanco, y

cuando recibe el acuse de recibo PACCH, estima (1310) la información de Avance de Temporización (413) asociada con el acuse de recibo PACCH, en donde se informa al BSS de la necesidad de estimar la información de Avance de Temporización cuando recibe el acuse de recibo PACCH mediante una bandera (420) dentro del PDU de DATO UNIDAD de DL de BSSGP.

10. BSS de acuerdo con la reivindicación 9, en donde el indicador es un Elemento de Información del Temporizador de Multilateración (520) que incluye un valor (509) del temporizador indicando una duración que el dispositivo inalámbrico blanco está por realizar el procedimiento MTA.

11. BSS de acuerdo con la reivindicación 9, en donde la bandera es un elemento de información (420a).

12. BSS de acuerdo con la reivindicación 9, en donde el acuse de recibo PACCH es un acuse de recibo de Enlace Descendente de Paquete PACCH de Cobertura Extendida (EC).

13. BSS de acuerdo con la reivindicación 9, en donde BSS cuando realiza la operación de estimación es además operativo para usar al menos uno

de un proceso de sobremuestreo y un proceso de interpolación cuando recibe el acuse de recibo PACCH para estimar la información de avance de temporización.

14. BSS de acuerdo con la reivindicación 9, en donde BSS es además operativo para transmitir a un Centro de Localización Móvil de Servicio (SMLC) (311), un Mensaje Orientado a la Conexión (424) de BSSMAP que incluye (i) la información de Avance de Temporización estimado, y (ii) la información de precisión (415) asociada con el dispositivo inalámbrico blanco.

15. Un método (1300) implementado en un Subsistema de la Estación de Base (BSS) (302₂) configurado para interactuar con un Nodo de Soporte del GPRS de Servicio (SGSN) (307) y un dispositivo inalámbrico blanco (304₃), en donde el método comprende:

transmitir (1302) al SGSN una Unidad de Datos de Paquete (PDU) (400) de COMANDO DE POSICIÓN del Protocolo del Servicio General de Radiocomunicaciones por Paquetes (GPRS) del BSS (BSSGP) que incluye (i) una (PDU) (402) del Protocolo de Servicios de Localización de Recursos Radioeléctricos (RRLP) en donde PDU de RRLP incluye un mensaje (404) de Solicitud de Avance de Temporización de Multilateración (MTA) de RRLP destinado para un dispositivo inalámbrico blanco, y (ii) un indicador (520, 535) de que el dispositivo inalámbrico blanco está por realizar un procedimiento de MTA,

recibir (1304) del SGSN una PDU (410) de DATO UNIDAD de Enlace Descendente DL de BSSGP que incluye una PDU (406) de Control de Enlace Lógico (LLC) destinada al dispositivo inalámbrico blanco, en donde PDU de LLC incluye PDU de RRLP, en donde PDU de RRLP además incluye el mensaje de Solicitud de MTA de RRLP,

transmitir (1306) al dispositivo inalámbrico blanco PDU de LLC que incluye PDU de RRLP, en donde PDU de RRLP además incluye el mensaje de Solicitud de MTA de RRLP,

en respuesta a la transmisión de PDU de LLC, recibe (1308) un acuse de recibo (422) del Canal de Control Asociado al Paquete (PACCH) del dispositivo inalámbrico blanco, y

cuando recibe el acuse de recibo PACCH, estima (1310) la información de Avance de Temporización (413) asociada con el acuse de recibo PACCH, en donde se informa al BSS de la necesidad de estimar la información de Avance de Temporización cuando recibe el acuse de recibo PACCH mediante una bandera (420) dentro del PDU de DATO UNIDAD de DL de BSSGP.

16. El método de acuerdo con la reivindicación 15, en donde el indicador es un Elemento de Información (520) del Temporizador de Multilateración que incluye un valor (509) del temporizador indicando una duración que el dispositivo inalámbrico blanco está por realizar el procedimiento MTA.

17. El método de acuerdo con la reivindicación 15, en donde la bandera es un elemento de información (420a).

18. El método de acuerdo con la reivindicación 15, en donde el acuse de recibo PACCH es un acuse de recibo de Enlace Descendente de Paquete PACCH de Cobertura Extendida (EC).

19. El método de acuerdo con la reivindicación 15, en donde el paso de estimación además comprende un paso para usar al menos uno de un proceso de sobremuestreo y un proceso de interpolación cuando recibe el acuse de recibo PACCH para estimar la información de avance de temporización.

20. El método de acuerdo con la reivindicación 15, que además comprende un paso de transmisión (1312) a un Centro de Localización Móvil de Servicio (SMLC) (311), un Mensaje Orientado a la Conexión (424) de BSSMAP que incluye (i) la información de Avance de Temporización estimado, y (ii) la información de precisión (415) asociada con el dispositivo inalámbrico blanco.

21. Un dispositivo inalámbrico (3043) configurado para interactuar

con un Subsistema de la Estación de Base (BSS) (302₂), en donde el dispositivo inalámbrico comprende:

un procesador (318₃), y

una memoria (320₃) que almacena instrucciones ejecutables por procesador, en donde el procesador hace interfase con la memoria para ejecutar las instrucciones ejecutables por procesador, por lo que dispositivo inalámbrico es operativo para:

recibir (1502) del BSS una Unidad de Datos de Paquete (PDU) (406) del Control de Enlace Lógico (LLC), en donde PDU de LLC incluye una PDU (402) del Protocolo de Servicios de Localización de Recursos Radioeléctricos (RRLP), en donde PDU de RRLP además incluye un Mensaje (404) de Solicitud de Avance de Temporización de Multilateración de RRLP que indica que el dispositivo inalámbrico no necesita realizar un procedimiento de Avance de Temporización de Multilateración en una celda de servicio, y

en respuesta a la recepción de PDU de LLC, transmite (1504) un acuse de recibo (422) del Canal de Control Asociado al Paquete (PACCH) al BSS.

22. El dispositivo inalámbrico de acuerdo con la reivindicación 21, en donde el acuse de recibo PACCH es un acuse de recibo de Enlace Descendente de Paquete PACCH de Cobertura Extendida (EC).

23. Un método (1500) implementado en un dispositivo inalámbrico (304₃) configurado para interactuar con un Subsistema de la Estación de Base (BSS) (302₂), en donde el método comprende:

recibir (1502) del BSS una Unidad de Datos de Paquete (PDU) (406) del Control de Enlace Lógico (LLC), en donde PDU de LLC incluye una PDU (402) del Protocolo de Servicios de Localización de Recursos Radioeléctricos (RRLP), en donde PDU de RRLP además incluye un Mensaje (404) de Solicitud de Avance de Temporización de Multilateración de RRLP que indica que el dispositivo inalámbrico

no necesita realizar un procedimiento de Avance de Temporización de Multilateración en una celda de servicio, y

en respuesta a la recepción de PDU de LLC, transmite (1504) un acuse de recibo (422) del Canal de Control Asociado al Paquete (PACCH) al BSS.

24. El método de acuerdo con la reivindicación 23, en donde el acuse de recibo PACCH es un acuse de recibo de Enlace Descendente de Paquete PACCH de Cobertura Extendida (EC).

Source: LM Ericsson

Title: Multilateration Procedure – TA Only

Document for: Discussion

Agenda Item: 7.1.1

Work Item / Release: ePOS_GERAN, REL-14

Abstract of the contribution: This contribution documents a proposed set of stage 3 pseudo CRs Applicable to ePOS_GERAN (blue shaded text in sections 2 through 11 below indicates proposed stage 3 modifications).

1. Working Assumptions

This variation of the Multilateration procedure described herein is referred to as “Multilateration Timing Advance” procedure. It is based on the following working assumptions:

- **Working Assumption 1:** The MS is triggered to perform the Multilateration Timing Advance procedure through reception of a new Multilateration Timing Advance Request RRLP message sent by the SMLC where the MS is assumed to be in the best serving cell upon reception of the RRLP message. (Agreed)
- **Working Assumption 2:** The Multilateration Timing Advance Request RRLP message may include network assistance information that consists of multiple sets of cells which the MS may take into account when performing Multilateration Timing Advance. Other assistance information may also be included in the Multilateration Timing Advance Request RRLP message and may be generated by the SMLC using implementation specific methods or acquired from the serving BSS. (Agreed)
- **Working assumption 3:** The MS autonomously selects the set of cells to use for performing the Multilateration Timing Advance procedure which may include a subset of the cells identified by the assistance information. (Agreed)
- **Working Assumption 4:** New SI and EC-SI information shall indicate whether or not a cell supports the Multilateration Timing Advance procedure using either the RLC Data Block Transmission method or the Extended Access Burst method. This indication may also be included for each of the cells identified by the assistance information sent to the MS in the Multilateration RRLP message. (Open)
- **Working Assumption 5:** If the information a MS needs to perform the Multilateration Timing Advance procedure using any given cell is not provided by the assistance information then it must be acquired by reading SI/EC-SI information sent in that cell prior to performing the procedure therein. (Agreed)
- **Working Assumption 6:** When performing the Multilateration Timing Advance procedure using the RLC Data Block Transmission method a MS sends a single MCS-1 coded RLC data block that

conveys the MS identity (TLLI), "Source Identity" information (i.e. the "Cell Identity" and "Location Area Code" (LAC) received in EC-SI2/SI13 of the cell in which it was triggered to perform Multilateration) and "MS Transmission Accuracy" (applicable to when it transmitted the RLC data block). (Open)

- **Working Assumption 7:** When performing the Multilateration Timing Advance procedure using the Extended Access Burst method a MS sends an extended access burst wherein the payload space conveys the MS identity (Short ID) and "MS Transmission Accuracy" (applicable to when it transmitted the extended access burst). (Open)
- **Working Assumption 8:** The assistance information included within the Multilateration Timing Advance Request RRLP message shall indicate if the MS is to use the RLC Data Block method or the Extended Access Burst method when performing Multilateration Timing Advance for cells identified by the assistance information (if they are used in the procedure). In addition, the assistance information shall indicate if the MS is to use the RLC Data Block method or the Extended Access Burst method when performing Multilateration Timing Advance for cells not identified by the assistance information. (Open)
- **Working Assumption 9:** If BSS determines it has not triggered the Multilateration procedure (i.e. it is a non-serving BSS) it sends the estimated "Timing Advance Value", the "Cell Identity" of the cell for which the Timing Advance value was estimated, the "BTS Reception Accuracy Level" applicable to the BTS that derived the Timing Advance value, the extracted "TLLI/Short ID", the extracted "Source Identity" and the extracted "MS Transmission Accuracy" to the MSC using the BSSAP-LE Connectionless Information message. (Agreed)
- **Working Assumption 10:** The MSC relays the information received from the non-serving BSS to the serving BSS corresponding to the "Source Identity" included in the received BSSAP-LE Connectionless Information message. (Agreed)
- **Working Assumption 11:** If the BSS determines it triggered the Multilateration Timing Advance procedure (i.e. it is the serving BSS) it sends its default SMLC a BSSMAP-LE Connection Oriented Information message that includes the estimated "Timing Advance Value", the "Cell Identity" of the cell for which the Timing Advance value was estimated, the extracted "MS Transmission Accuracy" and the "BTS Reception Accuracy Level" applicable to the BTS that derived the Timing Advance value. (Agreed)
- **Working Assumption 12:** When performing the Multilateration Timing Advance procedure a BSS estimates a "Timing Advance" value of up to 63 symbols and includes the estimated "Timing Advance" value, the applicable "BTS Reception Accuracy Level" and the extracted "MS Transmission Accuracy" within the information it sends to the serving SMLC. (Agreed)
- **Working Assumption 13:** A MS performing packet access as part of the Multilateration Timing Advance procedure shall not be subject to Implicit Reject (when PEO is enabled) or Implicit Reject Status (when EC-GSM is enabled). (Agreed)
- **Working Assumption 14:** A MS may only use the Multilateration Timing Advance procedure if it has enabled PEO or EC-GSM operation (i.e. due to tighter frequency re-use anticipated going forward the use of a 9 bit BSIC is seen to be needed in all Rel-13 and later devices. As such, some

advanced capability will be needed by all Rel-13 and later devices which effectively requires them to support at least partial PEO or EC-GSM capability). (Agreed)

- **Working Assumption 15:** The signalling events of Figure 1 below identify events associated with the “Multilateration Timing Advance” procedure once the location of a target MS has been determined by the SGSN and the corresponding serving BSS has received a “BSSGP PERFORM-LOCATION-REQUEST PDU” from the SGSN. These signalling events shall be used to develop corresponding stage 2 and stage 3 CRs for “Multilateration Timing Advance” within the scope of the Rel-14 ePOS_GERAN work item. (Agreed)

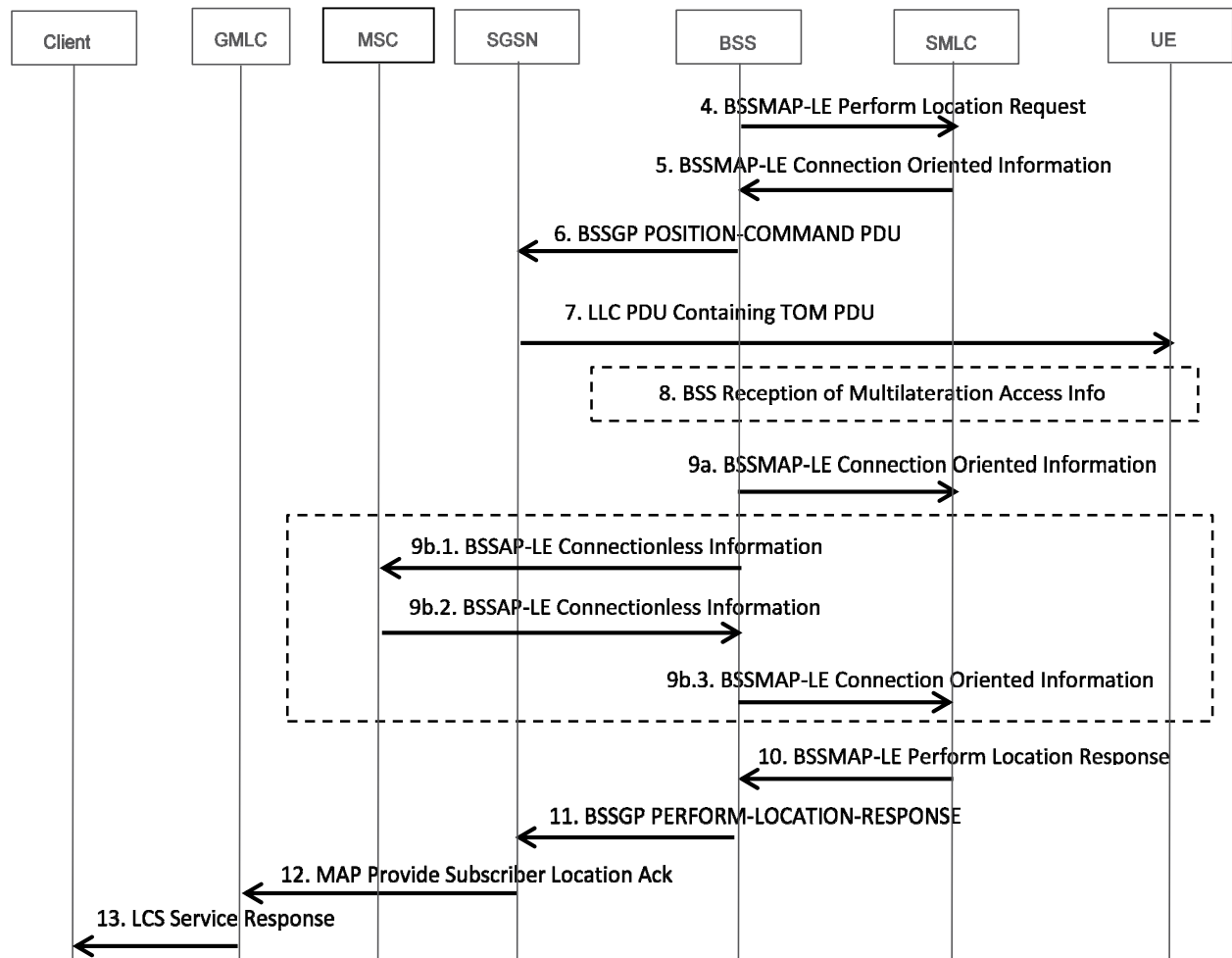


Figure 1 – Multilateration Timing Advance Signalling Events

2. SGSN Receives a Subscriber Location Request from GMLC

Upon receiving a “MAP Provide Subscriber Location” message from a GMLC the SGSN shall page the target MS to identify the serving cell unless the Ready timer is running (i.e. unless the serving cell is already known). The SGSN then sends the BSS managing the serving cell a “BSSGP PERFORM-LOCATION-REQUEST PDU” which includes the “LCS Capability” IE (i.e. this is a legacy IE modified to indicate the MS supports Multilateration as a positioning capability).

7.1 Paging procedure (48.018)

When an SGSN initiates the paging procedure for GPRS services as defined in 3GPP TS 24.008, it shall send one or more PAGING-PS PDUs to the BSS.

When instructed by an MSC/VLR to initiate a paging procedure for non-GPRS services as defined in 3GPP TS 24.008, an SGSN shall send one or more PAGING-CS PDUs to the BSS.

These paging PDUs shall contain the information elements necessary for the BSS to initiate paging for an MS within a group of cells.

The SGSN provides an indication of the cells within which the BSS shall page the MS. The levels of resolution within one BSS are: all cells within the BSS, all cells on the BSS within one location area, all cells on the BSS within one routing area, and one BVC (i.e. cell). A routing area, a location area, or a BSS area is associated with one or more NSEIs. If the cells in which to page the MS are served by several NSEIs then one paging PDU must be sent to each of these NSEIs.

A paging PDU shall be used to generate the corresponding radio interface paging request message(s) to be transmitted at the appropriate time.

It should be noted that each paging PDU relates to only one MS and therefore a BSS may pack pages for different MSs into the relevant 3GPP TS 24.008 or 3GPP TS 44.060 radio interface paging request messages.

In the case of paging for non-GPRS services, the SGSN shall provide the MS's IMSI and DRX Parameters. The SGSN shall also include the Global CN-Id information element in the paging PDU when this information element is received from the MSC/VLR. The Global CN-Id information element is received from the MSC/VLR if paging using only the IMSI parameter as identifier of the MS is performed via the SGSN when the MSC/VLR applies intra domain connection of RAN nodes to multiple CN nodes as described in 3GPP TS 23.236. The BSS shall then buffer this information element until receiving the paging response from the MS in order to route the paging response to the correct MSC/VLR.

In the case of paging for GPRS services, the SGSN shall provide the MS's IMSI. If DRX Parameters are available, the SGSN shall also provide the DRX Parameters. If eDRX Parameters are available, the SGSN shall also provide the eDRX Parameters (see sub-clause 7.1a).

NOTE: The IMSI and the DRX Parameters enable the BSS to derive the paging population number. Paging without DRX parameters may require a considerable extension of the paging duration.

An SGSN may provide the BSSGP with MS specific information, enabling a BSS to execute the paging procedure in an MS specific manner. This includes:

- QoS Profile. The Precedence parameter is set by the upper layers (in the SGSN). The SGSN shall set the bit rate parameter to "best effort". The SGSN shall set the transmission mode to unacknowledged. The BSS shall ignore the received bit rate, the BSSGP SDU type, LLC type, and transmission mode parameters;
- PFI or an aggregate BSS QoS profile information which indicates if the page is for signalling, for SMS, for TOM8, for best-effort, or for a specific packet flow. The aggregate BSS QoS profile in this case is used for paging only and is not stored by the BSS. If both of the optional PFI and ABQP IEs are present, the ABQP takes precedence.
- the most recently received downlink Coverage Class and the cell identity for the cell where the Coverage Class was reported by the MS, if previously received from the BSS in the UL-UNITDATA PDU.
- MS Radio Access Capability defining the radio capabilities of the MS. If there is valid MS Radio Access Capability information known by the SGSN for the associated MS, the SGSN shall include it in the PAGING-PS PDU. Otherwise, the MS Radio Access Capability shall not be present.
- Paging Attempt Information consisting of Paging Attempt Count and Intended Number of Paging Attempts information. If Paging Attempt Information is provided then the Paging Attempt Count field shall be increased by one at each new paging attempt performed for delivering a packet data payload available for delivery. If the SGSN cannot determine the number of intended paging attempts the SGSN shall use the code point 0000 corresponding to 'Information not available'.

If an SGSN provides a P-TMSI in a PAGING-PS PDU, then the BSS shall use the P-TMSI to address the MS. If the SGSN does not provide the P-TMSI in the PAGING-PS PDU, then the BSS shall use the IMSI to address the MS.

If the BSS determines that the nominal paging group of the MS occurs too far into the future (e.g. the BSS is unable to buffer the paging request until the next occurrence of the nominal paging group for the indicated MS) it responds to the PAGING-PS PDU by sending a PAGING-PS-REJECT PDU to the SGSN and includes information indicating the time until the next paging occasion therein.

If an SGSN provides a TLLI in a PAGING-CS PDU and a radio context identified by the TLLI exists within the BSS, then the paging request message shall be directly sent to the MS. If the SGSN does not provide the TLLI in the PAGING-CS PDU or if no radio context identified by the TLLI exists within the BSS, then the BSS shall use the TMSI, if provided in the PAGING-CS PDU, else the IMSI, to address the MS.

The PAGING-CS PDU consists of the parameters described above for a PAGING-PS PDU (except the P-TMSI, PFI, ABQP and QoS profile parameters) and, optionally, some or all of the following parameters; TMSI, TLLI, Global CN-Id, Channel Needed and eMLPP-Priority. The Channel Needed and eMLPP-Priority information shall be handled transparently by the BSS.

The SGSN may send the BSS a DUMMY-PAGING-PS PDU at any time to determine the time until the next paging occasion for the MS indicated therein. The BSS uses the information provided within the DUMMY-PAGING-PS PDU to calculate the time until the next paging occasion for the indicated MS and includes it within a DUMMY-PAGING-PS-RESPONSE PDU it sends back to the SGSN.

When the SGSN receives a "MAP Provide Subscriber Location" message (see 3GPP TS 29.002) from a GMLC it sends a PAGING-PS PDU to each BSS in the set of BSSs managing cells in the paging area corresponding to the target MS. Upon receiving the corresponding page response it sends the BSS managing the serving cell a BSSGP PERFORM-LOCATION-REQUEST PDU which includes the *LCS Capability* IE indicating that the MS supports Multilateration based positioning (see 3GPP TS 43.059).

10.5.1 PERFORM-LOCATION-REQUEST (48.018)

This PDU allows the SGSN to request the BSS to perform a location procedure for the target MS.

PDU type: PERFORM-LOCATION-REQUEST

Direction: SGSN to BSS

Table 10.5.1: PERFORM-LOCATION-REQUEST PDU content (48.018)

Information elements	Type / Reference	Presence	Format	Length
PDU type	PDU type/11.3.26	M	V	1
TLLI	TLLI/11.3.35	M	TLV	6
IMSI	IMSI/11.3.14	M	TLV	5-10
DRX Parameters (note 1)	DRX Parameters/11.3.11	O	TLV	4
BVCI (PCU-PTP)	BVCI/11.3.6	M	TLV	4
NSEI (PCU-PTP)	NSEI/11.3.48	M	TLV	4-?
Location Type	Location Type/11.3.53	M	TLV	3-?
Cell Identifier	Cell Identifier/11.3.9	M	TLV	10
LCS Capability (note 2)	LCS Capability/11.3.59	O	TLV	3-?
LCS Priority	LCS Priority/11.3.57	O	TLV	3-?
LCS QoS	LCS QoS/11.3.50	O	TLV	3-?
LCS Client Type (note 3)	LCS Client Type/11.3.51	C	TLV	3-?
Requested GPS Assistance Data (note 4)	Requested GPS Assistance Data/11.3.52	O	TLV	3-?
IMEI (note 5)	IMEI/11.3.91	O	TLV	10
GANSS Location Type	GANSS Location Type / 11.3.100	C	TLV	3
Requested GANSS Assistance Data (note 6)	Requested GANSS Assistance Data/11.3.99	O	TLV	3-?
eDRX Parameters (note 7)	eDRX Parameters/11.3.122	O	TLV	3
Coverage Class	Coverage Class/11.3.124	O	TLV	3
MS Radio Access Capability (note 8)	MS Radio Access Capability/11.3.22	O	TLV	7-?
NOTE 1: This IE is present if the SGSN has valid DRX Parameters for the TLLI. NOTE 2: This IE is present if the SGSN has received the information from the MS. NOTE 3: This IE is present if the location type indicates a request for a location estimate and is optional otherwise. NOTE 4: This IE is present if GPS assistance data is requested. NOTE 5: The IMEI could be sent in addition to the IMSI for the purpose of allowing correlation between the two identities. NOTE 6: This IE is present if GANSS assistance data is requested. NOTE 7: If the SGSN has valid eDRX Parameters for a TLLI it shall include the eDRX Parameters IE in which case the DRX Parameters IE shall not be included. For the case where PSM is enabled with eDRX and the Active timer is running the SGSN shall always include the negotiated eDRX value in the eDRX Parameters IE. NOTE 8: The field shall be present if there is valid MS Radio Access Capability information for the MS known by the SGSN; the field shall not be present otherwise.				

11.3.59 LCS Capability (48.018)

This information element provides the data/information on LCS Capability. The element coding is:

Table 11.3.59: LCS Capability IE

	8	7	6	5	4	3	2	1
octet 1	IEI							
octet 2, 2a	Length Indicator							
octet 3	Rest of element coded as the value part of the <i>PS LCS Capability</i> IE defined in 3GPP TS 24.008, not including 3GPP TS 24.008 IEI and length indicator							

10.5.5.22 PS LCS Capability (24.008)

The purpose of the *PS LCS Capability* element is to indicate the positioning methods and additional positioning capabilities supported by the MS for the provision of location services (LCS) via the PS domain in Gb-mode.

The *PS LCS Capability* is a type 4 information element with a length of 3 octets.

The *PS LCS Capability* element is coded as shown in figure 10.5.135b/3GPP TS 24.008 and table 10.5.153b/3GPP TS 24.008.

8	7	6	5	4	3	2	1	
PS LCS Capability IEI								octet 1
Length of PS LCS Capability contents								octet 2
Spare	MTA	APC	OTD-	OTD-	GPS-	GPS-	GPS-	octet 3
0	O		A	B	A	B	C	

Figure 10.5.135b/3GPP TS 24.008: *PS LCS Capability* information element
Table 10.5.153b/3GPP TS 24.008 *PS LCS Capability* information element

PS LCS Capability value (octet 3, bit 1 to 5)

MTA (Multilateration Timing Advance)

Bit 7

0	MTA not supported
1	MTA supported

APC (Additional Positioning Capabilities)

Bit 6

0	Additional Positioning Capabilities which can be retrieved by RRLP are not supported
1	Additional Positioning Capabilities which can be retrieved by RRLP are supported

OTD-A (MS assisted E-OTD)

Bit 5

0	MS assisted E-OTD not supported
1	MS assisted E-OTD supported

OTD-B (MS based E-OTD)

Bit 4

0	MS based E-OTD not supported
1	MS based E-OTD supported

GPS-A (MS assisted GPS)

Bit 3

0	MS assisted GPS not supported
1	MS assisted GPS supported

GPS-B (MS based GPS)

Bit 2

0	MS based GPS not supported
1	MS based GPS supported

GPS-C (Conventional GPS)

Bit 1

0	Conventional GPS not supported
1	Conventional GPS supported

Octet 3, bits 8, 7, 6 are spare and shall be coded all 0.

3. Serving BSS Triggers Multilateration

The BSS sends its default SMLC a “BSSMAP-LE Perform Location Request” message that includes the “LCS Capability” IE and the “BSS Multilateration Capability” IE.

9.1 BSSMAP-LE PERFORM LOCATION REQUEST message (49.031)

This message is sent to request a location estimate for a target MS and contains sufficient information to enable location according to the required QoS using any positioning method supported by the PLMN and, where necessary, MS. The message is also used to request LCS assistance data transfer to an MS or request deciphering keys for LCS broadcast assistance data. The message can be sent from the BSS to the SMLC.

Table 9.1: BSSMAP-LE PERFORM LOCATION REQUEST message content

Information element	Type/Reference	Presence	Format	Length in octets
Message type	Message Type	M	V	1
Location Type	Location Type	M	TLV	3-4
Cell Identifier	Cell Identifier	M	TLV	3-10
Classmark Information Type 3	Classmark Information Type 3	O	TLV	2-n
LCS Client Type	LCS Client Type	C	TLV	3
Chosen Channel	Chosen Channel	O	TLV	2-n
LCS Priority	LCS Priority	O	TLV	3
LCS QoS	LCS QoS	O	TLV	6
Requested GPS Assistance Data	Requested GPS Assistance Data	O	TLV	3-n
BSSLAP APDU	APDU	O	TLV	2-n
LCS Capability	LCS Capability	O	TLV	3-n
Packet Measurement Report	Packet Measurement Report	O	TLV	2-n
Measured Cell Identity List	Cell Identity List	O	TLV	6-n
IMSI	IMSI	O (Note 1)	TLV	5-10
IMEI	IMEI	O (Note 1)	TLV	10
GANSS Location Type	GANSS Location Type	C	TLV	3
Requested GANSS Assistance Data	Requested GANSS Assistance Data	O	TLV	3-n
BSS Multilateration Capability	BSS Multilateration Capability	O (Note 2)	TLV	2

NOTE 1: The IMSI should be sent preferably if known. The IMEI could be sent if the IMSI is not known, or in addition to the IMSI for the purpose of allowing correlation between the two identities.

NOTE 2: This IE is included when the BSS supports the Multilateration procedure.

10.26 LCS Capability (49.031)

This is a variable length information element that carries the LCS capabilities for the target MS.

	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2	Length indicator							
Octet 3-n	Rest of element coded as the value part of the LCS Capability information element in 3GPP TS 48.018, not including 3GPP TS 48.018 IEI and length indicator.							

Figure 10.26.1: LCS Capability IE

10.34 BSS Multilateration Capability (49.031)

This is a fixed length information element that indicates the Multilateration capability of the serving BSS.

	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2	spare				BSS Multilateration Capability			

Figure 10.34.1: LCS Capability IE

BSS Multilateration Capability (bits 1 to 4 of octet 2)

4 3 2 1
x x x 1 BSS Supports MTA

All remaining bitmap positions are reserved.

4. SMLC Triggers Multilateration in the MS

The SMLC uses the “LCS Capability” IE received in a “BSSMAP-LE Perform Location Request” message to determine that the Multilateration procedure is to be triggered for the corresponding target MS if the serving BSS supports Multilateration (wherein the presence of the “BSS Multilateration Capability” IE in the received “BSSMAP-LE Perform Location Request” message indicates the BSS supports Multilateration). The SMLC triggers the Multilateration procedure in the MS by sending the serving BSS a “BSSMAP-LE Connection Oriented Information” message (see Step 5 of Figure 1) and thereby becomes the serving SMLC:

- The “BSSLAP APDU” IE in the “BSSMAP-LE Connection Oriented Information” message includes a “MS Position Command” message which includes the “Multilateration Request” component which is delivered to the MS and indicates the MTAO Multilateration procedure is to be performed.
- The “Multilateration Request” component identifies one or more sets of cells wherein the MS autonomously selects which subset of the one or more sets of cells it shall use to perform Multilateration.
- The MS selects the strongest cell from each set of cells it selects for performing Multilateration and may also select one or more additional cells not identified by the “Multilateration Request” component.
- If the MS performs multilateration using a cell associated with a non-serving BSS that does not support Multilateration then the SMLC that triggered Multilateration in the MS (i.e. the serving SMLC) will not receive TA information for the target MS applicable to that cell. This requires the serving SMLC to ensure that each of the cells within each set of cells identified by the “Multilateration Request” component are managed by a BSS that supports Multilateration.

9.8 BSSMAP-LE CONNECTION ORIENTED INFORMATION message (49.031)

This message is sent in association with an existing signaling connection between an SMLC and another entity to transfer information between the SMLC and other entity belonging to a higher level protocol. The message can be sent from a BSS to an SMLC and from an SMLC to a BSS.

Table 9.8: BSSMAP-LE CONNECTION ORIENTED INFORMATION message content

Information element	Type/Reference	Presence	Format	Length in octets
Message type	Message Type	M	V	1
BSSLAP APDU	APDU	M	TLV	3-n
Segmentation	Segmentation	C	TLV	3
Multilateration Positioning Method	Multilateration Positioning Method	C (Note 1)	TLV	2
Cell Identifier	Cell Identifier	C (Note 2)	TLV	7
Multilateration Timing Advance	Multilateration Timing Advance	C (Note 2)	TV	3
NOTE 1: This IE is included when this message is sent from the SMLC to the BSS during the Multilateration procedure.				
NOTE 2: This IE is included when this message is sent from the BSS to the SMLC during the Multilateration procedure.				

10.3 APDU (49.031)

This is a variable length information element that conveys an embedded message or message segment associated with a higher level protocol. When the BSSMAP-LE CONNECTION ORIENTED INFORMATION message is sent from a BSS to a SMLC during the Multilateration procedure this information element is not used (i.e. the “Protocol ID” field shall indicate “reserved”).

	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2-3	Length indicator							
Octet 4	Spare	Protocol ID						
Octet 5 to Octet n	The rest of the information element contains a message or message segment whose content and encoding are defined according to the protocol ID.							

Length Indicator (octets 2-3).

The most significant bit is bit 8 of Octet 2, and the least significant bit is bit 1 in Octet 3. The length indicator defines the total number of octets after length indicator.

Protocol ID (bits 7-1 of octet 4).

0000000 reserved

0000001 BSSLAP

0000010 LLP

0000011 SMLCPP

Embedded Message (octets 5-n)

BSSLAP	the embedded message is as defined in 3GPP TS 48.071
LLP	the embedded message contains a Facility Information Element as defined in 3GPP TS 44.071 excluding the Facility IEI and length of Facility IEI octets defined in 3GPP TS 44.071.
SMLCPP	the embedded message is as defined in 3GPP TS 48.031

4.2.9 MS Position Command (48.071)

The BSSLAP MS Position Command is a message from the SMLC to BSS that contains the following information elements.

