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(54) POWER SHARING METHOD AND BASE STATION

LEISTUNGSTEILUNGSVERFAHREN UND BASISSTATION

PROCÉDÉ DE PARTAGE DE PUISSANCE ET STATION DE BASE

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Description

Field of the Invention

[0001] The present disclosure relates to the field of wireless communication technologies, and more specifically, relates to a power sharing method and a base station that is capable of implementing this method.

Description of the Related Art

[0002] G/U dual-mode base station refers to a base station that can simultaneously support both a global system for mobile communications (Global System for Mobile Communications, abbreviated as GSM) mode and a universal mobile telecommunication system (Universal Mobile Telecommunications System, abbreviated as UMTS) mode.

[0003] However, in the prior art, the maximum transmitting power configured for various carriers in the GSM mode and in the UMTS mode is fixed, which is difficult for realizing flexible power sharing.

[0004] EP 2 075 923 A1 mainly relates to a method for allocating power to carriers in one power amplifier and a power amplifier thereof are disclosed. According to the technical solution of the present invention, the sum of maximum transmit power set for the carriers is larger than the rated total power of the power amplifier. When the sum of transient transmit power of the carriers is less than or equal to the rated total power, the power amplifier allocates the transient transmit power of the carriers to the carriers; or else, the power amplifier allocates the rated total power to the carriers according to a preset rule.

SUMMARY OF THE INVENTION

[0005] The embodiments of the present disclosure provide a power sharing method and a base station, in order to realize dynamic and flexible power sharing among communication systems of different modes sharing a same power amplifier.

[0006] One embodiment of the present disclosure provides a power sharing method for use in communication systems of at least two different communication modes sharing a same power amplifier, the method being as the pending claim 1.

[0007] Another embodiment of the present disclosure provides a base station, wherein, communication systems of at least two different communication modes sharing a same power amplifier in the base station, and the base station being as the pending claim 12.

[0008] According to the embodiments of the present disclosure, when it is determined that power sharing needs to be performed according to the power demands, power sharing is performed among the communication systems of different modes, thereby realizing dynamic and flexible power sharing among communication systems of at least two modes.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

Fig.1 is a flowchart of a power sharing method provided by one embodiment of the present disclosure;
Fig.2 is a flowchart of a power sharing method provided by another embodiment of the present disclosure;
Fig.3 is a flowchart of a power sharing method provided by a further embodiment of the present disclosure;
Fig.4 is a diagram showing a frame structure when GSM has burst traffic after the power sharing method provided by the embodiments of the present disclosure is performed;
Fig.5 is a flowchart of a power sharing method provided by another embodiment of the present disclosure;
Fig.6 is a flowchart of a power sharing method provided by another embodiment of the present disclosure;
Fig.7 is a diagram showing power demand timing of the GSM and the UMTS in the method shown in Fig.6;
Fig.8 is a flowchart of a power sharing method provided by another embodiment of the present disclosure;
Fig.9 is a structural diagram showing a base station provided by one embodiment of the present disclosure;
Fig. 10 is a structural diagram showing a base station provided by another embodiment of the present disclosure;
Fig.11 is a structural diagram showing a base station provided by a further embodiment of the present disclosure;
Fig. 12 is a structural diagram showing a base station provided by a further another embodiment of the present disclosure;
Fig. 13 is a structural diagram showing a base station provided by another embodiment of the present disclosure.

DESCRIPTION OF THE EMBODIMENTS

[0010] In order to make the objects, the technical solutions and the advantages of the present disclosure clearer, the technical solutions provided by the present disclosure will be further described in detail, in conjunction with the accompanying drawings and taking the following embodiments as examples.

[0011] Firstly, it needs to be noted that, in the various embodiments of the present disclosure, a total carrier power that is allowed to be used can be configured in advance respectively for communication systems of each mode, such that a sum of the total power of the communication systems of each mode can be equal to

a rated power of a power amplifier.

[0012] Power configuration for communication systems of various modes can take power amplifier (Power Amplifier, abbreviated as PA) as a unit and can be performed within PA. If a plurality of PAs exists, processing is performed independently within each PA by employing the solutions set forth in the embodiments of the present disclosure, or combined processing is performed among the plurality of PAs, in order to meet a larger power amplifying demand.

[0013] Fig.1 is a flowchart of a power sharing method provided by one embodiment of the present disclosure. In this embodiment, communication systems of at least two modes share a same power amplifier, for example, a communication system of GSM mode and a communication system of UMTS mode share a same power amplifier. As shown in the figure, the method comprises:

> Step 101, determining whether to perform power sharing among the communication systems of different modes sharing the same power amplifier, according to the power demand of the communication systems of at least one mode in the communication systems of different modes.

[0014] For communication systems of different modes sharing the same power amplifier, according to the power demand of communication systems of one or more modes, it can be determined whether there exists remaining power for a communication system of a certain mode, such that it can determined whether power sharing is performed among the communication systems of different modes.

[0015] Step 102, if it is determined to perform the power sharing among the communication systems of different modes, adjusting the available power of communication systems of one or more modes.

[0016] If it is determined that power sharing needs to be performed among communication systems of different modes, the available power of communication systems of one or more modes can be dynamically adjusted. The particular ways for this adjusting can be various, some of which can make reference to the relevant descriptions of the subsequent embodiments.

[0017] According to the method of this embodiment, when it is determined that power sharing needs to be performed according to the power demand, power sharing is performed among communication systems of different modes, in order to realize dynamic and flexible power sharing among communication systems of at least two modes.

[0018] Additionally, it needs to be noted that, if the communication systems of at least one mode among the communication systems of different modes sharing the same power amplifier also uses other power amplifier(s) at the same time, then the above adjusting the available power of communication systems of one or more modes comprises: adjusting a proportion of the power of the shared power amplifier and the power of the other one or more power amplifiers that is consumed by the communication system which uses the other one or more power amplifiers at the same time, thereby reducing the power of the shared power amplifier that is consumed by the communication system which uses other one or more power amplifiers at the same time.

[0019] Wherein, various ways can be adopted for adjusting a proportion of the power of the shared power amplifier and the power of the other one or more power amplifiers that is consumed by the communication system which uses other one or more power amplifiers at the same time, so long as it can reduce the power of the shared power amplifier that is consumed by the communication system which uses other one or more power amplifiers at the same time. For example, it is assumed that the UMTS and the GSM share a first power amplifier but the GSM also uses a second power amplifier at the same time, then a proportion of the power of the first power amplifier and the second power amplifier that is consumed by the GSM can be adjusted, in order to reduce the power of the first power amplifier that is consumed by the GSM. Because the total power required by the GSM is fixed, when the GSM consumes more power of the second power amplifier, the power of the first power amplifier that is consumed by the GSM will become less, such that it is possible to make the power of the first power amplifier be consumed by the UMTS as much as possible. One of the ways is preferentially assigning the power of the second power amplifier to the GSM as its available power. It is noted that, demands vary with different configurations, sometimes the power of the two power amplifiers should be used evenly. For example, in MIMO (Multiple Input Multiple Output) scenario, the GSM can be caused to use the power of the first power amplifier and the second power amplifier as evenly as possible. Wherein, a distribution set or other manners can be adopted for sharing power from the GSM to the UMTS.

[0020] Fig.2 is a flowchart of a power sharing method provided by another embodiment of the present disclosure. In this embodiment, communication systems of different modes sharing the same power amplifier are referred to as a communication system of a first mode and communication systems of one or more other modes. As shown in the figure, the method comprises:

> Step 201, within a preset period, according to the power demand of the communication system of the first mode and the available power of the communication system of the first mode, obtaining the sharable remaining power of the communication system of the first mode.

[0021] In particular, the sharable remaining power of the communication systems of each mode can be obtained in the following ways.

[0022] When the preset period arrives, the current

power demand is subtracted from the total power currently configured for a communication system of one mode, and the obtained difference is the sharable remaining power; or, when the preset period arrives, the current power demand and the preserved power are subtracted from the available power currently configured for the communication system of one mode, and the obtained difference is the sharable remaining power; or, a fixed power value or a fixed proportion in the total power currently configured for the communication system of one mode can serve as the sharable remaining power.

[0023] Wherein, the current power demand refers to the power required by the communication system of one mode for maintaining the current operation. For example, the current power demand of the GSM mode refers to the maximum value among the sums of the power required by each time slot of the current eight time slots, including pilot transmitting power. In the time division multiple access (Time Division Multiple Access,abbreviated as TDMA) technology, a frame consists of eight time slots. The GSM pilot transmitting power refers to the power consumed at the time of transmitting pilot signals in the Broadcast Control Channel (abbreviated as BCCH). Since a pilot signal generally has a function of providing forward code division multiple access channel time limit, coherent demodulation phase reference, or the like, it is a very important signal whose transmitting power needs to be kept unchanged, such that this pilot signal will not be regarded as the sharable remaining power for being used by communication systems of other modes.

[0024] Wherein, the preserved power refers to an idle power preserved for being used by one mode, in case for the arrival of predictable burst traffic or being used for meeting power demand of the communication system of this mode in the next preset period. This preserved power can be set as any arbitrary numerical value as needed.

[0025] It needs to be noted that, the preset period herein can be set as needed. The above-mentioned communication system of the first mode can be any one of the communication systems of different modes sharing the same power amplifier.

[0026] Step 202, according to the power demand of communication systems of one or more other modes, deciding whether to agree to receive the sharable remaining power of the communication system of the first mode.

[0027] Specifically, if the network load of the communication systems of one or more other modes (such as the High Speed Downlink Packet Access (abbreviated as HSDPA) network load) is relatively light, when it is unnecessary to receive the shared power, it is refused to receive the remaining power. Alternatively, if the remaining time during which this remaining power can be shared is less than the minimum valid time (in a unit of ms) during which this remaining power can be used by the communication systems of one or more other modes, it is also refused to receive the shared power, in order to avoid excessively short use time of the shared power and low utilization after performing power sharing. Wherein, the remaining time refers to, within a sharing period, a period of time from determining to share the remaining power with the communication systems of one or more other modes for use till the end of this sharing period.

[0028] Step 203, if the sharable remaining power of the communication system of the first mode satisfies a preset sharing condition and the power demand of the communication systems of one or more other modes agree to receive the sharable remaining power of the communication system of the first mode, determining to perform power sharing among communication systems of different modes.

[0029] Specifically, if the sharable remaining power of the communication system of the first mode is larger than or equal to a first threshold, it is determined that the sharable remaining power of the communication system of the first mode satisfies the preset sharing condition; alternatively, if a difference between the sharable remaining power of the communication system of the first mode and the sharable remaining power of the communication systems of one or more other modes is larger than or equal to a second threshold, it is determined that the sharable remaining power of the communication system of the first mode satisfies the preset sharing condition. Of course, according to different demands, other ways also can be employed for determining whether the sharable remaining power of the communication system of the first mode satisfies the preset sharing condition, and details thereof are omitted. In addition, if the sharable remaining power of the communication system of the first mode does not satisfy the preset sharing condition, it can be re-determined whether the sharable remaining power of the communication system of another mode satisfies the preset sharing condition; if the sharable remaining power of this communication system of another mode satisfies the preset sharing condition, the power of this communication system can be shared to communication systems of other modes.

