

Search query (3): [SP]: methods, devices, and computer programs for compensating nonlinearities of a communication channel a method, carried out by a gateway transmitter (400), aims at compensating the nonlinearities of a communication channel (500) comprising a repeater (510). a plurality of digital signals is modulated (s10) on a plurality of carriers, wherein symbols of the constellation diagram used for modulation of each carrier are distorted in accordance with a pre-distortion function. the modulated signals are then frequency division multiplexed (s20), and sent (s30) for transmission, through the communication channel (500), to at least one receiver (600). the pre-distortion function involves a plurality of polynomial functions, each of which taking as input the symbols from all the carriers. the polynomial functions' coefficients, called "pre-distortion coefficients", are computed according to a direct learning approach, performed jointly for the plurality of carriers. the pre-distortion coefficients are iteratively updated based on received signals being fed back from a receiver (600). the invention also relates to transmitters and computer programs.

Results: 6

Search history

Search PN=(WO2016000787) (Results 1)

1:

Search [SP]: 1. method, carried out by a transmitter (400), hereinafter referred to as "gateway transmitter" (400), for compensating, at least partially, the nonlinearities of a communication channel (500) comprising at least one repeater (510), the method comprising modulating (s10) a plurality of digital signals on a plurality of carriers respectively, wherein symbols of the constellation diagram used for modulation of each carrier are distorted in accordance with a function, hereinafter referred to as "pre-distortion function" frequency division multiplexing (s20) the plurality of modulated digital signals and sending (s30) the frequency division multiplexed plurality of modulated digital signals for transmission, through the communication channel (500), to at least one receiver (600) wherein the pre-distortion function involves a plurality of polynomial functions, each of which taking as input the symbols from all the carriers, and the polynomial functions' coefficients being hereinafter referred to as "pre-distortion coefficients", and the pre-distortion coefficients are computed in accordance with a direct learning approach, the computation being performed jointly for the plurality of carriers, and the computation comprising iteratively updating the pre-distortion coefficients based on received signals being fed back from at least one among the at least one receiver (600) to the gateway transmitter (400). 2. method of claim 1, wherein the at least one repeater (510) comprises a transponder on board a satellite. 3. method of claim 2, wherein the transponder on board the satellite comprises at least one of an input multiplexing filter, an amplifier and an output multiplexing filter. 4. method according to any one of the preceding claims, wherein the at least one receiver (600) is a plurality of receivers (600). 5. method according to any one of the preceding claims, wherein, before received fed back signals are available, the pre-distortion coefficients are set as if the communication channel (500) had a linear gain with the gain factor being unity. 6. method according to any one of claims 1 to 4, wherein, before received fed back signals are available, the pre-distortion coefficients are set based on channel model parameters obtained in advance through at least one of tests, simulations and studies carried out on, or regarding, at least one of the communication channel (500) and at least one among the at least one repeater (510). 7. method according to any one of the preceding claims, wherein, for each carrier, only one of the plurality of polynomial functions is used for distorting symbols of the constellation diagram used for modulation of that carrier. 8. method according to any one of the preceding claims, wherein the direct learning approach employs at least one of a recursive least squares filter and a least mean squares filter. 9. method according to any one of the preceding claims, wherein the plurality of digital signals being subject to modulation are originally in the form of packets, each of the packets is assigned a packet identifier, the packets are kept stored in the gateway transmitter (400) together with their packet identifiers, after transmission, the received fed back signals are in the form of packets or rearranged, by the gateway transmitter (400), in the form of packets, and the computation of the pre-distortion coefficients involves comparing the contents of the received fed back signals' packets with the contents of the buffered packets to estimate the error rate caused by the communication channel (500). 10. method according to any one of the preceding claims, wherein fed back information on the received signals on all active carriers is required for triggering the process of computing the pre-distortion coefficients. 11. transmitter (400), hereinafter referred to as "gateway transmitter" (400), for compensating, at least partially, the nonlinearities of a communication channel (500) comprising at least one repeater (510), the gateway transmitter (400) comprising a modulating unit (401) for modulating a plurality of digital signals on a plurality of carriers respectively, wherein, in operation, symbols of the constellation diagram used for modulation of each carrier are distorted in accordance with a function, hereinafter referred to as "pre-distortion function" a multiplexing unit (402) for frequency division multiplexing the plurality of modulated digital signals a sending unit (403) for sending the frequency division multiplexed plurality of modulated digital signals for transmission, through the communication channel (500), to at least one receiver (600) the gateway transmitter (400) being such that the pre-distortion function involves a plurality of polynomial functions, each of which taking as input the symbols from all the carriers, and the polynomial functions' coefficients being hereinafter referred to as "pre-distortion coefficients", and the pre-distortion coefficients are computed in accordance with a direct learning approach, the computation being performed jointly for the plurality of carriers, and the computation comprising iteratively updating the pre-distortion coefficients based on received signals being fed back from at least one among the at least one receiver (600) to the gateway transmitter (400). 12. transmitter (400), hereinafter referred to as "gateway transmitter" (400), for compensating, at least partially, the nonlinearities of a communication channel (500) comprising at least one repeater (510), the gateway transmitter (400) comprising modulating means (401) for modulating a plurality of digital signals on a plurality of carriers respectively, wherein, in operation, symbols of the constellation diagram used for modulation of each carrier are distorted in accordance with a function, hereinafter referred to as "pre-distortion function" multiplexing means (402) for frequency division multiplexing the plurality of modulated digital signals sending means (403) for sending the frequency division multiplexed plurality of modulated digital signals for transmission, through the communication channel (500), to at least one receiver (600) the gateway transmitter (400) being configured such that the pre-distortion function involves a plurality of polynomial functions, each of which taking as input the symbols from all the carriers, and the polynomial functions' coefficients being hereinafter referred to as "pre-distortion coefficients", and the pre-distortion coefficients are computed in accordance with a direct learning approach, the computation being performed jointly for the plurality of carriers, and the computation comprising iteratively updating the pre-distortion coefficients based on received signals being fed back from at least one among the at least one receiver (600) to the gateway transmitter (400). 13. transmitter (400), hereinafter referred to as "gateway transmitter" (400), for compensating, at least partially, the nonlinearities of a communication channel (500) comprising at least one repeater (510), the gateway transmitter (400) comprising a modulator (401) for modulating a plurality of digital signals on a plurality of carriers respectively, wherein, in operation, symbols of the constellation diagram used for modulation of each carrier are distorted in accordance with a function, hereinafter referred to as "pre-distortion function" a multiplexer (402) for frequency division multiplexing the plurality of modulated digital signals a transmitter element (403) for sending the frequency division multiplexed plurality of modulated digital signals for transmission, through the communication channel (500), to at least one receiver (600) the gateway transmitter (400) being such that the pre-distortion function involves a plurality of polynomial functions, each of which taking as input the symbols from all the carriers, and the polynomial functions' coefficients being hereinafter referred to as "pre-distortion coefficients", and the pre-distortion coefficients are computed in accordance with a direct learning approach, the computation being performed jointly for the plurality of carriers, and the computation comprising iteratively updating the pre-distortion coefficients based on received signals being fed back from at least one among the at least one receiver (600) to the gateway transmitter (400). 14. gateway transmitter (400) according to any one of claims 11 to 13, being such that, in operation, before received fed back signals are available, the pre-distortion coefficients are set as if the communication channel (500) had a linear gain with the gain factor being unity. 15. gateway transmitter (400) according to any one of claims 11 to 13, being such that, in operation, before received fed back signals are available, the pre-distortion coefficients are set based on channel model parameters obtained in advance through at least one of (Results 0)