Table 4.2.9.1: MS Position Command message content

Information element	Type/Reference	Presence	Format	Length
Message Type	Message Type IE / 5.1	M	V	1
Flag	RRLP flag IE / 5.15	M	TV	2
RRLP Info	RRLP IE / 5.16	M	TLV	3-n

5.16 RRLP IE (48.071)

RRLP IE is coded as:

8	7	6	5	4	3	2	1	
Element identifier								octet 1
Length								octet 2-3
RRLP APDU (3GPP TS 44.031)								octet 4-n

Figure 5.16.1: RRLP IE

10.5 Cell Identifier (49.031)

This is a variable length information element identifying a particular cell.

	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2	Length indicator							
Octet 3	The rest of the information element is coded as the value part of the Cell Identifier IE defined in 3GPP TS 48.008.							

Figure 10.5.1: Cell Identifier IE

3.2.2.17 Cell Identifier (48.008)

This element uniquely identifies a cell within a BSS and is of variable length containing the following fields:

8	7	6	5	4	3	2	1	
Element identifier								octet 1
Length								octet 2
Spare				Cell identification discriminator				octet 3
Cell identification								octet 4-n

The coding of octet 2 is a binary number indicating the length of the remaining element. The length depends on the Cell identification discriminator (octet 3).

The coding of "Cell identification discriminator" (bits 1 to 4 of octet 3) is a binary number indicating if the whole or a part of Cell Global Identification, CGI, according to 3GPP TS 23.003 is used for cell identification in octet 4-n. The "Cell identification discriminator" is coded as follows:

0000	The whole Cell Global Identification, CGI, is used to identify the cell.
0001	Location Area Code, LAC, and Cell Identity, CI, is used to identify the cell.
0010	Cell Identity, CI, is used to identify the cell.
0011	No cell is associated with the transaction.

1000	Intersystem Handover to UTRAN or cdma2000 or E-UTRAN (CS to PS SRVCC to E-UTRAN). PLMN-ID, LAC (or TAC) and RNC-ID (or Extended RNC-ID or Corresponding RNC-ID), is used to identify the target RNC or the target eNB.
1001	Intersystem Handover to UTRAN or cdma2000 or E-UTRAN (CS to PS SRVCC to E-UTRAN). The RNC-ID (or Extended RNC-ID or Corresponding RNC-ID) is used to identify the target RNC or the target eNB.
1010	Intersystem Handover to UTRAN or cdma2000 or E-UTRAN (CS to PS SRVCC to E-UTRAN). LAC (or TAC) and RNC-ID (or Extended RNC-ID or Corresponding RNC-ID) are used to identify the target RNC or the target eNB.
1011	Serving Area Identity, SAI, is used to identify the Serving Area of UE within UTRAN or cdma2000 or to indicate an E-UTRAN source.
1100	LAC, RNC-ID (or Extended RNC-ID) and Cell Identity, CI, is used to identify a UTRAN cell for cell load information.

All other values are reserved.

The coding of octet 4-n depends on the Cell identification discriminator (octet 3). Below the coding is shown for each Cell identification discriminator:

NOTE: no coding is specified for a Cell identification discriminator value of "0011" as no additional information is required.

Coding of Cell Identification for Cell identification discriminator = 0000

8	7	6	5	4	3	2	1	
MCC dig 2				MCC dig 1				octet 4
MNC dig 3				MCC dig 3				octet 5
MNC dig 2				MNC dig 1				octet 6
LAC								octet 7
LAC cont.								octet 8
CI value								octet 9
CI value cont								octet 10

The octets 4-8 are coded as shown in 3GPP TS 24.008, Table 'Location Area Identification information element'.

The octet 5 bits 5-8 are filled by '1111' if 2 digit MNC is used.

The octets 9-10 are coded as shown in 3GPP TS 24.008, Table 'Cell Identity information element'.

10.36 Multilateration Positioning Method (49.031)

This is a fixed length information element that carries information identifying the specific Multilateration positioning method that has been triggered by the SMLC.

	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2	spare				MPM Timer		MPM	

Figure 10.36.1: Multilateration Positioning Method Information

Table 10.36.1: Multilateration Positioning Method information elements

MPM (Multilateration Positioning Method) (bits 1 and 2 of octet 2)	
This field indicates the specific Multilateration positioning method triggered by the SMLC.	
2 1	
0 0	MTA triggered
0 1	reserved
1 0	reserved
1 1	reserved
MPM Timer (bits 3, 4 and 5 of octet 2)	
This field indicates a MTA specific timer value that determines how long the MTA procedure is to run in the BSS. Upon expiration of the MTA specific timer the BSS releases corresponding SCCP connection between the BSS and the SMLC	
3 2 1	
0 0 0	2 seconds
0 0 1	4 seconds
0 1 0	6 seconds
0 1 1	8 seconds
1 0 0	10 seconds
1 0 1	15 seconds
1 1 0	20 seconds
1 1 1	25 seconds

10.37 Multilateration Timing Advance (MTA) (49.031)

This is a fixed length information element that carries information identifying a timing advance value.

	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2	spare	MS Sync Accuracy			BSS Sync Accuracy			MTA High
Octet 3	MTA Low							

Figure 10.37.1: MTA Information

Table 10.37.1: MTA information elements

MS Sync Accuracy (bits 5 to 7 of octet 2)

This field indicates the synchronization accuracy used by the MS when synchronizing to the downlink during the MTAO procedure and is coded as follows:

7	6	5	
0	0	0	MS Sync. Acc <1/16 of symbol period
0	0	1	1/16 of symbol period < MS Sync. Acc <1/8 of a symbol period
0	1	0	1/8 of a symbol period < MS Sync. Acc <3/16 of a symbol period
0	1	1	3/16 of a symbol period < MS Sync. Acc <1/4 of a symbol period
1	0	0	1/4 of a symbol period < MS Sync. Acc <5/16 of a symbol period
1	0	1	5/16 of a symbol period < MS Sync. Acc <3/8 of a symbol period
1	1	0	3/8 of a symbol period < MS Sync. Acc <7/16 of a symbol period
1	1	1	7/16 of a symbol period < MS Sync. Acc <1/2 of a symbol period

BSS Sync Accuracy (bits 2 to 4 of octet 2)

This field indicates the synchronization accuracy used by the BSS when estimating Timing Advance during the MTAO procedure and is coded as follows:

4	3	2	
0	0	0	BSS Sync. Acc <1/16 of symbol period
0	0	1	1/16 of symbol period < BSS Sync. Acc <1/8 of a symbol period
0	1	0	1/8 of a symbol period < BSS Sync. Acc <3/16 of a symbol period
0	1	1	3/16 of a symbol period < BSS Sync. Acc <1/4 of a symbol period
1	0	0	1/4 of a symbol period < BSS Sync. Acc <5/16 of a symbol period
1	0	1	5/16 of a symbol period < BSS Sync. Acc <3/8 of a symbol period
1	1	0	3/8 of a symbol period < BSS Sync. Acc <7/16 of a symbol period
1	1	1	7/16 of a symbol period < BSS Sync. Acc <1/2 of a symbol period

Multilateration Timing Advance (MTA) (octets 2 and 3)

The coding of the MTA field is the binary representation of the timing advance value in 1 symbol increments (values 0 to 63), 1/2 symbol increments (values 0 to 127), 1/4 symbol increments (values 0 to 255) or 1/8 symbol increments (values 0 to 511). The interpretation of this field is based on the value of the "BSS Sync Accuracy" field and the "MS Sync Accuracy" field; 1 symbol period = 48/13 μ s.

3.1 General Format of RRLP Message (44.031)

The general format of the RRLP message is given below, and based on:

- ITU-T Recommendation X.680;
- ITU-T Recommendation X.691;

and is consistent with these ITU-T recommendations. Also further definitions in the present document are based on ASN.1/94 defined in ITU-T Recommendation X.680 (ASN.1 1994). BASIC-PER, unaligned variant is used. Both RRLP ASN.1 modules, RRLP-Messages and RRLP-Components, are based on recommendations presented above.

ASN.1 identifiers have the same name as the corresponding parameters (information elements of the RRLP message, components, elements of components, fields of component elements etc) in other parts of the present document, except for the differences required by the ASN.1 notation (blanks between words are removed, the first letter of the first word is lower-case and the first letter of the following words are capitalized, e.g. "Reference Number" is mapped to "referenceNumber"). In addition some words may be abbreviated as follows:

msr	measure
req	request
rsp	response
nbr	number
ack	acknowledgement

Ellipsis Notation shall be used in the same way as described in 3GPP TS 29.002 and shall be supported on the radio interface by the MS and the network for all operations defined in the present document.

Table 3.1.a: RRLP Message Format

```

RRLP-Messages
-- { RRLP-messages }

DEFINITIONS AUTOMATIC TAGS ::=

BEGIN

IMPORTS
    MsrPosition-Req, MsrPosition-Rsp, AssistanceData,
    ProtocolError, PosCapability-Req, PosCapability-Rsp
FROM
    RRLP-Components      -- { RRLP-Components }
;

PDU ::= SEQUENCE {
    referenceNumber      INTEGER (0..7),
    component             RRLP-Component
}

RRLP-Component ::= CHOICE {
    msrPositionReq       MsrPosition-Req,
    msrPositionRsp       MsrPosition-Rsp,
    assistanceData        AssistanceData,
    assistanceDataAck     NULL,
    protocolError         ProtocolError,
    ...,
    posCapabilityReq      PosCapability-Req,
    posCapabilityRsp      PosCapability-Rsp,
    MTAOMultilaterationReq MTAOMultilateration-Req
}

END

```

The message consists of two information elements, that are further described in the following sub-clauses.

4.8 MTAO Multilateration Request (44.031)

This component is used by the SMLC to request a MS to perform the MTAO procedure. It includes up to 8 sets of non-serving cells. The MS selects the strongest non-serving cell in each set it chooses to use for MTAO and sends an EC MULTILATERATION REQUEST or an EGPRS MULTILATERATION REQUEST (see 3GPP TS 44.018 and 3GPP TS 44.060) thereon, receives a corresponding assignment message and then transmits a RLC data block on the assigned uplink TBF resources. This component is defined as follows:

Table 4.8.a: MTAO Multilateration Request

```
-- add this definition to RRLP-Components module

-- MTAO Multilateration request component
MTAOMultilateration-Req ::= SEQUENCE {
    Cellsets                               CellSets,
}
```

5.1 ASN.1 Description (44.031)

The following ASN.1 code defines the elements of components. See the Annex A for further description of the contents of components and their elements.

Table 5.1.a: ASN.1 Description

```

...

GANSSModelID ::= BIT STRING {
    model1 (0),
    model2 (1),
    model3 (2),
    model4 (3),
    model5 (4),
    model6 (5),
    model7 (6),
    model8 (7) } (SIZE (1..8))

-- indicates assistance data that may be needed by the MS
-- These elements are coded as defined in TS 49.031 with the exceptions defined in section A.8.2.3
AssistanceNeeded ::= SEQUENCE {
    gpsAssistanceData      GPSAssistanceData      OPTIONAL,
    ganssAssistanceData    GANSSAssistanceData    OPTIONAL,
    ...
}

CellSets ::= SEQUENCE {
    CellSet1      CellSet      OPTIONAL,      -- set 1
    CellSet2      CellSet      OPTIONAL,      -- set 2
    CellSet3      CellSet      OPTIONAL,      -- set 3
    CellSet4      CellSet      OPTIONAL,      -- set 4
    CellSet5      CellSet      OPTIONAL,      -- set 5
    CellSet6      CellSet      OPTIONAL,      -- set 6
    CellSet7      CellSet      OPTIONAL,      -- set 7
    CellSet8      CellSet      OPTIONAL      -- set 8
}

CellSet ::= SEQUENCE {
    EARFCN1      ARFCN,
    EARFCN2      ARFCN      OPTIONAL,
    EARFCN3      ARFCN      OPTIONAL,
    EARFCN4      ARFCN      OPTIONAL
}

EARFCN ::= INTEGER (0..1023)

```

5. Serving BSS Forwards RRLP Message to MS

The LCS entity in the BSS determines that the “BSSLAP APDU” IE within a “BSSMAP-LE CONNECTION ORIENTED INFORMATION” message received from the SMLC includes a “MS Position Command” and thereby determines that a RRLP message embedded therein needs to be delivered to the target MS (indicated by “TLI”).

- The LCS entity in the BSS extracts the embedded RRLP message from the “RRLP APDU” within the “MS Position Command” and forwards it to the BSSGP entity in the BSS.

- The BSSGP entity in the BSS sends the SGSN a “BSSGP POSITION-COMMAND PDU” (see Step 6 in Figure 1) and includes the embedded RRLP message (i.e. the “Multilateration Request” component) received from the LCS entity in the BSS as the embedded RRLP message within the “RRLP APDU” IE of the “BSSGP POSITION-COMMAND PDU”.
- Upon determining that the SMLC has triggered the MTAO positioning method the LCS entity in the BSS starts a MTAO specific timer according to the value of the “MPM Timer” field included in the BSSMAP-LE CONNECTION ORIENTED INFORMATION message sent from the SMLC to the BSS to trigger the Multilateration procedure.

10.5.4 POSITION-COMMAND (48.018)

This PDU allows the BSS to request the SGSN to perform the position command procedure.

PDU type: POSITION-COMMAND

Direction: BSS to SGSN

Table 10.5.4: POSITION-COMMAND PDU content

Information elements	Type / Reference	Presence	Format	Length
PDU type	PDU type/11.3.26	M	V	1
TLLI	TLLI/11.3.35	M	TLV	6
BVCI (PCU-PTP)	BVCI/11.3.6	M	TLV	4
RRLP Flags	RRLP Flags/11.3.60	M	TLV	3
RRLP APDU	RRLP APDU/11.3.49	M	TLV	3-?

11.3.49 RRLP APDU (48.018)

This information element conveys an embedded message associated with a higher level protocol. The element coding is:

Table 11.3.49: RRLP APDU IE

	8	7	6	5	4	3	2	1
octet 1	IEI							
octet 2, 2a	Length Indicator							
octet 3-?	The rest of the information element contains an embedded RRLP message whose content and encoding are defined according to the 3GPP TS 44.031. The RRLP protocol is not octet aligned. Therefore, the unused bits in the last octet are padded with zeroes.							

6. RRLP Message Delivered to MS

The BSSGP entity in the SGSN extracts the embedded RRLP message (i.e. the “Multilateration Request” component) from the “RRLP APDU” IE received in the “BSSGP POSITION-COMMAND PDU” and sends it to the TOM protocol entity.

- The TOM protocol entity prepends the TOM protocol header (1 octet) to the embedded RRLP message and sends the resulting TOM PDU to the LLC entity using the TOM SAP (i.e. the existing TOM Protocol Discriminator value = 0010 (RRLP) is used).

- The LLC entity generates an LLC PDU (containing the TOM PDU), applies ciphering + integrity protection to the LLC PDU if required (the information and FCS fields of I frames shall be ciphered whenever ciphering information has been assigned to the TLLI).
- The LLC PDU is sent to the serving BSS which establishes a downlink TBF and delivers the LLC PDU to the target MS using one or more downlink data blocks (see Step 7 in Figure 1).
- The LLC entity at the MS receives the LLC PDU and sends the payload therein to the TOM protocol entity.
- The TOM protocol entity in the MS strips off the TOM protocol header, determines the TOM Protocol Discriminator value = 0010 (RRLP) and therefore delivers the payload (RRLP message) to the RRLP application.

7. MS Performs the Multilateration Procedure

The RRLP application in the MS examines the RRLP message and determines that the “Multilateration Request” component indicating “MTAO” is present. The Multilateration application in the MS acts on the “Multilateration Request” component.

- The “Multilateration Request” component identifies up to 8 sets of cells wherein the MS autonomously selects which subset of these sets of cells it shall use to perform Multilateration.
- The MS selects the strongest cell from each set of cells it selects for performing Multilateration and may also select one or more additional cells not identified by the “Multilateration Request” component.
- The MS sends an access request indicating “Multilateration” in the serving cell and in each of the cells it selects for performing the Multilateration procedure.
- The MS receives an uplink TBF assignment message corresponding to each access request and transmits a RLC data block thereon that includes its “TLLI”, the “Source Identity” (i.e. the “Cell Identity” and “Location Area Code” (LAC) received in SI13 of the cell in which it received the RRLP message) and the “MS Sync Accuracy” (applicable to the MS at the point of sending the RLC data block) to the BSS.

3.5.2 Packet access procedure using CCCH (44.018)

The packet access procedure using CCCH may be used to establish a temporary block flow to support the transfer of LLC PDUs in the direction from the mobile station to the network. Establishment using one phase and two phase packet access, see 3GPP TS 44.060, are supported. The two phase packet access is supported by means of the single block or multiple block packet access option in this procedure, allowing the transfer of a PACKET RESOURCE REQUEST and possibly an ADDITIONAL MS RADIO ACCESS CAPABILITIES message to the network.

The single block packet access option in this procedure may also be used by a mobile station in packet idle mode to transfer an RLC/MAC control message other than the PACKET RESOURCE REQUEST message to the network, see sub-clause 3.5.2.2.

The single block MBMS access option in this procedure shall be used by a mobile station in packet idle mode to transfer the RLC/MAC control message MBMS SERVICE REQUEST message network, see sub-clause 3.5.4.

A MS that has enabled PEO (i.e. eDRX or PSM – see 3GPP TS 23.060 [74]) while in a cell that supports PEO, shall send an EGPRS PACKET CHANNEL REQUEST message with access type ‘PEO One Phase Access Request’ (see Table 3.5.2.1.2.2 and 3GPP TS 44.060 [76]) when attempting to establish a PS connection. An exception case is when it is accessing the network to perform the Multilateration procedure in which case it shall perform packet access in multiple cells (see 3GPP TS 44.031) wherein it sends an EGPRS MULTILATERATION REQUEST message (see 3GPP TS 44.060 [76]) in each of these cells as described in sub-clause 3.5.2.1.2.

3.5.2.1.2 Initiation of the packet access procedure: channel request (44.018)

A mobile station accessing the network when the low priority indicator is set to “MS is configured to NAS signalling low priority” (see 3GPP TS 24.008), when attempting to establish a PS connection, shall, while ignoring MS identities included within PAGING REQUEST messages, start listening to the downlink CCCH until successfully decoding one of the RR messages listed in sub-clause 3.3.1.1.1a. A MS that has enabled PEO shall read the PEO_BCCH_CHANGE_MARK field and the RCC field within the successfully decoded RR message. It shall use the 6 bit BSIC from the most recently read SCH and the RCC field from the decoded RR message to establish a BSIC (see 3GPP TS 45.008). If the BSIC does not match the BSIC value decoded upon first entering the serving cell (see 3GPP TS 45.008) it shall abort the packet access procedure and attempt cell re-selection. If a change of PEO BCCH CHANGE MARK is detected it shall first read SI13 before proceeding with the packet access procedure. If the RR message indicates an implicit reject for the PS domain (see sub-clause 3.3.1.1.1a) the mobile station shall abort the packet access procedure and initiate the implicit reject procedure (see sub-clause 3.3.1.1.3.2a). An exception case is where the mobile station has enabled EC operation and is sending an EC PACKET CHANNEL REQUEST message using the RACH (the *RACH Access Control* field indicates that RACH usage on timeslot number 0 is allowed, see sub-clause 3.5.2a) in which case it proceeds with the packet access without first decoding one of the RR messages listed in sub-clause 3.3.1.1.1a and checking the status of the PEO_BCCH_CHANGE_MARK field or implicit reject information sent therein. Another exception case is where the mobile station has enabled PEO and is accessing the network to perform the Multilateration procedure (see TS 3GPP 44.031) in which case it proceeds with the packet access without checking the status of the implicit reject information.

A MS that has enabled PEO and is accessing the network to perform the Multilateration procedure or is accessing the network when the low priority indicator is set to “MS is not configured for NAS signalling low priority” shall also listen to the downlink CCCH until successfully decoding one of the RR messages listed in sub-clause 3.3.1.1.1a and read the PEO_BCCH_CHANGE_MARK field and RCC field therein. It shall use the 6 bit BSIC from the most recently read SCH and the RCC field from the decoded RR message to establish a BSIC. If the BSIC does not match the BSIC value decoded upon first entering the serving cell (see 3GPP TS 45.008) it shall abort the packet access procedure and attempt cell re-selection. If a change of PEO_BCCH_CHANGE_MARK is detected then it shall first read SI13 prior to performing the packet access.

The network indicates the RCC value corresponding to the serving cell within an IMMEDIATE ASSIGNMENT message using the *IA Rest Octets* IE (see sub-clause 10.5.2.16) or within an IMMEDIATE ASSIGNMENT REJECT message using the *IAR Rest Octets* IE (see sub-clause 10.5.2.17) or within an IMMEDIATE ASSIGNMENT EXTENDED message using the *IAX Rest Octets* IE (see sub-clause 10.5.2.18) or within an IMMEDIATE PACKET ASSIGNMENT message using the *IPA Rest Octets* IE (see sub-clause 10.5.2.78) or within a PAGING REQUEST TYPE 1 message using the *P1 Rest Octets* IE (see sub-clause 10.5.2.23) or within a PAGING REQUEST TYPE 2 message using the *P2 Rest Octets* IE (see sub-clause 10.5.2.24) or within a PAGING REQUEST TYPE 3 message using the *P3 Rest Octets* IE (see sub-clause 10.5.2.25).

A mobile station that has enabled PEO shall, when attempting to establish a PS connection and while ignoring MS identities included within PAGING REQUEST messages, be able to successfully decode an RR message within 500ms of starting to listen to the downlink CCCH. Otherwise, the packet access procedure is aborted, a random access failure is indicated to upper layers and autonomous cell re-selection is performed according to 3GPP TS 43.022.

If a MS that has enabled PEO does not detect a change in the PEO_BCCH_CHANGE_MARK and the time elapsed since it last read SI13 exceeds 24 hours it should read SI13 before proceeding with the packet access procedure.

A mobile station initiates the packet access procedure by leaving idle mode and scheduling the sending of CHANNEL REQUEST or EGPRS PACKET CHANNEL REQUEST or EC PACKET CHANNEL REQUEST or EGPRS MULTILATERATION REQUEST messages on RACH as described in sub-clause 3.3.1.1.2 (i.e. only the portion of sub-clause 3.3.1.1.2 describing message scheduling is used when the packet access procedure is initiated as described in this sub-clause). The cause to be used in the CHANNEL REQUEST message for a non-EGPRS TBF mode capable MS or an EGPRS TBF mode capable MS in a non-EGPRS capable cell depends on the purpose of the packet access procedure as follows:

- If the purpose of the packet access procedure is to send user data and the requested RLC mode is unacknowledged mode, the mobile station shall request a single block packet access and attempt a two phase packet access.
- If the purpose of the packet access procedure is to send user data and the requested RLC mode is acknowledged mode, the mobile station shall request either a one phase packet access or a single block packet access.
- If the purpose of the packet access procedure is to send a Page Response, a Cell update (the mobile station was in GMM READY state before the cell reselection) or for any other GPRS Mobility Management or GPRS Session Management procedure, the mobile station shall request a one phase packet access.
- If the purpose of the packet access procedure is to send a Measurement Report, the mobile station shall request a single block packet access.
- If the purpose of the packet access procedure is to send a PACKET PAUSE message, the mobile station shall request a single block packet access. Upon sending the first CHANNEL REQUEST message the mobile station shall start timer T3204. If timer T3204 expires before an IMMEDIATE ASSIGNMENT message granting a single block period on an assigned packet uplink resource is received, the packet access procedure is aborted. If the mobile station receives an IMMEDIATE ASSIGNMENT message during the packet access procedure indicating a packet downlink assignment procedure, the mobile station shall ignore the message.
- If the purpose of the packet access procedure is to send an MBMS SERVICE REQUEST message to the network, the mobile station shall request a single block MBMS access.

- If the purpose of the packet access procedure is to send a signalling message and the mobile station is accessing the network when the low priority indicator is set to “MS is configured to NAS signalling low priority” it shall use the single block packet access option.

EGPRS TBF mode capable mobile stations shall monitor the GPRS Cell Options IE on the BCCH (SI13) for the cell's EGPRS capability and, if the mobile station is also Reduced Latency capable, the cell's Reduced Latency Access capability. In the GPRS Cell Options IE it is also indicated if the EGPRS PACKET CHANNEL REQUEST message is supported in the cell and if Reduced Latency Access is supported in the cell. An exception case is where a MS has enabled PEO and is attempting to establish a PS connection in which case the EGPRS PACKET CHANNEL REQUEST or EGPRS MULTILATERATION REQUEST message is sent regardless of whether or not the GPRS Cell Options IE indicates the EGPRS PACKET CHANNEL REQUEST message is supported in that cell. If the mobile station supports the IMMEDIATE PACKET ASSIGNMENT message, the mobile station shall monitor cell's capability for IMMEDIATE PACKET ASSIGNMENT message within paging messages received on its own paging sub-channel. Table 3.5.2.1.2.1 specifies which message and which establishment cause shall be used by an EGPRS mobile station when accessing an EGPRS capable cell depending on the purpose of the packet access procedure, and mobile station's and cell's capabilities for the case where the cell does not support PEO or EC operation; this table covers the case where PBCCH is not present in the cell (see 3GPP TS 44.060 for the case where PBCCH is present in the cell). Table 3.5.2.1.2.2 specifies which message and which establishment cause shall be used by a mobile station when PEO is enabled. Table 3.5.2.1.2.3 specifies which message and which establishment cause shall be used by a mobile station when EC operation is enabled and the *RACH Access Control* field (see sub-clause 9.1.30c) indicates the RACH is to be used by mobile stations that have selected coverage class 1 in both uplink and downlink. The network shall not indicate Reduced Latency Access is supported if the EGPRS PACKET CHANNEL REQUEST message is not indicated as supported. The network shall not indicate IMMEDIATE PACKET ASSIGNMENT message is supported if the EGPRS PACKET CHANNEL REQUEST message is not indicated as supported.

Table 3.5.2.1.2.1: EGPRS Packet Access Procedure (neither PEO nor EC operation enabled)

Purpose of the packet access procedure	EGPRS PACKET CHANNEL REQUEST supported in the cell	EGPRS PACKET CHANNEL REQUEST not supported in the cell
User data transfer - requested RLC mode = unacknowledged	EGPRS PACKET CHANNEL REQUEST with access type = 'Two Phase Access Request'	CHANNEL REQUEST with establishment cause = 'Single block packet access' for initiation of a two-phase access
User data transfer - requested RLC mode = acknowledged	EGPRS PACKET CHANNEL REQUEST with access type = 'One Phase Access Request' or 'Two Phase Access Request'	CHANNEL REQUEST with establishment cause = 'Single block packet access' for initiation of a two-phase access
User data transfer - requested RLC mode = acknowledged (Reduced Latency supported by MS)	EGPRS PACKET CHANNEL REQUEST with access type = 'One Phase Access Request by Reduced Latency MS' (NOTE 2)	CHANNEL REQUEST with establishment cause = 'Single block packet access' for initiation of a two-phase access
User data transfer - requested RLC mode = acknowledged by an IPA capable mobile station	EGPRS PACKET CHANNEL REQUEST with access type = 'One Phase Access Request' or 'Two Phase Access Request by IPA capable MS' (NOTE 3)	CHANNEL REQUEST with establishment cause = 'Single block packet access' for initiation of a two-phase access
Upper layer signalling transfer (e.g. page response, cell update, MM signalling, etc)	EGPRS PACKET CHANNEL REQUEST with access type = 'Signalling'	CHANNEL REQUEST with establishment cause = 'Single block packet access' for initiation of a two-phase access
Upper layer signalling transfer for a mobile station when the low priority indicator is set to "MS is configured to NAS signalling low priority" ¹ (e.g. page response, cell update, MM signalling, etc)	EGPRS PACKET CHANNEL REQUEST with access type = 'Signalling' (NOTE 5) or 'Two Phase Access Request' (NOTE 6)	CHANNEL REQUEST with establishment cause = 'Single block packet access' for initiation of a two-phase access
Upper layer signalling transfer (e.g. page response, cell update, MM signalling, etc) by an IPA capable mobile station	EGPRS PACKET CHANNEL REQUEST with access type = 'Signalling Request by IPA capable MS' (NOTE 4)	CHANNEL REQUEST with establishment cause = 'Single block packet access' for initiation of a two-phase access
Sending of a measurement report or of a PACKET CELL CHANGE FAILURE	CHANNEL REQUEST with establishment cause = 'Single block packet access'	
Sending of a PACKET PAUSE message	CHANNEL REQUEST with establishment cause = 'Single block packet access' (NOTE 1)	
Sending of an MBMS Service Request message	CHANNEL REQUEST with establishment cause = 'Single block MBMS access'	

NOTE 1:	Upon sending the first CHANNEL REQUEST message the mobile station shall start timer T3204. If timer T3204 expires before an IMMEDIATE ASSIGNMENT message granting a single block period on an assigned packet uplink resource is received, the packet access procedure is aborted. If the mobile station receives an IMMEDIATE ASSIGNMENT message during the packet access procedure indicating a packet downlink assignment procedure, the mobile station shall ignore the message.
NOTE 2:	The One phase Access Request by Reduced Latency MS shall be used by the mobile station supporting reduced latency if Reduced Latency Access is supported by the network. The 'One Phase Access Request by Reduced Latency MS' or 'Two Phase Access Request by IPA capable MS' may be used instead if the mobile station is capable of both Reduced Latency and IMMEDIATE PACKET ASSIGNMENT and the network supports IMMEDIATE PACKET ASSIGNMENT message and Reduced Latency Access.
NOTE 3:	(This note does not apply if Note 2 is applicable) The 'One Phase Access Request' with IPA capability signalled by the MultislotClass field in the EGPRS PACKET CHANNEL REQUEST message or 'Two Phase Access Request by IPA capable MS' shall be used by the mobile station supporting IMMEDIATE PACKET ASSIGNMENT message if support of the IMMEDIATE PACKET ASSIGNMENT message is signalled by the network.
NOTE 4:	The 'Signalling Request by IPA capable MS' shall be used if both mobile station and network supports IMMEDIATE PACKET ASSIGNMENT.
NOTE 5:	The access type 'Signalling' shall be used unless the mobile station is accessing the network when the low priority indicator is set to "MS is configured to NAS signalling low priority" (see 3GPP TS 24.008).
NOTE 6:	The access type 'Two Phase Access Request' shall be used if the mobile station is accessing the network when the low priority indicator is set to "MS is configured to NAS signalling low priority" (see 3GPP TS 24.008).

Table 3.5.2.1.2.2: EGPRS Packet Access Procedure (PEO enabled)

Purpose of the packet access procedure	PEO Capable Cell
User data transfer (requested RLC mode = acknowledged) or Upper layer signalling transfer (e.g. page response, cell update, MM signalling, etc)	EGPRS PACKET CHANNEL REQUEST with access type = 'PEO One Phase Access Request' (see TS 44.060 [76]) (NOTE 1)
Multilateration procedure has been triggered.	EGPRS MULTILATERATION REQUEST see TS 44.060 [76]) (NOTE 1)
NOTE 1: A PEO capable MS in a cell that does not support PEO shall operate according to Table 3.5.2.1.2.1.	

Table 3.5.2.1.2.3: EGPRS Packet Access Procedure (EC operation enabled – RACH used)

Purpose of the packet access procedure	EC-GSM-IoT Capable Cell
User data transfer (requested RLC mode = acknowledged) or Upper layer signalling transfer (e.g. page response, cell update, MM signalling, etc)	EC PACKET CHANNEL REQUEST sent using TS3 - see sub-clause 9.1.65 (NOTE 1)
NOTE 1: An EC capable MS in a cell that does not support EC-GSM-IoT shall operate according to Table 3.5.2.1.2.1 if it supports GPRS services using GPRS TBFs or EGPRS TBFs.	

Upon leaving idle mode the mobile station shall ignore PAGING REQUEST messages indicating a packet paging procedure.

A mobile station belonging to GPRS MS class A or B shall continue to monitor its paging subchannel on CCCH for PAGING REQUEST messages indicating an establishment of RR connection. A mobile station belonging to GPRS MS class B may abort the packet access procedure at the receipt of a PAGING REQUEST messages indicating an establishment of RR connection. An exception is the case of a MS that has enabled PEO or EC operation in which case the MS never monitors its paging subchannel on CCCH for PAGING REQUEST messages indicating an establishment of RR connection (see sub-clause 3.3.1).

The CHANNEL REQUEST or EGPRS PACKET CHANNEL REQUEST messages are sent on RACH and contain the parameters:

- an establishment cause which indicates packet access, and as applicable, a request for one phase packet access, single block packet access or a single block MBMS access for a CHANNEL REQUEST (sub-clause 9.1.8), or a request for one phase access or two phase access or short access or sending of signalling data for an EGPRS PACKET CHANNEL REQUEST (see 3GPP TS 44.060);
- a random reference which is drawn randomly from a uniform probability distribution for every new transmission;
- a capability indication which indicates the support of IMMEDIATE PACKET ASSIGNMENT for an EGPRS PACKET CHANNEL REQUEST (see 3GPP TS 44.060).

The EGPRS MULTILATERATION REQUEST messages are sent on RACH and indicate packet access by a mobile station that has enabled PEO operation and is accessing the network to perform the Multilateration procedure. In this case the only included parameter is a random reference which is drawn randomly from a uniform probability distribution for every new transmission.

Prior to sending an EGPRS PACKET CHANNEL REQUEST or EGPRS MULTILATERATION REQUEST message on the RACH a MS shall determine the applicable CCCH_GROUP as follows:

- If eDRX is enabled or it is attempting to enable eDRX the MS shall determine its CCCH_GROUP as per idle mode when extended DRX cycles are used (see 3GPP TS 45.002 [32]).
- Otherwise, the MS shall determine its CCCH_GROUP as per idle mode when extended DRX cycles are not used (see 3GPP TS 45.002 [32]).

The EC PACKET CHANNEL REQUEST messages are sent on RACH and indicate packet access by a mobile station that has enabled EC operation where the included parameters are as described in sub-clause 9.1.65. Prior to sending an EC PACKET CHANNEL REQUEST message on the RACH the MS shall set CCCH_GROUP = 0 (see sub-clauses 3.5.2.1.2 and 9.1.30c).