[0030] For example, it is assumed that the communication system of the first mode is GSM, if the remaining power of the GSM is larger than or equal to the first threshold, it indicates that the power demand of the GSM mode at this time point is relatively low and a portion of the remaining power of the GSM can be shared to other modes; otherwise, it indicates that the power demand of the GSM mode itself at this time point is also very high, and it is not appropriate to share power with other modes, for avoiding the normal operation of the GSM mode itself from being affected.

[0031] Again, for example, it is assumed that the communication system of the first mode is GSM and the communication systems of one other mode is UMTS, if the GSM mode has already shared power to the UMTS mode during the previous period, only when a difference between the sharable remaining power of the GSM communication system and the sharable remaining power of the UMTS is larger than or equal to the second threshold

can the sharing condition be satisfied, such that it is ensured that only when the GSM has enough remaining power it shares power with the UMTS, thereby avoiding power retrieving operation and repeated power sharing operations from being performed frequently, reducing the burden of the system. In addition to the GSM and the UMTS, there are communication systems of other modes, for example, the Long Term Evolution (abbreviated as LTE). However, regardless the modes of the communication systems, the processing are similar and thus this embodiment will not describe all of them.

[0032] It needs to be noted that, the above description has been made taking a situation in which the GSM shares the power to the UMTS as an example. However, in practical situations, it is also possible that the UMTS shares the power to the GSM. The numerical values of the first threshold and the second threshold can be set according to actual needs, and the embodiments of the present disclosure will not make any limitations on it.

[0033] In addition, if the communication system of the first mode is GSM, it further comprises, before obtaining the sharable remaining power of the communication system of the first mode in the above-mentioned step 201, deciding whether the number of non-primary B carriers in the GSM carriers reaches a preset numerical value, if it reaches the preset numerical value, performing the step of obtaining the sharable remaining power of the communication system of the first mode; wherein, the preset numerical value can be any arbitrary positive integer, the primary B carrier refers to a carrier that transmits pilot signals while the non-primary B carrier refers to the carriers other than the primary B carriers. In the GSM, in order to guarantee its normal operation, sufficient power will be assigned to the primary B carriers, which thus may consume a huge amount of available power. When the number of the non-primary B carriers is sufficiently high, a great amount of remaining power may be shared to communication systems of one or more other modes, and then the number of the non-primary B carriers can be decided in advance at the time of deciding whether there has remaining power for sharing. If the number of the non-primary B carriers does not reach the preset numerical value, the subsequent decision can be avoided.

[0034] Step 204, if it is determined to perform the power sharing among communication systems of different modes, the available power of communication systems of one or more modes is adjusted.

[0035] If it is determined that power sharing needs to be performed among communication systems of different modes, the available power of the communication systems of one or more modes can be dynamically adjusted. The particular ways for this adjusting are various, some of which can make reference to the relevant descriptions in the subsequent embodiments.

[0036] Fig.3 is a flowchart of a power sharing method provided by another embodiment of the present disclosure. As shown in the figure, it comprises:

Step 301, according to the power demand of the communication systems of at least one mode among the communication systems of different modes sharing the same power amplifier, determining whether to perform power sharing among the communication systems of different modes.

[0037] The implementation of this step can make reference to the relevant descriptions in Fig.1 or Fig.2, and thus details thereof will be omitted.

[0038] Step 302, according to the sharable remaining power of the communication system of the first mode, configuring available power for the communication system of the first mode and communication systems of one or more other modes.

[0039] For example, a difference obtained by subtracting the sharable remaining power from the total power currently configured for the communication system of the first mode can serve as the available power to be configured for the communication system of the first mode; and then, on the basis of the power currently configured for the one or more other modes, the sharable remaining power is assigned to the communication systems of one or more other modes according to a preset rule.

[0040] Specifically, assigning the sharable remaining power to the communication systems of one or more other modes according to a preset rule can go as follows: if there are multiple communication systems of other modes, assigning the sharable remaining power to the multiple communication systems of other modes in an order of time (for example, at 12:00, assigning the sharable remaining power to the UMTS for sharing; at 15:00, assigning the sharable remaining power to the LTE for sharing); or, according to the priorities of the multiple communication systems of other modes, assigning the sharable remaining power to the multiple communication systems of other modes in an order from a high priority to a low priority; or, assigning the sharable remaining power evenly to the multiple communication systems of other modes. Wherein, the priority can be determined according to the performances of the communication systems, for example, a high priority is provided for a communication system of a mode to which a problem of insufficient power tends to occur, in order to obtain sharing power preferentially; or the priority can be determined according to the inclinations of the operator, for example, if the operator wishes to preferentially guarantee the normal operation of the UMTS, then a high priority is provided for this UMTS system; or, the priority can be determined according to the power demands of the communication systems of these modes, the higher the power demand, the higher the priority that will be provided.

[0041] Step 303, sharing the sharable remaining power of the communication system of the first mode to the communication systems of one or more other modes.

[0042] For example, it is assumed that the communication system of the first mode is GSM, and the communication system of one other mode is UMTS. In particular,

the available power of the UMTS after obtaining the shared power is equal to a sum of the available power of the UMTS before obtaining the shared power and the shared power that is agreed to be received. Wherein, the shared power that is agreed to be received is a portion of power that the UMTS agrees to receive from the sharable remaining power of the GSM system. Further, the shared power received from the GSM mode can be used for the HSDPA network in the UMTS mode, wherein, the HSDPA network utilizes the power obtained by sharing from the GSM mode. Because the more the power there are, the more the available modulation code in the code division multiple access modulation manner and the more content is carried, it is possible to enhance the downlink data transmission rate for cell users.

[0043] Additionally, it is noted that, if an absolute value of a difference between the sharable remaining power of the communication system of the first mode obtained when the current preset period arrives and the sharable remaining power obtained when the previous preset period arrives is less than or equal to a third threshold, the available power of the communication systems of different modes can be kept unchanged; otherwise, according to the sharable remaining power of the communication system of the first mode, available power are configured for the communication system of the first mode and the communication systems of one or more other modes. Thus, when the remaining power of the communication system of the first mode changes greatly, shared power is provided to the communication systems of one or more other modes; while, when the remaining power of the communication system of the first mode changes slightly, it is not meaningful to re-perform power sharing, which avoids the configuration of available power from being frequently performed which in turn may add the burden of the system. The above-mentioned third threshold can be set according to actual needs as well.

[0044] The above embodiment provides a solution in which the communication system of the first mode provides a long-term power sharing to communication systems of other modes, after the communication system of the first mode has performed power sharing with the communication systems of one or more other modes, the communication system of the first mode may have burst traffic, or, it is predicted that the available power of the communication system of the first mode cannot satisfy the power demand of the communication system of the first mode during the next preset period, power retrieving can be performed. A situation in which burst traffic occurs will be taken as an example for the following description.

[0045] Below, descriptions are made taking a situation in which the GSM and the UMTS share the same power amplifier as an example, in which, it is assumed that the communication system of the first mode is GSM.

[0046] As shown in Fig.4, it is assumed that the GSM has provided power sharing to the UMTS, PA has configured three GSM carrier frequencies and one UMTS carrier frequency (represented as "G3U1" in Fig.4), wherein, the dotted line position represents that burst traffic having a power demand of 20W occurs to the GSM carrier frequency at this time point, when the power demanded by this burst traffic exceeds the available idle power of the GSM mode remaining after the GSM mode has provided shared power to the UMTS mode, the current GSM remaining available power cannot satisfy the demand of this burst traffic, and it is necessary at this time point to retrieve the power that has been shared to the UMTS mode in-time. The hatched portion in Fig.4 indicates performing a uniform peak clipping on the carrier frequency in a time slot assigned by the burst traffic, in order to ensure that the total power demand does not exceed the rated power of the PA at the GSM side and meanwhile power are retrieved back to the UMTS side. Thus, another embodiment of the present disclosure further provides the following power sharing method.

[0047] Fig.5 is a flowchart of a power sharing method provided by another embodiment of the present disclosure. As shown in the figure, after performing power sharing, it further comprises,

[0048] Step 401, when it is detected that burst traffic occurs to the communication system of the first mode and the available power of the communication system of the first mode does not satisfy the power demand required after the burst traffic occurs, it is determined to retrieval power, according to the available power of the communication system of the first mode and the power demand of the communication system of the first mode after the burst traffic occurs.

[0049] For example, it is assumed that the communication system of the first mode is UMTS, and the power demand of this UMTS during the next preset period is equal to a sum of the UMTS current power demand, the power demand at the time of transmitting HSDPA data during the next preset period, and the UMTS current remaining power.

[0050] Step 402, according to the retrieval power, updating the available power of the communication system of the first mode and the communication systems of one or more other modes.

[0051] Specifically, the available power of the communication system of the first mode after updating is equal to a sum of the available power of the communication system of the first mode before updating and the retrieval power. After completing the updating, power amplification is performed by the power amplifier based on the updated available power of the various systems.

[0052] With the method described in this embodiment, when the communication system of the first mode has a busy traffic, the shared power that is shared from the communication system of the first mode to the communication system of the second mode can be retrieved dynamically, which thus further improves the flexibility of power sharing and at the most extent avoids posing adverse influences for the performance of the communication system of the first mode.

[0053] Additionally, it needs to be noted that, since the

above process of power retrieving has a certain time delay, PA overloading may occur before completing power retrieving. Thus, before performing the above step 402, the following step can be performed: according to a difference between the power demand of the communication system of the first mode and the available power of the communication system of the first mode, reducing the available power of the communication system of the first mode.

[0054] For example, it is assumed that the communication system of the first mode is GSM. Particularly, calculation can be performed based on the following formula: GSM peak clipping power=GSM power demand - GSM available power.

[0055] Wherein, the GSM peak clipping power refers to the power to be reduced from the GSM available power. The GSM power demand comprises: the power demand (including transmitting power required by the pilot signal) before the arrival of the above burst traffic and the power required by the above burst traffic.

[0056] Then, according to the calculated GSM peak clipping power, peak clipping processing is performed on the business carrier configured under the GSM. The particular peak clipping processing can perform uniform peak clipping on each business carrier according to the number of the business carriers configured under the GSM. Each business carrier peak clipping power = GSM peak clipping power/the number of the GSM business carriers. Wherein, the business carrier refers to the carriers in the BCCH channel other than those for transmitting pilot signals.