Search [SP]: methods, devices, and computer programs for compensating nonlinearities of a communication channel a method, carried out by a gateway transmitter (400), aims at compensating the nonlinearities of a communication channel (500) comprising a repeater (510). a plurality of digital signals is modulated (s10) on a plurality of carriers, wherein symbols of the constellation diagram used for modulation of each carrier are distorted in accordance with a pre-distortion function. the modulated signals are then frequency division multiplexed (s20), and sent (s30) for transmission, through the communication channel (500), to at least one receiver (600). the pre-distortion function involves a plurality of polynomial functions, each of which taking as input the symbols from all the carriers. the polynomial functions' coefficients, called "pre-distortion coefficients", are computed according to a direct learning approach, performed jointly for the plurality of carriers. the pre-distortion coefficients are iteratively updated based on received signals being fed back from a receiver (600). the invention also relates to transmitters and computer programs. (Results 6)

Title: METHODS, DEVICES, AND COMPUTER PROGRAMS FOR COMPENSATING NONLINEARITIES OF A COMMUNICATION CHANNEL

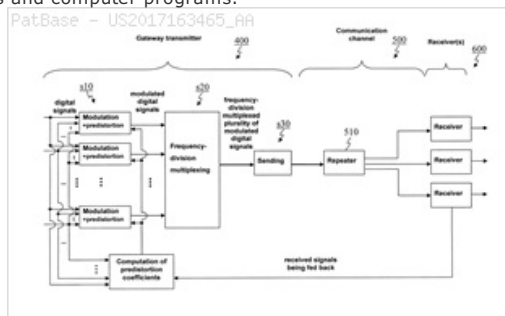
Abstract: Source: US2017163465A [EN] A method, carried out by a gateway transmitter (400), aims at compensating the nonlinearities of a communication channel (500) comprising a repeater (510). A plurality of digital signals is modulated (s10) on a plurality of carriers, wherein symbols of the constellation diagram used for modulation of each carrier are distorted in accordance with a pre-distortion function. The modulated signals are then frequency division multiplexed (s20), and sent (s30) for transmission, through the communication channel (500), to at least one receiver (600). The pre-distortion function involves a plurality of polynomial functions, each of which taking as input the symbols from all the carriers. The polynomial functions' coefficients, called "pre-distortion coefficients", are computed according to a direct learning approach, performed jointly for the plurality of carriers. The pre-distortion coefficients are iteratively updated based on received signals being fed back from a receiver (600). The invention also relates to transmitters and computer programs.

Classifications:

International (ipc 8-9): H04B7/00 H04L1/00 H04L1/24 H04L25/49 H04L27/36 H04L5/06 (Advanced/Invention)

International (ipc 1-7): H04L27/36 H04L5/06

CPC: H04L27/2634 H03F1/3258 H03F3/24 H04L1/0042 H04L1/248 H04L25/49 H04B7/00 H04L2027/0026 H04L27/368 H04L5/06



Family:

Publication number	Publication date	Application number	Application date
AU2014399359 AA	20160107	AU20140399359	20140704
BR112017000048 A2	20171031	BR20171100048	20140704
CO20170001021 A2	20170620	CO20170001021	20170203
DK3164959 T3	20180319	DK20140735960T	20140704
EP3164959 A1	20170510	EP20140735960	20140704
EP3164959 B1	20180214	EP20140735960	20140704
US2017163465 AA	20170608	US20140323794	20140704
WO16000787 A1	20160107	WO2014EP64311	20140704

Priority:

WO2014EP64311 20140704

Probable Assignee: SES SA

Assignee(s): (std): SES S A

Assignee(s): SES SA

Inventor(s): (std): BYSORE RAMA RAO BHAVANI SHANKAR ; MYSORE RAMA RAO BHAVAN SHANKAR ; MYSORE RAMA RAO BHAVANI SHANKAR ; OTTERSTEN BJORN ; PIAZZA ROBERTO

Inventor(s): ROBERTO PIAZZA ; BHAVANI SHANKAR BYSORE RAMA RAO ; BJORN OTTERSTEN

Agent(s): CULLENS PTY LTD; JOSE ANDRES RINCON USCATEGUI; HOFFMANN EITLE; DOUXCHAMPS NICOLAS ET AL

Designated states: AE AG AL AM AO AT AU AZ BA BB BE BF BG BH BJ BN BR BW BY BZ CA CF CG CH CI CL CM CN CO CR CU CY CZ DE DK DM DO DZ EC EE EG ES FI FR GA GB GD GE GH GM GN GQ GR GT GW HN HR HU ID IE IL IN IR IS IT JP KE KG KM KN KP KR KZ LA LC LI LK LR LS LT LU LV LY MA MC MD ME MG MK ML MN MR MT MW MX MY MZ NA NE NG NI NL NO NZ OM PA PE PG PH PL PT QA RO RS RU RW SA SC SD SE SG SI SK SL SM SN ST SV SY SZ TD TG TH TJ TM TN TR TT TZ UA UG US UZ VC VN ZA ZM ZW

Title: TRANSMISSION POWER OPTIMIZATION

Abstract: Source: US2008112506A [EN] A transceiver at one end of a variable data rate, time division duplex (TDD), adaptively modulated, point-to-point radio link transmits one or more pulses at different amplitude levels during a settling period of the transceiver's power amplifier. The highest level of the pulses is set to a level higher than the mean level of an OFDM symbol in a transmit burst immediately following the transmitted pulses, and is incrementally increased with each successive burst. A second transceiver at the opposite end of the link receives the transmitted pulses as time domain samples, normalizes the samples, and performs a cross correlation of the samples corresponding to the received pulses. When the cross correlation indicates that the power amplifier is operating at a maximal power level with regard to the amplifier linearity and the modulation mode and coding rate currently in use, the incremental increase of the transmission power ceases.

Classifications:**International (IPC 8-9):** H04B7/00 H04L27/04

H04L27/26 (Advanced/Invention);

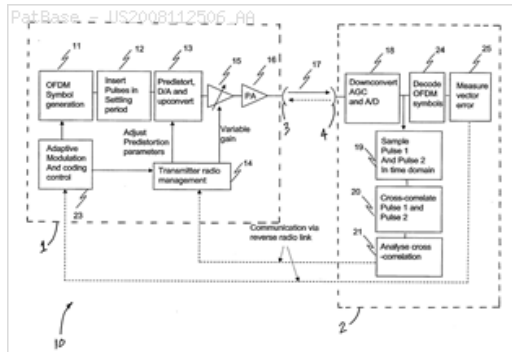
H04B7/00 H04L27/02 H04L27/26 (Core/Invention)

CPC: H04L5/1469 H04L27/2608 H04L27/2626 H04L27/368

H04W52/04 H04W52/267 H04W52/52

European: H04L27/26M3 H04L27/36G1A H04L5/14T H04W52/04

H04W52/26R H04W52/52 T04L27/26M1P

US: 375/300**Family:**

Publication number	Publication date	Application number	Application date
US2008112506 AA	20080515	US20060558943	20061113
WO08058806 A1	20080522	WO2007EP60349	20070930

Priority:

US20060558943 20061113

Probable Assignee: PIPING HOT NETWORKS LTD**Assignee(s):** (std): MOTOROLA INC ; PIPING HOT NETWORKS LTD ; STRONG PETER**Assignee(s):** PIPING HOT NETWORKS LIMITED**Inventor(s):** (std): STRONG PETER ; STRONG PETER N**Agent(s):** MOTOROLA INC ; JEPSEN RENE PIHL

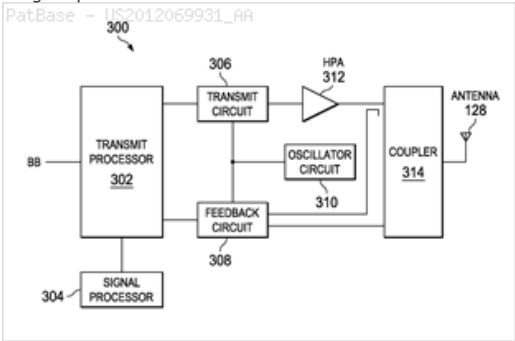
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Title: MULTI-BAND POWER AMPLIFIER DIGITAL PREDISTORTION SYSTEM AND METHOD

Abstract: Source: US2012069931A [EN] Traditionally, for multi-band communication systems, independent signal chains for each of the different bands are employed. By using such an architecture, there are a large number of components, and there is substantial power consumption. Here, transmit processor is provided that enables transmission across multiple bands using few components (namely, fewer signal chains), while also provided for digital predistortion.

Classifications:

International (IPC 8-9): H04L25/49 H04L27/00
H04L27/36 (Advanced/Invention)
CPC: H04L5/06 H03F1/3247 H03F2200/336 H04B1/62 H04L27/368
European: H03F1/32P2 H04B1/62 H04L27/36G1A H04L5/06
T03F200/336
US: 375/295 375/296 375/296P 375/297 375/318



Family:

Publication number	Publication date	Application number	Application date
US2012069931 AA	20120322	US20100888191	20100922
US8750410 BB	20140610	US20100888191	20100922

Priority:

US20100888191 20100922

Probable Assignee: TEXAS INSTRUMENTS INC

Assignee(s): (std): DING LEI ; GANDHI HARDIK P ; TEXAS INSTRUMENTS INC ; YANG ZIGANG

Inventor(s): (std): DING LEI ; GANDHI HARDIK P ; YANG ZIGANG

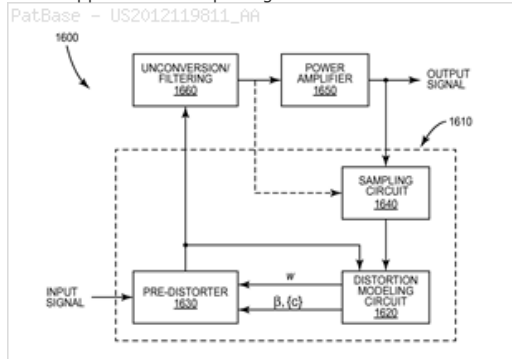
Agent(s): W JAMES; ALAN A R; FREDERICK J

Title: CONFIGURABLE BASIS-FUNCTION GENERATION FOR NONLINEAR MODELING

Abstract: Source: US2012119811A [EN] Digital predistorter circuits with selectable basis function configurations are described. In some embodiments, an input scaling block is introduced prior to a basis function generator structure. The input scaling factor is based on the input signal's average power. In other embodiments, configurable connection coefficients are used to construct the orthogonal basis functions. Multiple sets of tap weights for the predistorter are maintained, each set corresponding to a given basis function configuration. In an example method for pre-distorting an input signal to compensate for distortion introduced by an electronic device, a statistic characterizing the input signal is calculated, and one of a pre-determined set of basis function configurations is selected, based on the statistic. A set of pre-distortion model weights corresponding to the selected basis function configuration are determined, after which the selected basis function configuration and the corresponding set of pre-distortion model weights are applied to the input signal.

Classifications:**International (IPC 8-9):** H03F1/32 H03K5/08

H04K1/02 (Advanced/Invention)

CPC: H03F1/3247 H03F1/3252**European:** H03F1/32P2 H03F1/32P4**US:** 327/317 327/317P 375/295 375/296 375/297 455/114.2 455/114.3 455/126**Family:**

Publication number	Publication date	Application number	Application date
AU2010364182 AA	20120524	AU20100364182	20101116
AU2010364182 BB	20160707	AU20100364182	20101116
CA2817801 AA	20130513	CA20102817801	20101116
DE602010021710 D1	20150219	DE201060021710T	20101116
EP2641326 A1	20130925	EP20100807368	20101116
EP2641326 B1	20150107	EP20100807368	20101116
HU024880 T2	20160229	HU20100807368T	20101116
IN01842KN2013 A	20131018	IN2013KN01842	20130610
US2012119811 AA	20120517	US20100119165	20101116
US8576941 BB	20131105	US20100119165	20101116
WO12066381 A1	20120524	WO2010IB55192	20101116

Priority:

EP20100807368 20101116 WO2010IB55192 20101116

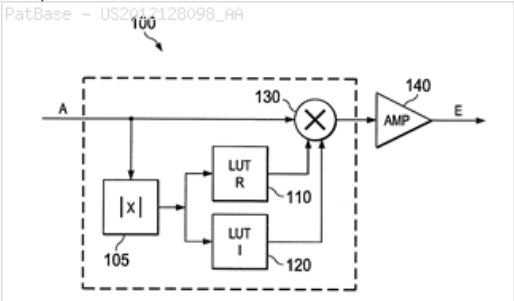
Probable Assignee: TELEFONAKTIEBOLAGET LM ERICSSON PUBL**Assignee(s):** (std): BAI CHUNLONG ; ERICSSON TELEFON AB L M ; LEHMAN BRIAN ; MORRIS BRADLEY JOHN ; TELEFONAKTIEBOLAGET L M ERICSSON PUBL**Assignee(s):** MORRIS BRAD1233 SHERMAN DRIVEOTTAWAO1K2C 2M7CA ; TELEFONAKTIEBOLAGET L M ERICSSON PUBLS-164 83STOCKHOLMSE ; TELEFONAKTIEBOLAGET LM ERICSSON PUBL ; LEHMAN BRIAN49 NORTHGATE STREETOTTAWAO1K2G 6C8CA ; MORRIS BRAD ; TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)**Inventor(s):** (std): LEHMAN BRIAN ; BAI CHUNLONG ; MORRIS BRADLEY JOHN ; MORRIS BRAD**Inventor(s):** MORRIS BRADLEY JOHN OTTAWA ; BAI CHUNLONG SAN DIEGO ; BAI CHUNLONGCA ; LEHMAN BRIAN OTTAWA ; LEHMAN BRIAN49 NORTHGATE STREETOTTAWAO1K2G 6C8CA ; MORRIS BRAD1233 SHERMAN DRIVEOTTAWAO1K2C 2M7CA**Agent(s):** WATERMARK PATENT AND TRADE MARKS ATTORNEYS; WATERMARK INTELLECTUAL PROPERTY PTY LTD; NICOLAESCU ALEX; ERICSSON CANADA PATENT GROUP; BURCHARDI THOMAS DIPL ING UNIV; HOFFMANN EITL; COATS AND BENNETT PLLC; BENNETT DAVID E**Designated states:** AE AG AL AM AO AT AU AZ BA BB BE BF BG BH BJ BR BW BY BZ CA CF CG CH CI CL CM CN CO CR CU CY CZ DE DK DM DO DZ EC EE EG ES FI FR GA GB GD GE GH GM GN GQ GR GT GW HN HR HU ID IE IL IN IS IT JP KE KG KM KN KP KR KZ LA LC LI LK LR LS LT LU LV LY MA MC MD ME MG MK ML MN MR MT MW MX MY MZ NA NE NG NI NL NO NZ OM PE PG PH PL PT RO RS RU SC SD SE SG SI SK SL SM SN ST SV SY SZ TD TG TH TJ TM TN TR TT TZ UA UG US UZ VC VN ZA ZM ZW