After sending the first CHANNEL REQUEST or EGPRS PACKET CHANNEL REQUEST or EGPRS MULTILATERATION REQUEST message, the mobile station shall start listening to the full downlink CCCH timeslot corresponding to its CCCH_GROUP. After sending the first EC PACKET CHANNEL REQUEST message a mobile station that has enabled EC operation shall listen to the downlink CCCH timeslot using CCCH_GROUP = 0 (see 3GPP TS 45.002). In addition, a mobile station that has sent a CHANNEL REQUEST or EGPRS PACKET CHANNEL REQUEST or EGPRS MULTILATERATION REQUEST message shall start listening to the BCCH to perform signal strength measurements as they are defined for packet idle mode, see 3GPP TS 45.008. A mobile station that has sent an EC PACKET CHANNEL REQUEST message need not perform signal strength measurements.

A mobile station accessing the network to perform the Multilateration procedure (see TS 3GPP 44.031) or accessing the network when the low priority indicator is set to “MS is configured to NAS signalling low priority (see 3GPP TS 24.008) that has sent one or more CHANNEL REQUEST or EGPRS PACKET CHANNEL REQUEST or EC PACKET CHANNEL REQUEST or EGPRS MULTILATERATION REQUEST messages shall proceed as follows:

- If the mobile station receives an IMMEDIATE ASSIGNMENT, an IMMEDIATE ASSIGNMENT EXTENDED, an EC IMMEDIATE ASSIGNMENT TYPE 1 (if EC operation is enabled), an IMMEDIATE PACKET ASSIGNMENT (if supported) or an IMMEDIATE ASSIGNMENT REJECT message corresponding to one of its last 3 transmitted CHANNEL REQUEST or EGPRS PACKET CHANNEL REQUEST or EC PACKET CHANNEL REQUEST or EGPRS MULTILATERATION REQUEST messages it shall act on that message as described in sub-clause 3.5.2.1.3.
- If the mobile station successfully decodes an RR message, which is not a response corresponding to one of its last 3 transmitted CHANNEL REQUEST or EGPRS CHANNEL REQUEST or EC PACKET CHANNEL REQUEST messages, that indicates an implicit reject for the PS domain (see sub-clause 3.3.1.1.1a) it shall start timer T3146 (if not already running) and initiate the implicit reject procedure as described in sub-clause 3.3.1.1.3.2a. An exception case is where a mobile station is accessing the network to perform the Multilateration procedure (i.e. sending an EGPRS MULTILATERATION REQUEST message) in which case it shall ignore the implicit reject information.

Having sent the maximum number of CHANNEL REQUEST or EGPRS PACKET CHANNEL REQUEST or EC PACKET CHANNEL REQUEST or EGPRS MULTILATERATION REQUEST messages, the mobile station starts timer T3146. At expiry of timer T3146, the packet access procedure is aborted, a random access failure is indicated to upper layers and autonomous cell re-selection is performed according to 3GPP TS 43.022.

If the mobile station receives an IMMEDIATE ASSIGNMENT or IMMEDIATE PACKET ASSIGNMENT message (if supported) during the packet access procedure indicating a packet downlink assignment procedure, the mobile station shall abort the packet access procedure and respond to the IMMEDIATE ASSIGNMENT or the IMMEDIATE PACKET ASSIGNMENT message as specified in sub-clause 3.5.3.1.2 or sub-clause 3.5.3.2. If the Packet Downlink Assignment IE in IMMEDIATE ASSIGNMENT message or *IPA Downlink Assignment struct* in IMMEDIATE PACKET ASSIGNMENT message indicates a downlink TBF, the mobile station shall then attempt an establishment of uplink TBF, using the procedure specified in 3GPP TS 44.060 which is applicable in packet transfer mode. If the Packet Downlink Assignment IE in IMMEDIATE ASSIGNMENT message indicates a downlink single block then the mobile station shall wait for the allocated single block and react on the received message before reattempting the uplink TBF establishment.

3.5.2.1.2a EC Packet access procedure (EC-CCCH) (44.018)

The RR entity of a mobile station initiates the packet access procedure by scheduling the sending of EC PACKET CHANNEL REQUEST or EC MULTILATERATION REQUEST messages (see Table 3.5.2.1.2a.1 and sub-clause 9.1.65) as follows:

- Using the 1TS EC-RACH Mapping method if CC1 has been selected on the uplink or if *Access_Timeslots=0*, sent in EC SYSTEM INFORMATION TYPE 2.
- Using the 2TS EC-RACH Mapping method if CC2, CC3 or CC4 has been selected on the uplink and *Access_Timeslots=1*, sent in EC SYSTEM INFORMATION TYPE 2.

- When the 2TS EC-RACH Mapping method is used the EC-RACH is mapped over two consecutive timeslots, and the EC PACKET CHANNEL REQUEST messages sent across the 2 timeslots shall be identical and shall use the same training sequence code (i.e one of TS5, TS6 or TS7 is used according to the uplink CC).

See 3GPP TS 45.002 for details regarding coverage class specific rules for multiplexing blind physical layer transmissions using the 2 TS EC-RACH.

Prior to sending an EC PACKET CHANNEL REQUEST or EC MULTILATERATION REQUEST message on the EC-RACH a MS shall determine the applicable EC_CCCH_GROUP as per idle mode for EC-GSM-IoT (see 3GPP TS 45.002 [32]).

After scheduling the transmission of EC PACKET CHANNEL REQUEST or EC MULTILATERATION REQUEST messages it leaves idle mode (in particular, the mobile station shall ignore EC PAGING REQUEST messages).

Table 3.5.2.1.2a.1: EC Packet Access Procedure

Purpose of the packet access procedure	EC-GSM-IoT Capable Cell
User data transfer (requested RLC mode = acknowledged) or Upper layer signalling transfer (e.g. page response, cell update, MM signalling, etc)	EC PACKET CHANNEL REQUEST sent using either TS3, TS4, TS5, TS6 or TS7 - see sub-clause 9.1.65 (NOTE 1)
Multilateration procedure has been triggered.	EC MULTILATERATION REQUEST sent using either TS4, TS5, TS6 or TS7 - see sub-clause 9.1.65 (NOTE 1)
NOTE 1: An EC capable MS in a cell that does not support EC-GSM-IoT shall operate according to Table 3.5.2.1.2.1 if it supports GPRS TBFs or EGPRS TBFs.	

The mobile station then sends maximally $M + 1$ EC PACKET CHANNEL REQUEST or EC MULTILATERATION REQUEST messages where each message is repeated according to the number of blind physical layer transmissions corresponding to its uplink CC. The first EC PACKET CHANNEL REQUEST or EC MULTILATERATION REQUEST message is sent using a transmission opportunity corresponding to its uplink coverage class randomly selected (with uniform probability distribution) from a set of Tcc 51-multiframes on the EC-RACH/RACH as shown in Table 3.5.2.1.2a.2. When sending a page response the set of Tcc 51-multiframes starts with the first 51-multiframe immediately following the last 51-multiframe used for receiving the corresponding paging request. For a mobile originated access attempt the set of Tcc 51-multiframes starts with the first 51-multiframe (following the 51-multiframe during which upper layers requested the transfer of a LLC PDU) that contains a transmission opportunity corresponding to its uplink coverage class.

Table 3.5.2.1.2a.2: Values of parameters Scc and Tcc

	Scc	Tcc
CC1	Sm	Tm
CC2	Sm	Tm
CC3	2*Sm	2*Tm
CC4	4*Sm	2*(Tm+1)

The value for Sm is sent in the EC SYSTEM INFORMATION TYPE 2 message and is used for determining the Scc value applicable for monitoring the EC-AGCH according to the selected downlink coverage class of the mobile station.

The value for T_m is sent in the EC SYSTEM INFORMATION TYPE 2 message and is used for determining the T_{ec} value applicable for randomly selecting an EC-RACH (and possibly RACH) transmission opportunity corresponding to the selected uplink coverage class of the mobile station.

M is the value of the parameter "EC_Max_Retrans" sent in the EC SYSTEM INFORMATION TYPE 2 message.

The EC PACKET CHANNEL REQUEST message (see sub-clause 9.1.65) contains the following parameters:

- a random reference field which is drawn randomly from a uniform probability distribution for every new transmission;
- a field indicating the downlink coverage class selected by the mobile station (only included when the message is sent on EC-RACH);
- a field indicating the signal strength measured by the MS (only included when the message is sent on RACH);
- a field indicating the purpose of the data transfer ("page response", "cell update", "RLC/MAC control message" or "uplink data transfer") and the number of uplink data blocks it has to send (assuming MCS-1 channel coding is used);
- a field indicating the priority of the packet access request.

The EC MULTILATERATION REQUEST message (see sub-clause 9.1.65) contains the following parameters:

- a random reference field which is drawn randomly from a uniform probability distribution for every new transmission;
- a field indicating the downlink coverage class selected by the mobile station.

After sending the first EC PACKET CHANNEL REQUEST or EC MULTILATERATION REQUEST message or a subsequent retransmission, the mobile station shall start reading the EC-AGCH (according to the downlink coverage class indicated within the corresponding EC PACKET CHANNEL REQUEST or EC MULTILATERATION REQUEST message) in an attempt to find a response matching its last transmission.

- A MS that has selected downlink CC1 shall begin looking for a matching response starting within downlink 51-multiframe N (i.e. $N = \text{TDMA FN} \div 51$) if it used uplink 51-multiframe N to send the last blind physical layer transmission of the EC PACKET CHANNEL REQUEST or EC MULTILATERATION REQUEST message and there is at least one remaining valid CC1 reception opportunity in downlink 51-multiframe N. If a matching response is not found or there are no remaining valid CC1 reception opportunities within downlink 51-multiframe N it shall start reading 51-multiframe N+1 in an attempt to find a matching response. The total number of downlink 51-multiframes it reads (excluding downlink 51-multiframe N) in an attempt to find a matching response is determined by S_{cc} (see Table 3.5.2.1.2a.2).

- A MS that has selected downlink CC2 shall begin looking for a matching response starting within downlink 51-multiframe N if it used uplink 51-multiframe N to send the last blind physical layer transmission of the EC PACKET CHANNEL REQUEST or EC MULTILATERATION REQUEST message, $N \bmod 2 = 0$ and there is at least one remaining valid CC2 reception opportunity that starts in downlink 51-multiframe N. If a matching response is not found using downlink 51-multiframes N and N+1 or there are no remaining valid CC2 reception opportunities that start within downlink 51-multiframe N it shall start reading downlink 51-multiframe N+1 (respectively N+2) if $N \bmod 2 = 1$ (respectively $N \bmod 2 = 0$). The total number of downlink 51-multiframes it reads (excluding downlink 51-multiframe N) in an attempt to find a matching response is determined by Scc (see Table 3.5.2.1.2a.2).
- A MS that has selected downlink CC3 shall begin looking for a matching response starting with downlink 51-multiframe N+1 (respectively N+2) when it used uplink 51-multiframe N to send the last blind physical layer transmission of the EC PACKET CHANNEL REQUEST or EC MULTILATERATION REQUEST message where $N \bmod 2 = 1$ (respectively $N \bmod 2 = 0$). The total number of downlink 51-multiframes it reads in an attempt to find a matching response is determined by Scc (see Table 3.5.2.1.2a.2).
- A MS that has selected downlink CC4 shall begin looking for a matching response starting with downlink 51-multiframe N+1 (respectively N+2, N+3, N+4) when it used uplink 51-multiframe N to send the last blind physical layer transmission of the EC PACKET CHANNEL REQUEST or EC MULTILATERATION REQUEST message where $N \bmod 4 = 3$ (respectively $N \bmod 4 = 2, 1, 0$). The total number of downlink 51-multiframes it reads in an attempt to find a matching response is determined by Scc (see Table 3.5.2.1.2a.2).

A mobile station accessing the network when the low priority indicator is set to “MS is configured to NAS signalling low priority” (see 3GPP TS 24.008) that has sent one or more EC PACKET CHANNEL REQUEST or EC MULTILATERATION REQUEST messages shall proceed as follows:

- If, while reading the total number of downlink 51-multiframes determined by Scc, the mobile station receives an EC IMMEDIATE ASSIGNMENT TYPE 2 or an EC IMMEDIATE ASSIGNMENT REJECT message corresponding to its last transmitted EC PACKET CHANNEL REQUEST or EC MULTILATERATION REQUEST message it shall act on that message as described in sub-clause 3.5.2.1.3a.
- If a matching response is not found and the mobile station is not sending an exception report (see sub-clause 9.1.65) it shall examine the Implicit Reject Status (IRS) field sent as part of the EC-SCH INFORMATION message (see sub-clause 9.1.30c). If the IRS field indicates the access attempt is rejected the mobile station shall abort the packet access procedure, start timer T3146 (if not already running) and initiate the EC Implicit Reject procedure (see sub-clause 3.5.2a.2). An exception case is where a mobile station is performing the Multilateration procedure (i.e. sending an EC MULTILATERATION REQUEST message) in which case it shall not examine the IRS field.
- Otherwise, the MS schedules the sending of another EC PACKET CHANNEL REQUEST or EC MULTILATERATION REQUEST message (if allowed according to "EC_Max_Retrans") using a transmission opportunity corresponding to its uplink coverage class randomly selected (with uniform probability distribution) from a set of Tcc 51-multiframes on the EC-RACH (determined using Tm as shown in Table 3.5.2.1.2a.2).
- The set of Tcc 51-multiframes starts with the first 51-multiframe (following the set of Scc downlink 51-multiframe read in attempt to find a matching response or following the last downlink 51-multiframe read to acquire the IRS field) that contains a transmission opportunity corresponding to its uplink coverage class.

- When scheduling another EC PACKET CHANNEL REQUEST or EC MULTILATERATION REQUEST message the MS uses the “CC_Access_Adaptation” parameter (broadcast in EC SYSTEM INFORMATION TYPE 2 message) to determine if it is allowed to increment both its uplink CC and downlink CC to the next CC supported by the network (unless it is already using CC4).
- Upon incrementing its uplink/downlink CC the number of subsequent EC PACKET CHANNEL REQUEST or EC MULTILATERATION REQUEST message transmission attempts that may occur before it is allowed to increment its uplink/downlink CC once again is the same as when sending the first EC PACKET CHANNEL REQUEST or EC MULTILATERATION REQUEST message (i.e. determined by the “CC_Access_Adaptation” parameter).
- When sending up to $M + 1$ EC PACKET CHANNEL REQUEST or EC MULTILATERATION REQUEST messages the MS may increment its uplink CC and downlink CC a maximum of 2 times if CC adaptations are allowed according to the “CC_Access_Adaptation” parameter.

Having sent $M + 1$ EC PACKET CHANNEL REQUEST or EC MULTILATERATION REQUEST messages, the RR entity of the mobile station starts timer T3146 at the start of the first of the set of downlink 51-multiframes (excluding downlink 51-multiframe N) it reads in an attempt to find a matching response as determined by S_{cc} (see Table 3.5.2.1.2a.2). At expiry of timer T3146, the packet access procedure is aborted, a random access failure is indicated to upper layers and autonomous cell re-selection is performed according to 3GPP TS 43.022.

3.5.2.1.3.1 On receipt of a CHANNEL REQUEST or EGPRS PACKET CHANNEL REQUEST or EC PACKET CHANNEL REQUEST or EGPRS MULTILATERATION REQUEST message (44.018)

On receipt of a CHANNEL REQUEST message indicating a packet access, the network may allocate a temporary flow identity and assign a packet uplink resource comprising one PDCH for an uplink temporary block flow in GPRS TBF mode. On receipt of an EGPRS PACKET CHANNEL REQUEST message, the network may allocate a temporary flow identity and assign a packet uplink resource comprising one PDCH for an uplink temporary block flow in EGPRS TBF mode or GPRS TBF mode.

On receipt of an EC PACKET CHANNEL REQUEST message on the RACH, the network may allocate a temporary flow identity and assign pre-allocated packet uplink resources comprising one or several PDCHs for an uplink temporary block flow in EC TBF mode. The transmission of an EGPRS MULTILATERATION REQUEST message on the RACH (see 3GPP TS 44.060) implicitly indicates a request for an uplink TBF for which only a single RLC data block will be transmitted.

If the establishment cause in the CHANNEL REQUEST message indicates a request for a single block packet access, the network shall grant only the single block period on the assigned packet uplink resource if the network allocates resource for the mobile station. If the establishment cause in the EGPRS PACKET CHANNEL REQUEST message indicates a request for a two phase access, the network shall grant one or two radio blocks for the mobile station (within a Multi Block allocation) to send a PACKET RESOURCE REQUEST and possibly an ADDITIONAL MS RADIO ACCESS CAPABILITIES messages on the assigned packet uplink resource if the network allocates resource for the mobile station.

If the establishment cause in the CHANNEL REQUEST message indicates a request for one phase packet access, the network may grant either a one phase packet access or a single block packet access for the mobile station. If a single block packet access is granted, it forces the mobile station to perform a two phase packet access. If the establishment cause in the EGPRS PACKET CHANNEL REQUEST message indicates a request for one phase packet access or sending signalling data, the network may grant either a one phase packet access or a two phase access (within a Multi Block allocation). If a multiple block packet access is granted, it forces the mobile station to perform a two phase packet access. In the case of a MS that has enabled PEO the establishment cause always indicates a one phase access and the network shall prioritize the granting of a one phase packet access.

When EC operation is not enabled the packet uplink resource is assigned to the mobile station in an IMMEDIATE ASSIGNMENT or an IMMEDIATE PACKET ASSIGNMENT message (if supported) sent in unacknowledged mode on the same CCCH timeslot on which the network has received the CHANNEL REQUEST or the EGPRS PACKET CHANNEL REQUEST message. The network may assign packet resource to the mobile station in an IMMEDIATE PACKET ASSIGNMENT message if the received EGPRS PACKET CHANNEL REQUEST message indicates the support of this assignment message. There is no further restriction on what part of the downlink CCCH timeslot the IMMEDIATE ASSIGNMENT and IMMEDIATE PACKET ASSIGNMENT message can be sent. Timer T3141 is started on the network side.

When EC operation is enabled the packet uplink resource is assigned to the mobile station in an EC IMMEDIATE ASSIGNMENT TYPE 1 message sent in unacknowledged mode on the same CCCH timeslot on which the network received the EC PACKET CHANNEL REQUEST message (see Table 3.5.2.1.2.3). Timer T3141 is started on the network side.

The IMMEDIATE ASSIGNMENT and EC IMMEDIATE ASSIGNMENT TYPE 1 messages contain:

- the information field of the CHANNEL REQUEST, the EGPRS PACKET CHANNEL REQUEST or the EC PACKET CHANNEL REQUEST message and the frame number of the frame in which the CHANNEL REQUEST, the EGPRS PACKET CHANNEL REQUEST or the EC PACKET CHANNEL REQUEST message was received;
- the packet channel description;
- the initial timing advance;
- the packet uplink assignment or EGPRS packet uplink assignment construction (only applies to the IMMEDIATE ASSIGNMENT message).
- the packet resources used for the uplink EC TBF which includes the set of pre-allocated uplink resources described by the *EC Fixed Uplink Allocation* IE (only applies to the EC IMMEDIATE ASSIGNMENT TYPE 1 message).

The IMMEDIATE PACKET ASSIGNMENT message contains parameters relevant to the assignment of packet resources as specified in subclauses 3.5.2.1.3.2 and 3.5.2.1.3.3.

If frequency hopping is applied, the network may use the indirect encoding or the direct encoding of the frequency configuration in the *Packet Channel Description* information element in IMMEDIATE ASSIGNMENT message or in the *IPA Uplink Assignment struct*, *IPA Downlink Assignment struct*, or *IPA Single Block Uplink Assignment struct* in IMMEDIATE PACKET ASSIGNMENT message. If the indirect encoding is used, the mobile station uses information received in system information or stored from a previous assignment to determine the frequency parameters, see 3GPP TS 44.060. If the direct encoding is used, the mobile station uses the cell allocation defined for the cell to decode the mobile allocation.

If the *indirect encoding* is used, the IMMEDIATE ASSIGNMENT or IMMEDIATE PACKET ASSIGNMENT message may contain a CHANGE_MARK_1 field. If that is present, the mobile station shall verify the validity of the SI13_CHANGE_MARK associated with the GPRS mobile allocation to which the message refers, see 3GPP TS 44.060. If the CHANGE_MARK_1 field and the SI13_CHANGE_MARK do not match, the message does not satisfactorily define a PDCH.

If EC operation is enabled the network indicates the frequency configuration in the *EC Packet Channel Description Type 1* information element (see sub-clause 10.5.2.84) in the EC IMMEDIATE ASSIGNMENT TYPE 1 message.

If the mobile station receives an IMMEDIATE ASSIGNMENT message and the *Dedicated mode or TBF* information element indicates that this is the first message in a two-message assignment, the mobile station shall continue to listen to the full CCCH. The network may send a second IMMEDIATE ASSIGNMENT message to the mobile station within two multiframe periods following the first IMMEDIATE ASSIGNMENT message, specifying the packet channel description and, if required, a mobile allocation for the assignment. The two IMMEDIATE ASSIGNMENT messages in a two-message assignment shall have the same contents of the *Request Reference* information elements.

If the mobile station does not receive the second IMMEDIATE ASSIGNMENT messages in a two-message assignment within two multiframe periods following the first message, the mobile station shall discard the first IMMEDIATE ASSIGNMENT message received.

On receipt of an IMMEDIATE ASSIGNMENT message or, in case of a two-message assignment, a matching pair of IMMEDIATE ASSIGNMENT messages corresponding to one of its 3 last CHANNEL REQUEST or EGPRS PACKET CHANNEL REQUEST or EGPRS MULTILATERATION REQUEST messages, the mobile station stops T3146 (if running), stops sending CHANNEL REQUEST or EGPRS PACKET CHANNEL REQUEST messages, and switches to the assigned PDCH.

On receipt of an EC IMMEDIATE ASSIGNMENT TYPE 1 message corresponding to one of its 3 last EC PACKET CHANNEL REQUEST messages on the RACH, the mobile station stops T3146 (if running), stops sending EGPRS PACKET CHANNEL REQUEST or EGPRS MULTILATERATION REQUEST messages, and switches to the assigned PDCH(s).

The content of the packet uplink assignment construction (respectively EGPRS packet uplink assignment construction) indicates which type of packet access is granted: *one phase packet access* or *single (respectively multiple) block packet access*.

3.5.2.1.3a.1 On receipt of an EC PACKET CHANNEL REQUEST or EC MULTILATERATION REQUEST message (44.018)

On receipt of an EC PACKET CHANNEL REQUEST or EC MULTILATERATION REQUEST message on the EC-RACH (see Table 3.5.2.1.2a.1), the network may allocate a temporary flow identity and assign pre-allocated packet uplink resources comprising one or four PDCHs (determined by the uplink coverage class of the mobile station) for an uplink temporary block flow in EC TBF mode.

When an EC PACKET CHANNEL REQUEST message is transmitted on the EC-RACH it implicitly indicates a request for an uplink EC TBF. The transmission of an EC MULTILATERATION REQUEST message on the EC-RACH (see sub-clause 9.1.65) implicitly indicates a request for an uplink EC TBF for which only a single RLC data block will be transmitted. Packet uplink resources are assigned to the mobile station in an EC IMMEDIATE ASSIGNMENT TYPE 2 message sent on the same EC-CCCH timeslot on which the network has received the EC PACKET CHANNEL REQUEST message.

On receipt of an EC IMMEDIATE ASSIGNMENT TYPE 2 message corresponding to its last EC PACKET CHANNEL REQUEST message, the mobile station stops T3146 (if running), stops sending EC PACKET CHANNEL REQUEST messages, and switches to the assigned PDCH(s).

The EC IMMEDIATE ASSIGNMENT TYPE 2 message contains:

- The downlink coverage class used when transmitting the message;
- optionally, an indication of page extension information;
- the 3 random bits of the information field of the EC PACKET CHANNEL REQUEST message and the 10 least significant bits of the frame number of the frame in which the EC PACKET CHANNEL REQUEST message was received;
- the EC_MA_NUMBER;
- training sequence code (TSC) information;
- the temporary flow identity;
- the EGPRS modulation and coding scheme for RLC data blocks;
- the power control parameters;
- optionally, the initial timing advance;
- the packet resources used for the uplink TBF which includes the set of pre-allocated uplink resources described by the EC Fixed Uplink Allocation IE;
- an indication of the uplink and downlink coverage class the MS is to use on the assigned packet resources;
- an indication of the quarter hyperframe used to send the EC IMMEDIATE ASSIGNMENT TYPE 2 message.

The EC_MA_NUMBER field of the *EC Packet Channel Description Type 2* IE (see sub-clause 10.5.2.85) indicates the mobile allocation set to be used for EC operation.

When the mobile station switches to the assigned PDCH(s), it shall take the power control parameters received in the the EC IMMEDIATE ASSIGNMENT TYPE 2 message into account,

3.5.2a Packet access procedure using EC-CCCH (44.018)

The packet access procedure using EC-CCCH may be used to establish a temporary block flow to support the transfer of LLC PDUs in the direction from the mobile station to the network.

If EC operation is enabled a MS that supports GPRS services using GPRS/EGPRS TBFs may choose to disable EC operation in the serving cell in which case the MS shall perform packet access as described in sub-clause 3.5.2. Similarly, an EC capable mobile station that reselects from a cell that does not support EC-GSM-IoT to a cell that supports EC-GSM-IoT may choose to not enable EC operation in which case it shall perform packet access as described in sub-clause 3.5.2. If EC operation is enabled and a MS performs reselection to a cell that does not support EC-GSM-IoT then it shall perform packet access as described in sub-clause 3.5.2.

If a mobile station is accessing the network to perform the Multilateration procedure it shall perform packet access in multiple cells (see 3GPP TS 44.031) wherein it sends an EC MULTILATERATION REQUEST message (see sub-clause 9.1.65) in each of these cells as described in sub-clause 3.5.2.1.2a. Otherwise, the mobile station proceeds as described in the remainder of this sub-clause.

The mobile station shall perform an EC-GSM-IoT preliminary access barring check before accessing the network (see sub-clause 3.5.2a.1). If the preliminary access barring check indicates network access is barred then access to the network is not allowed. Otherwise, the mobile station proceeds as described in the remainder of this sub-clause.

A mobile station that is accessing the network when the low priority indicator is set to “MS is configured to NAS signalling low priority” (see 3GPP TS 24.008 [79]) and is not sending an exception report (see sub-clause 9.1.65), shall read the *Implicit Reject Status* (IRS) field, *EC-BCCH CHANGE MARK* field and *RACH Access Control* field sent in the EC-SCH INFORMATION message (see Figure 9.1.30c.1 and 3GPP TS 45.002) prior to accessing the network. If a change of *EC-BCCH CHANGE MARK* is detected it shall read one or more EC-SYSTEM INFORMATION messages as needed (see sub-clause 3.10.4). The MS then proceeds as follows:

- If the IRS field indicates the access attempt is rejected the mobile station shall abort the packet access procedure and initiate the EC Implicit Reject procedure (see sub-clause 3.5.2a.2).
- If the IRS field indicates the access attempt is not rejected, the *RACH Access Control* field indicates that RACH usage on timeslot number 0 is not allowed it shall proceed with the packet access procedure as described in sub-clause 3.5.2.1.2a.
- If the IRS field indicates the access attempt is not rejected, the *RACH Access Control* field indicates that RACH usage on timeslot number 0 is allowed and the mobile station has selected CC1 in both uplink and downlink, see 3GPP TS 45.008 [34], it shall proceed with the packet access procedure as described in sub-clause 3.5.2.1.2.
- If the IRS field indicates the access attempt is not rejected and the mobile station has selected CC2, CC3 or CC4 in the uplink and/or downlink (see 3GPP TS 45.008 [34]) then it shall proceed with the packet access procedure as described in sub-clause 3.5.2.1.2a.

A mobile station that is accessing the network when the low priority indicator is set to “MS is not configured for NAS signalling low priority” or is sending an exception report when the low priority indicator is set to clause.

A mobile station that is accessing the network when the low priority indicator is set to “MS is configured to NAS signalling low priority” and is configured for dual priority (see 3GPP TS 24.008[79]), shall examine the *EC-BCCH CHANGE MARK* field and *RACH Access Control* field sent in the EC-SCH INFORMATION message. If a change of *EC-BCCH CHANGE MARK* is detected it shall read one or more EC SYSTEM INFORMATION messages as needed (see sub-clause 3.10.4) and then proceed as follows:

- If the RACH Access Control field indicates that RACH usage is allowed and the mobile station has selected CC1 in both the uplink and downlink it shall proceed with the packet access procedure using the RACH on timeslot 0 (see sub-clause 3.5.2.1.2).
- Otherwise, it shall proceed with the packet access procedure as described in sub-clause 3.5.2.1.2a.

9.1.65 EC Packet Channel Request (44.018)

This message may be sent by an EC capable mobile station attempting system access using the EC-RACH (see sub-clause 3.5.2.1.2a) in which the message format is as shown in Tables 9.1.65.1 and 9.1.65.2. This message can also be sent using the RACH (see sub-clause 3.5.2.1.2) in which the message format is as shown in Tables 9.1.65.3 and 9.1.65.4.

The uplink access burst block format is defined in 3GPP TS 44.004. The order of bit transmission is defined in 3GPP TS 44.004. The message is coded in 11-bit format.

The EC capability is implied when a MS attempts system access using the EC-RACH or by the use of TS3 when a MS attempts system access using the RACH.

Table 9.1.65.1: EC PACKET CHANNEL REQUEST messages (EC-RACH)

Training sequence (see 3GPP TS 45.002)	bits 11.....1	Packet Channel Access
TS3	< EC PACKET CHANNEL REQUEST message content >	Uplink CC1 MS
TS4	< EC MULTILATERATION REQUEST message content >	Uplink CC1 MS
TS5	< EC PACKET CHANNEL REQUEST message content > or < EC MULTILATERATION REQUEST message content >	Uplink CC2 MS
TS6	< EC PACKET CHANNEL REQUEST message content > or < EC MULTILATERATION REQUEST message content >	Uplink CC3 MS
TS7	< EC PACKET CHANNEL REQUEST message content > or < EC MULTILATERATION REQUEST message content >	Uplink CC4 MS

Table 9.1.65.2: EC PACKET CHANNEL REQUEST message content (EC-RACH)

TS	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7	Bit 8	Bit 9	Bit 10	Bit 11
3 (CC1)	< EC PACKET CHANNEL REQUEST message content > :: = < EC-NumberOfBlocks : bit (3) > < EC Priority : bit (1) > < RandomBits : bit (3) > < Selected DL Coverage Class : bit (3) > ;										EGPRS Capability
4 (CC1)	0	0	< EC MULTILATERATION REQUEST message content > :: = < RandomBits : bit (3) > < Selected DL Coverage Class : bit (3) > < Spare : bit (2) > ;								EGPRS Capability
5 (CC2)	< EC PACKET CHANNEL REQUEST message content > :: = < EC-NumberOfBlocks : bit (3) > < EC Priority : bit (1) > < RandomBits : bit (3) > < Selected DL Coverage Class : bit (3) > ;										0
5 (CC2)	0	0	< EC MULTILATERATION REQUEST message content > :: = < RandomBits : bit (3) > < Selected DL Coverage Class : bit (3) > < Spare : bit (2) > ;								1
6 (CC3)	< EC PACKET CHANNEL REQUEST message content > :: = < EC-NumberOfBlocks : bit (3) > < EC Priority : bit (1) > < RandomBits : bit (3) > < Selected DL Coverage Class : bit (3) > ;										0
6 (CC3)	0	0	< EC MULTILATERATION REQUEST message content > :: = < RandomBits : bit (3) > < Selected DL Coverage Class : bit (3) > < Spare : bit (2) > ;								1
7 (CC4)	< EC PACKET CHANNEL REQUEST message content > :: = < EC-NumberOfBlocks : bit (3) > < EC Priority : bit (1) > < RandomBits : bit (3) > < Selected DL Coverage Class : bit (3) > ;										0
7 (CC4)	0	0	< EC MULTILATERATION REQUEST message content > :: = < RandomBits : bit (3) > < Selected DL Coverage Class : bit (3) > < Spare : bit (2) > ;								1

Table 9.1.65.3: EC PACKET CHANNEL REQUEST messages (RACH)

Training sequence (see 3GPP TS 45.002)	bits 11.....1	Packet Channel Access
TS3	< EC PACKET CHANNEL REQUEST message content > (Note 1)	Uplink CC1 MS
TS5	< EC PACKET CHANNEL REQUEST message content > or < EC MULTILATERATION REQUEST message content > (Note 2)	Uplink CC2 MS
TS6	< EC PACKET CHANNEL REQUEST message content > or < EC MULTILATERATION REQUEST message content > (Note 2)	Uplink CC3 MS
TS7	< EC PACKET CHANNEL REQUEST message content > or < EC MULTILATERATION REQUEST message content > (Note 2)	Uplink CC4 MS
Note 1: Only sent on RACH when RACH Access Control is enabled (see sub-clause 9.1.30c)		
Note 2: Only sent on RACH when 2TS EC-RACH is enabled (see sub-clause 9.1.43q)		

Table 9.1.65.4: EC PACKET CHANNEL REQUEST message content (RACH)

TS	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7	Bit 8	Bit 9	Bit 10	Bit 11
3 (CC1)	< EC PACKET CHANNEL REQUEST message content > :: = < EC-NumberOfBlocks : bit (3) > < EC Priority : bit (1) > < RandomBits : bit (3) > < Signal Strength : bit (3) > ;										EGPRS Capability
5 (CC2)	< EC PACKET CHANNEL REQUEST message content > :: = < EC-NumberOfBlocks : bit (3) > < EC Priority : bit (1) > < RandomBits : bit (3) > < Selected DL Coverage Class : bit (3) > ;										0
5 (CC2)	0	0	< EC MULTILATERATION REQUEST message content > :: = < RandomBits : bit (3) > < Selected DL Coverage Class : bit (3) > < Spare : bit (2) > ;								1
6 (CC3)	< EC PACKET CHANNEL REQUEST message content > :: = < EC-NumberOfBlocks : bit (3) > < EC Priority : bit (1) > < RandomBits : bit (3) > < Selected DL Coverage Class : bit (3) > ;										0
6 (CC3)	0	0	< EC MULTILATERATION REQUEST message content > :: = < RandomBits : bit (3) > < Selected DL Coverage Class : bit (3) > < Spare : bit (2) > ;								1
7 (CC4)	< EC PACKET CHANNEL REQUEST message content > :: = < EC-NumberOfBlocks : bit (3) > < EC Priority : bit (1) > < RandomBits : bit (3) > < Selected DL Coverage Class : bit (3) > ;										0
7 (CC4)	0	0	< EC MULTILATERATION REQUEST message content > :: = < RandomBits : bit (3) > < Selected DL Coverage Class : bit (3) > < Spare : bit (2) > ;								1

11.2.5a EGPRS Packet Channel Request (44.060)

This message may be sent by an EGPRS capable mobile station in a cell supporting EGPRS and where the EGPRS_PACKET_CHANNEL_REQUEST parameter indicates that this message shall be used.