[0057] It needs to be noted that, the above descriptions are made by taking a situation in which burst traffic occurs as an example. It is understood that, when it is predicated that the available power of the communication system of the first mode does not satisfy the power demand of the communication system of the first mode during the next preset period, a similar processing can be used. In such scene, the retrieval power can be determined according to the power demand within the next preset period and the available power of the communication system of the first mode.

[0058] Fig.6 is a flowchart of a power sharing method provided by another embodiment of the present disclosure. As shown in the figure, the method comprises:

Step 501, taking the maximum power control period in the communication systems of different modes as a unit, within each minimum power control period in the communication systems of different modes, obtaining a sum of the power demands of the communication systems of different modes sharing the same power amplifier, wherein, if the sum of the power demands is larger than the rated power of the power amplifier, it is determined to perform power sharing among communication systems of different modes.

[0059] For example, it is assumed that a communication system of one mode is GSM and the communication system of another mode is UMTS. As shown in Fig.7, it is a diagram showing the power demand timings of the GSM and the UMTS, the numbers "0", "1"..... "7" in the figure indicate the numbers of the eight time slots within one TDMA frame. As shown in the figure, herein, a length (such as, 2ms) of one time slot of the UMTS can be understood as the maximum power control period, while a length of the one time slot of the GSM can be understood as the minimum power control period. For example, within a first 2ms time slot of the UMTS, a sum of the power demands of the GSM and the UMTS are obtained within the time slots of the GSM that are numbered as "0", "1" and "2". If the obtained sum of the power demands is larger than the rated power of the power amplifier, it is determined that power sharing needs to be performed between the GSM and the UMTS.

[0060] Step 502, adjusting the available power of the communication systems of one or more modes.

[0061] For example, it is assumed that a communication system of one mode is GSM and the communication system of another mode is UMTS. The specific procedure goes as follows:

(1) If the GSM current power demand exceeds the GSM available power while the UMTS current power demand does not exceed the UMTS available power, peak clipping processing is performed on the GSM, and the GSM peak clipping power = the GSM current power demand + the UMTS current power demand - the rated power of the power amplifier.
Wherein, performing peak clipping processing on the GSM means reducing the average transmitting power. "GSM current power demand + UMTS current power demand" represents a total power demand of the GSM and the UMTS. A portion of this total power demand that exceeds the PA rated power is used as the GSM peak clipping power for performing peak clipping processing on the GSM, in order to guarantee the power demand of the UMTS.
(2) If the GSM current power demand does not exceed the GSM available power while the UMTS current power demand exceeds the UMTS available power, peak clipping processing will not be performed in the GSM mode.
(3) If the GSM current power demand exceeds the GSM available power and the UMTS current power demand also exceeds the UMTS available power, peak clipping processing is performed on the GSM, and GSM peak clipping power = GSM current power demand - GSM available power.

[0062] Since the GSM current power exceeds the GSM available power, the exceeding portion is used as the GSM peak clipping power for performing peak clipping on the GSM.

[0063] When the above communication systems of dif-

ferent modes sharing the same power amplifier are the GSM and the UMTS, this embodiment can further comprise the following steps:

Step 503, if the power of the combined radio-frequency signal of the GSM and the UMTS exceeds the rated power of the power amplifier, wave clipping processing is performed on the UMTS.

[0064] For example, after performing peak clipping processing on the GSM in step 502, the combined radio-frequency signal of the GSM and the UMTS still has a power that may exceed the rated power of the power amplifier, and thus this step is employed for performing wave clipping processing on the UMTS, wherein, the wave clipping processing means reducing peak-to-average ratio.

[0065] With the method described in this embodiment, based on the power control period in the communication systems of different modes, an instantaneous power sharing is realized, thereby realizing dynamic and flexible power sharing among communication systems of at least two modes.

[0066] Fig.8 is a flowchart of a power sharing method provided by another embodiment of the present disclosure. As shown in the figure, the method comprises:

Step 601, if the power demand of the communication system having a high priority among the communication systems of different modes sharing the same power amplifier exceeds a preset load threshold, it is determined to perform power sharing among communication systems of different modes.

[0067] Wherein, the priority can be determined according to the performances of the communication systems, for example, a high priority is provided for a communication system of a mode to which a problem of insufficient power tends to occur, in order to preferentially obtain shared power; or the priority can be determined according to the inclinations of the operator, for example, if the operator wishes to preferentially guarantee the normal operation of the UMTS, then a high priority is provided for this UMTS system; or, the priority can be determined according to the power demands of the communication systems of these modes, the higher the power demand, the higher the priority that will be provided. Of course, the priority of the communication systems can be determined by other ways, and this embodiment will not make any limitations on it.

[0068] Step 602, reducing the available power of the communication system having a low priority.

[0069] According to the method described in this embodiment, when the power demand of the communication system having a high priority among the communication systems of different modes sharing the same power amplifier exceeds the preset load threshold, it is determined to perform power sharing among communication systems of different modes, and the available power of the communication system having a low priority is reduced, thereby facilitating that the communication system having a high priority can be guaranteed to have sufficient available power.

[0070] Fig.9 is a diagram showing the structure of the base station provided by one embodiment of the present disclosure. As shown in the figure, in this base station 10, communication systems of at least two modes share the same power amplifier in the base station. This base station can include a share determining module 11 and a power adjusting module 12, wherein

the share determining module 11 in the base station 10 determines whether to perform power sharing among communication systems of different modes sharing the same power amplifier according to the power demand of communication systems of at least one modes in the communication systems of different modes; when the share determining module 11 determines to perform power sharing among communication systems of different modes, the power adjusting module 12 adjusts the available power of the communication systems of one or more modes.

[0071] If it is determined that power sharing needs to be performed among communication systems of different modes, the available power of communication systems of one or more modes can be dynamically adjusted. The specific ways for this adjusting can be various, some of which can make reference to the relevant descriptions of the above method embodiments.

[0072] In the base station of this embodiment, when it is determined to perform power sharing according to power demand, power sharing is performed among communication systems of different modes, thereby realizing dynamic and flexible power sharing among communication systems of at least two modes.

[0073] Additionally, it needs to be noted that, if the communication systems of at least one mode among the communication systems of different modes sharing the same power amplifier also uses other power amplifier at the same time, the above power adjusting module 12 can adjust a proportion of the power of the shared power amplifier and the power of the other one or more power amplifiers that is consumed by the communication system which uses the other one or more power amplifiers at the same time, thereby reducing the power of the shared power amplifier that is consumed by the communication system which uses other one or more power amplifiers at the same time. Reference can be made to the relevant contents in the above method embodiments, and thus details thereof are omitted.

[0074] Fig.10 is a diagram showing the structure of a base station provided by another embodiment of the present disclosure. As shown in the figure, the share determining module 11 in the base station of this embodiment can comprise: a power obtaining unit 1101 and a reception deciding unit 1102; further, the power adjusting module 12 can comprise a power operation unit 1201

and a power distribution unit 1202. Wherein
the power obtaining unit 1101 obtains, within a preset period, according to the power demand of the communication system of the first mode and the available power of the communication system of the first mode, the sharable remaining power of the communication system of the first mode. Specifically, the sharable remaining power of the communication systems of different modes can be obtained in the following ways.

[0075] When the preset period arrives, the current power demand is subtracted from the total power currently configured for a communication system of one mode, and the obtained difference is the sharable remaining power; or, when the preset period arrives, the current power demand and the preserved power are subtracted from the available power currently configured for a communication system of one mode, and the obtained difference is the sharable remaining power; or, a fixed power value or a fixed proportion in the total power currently configured for a communication system of one mode can serve as the sharable remaining power.

[0076] Wherein, the current power demand refers to the power required by a communication system of one mode for maintaining the current operation. The preserved power refers to an idle power preserved for being used by one mode, in case for the arrival of predictable burst traffic. This preserved power can be set as any arbitrary numerical value as needed. It needs to be noted that, the preset period herein can be set as needed. The above-mentioned communication system of the first mode can be any one of the communication systems of different modes sharing the same power amplifier.

[0077] The reception deciding unit 1102 decides, according to the power demand of the communication systems of one or more other modes, whether to agree to receive the sharable remaining power of the communication system of the first mode. If the sharable remaining power of the communication system of the first mode satisfies the preset sharing condition and the communication systems of one or more other modes agree to receive the sharable remaining power of the communication system of the first mode, it is determined to perform power sharing among communication systems of different modes.

[0078] Wherein, the reception deciding unit 1102 can decide, according to network load of the communication systems of one or more other modes or the remaining time during which the remaining power can be shared, whether to agree to receive the sharable remaining power of the communication system of the first mode. Specifically, if the network load of the communication systems of one or more modes (such as the HSDPA network load) is relatively light, and when it is unnecessary to receive the shared power, it is refused to receive the remaining power. Alternatively, if the remaining time during which this remaining power can be shared is less than the minimum valid time (in a unit of ms) during which this remaining power can be used by the communication systems of one or more other modes, it is also refused to receive the shared power, in order to avoid excessively short use time of the shared power and low utilization after performing power sharing. Wherein, the remaining time refers to, within a sharing period, a period of time from determining to share the remaining power to the communication systems of one or more other modes till the end of this sharing period.

[0079] When the share determining module 11 determines to perform power sharing among communication systems of different modes, the power operation unit in the power adjusting module 12 can use a difference obtained by subtracting the sharable remaining power from the total power currently configured for the communication system of the first mode as the available power configured for the communication system of the first mode; and then, the power distribution unit 1202 assigns, on the basis of the power currently configured for the one or more other modes, the sharable remaining power to the communication systems of one or more other modes according to a preset rule.

[0080] Specifically, assigning the sharable remaining power to the communication systems of one or more other modes according to a preset rule can go as follows: if there are multiple communication systems of other modes, assigning the sharable remaining power to the multiple communication systems of other modes in an order of time; or, according to the priorities of the multiple communication systems of other modes, assigning the sharable remaining power to the multiple communication systems of other modes in an order from a high priority to a low priority; or, assigning the sharable remaining power evenly to the multiple communication systems of other modes. Wherein, the priority can be determined according to the performances of the communication systems, for example, a high priority is provided for a communication system of a mode to which a problem of insufficient power tend to occur, in order to obtain the shared power preferentially; or the priority can be determined according to the inclinations of the operator, for example, if the operator wishes to preferentially guarantee the normal operation of the UMTS, a high priority is provided for this UMTS system; or, the priority can be determined according to the power demands of communication systems of these modes, the higher the power demand is, the higher priority will be provided.

[0081] In addition, after the communication system of the first mode has performed power sharing with the communication systems of one or more other modes, the communication system of the first mode may have burst traffic, reference can be made to Fig.4 and its relevant descriptions for details of the burst traffic, and thus details thereof are omitted; or, it is predicted that the available power of the communication system of the first mode cannot satisfy the power demand of the communication system of the first mode during the next preset period; at this time point, power retrieving can be performed.