Title: APPARATUS AND METHOD FOR DIGITAL PREDISTORTION OF NON-LINEAR AMPLIFIERS

Abstract: Source: US2012128098A [EN] A method used in a transmitting device comprising a non-linear amplifier and a digital predistortion (DPD) circuit. The method updates real and imaginary look-up tables used by the DPD. The method comprises: i) time-aligning a complex input signal, A, and a complex output signal, E. Signal A is a scan from 0 to a maximum value comprising N discrete points and signal E also comprises N discrete points. The method comprises: ii) performing an array division of $A/E = (Y_r, Y_i)$, where Y_r and Y_i are the real and imaginary components, respectively; and iii) computing a real curve and an imaginary curve using curve-fitting algorithms that best fit the data with coordinates $(|A|, Y_r)$ and $(|A|, Y_i)$. The method stores the real curve in a real lookup table (LUT) and the imaginary curve in an imaginary lookup table (LUT). The method iteratively updates the real LUT and the imaginary LUT.

Classifications:

International (IPC 8-9): H03F1/32 H04L25/49 (Advanced/Invention)
CPC: H03F1/3294 H03F1/3247 H03F2201/3224 H03F2201/3233
European: H03F1/32P14 H03F1/32P2 T03F201/3224 T03F201/3233
US: 375/296 375/296P 375/297



Family:

Publication number	Publication date	Application number	Application date
US2012128098 AA	20120524	US20110301479	20111121
US8903015 BB	20141202	US20110301479	20111121

Priority:

US20100416189P 20101122 US20110301479 20111121

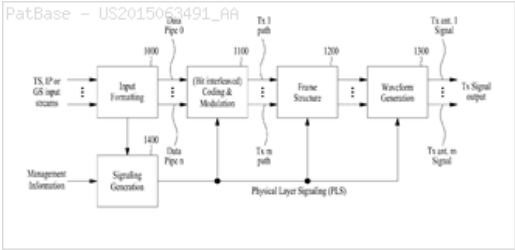
Probable Assignee: SAMSUNG ELECTRONICS CO LTD
Assignee(s): (std): HADDAD KHALIL ; SAMSUNG ELECTRONICS CO LTD
Assignee(s): SAMSUNG ELECTRONICS CO
Inventor(s): (std): HADDAD KHALIL

Title: APPARATUS FOR TRANSMITTING BROADCAST SIGNALS, APPARATUS FOR RECEIVING BROADCAST SIGNALS, METHOD FOR TRANSMITTING BROADCAST SIGNALS AND METHOD FOR RECEIVING BROADCAST SIGNALS

Abstract: Source: US2015063491A [EN] A method and an apparatus for transmitting broadcast signals thereof are disclosed. The apparatus for transmitting broadcast signals comprises an encoder for encoding service data corresponding to each of a plurality of transmission unit, wherein the each of a plurality of transmission unit carries at least one service component, a frame builder for building at least one signal frame including the encoded service data, a phase distortion unit for performing a phase distortion on data in the built at least one signal frame, a modulator for modulating data in the built at least one signal frame by an OFDM (Orthogonal Frequency Division Multiplex) scheme and a transmitter for transmitting the broadcast signals including the modulated data.

Classifications:

International (IPC 8-9): H04B7/04 H04B7/0413 H04B7/06 H04H20/42 H04H20/71 H04H60/07 H04K1/10 H04L25/03 H04L27/00 H04L27/26 H04N21/234 H04N21/2362 H04N21/2383 H04N21/438 H04N7/08 (Advanced/Invention); H04L5/00 H04N7/08 (Advanced/Non-invention)
CPC: H04L27/2649 H04L27/2602 H04H20/42 H04H60/07 H04N21/2362 H04N21/2383 H04B7/06 H04L27/2627 H04B7/0413 H04H20/71 H04L27/00 H04L27/2634 H04N7/08 H04N21/234 H04N21/4382 H04L5/0044 H04L25/03242 H04L25/03891
US: 1/1 375/295 375/340



Family:

Publication number	Publication date	Application number	Application date
EP3042495 A1	20160713	EP20140842287	20140904
EP3042495 A4	20170426	EP20140842287	20140904
KR101830741 B1	20180221	KR20167009008	20140904
KR20160052692 A	20160512	KR20167009008	20140904
US2015063491 AA	20150305	US20140477167	20140904
US2016191290 AA	20160630	US20160064199	20160308
US9350472 BB	20160524	US20140477167	20140904
US9537698 BB	20170103	US20160064199	20160308
WO15034298 A1	20150312	WO2014KR08339	20140904

Priority:

US20130873838P 20130905 US20130876734P 20130911 US20140477167 20140904
WO2014KR08339 20140904 US20160064199 20160308

Probable Assignee: LG ELECTRONICS INC

Assignee(s): (std): LG ELECTRONICS INC

Inventor(s): (std): MUN CHULKYU ; KO WOOSUK ; KIM WOOCHAN ; HONG SUNGRYONG ; BAEK JONGSEOB

Agent(s): CABINET PLASSERAUD; DENTONS US LLP; KIM YONG IN ET AL

Designated states: AE AG AL AM AO AT AU AZ BA BB BE BF BG BH BJ BN BR BW BY BZ CA CF CG CH CI CL CM CN CO CR CU CY CZ DE DK DM DO DZ EC EE EG ES FI FR GA GB GD GE GH GM GN GQ GR GT GW HN HR HU ID IE IL IN IR IS IT JP KE KG KM KN KP KR KZ LA LC LI LK LR LS LT LU LV LY MA MC MD ME MG MK ML MN MR MT MW MX MY MZ NA NE NG NI NL NO NZ OM PA PE PG PH PL PT QA RO RS RU RW SA SC SD SE SG SI SK SL SM SN ST SV SY SZ TD TG TH TJ TM TN TR TT TZ UA UG US UZ VC VN ZA ZM ZW

Search history

Search PN=(WO2016000787) (Results 1)

1:

Search [SP]: 1. method, carried out by a transmitter (400), hereinafter referred to as "gateway transmitter" (400), for compensating, at least partially, the nonlinearities of a communication channel (500) comprising at least one repeater (510), the method comprising modulating (s10) a plurality of digital signals on a plurality of carriers respectively, wherein symbols of the constellation diagram used for modulation of each carrier are distorted in accordance with a function, hereinafter referred to as "pre-distortion function" frequency division multiplexing (s20) the plurality of modulated digital signals and sending (s30) the frequency division multiplexed plurality of modulated digital signals for transmission, through the communication channel (500), to at least one receiver (600) wherein the pre-distortion function involves a plurality of polynomial functions, each of which taking as input the symbols from all the carriers, and the polynomial functions' coefficients being hereinafter referred to as "pre-distortion coefficients", and the pre-distortion coefficients are computed in accordance with a direct learning approach, the computation being performed jointly for the plurality of carriers, and the computation comprising iteratively updating the pre-distortion coefficients based on received signals being fed back from at least one among the at least one receiver (600) to the gateway transmitter (400). 2. method of claim 1, wherein the at least one repeater (510) comprises a transponder on board a satellite. 3. method of claim 2, wherein the transponder on board the satellite comprises at least one of an input multiplexing filter, an amplifier and an output multiplexing filter. 4. method according to any one of the preceding claims, wherein the at least one receiver (600) is a plurality of receivers (600). 5. method according to any one of the preceding claims, wherein, before received fed back signals are available, the pre-distortion coefficients are set as if the communication channel (500) had a linear gain with the gain factor being unity. 6. method according to any one of claims 1 to 4, wherein, before received fed back signals are available, the pre-distortion coefficients are set based on channel model parameters obtained in advance through at least one of tests, simulations and studies carried out on, or regarding, at least one of the communication channel (500) and at least one among the at least one repeater (510). 7. method according to any one of the preceding claims, wherein, for each carrier, only one of the plurality of polynomial functions is used for distorting symbols of the constellation diagram used for modulation of that carrier. 8. method according to any one of the preceding claims, wherein the direct learning approach employs at least one of a recursive least squares filter and a least mean squares filter. 9. method according to any one of the preceding claims, wherein the plurality of digital signals being subject to modulation are originally in the form of packets, each of the packets is assigned a packet identifier, the packets are kept stored in the gateway transmitter (400) together with their packet identifiers, after transmission, the received fed back signals are in the form of packets or rearranged, by the gateway transmitter (400), in the form of packets, and the computation of the pre-distortion coefficients involves comparing the contents of the received fed back signals' packets with the contents of the buffered packets to estimate the error rate caused by the communication channel (500). 10. method according to any one of the preceding claims, wherein fed back information on the received signals on all active carriers is required for triggering the process of computing the pre-distortion coefficients. 11. transmitter (400), hereinafter referred to as "gateway transmitter" (400), for compensating, at least partially, the nonlinearities of a communication channel (500) comprising at least one repeater (510), the gateway transmitter (400) comprising a modulating unit (401) for modulating a plurality of digital signals on a plurality of carriers respectively, wherein, in operation, symbols of the constellation diagram used for modulation of each carrier are distorted in accordance with a function, hereinafter referred to as "pre-distortion function" a multiplexing unit (402) for frequency division multiplexing the plurality of modulated digital signals a sending unit (403) for sending the frequency division multiplexed plurality of modulated digital signals for transmission, through the communication channel (500), to at least one receiver (600) the gateway transmitter (400) being such that the pre-distortion function involves a plurality of polynomial functions, each of which taking as input the symbols from all the carriers, and the polynomial functions' coefficients being hereinafter referred to as "pre-distortion coefficients", and the pre-distortion coefficients are computed in accordance with a direct learning approach, the computation being performed jointly for the plurality of carriers, and the computation comprising iteratively updating the pre-distortion coefficients based on received signals being fed back from at least one among the at least one receiver (600) to the gateway transmitter (400). 12. transmitter (400), hereinafter referred to as "gateway transmitter" (400), for compensating, at least partially, the nonlinearities of a communication channel (500) comprising at least one repeater (510), the gateway transmitter (400) comprising modulating means (401) for modulating a plurality of digital signals on a plurality of carriers respectively, wherein, in operation, symbols of the constellation diagram used for modulation of each carrier are distorted in accordance with a function, hereinafter referred to as "pre-distortion function" multiplexing means (402) for frequency division multiplexing the plurality of modulated digital signals sending means (403) for sending the frequency division multiplexed plurality of modulated digital signals for transmission, through the communication channel (500), to at least one receiver (600) the gateway transmitter (400) being configured such that the pre-distortion function involves a plurality of polynomial functions, each of which taking as input the symbols from all the carriers, and the polynomial functions' coefficients being hereinafter referred to as "pre-distortion coefficients", and the pre-distortion coefficients are computed in accordance with a direct learning approach, the computation being performed jointly for the plurality of carriers, and the computation comprising iteratively updating the pre-distortion coefficients based on received signals being fed back from at least one among the at least one receiver (600) to the gateway transmitter (400). 13. transmitter (400), hereinafter referred to as "gateway transmitter" (400), for compensating, at least partially, the nonlinearities of a communication channel (500) comprising at least one repeater (510), the gateway transmitter (400) comprising a modulator (401) for modulating a plurality of digital signals on a plurality of carriers respectively, wherein, in operation, symbols of the constellation diagram used for modulation of each carrier are distorted in accordance with a function, hereinafter referred to as "pre-distortion function" a multiplexer (402) for frequency division multiplexing the plurality of modulated digital signals a transmitter element (403) for sending the frequency division multiplexed plurality of modulated digital signals for transmission, through the communication channel (500), to at least one receiver (600) the gateway transmitter (400) being such that the pre-distortion function involves a plurality of polynomial functions, each of which taking as input the symbols from all the carriers, and the polynomial functions' coefficients being hereinafter referred to as "pre-distortion coefficients", and the pre-distortion coefficients are computed in accordance with a direct learning approach, the computation being performed jointly for the plurality of carriers, and the computation comprising iteratively updating the pre-distortion coefficients based on received signals being fed back from at least one among the at least one receiver (600) to the gateway transmitter (400). 14. gateway transmitter (400) according to any one of claims 11 to 13, being such that, in operation, before received fed back signals are available, the pre-distortion coefficients are set as if the communication channel (500) had a linear gain with the gain factor being unity. 15. gateway transmitter (400) according to any one of claims 11 to 13, being such that, in operation, before received fed back signals are available, the pre-distortion coefficients are set based on channel model parameters obtained in advance through at least one of (Results 0)

Search [SP]: methods, devices, and computer programs for compensating nonlinearities of a communication channel a method, carried out by a gateway transmitter (400), aims at compensating the nonlinearities of a communication channel (500) comprising a repeater (510). a plurality of digital signals is modulated (s10) on a plurality of carriers, wherein symbols of the constellation diagram used for modulation of each carrier are distorted in accordance with a pre-distortion function. the modulated signals are then frequency division multiplexed (s20), and sent (s30) for transmission, through the communication channel (500), to at least one receiver (600). the pre-distortion function involves a plurality of polynomial functions, each of which taking as input the symbols from all the carriers. the polynomial functions' coefficients, called "pre-distortion coefficients", are computed according to a direct learning approach, performed jointly for the plurality of carriers. the pre-distortion coefficients are iteratively updated based on received signals being fed back from a receiver (600). the invention also relates to transmitters and computer programs. (Results 6)