This message is sent in random mode on the PRACH using the PRACH uplink block format or on the RACH (see 3GPP TS 44.018) using the RACH uplink / Uplink access burst block format defined in 3GPP TS 44.004. The order of bit transmission is defined in 3GPP TS 44.004. The numbering, assembling and field mapping conventions defined for RLC/MAC control blocks in sub-clause 10.0b shall apply. The message is coded in 11-bit format.

The EGPRS capability is indicated using alternative training sequences (see 3GPP TS 45.002).

Table 11.2.5a.1: EGPRS PACKET CHANNEL REQUEST messages (non-PEO access)

Training sequence (see 3GPP TS 45.002)	bits 11.....1	Packet Channel Access
TS1	< EGPRS Packet channel request message content >	EGPRS with 8PSK capability in uplink
TS2	< EGPRS Packet channel request message content >	EGPRS without 8PSK capability in uplink

Table 11.2.5a.2: EGPRS PACKET CHANNEL REQUEST message content (non-PEO access)

< EGPRS Packet channel request message content > ::=		
< One Phase Access Request :	0	< MultislotClass : bit (5) > < Priority : bit (2) > < RandomBits : bit (3) > >
< Short Access Request : <i>value 100 was allocated in an earlier</i> <i>version of the protocol and shall not be used</i>	100	-- The
< One Phase Access Request by Reduced Latency MS : 101 < Two Phase Access Request : 110000 < Signalling : 110011 < One phase Access Request in RLC unack mode : 110101 < Dedicated Channel Request : 110110 < Emergency call : 110111 < Two Phase Access Request by IPA capable MS 111000 < Signalling by IPA capable MS : 111001		< NumberOfBlocks : bit (3) > < Priority : bit (2) > < RandomBits : bit (3) > > < MultislotClassGroup : bit (3) > < Priority : bit (2) > < RandomBits : bit (3) > > < Priority : bit (2) > < RandomBits : bit (3) > > < RandomBits : bit (5) > > < RandomBits : bit (5) > > < RandomBits : bit (5) > > < RandomBits : bit (5) > > < Priority : bit (2) > < RandomBits : bit (3) > > < RandomBits : bit (5) > >;

Table 11.2.5a.3: EGPRS PACKET CHANNEL REQUEST messages (PEO access)

Training sequence (see 3GPP TS 45.002)	bits 11.....1	Packet Channel Access
TS4	< EGPRS PACKET CHANNEL REQUEST message content >	Access from a MS that has enabled PEO and is performing the Packet Access procedure.
TS4	< EGPRS MULTILATERATION REQUEST message content >	Access from a MS that has enabled PEO and is performing the Multilateration procedure.

Table 11.2.5a.4: EGPRS PACKET CHANNEL REQUEST message content (PEO access)

TS	Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7	Bit 8	Bit 9	Bit 10
4	0	0	0	< EGPRS PACKET CHANNEL REQUEST message content for 'PEO One Phase Access Request' > ::= < Access Cause : bit (2) > < PEO Priority : bit (1) > < Random Bits : bit (3) > < EGPRS Capability : bit (1) > < Spare : bit (1) > ;							
4	0	0	1	< EGPRS MULTILATERATION REQUEST message content > :: = < RandomBits : bit (3) > < Spare : bit (5) > ;							
4	0	1	Spare (9)								
4	1	Spare (10)									

NOTE: A mobile station that has enabled PEO (i.e. eDRX or PSM – see 3GPP TS 23.060 [19]) while in a cell that supports PEO, shall always send an EGPRS PACKET CHANNEL REQUEST message using TS4 (see Table 11.2.5a.3) and access type 'PEO One Phase Access Request' (see Table 11.2.5a.4) on the RACH when performing the Packet Access procedure or an EGPRS MULTILATERATION REQUEST message on the RACH when performing the Multilateration procedure.

8. BSS Receives RLC Data Block During Multilateration

Upon receiving an uplink RLC data block on an uplink TBF established in response to an access request indicating “Multilateration” the BSS extracts the “TLLI”, “Source Identity” and “MS Sync Accuracy” included therein (see step 8 in Figure 1). The RLC data block sent for the Multilateration procedure does not contain an LLC PDU.

10.4.14a Length Indicator (LI) field in EGPRS TBF mode, EC TBF mode and TCH TBF mode (lu mode) (44.060)

The Length indicator is used to delimit Upper Layer PDUs within the RLC data block. Additionally for *lu mode*, a Length Indicator of value 127 may be used to indicate the presence of filler information within the RLC data block. If the first length indicator in the RLC data block is set to 127, then the entire RLC data block contains filler information.

The first Length Indicator (respectively, second length Indicator, if the first is of value 123, as described below) shall indicate the number of octets of the RLC data field belonging to the first Upper Layer PDU, the second Length Indicator (respectively third Length Indicator, if the first is of value 123, as described below) shall indicate the number of octets of the RLC data field belonging to the second Upper Layer PDU, etc. Only the last segment of any Upper Layer PDU, including those with only one segment, shall be identified with a Length Indicator. The length indicator shall be placed in the RLC data block corresponding to the last segment of the Upper Layer PDU, unless the Upper Layer PDU without the corresponding LI field fills the RLC data block precisely. In this singular case, the Length Indicator shall be placed as the first Length Indicator in the next in sequence RLC data block and take the value 0. The inclusion of a Length Indicator that indicates the presence of a Selected PLMN Index field (see sub-clause 10.4.27) will never correspond to an Upper Layer PDU and therefore will never result in this singular case.

If the Upper Layer PDU does not fill the current RLC data block, a Length Indicator with value 127 (111 1111) shall be included as the last Length Indicator of the current RLC data block, indicating that there is no following Upper Layer PDU in this RLC data block. If the Upper Layer PDU does not fill the RLC data block and there is only one octet left, then the Length Indicator corresponding to the Upper Layer PDU is the last Length Indicator field that shall be included in the RLC data block.

During RLC non-persistent mode of operation, or, during RLC unacknowledged mode of operation if the network has commanded the usage of "Indication of Upper Layer PDU Start for RLC UM" for the TBF, and if the current RLC data block starts with the first segment of a new Upper Layer PDU, then a Length Indicator taking the value 126 shall be placed as the first Length Indicator in the RLC data block unless a Length Indicator with the value 0, signalling that the last segment of the previous Upper Layer PDU precisely fills the previous in sequence RLC data block, shall be included.

If the network and the mobile station support dynamic timeslot reduction (see sub-clause 8.1.8), a Length Indicator with value 125 indicates the presence of dynamic timeslot reduction control information which shall be included after the last Upper Layer PDU.

If EMSR is enabled, the transmission of an Upper Layer PDU can be suspended to transmit a higher priority Upper Layer PDU by including an LI with a value of 124 as the first LI field within the next transmitted RLC data block where an octet containing the TFI value associated with the higher priority Upper Layer PDU immediately follows the LI field. The transmission of the suspended Upper Layer PDU is resumed by including an LI with a value of 124 followed by an octet containing the TFI (and eTFI if assigned, see sub-clause 5.13) associated with the Upper Layer PDU whose transmission is resumed after the LI associated with the last segment of the higher priority Upper Layer PDU whose transmission is completed. The transition from the last segment of an Upper Layer PDU to the first segment of a new Upper Layer PDU associated with a different PFC can also occur within an RLC data block (i.e. no suspend occurs) in which case the transition is indicated by including an LI with a value of 124 followed by an octet containing the TFI (and eTFI if assigned) associated with the new Upper Layer PDU after the LI associated with the last segment of the Upper Layer PDU whose transmission is completed. In addition:

- If the last segment of the Upper Layer PDU without the corresponding LI field fills the RLC data block precisely and the next in sequence RLC data block is in the same radio block, then a Length Indicator with the value 0 shall be placed as the first Length Indicator in the next in sequence RLC data block.

- If the last segment of the Upper Layer PDU without the corresponding LI field fills the RLC data block precisely and the next in sequence RLC data block is in a different radio block, then a Length Indicator with the value 0 shall be placed as the first Length Indicator in the next in sequence RLC data block and the TFI in the RLC/MAC header associated with the next in sequence RLC data block and, if eTFI is assigned, the eTFI indicated by the CRC of the next in sequence RLC data block, shall correspond to the last segment of the Upper Layer PDU.
- When a Length Indicator having the value 124 is included in the same RLC data block as the last segment of the Upper Layer PDU and fills the RLC data block precisely then the first octet of the RLC data field of the next in sequence RLC data block shall include the TFI (and eTFI if assigned) corresponding to the Upper Layer PDU whose transmission is resumed (if a suspend occurred) or to a new Upper Layer PDU (if no suspend occurred).

A Length Indicator of value 123 is used by a mobile station supporting network sharing to indicate the presence of the *Selected PLMN Index* field (see sub-clause 10.4.27) in the octet immediately following this Length Indicator. In this case it shall always be the first Length Indicator in the RLC data block. The first Length Indicator used for the case of EMSR requires that at least one previous RLC data block has been sent for the uplink TBF whereas the first Length Indicator used to indicate the presence of the Selected PLMN Index field shall always occur within the very first RLC data block sent for the uplink TBF and as such they can never occur within the same RLC data block.

When performing the Multilateration procedure (see sub-clauses 3.5.2 and 3.5.2a) a Length Indicator of value 122 is used by a mobile station to indicate the presence of the “*Source Identity*” and “*MS Sync Accuracy*” fields in the 5 octets immediately following the Length Indicator. In this case it shall always be the first Length Indicator in the RLC data block. The first Length Indicator used for the case of EMSR requires that at least one previous RLC data block has been sent for the uplink TBF whereas the Length Indicator used to indicate the presence of the “*Source Identity*” and “*MS Sync Accuracy*” fields shall always occur within the single RLC data block sent for the Multilateration procedure and as such they can never occur within the same RLC data block.

The final RLC data block of a TBF shall have a Length Indicator field corresponding to the final Upper Layer PDU unless the final Upper Layer PDU fills the RLC data block precisely. If the final Upper Layer PDU fills the final RLC data block precisely, the final Upper Layer PDU shall be sent without a corresponding Length Indicator field.

The Length Indicator field is 7 bits in length and shall be encoded as a binary number. The valid values are the values ranging from 0 to 74 for an EGPRS TBF, an EC TBF, an EGPRS2-A uplink TBF or an EGPRS2-B TBF, from 0 to 82 for an EGPRS2-A downlink TBF, from 0 to 103 in TCH TBF mode (*Iu mode*), and the values 122 to 127. All other values are reserved. A mobile station detecting a reserved Length Indicator value or an inconsistent encoding of the Length Indicator and E fields shall ignore the RLC data block.

The interpretation of the value contained in the length indicator with corresponding E bit is summarized in table 10.4.14a.1 and some examples are shown in annex B.

Table 10.4.14a.1: Interpretation of values of LI field and E bit

Value of LI in a RLC data block	Value of E bit in the same octet	Interpretation
k-th LI (k>0 integer): 0< value <75 (EGPRS/EC-GSM-IoT except EGPRS2-A downlink) 0< value <83 (EGPRS2-A downlink) 0< value <104 (TCH)	0 1	The value of the k-th LI is the number of octets of the k-th Upper Layer PDU, or the last segment of it, in the current RLC data block. There is at least one Upper Layer PDU following the k-th Upper Layer PDU in the current RLC data block. There is no more than one Upper Layer PDU following the k-th Upper Layer PDU in the current RLC data block.
1 st LI: value =0 1 st LI: value = 126 k-th LI (k>1 integer): 0< value <75 (EGPRS/EC-GSM-IoT except EGPRS2-A downlink) 0< value <83 (EGPRS2-A downlink) 0< value <104 (TCH)	0 0 0 1	The last Upper Layer PDU of the previous in sequence RLC data block ends at the boundary of that RLC data block and it has no LI in the header of that RLC data block. Thus the current RLC data block contains the first segment of all included Upper Layer PDUs. The current RLC data block contains the first segment of all included Upper Layer PDUs. The k-th LI contains the number of octets of the (k-1)-th Upper Layer PDU in the current RLC data block. There is at least one Upper Layer PDU following the (k-1)-th Upper Layer PDU in the current RLC data block. There is no more than one Upper Layer PDU following the (k-1)-th Upper Layer PDU in the current RLC data block.
k-th LI: value=127	1	The octets between the end of the Upper Layer PDU indicated by the (k-1)-th LI and the end of the current RLC data block are filling octets.
1 st LI: value=0	1	The previous RLC data block contains a Upper Layer PDU, or a part of it, that fills precisely the previous data block and for which there is no length indicator in that RLC data block. The current RLC data block contains a Upper Layer PDU that either fills the current RLC data block precisely or continues in the next RLC data block.
1 st LI: value = 126	1	The current RLC data block contains the first segment of an Upper Layer PDU that either fills the current RLC data block precisely or continues in the next RLC data block.
1 st LI: value=127 (<i>lu mode</i> only)	1	All octets of the RLC Data block contain filling information.
k-th LI: value=125 (this value is not supported in EC operation)	0/1	The current RLC data block contains the dynamic timeslot reduction control information.
k-th LI: value=124 (this value is only allowed if EMSR is enabled)	0	An LI value of 124 serves as a TFI transition indicator and is immediately followed by an octet containing the TFI associated with the next Upper Layer PDU segment in bit positions 1 to 5 (where bit 5 is the most significant bit) and reserved bits in bit positions 6 to 8. If eTFI is assigned then it shall be indicated by bit positions 6 to 8 (where bit 8 is the most significant bit).
1 st LI: value=123 (this value is only allowed if network sharing is supported both by the network and the mobile station)	0/1	An LI value of 123 serves as a <i>Selected PLMN Index</i> field indicator and is immediately followed by an octet that contains the <i>Selected PLMN Index</i> field (see sub-clause 10.4.27).

1 st LI:value=122 (this value is only used if the MS has received an RRLP message triggering it to perform the Multilateration procedure)	0/1	An LI value of 122 serves as an indicator that the RLC data block includes the “ <i>Source Identity</i> ” and “ <i>MS Transmission Accuracy</i> ” fields and is immediately followed by 5 octets that contain this information. The first four octets immediately following LI = 122 contain “ <i>Cell Identity</i> ” and “ <i>Location Area Code</i> ” (coded as indicated in the system SYSTEM INFORMATION TYPE 3 message sent in the serving cell where it was commanded to perform the Multilateration procedure) and the last octet contains the “ <i>MS Transmission Accuracy</i> ” field (coded per the value part of the Multilateration Timing Advance IE defined in 3GPP TS 49.031).
No LI field present	n.a.	The Upper Layer PDU that starts with the current RLC data block either fills the current RLC data block precisely or continues in the following in-sequence RLC data block

9. BSS Forwards TA Information to Serving SMLC

A BSS receives “Source Identity” information (i.e. “Cell Identity” and “Location Area Code” information identifying the cell in which Multilateration was triggered) and “MS Sync Accuracy” information within a RLC data block sent by a MS in each cell it uses to perform the Multilateration procedure.

- If it has a context for the indicated “TLLI” (i.e. it triggered the current Multilateration procedure for the indicated TLLI) it realizes it is the serving BSS and sends its default SMLC a “BSSMAP-LE CONNECTION ORIENTED INFORMATION” message (see step 9a of Figure 1) containing “MULTILATERATION TIMING ADVANCE”, “CELL IDENTIFIER”, “BSS SYNC ACCURACY” and “MS SYNC ACCURACY” information. In this case the “CELL IDENTIFIER” is the identity of the cell in which the RLC data block was received.
- If it has no context for the indicated “TLLI” it realizes it is a non-serving BSS and sends the MSC a “BSSAP-LE CONNECTIONLESS INFORMATION” message (see Steps 9b.1 and 9b.2 of Figure 1) containing “TLLI”, “MULTILATERATION TIMING ADVANCE”, “BSS SYNC ACCURACY” and “MS SYNC ACCURACY” information. The “Network Element Identity (source)” IE is configured according to the Cell Identity of the cell in which the RLC data block was received by the non-serving BSS. The “Network Element Identity (target)” IE is configured according to the “Source Identity” information the non-serving BSS received in the RLC data block).
- The MSC then forwards the “BSSAP-LE CONNECTIONLESS INFORMATION” message to the serving BSS (identified by the “Network Element Identity (target)” IE in the “BSSAP-LE CONNECTIONLESS INFORMATION” message).

- The serving BSS uses the “TLI” information in the “BSSAP-LE CONNECTIONLESS INFORMATION” message to identify the MS context/BSSMAP-LE Connection and then sends its default SMLC a “BSSMAP-LE CONNECTION ORIENTED INFORMATION” message (see step 9b.3 of Figure 1) containing “MULTILATERATION TIMING ADVANCE”, “CELL IDENTIFIER”, “BSS SYNC ACCURACY” and “MS SYNC ACCURACY” information. In this case the “CELL IDENTIFIER” is the identity of the cell for which “MULTILATERATION TIMING ADVANCE” information is provided as indicated by the “Network Element Identity (source)” IE of the “BSSAP-LE CONNECTIONLESS INFORMATION” message.

3.2.1.74 BSSAP-LE CONNECTIONLESS INFORMATION (48.008)

This message is sent from the BSS to the MSC or from the MSC to the BSS. The MSC forwards the CONNECTIONLESS INFORMATION message to the BSS as to which cell is indicated in the message. The message is sent as a connectionless SCCP message.

INFORMATION ELEMENT	REFERENCE	DIRECTION	TYPE	LEN
Message Type	3.2.2.1	Both	M	1
Network Element Identity (source)	3.2.2.69	Both	M	3-n
Network Element Identity (target)	3.2.2.69	Both	M	3-n
APDU	3.2.2.68	Both	M	3-n
Segmentation	3.2.2.74	Both	C (note 1)	5
Return Error Request	3.2.2.72	Both	C (note 2)	3-n
Return Error Cause	3.2.2.73	Both	C (note 3)	3-n
TLI	3.2.2.133	Both	O (note 4)	5
Multilateration Timing Advance	3.2.2.134	Both	O (note 4)	3
NOTE 1: This IE is present if and only if the APDU contains a message segment.				
NOTE 2: The IE is present when the source of a message requests for an error response if the message cannot be delivered to its final destination. If this IE is present, then Return Error Cause shall not be present.				
NOTE 3: The IE is present when an error is indicated that the message was not delivered to its final destination. If this IE is present, then Return Error Request shall not be present. Refer to 3GPP TS 49.031 for cause values				
NOTE 4: This IE is included when this message is sent during the Multilateration procedure.				

3.2.2.69 Network Element Identity (48.008)

This is a variable length information element identifying a network element. by association with either a designated cell site or a designated location area.

It is coded as follows:

8	7	6	5	4	3	2	1	
Element identifier								octet 1
Length								octet 2
Network Element Identity								octet 3-n

The coding of octet 2 is a binary number indicating the length of the remaining element.

The Network Element Identity octets 3 to n are coded in the same way as the equivalent octets in the Network Element Identity element of 3GPP TS 49.031.

- When the Multilateration procedure is used and the BSSAP-LE CONNECTIONLESS INFORMATION message is sent from a BSS to the MSC the Network Element Identity (target) information element is coded using the “*Source Identity*” information passed from a MS to the BSS during the Multilateration procedure and the “Network Element Identity (source)” information element is configured according to the Cell Identity of the cell in which the RLC data block was received by the non-serving BSS (see 3GPP TS 44.060).

10.19 Network Element Identity (49.031)

This is a variable length information element identifying a network element. by association with either a designated cell site or a designated location area.

	8	7	6	5	4	3	2	1
Octet 1	IEI							
Octet 2	Length indicator							
Octet 3	spare				Identity Discriminator			
Octet 4 to Octet n	Network Element Identification							

Figure 10.19.1: Network Element Identity IE

Identity Discriminator (bits 4-1 of octet 3)

0000 Identification using the MCC + MNC + LAC + CI as defined in 3GPP TS 23.003
 0001 Identification using LAC + CI as defined in 3GPP TS 23.003
 0100 Identification using the MCC + MNC + LAC as defined in 3GPP TS 23.003
 0101 Identification using the LAC as defined in 3GPP TS 23.003
 0110 Identification using LMU ID as defined below
 All other values are reserved.

	8	7	6	5	4	3	2	1
Octet 4 to Octet 10	MCC+MNC+LAC+CI							

Figure 10.19.2: Coding of Network Element Identification using the MCC+MNC+LAC+CI

Octets 4 to 10 are coded as the Cell Identification of the Cell Identifier IE for Cell identification discriminator = 0000 defined in 3GPP TS 48.008.

	8	7	6	5	4	3	2	1
Octet 4 to Octet 7	LAC + CI							

Figure 10.19.3: Coding of Network Element Identification using the LAC + CI

Octets 4 to 7 are coded as the Cell Identification of the Cell Identifier IE for Cell identification discriminator = 0001 defined in 3GPP TS 48.008.

	8	7	6	5	4	3	2	1
Octet 4 to Octet 6	MCC+ MNC							
Octet 7 to Octet 8	LAC							

Figure 10.19.4: Coding of Network Element Identification using the MCC + MNC + LAC

Octets 4 to 8 are coded as the corresponding octets in the Cell Identification of the Cell Identifier List IE for Cell identification discriminator = 0100 defined in 3GPP TS 48.008.

	8	7	6	5	4	3	2	1
Octet 4	LAC							
Octet 5	LAC - continued							

Figure 10.19.5: Coding of Network Element Identification using the LAC

Octets 4 to 5 are coded as the corresponding octets in the Cell Identification of the Cell Identifier List IE for Cell identification discriminator = 0101 defined in 3GPP TS 48.008.

	8	7	6	5	4	3	2	1
Octet 4	LMU ID							
...	LMU ID - continued							
Octet n	LMU ID - continued							

Figure 10.19.6: Coding of Network Element Identification using the LMU ID

Octets 4 and possible additional octets are coded as one to six octets of unformatted data. The maximum allowed length for the LMU ID is 6 (in this case octet 4-9 carry the LMU ID). This type of Network Element Identity is a BSS allocated address for an LMU. It shall not be used for addressing an SMLC and shall not be used when the Network Element Identity is sent to the core network (i.e. one of the other choices above shall be used in such a case).

3.2.2.68 APDU (48.008)

This information element is defined as a general container for passing information transparently between BSSs or between BSS and SMLC via the MSC.

It is coded as follows:

8	7	6	5	4	3	2	1	
Element identifier								octet 1
Length								octet 2-3
APDU								octet 4-n

The length indicator is a binary indication of the number of octets following in the element.

The APDU octets 4 to n are coded in the same way as the equivalent octet in the APDU element of 3GPP TS 49.031. When the BSSAP-LE CONNECTIONLESS INFORMATION message is sent from a BSS to a MSC or from a MSC to a BSS during the Multilateration procedure this information element is not used (i.e. the "Protocol ID" field shall indicate "reserved").

3.2.2.133 Temporary logical link Identity (TLLI) (48.008)

This information element is defined as a general container for passing information transparently between BSSs via the MSC.

It is coded as follows:

8	7	6	5	4	3	2	1	
Element identifier								octet 1
TLLI								octet 2-5

The TLLI octets are coded as the value part of the TLLI information element in 3GPP TS 44.018, not including 3GPP TS 44.018 IEI.

3.2.2.134 Multilateration Timing Advance (MTA) (48.008)

This information element is defined as a general container for passing information transparently between BSSs via the MSC.

It is coded as follows:

8	7	6	5	4	3	2	1	
Element identifier								octet 1
MTA								octet 2-3

The MTA field is coded according to the value part of the Multilateration Timing Advance information element described in 3GPP TS 49.031 (i.e. not including 3GPP TS 49.031 IEI)

10. SMLC Completes the Multilateration Procedure

The serving SMLC collects all “TA Information”, “Cell Identifier”, “MS Sync Accuracy” and “BSS Sync Accuracy” information associated with a given MTAO Multilateration procedure until the corresponding SCCP connection between the BSS and the SMLC is released by the serving BSS (i.e. released upon expiration of the MTAO specific timer in the serving BSS). It then determines the location of the corresponding MS and sends the serving BSS a “BSSMAP-LE Perform Location Response” message and includes the determined location information in the “Location Estimate” IE (see step 10 of Figure 1).

9.2 BSSMAP-LE PERFORM LOCATION RESPONSE message (49.031)

This message is sent in response to a BSSMAP-LE Perform Location Request to return a successful location estimate for a target MS or to indicate some failure in obtaining this. The message is also sent in response to a BSSMAP-LE Perform Location Request to return deciphering keys or an indication that LCS assistance data has been successfully delivered to an MS. The message can be sent from the SMLC to the BSS.

Table 9.2: BSSMAP-LE PERFORM LOCATION RESPONSE message content

Information element	Type/Reference	Presence	Format	Length in octets
Message type	Message Type	M	V	1
Location Estimate	Geographic Location	C	TLV	2-22
Positioning Data	Positioning Data	O	TLV	2-n
Deciphering Keys	Deciphering Keys	O	TLV	17
LCS Cause	LCS Cause	O	TLV	3-4
Velocity Data	Velocity Data	O	TLV	6-9
GANSS Positioning Data	GANSS Positioning Data	O	TLV	3-n

11. MS Location Estimate Relayed to LCS Client

The serving BSS sends the SGSN a “BSSGP PERFORM-LOCATION-RESPONSE PDU” message that includes the identified MS location in the “Location Estimate” IE (see step 11 of Figure 1). The SGSN then sends a “MAP Provide Subscriber Location Ack” message to the GMLC (see step 12 of Figure 1) and the GMLC sends the LCS client the requested location information in the “LCS Service Response” message (see step 13 of Figure 1).

10.5.2 PERFORM-LOCATION-RESPONSE (48.018)

This PDU allows the BSS to respond to the SGSN after the completion of the location procedure.

PDU type: PERFORM-LOCATION-RESPONSE

Direction: BSS to SGSN

Table 10.5.2: PERFORM-LOCATION-RESPONSE PDU content

Information elements	Type / Reference	Presence	Format	Length
PDU type	PDU type/11.3.26	M	V	1
TLLI	TLLI/11.3.35	M	TLV	6
BVCI (PCU-PTP)	BVCI/11.3.6	M	TLV	4
Location Estimate (note 1)	Location Estimate/11.3.54	C	TLV	3-?
Positioning Data	Positioning Data/11.3.55	O	TLV	3-?
Deciphering Keys (note 2)	Deciphering Keys/11.3.56	C	TLV	3-?
LCS Cause (note 3)	LCS Cause/11.3.58	O	TLV	3-?
Velocity Data	Velocity Data/11.3.96	O	TLV	3-?
GANSS Positioning Data	GANSS Positioning Data / 11.3.101	O	TLV	3-?
NOTE 1: This IE is present if the location of the target MS was requested and the procedure succeeded.				
NOTE 2: This IE is present if the deciphering keys were requested and the procedure succeeded.				
NOTE 3: This IE is present if the procedure failed.				

12.Way Forward

Adopt the set of working assumptions provided in section 1 above.

CHANGE REQUEST

CR-Form-v11.1

43.059 CR 0081 rev 3 Current version: 13.2.0

For [HELP](#) on using this form: comprehensive instructions can be found at
<http://www.3gpp.org/Change-Requests>.

Proposed change affects: UICC apps ☐ ME ☒ Radio Access Network ☒ Core Network ☒

Title:	Introduction of Multilateration		
Source to WG:	Ericsson LM		
Source to TSG:	R6		
Work item code:	ePOS_GERAN-Core	Date:	2016-11-14
Category:	B Use one of the following categories: F (correction) A (mirror corresponding to a change in an earlier release) B (addition of feature), C (functional modification of feature) D (editorial modification) Detailed explanations of the above categories can be found in 3GPP TR 21.900 .		
Release:	Rel-14 Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) Rel-12 (Release 12) Rel-13 (Release 13) Rel-14 (Release 14)		

Reason for change:	Introduction of the enhanced positioning feature known as Multilateration.
Summary of change:	A description of the Multilateration feature is provided.
Consequences if not approved:	The Multilateration feature will not be supported

Clauses affected:	3.2, 4, 4.2.5 (new), 5.5.2, 5.5.4, 8.1a, 8.2, 9.6 (new), 9.6.1(new), 9.6.2(new), 9.6.3(new), 9.6.4(new)						
Other specs	<table><tr><td>Y</td><td>N</td></tr><tr><td>X</td><td></td></tr></table>	Y	N	X		Other core specifications	TS 44.060 CR 1631 TS 44.018 CR 1048 TS 48.018 CR 0430 TS 48.008 CR 0410 TS 49.031 CR 0066 TS 44.031 CR 0227 TS 24.008 (draft) TS/TR ... CR ... TS/TR ... CR ...
Y	N						
X							
affected: (show related CRs)	<table><tr><td></td><td>X</td></tr><tr><td></td><td>X</td></tr></table>		X		X	Test specifications O&M Specifications	
	X						
	X						
Other comments:							

*** First Change ***

3.2 Abbreviations

For the purposes of the present document, the following abbreviations and the abbreviations given in 3GPP TS 21.905 apply.

2G-	Second Generation
3G-	Third Generation
A	Interface between GERAN BSS and MSC
A-GNSS	Assisted GNSS
A-GPS	Assisted GPS
ATD	Absolute Time Difference
BDS	BeiDou Navigation Satellite System
BSSLAP	Base Station System Application Part
BSSAP-LE	Base Station System Application Part LCS Extension
CBC-BSC	Interface between CBC and BSC
CBC-SMLC	Interface between CBC and SMLC
D-GPS	Differential GPS
E-OTD	Enhanced Observed Time Difference
GNSS	Global Navigation Satellite System (e.g. GPS, Galileo)
Iu	Interface between GERAN BSS and 3G Core Network
Iu-cs	Interface between GERAN BSS and 3G MSC
Iu-ps	Interface between GERAN BSS and 3G SGSN
Gb	Interface between GERAN BSS and SGSN
Lb	Interface between SMLC and BSC
LCCF	Location Client Control Function
LCF	Location Client Function
LSBeF	Location System Broadcast Function
LSCF	Location System Control Function
LSOF	Location System Operation Function
<u>MTA</u>	<u>Multilateration Timing Advance</u>
PCF	Position Calculation Function
PRCF	Positioning Radio Co-ordination Function
PRRM	Positioning Radio Resource Management
PSMF	Positioning Signal Measurement Function
RIT	Radio Interface Timing
RRLP	Radio Resource Link Protocol
RTD	Real Time Difference
SMSCB	Short Message Service Cell Broadcast
SMLCPP	Serving Mobile Location Center Peer Protocol
TA	Timing Advance
UDT	SCCP Unitdata message
Um	GERAN Air Interface
UTC	Universal Coordinated Time
U-TDOA	Uplink Time Difference of Arrival

*** Next Change ***

4 Main concepts

A general description of location services and the service requirements is given in the specification 3GPP TS 22.071. By measuring radio signals the capability to determine the geographic location of the mobile station (MS) shall be provided. The location information may be requested by and reported to a client (application) associated with the MS, or by a client within or attached to the Core Network. The location information may also be utilised internally by GERAN, for example to support features such as home location billing. The location information shall be reported in standard formats, such as those for cell based or geographical coordinates of the location of the MS.

It shall be possible for the majority of the MS (active or idle) within a network to use the feature without compromising the radio transmission or signalling capabilities of the GERAN.

~~Five~~ positioning mechanisms are supported for LCS: Timing Advance (TA), Enhanced Observed Time Difference (E-OTD), Global Navigation Satellite System (GNSS) based positioning (A-GNSS), ~~and~~ Uplink Time Difference Of Arrival (U-TDOA) ~~and Multilateration Timing Advance (MTA).~~

*** Next Change ***

4.2 Standard LCS Methods

4.2.1 Timing Advance

The TA is based on the existing Timing Advance (TA) parameter. The TA value is known for the serving BTS. To obtain TA values in case the MS is in idle mode a special procedure, not noticed by the GSM subscriber (no ringing tone), is set up. The cell-ID of the serving cell and the TA is returned as the result of the TA.

TA may be used to assist all positioning mechanisms.

4.2.2 Enhanced Observed Time Difference (E-OTD) positioning mechanism

The E-OTD method is based on measurements in the MS of the Enhanced Observed Time Difference of arrival of bursts of nearby pairs of BTSs. For E-OTD measurement synchronization, normal and dummy bursts are used. When the transmission frames of BTSs are not synchronized, the network needs to measure the Real or Absolute Time Differences (RTDs or ATDs) between them. To obtain accurate trilateration, E-OTD measurements and, for non-synchronized BTSs, RTD or ATD measurements are needed for at least three distinct pairs of geographically dispersed BTSs. Based on the measured E-OTD values the location of MS can be calculated either in the network or in the MS itself, if all the needed information is available in MS.

4.2.3 Global Navigation Satellite System (GNSS) based positioning mechanism

Global Navigation Satellite System (GNSS) refers to satellite systems that are set up for positioning purposes. Systems belonging to this category, that are operational today or will be in the near future are e.g., GPS, Galileo, Satellite Based Augmentation Systems (SBAS), Modernized GPS, Quasi Zenith Satellite System (QZSS), GLONASS and BDS.

A mobile station with GNSS measurement capability may operate in an autonomous mode or in an assisted mode for example MS-assisted or MS-based mode. In autonomous mode MS determines its position based on signals received

from GNSS without assistance from network. In assisted mode, MS receives assistance data from network. MS may support one or several GNSSs and the assistance data content may vary depending on this capability.

A-GNSS refers to a concept which supports several global navigation satellite systems and their different navigation signals, including e.g. GPS, Galileo, Satellite Based Augmentation Systems (SBAS), Modernized GPS, Quasi Zenith Satellite System (QZSS), GLONASS and BDS. The assistance data shall enable combined usage of satellite signals belonging to different GNSS or simple usage of one GNSS system independently from the other.