[0082] Another embodiment of the present disclosure

also provides another base station. Fig.11 is a diagram showing the structure of a base station provided by another embodiment of the present disclosure. As shown in the figure, the base station 10 also comprises: a retrieval power determining module 13 and a power updating module 14, wherein:

When it is detected that burst traffic occurs to the communication system of the first mode and the available power of the communication system of the first mode does not satisfy the power demand required after the burst traffic occurs, the retrieval power determining module 13 determines the retrieval power according to the available power of the communication system of the first mode and the power demand of the communication system of the first mode after the burst traffic occurs; or, when it is predicated that the available power of the communication system of the first mode cannot satisfy the power demand of the communication system of the first mode during the next preset period, the retrieval power determining module 13 determines the retrieval power according to the power demand within the next preset period and the available power of the communication system of the first mode; the power updating module 14 updates the available power of the communication system of the first mode and the communication systems of one or more modes according to the retrieval power determined by the retrieval power determining module.

[0083] Specifically, the available power of the communication system of the first mode after updating = the available power of the communication system of the first mode before updating + the retrieval power.

[0084] With this embodiment, when the communication system of the first mode has a busy traffic, the shared power that is shared from the communication system of the first mode to the communication system of the second mode can be taken back dynamically, which thus further improves the flexibility of power sharing and to the maximum extent avoids posing adverse influences on the performance of the communication system of the first mode.

[0085] Fig. 12 is a diagram showing the structure of a base station provided by another embodiment of the present disclosure. As shown in the figure, the share determining module 11 in the base station 10 comprises: a power demand obtaining unit 1111 and a share determining unit 1112; the power adjusting module 12 comprises: a peak clipping processing unit 1211 and a wave clipping processing unit 1212, wherein:

The power demand obtaining unit 1111 takes the maximum power control period in the communication systems of different modes as a unit, within each minimum power control period in the communication systems of different modes, obtains a sum of the power demands of the communication systems of different modes sharing the same power amplifier; if the sum of the power demands is larger than the rated power of the power amplifier, the share determining unit 1112 determines to perform power sharing among communication systems of different modes. It is assumed that a communication system of one mode is GSM and the communication system of another mode is UMTS. Reference can be made to Fig.7 and its relevant description for details of the power demand timing of the GSM and the UMTS, and thus details thereof are omitted.

[0086] Hereinafter, if the GSM current power demand exceeds the GSM available power while the UMTS current power demand does not exceed the UMTS available power, peak clipping processing is performed on the GSM by the peak clipping processing unit 1211, and the GSM peak clipping power = the GSM current power demand + the UMTS current power demand - the rated power of the power amplifier; and/or, if the GSM current power demand exceeds the GSM available power and the UMTS current power demand also exceeds the UMTS available power, peak clipping processing is performed on the GSM, and GSM peak clipping power = GSM current power demand - GSM available power. Since the GSM current power exceeds the GSM available power, the exceeding portion is used as the GSM peak clipping power for performing peak clipping on the GSM. Additionally, if the GSM current power demand does not exceed the GSM available power while the UMTS current power demand exceeds the UMTS available power, peak clipping processing will not be performed in the GSM mode.

[0087] After the peak clipping unit performs peak clipping processing, if the power of the combined radio-frequency signal of the GSM and the UMTS exceeds the rated power of the power amplifier, wave clipping processing is performed on the UMTS by the wave clipping processing unit 1212.

[0088] For example, after performing peak clipping processing on the GSM in step 502, the combined radio-frequency signal of the GSM and the UMTS still has a power that may exceed the rated power of the power amplifier, and thus this step is employed for performing wave clipping processing on the UMTS, wherein, the wave clipping processing means reducing peak-to-average ratio.

[0089] With this embodiment, based on the power control period in the communication systems of different modes, an instantaneous power sharing is realized, thereby realizing dynamic and flexible power sharing among communication systems of at least two modes.

[0090] Fig. 13 is a diagram showing the structure of a base station provided by another embodiment of the present disclosure. As shown in the figure, the share determining module 11 in the base station 10 comprises: a threshold deciding unit 1121 and a threshold determining

unit 1122, wherein:

> The threshold deciding unit 1121 decides if the power demand of the communication system having a high priority among the communication systems of different modes sharing the same power amplifier exceeds a preset load threshold. Wherein, the priority can be determined according to the performances of the communication systems. For example, a high priority is provided for a communication system of a mode to which a problem of insufficient power tends to occur, in order to preferentially obtain the shared power; or the priority can be determined according to the inclinations of the operator, for example, if the operator wishes to preferentially guarantee the normal operation of the UMTS, then a high priority is provided for this UMTS system; or, the priority can be determined according to the power demands of the communication systems of these modes, the higher the power demand is, the higher priority will be provided.

[0091] If the threshold deciding unit 1121 decides that the power demand of the communication system having a high priority exceeds the preset load threshold, the threshold determining unit 1122 determines to perform power sharing among communication systems of different modes.

[0092] Hereinafter, when the threshold determining unit 1122 determines to perform power sharing among communication systems of different modes, the available power of the communication system having a low priority is reduced by the power adjusting module 12.

[0093] According to the base station described in this embodiment, when the power demand of the communication system having a high priority among the communication systems of different modes sharing the same power amplifier exceeds the preset load threshold, it is determined to perform power sharing among communication systems of different modes, and the available power of the communication system having a low priority is reduced, thereby facilitating that the communication system having a high priority can be guaranteed to have sufficient available power.

[0094] It needs to be noted that, the base station described in the embodiments of Fig.9 to Fig.13 can be a microcellular base station (MBTS).

[0095] One of ordinary skill in the art can understand that, all or part of the steps for implementing the above method embodiments can be implemented through program instruction related hardware. The program can be stored in a computer readable access storage medium, which executes the steps of the above method embodiments when being executed; the above mentioned storage medium comprises various media that can store program codes, such as, ROM, RAM, magnetic disk or optical disk.

[0096] Embodiments relates to the present invention are as follows:

Item 1. A power sharing method, communication systems of at least two modes share a same power amplifier, said method comprises:

> determining whether to perform power sharing among communication systems of different modes, according to a power demand of a communication system of at least one mode among the communication systems of different modes sharing a same power amplifier; and
> adjusting an available power of communication systems of one or more modes if it is determined to perform power sharing among the communication systems of different modes.

Item 2. The method according to item 1, the step of determining whether to perform power sharing among the communication systems of different modes sharing a same power amplifier, according to a power demand of the communication system of at least one mode among communication systems of different modes, comprises:

> within a preset period, obtaining a sharable remaining power of a communication system of a first mode, according to a power demand of said communication system of the first mode and an available power of said communication system of the first mode;
> deciding whether to agree to receive the sharable remaining power of the communication system of the first mode, according to a power demand of communication systems of one or more other modes; and
> determining to perform power sharing among the communication systems of different modes, if the sharable remaining power of said communication system of the first mode satisfies a preset sharing condition and said communication systems of one or more other modes agree to receive the sharable remaining power of said communication system of the first mode.

Item 3. The method according to item 2, the step of deciding whether to agree to receive the sharable remaining power of the communication system of the first mode according to a power demand of communication systems of one or more other modes, comprises:

> deciding whether to agree to receive the sharable remaining power of the communication system of the first mode, according to network load of the communication systems of one or more other modes or a remaining time during which said remaining power can be shared.

Item 4. The method according to item 2, the step of adjusting the available power of the communication systems of one or more modes comprises:

configuring available power for the communication system of the first mode and the communication systems of one or more other modes according to the sharable remaining power of the communication system of the first mode, in order to share the sharable remaining power of the communication system of the first mode to the communication systems of one or more other modes.

Item 5. The method according to item 2, if the sharable remaining power of the communication system of the first mode is larger than or equal to a first threshold, determining that the sharable remaining power of the communication system of the first mode satisfies a preset sharing condition; or,
if a difference between the sharable remaining power of the communication system of the first mode and the sharable remaining power of the communication systems of one or more other modes is larger than or equal to a second threshold, determining that the sharable remaining power of the communication system of the first mode satisfies the preset sharing condition.

Item 6. The method according to item 2, if said communication system of the first mode is a global system for mobile communications, before obtaining the sharable remaining power of the communication system of the first mode, the method further comprises:

deciding whether the number of non-primary B carriers in carriers of the global system formobile communications has reached a predetermined numerical value, if it has reached the predetermined numerical value, the step of obtaining the sharable remaining power of the communication system of the first mode is performed; wherein, said predetermined numerical value is an arbitrary positive integer.

Item 7. The method according to any one of items 3 to 6, the step of configuring available power for the communication system of the first mode and the communication systems of one or more other modes according to the sharable remaining power of the communication system of the first mode comprises:

subtracting said sharable remaining power from the total power currently configured for said communication system of the first mode, and using a difference obtained thereby as an available power of said communication system of the first mode;
on basis of the power currently configured for the communication systems of one or more other modes, assigning said sharable remaining power to the communication systems of one or more other modes according to a preset rule.

Item 8. The method according to item 7, the step of assigning said sharable remaining power to the communication systems of one or more other modes according to a preset rule comprises:

if there are multiple communication systems of other modes, assigning said sharable remaining power to said multiple communication systems of other modes in an order of time; or,
according to priorities of said multiple communication systems of other modes, assigning said sharable remaining power to said multiple communication systems of other modes in an order from a high priority to a lower priority; or,
if there are multiple communication systems of other modes, assigning said sharable remaining power to said multiple communication systems of other modes evenly.

Item 9. The method according to any one of items 2 to 6, obtaining a sharable remaining power of the communication systems of different modes in the following ways:

when a preset period arrives, subtracting the current power demand from the total power currently configured for the communication system of one mode, a difference obtained thereby serves as said sharable remaining power; or
when a preset period arrives, subtracting the current power demand and the preserved power from the available power currently configured for the communication system of one mode, a difference obtained thereby serves as said sharable remaining power; or
a fixed power value or a fixed proportion of total power the currently configured for the communication system of one mode serves as said sharable remaining power.

Item 10. The method according to item 2, said method further comprises: if an absolute value of a difference between the sharable remaining power of said communication system of the first mode obtained when the current preset period arrives and the sharable remaining power obtained when the previous preset period arrives is less than or equal to a third threshold, keeping the available power of the communication systems of different modes unchanged, otherwise, configuring available power for the communication system of the first mode and the commu-

nication systems of one or more other modes, according to the sharable remaining power of said communication system of the first mode.

Item 11. The method according to item 2, characterized in that:

said communication system of the first mode is global system for mobile communications and said communication system of one other mode is universal mobile telecommunications system; the available power shared by said global system for mobile communications to said universal mobile telecommunications system is used for enhancing the rate of high-speed downlink packet access user.