Search [SP]: technical field[0001] the present invention relates to methods, devices, and computer programs for compensating, at least partially, nonlinearities of a communication channel. the invention may notably be used, but is not limited thereto, in satellite communications systems, to compensate, at least partially, nonlinearities of satellite communication channels. background[0002] there is a constant need, in telecommunications, to provide high data transmission rates. this need, together with the demand for ubiquitous connectivity, is exemplified in the context of providing broadband internet connectivity by satellite. satellites with multiple spot beam coverage are for example being provided, such as the viasat-1 satellite, launched in 2011 and considered one of the highest capacity communications satellites, with a total throughput of about 140 gbit/s. [0003] to meet this need, changes to the satellite payload architecture and the communication methodology are researched. transition from single beam to multiple beam systems is an evidence of the former. while advanced payload architectures are being considered, it is also useful to address the transmitter and receiver-based digital processing techniques being used, particularly in view of efficiently using the available electromagnetic spectrum, being a scarce resource. [0004] some transmitter and receiver-based digital processing techniques are specifically adapted for situations where a single amplifier on board a satellite is used for amplification of multiple satellite links. with the development of wideband amplifiers, joint amplification of multiple carriers allows saving of the payload mass in comparison to the traditional single amplifier per link case. the sharing of satellite payload among many links reduces the hardware costs and complexity, and also provides a degree of flexibility for system designers by making a wide range of configurations available (such as for example the bandwidth of the carriers, the number of carriers, and the carrier spacing) without requiring changes on-board the satellite. [0005] efficient amplification is, however, typically a non-linear operation and joint amplification of multiple carriers leads to spurious inter-modulation products. this, coupled with the on-board filtering, leads to distortions caused by symbols from other carriers, i.e. adjacent-

channel interference (aci), or from the same carrier itself, i.e. intersymbol interference (isi). these distortions can cause severe degradation in the link performance, all the more so for higher order (spectrally efficient) modulations. in the absence of compensation techniques, either a large guard-band between the carriers should be used and/or the amplifier should be operated in a linear region. the former results in inefficient frequency carrier segregation, while the latter translates into a power loss compared to single carrier operations depending on the spectral efficiencies of the individual carriers. the benefit of joint amplification in terms of mission costs is more than offset by the loss in power and spectral efficiencies.[0006] to overcome this situation, mitigation techniques are needed, and should be implemented on the ground, to provide upgrade flexibility while keeping the payload complexity intact. the techniques at the transmitter are called "pre-distortion", whereas those at the receiver are known as "equalization" (eq). some on-ground digital processing techniques are used to minimize isi and aci effects in a multiple carrier system with high power amplifier (hpa) on board a transparent (or "bent pipe") satellite. transparent satellites receive the data-bearing signals from one or more gateways and then redirect them to the ground receivers after performing frequency translation and amplification, as needed.[0007] single carrier techniques cannot be used in a straightforward manner for multiple carrier techniques, due to the joint processing at the gateway and the absence of adjacent carriers in single carrier techniques. in multicarrier signal digital pre-distortion (dpd) techniques, the compensation technique acts on the superposition of the carriers, prior to transmission on the uplink channel to the satellite. in multicarrier data dpd techniques, the processing occurs at the carrier level, before pulse-shaping, frequency translation, superposition of the carriers, and uplink transmission to the satellite. in both multicarrier signal and data dpd techniques, no change is required to the functions of the satellite transponder and the receivers.[0008] r. piazza et al, "multicarrier digital pre-distortion/equalization techniques for non-linear satellite channels," proc. of the 30th aiaa international communications satellite systems conference (icssc-2012), ottawa, canada, 24-27 sep. 2012, discusses the use of dpd and eq as mitigation techniques in a multiple carrier scenario, i.e. a scenario where multiple carriers are amplified by a single hpa.[0009] n. kelly et al, "digital predistortion feasibility studies for multicarrier satellite communication systems," proc. of the 31th aiaa international communications satellite systems conference (icssc-2013), florence, italy, oct. 14-17, 2013, discusses the applicability of dpd techniques to the linearization of multicarrier satellite communication systems. the paper focuses on a signal dpd technique, involving pre-distortion applied after combining the multiple carriers into a single multicarrier signal.[0010] u.s. pat. no. 5,598,436 relates to the distortion of a modulation constellation in a monocarrier system (col. 1, lines 64-67) and the distortion of a single ofdm multicarrier signal in a multicarrier system (col 2, lines 30-33 figs. 9 and 11).[0011] it is desirable to improve the methods of the prior art, with in mind notably the system performance, processing requirements, complexity and robustness to noise.summary[0012] to meet or at least partially meet the above-mentioned goals, methods, transmitters and computer programs according to the invention are defined in the independent claims. particular embodiments are defined in the dependent claims.[0013] in one embodiment, a method is carried out by a transmitter (hereinafter referred to as "gateway transmitter") for compensating, at least partially, the nonlinearities of a communication channel comprising at least one repeater. in the method, a plurality of digital signals are modulated on a plurality of carriers respectively, and the symbols of the constellation diagram used for modulation of each carrier are distorted in accordance with a function, hereinafter referred to as "pre-distortion function". the plurality of modulated digital signals are then frequency division multiplexed. the frequency division multiplexed plurality of modulated digital signals is sent for transmission, through the communication channel, to at least one receiver. the pre-distortion function involves a plurality of polynomial functions, each of which taking as input the symbols from all the carriers, and the polynomial functions' coefficients being hereinafter referred to as "pre-distortion coefficients". the pre-distortion coefficients are computed in accordance with a direct learning approach, wherein this computation is performed jointly for the plurality of carriers, and the computation comprises iteratively updating the pre-distortion coefficients based on received signals being fed back from at least one among the at least one receiver to the gateway transmitter.[0014] the method enables to enhance the performance of the non-linearity compensation in a multi-carrier context thanks to the higher robustness to receiver noise. in particular, the pre-distortion carried out prior to multiplexing in conjunction with the use of a direct-learning method provides a synergistic effect going beyond the techniques known in the prior art. the method also requires a relatively simple architecture.[0015] the invention also relates, in one embodiment, to a gateway transmitter for compensating, at least partially, the nonlinearities of a communication channel comprising at least one repeater. the gateway transmitter comprises a modulating unit, a multiplexing unit, and a sending unit. the modulating unit is configured for modulating a plurality of digital signals on a plurality of carriers respectively, wherein, in operation, symbols of the constellation diagram used for modulation of each carrier are distorted in accordance with a pre-distortion function. the multiplexing unit is configured for frequency division multiplexing the modulated digital signals. the sending unit is configured for sending the frequency division multiplexed plurality of modulated digital signals for transmission, through the communication channel, to at least one receiver. the pre-distortion function used in the gateway transmitter involves a plurality of polynomial functions, each of which taking as input the symbols from all the carriers. the polynomial functions' coefficients are referred to as "pre-distortion coefficients". those are computed in accordance with a direct learning approach, the computation being performed jointly for the plurality of carriers, and the computation comprising iteratively updating the pre-distortion coefficients based on received signals being fed back from at least one among the at least one receiver to the gateway transmitter.[0016] the invention also relates, in one embodiment, to a system comprising a gateway transmitter as described above, and one or more repeater on a communication channel as described above.[0017] the invention further relates to computer programs, computer program products and storage mediums comprising computer-readable instructions configured, when executed on a comp (Results 6)

Search fn=(50793813 or 51130844 or 58630854 or 51106534 or 41800410) (Results 5)
5:

Title: TRANSMISSION POWER OPTIMIZATION

Abstract: Source: US2008112506A [EN] A transceiver at one end of a variable data rate, time division duplex (TDD), adaptively modulated, point-to-point radio link transmits one or more pulses at different amplitude levels during a settling period of the transceiver's power amplifier. The highest level of the pulses is set to a level higher than the mean level of an OFDM symbol in a transmit burst immediately following the transmitted pulses, and is incrementally increased with each successive burst. A second transceiver at the opposite end of the link receives the transmitted pulses as time domain samples, normalizes the samples, and performs a cross correlation of the samples corresponding to the received pulses. When the cross correlation indicates that the power amplifier is operating at a maximal power level with regard to the amplifier linearity and the modulation mode and coding rate currently in use, the incremental increase of the transmission power ceases.