4.2.4 Uplink Time Difference of Arrival (U-TDOA) positioning mechanism

The U-TDOA positioning method is based on network measurements of the Time Of Arrival (TOA) of a known signal sent from the mobile and received at three or more LMUs. The known signal is the normal bursts generated by a mobile while in the dedicated mode; either on the SDCCH or TCH. The method requires LMUs in the geographic vicinity of the mobile to be positioned to accurately measure the TOA of the bursts. Since the geographical coordinates of the measurement units are known, the mobile position can be calculated via hyperbolic trilateration. This method will work with existing mobiles without any modification.

4.2.5 Multilateration Timing Advance

This positioning method is based on one or more BSS acquiring Timing Advance (TA) information from a set of cells selected by the MS wherein the MS is triggered to perform MTA as a result of receiving a RRLP message from an SMLC indicating the MTA positioning method is to be used (see sub-clause 9.6.1). The MS sends an access request indicating "Multilateration Timing Advance" in each of the cells it selects for performing the Multilateration Timing Advance procedure.

*** Next Change ***

5.5.2 SMLC

The SMLC is either a separate network element of GERAN or integrated functionality in BSC that contains functionality required to support LCS. The SMLC manages the overall co-ordination and scheduling of resources required for the location of a mobile. It also calculates the final location and velocity estimate and estimates the achieved accuracy. The SMLC may control a number of LMUs for the purpose of obtaining radio interface measurements to locate or help locate MS subscribers in the area that it serves. The SMLC is administered with the capabilities and types of measurement produced by each of its LMUs (only applicable for positioning methods that makes use of LMUs).

*** Next Change ***

5.5.4 LMU

The LCS Measurement Unit (LMU) entity makes measurements (e.g. of radio signals) and communicates these measurements to the SMLC (e.g. the PCRF). The LMU contains a PSMF and may also perform calculations associated with the measurements. The LMU may make its measurements in response to requests (e.g. from the SMLC), or it may autonomously measure and report regularly (e.g. timing of BTS transmissions) or when there are significant changes in radio conditions (e.g. changes in the RTD). There may be one or more LMUs associated with the SMLC and an LCS request may involve measurements by one or more LMUs. LMU functionality may be integrated in a BTS. The MTA positioning method does not make use of LMUs.

An LMU makes radio measurements to support one or more positioning methods; these assistance measurements are specific to all MSs in a certain geographic area. All location and assistance measurements obtained by an LMU are supplied to the SMLC associated with the LMU. Instructions concerning the timing, the nature, and any periodicity of these measurements are either provided by the SMLC or are pre-administered in the LMU.

- Con formato: Resaltar
- Con formato: Resaltar
- Con formato: Resaltar
- Con formato: Resaltar
- Con formato: Resaltar

The following assistance measurement obtained by an LMU has a generic status usable by more than one position method:

- Radio Interface Timing measurements – comprise Absolute Time Differences (ATDs) or Real Time Differences (RTDs) of the signals transmitted by Base Stations, where timing differences are measured relative to either some absolute time difference (ATD) or the signals of another Base Station (RTD).

*** Next Change ***

8.1a Information Transfer between an SMLC and a Target MS in the PS Domain in A/Gb mode

An SMLC uses the procedure shown below in order to obtain the MS position or positioning measurements from a target MS or transfer location assistance information to a target MS in the PS domain after a request has been received from the BSS serving the target MS.

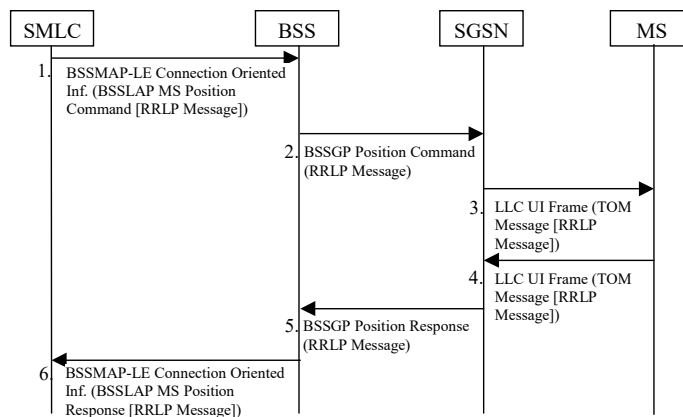


Figure 16a: Information Transfer between an SMLC and a Target MS in PS Domain

- 1) The SMLC passes a BSSAP-LE Connection Oriented Information message to the serving BSS containing an embedded BSSLAP MS Position Command with an RRLP message parameter. The message is transferred using the SCCP connection established between the SMLC and BSS for positioning the target MS. If the RRLP message is larger than the RRLP maximum PDU size, RRLP pseudo-segmentation shall be used. The SMLC shall indicate in the positioning command bit in the RRLP flags IE in the BSSLAP MS Position Command whether the embedded RRLP message contains a positioning command versus a non-command – e.g. positioning assistance data.
- 2) The BSS relays the embedded RRLP message and the RRLP flags IE to the SGSN inside a BSSGP Position Command message. When the BSSGP Position Command message has been transferred, the BSS shall start a positioning supervision timer if not already in progress or restart if the timer is already in progress. If the timer expires before the final response in step 5 is received, the BSS shall return a BSSAP-LE Connection Oriented Information message to the SMLC containing a BSSLAP Abort with a cause of BSS timeout.
- 3) The SGSN receives the RRLP message in the BSSGP Position Command message and relays it to the MS in an LLC UI frame. The TOM protocol with SAPI TOM8 is used for transfer of RRLP messages. The positioning command bit from the RRLP flags IE in the BSSGP message is also relayed using the C/R bit in the TOM

header (see 3GPP TS 44.031 [15]). The received C/R bit may be ignored by the MS or used for implementation purposes.

- 4) When the target MS has positioning information to return to the SMLC, it sends an LLC UI Frame to the SGSN containing an embedded RRLP message. The TOM protocol is used for transfer of RRLP messages. If the RRLP message is larger than the RRLP maximum PDU size, RRLP pseudo-segmentation shall be used. If the RRLP pseudo-segmentation is used, the MS shall send several RRLP messages. In each message the MS shall indicate in the C/R bit in the TOM protocol header whether it is the final response or not. The final response shall be the last RRLP message that the MS expects to send in response to RRLP messages received so far from the SMLC. In the final message the MS shall indicate that it is the final response by setting the appropriate RRLP flag. [For the MTA positioning method the MS does not send a RRLP message in response to the RRLP message it receives in step 3.](#)
- 5) The SGSN relays the RRLP message to the BSS. The RRLP message is sent in a BSSG Position Response message. The C/R bit from the TOM header is relayed using the final response bit in the RRLP flags IE in the BSSGP message.
- 6) If the timer started in step 2 has already expired, the BSS discards the RRLP message received in step 5. Otherwise, the BSS relays the RRLP message and the RRLP flags IE to the SMLC inside a BSSLAP MS Positioning Response message contained in a BSSAP-LE Connection Oriented Information message. If the SMLC indicated a positioning command in the most recent message to be transferred in step 1 and the MS has indicated a final response, the BSS may add additional measurement information to the BSSLAP MS Position Response in the last BSSAP-LE message. The BSS shall stop the supervision timer started in step 2 when the final response from the MS has been transferred. The SMLC may transfer a further RRLP message to the MS (e.g. containing assistance data or a positioning command) according to steps 1, 2, and 3 and the MS may return a subsequent response according to steps 4, 5, and 6. Steps 4-6 are repeated if the RRLP pseudo-segmentation is used for the uplink message.

*** Next Change ***

8.2 Information Transfer between an SMLC and a BSC

An SMLC uses the procedure shown below in order to obtain positioning related information from the BSC serving a particular target MS after a positioning request has been received from the BSC. This procedure applies to positioning of an MS in both the CS and the PS domains.

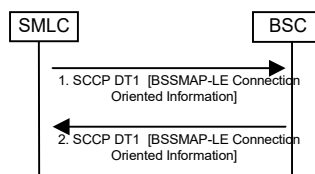


Figure 17: Information Transfer between an SMLC and a BSC

- 1) The SMLC passes a BSSAP-LE Connection Oriented Information message to the BSC containing an embedded BSSLAP message. The BSSAP-LE message is transferred using the SCCP connection previously established between the SMLC and BSC when the positioning request for the target MS was initially sent to the SMLC. The BSC recognizes that it is the final destination due to the presence of the embedded BSSLAP message.
- 2) When the BSC has positioning information for the target MS to return to the SMLC, it sends a BSSAP-LE Connection Oriented Information message to the SMLC containing an embedded BSSLAP message. The message is sent using the SCCP connection previously established for positioning the target MS. [For the MTA positioning method the BSC may not include an embedded BSSLAP message in the BSSAP-LE Connection Oriented Information message it sends to the SMLC.](#)

*** Last Change ***

9.6 MTA Positioning Procedures

9.6.1 General procedure

This positioning method is based on one or more BSS acquiring Timing Advance (TA) information from a set of cells selected by the MS wherein the MS is triggered to perform MTA as a result of receiving a RRLP message from an SMLC indicating the MTA positioning method is to be used. The RRLP message may include network assistance information that indicates one or more suitable neighbour cells, including which of the indicated neighbour cells are co-sited cells, targeted positioning accuracy in the form of number of cells involved, required MS Transmission Accuracy, neighbour cell specific RACH/EC-RACH control parameters as well as an assignment of a Short ID to be used during the TA estimation procedure. Based on signal strength the MS autonomously selects which subset of the cells identified by the network assistance information (if any) to use for MTA and may also select one or more additional cells not identified within the triggering RRLP message to perform MTA. In each of the selected cells the MS performs packet access for the BSS to be able to estimate a TA value for that particular cell. All TA estimations made by a BSS for any given MS performing MTA are relayed to the serving SMLC along with the identity of the reporting cell thereby allowing the SMLC to estimate the position of the target MS. The MTA procedure is only applicable for the PS domain in A/Gb-mode.

9.6.2 Multilateration Timing Advance Request

The signalling flow is generic irrespective if the MS is in Packet Idle or Packet Transfer mode. If the MS is in Packet Idle mode, the SGSN initiates paging towards the MS and indicates in the page that the device is being paged for positioning. This triggers the MS to start the cell re-selection procedure unless a cell re-selection has been performed up to 60 seconds prior to receiving the paging request message indicating paging for positioning method. selects the "best" cell, and send a page response to the SGSN. The signaling flow in Figure 38 below applies to integrated and standalone SMLCs in a packet switched network.

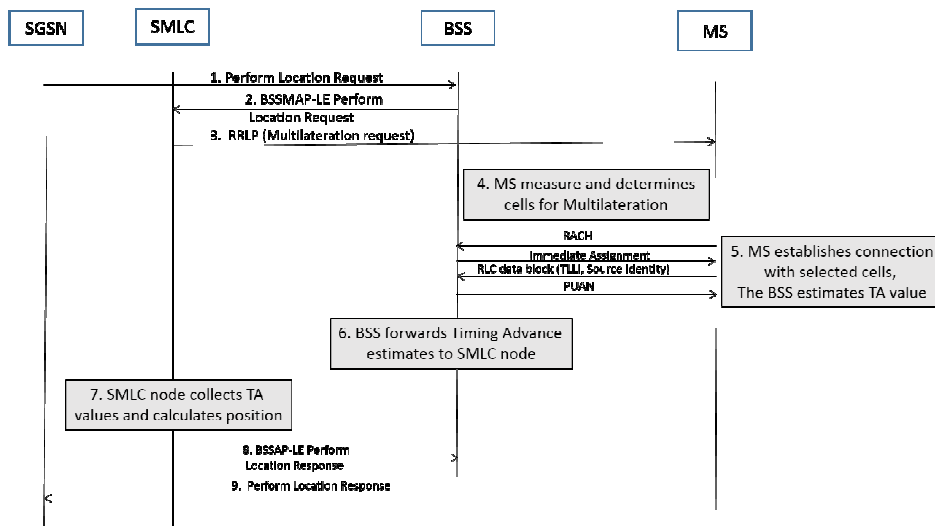


Figure 38: MTA positioning procedures in the PS domain

1. The SGSN sends a BSSGP PERFORM-LOCATION-REQUEST to the BSC serving the MS.
2. The BSC sends the SMLC a BSSMAP-LE Perform Location Request message that includes the LCS capability IE and the BSS Multilateration Capability IE. If available, the BSC also includes the cell-ID and TA value of the serving cell.
3. Based on the serving cell the SMLC includes assistance data, if any, in an RRLP MULTILATERATION REQUEST message and sends the message to the MS (tunnelled via the BSS and the SGSN, see sub-step below and sub-clause 8.1a for the general description).
 - 3a. The SMLC passes a BSSAP-LE Connection Oriented Information message to the serving BSS containing an indication of the type of Multilateration method, a Multilateration Positioning Method timer and an embedded BSSMAP MS Position Command with an RRLP message parameter including the RRLP MULTILATERATION REQUEST message.
 - 3b. The BSS relays the embedded RRLP message and the RRLP flags IE to the SGSN inside a BSSGP Position Command message. When the BSSGP Position Command message has been transferred, the BSS shall start a Multilateration supervision timer for the associated SCCP connection corresponding to the value indicated by the Multilateration Positioning Method timer field and upon expiry release the connection.
 - 3c. The SGSN receives the RRLP message in the BSSGP Position Command message and relays it to the MS in an LLC UI frame.
4. The RRLP application in the MS examines the RRLP MULTILATERATION REQUEST message and if assistance data is present uses the assistance data to autonomously select which subset of these sets of cells it shall use to perform Multilateration. The MS may also select one or more additional cells not provided by the RRLP MULTILATERATION REQUEST message.
5. The MS sends an access request indicating "Multilateration Timing Advance" in the serving cell and in each of the cells it selects for performing the Multilateration Timing Advance procedure.
 - New SI and EC-SI information shall indicate whether or not a cell supports the Multilateration Timing Advance procedure using either the RLC Data Block Transmission method or the Extended Access Burst method. This indication may also be included for each of the cells identified by the assistance information sent to the MS in the Multilateration RRLP message.

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• The inclusion of a Short ID for one or more cells in the assistance information included within the Multilateration Timing Advance Request RRLP message indicates the MS is to use Extended Access Burst method when performing Multilateration Timing Advance for those cells (if they are used in the procedure). In the absence of Short ID information for any cell the MS selects for performing Multilateration Timing Advance, it shall use the RLC Data Block Transmission method therein.

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• When performing the Multilateration Timing Advance procedure using the RLC Data Block Transmission method a MS sends a single MCS-1 coded RLC data block that conveys the MS identity (TLLI), "Source Identity" information (i.e. the "Cell Identity" and "Location Area Code" (LAC) received in EC-SI2/SI13 of the cell in which it was triggered to perform Multilateration) and "MS Transmission Accuracy" (applicable to when it transmitted the RLC data block). The RLC data block sent during the Multilateration Timing Advance procedure does not contain an LLC PDU.

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• When performing the Multilateration Timing Advance procedure using the Extended Access Burst method a MS sends an extended access burst wherein the payload space conveys the MS identity (Short ID) and "MS Transmission Accuracy" (applicable to when it transmitted the extended access burst). The Extended Access Burst method is only used for cells belonging to the serving BSS.

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6. If the BSS has a context for the indicated MS Identity (Short ID or TLLI) i.e. it triggered the current Multilateration Timing Advance procedure for the indicated MS Identity it realizes it is the serving BSS and sends its default SMLC a "BSSMAP-LE Connection Oriented Information" message containing "Multilateration Timing Advance", "MS Transmission Accuracy", "BTS Reception Accuracy Level" and "Cell Identifier" information.

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If the BSS has no context for the indicated MS Identity, it realizes it is a non-serving BSS and sends the MSC a "BSSAP-LE Connectionless Information" message. The MSC then forwards the "BSSAP-LE Connectionless Information" message to the serving BSS (identified by the "Network Element Identity (target)" IE in the "BSSAP-LE Connectionless Information" message). The serving BSS then sends its default SMLC a "BSSMAP-LE Connection Oriented Information" message containing "Multilateration Timing Advance", "MS Transmission Accuracy", "BTS Reception Accuracy Level" and "Cell Identifier" information.

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7. The serving SMLC collects all "TA Information", "MS Transmission Accuracy", "BTS Reception Accuracy Level" and "Cell Identifier" information associated with a given MS for up to the length of the Multilateration Positioning Method timer after triggering the Multilateration Timing Advance procedure for that MS and then determines the location.

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8. The SMLC then sends the serving BSS a "BSSMAP-LE Perform Location Response" message and includes the determined location information in the "Location Estimate" IE.

9. The serving BSS sends the SGSN a "BSSGP PERFORM-LOCATION-RESPONSE PDU" message that includes the identified MS location in the "Location Estimate" IE.

9.6.3 Error Handling for MTA

Case 1: When the SMLC sends the BSSAP-LE Connection Oriented Information message containing the RRLP Multilateration Request messages to the BSS and the BSS cannot support the procedure it will send a BSSLAP reject message to the SMLC.

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Case 2: When the BSC forwards the RRLP Multilateration Request message in an BSSGP Position Command message the Multilateration supervision timer is started. After this, if the BSS determines that the current location procedure cannot be continued, the BSS sends an abort message to the SMLC. The determination that an MS reselection to a new cell has occurred is not a reason for the BSS to abort the procedure.

Case 3: If the Multilateration supervision timer times out in BSS before any "Multilateration Timing Advance", "MS Transmission Accuracy", "BTS Reception Accuracy Level" and "Cell Identifier" information for the target MS is sent to the SMLC, the BSS shall send a BSSLAP Abort to the SMLC. The location service attempt may then be restarted from the LCS Client, VMSC, or SGSN.

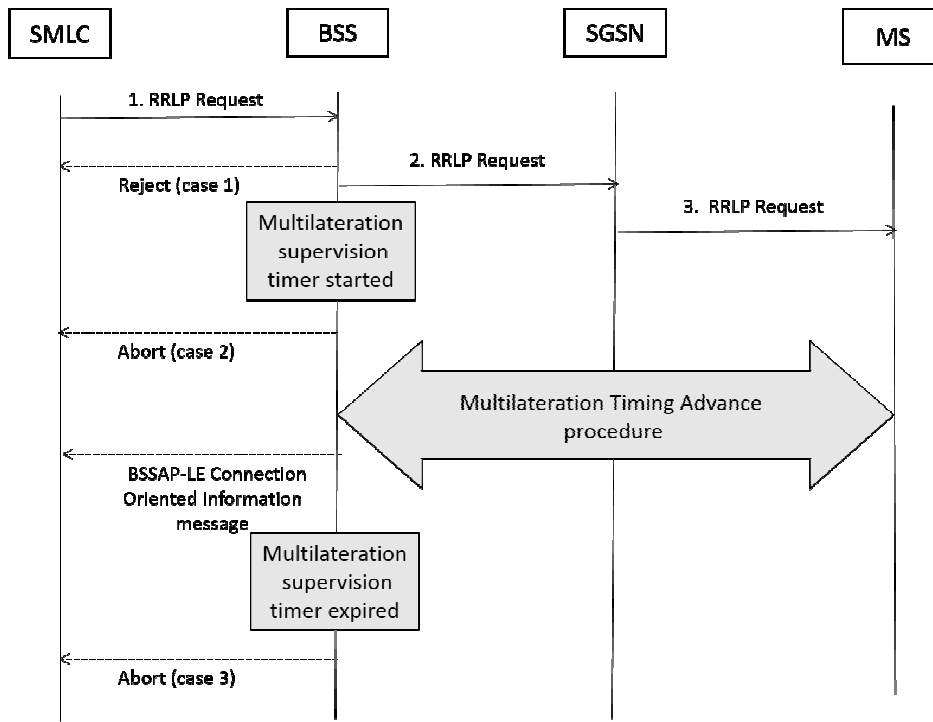


Figure 39: Error Handling for the SMLC in PS domain

9.6.4 Provisioning of assistance data

The MS is triggered to perform the Multilateration Timing Advance procedure through reception of a new Multilateration Timing Advance Request RRLP message sent by the SMLC where the MS is assumed to be in the best serving cell upon reception of the RRLP message. The Multilateration Timing Advance Request RRLP message may include network assistance information that consists of multiple sets of cells which the MS may take into account when performing Multilateration Timing Advance. Additional assistance information may also be included in the Multilateration Timing Advance Request RRLP message and may be generated by the SMLC using implementation specific methods or acquired from the serving BSS. Some examples of additional assistance information include information about suitable neighbour cells, an indication of which of the indicated neighbour cells are co-sited cells, requested accuracy of the positioning procedure in the form of number of cells involved, required MS Transmission accuracy, neighbour cell specific RACH/EC-RACH control parameters as well as an assignment of a Short ID to be used during the TA estimation procedure. The MS autonomously selects the set of cells to use for performing the Multilateration Timing Advance procedure which may include a subset of the cells identified by the assistance information. The sending of assistance data improves the location accuracy for the Multilateration Timing Advance procedure and decreases the energy consumed in the MS to perform the positioning.

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*** End of Changes ***

Positioning enhancements for GERAN – introducing Timing Advance trilateration

1 Introduction

At GERAN#67 a new work item on Extended Coverage GSM was approved. The final version of the Cellular IoT Technical Report evaluating the Extended Coverage GSM (EC-GSM-IoT) candidate technique and motivating the work item can be found in [1].

Currently, for EC-GSM-IoT, when it comes to positioning only the Cell ID + timing advance method will be supported within Rel-13. This method has an inherent accuracy of around 550 m along an arc within a given cell.

Device positioning and tracking is important in many IoT applications such as asset tracking. GPS based positioning method is not appropriate for many IoT applications due to additional costs as well as poor or no indoor coverage. Additionally the limited deployment of E-OTD and U-TDOA in GERAN networks implies that these methods are unsuitable for improving the positioning accuracy for EC-GSM-IoT devices. Moreover, these methods require deployment of dedicated hardware in order to be supported.

This paper provides a high level description of a potential new positioning method called timing advance (TA) trilateration which in turn builds on the already existing timing advance estimation method as defined in 3GPP TS 43.059. The TA trilateration method can thus be deployed in GERAN based networks as a software upgrade without any hardware impacts.

It is furthermore proposed to include this positioning method as an enhancement to EC-GSM-IoT as a new Work Item in Rel-14.

As an addition, given that the use of E-OTD and U-TDOA is quite uncommon it is proposed that the TA trilateration method is also standardized for legacy (E)GPRS operation within Rel-14.

2 Timing Advance trilateration

The basic idea to improve the positioning accuracy is based on extending the current Cell ID + timing advance method by performing a trilateration based on timing advance values. For this to work the timing advance value from at least, for sectorized cell deployments and favorable geometry two and general case three neighboring base stations are needed, see Figure 1 and Figure 2 below.

On a high level the following steps could be seen as needed (steps impacted by the TA trilateration method are indicated with red text):

1. SGSN sends Perform Location Request to the BSS (48.018)
2. The BSS sends the BSSAP-LE Perform Location Request message to request the SMLC to start the positioning procedure (48.071).

3. The SMLC sends a BSSMAP-LE Connection Oriented Information message (TA trilateration request) to the BSC serving a particular target MS.
4. The BSS triggers the MS to send Neighbor cell measurement report (via page or PACCH message).
5. MS sends measurement report to the BSS
6. The BSS sends Candidate BTS list derived from measurement report to SMLC node for determination of best base stations for trilateration.
7. The SMLC node returns Selected BTS list to BSS that contains a list of cells for which TA values are to be obtained.
8. The BSS sends BTS Cell reselection list to the MS which triggers MS to reselect to listed base stations and request a single block allocation for a control message containing TLLI such that the device and hence the associated TA value can be linked. This provides the BSS with TA values for the listed base station, TA_1 , TA_2 , TA_3 to TA_n .
9. The BSS collects the TA values internally and sends an BSSMAP-LE Connection Oriented Information message (TA trilateration response) to the SMLC node.
10. The SMLC nodes performs the trilateration based on received TA values and returns a BSSAP-LE Perform Location Response message to the BSC containing location estimate.

Alternatively, step 5 through 8 could be modified/omitted if the MS after the trigger in step 4 autonomously connects/reselects to the best cells. This has however some drawback in that the selected base stations may not be ideal from a positioning accuracy point of view.

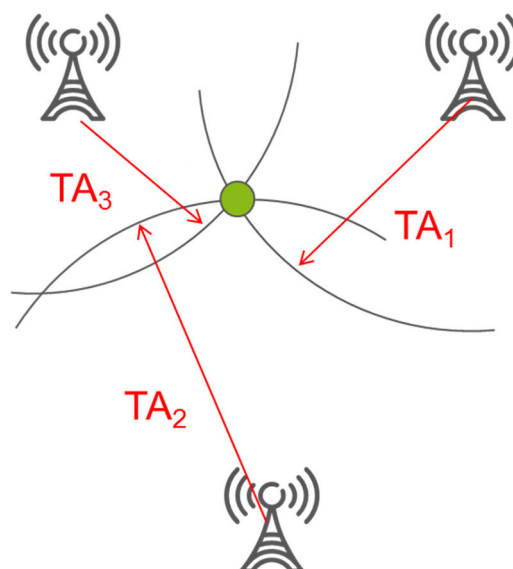


Figure 1 Illustration of timing advance trilateration method

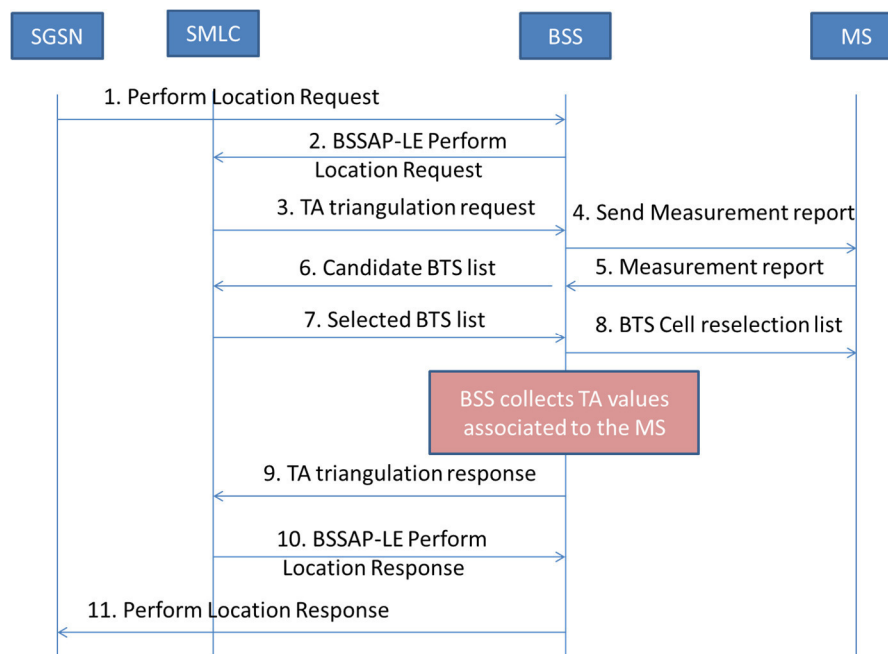


Figure 2 Schematic illustration of TA trilateration positioning procedure.

3 Tightening the BTS and MS requirements

It should further be noted that even better accuracy can be achieved with finer TA estimation granularity in the BTS along with tighter MS requirements when it comes to the MS assessing the BTS timing. This is elaborated in more detail below.

First of all, currently when assigning timing advance values to the MS for the purpose of communication with the BTS it is done in units of 1 symbol, see e.g. 3GPP TS 44.018 and 3GPP TS 44.060. From this point of view there is in other words no need for the BTS to estimate the timing advance value with accuracy greater than 1 symbol. However, for the purpose of estimating the position the greater the timing advance accuracy the greater the positioning accuracy. Higher timing advance estimation may for example be achieved by oversampling of the received signal.

Secondly, when it comes to the requirements on the MS in assessing the BTS timing the following is stated in 3GPP TS 45.010 “In determining the timing of signals from the BTS, the timings shall be assessed in such a way that the timing assessment error is less than $\frac{1}{2}$ normal symbol periods”. In other words, even if the BTS estimation of timing advance value can be improved, the accuracy will not exceed $\frac{1}{2}$ symbol or 275 meters unless the MS requirement related to estimating the BTS timing also is tightened.

In summary, given that improving the BTS timing advance estimation as well as the MS requirement on BTS timing estimation will improve the accuracy of the proposed method it is proposed to further study what the limitations are with the requirement to avoid significant impacts to both the BTS and MS hardware.

4 Impacts to battery life time

EC-GSM-IoT has been specified with a target of 10 years battery life time and it has been shown that this target can be met at most evaluation points [3]. In order to estimate the

impacts of performing a positioning on the battery life time a comparison is performed between the energy it takes to send a mobile originated report of 200 bytes, the energy it takes to perform a positioning request according the new method as well as U-TDOA. For the sake of simplicity the comparison is performed assuming a device in Coverage Class 1. The message flows for each procedure can be found in Figure 2 and in the Annex.

Evaluations are done assuming an operating voltage of 3.3 V, an operating current of 1.23 A and 0.03 A at transmission and reception, respectively [1]. Contributions from light and deep sleep have been ignored (knowing that this contributes only marginally to the overall consumption during a limited procedure that the main purpose here is to get a rough comparison among different procedures).

The average number of received bursts for a CC1 device to synchronize to a cell is 43 (see ref [1] sub-clause 6.2.6.6.2) which is equivalent to 25 ms on-time ($43 \times 0.577 = 24.8$ ms). The measurement then requires 10 samples to estimate the received signal level (see 3GPP TS 45.008). It is assumed a correlator based estimator is used on the EC-SCH which requires two identical signals to be received. Considering that 1 EC-SCH is already received in the 43 bursts, 19 ($9 \times 2 + 1$) additional burst need to be read. The total receiver on-time for both the sync and measurement then becomes $(43 + 19) \times 0.577 = 35.8$ ms.

The energy to:

- send a RACH burst is calculated as $3.3 \times 1.23 \text{ A} \times 0.577 \text{ msec} = 2.34 \text{ mJ}$,
- send one UL block is calculated as $4 \times 3.3 \times 1.23 \times 0.577 = 9.37 \text{ mJ}$
- receive one data DL block is calculated as $4 \times 3.3 \times 0.03 \text{ A} \times 0.577 = 0.23 \text{ mJ}$.
- receive one EC- AGCH/EC-PCH block is calculated as $2 \times 3.3 \times 0.03 \text{ A} \times 0.577 = 0.11 \text{ mJ}$
- Sync to one neighbor cell is calculated as $3.3 \times 0.03 \times 25 = 2.47 \text{ mJ}$
- sync and measure one neighbor cell is calculated as $3.3 \times 0.03 \times 35.8 \text{ ms} = 3.54 \text{ mJ}$

In table 1, the calculations for the different procedures are summarized and compared. It can be seen that the energy to perform a positioning with the TA trilateration procedure is on the same order as sending a 200 byte mobile autonomous report or roughly 100 mJ. For the U-TDOA procedure the energy to perform a location varies between 50 to 204 mJ all depending on how many times the Packet Polling procedure needs to be repeated (4 to 20 times) to achieve the targeted accuracy [9]. Moreover, given that the energy to send a 200 byte report and the energy to perform one positioning with the new proposed method are roughly on the same order one can draw the conclusion that the positioning itself will not set the battery lifetime limit but rather that the combination of number of reports and position events will have to be considered.

Table 1 Comparison of energy to send 200 byte report, and perform positioning with TA trilateration and U-TDOA

Send 200 byte report		TA trilateration		U-TDOA	
Message	Energy	Message	Energy	Message	Energy
RACH (UL)	2.34	Page (DL)	0.11	Page (DL)	0.11
Fixed UL assign. (DL)	0.11	RACH (UL)	2.34	RACH(UL)	2.34

10 UL blocks (Report UL)	93.7	FUA (DL)	0.11	FUA (DL)	0.11
PUAN (DL)	0.23	Page response (UL)	9.37	Page response (UL)	9.37
Packet DL. Assign.	0.23	PUAN (DL)	0.23	PUAN (DL)	0.23
4 DL Block (DL Ack)	0.92	Measurem. Req. (DL)	0.23	Packet DL Assign. (DL)	0.23
PDAN (UL)	9.37	Measure on 5 Neighbors+ reconfirm serving cell	21.2	4-20xPacket Poll (DL)	0.92-4.6
		RACH (UL)	2.34	4-20xPacket Control Ack. (UL)	37.5-187.4
		Fixed UL assign. (DL)	0.11		
		Meas. Rep. (UL)	9.37		
		PUAN (DL)	0.23		
		Packet DL. Assign.	0.23		
		Candidate list (DL)	0.23		
		PDAN (UL)	9.37		
		Sync to 3 cells	7.42		
		3xRACH	7.02		
		3xFUA	0.33		
		3xControl Message UL (TLLI)	28.1		
Total	107 mJ		98 mJ		51-204 mJ

5 Comparison

It is the view of the sourcing company that U-TDOA and E-OTD are unsuitable for improving the positioning accuracy for EC-GSM-IoT devices mainly due the need of dedicated hardware (LMUs) and in case of U-TDOA the need to have synchronized networks (GPS). It should further be mentioned that it is not clear that these methods also can be extended to support + 20 dB extended coverage. Table 2 summarizes various aspects related to the three methods.

Table 2, Comparison among TA trilateration, U-TDOA and E-OTD.

	TA trilateration	U-TDOA	E-OTD
Dedicated hardware	No	Yes	Yes
Synchronized Network	No	Yes	No
Supports +20 dB	Yes	?	?
MS impact	Yes	No	Yes

6 Standardization impact

To introduce the TA trilateration method along with a tightening MS requirements into the specifications the following updates are needed:

- 43.059 Addition of new positioning method
- 48.071 Introduction of two new messages, TA trilateration request and response messages
- 49.031 Addition of TA trilateration method
- 44.018 Messages and procedure to trigger MS measurements for MS in idle mode
- 44.060 Messages and procedure to trigger MS measurements for MS in connected mode. Messages and procedures to support the TA trilateration method (Measurement Report, BTS candidate list etc)
- 45.010 Tightening of the MS Assessment of BTS timing.
- 24.008 capability bit for MS support of TA trilateration method

7 Proposal

Based on the analysis provided in this discussion paper it is proposed to start a new work item at RAN#72 [2] with purpose to introduce Timing Advance trilateration as new positioning method for both EC-GSM-IoT and GPRS/EGPRS with Rel-14.