Item 12. The method according to item 2, said method further comprises:

when it is detected that burst traffic arrives at said communication system of the first mode and the available power of said communication system of the first mode does not satisfy the power demand required after said burst traffic arrives, determining a retrieval power, according to the power demand of said communication system of the first mode required after said burst traffic arrives and the available power of said communication system of the first mode, or, when it is predicted that the available power of said communication system of the first mode does not satisfy the power demand of said communication system of the first mode within a next preset period, determining a retrieval power, according to the power demand within the next preset period and the available power of said communication system of the first mode;
updating the available power of the communication system of the first mode and the communication systems of one or more other modes, according to said retrieval power.

Item 13. The method according to item 12, before the step of updating the available power of the communication system of the first mode and the communication systems of one or more other modes according to said retrieval power, comprises:

reducing the power of said communication system of the first mode according to a difference between the power demand of said communication system of the first mode and the available power of said communication system of the first mode.

Item 14. The method according to item 1, the step of determining whether to perform power sharing among communication systems of different modes sharing a same power amplifier according to a power demand of communication systems of at least one mode among communication systems of different modes, comprises:

taking a maximum power control period in the communication systems of different modes as a unit, within each minimum power control period in the communication systems of different modes, obtaining a sum of power demands of the communication systems of different modes sharing the same power amplifier, if the sum of power demands is larger than a rated power of said power amplifier, determining to perform power sharing among the communication systems of different modes.

Item 15. The method according to item 14, the communication systems of different modes sharing the same power amplifier are global system for mobile communications (GSM) and universal mobile telecommunications system (UMTS), said adjusting the available power of the communication systems of one or more modes comprises:

if the current power demand of said GSM exceeds the available power of said GSM while the current power demand of said UMTS does not exceed the available power of said UMTS, performing peak clipping processing on said GSM, and GSM peak clipping power = GSM current power demand + UMTS current power demand - rated power of the power amplifier; and/or
if the current power demand of said GSM exceeds the available power of said GSM while the current power demand of said UMTS also exceeds the available power of said UMTS, performing peak clipping processing on said GSM, and GSM peak clipping power = GSM current power demand - GSM available power.

Item 16. The method according to item 15, after performing peak clipping processing on said GSM, the method further comprises:

if the power of the combined radio-frequency signal of said GSM and said UMTS exceeds the rated power of the power amplifier, performing wave clipping processing on said UMTS.

Item 17. The method according to item 1, the step of determining whether to perform power sharing among communication systems of different modes sharing a same power amplifier according to a power demand of the communication systems of at least one mode among communication systems of differ-

ent modes, comprises: if a power demand of a communication system having a high priority in the communication systems of different modes sharing the same power amplifier exceeds a preset load threshold, determining to perform power sharing among the communication systems of different modes.

Item 18. The method according to item 17, the step of adjusting the available power of communication systems of one or more modes comprises: reducing the available power of a communication system having a low priority.

Item 19. The method according to item 1, if the communication systems of at least one mode among the communication systems of different modes sharing the same power amplifier also uses other one or more power amplifiers at the same time, said adjusting the available power of communication systems of one or more modes comprises:

adjusting a proportion of the power of the shared power amplifier and the power of the other one or more power amplifiers that is consumed by the communication system which uses the other one or more power amplifiers at the same time, in order to reduce the power of the shared power amplifier that is consumed by the communication system which uses other one or more power amplifiers at the same time.

Item 20. A base station, wherein, communication systems of at least two modes share a same power amplifier in said base station, said base station comprises:

a share determining module configured to, according to a power demand of the communication systems of at least one mode among communication systems of different modes sharing a same power amplifier, determine whether to perform power sharing among communication systems of different modes;
a power adjusting module configured to, when the share determining module determines to perform power sharing among communication systems of different modes, adjust an available power of communication systems of one or more modes.

Item 21. The base station according to item 20, said share determining module comprises:

a power obtaining unit configured to, within a preset period, according to a power demand of a communication system of first mode and an available power of said communication system of the first mode, obtain a sharable remaining power of said communication system of the first mode;
a reception deciding unit configured to, according to a power demand of communication systems of one or more other modes, decide whether to agree to receive the sharable remaining power of the communication system of the first mode; determine to perform power sharing among communication systems of different modes, if the sharable remaining power of said communication system of the first mode satisfies a preset sharing condition and said communication systems of one or more other modes agree to receive the sharable remaining power of said communication system of the first mode.

Item 22. The base station according to item 21, said reception deciding unit decides, according to network load of communication systems of one or more other modes or a remaining time during which said remaining power can be shared, whether to agree to receive the sharable remaining power of the communication system of the first mode.

Item 23. The base station according to item 21, said power adjusting module comprises:

a power operation unit configured to, subtract said sharable remaining power from the total power currently configured for said communication system of the first mode, and use a difference obtained thereby as an available power of said communication system of the first mode;
a power distribution unit configured to, on a basis of the power currently configured for the communication systems of one or more other modes, assign said sharable remaining power to the communication systems of one or more other modes according to a preset rule.

Item 24. The base station according to item 21, said base station further comprises:

a retrieval power determining module configured to, when it is detected that burst traffic arrives at said communication system of the first mode and the available power of said communication system of the first mode does not satisfy the power demand required after said burst traffic arrives, according to the power demand of said communication system of the first mode required after said burst traffic arrives and the available power of said communication system of the first mode, determine a retrieval power, or, when it is predicted that the available power of said communication system of the first mode does not satisfy the power demand of said communication system of the first mode within a next

preset period, according to the power demand within the next preset period and the available power of said communication system of the first mode, determine a retrieval power;
a power updating module configured to, according to said retrieval power determined by the retrieval power determining module, update available power of the communication system of the first mode and the communication systems of one or more other modes.

Item 25. The base station according to item 20, said share determining module comprises:

a power demand obtaining unit configured to, taking a maximum power control period in the communication systems of different modes as a unit, within each minimum power control period in the communication systems of different modes, obtain a sum of power demands of the communication systems of different modes sharing the same power amplifier;
a share determining unit configured to, if the sum of power demands is larger than a rated power of said power amplifier, determine to perform power sharing among the communication systems of different modes.

Item 26. The base station according to item 25, the communication systems of different modes sharing the same power amplifier are global system for mobile communication (GSM) and universal mobile telecommunications system (UMTS), said power adjusting module comprises:

a peak clipping processing unit configured to, if the GSM current power demand exceeds the available power of said GSM while the UMTS current power demand does not exceed the available power of said UMTS, perform peak clipping processing on said GSM, and GSM peak clipping power = GSM current power demand + UMTS current power demand - rated power of the power amplifier; and/or for, if the GSM current power demand exceeds the GSM available power and the UMTS current power demand also exceeds the UMTS available power, perform peak clipping processing on said GSM, and GSM peak clipping power = GSM current power demand - GSM available power;
a wave clipping processing unit configured to, after performing said peak clipping processing by said peak clipping processing unit, if the power of the combined radio-frequency signal of said GSM and said UMTS exceeds the rated power of the power amplifier, perform wave clipping processing on said UMTS.

Item 27. The base station according to item 20, said share determining module comprises:

a threshold deciding unit configured to decide whether a power demand of a communication system having a high priority in the communication systems of different modes sharing the same power amplifier exceeds a preset load threshold;
a threshold determining unit configured to, if the threshold deciding unit decides that a power demand of a communication system having a high priority exceeds a preset load threshold, determine to perform power sharing among the communication systems of different modes.

Item 28. The base station according to item 27, said power adjusting module is configured to reduce the available power of a communication system having a low priority when said threshold determining unit determines to perform power sharing among communication systems of different modes.

Item 29. The base station according to item 20, if the communication systems of at least one mode among the communication systems of different modes sharing the same power amplifier also uses other one or more power amplifiers at the same time, said power adjusting module is also used for adjusting a proportion of the power of the shared power amplifier and the power of the other one or more power amplifiers that is consumed by the communication system which uses other one or more power amplifiers at the same time, in order to reduce the power of the shared power amplifier that is consumed by the communication system which uses other one or more power amplifiers.

[0097] Finally, it should be noted that, the above embodiments are merely for describing the technical solutions of the present disclosure, but are not intended to limit the technical solutions of the present disclosure. Although the present disclosure has been described in detail with reference to the above embodiments, one of ordinary skill in the art should understand that, the technical solutions recited in the above embodiments can be modified, or some of the technical features thereof can be equivalently replaced. These modifications and replacements will not cause the relevant technical solutions to depart from the idea of the technical solutions of the embodiments.

Claims

1. A power sharing method for use in communication systems of at least two different communication modes sharing a same power amplifier, wherein the

method comprises:

determining (101) whether to perform power sharing among the communication systems of the at least two different communication modes, according to a power demand of a communication system of at least one communication mode among the communication systems of the at least two different communication modes sharing a same power amplifier; and
adjusting (102; 204)an available power of communication systems of one or more communication modes in situation of power sharing among the communication systems of the at least two different communication modes to be performed;

characterized in that, the step of determining whether to perform power sharing among the communication systems of the at least two different communication modes sharing a same power amplifier, according to a power demand of the communication system of at least one communication mode among communication systems of the at least two different communication modes, comprises:

obtaining (201) a sharable remaining power of a communication system of a first communication mode, according to a power demand of said communication system of the first communication mode and an available power of said communication system of the first communication mode;
deciding (202)whether to agree to receive the sharable remaining power of the communication system of the first communication mode, according to a power demand of communication systems of one or more other communication modes; and
determining (203) to perform power sharing among the communication systems of the at least two different communication modes, if the sharable remaining power of said communication system of the first communication mode satisfies a preset sharing condition and said communication systems of one or more other communication modes agree to receive the sharable remaining power of said communication system of the first communication mode;
wherein the at least two different communication modes comprise at least two of the following: global system for mobile communications (GSM), universal mobile telecommunications system (UMTS) and long term evolution (LTE).

2. The method according to claim 1, **characterized in that**, the step of deciding whether to agree to receive the sharable remaining power of the communication system of the first communication mode according to a power demand of communication systems of one or more other communication modes, comprises:

deciding whether to agree to receive the sharable remaining power of the communication system of the first communication mode, according to network load of the communication systems of one or more other communication modes or a remaining time during which said remaining power can be shared.

3. The method according to claim 1, **characterized in that**, the step of adjusting the available power of the communication systems of one or more communication modes comprises:

configuring available power for the communication system of the first communication mode and the communication systems of one or more other communication modes according to the sharable remaining power of the communication system of the first communication mode, in order to share the sharable remaining power of the communication system of the first communication mode to the communication systems of one or more other communication modes.

4. The method according to claim 1, **characterized in that**, in situation that the sharable remaining power of the communication system of the first communication mode is larger than or equal to a first threshold, the sharable remaining power of the communication system of the first communication mode satisfies a preset sharing condition; or,
in situation that a difference between the sharable remaining power of the communication system of the first communication mode and the sharable remaining power of the communication systems of one or more other communication modes is larger than or equal to a second threshold, the sharable remaining power of the communication system of the first communication mode satisfies the preset sharing condition.