Classifications:**International (IPC 8-9):** H04B7/00 H04L27/04

H04L27/26 (Advanced/Invention);

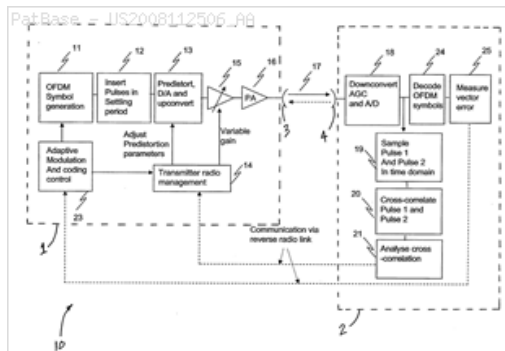
H04B7/00 H04L27/02 H04L27/26 (Core/Invention)

CPC: H04L5/1469 H04L27/2608 H04L27/2626 H04L27/368

H04W52/04 H04W52/267 H04W52/52

European: H04L27/26M3 H04L27/36G1A H04L5/14T H04W52/04

H04W52/26R H04W52/52 T04L27/26M1P

US: 375/300**Family:**

Publication number	Publication date	Application number	Application date
US2008112506 AA	20080515	US20060558943	20061113
WO08058806 A1	20080522	WO2007EP60349	20070930

Priority:

US20060558943 20061113

Probable Assignee: PIPING HOT NETWORKS LTD**Assignee(s):** (std): MOTOROLA INC ; PIPING HOT NETWORKS LTD ; STRONG PETER**Assignee(s):** PIPING HOT NETWORKS LIMITED**Inventor(s):** (std): STRONG PETER ; STRONG PETER N**Agent(s):** MOTOROLA INC ; JEPSEN RENE PIHL

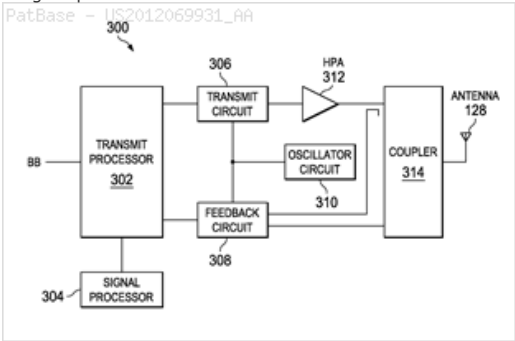
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Title: MULTI-BAND POWER AMPLIFIER DIGITAL PREDISTORTION SYSTEM AND METHOD

Abstract: Source: US2012069931A [EN] Traditionally, for multi-band communication systems, independent signal chains for each of the different bands are employed. By using such an architecture, there are a large number of components, and there is substantial power consumption. Here, transmit processor is provided that enables transmission across multiple bands using few components (namely, fewer signal chains), while also provided for digital predistortion.

Classifications:

International (IPC 8-9): H04L25/49 H04L27/00
H04L27/36 (Advanced/Invention)
CPC: H04L5/06 H03F1/3247 H03F2200/336 H04B1/62 H04L27/368
European: H03F1/32P2 H04B1/62 H04L27/36G1A H04L5/06
T03F200/336
US: 375/295 375/296 375/296P 375/297 375/318



Family:

Publication number	Publication date	Application number	Application date
US2012069931 AA	20120322	US20100888191	20100922
US8750410 BB	20140610	US20100888191	20100922

Priority:

US20100888191 20100922

Probable Assignee: TEXAS INSTRUMENTS INC

Assignee(s): (std): DING LEI ; GANDHI HARDIK P ; TEXAS INSTRUMENTS INC ; YANG ZIGANG

Inventor(s): (std): DING LEI ; GANDHI HARDIK P ; YANG ZIGANG

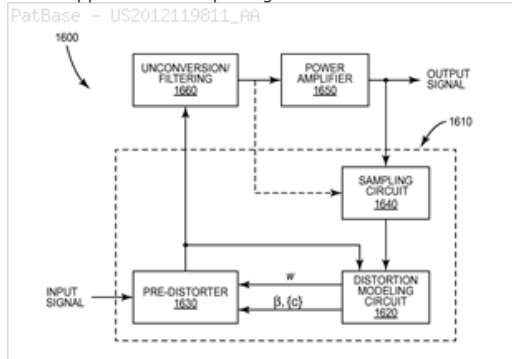
Agent(s): W JAMES; ALAN A R; FREDERICK J

Title: CONFIGURABLE BASIS-FUNCTION GENERATION FOR NONLINEAR MODELING

Abstract: Source: US2012119811A [EN] Digital predistorter circuits with selectable basis function configurations are described. In some embodiments, an input scaling block is introduced prior to a basis function generator structure. The input scaling factor is based on the input signal's average power. In other embodiments, configurable connection coefficients are used to construct the orthogonal basis functions. Multiple sets of tap weights for the predistorter are maintained, each set corresponding to a given basis function configuration. In an example method for pre-distorting an input signal to compensate for distortion introduced by an electronic device, a statistic characterizing the input signal is calculated, and one of a pre-determined set of basis function configurations is selected, based on the statistic. A set of pre-distortion model weights corresponding to the selected basis function configuration are determined, after which the selected basis function configuration and the corresponding set of pre-distortion model weights are applied to the input signal.

Classifications:**International (IPC 8-9):** H03F1/32 H03K5/08

H04K1/02 (Advanced/Invention)

CPC: H03F1/3247 H03F1/3252**European:** H03F1/32P2 H03F1/32P4**US:** 327/317 327/317P 375/295 375/296 375/297 455/114.2 455/114.3 455/126**Family:**

Publication number	Publication date	Application number	Application date
AU2010364182 AA	20120524	AU20100364182	20101116
AU2010364182 BB	20160707	AU20100364182	20101116
CA2817801 AA	20130513	CA20102817801	20101116
DE602010021710 D1	20150219	DE201060021710T	20101116
EP2641326 A1	20130925	EP20100807368	20101116
EP2641326 B1	20150107	EP20100807368	20101116
HU024880 T2	20160229	HU20100807368T	20101116
IN01842KN2013 A	20131018	IN2013KN01842	20130610
US2012119811 AA	20120517	US20100119165	20101116
US8576941 BB	20131105	US20100119165	20101116
WO12066381 A1	20120524	WO2010IB55192	20101116

Priority:

EP20100807368 20101116 WO2010IB55192 20101116

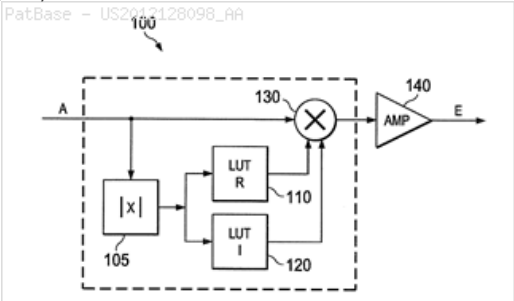
Probable Assignee: TELEFONAKTIEBOLAGET LM ERICSSON PUBL**Assignee(s):** (std): BAI CHUNLONG ; ERICSSON TELEFON AB L M ; LEHMAN BRIAN ; MORRIS BRADLEY JOHN ; TELEFONAKTIEBOLAGET L M ERICSSON PUBL**Assignee(s):** MORRIS BRAD1233 SHERMAN DRIVEOTTAWAO1K2C 2M7CA ; TELEFONAKTIEBOLAGET L M ERICSSON PUBLS-164 83STOCKHOLMSE ; TELEFONAKTIEBOLAGET LM ERICSSON PUBL ; LEHMAN BRIAN49 NORTHGATE STREETOTTAWAO1K2G 6C8CA ; MORRIS BRAD ; TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)**Inventor(s):** (std): LEHMAN BRIAN ; BAI CHUNLONG ; MORRIS BRADLEY JOHN ; MORRIS BRAD**Inventor(s):** MORRIS BRADLEY JOHN OTTAWA ; BAI CHUNLONG SAN DIEGO ; BAI CHUNLONGCA ; LEHMAN BRIAN OTTAWA ; LEHMAN BRIAN49 NORTHGATE STREETOTTAWAO1K2G 6C8CA ; MORRIS BRAD1233 SHERMAN DRIVEOTTAWAO1K2C 2M7CA**Agent(s):** WATERMARK PATENT AND TRADE MARKS ATTORNEYS; WATERMARK INTELLECTUAL PROPERTY PTY LTD; NICOLAESCU ALEX; ERICSSON CANADA PATENT GROUP; BURCHARDI THOMAS DIPL ING UNIV; HOFFMANN EITL; COATS AND BENNETT PLLC; BENNETT DAVID E**Designated states:** AE AG AL AM AO AT AU AZ BA BB BE BF BG BH BJ BR BW BY BZ CA CF CG CH CI CL CM CN CO CR CU CY CZ DE DK DM DO DZ EC EE EG ES FI FR GA GB GD GE GH GM GN GQ GR GT GW HN HR HU ID IE IL IN IS IT JP KE KG KM KN KP KR KZ LA LC LI LK LR LS LT LU LV LY MA MC MD ME MG MK ML MN MR MT MW MX MY MZ NA NE NG NI NL NO NZ OM PE PG PH PL PT RO RS RU SC SD SE SG SI SK SL SM SN ST SV SY SZ TD TG TH TJ TM TN TR TT TZ UA UG US UZ VC VN ZA ZM ZW

Title: APPARATUS AND METHOD FOR DIGITAL PREDISTORTION OF NON-LINEAR AMPLIFIERS

Abstract: Source: US2012128098A [EN] A method used in a transmitting device comprising a non-linear amplifier and a digital predistortion (DPD) circuit. The method updates real and imaginary look-up tables used by the DPD. The method comprises: i) time-aligning a complex input signal, A, and a complex output signal, E. Signal A is a scan from 0 to a maximum value comprising N discrete points and signal E also comprises N discrete points. The method comprises: ii) performing an array division of $A/E=(Y_r, Y_i)$, where Y_r and Y_i are the real and imaginary components, respectively; and iii) computing a real curve and an imaginary curve using curve-fitting algorithms that best fit the data with coordinates $(|A|, Y_r)$ and $(|A|, Y_i)$. The method stores the real curve in a real lookup table (LUT) and the imaginary curve in an imaginary lookup table (LUT). The method iteratively updates the real LUT and the imaginary LUT.

Classifications:

International (IPC 8-9): H03F1/32 H04L25/49 (Advanced/Invention)
CPC: H03F1/3294 H03F1/3247 H03F2201/3224 H03F2201/3233
European: H03F1/32P14 H03F1/32P2 T03F201/3224 T03F201/3233
US: 375/296 375/296P 375/297



Family:

Publication number	Publication date	Application number	Application date
US2012128098 AA	20120524	US20110301479	20111121
US8903015 BB	20141202	US20110301479	20111121

Priority:

US20100416189P 20101122 US20110301479 20111121

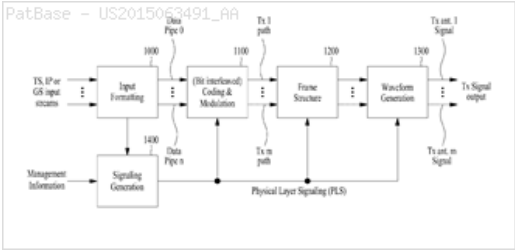
Probable Assignee: SAMSUNG ELECTRONICS CO LTD
Assignee(s): (std): HADDAD KHALIL ; SAMSUNG ELECTRONICS CO LTD
Assignee(s): SAMSUNG ELECTRONICS CO
Inventor(s): (std): HADDAD KHALIL

Title: APPARATUS FOR TRANSMITTING BROADCAST SIGNALS, APPARATUS FOR RECEIVING BROADCAST SIGNALS, METHOD FOR TRANSMITTING BROADCAST SIGNALS AND METHOD FOR RECEIVING BROADCAST SIGNALS

Abstract: Source: US2015063491A [EN] A method and an apparatus for transmitting broadcast signals thereof are disclosed. The apparatus for transmitting broadcast signals comprises an encoder for encoding service data corresponding to each of a plurality of transmission unit, wherein the each of a plurality of transmission unit carries at least one service component, a frame builder for building at least one signal frame including the encoded service data, a phase distortion unit for performing a phase distortion on data in the built at least one signal frame, a modulator for modulating data in the built at least one signal frame by an OFDM (Orthogonal Frequency Division Multiplex) scheme and a transmitter for transmitting the broadcast signals including the modulated data.

Classifications:

International (IPC 8-9): H04B7/04 H04B7/0413 H04B7/06
H04H20/42 H04H20/71 H04H60/07 H04K1/10 H04L25/03 H04L27/00
H04L27/26 H04N21/234 H04N21/2362 H04N21/2383 H04N21/438
H04N7/08 (Advanced/Invention);
H04L5/00 H04N7/08 (Advanced/Non-invention)
CPC: H04L27/2649 H04L27/2602 H04H20/42 H04H60/07
H04N21/2362 H04N21/2383 H04B7/06 H04L27/2627 H04B7/0413
H04H20/71 H04L27/00 H04L27/2634 H04N7/08 H04N21/234
H04N21/4382 H04L5/0044 H04L25/03242 H04L25/03891
US: 1/1 375/295 375/340



Family:

Publication number	Publication date	Application number	Application date
EP3042495 A1	20160713	EP20140842287	20140904
EP3042495 A4	20170426	EP20140842287	20140904
KR101830741 B1	20180221	KR20167009008	20140904
KR20160052692 A	20160512	KR20167009008	20140904
US2015063491 AA	20150305	US20140477167	20140904
US2016191290 AA	20160630	US20160064199	20160308
US9350472 BB	20160524	US20140477167	20140904
US9537698 BB	20170103	US20160064199	20160308
WO15034298 A1	20150312	WO2014KR08339	20140904

Priority:

US20130873838P 20130905 US20130876734P 20130911 US20140477167 20140904
WO2014KR08339 20140904 US20160064199 20160308

Probable Assignee: LG ELECTRONICS INC

Assignee(s): (std): LG ELECTRONICS INC

Inventor(s): (std): MUN CHULKYU ; KO WOOSUK ; KIM WOOCHAN ; HONG SUNGRYONG ; BAEK JONGSEOB

Agent(s): CABINET PLASSERAUD; DENTONS US LLP; KIM YONG IN ET AL

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