8 References

- [1] 3GPP TR 45.820 V13.0.0, "Cellular System Support for Ultra Low Complexity and Low Throughput Internet of Things".
- [2] RP-161033, "New WID on Positioning Enhancements for GERAN", source Ericsson LM, 3GPP TSG RAN#72.
- [3] GP-160351, "EC-GSM-IoT performance summary", source Ericsson, 3GPP TSG GERAN#70.
- [4] GP-0205526, "Presentation of U-TDOA in GPRS Feasibility Study (presentation of Feasibility Study)", source TruePosition, GERAN#9.

9 Annex

9.1 Message flow Mobile autonomous report

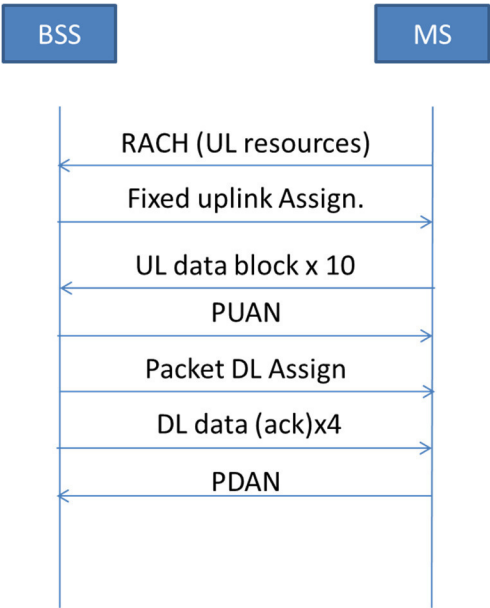


Figure 3 Message and data flow for mobile autonomous report

9.2 Message flow for U-TDOA positioning (MS in idle state)

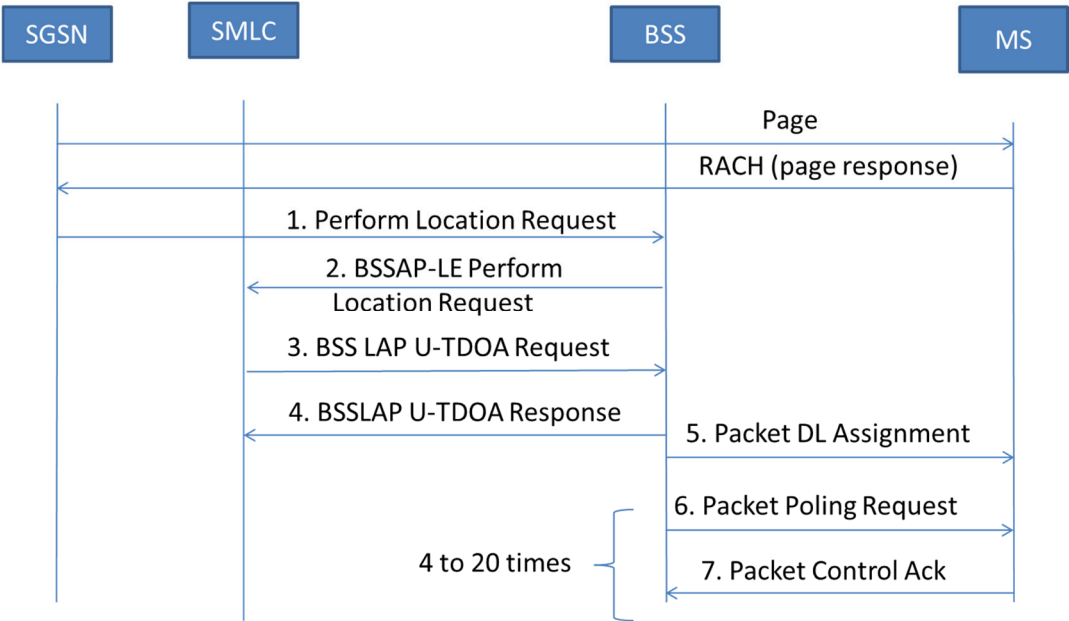


Figure 4 Message flow for U-TDOA procedure

Agenda Item: 7.2.11.1.2 Uplink-based narrowband positioning

Source: Ericsson

Title: On timing advance based multi-leg positioning for NB-IoT

Document for: Discussion

1 Background

At the RAN#72 a Release 14 work item on Enhancements of NB-IoT [1] was approved containing the following objective:

- *“Introduce E-CID core requirements:*
 - *RSRP/RSRQ measurement [RAN4 only]*
 - *UE Rx-Tx time difference measurement [RAN4 only]*
- *Support of UTDOA or OTDOA:*
 - *Study accuracy, UE complexity, UE power consumption for both UTDOA and OTDOA using NB-IoT and provide recommendation to RAN#73 on which one solution to adopt [RAN1]*
 - *3GPP network operators are invited to provide inputs to RAN1#86 on their positioning requirements. Companies are encouraged to include both methods in their evaluations.*
 - *Based on the study make a choice (either uplink positioning or OTDOA) during RAN#73*

RAN1 is asked to compare UL and DL based TDOA for NB-IoT and provide a recommendation to RAN#73 on which of these two solutions to adopt for NB-IoT. In this contribution, we introduce an uplink positioning method for NB-IoT denoted Timing Advance based Multi-leg positioning (TAM). The main advantage of this technique is that it is designed to function in time asynchronous networks as well as time synchronized networks.

2 Timing advance based multi-leg positioning for NB-IoT

In the Timing Advance based Multi-leg (TAM) method, positioning of NB-IoT UEs is based on a procedure triggered by a positioning node, i.e. an eSMC, where the UE is paged and requested to synchronize to a number of neighbouring cells, and in each cell attempt to access and identify itself to the eNB. The eNB in each cell estimates the timing advance (TA) value of the access attempt and forwards this tagged with the UE identity to the positioning node. The positioning node uses the received set of TA values, and pre-known positions of the involved eNBs to estimate a position of the UE.

Figure 1 provides a general overview of possible nodes, information elements and physical channels involved in the positioning of a device. This contribution will focus on the radio layer aspects of TAM and leave higher layer details concerning protocol implementations and general architecture considerations for later study.

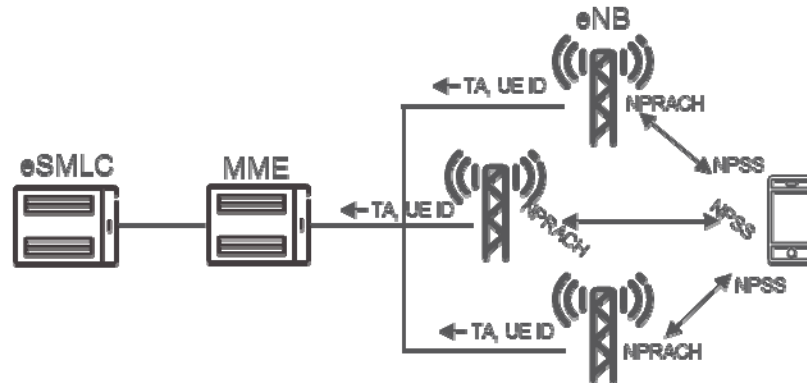


Figure 1 General illustration of the nodes, interfaces, protocol and physical channels involved in the positioning of a device.

In the first step the UE is paged and the positioning procedure is triggered. The selection of the neighbouring cells a UE should synchronize to and access can have different levels of complexity:

- In its simplest form the positioning request is merely asking the UE to attempt to perform access in a certain number of cells N. The UE is then autonomously selecting the N cells, e.g. based on signal level ranking, synchronizes to each of them and performs the access. This simple assumption was explored in the simulations presented in section 3.
- In a more sophisticated version the UE is feeding the NW with a measurement report. Based on this measurement report in combination with knowledge of the geographical position of each eNB relative the position of the serving cell the serving eNB asks the UE to synchronize and perform access in N specific cells. In the simulations performed in section 3 also the option to select the N cells based on the geometry between the eNBs involved in a positioning attempt was explored.

The UE can synchronize to a cell using the in Release 13 already specified physical channels, e.g. the NPSS, NSSS and NRS. A new Release 14 signal dedicated for positioning could also be considered. The timing accuracy that can be achieved by a UE when synchronizing to the selected DL signal is of high importance to the overall positioning accuracy.

When the UE performs the system access in the neighbouring cells it needs to follow the connection procedure at least until RRC Connection Request (msg3) for contention to be resolved on the network side. During the connection setup the eNB needs to estimate the UL TA, e.g. via the NPRACH or msg3. After contention resolution the eNB forwards the estimated TA and the UE S-TMSI, extracted from msg3, to the positioning server. The accuracy of the eNB TA estimate is also crucial for the positioning accuracy.

In the final step the positioning node collects the TA estimates from each eNB, and uses these in combination with the known geographical locations of the eNBs to position the device.

It should be noted that a similar procedure has been proposed to be considered in RAN6 for the Release 14 work item on positioning for EC-GSM-IoT [4].

3 Simulations

To estimate the accuracy of the TAM solution the novel simulator described in [2] was used to run a set of simulations. The simulator was configured in accordance with the assumptions described in [3], and Table 1 highlights a few selected assumptions of importance.

Table 1 System simulation assumptions.

Assumption	Comments
eNB TA error model	Based on NPRACH, see [2] for details.
UE timing error model	$U(-0.5/240 \cdot 10^3 \text{ s}, +0.5/240 \cdot 10^3 \text{ s})$, see [2] for details.
Propagation condition	TU 1Hz, EPA 1Hz Note: The eNB TA error model applies to both propagation conditions.
Max number of eNBs per positioning attempt	5, 10, 15, 20
Minimum number of eNBs required in a positioning attempt	3
Mechanism to select eNBs in a positioning attempt	eNBs based on signal strength (SS). eNBs based on geometry (geographical location relative serving cell)
eNB output power	43 dBm (standalone mode of operation) Note: The UL and DL timing error models are independent of DL SINR, so the results presented applies equally well to inband and guardband operation
UE output power	23 dBm
NPRACH Resource usage	2, 8 or 32 repetitions per preamble attempt (see numRepetitionPerPreambleAttempt in TS 36.321). NPRACH thresholds configured to the -101 and -111 dBm (see RSRP-ThresholdsNPRACH-InfoList-NB in 36.331)
NPRACH power control	The preamble initial received target power was set to -90 dBm (see preambleInitialReceivedTargetPower in TS 36.311).
UE mobility	0 km/h
NW synchronization	No
Frequency reuse	Any

When considering the assumptions listed above it should be noted that the simplistic UE timing error model applied in the simulations are corresponding to a low complexity UE with slightly better timing performance than the requirement specified for NB-IoT [5] and is independent of SINR, and applies equally well to both EPA and TU propagation conditions. For the eNB the NPRACH TA error model is both dependent on SINR and propagation conditions as described in [5].

Parts of the results recorded from the simulations are presented in Figure 2. The figure shows that a positioning accuracy of around 150 meters may be achieved at the 67th percentile if up to 10 eNBs are involved in the positioning attempt and the propagation conditions corresponds to the EPA or TU channel models,. The TU performance is as seen slightly inferior compared to the EPA performance.

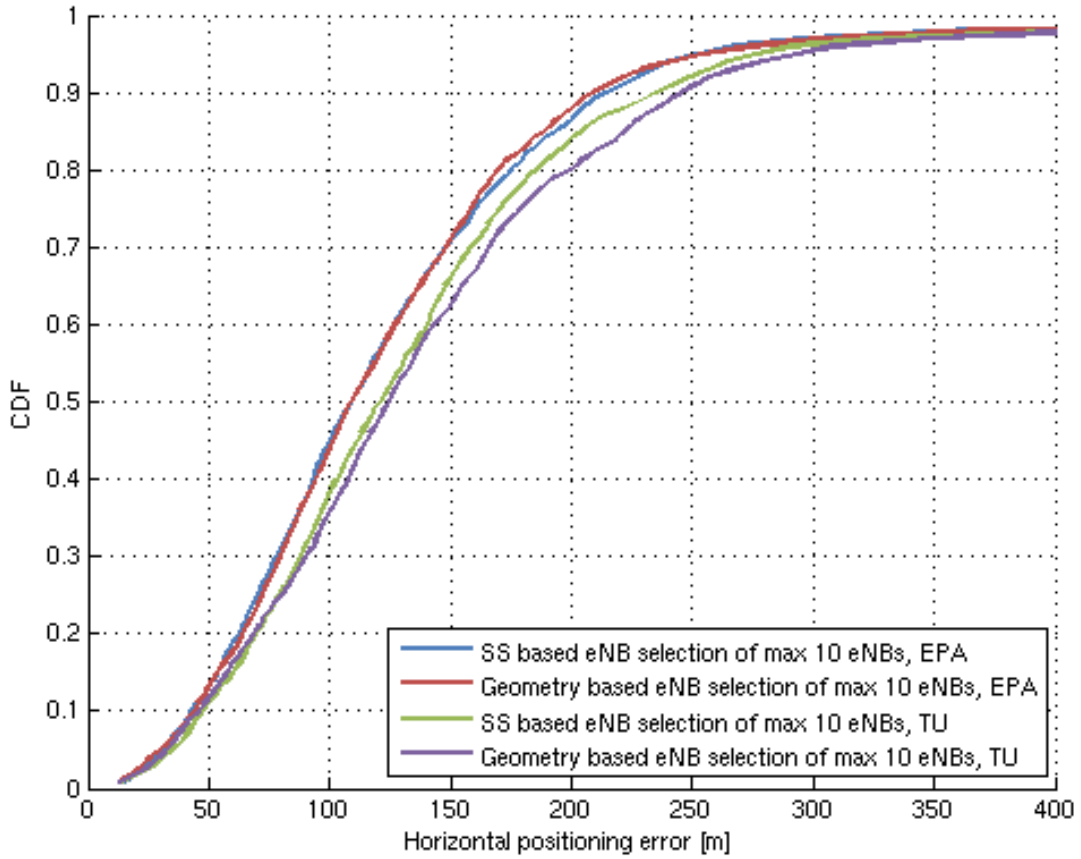


Figure 2 Horizontal positioning error distribution for the TAM positioning method.

The results from all simulations for the TAM position method, including the ones seen above, are summarized in the below two tables where the horizontal accuracy achievable at the 67th and 95th percentile are presented.

A first observation from the tables is that the achievable results are dependent on the maximum number of eNBs involved in the positioning procedure of a UE. Then, when up to 5 eNBs are targeted for a positioning attempt the implementation based on geometry, i.e. the geographical location, of the eNBs is showing improved performance compared to the implementation based on signal strength (SS) selection of eNBs. This is partially a consequence of the SINR invariant UE timing error model. For 10 or more eNBs the performance of the two approaches are more or less comparable.

Table 2 Horizontal accuracy achievable at the 67th and 95th percentile for EPA propagation conditions.

Max number of eNBs	Accuracy at 67 th and 95 th percentile [m]	
	SS based eNB selection	Geometry based eNB selection
5 eNBs	205 / 439	201 / 347
10 eNBs	140 / 253	141 / 254
15 eNBs	118 / 231	118 / 230
20eNBs	108 / 221	112 / 233

Table 3 Horizontal accuracy achievable at the 67th and 95th percentile for TU propagation conditions.

Max number of eNBs	Accuracy at 67 th and 95 th percentile [m]	
	SS based eNB selection	Geometry based eNB selection
5 eNBs	235 / 508	218 / 385
10 eNBs	159 / 294	151 / 277
15 eNBs	130 / 252	129 / 249
20eNBs	115 / 249	119 / 244

Of interest is also the likelihood that a UE cannot access three or more cells, which is needed to complete the presented TAM procedure. In the above investigated network setup the likelihood of a UE not being able to access three or more cells, due to a coupling loss exceeding 164 dB, was recorded to 1.5%.

4 Analysis

The TAM procedure outlined in this paper involves a procedure impacting both at the UE and eNB side. For the UE the requirement to synchronize and access a number of cells will when the UE is in extended coverage be time consuming.

It may also have an impact on the UE energy consumption, and this aspect deserves further attention.

Observation 1: TAM can be associated with a long estimation time which may have an impact on the UE battery consumption and a positioning delay

But it should be noted that for TAM, being a TA based method, it is sufficient to access three cells. For time difference of arrival (TDOA) based methods at least four cells need to be involved in a positioning attempt.

The procedure will also consume radio resources in each cell the UE visits, and optimizations to the contention resolution procedure discussed in section 2 may be considered to improve the method.

The TAM positioning accuracy is furthermore heavily dependent on the UE and eNB timing estimation performance. The results presented in section 3 were based on the UE timing error model presented in [2] where the UE performance is assumed to correspond to a timing error uniformly distributed between $\pm 5/240 \cdot 10^3$ s. This is believed to map to a low complexity UE just slightly better than the 3GPP timing requirement **Error! Reference source not found.** It is expected that the presented performance will be improved for a UE supporting higher accuracy than the minimum requirements defined by 3GPP.

Observation 2: TAM can be improved by more tailored UE processing.

TAM does not require a synchronized network, since the considered TA measurements are associated to the relative distance between the eNB and the UE.

Observation 3: TAM does not require a synchronized network.

5 Conclusions

This contribution has introduced a new uplink based procedure for positioning of NB-IoT devices in asynchronous networks. It has been shown that promising results are within reach if sufficiently many eNBs are involved in the positioning of a device. It is therefore felt motivated to continue the investigation of solutions for asynchronous networks within the framework of the Release 14 work item on NB-IoT. Going forward special attention is needed on the feasibility to improve the UE TA estimation accuracy while limiting the impact on the UE complexity, on the impact on UE power consumption and on the procedures needed to support the proposed method.

In addition to the above summary the following observations were made in the contribution:

Observation 1: TAM may be associated with a long estimation time which may have an impact on the UE battery consumption and a positioning delay.

Observation 2: TAM can be improved by more tailored UE processing.

Observation 3: TAM does not require a synchronized network.

6 References

- [1] RP-161318, Enhancements of NB-IoT, RAN#72, source Vodafone et al
- [2] R1-167424, New simulator for positioning of NB-IoT, RAN1#86, source Ericsson
- [3] R1-167423, On requirements and assumptions for positioning of NB-IoT, RAN1#86, source Ericsson
- [4] RP-161034, Positioning enhancements for GERAN – introducing TA trilateration, RAN#72, source Ericsson
- [5] TS 36.133, Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management

Serving Cell TA Estimation for Multilateration Positioning

1. INTRODUCTION

A new work item for positioning enhancements for GERAN [1] was agreed at RAN#72. Two variants of the multilateration positioning procedure are proposed for enhanced positioning estimation for Rel-14:

- i) the Multilateration Timing advance method using the estimated timing advance to the serving cell and suitable neighbour cells for position estimation and
- ii) the Multilateration OTD method using the estimated timing advance to the serving cell and the MS measurement report containing the estimated OTD with neighbour cells for position estimation.

Both these methods require timing advance estimation for the MS under interest at the serving cell which transmits the *RRLP:Multilateration Request* message to the MS.

This contribution proposes some modifications related to the timing advance estimation at the serving cell prior to sending the *RRLP:Multilateration Request* message to the MS.

2. PROPOSED MODIFICATIONS TO SERVING CELL TA ESTIMATION

2.1 Serving cell TA estimation for Multilateration Positioning

The Multilateration Timing Advance procedure is triggered by sending the *RRLP:Multilateration Request* message to the MS. The MS then autonomously selects suitable neighbour cells based on network assisted information given in the *RRLP:Multilateration Request* message and performs the multilateration TA procedure in these cells. As per the message contents proposed for the *RRLP:Multilateration Request* in [2], the cell list provided in the assistance information only contains non-serving cells, however an accurate TA estimation to the serving cell is of key relevance in order to achieve an accurate position estimate. Hence two options exist for an accurate serving cell TA estimation:

- 1) As part of the multilateration TA procedure MS performs the multilateration TA access attempt also towards the serving cell as it is not included in the network assistance information.
- 2) The MS skips the multilateration TA access attempt to the serving cell, as it has established an (EC) TBF prior to receiving the *RRLP:Multilateration Request* message which serves to estimate its TA.

The second option is preferred, since it is more energy efficient and furthermore reduces the overall delay of the procedure. In this case, the timing advance to the serving cell should be estimated during (EC) TBF operation and be reported by the BSS towards the SMLC along with BTS receiver accuracy and MS accuracy related information, required for multilateration TA positioning, prior or at the release of the (EC) TBF.

Hence two related working assumptions WA1 and WA2 are proposed below.

WA1: The timing advance to the serving cell is estimated during (EC) TBF operation for sending the *RRLP:Multilateration Request* message, thus avoiding another multilateration TA access to the serving cell.

WA2: The timing advance to the serving cell needs also to be estimated for the Multilateration OTD method. It is also done during (EC) TBF operation for sending the *RRLP:Multilateration OTD Request* message.

Estimating the timing advance at the serving cell and reporting the MS accuracy related measurement quantities over the air to forward this information to SMLC requires however additional changes to the Multilateration Positioning procedure related to sending an access request for the paging response to the paging request indicating paging for positioning. This is elaborated in the following subsections.

2.2 TA estimation upon access request for sending 'paging for positioning' response

The TA estimation for positioning on access bursts and normal bursts requires additional processing at the base station to achieve a higher accuracy. This additional processing includes oversampling and interpolation of the channel impulse response. In order to apply this additional processing on the bursts related to the multilateration TA procedure, the base station should be enabled to differentiate the access attempt for multilateration TA and channel access attempts with other establishment causes. In case of neighbour cells where the MS performs multilateration TA access on reception of the *RRLP:Multilateration Request* message, a new channel access message type was already decided to be introduced, but for the serving cell a similar differentiation is needed. Thus it is proposed to distinguish a message carrying a 'paging for positioning' response (used both for Multilateration TA and Multilateration OTD) from a channel access request carrying a page response (legacy case) or other establishment causes. This yields working assumption WA3.

WA3: Differentiation of the channel access request for sending the 'paging for positioning' response with channel access requests due to other establishment causes is required to apply additional processing at the serving cell for accurate timing estimation of the bursts contributing to TA estimation for multilateration positioning.

To this purpose the MS needs to send a new establishment cause in the new (EC-)RACH message, foreseen for TA multilateration, which enables the BSS to differentiate this access from others and apply additional processing for timing estimation with higher accuracy. In particular it is proposed to use one of the spare bits in the *EGPRS Packet Channel Request* and *EC Packet Channel Request* messages for Multilateration Timing Advance to indicate that the channels access request is related to a page for positioning to start Multilateration Positioning. This yields working assumption WA4.

WA4: The MS shall use *EGPRS Packet Channel Request* or *EC Packet Channel Request* messages for Multilateration Timing Advance for sending the paging for positioning' response. To this purpose one of the available spare bits in the message Multilateration Channel Request is used to indicate that that the channels access request is related to a page for positioning or not.

2.3 Obtaining the MS accuracy related information upon access request for sending 'paging for positioning' response

To inform the SMLC about the MS accuracy related information for the serving cell, the MS needs to include its downlink synchronisation accuracy and transmission offset measured quantities in the RLC block granted on UL, which is sent via the serving cell to the BSS and which also carries the TLLI of the MS. The BSS forwards this information along with the

estimated timing advance and BTS reception accuracy quantity to the SMLC as part of the multilateration positioning procedure.

For estimating the timing advance to the serving cell, the serving cell performs the estimate during (EC) TBF operation required for sending the paging response. The MS includes the MS accuracy related parameters in the RLC block which conveys the LLC frame to the SGSN as paging response to the paging request for positioning. This yields working assumption WA5.

WA 5: When MS sends the 'paging for positioning' response in the LLC frame to the SGSN via establishing an (EC) TBF, it includes aside the TLLI the MS downlink synchronisation accuracy and the MS transmission offset measured quantities in the RLC block.

3. SIGNALING PROCEDURE FOR SERVING CELL TA ESTIMATION

Changes to the Multilateration TA procedure for MS in idle mode and in connected mode are depicted in this section which includes serving cell timing advance estimation before releasing the (EC) TBF with serving cell in order to perform neighbour cell multilateration TA.

3.1 Serving Cell Timing Advance Estimation for MS in idle mode

Changes for MS in idle mode are illustrated in Figure 1.

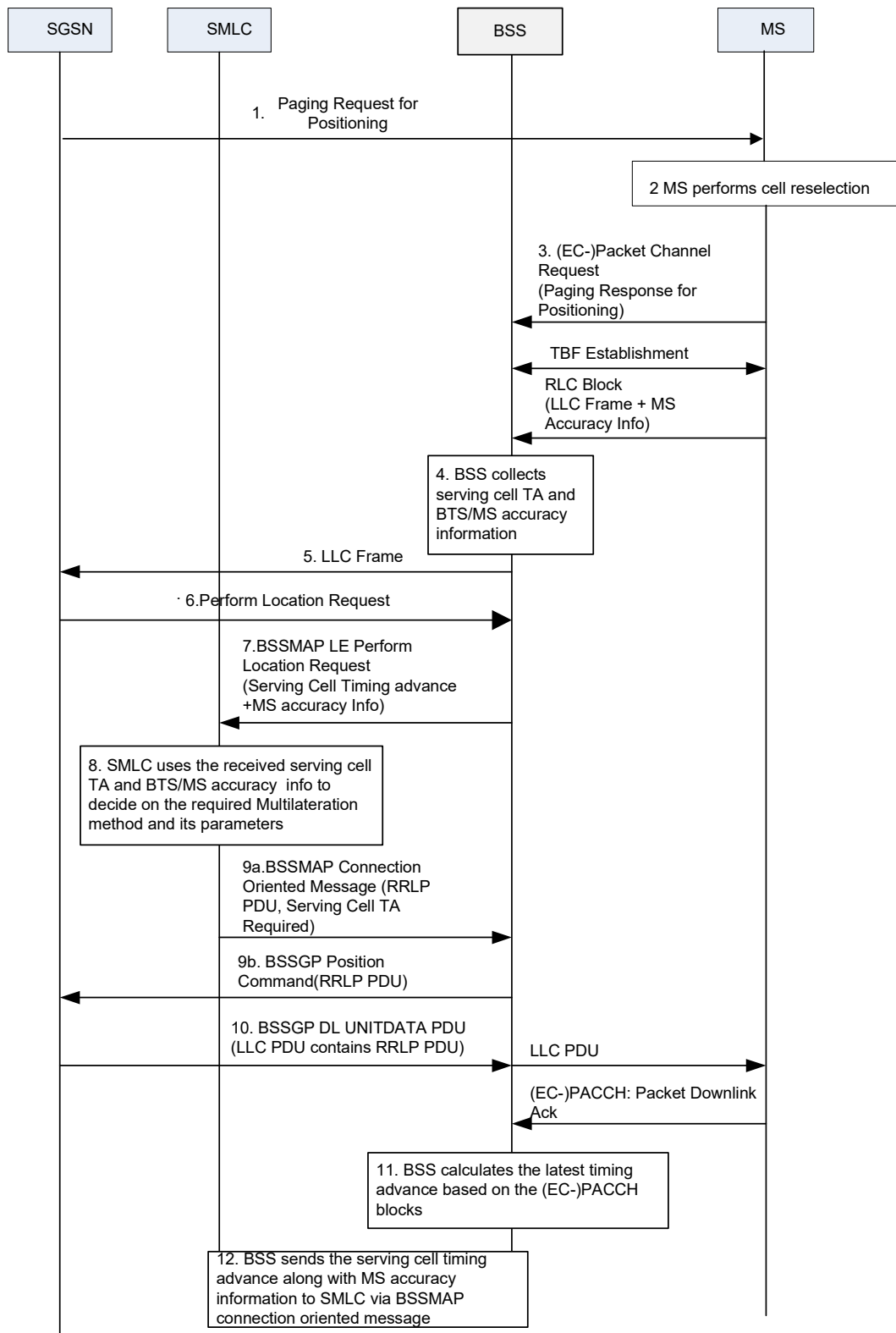


Figure 1: Estimation of TA of serving cell within the Multilateration Positioning procedure (MS in idle mode).

The procedure consists of the following steps.

1. SGSN sends paging request indicating paging for positioning to MS which triggers the MS to immediately perform cell reselection.

2. MS performs cell reselection to select suitable cell for sending the (EC-)RACH message which initiates the transmission of the paging response.
3. MS sends *EGPRS Packet Channel Request* or *EC Packet Channel Request* message with additional indication that it contains a paging response.
4. BSS estimates the timing advance with higher accuracy on the received access burst and also based on the normal bursts used to send the RLC block and determines the BTS synchronization accuracy. BSS receives the RLC block with information on TLLI, MS DL synchronisation accuracy and MS transmission offset and stores all quantities in the MS context.
5. BSS forwards the paging response (LLC frame) including the TLLI and the serving cell ID to SGSN.
6. SGSN sends the Perform Location Request message to BSS.
7. BSS includes the stored values related to timing advance, MS and BTS receiver accuracy and MS transmission offset in the BSSMAP LE Perform Location Request message and sends it to SMLC.
8. SMLC considers this information as serving cell related timing estimation for the TA based multilateration and determines the parameters for Multilateration Positioning (i.e. method, target number of cells for access or measurement).
9. SMLC forms the RRLP:Multilateration Request message and sends it to SGSN via BSS (step 9a and 9b) by using BSSMAP connection oriented message which carries the RRLP message. This BSSMAP message may include an additional parameter to indicate to BSS that latest serving cell TA is required from BSS. Based on this indication, BSS will send the estimated timing advance on reception of next uplink radio block.
10. BSS receives the DL UNITDATA PDU and sends it to MS.
11. MS sends an (EC-)PACCH block to BSS for acknowledging the receipt of the RRLP:Multilateration Request message.
12. On reception of uplink (EC-)PACCH block, BSS estimates the latest timing advance to the serving cell and sends the timing advance along with BTS receiver accuracy and MS accuracy parameters to SMLC to update the serving cell related timing estimation before the MS leaves the cell for TA multilateration.
13. By comparing serving cell related timing information at both instants (after paging request and after Multilateration request) the SMLC may detect if the MS is stationary or moving.

This yields working assumption WA6.

WA6: The signaling procedure described in this section is used as mechanism for obtaining the timing advance to the serving cell for the multilateration positioning procedures and for MS in idle mode.

3.2 Serving Cell Timing Advance Estimation for MS in connected mode

If the MS is in connected mode, the serving cell is known at the SGSN. In this case the SGSN sends the Perform Location Request message to the serving BSS without signalling related to paging for positioning. In this case, the BSS may not have the timing advance of the serving cell estimated with required accuracy and furthermore the MS synchronisation accuracy information is not available at the BSS.

In this case, the SMLC triggers a separate procedure to obtain the serving cell timing advance prior to the multilateration TA procedure. It requests the TA for the serving cell from the serving BSS by means of Network Assistance Information request and the BSS sends a Packet Polling Request message to the MS indicating that MS accuracy related information is required for Multilateration Positioning. The MS then sends a new (EC-)PACCH (e.g. PDAN or Packet Control Acknowledgement) message containing the MS accuracy related information. This yields working assumption WA7.

WA7: To estimate the timing advance to the serving cell for MS in connected mode for Multilateration Positioning, a new (EC-)PACCH message is required for UL to convey the MS Synchronisation accuracy and MS Transmission offset measured quantities as well as an indication in the (EC) Packet Polling Request on DL to command the usage of the new uplink (EC-)PACCH message.

4. SUMMARY

The sourcing company proposes to agree on the following working assumptions related to the serving cell timing advance estimation and the transport of BTS receiver accuracy and MS accuracy related information for the Multilateration Positioning procedures.

WA1: The timing advance to the serving cell is estimated during (EC) TBF operation for sending the *RRLP:Multilateration Request* message, thus avoiding another multilateration TA access to the serving cell.

WA2: The timing advance to the serving cell needs also to be estimated for the Multilateration OTD method. It is also done during (EC) TBF operation for sending the *RRLP:Multilateration OTD Request* message.

WA3: Differentiation of the channel access request for sending the 'paging for positioning' response with channel access requests due to other establishment causes is required to apply additional processing at the serving cell for accurate timing estimation of the bursts contributing to TA estimation for multilateration positioning.

WA4: The MS shall use *EGPRS Packet Channel Request* or *EC Packet Channel Request* messages for Multilateration Timing Advance for sending the paging for positioning' response. To this purpose one of the available spare bits in the message Multilateration Channel Request is used to indicate that that the channels access request is related to a page for positioning or not.

WA 5: When MS sends the 'paging for positioning' response in the LLC frame to the SGSN via establishing an (EC) TBF, it includes aside the TLLI the MS downlink synchronisation accuracy and the MS transmission offset measured quantities in the RLC block.

WA6: The signaling procedure described in section 3.1 is used as mechanism for obtaining the timing advance to the serving cell for the multilateration positioning procedures and for MS in idle mode.

WA7: To estimate the timing advance to the serving cell for MS in connected mode for Multilateration Positioning, a new (EC-)PACCH message is required for UL to convey the MS Synchronisation accuracy and MS Transmission offset measured quantities as well as an indication in the (EC) Packet Polling Request on DL to command the usage of the new uplink (EC-)PACCH message.

Corresponding changes with regard to 3GPP TS 43.059 are captured in [3] and [4].

REFERENCES

- [1] RP-161260, "New WID on Positioning Enhancements for GERAN", source Ericsson et al., RAN#72
- [2] R6-160153, CR to 44.031 "Introduction of Multilateration", source Ericsson, RAN6#2

- [3] R6-170048, CR to 43.059-0083 "Introduction of Multilateration Timing Advance", source Nokia, RAN6#3
- [4] R6-170039, CR to 43.059-0082 "Introduction of Multilateration OTD ", source Nokia, RAN6#3

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

PCT

To:

Henderson, Mymy
HENDERSON, Mymy
2755 Augustine Drive
Santa Clara CA 95054
ETATS-UNIS D'AMERIQUE

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL SEARCH REPORT AND
THE WRITTEN OPINION OF THE INTERNATIONAL
SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

Applicant's or agent's file reference P71354-WO1	Date of mailing (day/month/year) 29 March 2018 (29-03-2018)
International application No. PCT/IB2018/050684	International filing date (day/month/year) 2 February 2018 (02-02-2018)
Applicant TELEFONAKTIEBOLAGET L M ERICSSON (PUBL)	

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

Filing of amendments and statement under Article 19:

The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

When? The time limit for filing such amendments is normally two months from the date of transmittal of the International Search Report.