5. The method according to claim 1, **characterized in that**, if said communication system of the first communication mode is a global system for mobile communications, before obtaining the sharable remaining power of the communication system of the first communication mode, the method further comprises:

in situation that a number of non-primary B carriers in carriers of the global system for mobile communications reaches a predetermined numerical value, the step of obtaining the sharable

remaining power of the communication system of the first communication mode is performed; wherein, said predetermined numerical value is an arbitrary positive integer.

6. The method according to any one of claims 2 to 5, **characterized in that**, the step of configuring available power for the communication system of the first communication mode and the communication systems of one or more other communication modes according to the sharable remaining power of the communication system of the first communication mode comprises:

subtracting said sharable remaining power from a total power currently configured for said communication system of the first communication mode, and using a difference obtained thereby as an available power of said communication system of the first communication mode;
on basis of the power currently configured for the communication systems of one or more other communication modes, assigning said sharable remaining power to the communication systems of one or more other communication modes according to a preset rule.

7. The method according to claim 6, **characterized in that**, the step of assigning said sharable remaining power to the communication systems of one or more other communication modes according to a preset rule comprises:

in situation that there are multiple communication systems of other communication modes, assigning said sharable remaining power to said multiple communication systems of other communication modes in an order of time; or,
according to priorities of said multiple communication systems of other communication modes, assigning said sharable remaining power to said multiple communication systems of other communication modes in an order from a high priority to a lower priority; or,
in situation that there are multiple communication systems of other communication modes, assigning said sharable remaining power to said multiple communication systems of other communication modes evenly.

8. The method according to any one of claims 1 to 5, **characterized in that**, obtaining a sharable remaining power of the communication systems of at least two different communication modes in the following ways:

in situation that a preset period arrives, subtracting the current power demand from the total power currently configured for the communication system of one communication mode, a difference obtained thereby serves as said sharable remaining power; or
in situation that a preset period arrives, subtracting the current power demand and a preserved power from the available power currently configured for the communication system of one communication mode, a difference obtained thereby serves as said sharable remaining power; or
a fixed power value or a fixed proportion of total power the currently configured for the communication system of one communication mode serves as said sharable remaining power.

9. The method according to claim 1, **characterized in that**, said method further comprises: in situation that an absolute value of a difference between the sharable remaining power of said communication system of the first communication mode obtained in situation that a current preset period arrives and the sharable remaining power obtained when a previous preset period arrives is less than or equal to a third threshold, keeping the available power of the communication systems of different communication modes unchanged, otherwise, configuring available power for the communication system of the first communication mode and the communication systems of one or more other communication modes, according to the sharable remaining power of said communication system of the first communication mode.

10. The method according to claim 1, **characterized in that**, said method further comprises:

in situation that the available power of said communication system of the first communication mode does not satisfy a power demand required by said communication system of the first communication mode, determining a retrieval power, according to the power demand of said communication system of the first communication mode;
updating the available power of the communication system of the first communication mode and the communication systems of one or more other communication modes, according to said retrieval power.

11. The method according to claim 1, **characterized in that**, the step of determining whether to perform power sharing among communication systems of different modes sharing a same power amplifier according to a power demand of the communication systems of at least one mode among communication systems of at least two different modes, comprises:

if a power demand of a communication system having a high priority in the communication systems of different modes sharing the same power amplifier exceeds a preset load threshold, determining to perform power sharing among the communication systems of at least two different modes.

12. A base station, wherein, communication systems of at least two different communication modes sharing a same power amplifier in said base station, said base station comprises:

a share determining module (11) configured to, according to a power demand of the communication systems of at least one communication mode among the communication systems of at least two different communication modes sharing a same power amplifier, determine whether to perform power sharing among communication systems of at least two different communication modes;
a power adjusting module (12) configured to, in situation of power sharing among the communication systems of at least two different communication modes to be performed, adjust an available power of communication systems of one or more communication modes;
characterized in that, said share determining module comprises:

a power obtaining unit (1101) configured to, according to a power demand of a communication system of first communication mode and an available power of said communication system of the first communication mode, obtain a sharable remaining power of said communication system of the first communication mode;
a reception deciding unit (1102) configured to, according to a power demand of communication systems of one or more other communication modes, decide whether to agree to receive the sharable remaining power of the communication system of the first communication mode; determine to perform power sharing among communication systems of at least two different communication modes, if the sharable remaining power of said communication system of the first communication mode satisfies a preset sharing condition and said communication systems of one or more other communication modes agree to receive the sharable remaining power of said communication system of the first communication mode;
wherein the at least two different communication modes comprise at least two of the following: global system for mobile communications (GSM), universal mobile telecommunications system (UMTS) and long term evolution (LTE).

13. The base station according to claim 12, **characterized in that**, said reception deciding unit (1102) is configured to decide, according to network load of communication systems of one or more other communication modes or a remaining time during which said remaining power can be shared, whether to agree to receive the sharable remaining power of the communication system of the first communication mode.

14. The base station according to claim 11, **characterized in that**, said power adjusting module comprises:

a power operation unit (1201) configured to, subtract said sharable remaining power from the total power currently configured for said communication system of the first communication mode, and use a difference obtained thereby as an available power of said communication system of the first communication mode;
a power distribution unit (1202) configured to, on a basis of the power currently configured for the communication systems of one or more other communication modes, assign said sharable remaining power to the communication systems of one or more other communication modes according to a preset rule.

15. The base station according to claim 11, **characterized in that**, said base station further comprises:

a retrieval power determining module (13) configured to, in situation that the available power of said communication system of the first communication mode does not satisfy a power demand required by said communication system of the first communication mode, determine a retrieval power according to the power demand of said communication system of the first communication mode;
a power updating module(15) configured to, according to said retrieval power determined by the retrieval power determining module, update available power of the communication system of the first communication mode and the communication systems of one or more other communication modes.

Patentansprüche

1. Verfahren zum gemeinsamen Nutzen von Leistung für die Verwendung in Kommunikationssystemen mit mindestens zwei verschiedenen Kommunikationsbetriebsarten, die denselben Leistungsverstärker gemeinsam nutzen, wobei das Verfahren Folgendes umfasst:

   Bestimmen (101) gemäß einem Leistungsbedarf eines Kommunikationssystems mit mindestens einer Kommunikationsbetriebsart unter den Kommunikationssystemen mit den mindestens zwei verschiedenen Kommunikationsbetriebsarten, die denselben Leistungsverstärker gemeinsam nutzen, ob eine gemeinsame Nutzung von Leistung unter den Kommunikationssystemen mit den mindestens zwei verschiedenen Kommunikationsbetriebsarten auszuführen ist; und
   Anpassen (102; 204) einer verfügbaren Leistung von Kommunikationssystemen mit einer oder mehreren Kommunikationsbetriebsarten in der Situation, in der eine gemeinsame Nutzung von Leistung unter den Kommunikationssystemen mit den mindestens zwei verschiedenen Kommunikationsbetriebsarten auszuführen ist;

   dadurch gekennzeichnet, dass der Schritt des Bestimmens gemäß einem Leistungsbedarf des Kommunikationssystems mit mindestens einer Kommunikationsbetriebsart unter den Kommunikationssystemen mit den mindestens zwei verschiedenen Kommunikationsbetriebsarten, ob eine gemeinsame Nutzung von Leistung unter den Kommunikationssystemen mit den mindestens zwei verschiedenen Kommunikationsbetriebsarten, die denselben Leistungsverstärker gemeinsam nutzen, auszuführen ist, umfasst:

   Erhalten (201) einer gemeinsam nutzbaren Restleistung eines Kommunikationssystems mit einer ersten Kommunikationsbetriebsart gemäß einem Leistungsbedarf des Kommunikationssystems mit der ersten Kommunikationsbetriebsart und einer verfügbaren Leistung des Kommunikationssystems mit der ersten Kommunikationsbetriebsart;
   Entscheiden (202) gemäß einem Leistungsbedarf von Kommunikationssystemen mit einer oder mehreren anderen Kommunikationsbetriebsarten, ob zuzustimmen ist, die gemeinsam nutzbare Restleistung des Kommunikationssystems mit der ersten Kommunikationsbetriebsart zu empfangen; und
   Bestimmen (203), eine gemeinsame Nutzung von Leistung unter den Kommunikationssystemen mit den mindestens zwei verschiedenen Kommunikationsbetriebsarten auszuführen, wenn die gemeinsam nutzbare Restleistung des Kommunikationssystems mit der ersten Kommunikationsbetriebsart eine voreingestellte Bedingung für gemeinsame Nutzung erfüllt und die Kommunikationssysteme mit einer oder mehreren anderen Kommunikationsbetriebsarten zustimmen, die gemeinsam nutzbare Restleistung des Kommunikationssystems mit der ersten Kommunikationsbetriebsart zu empfangen;
   wobei die mindestens zwei verschiedenen Kommunikationsbetriebsarten mindestens zwei der Folgenden umfassen: ein globales System für mobile Kommunikationen (GSM), ein universelles mobiles Telekommunikationssystem (UMTS) und eine Langzeitevolution (LTE).

2. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** der Schritt des Entscheidens gemäß einem Leistungsbedarf von Kommunikationssystemen mit einer oder mehreren anderen Kommunikationsbetriebsarten, ob zuzustimmen ist, die gemeinsam nutzbare Restleistung des Kommunikationssystems mit der ersten Kommunikationsbetriebsart zu empfangen, Folgendes umfasst:

   Entscheiden gemäß einer Netzlast der Kommunikationssysteme mit einer oder mehreren anderen Kommunikationsbetriebsarten oder einer Restzeit, während der die Restleistung gemeinsam genutzt werden kann, ob zuzustimmen ist, die gemeinsam nutzbare Restleistung des Kommunikationssystems mit der ersten Kommunikationsbetriebsart zu empfangen.

3. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** der Schritt des Anpassens der verfügbaren Leistung der Kommunikationssysteme mit einer oder mehreren Kommunikationsbetriebsarten Folgendes umfasst:

   Konfigurieren einer verfügbaren Leistung für das Kommunikationssystem mit der ersten Kommunikationsbetriebsart und der Kommunikationssysteme mit einer oder mehreren anderen Kommunikationsbetriebsarten gemäß der gemeinsam nutzbaren Restleistung des Kommunikationssystems mit der ersten Kommunikationsbetriebsart, um die gemeinsam nutzbare Restleistung des Kommunikationssystems mit der ersten Kommunikationsbetriebsart mit den Kommunikationssystemen mit einer oder mehreren anderen Kommunikationsbetriebsarten gemeinsam zu nutzen.

4. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** in der Situation, in der die gemein-

sam nutzbare Restleistung des Kommunikationssystems mit der ersten Kommunikationsbetriebsart größer als ein erster Schwellenwert oder gleich diesem ist, die gemeinsam nutzbare Restleistung des Kommunikationssystems mit der ersten Kommunikationsbetriebsart eine voreingestellte Bedingung für gemeinsame Nutzung erfüllt; oder
in der Situation, in der ein Unterschied zwischen der gemeinsam nutzbaren Restleistung des Kommunikationssystems mit der ersten Kommunikationsbetriebsart und der gemeinsam nutzbaren Restleistung der Kommunikationssysteme mit einer oder mehreren anderen Kommunikationsbetriebsarten größer als ein zweiter Schwellenwert oder gleich diesem ist, die gemeinsam nutzbare Restleistung des Kommunikationssystems mit der ersten Kommunikationsbetriebsart die voreingestellte Bedingung für gemeinsame Nutzung erfüllt.

5. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** dann, wenn das Kommunikationssystem mit der ersten Kommunikationsbetriebsart ein globales System für mobile Kommunikationen ist, das Verfahren vor dem Erhalten der gemeinsam nutzbaren Restleistung des Kommunikationssystems mit der ersten Kommunikationsbetriebsart ferner Folgendes umfasst:

in der Situation, in der eine Anzahl von nicht primären B-Trägern in Trägern des globalen Systems für mobile Kommunikationen einen vorgegebenen numerischen Wert erreicht, wird der Schritt des Erhaltens der gemeinsam nutzbaren Restleistung des Kommunikationssystems mit der ersten Kommunikationsbetriebsart ausgeführt; wobei der vorgegebene numerische Wert eine beliebige positive ganze Zahl ist.

6. Verfahren nach einem der Ansprüche 2 bis 5, **dadurch gekennzeichnet, dass** der Schritt des Konfigurierens der verfügbaren Leistung für das Kommunikationssystem mit der ersten Kommunikationsbetriebsart und der Kommunikationssysteme mit einer oder mehreren anderen Kommunikationsbetriebsarten gemäß der gemeinsam nutzbaren Restleistung des Kommunikationssystems mit der ersten Kommunikationsbetriebsart Folgendes umfasst:

Subtrahieren der gemeinsam nutzbaren Restleistung von einer Gesamtleistung, die derzeit für das Kommunikationssystem mit der ersten Kommunikationsbetriebsart konfiguriert ist, und Verwenden eines dadurch erhaltenen Unterschieds als eine verfügbare Leistung des Kommunikationssystems mit der ersten Kommunikationsbetriebsart;
anhand der Leistung, die derzeit für die Kommunikationssysteme mit einer oder mehreren anderen Kommunikationsbetriebsarten konfiguriert ist, Zuweisen der gemeinsam nutzbaren Restleistung zu den Kommunikationssystemen mit einer oder mehreren anderen Kommunikationsbetriebsarten gemäß einer voreingestellten Regel.

7. Verfahren nach Anspruch 6, **dadurch gekennzeichnet, dass** der Schritt des Zuweisens der gemeinsam nutzbaren Restleistung zu den Kommunikationssystemen mit einer oder mehreren anderen Kommunikationsbetriebsarten gemäß einer voreingestellten Regel Folgendes umfasst:

in der Situation, in der mehrere Kommunikationssysteme mit anderen Kommunikationsbetriebsarten vorhanden sind, Zuweisen der gemeinsam nutzbaren Restleistung zu den mehreren Kommunikationssystemen mit anderen Kommunikationsbetriebsarten in einer Reihenfolge der Zeit; oder
Zuweisen gemäß Prioritäten der mehreren Kommunikationssysteme mit anderen Kommunikationsbetriebsarten der gemeinsam nutzbaren Restleistung zu den mehreren Kommunikationssystemen mit anderen Kommunikationsbetriebsarten in einer Reihenfolge von einer hohen Priorität zu einer geringen Priorität; oder
in der Situation, in der es mehrere Kommunikationssysteme mit anderen Kommunikationsbetriebsarten gibt, gleichmäßiges Zuweisen der gemeinsam nutzbaren Restleistung zu den mehreren Kommunikationssystemen mit anderen Kommunikationsbetriebsarten.

8. Verfahren nach einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet, dass** eine gemeinsam nutzbare Restleistung der Kommunikationssysteme mit mindestens zwei verschiedenen Kommunikationsbetriebsarten in den folgenden Weisen erhalten wird:

in der Situation, in der eine voreingestellte Periode eintrifft, Subtrahieren des aktuellen Leistungsbedarfs von der Gesamtleistung, die derzeit für das Kommunikationssystem mit einer Kommunikationsbetriebsart konfiguriert ist, wobei ein Unterschied, der dadurch erhalten wird, als die gemeinsam nutzbare Restleistung dient; oder
in der Situation, in der eine voreingestellte Periode eintrifft, Subtrahieren des aktuellen Leistungsbedarfs und einer bewahrten Leistung von der verfügbaren Leistung, die derzeit für das Kommunikationssystem einer Kommunikationsbetriebsart konfiguriert ist, wobei ein dadurch erhaltener Unterschied als die gemeinsam nutzbare Restleistung dient; oder

ein fester Leistungswert oder ein fester Anteil einer Gesamtleistung, die derzeit für das Kommunikationssystem einer Kommunikationsbetriebsart konfiguriert ist, dient als die gemeinsam nutzbare Restleistung.

9. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** das Verfahren ferner Folgendes umfasst: in einer Situation, in der ein absoluter Wert eines Unterschieds zwischen der gemeinsam nutzbaren Restleistung des Kommunikationssystems mit der ersten Kommunikationsbetriebsart, der in der Situation erhalten wird, in der eine aktuelle voreingestellte Periode eintrifft und die gemeinsam nutzbare Restleistung, die erhalten wird, wenn eine vorherige voreingestellte Periode eintrifft, kleiner als ein dritter Schwellenwert oder gleich diesem ist, Halten der verfügbaren Leistung der Kommunikationssysteme verschiedener Kommunikationsbetriebsarten unverändert, anderenfalls Konfigurieren der verfügbaren Leistung für das Kommunikationssystem mit der ersten Kommunikationsbetriebsart und der Kommunikationssysteme mit einer oder mehreren anderen Kommunikationsbetriebsarten gemäß der gemeinsam nutzbaren Restleistung des Kommunikationssystems mit der ersten Kommunikationsbetriebsart.

10. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** das Verfahren ferner Folgendes umfasst:

in der Situation, in der die verfügbare Leistung des Kommunikationssystems mit der ersten Kommunikationsbetriebsart einen Leistungsbedarf, der durch das Kommunikationssystem mit der ersten Kommunikationsbetriebsart benötigt wird, nicht erfüllt, Bestimmen einer Rückgewinnungsleistung gemäß dem Leistungsbedarf des Kommunikationssystems mit der ersten Kommunikationsbetriebsart;
Aktualisieren der verfügbaren Leistung des Kommunikationssystems mit der ersten Kommunikationsbetriebsart und der Kommunikationssysteme mit einer oder mehreren anderen Kommunikationsbetriebsarten gemäß der Rückgewinnungsleistung.

11. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** der Schritt des Bestimmens gemäß einem Leistungsbedarf der Kommunikationssysteme mindestens einer Betriebsart unter Kommunikationssystemen mit mindestens zwei verschiedenen Betriebsarten, ob eine gemeinsame Nutzung von Leistung unter Kommunikationssystemen mit verschiedenen Betriebsarten, die denselben Leistungsverstärker gemeinsam nutzen, auszuführen ist, Folgendes umfasst:

dann, wenn ein Leistungsbedarf eines Kommunikationssystems mit einer hohen Priorität unter den Kommunikationssystemen mit verschiedenen Betriebsarten, die denselben Leistungsverstärker gemeinsam nutzen, einen voreingestellten Lastschwellenwert überschreitet, Bestimmen, dass eine gemeinsame Nutzung von Leistung unter den Kommunikationssystemen mit mindestens zwei verschiedenen Betriebsarten auszuführen ist.

12. Basisstation, wobei Kommunikationssysteme mit mindestens zwei verschiedenen Kommunikationsbetriebsarten denselben Leistungsverstärker in der Basisstation gemeinsam nutzen, wobei die Basisstation Folgendes umfasst:

ein Modul (11) zum Bestimmen der gemeinsamen Nutzung, das konfiguriert ist, gemäß einem Leistungsbedarf der Kommunikationssysteme mit mindestens einer Kommunikationsbetriebsart unter den Kommunikationssystemen mit mindestens zwei verschiedenen Kommunikationsbetriebsarten, die denselben Leistungsverstärker gemeinsam nutzen, zu bestimmen, ob eine gemeinsame Nutzung von Leistung unter Kommunikationssystemen mit mindestens zwei verschiedenen Kommunikationsbetriebsarten auszuführen ist;
ein Leistungsanpassungsmodul (12), das konfiguriert ist, in der Situation, in der eine gemeinsame Nutzung von Leistung unter den Kommunikationssystemen mit mindestens zwei verschiedenen Kommunikationsbetriebsraten auszuführen ist, eine verfügbare Leistung von Kommunikationssystemen mit einer oder mehreren Kommunikationsbetriebsarten anzupassen;
dadurch gekennzeichnet, dass das Modul zum Bestimmen der gemeinsamen Nutzung Folgendes umfasst:

eine Leistungserhaltungseinheit (1101), die konfiguriert ist, gemäß einem Leistungsbedarf eines Kommunikationssystems mit einer ersten Kommunikationsbetriebsart und einer verfügbaren Leistung des Kommunikationssystems mit der ersten Kommunikationsbetriebsart eine gemeinsam nutzbare Restleistung des Kommunikationssystems mit der ersten Kommunikationsbetriebsart zu erhalten;
eine Empfangsentscheidungseinheit (1102), die konfiguriert ist, gemäß einem Leistungsbedarf von Kommunikationssystemen mit einer oder mehreren anderen Kommunikationsbetriebsarten zu entscheiden, ob zuzustimmen ist, die gemeinsam nutzbare Restleistung des Kommunikati-

onssystems mit der ersten Kommunikationsbetriebsart zu empfangen; zu bestimmen, eine gemeinsame Nutzung von Leistung unter Kommunikationssystemen mit mindestens zwei verschiedenen Kommunikationsbetriebsarten auszuführen, wenn die gemeinsam nutzbare Restleistung des Kommunikationssystems mit der ersten Kommunikationsbetriebsart eine voreingestellte Bedingung für gemeinsame Nutzung erfüllt und die Kommunikationssysteme mit einer oder mehreren anderen Kommunikationsbetriebsarten zustimmen, die gemeinsam nutzbare Restleistung des Kommunikationssystems mit der ersten Kommunikationsbetriebsart zu empfangen;
wobei die mindestens zwei verschiedenen Kommunikationsbetriebsarten mindestens zwei der Folgenden umfassen: ein globales System für mobile Kommunikationen (GSM), ein universelles mobiles Telekommunikationssystem (UMTS) und eine Langzeitevolution (LTE).