How? Directly to the International Bureau of WIPO, 34 chemin des Colombettes
1211 Geneva 20, Switzerland, Facsimile No.: (41-22) 338.82.70

For more detailed instructions, see *PCT Applicant's Guide*, International Phase, paragraphs 9.004 - 9.011.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.
3. ☐ **With regard to any protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:
- ☐ the protest together with the decision thereon has been transmitted to the International Bureau together with any applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.
- ☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. Reminders

The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. These comments will be made available to the public after international publication. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established.

Shortly after the expiration of **18 months from the priority date, the international application will be published** by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before the completion of the technical preparations for international publication (Rules 90*bis*.1 and 90*bis*.3).

Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for **entry into the national phase** before those designated Offices. In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months. For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide*, National Chapters.

Within **22 months from the priority date, the applicant may request that a supplementary international search be carried out** by a different International Searching Authority that offers this service (Rule 45*bis*.1). The procedure for requesting supplementary international search is described in the *PCT Applicant's Guide*, International Phase, paragraphs 8.006-8.032.

Name and mailing address of the International Searching Authority



European Patent Office, P.B. 5818 Patentlaan 2
NL-2280 HV Rijswijk
Tel. (+31-70) 340-2040
Fax: (+31-70) 340-3016

Authorized officer

SCHUR, Marlene
Tel: +49 (0)30 25901-717

PATENT COOPERATION TREATY

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INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference P71354-WO1	FOR FURTHER ACTION see Form PCT/ISA/220 as well as, where applicable, item 5 below.	
International application No. PCT/IB2018/050684	International filing date (<i>day/month/year</i>) 2 February 2018 (02-02-2018)	(Earliest) Priority Date (<i>day/month/year</i>) 2 February 2017 (02-02-2017)
Applicant TELEFONAKTIEBOLAGET L M ERICSSON (PUBL)		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 4 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of:

- ☒ the international application in the language in which it was filed
- ☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6**bis**(a)).

c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (See Box No. II)

3. ☐ **Unity of invention is lacking** (see Box No III)

4. With regard to the **title**,

- ☒ the text is approved as submitted by the applicant
- ☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

- ☒ the text is approved as submitted by the applicant
- ☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority

6. With regard to the **drawings**,

a. the figure of the **drawings** to be published with the abstract is Figure No. 3

- ☒ as suggested by the applicant
- ☐ as selected by this Authority, because the applicant failed to suggest a figure
- ☐ as selected by this Authority, because this figure better characterizes the invention

b. ☐ none of the figures is to be published with the abstract

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2018/050684

A. CLASSIFICATION OF SUBJECT MATTER

INV. H04W64/00

ADD. H04W68/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H04W

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	LM ERICSSON: "Multilateration Procedure - TA Only", 3GPP DRAFT; R6-160273 - MULTILATERATION PROCEDURE - TA ONLY (WAS R6-160261), 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CE , no. Reno, Nevada USA; 20161114 - 20161118 18 November 2016 (2016-11-18), XP051198955, Retrieved from the Internet: URL:http://www.3gpp.org/ftp/tsg_ran/WG6_le gacyRAN/TSGR6_02/Docs/ [retrieved on 2016-11-18] page 17 - page 18 ----- -/--	1-24



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

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Date of the actual completion of the international search

21 March 2018

Date of mailing of the international search report

29/03/2018

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European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Eraso Helguera, J

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2018/050684

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	ERICSSON LM: "Introduction of Multilateration", 3GPP DRAFT; R6-160274 CR 43.059 INTRODUCTION OF MULTILATERATION USING TIMING ADVANCE, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANT , vol. TSG RAN, no. Reno, Nevada USA; 20161114 - 20161118 18 November 2016 (2016-11-18), XP051198956, Retrieved from the Internet: URL:http://www.3gpp.org/ftp/tsg_ran/WG6_legacyRAN/TSGR6_02/Docs/ [retrieved on 2016-11-18] the whole document -----	1-24
A	ERICSSON: "Positioning enhancements for GERAN - introducing Timing Advance trilateration", 3GPP DRAFT; RP-161034 - POSITIONING ENHANCEMENTS FOR GERAN - INTRODUCING TA TRILATERATION, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHI , vol. TSG RAN, no. Busan, Korea; 20160613 - 20160616 12 June 2016 (2016-06-12), XP051103882, Retrieved from the Internet: URL:http://www.3gpp.org/ftp/Meetings_3GPP_SYNC/RAN/Docs/ [retrieved on 2016-06-12] cited in the application the whole document -----	1-24
A	ERICSSON: "On timing advance based multi-leg positioning for NB-IoT", 3GPP DRAFT; R1-167426 - ON TIMING ADVANCE BASED MULTI-LEG POSITIONING FOR NB-IOT, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOL , vol. RAN WG1, no. Gothenburg, Sweden; 20160822 - 20160826 21 August 2016 (2016-08-21), XP051125896, Retrieved from the Internet: URL:http://www.3gpp.org/ftp/Meetings_3GPP_SYNC/RAN1/Docs/ [retrieved on 2016-08-21] cited in the application the whole document -----	1-24
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INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2018/050684

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P	NOKIA: "Serving Cell TA Estimation for Multilateration Positioning", 3GPP DRAFT; R6-170045 SERVING CELL TA ESTIMATION FOR MULTILATERATION POSITIONING, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOL , vol. TSG RAN, no. Athens, Greece; 20170213 - 20170217 3 February 2017 (2017-02-03), XP051227257, Retrieved from the Internet: URL:http://www.3gpp.org/ftp/tsg_ran/WG6_legacyRAN/TSGR6_03/Docs/ [retrieved on 2017-02-03] the whole document -----	1-24

TITLE: NOTIFICATION OF DELIVERY OF A RRLP MULTILATERATION TIMNG ADVANCE REQUEST MESSAGE TO A BASE STATION SUBSYSTEM (BSS)

APPLICANT: TELEFONAKTIEBOLAGET L M ERICSSON (PUBL)

IPC CLASSIFICATION: H04W64/00, H04W68/00

EXAMINER: Eraso Helguera, J

CONSULTED DATABASES: NPL, EPODOC, WPI, XP3GPP

CLASSIFICATION SYMBOLS DEFINING EXTENT OF THE SEARCH:

IPC:

CPC: H04W64/00, H04W68/00

FI/F-TERMS:

KEYWORDS OR OTHER ELEMENTS FEATURING THE INVENTION:

multilateration_timing_advance, MTA, BSSGP, POSITION_COMMAND, timer, flag[,s],
SGSN, BSS, RRLP, request, DL_UNITDATA, PACCH_acknowledgement, serving_cell,
estimation

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

To:

see form PCT/ISA/220

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/IB2018/050684

International filing date (day/month/year)
02.02.2018

Priority date (day/month/year)
02.02.2017

International Patent Classification (IPC) or both national classification and IPC
INV. H04W64/00 ADD. H04W68/00

Applicant
TELEFONAKTIEBOLAGET L M ERICSSON (PUBL)

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☒ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☒ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA:



European Patent Office
Gitschiner Str. 103
D-10958 Berlin
Tel. +49 30 25901 - 0
Fax: +49 30 25901 - 840

Date of completion of
this opinion

see form
PCT/ISA/210

Authorized Officer

Eraso Helguera, J

Telephone No. +49 30 25901-0



Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - ☒ the international application in the language in which it was filed.
 - ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).
2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))
3. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:
 - a. ☐ forming part of the international application as filed:
 - ☐ in the form of an Annex C/ST.25 text file.
 - ☐ on paper or in the form of an image file.
 - b. ☐ furnished together with the international application under PCT Rule 13ter.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.
 - c. ☐ furnished subsequent to the international filing date for the purposes of international search only:
 - ☐ in the form of an Annex C/ST.25 text file (Rule 13ter.1(a)).
 - ☐ on paper or in the form of an image file (Rule 13ter.1(b) and Administrative Instructions, Section 713).
4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

Box No. II Priority

1. ☒ The validity of the priority claim has not been considered because the International Searching Authority does not have in its possession a copy of the earlier application whose priority has been claimed or, where required, a translation of that earlier application. This opinion has nevertheless been established on the assumption that the relevant date (Rules 43bis.1 and 64.1) is the claimed priority date.
2. ☐ This opinion has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rules 43bis.1 and 64.1). Thus for the purposes of this opinion, the international filing date indicated above is considered to be the relevant date.
3. Additional observations, if necessary:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	<u>1-24</u>
	No: Claims	
Inventive step (IS)	Yes: Claims	<u>1-24</u>
	No: Claims	
Industrial applicability (IA)	Yes: Claims	<u>1-24</u>
	No: Claims	

2. Citations and explanations

see separate sheet

Box No. VI Certain documents cited

1. Certain published documents (Rules 43*bis*.1 and 70.10)

and / or

2. Non-written disclosures (Rules 43*bis*.1 and 70.9)

see form 210

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

- D1 LM ERICSSON: "Multilateration Procedure - TA Only",
3GPP DRAFT; R6-160273 - MULTILATERATION PROCEDURE
- TA ONLY (WAS R6-160261), 3RD GENERATION
PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE
CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-
ANTIPOLIS CE
,
no. Reno, Nevada USA; 20161114 - 20161118 18 November
2016 (2016-11-18), XP051198955,
Retrieved from the Internet:
URL:[http://www.3gpp.org/ftp/tsg_ran/WG6_legacyRAN/
TSGR6_02/Docs/](http://www.3gpp.org/ftp/tsg_ran/WG6_legacyRAN/TSGR6_02/Docs/)
[retrieved on 2016-11-18]
- D2 ERICSSON LM: "Introduction of Multilateration",
3GPP DRAFT; R6-160274 CR 43.059 INTRODUCTION OF
MULTILATERATION USING TIMING ADVANCE, 3RD
GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE
COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ;
F-06921 SOPHIA-ANT
,
vol. TSG RAN, no. Reno, Nevada USA; 20161114 - 20161118
18 November 2016 (2016-11-18), XP051198956,
Retrieved from the Internet:
URL:[http://www.3gpp.org/ftp/tsg_ran/WG6_legacyRAN/
TSGR6_02/Docs/](http://www.3gpp.org/ftp/tsg_ran/WG6_legacyRAN/TSGR6_02/Docs/)
[retrieved on 2016-11-18]
- D3 ERICSSON: "Positioning enhancements for GERAN -
introducing Timing Advance trilateration",
3GPP DRAFT; RP-161034 - POSITIONING ENHANCEMENTS
FOR GERAN - INTRODUCING TA TRILATERATION, 3RD
GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE
COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ;

F-06921 SOPHI

,
vol. TSG RAN, no. Busan, Korea; 20160613 - 20160616 12 June
2016 (2016-06-12), XP051103882,
Retrieved from the Internet:
URL:http://www.3gpp.org/ftp/Meetings_3GPP_SYNC/RAN/Docs/
[retrieved on 2016-06-12]
cited in the application

D4 ERICSSON: "On timing advance based multi-leg positioning for
NB-IoT",
3GPP DRAFT; R1-167426 - ON TIMING ADVANCE BASED
MULTI-LEG POSITIONING FOR NB-IOT, 3RD GENERATION
PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE
CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-
ANTIPOL
,
vol. RAN WG1, no. Gothenburg, Sweden; 20160822 - 20160826
21 August 2016 (2016-08-21), XP051125896,
Retrieved from the Internet:
URL:[http://www.3gpp.org/ftp/Meetings_3GPP_SYNC/RAN1/](http://www.3gpp.org/ftp/Meetings_3GPP_SYNC/RAN1/Docs/)
Docs/
[retrieved on 2016-08-21]
cited in the application

- 1 D1 is regarded as being the prior art closest to the subject-matter of claim 1,
and discloses:
- 1.1 A Serving GPRS Support Node, SGSN, (see paragraph 6: *SGSN*) configured
to interact with a Base Station Subsystem, BSS, (see paragraph 5: *BSS*), the
SGSN comprising:
a processor; and,
a memory that stores processor-executable instructions, wherein the
processor interfaces with the memory to execute the processor-executable
instructions, whereby the SGSN is operable to:
receive (see paragraph 6: *The BSSGP entity in the SGSN extracts the
embedded RRLP message (i.e. the "Multilateration Request" component)*
from the "RRLP APDU" IE received in the "BSSGP POSITION-COMMAND
PDU" and sends it to the TOM protocol entity), from the BSS, a BSS General

Packet Radio Service, GPRS, Protocol, BSSGP, POSITION-COMMAND Packet Data Unit, PDU, (see paragraph 10.5.4: *POSITION-COMMAND PDU*) which includes (i) a Radio Resource Location Services Protocol, RRLP, PDU (see paragraph 11.3.49: *RRLP APDU*), wherein the RRLP PDU includes a RRLP Multilateration Timing Advance, MTA. Request message (see paragraph 6: *embedded RRLP message*) intended for a target wireless device (see paragraph 6: *MS*), and (ii) an indicator (see paragraph 4.8: *MTAO Multilateration Request*) that the target wireless device is to perform a MTA procedure;

transmit (see paragraph 6: *The LLC PDU is sent to the serving BSS*), to the BSS, a BSSGP Down Link, DL, -UNITDATA PDU which includes a Logical Link Control, LLC, PDU (see paragraph 6: *The LLC entity generates an LLC PDU (containing the TOM PDU)*) intended for the target wireless device, wherein the LLC PDU includes the RRLP PDU, wherein the RRLP PDU further includes the RRLP MTA Request Message (see paragraph 6: *The BSSGP entity in the SGSN extracts the embedded RRLP message (i.e. the "Multilateration Request" component) from the "RRLP APDU" IE received in the "BSSGP POSITION-COMMAND PDU" and sends it to the TOM protocol entity. The TOM protocol entity prepends the TOM protocol header (1 octet) to the embedded RRLP message and sends the resulting TOM PDU to the LLC entity using the TOM SAP.*

The subject-matter of claim 1 therefore differs from this known SGSN in that , the BSSGP DL-UNITDATA PDU further includes a flag which indicates to the BSS a need to estimate timing advance information when receiving a Packet Associated Control Channel, PACCH, acknowledgement from the target wireless device, and is therefore new (Article 33(2) PCT).

The problem to be solved by the present invention may be regarded as how to have the BSS estimate a "Timing Advance" (see Working Assumption 12).

The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

No other document in the prior art teaches or suggests the use of the distinguishing feature above for this purpose. The straightforward solution starting from D1 for the skilled person would consider would be to either to re-use a BSSGP PDU type known to be used for signalling purposes, or to create a new signalling BSSGP PDU type, but, in any case, the straightforward solution would be to use a signalling BSSGP PDU sent by the

SGSN to the BSS on a signalling BVC to inform the BSS that it needs to estimate timing advance information when receiving a Packet Associated Control Channel, PACCH, acknowledgement from the target wireless device, rather than a flag on the BSSGP DL-UNITDATA PDU as specified above, which is sent on a Cell BVC. None of the documents D2, D3 and D4 discloses or hints at the distinguishing features either.

1.2 The same reasoning above applies correspondingly to the method of claim 5, which is therefore considered new (Article 33(2) PCT) and as involving an inventive step (Article 33(3) PCT).

2 D1 is regarded as being the prior art closest to the subject-matter of claim 9, and discloses:

2.1 A Base Station Subsystem, BSS, (see paragraph 5: *BSS*) configured to interact with a Serving GPRS Support Node, SGSN, (see paragraph 6: *SGSN*) and a target wireless device (see paragraph 6: *MS*), the BSS comprising:
a processor; and,
a memory that stores processor-executable instructions, wherein the processor interfaces with the memory to execute the processor-executable instructions, whereby the BSS is operable to:
transmit (see paragraph 5: *The BSSGP entity in the BSS sends the SGSN a "BSSGP POSITION-COMMAND PDU" (see Step 6 in Figure 1) and includes the embedded RRLP message (i.e. the "Multilateration Request" component) received from the LCS entity in the BSS as the embedded RRLP message within the "RRLP APDU" IE of the "BSSGP POSITION-COMMAND PDU"*), to the SGSN, a BSS General Packet Radio Service, GPRS, Protocol, BSSGP, POSITION-COMMAND Packet Data Unit, PDU, (see paragraph 10.5.4: *POSITION-COMMAND PDU*) which includes (i) a Radio Resource Location Services Protocol, RRLP, PDU (see paragraph 11.3.49: *RRLP APDU*), wherein the RRLP PDU includes a RRLP Multilateration Timing Advance, MTA. Request message (see paragraph 6: *embedded RRLP message*) intended for the target wireless device (see paragraph 6: *MS*), and (ii) an indicator (see paragraph 4.8: *MTAO Multilateration Request*) that the target wireless device is to perform a MTA procedure;
receive (see paragraph 6: *The LLC PDU is sent to the serving BSS*), from the SGSN, a BSSGP Down Link, DL, -UNITDATA PDU which includes a Logical Link Control, LLC, PDU (see paragraph 6: *The LLC entity generates an LLC PDU (containing the TOM PDU)*) intended for the target wireless device,

wherein the LLC PDU includes the RRLP PDU, wherein the RRLP PDU further includes the RRLP MTA Request Message (see paragraph 6: *The BSSGP entity in the SGSN extracts the embedded RRLP message (i.e. the "Multilateration Request" component) from the "RRLP APDU" IE received in the "BSSGP POSITION-COMMAND PDU" and sends it to the TOM protocol entity. The TOM protocol entity prepends the TOM protocol header (1 octet) to the embedded RRLP message and sends the resulting TOM PDU to the LLC entity using the TOM SAP.*

The subject-matter of claim 9 therefore differs from this known BSS in that in response to transmitting the LLC PDU, it receives a Packet Associated Control Channel, PACCH, acknowledgement, from the target wireless device; and,

when receiving the PACCH acknowledgement, it estimates timing advance information associated with the PACCH acknowledgement, wherein the BSS is informed of a need to estimate the timing advance information when receiving the PACCH acknowledgement by a flag within the BSSGP DL-UNITDATA PDU, and is therefore new (Article 33(2) PCT).

The problem to be solved by the present invention may be regarded as how to have the BSS estimate a "Timing Advance" (see Working Assumption 12).

The solution to this problem proposed in claim 9 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

No other document in the prior art teaches or suggests the use of the distinguishing feature above for this purpose. The straightforward solution starting from D1 for the skilled person would consider would be either to re-use a BSSGP PDU type known to be used for signalling purposes, or to create a new signalling BSSGP PDU type, but, in any case, the straightforward solution would be to use a signalling BSSGP PDU sent by the SGSN to the BSS on a signalling BVC, rather than a flag on the BSSGP DL-UNITDATA PDU specified above, which is sent on a Cell BVC. Besides, D1 does not hint at the use of PACCH acknowledgement received from the MS to perform the estimate. None of the documents D2, D3 and D4 discloses or hints at the distinguishing features either.

- 2.2 The same reasoning above applies correspondingly to the method of claim 15, which is therefore considered new (Article 33(2) PCT) and as involving an inventive step (Article 33(3) PCT).

3 D1 is regarded as being the prior art closest to the subject-matter of claim 21, and discloses:

3.1 A wireless device (see paragraph 6: *MS*) configured to interact with a Base Station Subsystem, BSS, (see paragraph 5: *BSS*), the wireless device comprising:
a processor; and,
a memory that stores processor-executable instructions, wherein the processor interfaces with the memory to execute the processor-executable instructions, whereby the wireless device is operable to:
receive (see paragraph 6: *The LLC PDU is sent to the serving BSS which establishes a downlink TBF and delivers the LLC*), from the BSS, a LLC, PDU (see paragraph 6: *The LLC entity generates an LLC PDU (containing the TOM PDU)*), wherein the LLC PDU includes a Radio Resource Location Service Protocol, RRLP, PDU, wherein the RRLP PDU further includes a RRLP Multilateration Timing Advance Request Message (see paragraph 6: *The BSSGP entity in the SGSN extracts the embedded RRLP message (i.e. the "Multilateration Request" component) from the "RRLP APDU" IE received in the "BSSGP POSITION-COMMAND PDU" and sends it to the TOM protocol entity. The TOM protocol entity prepends the TOM protocol header (1 octet) to the embedded RRLP message and sends the resulting TOM PDU to the LLC entity using the TOM SAP*).

The subject-matter of claim 21 therefore differs from this known wireless device in that the RRLP MTA Request Message indicates that the wireless device does not need to perform a Multilateration Timing Advance procedure in a serving cell, and in response to receiving the LLC PDU, it transmits a Packet Associated Control Channel, PACCH, acknowledgement to the BSS. and is therefore new (Article 33(2) PCT).

The problem to be solved by the present invention may be regarded as how to have the BSS estimate a "Timing Advance" (see Working Assumption 12).

The solution to this problem proposed in claim 21 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

No other document in the prior art teaches or suggests the use of the distinguishing feature above for this purpose. The skilled person starting from D1 would arrive at modifying the RRLP:MTA Request so as to prevent the wireless device from performing multilateration TA access attempts also

towards the serving cell. However, further transmitting a Packet Associated Control Channel, PACCH, acknowledgement to the BSS, which enables the BSS to perform the estimate, cannot be derived in a straightforward manner from D1 and it would require the use of hindsight. None of the documents D2, D3 and D4 discloses or hints at the distinguishing features either.

- 3.2 The same reasoning above applies correspondingly to the method of claim 23, which is therefore considered new (Article 33(2) PCT) and as involving an inventive step (Article 33(3) PCT).
- 4 Claims 2-4, 6-8, 10-14, 16-20, 22, 24 are dependent on one or more independent claims whose subject-matter is considered as being new and inventive, as discussed above, and as such said dependent claims also meet the requirements of the PCT with respect to novelty and inventive step.

Re Item VI

Certain documents cited

- D5 NOKIA: "Serving Cell TA Estimation for Multilateration Positioning", 3GPP DRAFT; R6-170045 SERVING CELL TA ESTIMATION FOR MULTILATERATION POSITIONING, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOL
- ,
- vol. TSG RAN, no. Athens, Greece; 20170213 - 20170217 3 February 2017 (2017-02-03), XP051227257,
- Retrieved from the Internet:
- URL:http://www.3gpp.org/ftp/tsg_ran/WG6_legacyRAN/TSGR6_03/Docs/ [retrieved on 2017-02-03]

Possible steps after receipt of the international search report (ISR) and written opinion of the International Searching Authority (WO/ISA)

General information

For all international applications, the competent International Searching Authority (ISA) will establish an international search report (ISR) accompanied by a written opinion of the International Searching Authority (WO/ISA). The WO/ISA may be responded to by

- filing informal comments with the International Bureau of WIPO (IB) (where no demand for international preliminary examination (**demand**) is filed)
- filing amendments under Art. 19 PCT (this can be done whether or not a **demand** is filed)
- filing amendments under Art. 34 PCT and/or formal observations in response to objections raised in the WO/ISA (where a **demand** is actually filed)

This document explains these possibilities.

Filing informal comments

After receipt of the ISR and WO/ISA, the applicant may file informal comments on the WO/ISA, directly with the IB (see International Search and Preliminary Examination Guidelines 2.15). These will be communicated to the designated/elected Offices, together with the International Preliminary Report on Patentability (IPRP) at 30 months from the priority date.

Amending claims under Art. 19 PCT

The applicant may file amended claims under Art. 19 PCT, directly with the IB by the later of the following dates:

- 2 months from the date of mailing of the ISR and the WO/ISA
- 16 months from the priority date

However, any such amendment received by the IB after the expiration of the applicable time limit shall be **considered to have been received on time** by the IB, if it reaches it **before** the technical preparations for international publication have been completed (the 15th day prior to the date of publication, see PCT Applicant's Guide, International Phase, 9.013).

For further information, please see Rule 46 PCT as well as form PCT/ISA/220.

Please also note that, when filing amended claims under Art. 19 PCT, such amendments shall be **accompanied by a letter** identifying the amendments made and also the basis for the amendments in the application as originally filed (Rule 46.5(b) PCT). Where a **demand** is filed, failure to comply with this requirement may result in the amendments being ignored in the International Preliminary Examination Report (IPER), see Rule 70.2(c-bis) PCT.

**Filing a demand
for international
preliminary
examination**

In principle, the **WO/ISA** will be considered to be the written opinion of the International Preliminary Examining Authority (**IPEA**). Where the **WO/ISA** issued by the **EPO** as **ISA** gives a positive opinion on the international application and the invention to which it relates, filing a **demand** with the **EPO** as **IPEA** would normally be unnecessary, since a positive **IPRP** would anyway be established by the **IB** based on the **WO/ISA** (see also further below).

If the applicant wishes to file a **demand** (for example, to allow him to argue his case in international preliminary examination with regard to objections raised in a negative **WO/ISA** before the **IPEA** issues an **IPER**), this must be done before expiration of **3 months after the date of mailing of the ISR and WO/ISA or 22 months after priority date**, whichever expires later (Rule 54*bis* PCT). Amendments under Art. 34 PCT can be filed with the **IPEA**, normally at the same time as filing the demand (Rule 66.1(b) PCT) or within the time limit set for reply to any written opinion issued during international preliminary examination by the **IPEA**.

If a **demand** is filed at the **EPO** as **IPEA** and no comments/amendments have been received by the time the **EPO** starts drawing up the **IPER** (Rule 66.4*bis* PCT), the **WO/ISA** will be transformed by the **IPEA** into an **IPER** (also called the **IPRP (Chapter II)** which would merely reflect the content of the **WO/ISA** (OJ 10/2011, 532). The **demand** can still be withdrawn (Art. 37 PCT).

Please also note that, when filing amendments under Art. 34 PCT, such amendments shall be accompanied by a letter which identifies the amendments made and also the basis for the amendments in the application as originally filed (Rule 66.8(a) PCT). Failure to comply with this requirement may result in the amendments being ignored in the **IPER (IPRP (Chapter II))**, see Rule 70.2(c-*bis*) PCT.

**Filing a request
for supplementary
international
search**

The applicant may, with the **IB**, file a request for **supplementary international search** under Rule 45*bis*.1 PCT. The present **ISR** and **WO/ISA** may also be taken into account in the execution of that supplementary international search, provided that these are available to the Authority charged with this task before it starts the supplementary search (Rule 45*bis*.5 PCT).

This kind of request **cannot be filed specifying the ISA** who did the **international search**.

More information on this topic can be found in the **PCT Applicant's Guide**, Chapter 8 (<http://www.wipo.int/pct/en/guide/ip08.html>).

**End of the
international
phase**

Where no **demand** is filed, at the end of the international phase, the **IB** will transform the **WO/ISA** into the **IPRP (PCT Chapter I)** (Rule 44*bis* PCT), which will then be transmitted together with possible informal comments to the designated Offices. Where a demand is filed, the **WO/ISA** is not transformed into an **IPRP (Chapter I)** by the **IB**, but rather the **IPEA** will establish an **IPER**, (the **IPER** is the same as the **IPRP (PCT Chapter II)**, see Rule 70.15 PCT).

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CLAIMS:

1. A Serving GPRS Support Node (SGSN) (307) configured to interact with a Base Station Subsystem (BSS) (302₂), the SGSN comprising:
 - 5 a processor (346); and,
 - a memory (348) that stores processor-executable instructions, wherein the processor interfaces with the memory to execute the processor-executable instructions, whereby the SGSN is operable to:
 - 10 receive (1102), from the BSS, a BSS General Packet Radio Service (GPRS) Protocol (BSSGP) POSITION-COMMAND Packet Data Unit (PDU) (400) which includes (i) a Radio Resource Location Services Protocol (RRLP) PDU (402), wherein the RRLP PDU includes a RRLP Multilateration Timing Advance (MTA) Request message (404) intended for a target wireless device (304₃), and (ii) an indicator (520, 535) that the target wireless device is to perform a MTA procedure;
 - 15 transmit (1104), to the BSS, a BSSGP Down Link (DL)-UNITDATA PDU (410) which includes a Logical Link Control (LLC) PDU (406) intended for the target wireless device, wherein the LLC PDU includes the RRLP PDU, wherein the RRLP PDU further includes the RRLP MTA Request Message, wherein the BSSGP DL-UNITDATA PDU further includes a flag (420) which indicates to the BSS a need to estimate timing advance
 - 20 information (413) when receiving a Packet Associated Control Channel (PACCH) acknowledgment (422) from the target wireless device.
2. The SGSN of claim 1, wherein the indicator is a Multilateration Timer Information Element (520) that includes a timer value (509) indicating a duration that the
- 25 target wireless device is to perform the MTA procedure.
3. The SGSN of claim 1, wherein the flag is an information element (420a).
4. The SGSN of claim 1, wherein the Packet Associated Control Channel (PACCH) Packet Downlink acknowledgment is an Extended Coverage (EC) PACCH Packet
- 30 Downlink acknowledgment.

5. A method (1100) implemented in a Serving GPRS Support Node (SGSN) (307) configured to interact with a Base Station Subsystem (BSS) (302₂), the method comprising:

receiving (1102), from the BSS, a BSS General Packet Radio Service (GPRS) Protocol (BSSGP) POSITION-COMMAND Packet Data Unit (PDU) (400) which includes

5 (i) a Radio Resource Location Services Protocol (RRLP) PDU (402), wherein the RRLP PDU includes a RRLP Multilateration Timing Advance (MTA) Request message (404) intended for a target wireless device (304₃), and (ii) an indicator (520, 535) that the target wireless device is to perform a MTA procedure;

transmitting (1104), to the BSS, a BSSGP Down Link (DL)-UNITDATA PDU (410)
10 which includes a Logical Link Control (LLC) PDU (406) intended for the target wireless device, wherein the LLC PDU includes the RRLP PDU, wherein the RRLP PDU further includes the RRLP MTA Request Message, wherein the BSSGP DL-UNITDATA PDU further includes a flag (420) which indicates to the BSS a need to estimate timing advance information (413) when receiving a Packet Associated Control Channel (PACCH)
15 acknowledgment (422) from the target wireless device.

6. The method of claim 5, wherein the indicator is an Multilateration Timer Information Element (520) that includes a timer value (509) indicating a duration that the
20 target wireless device is to perform the MTA procedure.

7. The method of claim 5, wherein the flag is an information element (420a).

8. The method of claim 5, wherein the Packet Associated Control Channel (PACCH) Packet Downlink acknowledgment is an Extended Coverage (EC) PACCH Packet
25 Downlink acknowledgment.

9. A Base Station Subsystem (BSS) (302₂) configured to interact with a Serving GPRS Support Node (SGSN) (307) and a target wireless device (304₃), the BSS comprising:

30 a processor (332₂) ; and,

a memory (334₂) that stores processor-executable instructions, wherein the processor interfaces with the memory to execute the processor-executable instructions, whereby the BSS is operable to:

transmit (1302), to the SGSN, a BSS General Packet Radio Service (GPRS) Protocol (BSSGP) POSITION-COMMAND Packet Data Unit (PDU) (400) which (i) includes a Radio Resource Location Services Protocol (RRLP) PDU (402), wherein the RRLP PDU includes a RRLP Multilateration Timing Advance (MTA) Request message (404) intended for the target wireless device, and (ii) an indicator (520, 535) that the target wireless device is to perform a MTA procedure;

receive (1304), from the SGSN, a BSSGP Down Link (DL)-UNITDATA PDU (410) which includes a Logical Link Control (LLC) PDU (406) intended for the target wireless device, wherein the LLC PDU includes the RRLP PDU, wherein the RRLP PDU further includes the RRLP MTA Request Message;

transmit (1306), to the target wireless device, the LLC PDU which includes the RRLP PDU, wherein the RRLP PDU further includes the RRLP MTA Request Message;

in response to transmitting the LLC PDU, receive (1308) a Packet Associated Control Channel (PACCH) acknowledgment (422) from the target wireless device; and,

when receiving the PACCH acknowledgment, estimate (1310) timing advance information (413) associated with the PACCH acknowledgment, wherein the BSS is informed of a need to estimate the timing advance information when receiving the PACCH acknowledgment by a flag (420) within the BSSGP DL-UNITDATA PDU.

10. The BSS of claim 9, wherein the indicator is an Multilateration Timer Information Element (520) that includes a timer value (509) indicating a duration that the target wireless device is to perform the MTA procedure.

11. The BSS of claim 9, wherein the flag is an information element (420a).

12. The BSS of claim 9, wherein the Packet Associated Control Channel (PACCH) Packet Downlink acknowledgment is an Extended Coverage (EC) PACCH Packet Downlink acknowledgment.

13. The BSS of claim 9, wherein the BSS when performing the estimate operation is further operable to use at least one of an oversampling process and an interpolation process when receiving the PACCH acknowledgment to estimate the timing advance information.

5 14. The BSS of claim 9, wherein the BSS is further operable to transmit (1312), to a Serving Mobile Location Center (SMLC), a BSSMAP Connection Oriented Message (424) which includes (i) the estimated timing advance information; and (ii) accuracy information (415) associated with the target wireless device.

10 15. A method (1300) implemented in a Base Station Subsystem (BSS) (302₂) configured to interact with a Serving GPRS Support Node (SGSN) (307) and a target wireless device (304₃), the method comprising:

transmitting (1302), to the SGSN, a BSS General Packet Radio Service (GPRS) Protocol (BSSGP) POSITION-COMMAND Packet Data Unit (PDU) (400) which includes
15 (i) a Radio Resource Location Services Protocol (RRLP) PDU (402), wherein the RRLP PDU includes a RRLP Multilateration Timing Advance (MTA) Request message (404) intended for the target wireless device, and (ii) an indicator (520, 535) that the target wireless device is to perform a MTA procedure;

receiving (1304), from the SGSN, a BSSGP Down Link (DL)-UNITDATA PDU
20 (410) which includes a Logical Link Control (LLC) PDU (406) intended for the target wireless device, wherein the LLC PDU includes the RRLP PDU, wherein the RRLP PDU further includes the RRLP MTA Request Message;

transmitting (1306), to the target wireless device, the LLC PDU includes the RRLP PDU, wherein the RRLP PDU further includes the RRLP MTA Request Message;

25 in response to transmitting the LLC PDU, receiving (1308) a Packet Associated Control Channel (PACCH) acknowledgment (422) from the target wireless device; and,

when receiving the PACCH acknowledgment, estimating (1310) timing advance information (413) associated with the PACCH acknowledgment, wherein the BSS is informed of a need to estimate the timing advance information when receiving the PACCH
30 acknowledgment by a flag (420) within the BSSGP DL-UNITDATA PDU.

16. The method of claim 15, wherein the indicator is an Multilateration Timer Information Element (520) that includes a timer value (509) indicating a duration that the target wireless device is to perform the MTA procedure.

5 17. The method of claim 15, wherein the flag is an information element (420a).

18. The method of claim 15, wherein the Packet Associated Control Channel (PACCH) Packet Downlink acknowledgment is an Extended Coverage (EC) PACCH Packet Downlink acknowledgment.

10

19. The method of claim 15, wherein the step of estimating further comprises a step of using at least one of an oversampling process and an interpolation process when receiving the PACCH acknowledgment to estimate the timing advance information.

15 20. The method of claim 15, further comprising a step of transmitting (1012), to a Serving Mobile Location Center (SMLC), a BSSMAP Connection Oriented Message (424) which includes (i) the estimated timing advance information; and (ii) accuracy information (415) associated with the target wireless device.

20 21. A wireless device (304₃) configured to interact with a Base Station Subsystem (BSS) (302₂), the wireless device comprising:

a processor (318₃); and,

a memory (320₃) that stores processor-executable instructions, wherein the processor interfaces with the memory to execute the processor-executable instructions, whereby the
25 wireless device is operable to:

receive (1502), from the BSS, a Logical Link Control (LLC) Packet Data Unit (PDU) (406), wherein the LLC PDU includes a Radio Resource Location Service Protocol (RRLP) PDU (402), wherein the RRLP PDU further includes a RRLP Multilateration Timing Advance Request Message (404) which indicates that the wireless device does not
30 need to perform a Multilateration Timing Advance procedure in a serving cell; and,

in response to receiving the LLC PDU, transmit (1504) a Packet Associated Control Channel (PACCH) acknowledgment (422) to the BSS.

22. The wireless device of claim 21, wherein the Packet Associated Control Channel (PACCH) Packet Downlink acknowledgment is an Extended Coverage (EC) PACCH Packet Downlink acknowledgment.

5

23. A method (1500) implanted in a wireless device (304₃) configured to interact with a Base Station Subsystem (BSS) (302₂), the method comprising:

receiving (1502), from the BSS, a Logical Link Control (LLC) Packet Data Unit (PDU) (406), wherein the LLC PDU includes a Radio Resource Location Service Protocol (RRLP) PDU (402), wherein the RRLP PDU further includes a RRLP Multilateration Timing Advance Request Message (404) which indicates that the wireless device does not need to perform a Multilateration Timing Advance procedure in a serving cell; and,

in response to receiving the LLC PDU, transmitting (1504) a Packet Associated Control Channel (PACCH) acknowledgment (422) to the BSS.

15

24. The method of claim 23, wherein the Packet Associated Control Channel (PACCH) Packet Downlink acknowledgment is an Extended Coverage (EC) PACCH Packet Downlink acknowledgment.

Recuadro No. V Declaración razonada bajo el Artículo 35(2) con relación a la novedad, nivel inventivo o aplicación industrial; citaciones y explicaciones que soportan dicha declaración

1. Declaración

Novedad (N)	Sí:	Reivindicaciones	<u>1-24</u>
	No:	Reivindicaciones	
Nivel inventivo (NI)	Sí:	Reivindicaciones	<u>1-24</u>
	No:	Reivindicaciones	
Aplicación industrial (AI)	Sí:	Reivindicaciones	<u>1-24</u>
	No:	Reivindicaciones	

2. Citaciones y explicaciones (Regla 70.7):

ver hoja separada

Recuadro No. VI Ciertos documentos citados

1. Ciertos documentos publicados (Reglas 43bis.1 y 70.10)

y/o

2. Divulgaciones no escritas (Reglas 43bis.1 y 70.9)

ver formulario 210

(HOJA SEPARADA)

Re Ítem V

Declaración razonada con relación a la novedad, nivel inventivo o aplicación industrial; citaciones y explicaciones que soportan dicha declaración

Se hace referencia a los siguientes documentos:

- D1 LM ERICSSON: “Procedimiento de Multilateración – Sólo TA”, 3GPP DRAFT; R6-160273 – PROCEDIMIENTO DE MULTILATERACION – SOLO TA (ERA R6-160261), PROYECTO DE ASOCIACION DE 3ª GENERACION (3GPP), CENTRO DE COMPETENCIA MOVIL; 650, ROUTE DES LUCIOLES; F-06921 SOPHIA-ANTIPOLIS CE, No. Reno, Nevada, EE.UU.; 20161114 – 20161118 18 de noviembre de 2016 (2016-11-18), XP051198955, Recuperado del Internet: [URL:http://www.3gpp.org/ftp/tsg_ran/WG6_legacyRAN/TSGR6_02/Docs/](http://www.3gpp.org/ftp/tsg_ran/WG6_legacyRAN/TSGR6_02/Docs/) [recuperado en 2016-11-18]
- D2 ERICSSON LM: “Introducción de Multilateración”, 3GPP DRAFT; R6-160274 CR 43.059 INTRODUCCION DE MULTILATERACION USANDO AVANCE EN TIEMPO, PROYECTO DE ASOCIACION DE 3ª GENERACION (3GPP), CENTRO DE COMPETENCIA MOVIL; 650, ROUTE DES LUCIOLES; F-06921 SOPHIA-ANTIPOL, vol. TSG RAN, no. Reno, Nevada EE.UU.; 20161114 – 20161118 18 de noviembre de 2016 (2016-11-18), XP051198956, Recuperado de internet: [URL:http://www.3gpp.org/ftp/tsg_ran/WG6_legacyRAN/TSGR6-02/Docs/](http://www.3gpp.org/ftp/tsg_ran/WG6_legacyRAN/TSGR6-02/Docs/) [recuperado en 2016-11-18] citado en la solicitud
- D3 ERICSSON: “Mejoras de posicionamiento para GERAN – introducción a trilateración Avanzada en Tiempo”, 3GPP DRAFT; RP-161034 – MEJORAS DE POSICIONAMIENTO PARA GERAN – INTRODUCCION A TRILATERACION TA, PROYECTO DE ASOCIACION DE 3ª
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GENERACION (3GPP), CENTRO DE COMPETENCIA MOVIL; 650, ROUTE DES LUCIOLES; F-06921 SOPHI, vol. TSG RAN, No. Busan, Corea; 20160613 – 20160616 12 de junio de 2016 (2016-06-12), XP051103882, Recuperado de Internet:
[URL:http://www.3gpp.org/ftp/Meetings_3GPP_SYNC/RAN/Docs/](http://www.3gpp.org/ftp/Meetings_3GPP_SYNC/RAN/Docs/)

[recuperado en 2016-06-12] citado en la solicitud

- D4 ERICSSON: “Posicionamiento de múltiples ramas a base de tiempo avanzado para NB-IoT”, 3GPP DRAFT; R1-167426 – POSICIONAMIENTO DE MULTIPLES RAMAS A BASE DE TIEMPO AVANZADO PARA NB-IOT, PROYECTO DE ASOCIACION DE 3ª GENERACION (3GPP), CENTRO DE COMPETENCIA MOVIL; 650, ROUTE DES LUCIOLES; F-06921 SOPHIA-ANTIPOL, vol. RAN WG1, no. Gothenburg, Suecia; 20160822 – 20160826 21 de agosto de 2016 (2016-08-21), XP051125896, Recuperado de internet:
[URL:http://www.3gpp.org/ftp/Meetings_3GPP_SYNC/RAN1/Docs/](http://www.3gpp.org/ftp/Meetings_3GPP_SYNC/RAN1/Docs/)

[recuperado en 2016-08-21] citado en la solicitud

- 1 D1 es considerado como el más cercano en el arte previo a la materia objeto de la reivindicación 1, y divulga:
- 1.1 Un Nodo de Soporte de Servicio GPRS, SGSN, (ver párrafo 6: SGSN) configurado para interactuar con un Subsistema de Estación Base, BSS (ver párrafo 5: BSS), el SGSN comprende:
- un procesador; y
- una memoria que almacena instrucciones ejecutables por procesador, en donde el procesador interactúa con la memoria para ejecutar las instrucciones ejecutables por procesador, por lo cual el SGSN es operable para:
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recibir (ver párrafo 6: *La entidad BSSGP en el SGSN extrae el mensaje RRLP embebido (es decir, el componente de “Solicitud de Multilateración”) del IE “RRLP APDU” recibido en el “PDU DE POSICION-COMANDO BSSGP” y lo envía a la entidad de protocolo TOM*), del BSS, una Unidad de Datos de Protocolo PDU de Servicio de Radio de Paquete General BSS, GPRS, Protocolo, BSSGP, POSICION-COMANDO (ver párrafo 10.5.4: *PDU DE POSICION-COMANDO*) que incluye (i) una PDU de Servicios de Ubicación de Recurso de Radio, RRLP (ver párrafo 11.3.49: *APDU RRLP*), en donde la PDU RRLP incluye un Avance de Tiempo de Multilateración, MTA, de RRLP (ver párrafo 6: *mensaje RRLP embebido*) destinado para un dispositivo inalámbrico objetivo (ver párrafo 6: *MS*), y (ii) un indicador (ver párrafo 4.8: *Solicitud de Multilateración MTAO*) que el dispositivo inalámbrico objetivo va a realizar un procedimiento MTA;

transmitir (ver párrafo 6: *La PDU LLC es enviada al BSS en servicio*), al BSS; una PDU BSSGO de Enlace Descendente, -UNITDATA que incluye una PDU de Control de Enlace Lógico, LLC (ver párrafo 6: *La entidad LLC genera una PDU LLC (que contiene la PDU TOM)*) destinada para el dispositivo inalámbrico objetivo, en donde la PDU LLC incluye la PDU RRLP, en donde al PDU RRLP además incluye un Mensaje de Solicitud MTA RRLP (ver párrafo 6: *La entidad BSSGP en el SGSN extrae el mensaje RRLP embebido (es decir, el componente de “Solicitud de Multilateración”) del IE “APDU RRLP” recibido en el “PDU BSSGP POSICION-COMANDO” y lo envía a la entidad de protocolo TOM. La entidad de protocolo TOM antepone el encabezado de protocolo TOM (1 octeto) al mensaje RRLP embebido y envía la PDU TOM resultante a la entidad LLC usando el SAP TOM*).

La materia objeto de la reivindicación 1, por lo tanto, difiere de este SGSN conocido en que la PDU BSSGP DL-UNITDATA además incluye una

bandera que indica al BSS una necesidad de calcular la información de avance de tiempo cuando recibe un reconocimiento de Canal de Control Asociado de Paquete, PACCH, del dispositivo inalámbrico objetivo, y, por lo tanto, es novedosa (Artículo 33(2) del PCT).

El problema a resolver por la presente invención puede ser considerado en como tener al BSS que calcule un “Avance de Tiempo” (ser Suposición de Trabajo 12)

La solución a este problema propuesta en la reivindicación 1 de la presente solicitud se considera que involucra un nivel inventivo (Artículo 33(3) del PCT) por las siguientes razones:

Ningún otro documento en el arte previo enseña o sugiere el uso de la característica distinguible anterior para este propósito. La solución directa partiendo de D1 que consideraría el experto en la materia sería reutilizar un tipo PDU BSSGP conocido por ser usado para propósitos de señalización, o crear un nuevo tipo PDU BSSGP de señalización, pero, en cualquier caso, la solución directa sería usar una PDU BSSGP de señalización enviada por el SGSN al BSS en un BVC de señalización para informar al BSS que necesita calcular la información de avance de tiempo cuando recibe un reconocimiento de Canal de Control Asociado de Paquete, PACCH, del dispositivo inalámbrico objetivo, en lugar de una bandera en la PDU BSSGP DL-UNITDATA como se especificó anteriormente, el cual es enviado en un BVC de Celda. Ninguno de los documentos D2, D3 y D4 tampoco divulga o sugiere las características distinguibles.

- 1.2 El mismo razonamiento anterior aplica de forma correspondiente al método de la reivindicación 5, el cual, por lo tanto, es considerado como novedoso (Artículo 33(2) del PCT) e involucra un nivel inventivo (Artículo 33(3) del PCT).
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- 2 D1 es considerado que es el más cercano en el estado del arte a la materia objeto de la reivindicación 9, y divulga:
- 2.1 Un Subsistema de Estación Base, BSS (ver párrafo 5: *BSS*) configurado para interactuar con un Nodo de Soporte de Servicio GPRS, SGSN, (ver párrafo 6: *SGSN*) y un dispositivo inalámbrico objetivo (ver párrafo 6: *MS*), el BSS comprende:
- un procesador; y
- una memoria que almacena instrucciones ejecutables por procesador, en donde el procesador interactúa con la memoria para ejecutar las instrucciones ejecutables por procesador, por lo cual el BSS es operable para:
- transmitir (ver párrafo 5: *La entidad BSSGP en el BSS envía al SGSN un "PDU BSSGP POSICION-COMANDO" (ver Paso 6 en Figura 1) e incluye el mensaje RRLP embebido (es decir, el componente de "Solicitud de Multilateración") recibido de la entidad LCS en el BSS como el mensaje RRLP embebido dentro del IE "RRLP APDU" del "PDU BSSGP POSICION-COMANDO"*), al SGSN, una Unidad de Datos de Paquete, PDU, de Protocolo BSSGP de Servicio de Radio de Paquete General, GPRS, BSS POSICION-COMANDO (ver párrafo 10.5.4: PDU POSICION-COMANDO) el cual incluye (i) una PDU de Servicios de Ubicación de Recurso de Radio, RRLP (ver párrafo 11.3.49: *APDU RRLP*), en donde la PDU RRLP incluye un Avance de Tiempo de Multilateración, MTA, de RRLP. El mensaje de solicitud (ver párrafo 6: *mensaje RRLP embebido*) está destinado para el dispositivo inalámbrico objetivo (ver párrafo 6: *MS*), y (ii) un indicador (ver párrafo 4.8: *Solicitud de Multilateración MTAO*) que el dispositivo inalámbrico objetivo va a realizar un procedimiento MTA; recibir (ver párrafo 6: *La PDU LLC es enviada al BSS en servicio*), del SGSN, una PDU BSSGP de Enlace Descendente, -UNITDATA que incluye
-

una PDU de Control de Enlace Lógico, LLC (ver párrafo 6: *La entidad LLC genera una PDU LLC (que contiene la PDU TOM)*) destinada para el dispositivo inalámbrico objetivo, en donde la PDU LLC incluye la PDU RRLP, en donde la PDU RRLP además incluye un Mensaje de Solicitud MTA RRLP (ver párrafo 6: *La entidad BSSGP en el SGSN extrae el mensaje RRLP embebido (es decir, el componente de “Solicitud de Multilateración”) del IE “APDU RRLP” recibido en el “PDU BSSGP POSICION-COMANDO” y lo envía a la entidad de protocolo TOM. La entidad de protocolo TOM antepone el encabezado de protocolo TOM (1 octeto) al mensaje RRLP embebido y envía la PDU TOM resultante a la entidad LLC usando el SAP TOM*).

La materia objeto de la reivindicación 9, por lo tanto, difiere de este BSS conocido en que en respuesta a transmitir la PDU LLC, este recibe un reconocimiento de Canal de Control Asociado de Paquete, PACCH, del dispositivo inalámbrico objetivo; y

cuando recibe el reconocimiento PACCH, este calcula la información de avance de tiempo asociada con el reconocimiento PACCH, en donde el BSS es informado de una necesidad de calcular la información de avance de tiempo cuando se recibe el reconocimiento PACCH por medio de una bandera dentro de la PDU BSSGP DL-UNITDATA, y por lo tanto, es novedosa (Artículo 33(2) del PCT).

El problema a resolver por la presente invención puede ser considerado en como tener al BSS que calcule un “Avance de Tiempo” (ser Suposición de Trabajo 12).

La solución a este problema propuesta en la reivindicación 9 de la presente solicitud se considera que involucra un nivel inventivo (Artículo 33(3) del PCT) por las siguientes razones:

Ningún otro documento en el arte previo enseña o sugiere el uso de la característica distinguible anterior para este propósito. La solución directa partiendo de D1 que consideraría el experto en la materia sería reutilizar un tipo PDU BSSGP conocido por ser usado para propósitos de señalización, o crear un nuevo tipo PDU BSSGP de señalización, pero, en cualquier caso, la solución directa sería usar una PDU BSSGP de señalización enviada por el SGSN al BSS en un BVC de señalización, en lugar de una bandera en la PDU BSSGP DL-UNITDATA como se especificó anteriormente, el cual es enviado en un BVC de Celda. Además, D1 no sugiere el uso del reconocimiento PACCH recibido del MS para realizar el cálculo. Ninguno de los documentos D2, D3 y D4 tampoco divulga o sugiere las características distinguibles.

2.2 El mismo razonamiento anterior aplica de forma correspondiente al método de la reivindicación 15, el cual, por lo tanto, es considerado novedoso (Artículo 33(2) del PCT) y que involucra un nivel inventivo (Artículo 33(3) del PCT).

3 D1 es considerado como el más cercano en el arte previo a la materia objeto de la reivindicación 21, y divulga:

3.1 Un dispositivo inalámbrico (ver párrafo: *MS*) configurado para interactuar con un Subsistema de Estación Base, BSS (ver párrafo 5: *BSS*), el dispositivo inalámbrico comprende:

un procesador; y

una memoria que almacena instrucciones ejecutables por procesador, en donde el procesador interactúa con la memoria para ejecutar las instrucciones ejecutables por procesador, por lo cual el dispositivo inalámbrico es operable para:

recibir (ver párrafo 6: *La PDU LLC es enviada al BSS en servicio el cual establece un TBF de enlace descendente y entrega el LLC*), del BSS, una

LLC, PDU (ver párrafo 6: *La entidad LLC genera una PDU LLC (que contiene la PDU TOM)*), en donde la PDU LLC incluye una PDU de Protocolo de Localización de Recurso de Radio, RRLP, en donde la PDU RRLP además incluye un Mensaje de Solicitud de Avance de Tiempo de Multilateración RRLP (ver párrafo 6: *La entidad BSSGP en el SGSN extrae el mensaje RRLP embebido (es decir, el componente de “Solicitud de Multilateración”) del IE “APDU RRLP” recibido en el “PDU BSSGP POSICION-COMANDO” y lo envía a la entidad de protocolo TOM. La entidad de protocolo TOM antepone el encabezado de protocolo TOM (1 octeto) al mensaje RRLP embebido y envía la PDU TOM resultante a la entidad LLC usando el SAP TOM*).

La materia objeto de la reivindicación 21, por lo tanto, difiere de este dispositivo inalámbrico conocido en que el Mensaje de Solicitud MTA RRLP indica que el dispositivo inalámbrico no necesita realizar un procedimiento de Avance de Tiempo de Multilateración en una celda en servicio, y en respuesta a recibir la PDU LLC, transmite un reconocimiento de Canal de Control Asociado de Paquete, PACCH, al BSS, y, por lo tanto, es novedosa (Artículo 33(2) del PCT).

El problema a resolver por la presente invención puede ser considerado en como tener al BSS que calcule un “Avance de Tiempo” (ser Suposición de Trabajo 12).

La solución a este problema propuesta en la reivindicación 21 de la presente solicitud se considera que involucra un nivel inventivo (Artículo 33(3) del PCT) por las siguientes razones:

Ningún otro documento en el arte previo enseña o sugiere el uso de la característica distinguible anterior para este propósito. El experto en la materia partiendo de D1 llegaría a modificar la Solicitud RRLP:MTA con el fin de prevenir que el dispositivo inalámbrico realice intentos de acceso a

TA de multilateración también hacia la celda en servicio. Sin embargo, transmitir además un reconocimiento de Canal de Control Asociado con Paquete, PACCH, al BSS, lo cual permite que el BSS realice el cálculo, no puede ser entregado en una forma directa a partir de D1 y requeriría el uso de comprensión retrospectiva. Ninguno de los documentos D2, D3 y D4 tampoco divulga o sugiere las características distinguibles.

- 3.2 El mismo razonamiento anterior aplica de forma correspondiente al método de la reivindicación 23, el cual, por lo tanto, es considerado como novedoso (Artículo 33(2) del PCT) e involucra un nivel inventivo (Artículo 33(3) del PCT).
- 4 Las reivindicaciones 2-4, 6-8, 10-14, 16-20, 22, 24 son dependientes de una o más reivindicaciones independientes cuya materia objeto es considerada que es novedosa e inventiva, como se indicó anteriormente, y como tal dichas reivindicaciones dependientes también cumplen los requerimientos del PCT con respecto a novedad y nivel inventivo.

Re Ítem VI

Ciertos documentos citados

- D5 NOKIA: “Estimación TA de Celda en Servicio para Posicionamiento de Multilateración”, 3GPP DRAFT; R6-170045 ESTIMACION TA DE CELDA EN SERVICIO PARA POSICIONAMIENTO DE MULTILATERACION, PROYECTO DE ASOCIACION DE 3ª GENERACION (3GPP), CENTRO DE COMPETENCIA MOVIL; 650, ROUTE DES LUCIOLES; F-06921 SOPHIA-ANTIPOL, vol. TSG RAN, no. Atenas, Grecia; 20170213 – 20170217 3 de febrero de 2017 (2017-02-03), XP051227257, Recuperado del Internet:
[URL:http://www.3gpp.org/ftp/tsg_ran/WG6_legacyRAN/TSGR6_03/Docs/](http://www.3gpp.org/ftp/tsg_ran/WG6_legacyRAN/TSGR6_03/Docs/)
[recuperado en 2017-02-03]
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REIVINDICACIONES

1. Un Nodo de Soporte del GPRS de Servicio (SGSN) (307) configurado para interactuar con un Subsistema de la Estación de Base (BSS) (302₂), en donde el SGSN comprende:

un procesador (346), y

una memoria (348) que almacena instrucciones ejecutables por procesador, en donde el procesador hace interfase con la memoria para ejecutar las instrucciones ejecutables por procesador, por lo que SGSN es operativo para:

recibir (1102) del BSS una Unidad de Datos de Paquete (PDU) (400) de COMANDO DE POSICIÓN del Protocolo del Servicio General de Radiocomunicaciones por Paquetes (GPRS) del BSS (BSSGP) que incluye (i) una (PDU) (402) del Protocolo de Servicios de Localización de Recursos Radioeléctricos (RRLP) en donde PDU de RRLP incluye un mensaje (404) de Solicitud de Avance de Temporización de Multilateración (MTA) de RRLP destinado para un dispositivo inalámbrico (304₃) blanco, y (ii) un indicador (520, 535) de que el dispositivo inalámbrico blanco está por realizar un procedimiento de MTA, y

transmitir (1104) al BSS una PDU (410) de DATO UNIDAD de Enlace Descendente DL de BSSGP que incluye una PDU (406) de Control de Enlace Lógico (LLC) destinada al dispositivo inalámbrico blanco, en donde PDU de LLC incluye PDU de RRLP. en donde PDU de RRLP además incluye el mensaje de Solicitud de MTA de RRLP y en donde PDU de DATO UNIDAD de DL de BSSGP además incluye una bandera (420) que indica al BSS la necesidad de estimar la información de Avance de Temporización (413) cuando recibe un acuse de recibo (422) del Canal de Control Asociado al Paquete (PACCH) del dispositivo inalámbrico blanco.

2. El SGSN de acuerdo con la reivindicación 1, en donde el indicador es un Elemento de Información del Temporizador de Multilateración (720) que incluye un valor (509) del temporizador indicando una duración que el dispositivo inalámbrico blanco está por realizar el procedimiento MTA.

3. El SGSN de acuerdo con la reivindicación 1, en donde la bandera es un elemento de información (420a).

4. El SGSN de acuerdo con la reivindicación 1, en donde el acuse de recibo PACCH es un acuse de recibo de Enlace Descendente de Paquete PACCH de Cobertura Extendida (EC).

5. Un método (1100) implementado en un Nodo de Soporte del GPRS de Servicio (SGSN) (307) configurado para interactuar con un Subsistema de la Estación de Base (BSS) (302₂), en donde el método comprende:

recibir (1102) del BSS una Unidad de Datos de Paquete (PDU) (400) de COMANDO DE POSICIÓN del Protocolo del Servicio General de Radiocomunicaciones por Paquetes (GPRS) del BSS (BSSGP) que incluye (i) una (PDU) (402) del Protocolo de Servicios de Localización de Recursos Radioeléctricos (RRLP) en donde PDU de RRLP incluye un mensaje (404) de Solicitud de Avance de Temporización de Multilateración (MTA) de RRLP destinado para un dispositivo inalámbrico (304₃) blanco, y (ii) un indicador (520, 535) de que el dispositivo inalámbrico blanco está por realizar un procedimiento de MTA, y

transmitir (1104) al BSS una PDU (410) de DATO UNIDAD de Enlace Descendente DL de BSSGP que incluye una PDU (406) de Control de Enlace Lógico (LLC) destinada al dispositivo inalámbrico blanco, en donde PDU de LLC incluye PDU de RRLP, en donde PDU de RRLP además incluye el mensaje de Solicitud de MTA de RRLP y en donde PDU de DATO UNIDAD de DL de BSSGP además incluye una bandera (420) que indica al BSS la necesidad de estimar la

información de Avance de Temporización (413) cuando recibe un acuse de recibo (422) del Canal de Control Asociado al Paquete (PACCH) del dispositivo inalámbrico blanco.

6. El método de acuerdo con la reivindicación 5, en donde el indicador es un Elemento de Información (520) del Temporizador de Multilateración que incluye un valor (509) del temporizador indicando una duración que el dispositivo inalámbrico blanco está por realizar el procedimiento MTA.

7. El método de acuerdo con la reivindicación 5, en donde la bandera es un elemento de información (420a).

8. El método de acuerdo con la reivindicación 5, en donde el acuse de recibo PACCH es un acuse de recibo de Enlace Descendente de Paquete PACCH de Cobertura Extendida (EC).

9. Un Subsistema de la Estación de Base (BSS) (302₂) configurado para interactuar con un Nodo de Soporte del GPRS de Servicio (SGSN) (607) y un dispositivo inalámbrico (304₃), en donde BSS comprende:

un procesador (332₂), y

una memoria (334₂) que almacena instrucciones ejecutables por procesador, en donde el procesador hace interfase con la memoria para ejecutar las instrucciones ejecutables por procesador, por lo que BSS es operativo para:

transmitir (1302) al SGSN una Unidad de Datos de Paquete (PDU) (400) de COMANDO DE POSICIÓN del Protocolo del Servicio General de Radiocomunicaciones por Paquetes (GPRS) del BSS (BSSGP) que incluye (i) una (PDU) (402) del Protocolo de Servicios de Localización de Recursos Radioeléctricos (RRLP) en donde PDU de RRLP incluye un mensaje (404) de Solicitud de Avance de Temporización de Multilateración (MTA) de RRLP destinado para un dispositivo inalámbrico blanco, y (ii) un indicador (520, 535) de que el dispositivo inalámbrico blanco está por realizar un procedimiento de MTA,

recibir (1304) del SGSN una PDU (410) de DATO UNIDAD de Enlace Descendente DL de BSSGP que incluye una PDU (406) de Control de Enlace Lógico (LLC) destinada al dispositivo inalámbrico blanco, en donde PDU de LLC incluye PDU de RRLP, en donde PDU de RRLP además incluye el mensaje de Solicitud de MTA de RRLP,

transmitir (1306) al dispositivo inalámbrico blanco PDU de LLC que incluye PDU de RRLP, en donde PDU de RRLP además incluye el mensaje de Solicitud de MTA de RRLP,

en respuesta a la transmisión de PDU de LLC, recibe (1308) un acuse de recibo (422) del Canal de Control Asociado al Paquete (PACCH) del dispositivo inalámbrico blanco, y

cuando recibe el acuse de recibo PACCH, estima (1310) la información de Avance de Temporización (413) asociada con el acuse de recibo PACCH, en donde se informa al BSS de la necesidad de estimar la información de Avance de Temporización cuando recibe el acuse de recibo PACCH mediante una bandera (420) dentro del PDU de DATO UNIDAD de DL de BSSGP.

10. BSS de acuerdo con la reivindicación 9, en donde el indicador es un Elemento de Información del Temporizador de Multilateración (520) que incluye un valor (509) del temporizador indicando una duración que el dispositivo inalámbrico blanco está por realizar el procedimiento MTA.

11. BSS de acuerdo con la reivindicación 9, en donde la bandera es un elemento de información (420a).

12. BSS de acuerdo con la reivindicación 9, en donde el acuse de recibo PACCH es un acuse de recibo de Enlace Descendente de Paquete PACCH de Cobertura Extendida (EC).

13. BSS de acuerdo con la reivindicación 9, en donde BSS cuando realiza la operación de estimación es además operativo para usar al menos uno

de un proceso de sobremuestreo y un proceso de interpolación cuando recibe el acuse de recibo PACCH para estimar la información de avance de temporización.

14. BSS de acuerdo con la reivindicación 9, en donde BSS es además operativo para transmitir a un Centro de Localización Móvil de Servicio (SMLC) (311), un Mensaje Orientado a la Conexión (424) de BSSMAP que incluye (i) la información de Avance de Temporización estimado, y (ii) la información de precisión (415) asociada con el dispositivo inalámbrico blanco.

15. Un método (1300) implementado en un Subsistema de la Estación de Base (BSS) (302₂) configurado para interactuar con un Nodo de Soporte del GPRS de Servicio (SGSN) (307) y un dispositivo inalámbrico blanco (304₃), en donde el método comprende:

transmitir (1302) al SGSN una Unidad de Datos de Paquete (PDU) (400) de COMANDO DE POSICIÓN del Protocolo del Servicio General de Radiocomunicaciones por Paquetes (GPRS) del BSS (BSSGP) que incluye (i) una (PDU) (402) del Protocolo de Servicios de Localización de Recursos Radioeléctricos (RRLP) en donde PDU de RRLP incluye un mensaje (404) de Solicitud de Avance de Temporización de Multilateración (MTA) de RRLP destinado para un dispositivo inalámbrico blanco, y (ii) un indicador (520, 535) de que el dispositivo inalámbrico blanco está por realizar un procedimiento de MTA,

recibir (1304) del SGSN una PDU (410) de DATO UNIDAD de Enlace Descendente DL de BSSGP que incluye una PDU (406) de Control de Enlace Lógico (LLC) destinada al dispositivo inalámbrico blanco, en donde PDU de LLC incluye PDU de RRLP, en donde PDU de RRLP además incluye el mensaje de Solicitud de MTA de RRLP,

transmitir (1306) al dispositivo inalámbrico blanco PDU de LLC que incluye PDU de RRLP, en donde PDU de RRLP además incluye el mensaje de Solicitud de MTA de RRLP,

en respuesta a la transmisión de PDU de LLC, recibe (1308) un acuse de recibo (422) del Canal de Control Asociado al Paquete (PACCH) del dispositivo inalámbrico blanco, y

cuando recibe el acuse de recibo PACCH, estima (1310) la información de Avance de Temporización (413) asociada con el acuse de recibo PACCH, en donde se informa al BSS de la necesidad de estimar la información de Avance de Temporización cuando recibe el acuse de recibo PACCH mediante una bandera (420) dentro del PDU de DATO UNIDAD de DL de BSSGP.

16. El método de acuerdo con la reivindicación 15, en donde el indicador es un Elemento de Información (520) del Temporizador de Multilateración que incluye un valor (509) del temporizador indicando una duración que el dispositivo inalámbrico blanco está por realizar el procedimiento MTA.

17. El método de acuerdo con la reivindicación 15, en donde la bandera es un elemento de información (420a).

18. El método de acuerdo con la reivindicación 15, en donde el acuse de recibo PACCH es un acuse de recibo de Enlace Descendente de Paquete PACCH de Cobertura Extendida (EC).

19. El método de acuerdo con la reivindicación 15, en donde el paso de estimación además comprende un paso para usar al menos uno de un proceso de sobremuestreo y un proceso de interpolación cuando recibe el acuse de recibo PACCH para estimar la información de avance de temporización.

20. El método de acuerdo con la reivindicación 15, que además comprende un paso de transmisión (1312) a un Centro de Localización Móvil de Servicio (SMLC) (311), un Mensaje Orientado a la Conexión (424) de BSSMAP que incluye (i) la información de Avance de Temporización estimado, y (ii) la información de precisión (415) asociada con el dispositivo inalámbrico blanco.

21. Un dispositivo inalámbrico (3043) configurado para interactuar

con un Subsistema de la Estación de Base (BSS) (302₂), en donde el dispositivo inalámbrico comprende:

un procesador (318₃), y

una memoria (320₃) que almacena instrucciones ejecutables por procesador, en donde el procesador hace interfase con la memoria para ejecutar las instrucciones ejecutables por procesador, por lo que dispositivo inalámbrico es operativo para:

recibir (1502) del BSS una Unidad de Datos de Paquete (PDU) (406) del Control de Enlace Lógico (LLC), en donde PDU de LLC incluye una PDU (402) del Protocolo de Servicios de Localización de Recursos Radioeléctricos (RRLP), en donde PDU de RRLP además incluye un Mensaje (404) de Solicitud de Avance de Temporización de Multilateración de RRLP que indica que el dispositivo inalámbrico no necesita realizar un procedimiento de Avance de Temporización de Multilateración en una celda de servicio, y

en respuesta a la recepción de PDU de LLC, transmite (1504) un acuse de recibo (422) del Canal de Control Asociado al Paquete (PACCH) al BSS.

22. El dispositivo inalámbrico de acuerdo con la reivindicación 21, en donde el acuse de recibo PACCH es un acuse de recibo de Enlace Descendente de Paquete PACCH de Cobertura Extendida (EC).

23. Un método (1500) implementado en un dispositivo inalámbrico (304₃) configurado para interactuar con un Subsistema de la Estación de Base (BSS) (302₂), en donde el método comprende:

recibir (1502) del BSS una Unidad de Datos de Paquete (PDU) (406) del Control de Enlace Lógico (LLC), en donde PDU de LLC incluye una PDU (402) del Protocolo de Servicios de Localización de Recursos Radioeléctricos (RRLP), en donde PDU de RRLP además incluye un Mensaje (404) de Solicitud de Avance de Temporización de Multilateración de RRLP que indica que el dispositivo inalámbrico

no necesita realizar un procedimiento de Avance de Temporización de Multilateración en una celda de servicio, y

en respuesta a la recepción de PDU de LLC, transmite (1504) un acuse de recibo (422) del Canal de Control Asociado al Paquete (PACCH) al BSS.

24. El método de acuerdo con la reivindicación 23, en donde el acuse de recibo PACCH es un acuse de recibo de Enlace Descendente de Paquete PACCH de Cobertura Extendida (EC).