13. Basisstation nach Anspruch 12, **dadurch gekennzeichnet, dass** die Empfangsentscheidungseinheit (1102) konfiguriert ist, gemäß einer Netzlast von Kommunikationssystemen mit einer oder mehreren anderen Kommunikationsbetriebsarten oder einer Restzeit, während der die Restleistung gemeinsam genutzt werden kann, zu entscheiden, ob zuzustimmen ist, die gemeinsam nutzbare Restleistung des Kommunikationssystems mit der ersten Kommunikationsbetriebsart zu empfangen.

14. Basisstation nach Anspruch 11, **dadurch gekennzeichnet, dass** das Leistungsanpassungsmodul Folgendes umfasst:

eine Leistungsbetriebseinheit (1201), die konfiguriert ist, die gemeinsam nutzbare Restleistung von der Gesamtleistung, die derzeit für das Kommunikationssystem mit der ersten Kommunikationsbetriebsart konfiguriert ist, zu subtrahieren und einen dadurch erhaltenen Unterschied als eine verfügbare Leistung des Kommunikationssystems mit der ersten Kommunikationsbetriebsart zu verwenden;
eine Leistungsverteilungseinheit (1202), die konfiguriert ist, anhand der Leistung, die derzeit für die Kommunikationssysteme mit einer oder mehreren anderen Kommunikationsbetriebsarten konfiguriert ist, die gemeinsam nutzbare Restleistung zu den Kommunikationssystemen mit einer oder mehreren anderen Kommunikationsbetriebsarten gemäß einer voreingestellten Regel zuzuweisen.

15. Basisstation nach Anspruch 11, **dadurch gekennzeichnet, dass** die Basisstation ferner Folgendes umfasst:

ein Rückgewinnungsleistungsbestimmungsmodul (13) das konfiguriert ist, in der Situation, in der die verfügbare Leistung des Kommunikationssystems mit der ersten Kommunikationsbetriebsart einen Leistungsbedarf, der durch das Kommunikationssystem der ersten Kommunikationsbetriebsart benötigt wird, nicht erfüllt, eine Rückgewinnungsleistung gemäß dem Leistungsbedarf des Kommunikationssystems mit der ersten Kommunikationsbetriebsart zu bestimmen;
ein Leistungsaktualisierungsmodul (15), das konfiguriert ist, gemäß der durch das Rückgewinnungsleistungsbestimmungsmodul bestimmten Rückgewinnungsleistung die verfügbare Leistung des Kommunikationssystems mit der ersten Kommunikationsbetriebsart und der Kommunikationssysteme mit einer oder mehreren anderen Kommunikationsbetriebsarten zu aktualisieren.

Revendications

1. Procédé de partage de puissance destiné à être utilisé dans des systèmes de communication d'au moins deux différents modes de communication partageant un même amplificateur de puissance, dans lequel le procédé comprend les étapes suivantes :

déterminer (101) s'il faut exécuter un partage de puissance parmi les systèmes de communication desdits deux différents modes de communication, selon une demande de puissance d'un système de communication d'au moins un mode de communication parmi les systèmes de communication desdits deux différents modes de communication partageant un même amplificateur de puissance ; et
ajuster (102 ; 204) une puissance disponible de systèmes de communication d'un ou plusieurs modes de communication dans une situation de partage de puissance parmi les systèmes de communication desdits deux différents modes de communication devant être exécutés ;
caractérisé en ce que l'étape consistant à déterminer s'il faut exécuter un partage de puissance parmi les systèmes de communication desdits deux différents modes de communication partageant un même amplificateur de puissance, selon une demande de puissance du système de communication d'au moins un mode de communication parmi des systèmes de communication desdits deux différents modes de

communication, comprend :

obtenir (201) une puissance restante partageable d'un système de communication d'un premier mode de communication selon une demande de puissance dudit système de communication du premier mode de communication et une puissance disponible dudit système de communication du premier mode de communication ;
décider (202) s'il faut accepter de recevoir la puissance restante partageable du système de communication du premier mode de communication, selon une demande de puissance de systèmes de communication d'un ou plusieurs autres modes de communication ; et
déterminer (203) d'exécuter un partage de puissance parmi les systèmes de communication desdits deux différents modes de communication, si la puissance restante partageable dudit système de communication du premier mode de communication satisfait une condition de partage prédéfinie et si lesdits systèmes de communication d'un ou plusieurs autres modes de communication acceptent de recevoir la puissance restante partageable dudit système de communication du premier mode de communication ;
lesdits deux différents modes de communication comportant au moins deux des éléments suivants : système mondial de communication avec les mobiles (GSM), système universel de télécommunication avec les mobiles (UMTS) et technologie d'évolution à long terme (LTE).

2. Procédé selon la revendication 1, **caractérisé en ce que** l'étape consistant à décider s'il faut accepter de recevoir la puissance restante partageable du système de communication du premier mode de communication, selon une demande de puissance de systèmes de communication d'un ou plusieurs autres modes de communication, comprend :

décider s'il faut accepter de recevoir la puissance restante partageable du système de communication du premier mode de communication, selon une charge réseau des systèmes de communication d'un ou plusieurs autres modes de communication ou un temps restant durant lequel ladite puissance restante peut être partagée.

3. Procédé selon la revendication 1, **caractérisé en ce que** l'étape consistant à ajuster la puissance disponible des systèmes de communication d'un ou plusieurs modes de communication comprend :

configurer une puissance disponible pour le système de communication du premier mode de communication et les systèmes de communication d'un ou plusieurs autres modes de communication selon la puissance restante partageable du système de communication du premier mode de communication, afin de partager la puissance restante partageable du système de communication du premier mode de communication avec les systèmes de communication d'un ou plusieurs autres modes de communication.

4. Procédé selon la revendication 1, **caractérisé en ce que**, dans une situation où la puissance restante partageable du système de communication du premier mode de communication est supérieure ou égale à un premier seuil, la puissance restante partageable du système de communication du premier mode de communication satisfait une condition de partage prédéfinie ; ou,
dans une situation où une différence entre la puissance restante partageable du système de communication du premier mode de communication et la puissance restante partageable des systèmes de communication d'un ou plusieurs autres modes de communication est supérieure ou égale à un deuxième seuil, la puissance restante partageable du système de communication du premier mode de communication satisfait la condition de partage prédéfinie.

5. Procédé selon la revendication 1, **caractérisé en ce que**, si ledit système de communication du premier mode de communication est un système mondial de communication avec les mobiles, avant d'obtenir la puissance restante partageable du système de communication du premier mode de communication, le procédé comprend en outre :

dans une situation où un certain nombre de porteuses B non primaires dans des porteuses du système mondial de communication avec les mobiles atteint une valeur numérique prédéterminée, l'étape consistant à obtenir la puissance restante partageable du système de communication du premier mode de communication est exécutée ; ladite valeur numérique prédéterminée étant un nombre entier positif arbitraire.

6. Procédé selon l'une quelconque des revendications 2 à 5, **caractérisé en ce que** l'étape consistant à configurer une puissance disponible pour le système de communication du premier mode de communication et les systèmes de communication d'un ou plusieurs autres modes de communication selon la

puissance restante partageable du système de communication du premier mode de communication comprend :

soustraire ladite puissance restante partageable à partir d'une puissance totale couramment configurée pour ledit système de communication du premier mode de communication, et utiliser une différence ainsi obtenue comme une puissance disponible dudit système de communication du premier mode de communication ;
sur la base de la puissance couramment configurée pour les systèmes de communication d'un ou plusieurs autres modes de communication, affecter ladite puissance restante partageable aux systèmes de communication d'un ou plusieurs autres modes de communication selon une règle prédéfinie

7. Procédé selon la revendication 6, **caractérisé en ce que** l'étape consistant à affecter ladite puissance restante partageable aux systèmes de communication d'un ou plusieurs autres modes de communication selon une règle prédéfinie comprend :

dans une situation où il existe plusieurs systèmes de communication d'autres modes de communication, affecter ladite puissance restante partageable auxdits multiples systèmes de communication d'autres modes de communication dans un ordre temporel ; ou,
selon des priorités desdits multiples systèmes de communication d'autres modes de communication, affecter ladite puissance restante partageable auxdits multiples systèmes de communication d'autres modes de communication dans un ordre allant d'une priorité élevée à une priorité plus faible ; ou,
dans une situation où il existe plusieurs systèmes de communication d'autres modes de communication, affecter ladite puissance restante partageable auxdits multiples systèmes de communication d'autres modes de communication de façon égale.

8. Procédé selon l'une quelconque des revendications 1 à 5, **caractérisé par** obtenir une puissance restante partageable des systèmes de communication d'au moins deux différents modes de communication de la façon suivante :

dans une situation où une période prédéfinie arrive, soustraire la demande de puissance courante à partir de la puissance totale couramment configurée pour le système de communication d'un mode de communication, une différence ainsi obtenue servant comme ladite puissance restante partageable ; ou
dans une situation où une période prédéfinie arrive, soustraire la demande de puissance courante et une puissance préservée à partir de la puissance disponible couramment configurée pour le système de communication d'un mode de communication, une différence ainsi obtenue servant comme ladite puissance restante partageable ; ou
une valeur de puissance fixe ou une proportion fixe de la puissance totale couramment configurée pour le système de communication d'un mode de communication sert comme ladite puissance restante partageable.

9. Procédé selon la revendication 1, **caractérisé en ce que** ledit procédé comprend en outre : dans une situation où une valeur absolue d'une différence entre la puissance restante partageable dudit système de communication du premier mode de communication obtenue dans une situation où une période prédéfinie courante arrive et la puissance restante partageable obtenue lorsqu'une période prédéfinie précédente arrive est inférieure ou égale à un troisième seuil, laisser la puissance disponible des systèmes de communication de différents modes de communication inchangée ; dans le cas contraire, configurer une puissance disponible pour le système de communication du premier mode de communication et les systèmes de communication d'un ou plusieurs autres modes de communication, selon la puissance restante partageable dudit système de communication du premier mode de communication.

10. Procédé selon la revendication 1, **caractérisé en ce que** ledit procédé comprend en outre :

dans une situation où la puissance disponible dudit système de communication du premier mode de communication ne satisfait pas une demande de puissance requise par ledit système de communication du premier mode de communication, déterminer une puissance de récupération, selon la demande de puissance dudit système de communication du premier mode de communication ;
mettre à jour la puissance disponible du système de communication du premier mode de communication et des systèmes de communication d'un ou plusieurs autres modes de communication, selon ladite puissance de récupération.

11. Procédé selon la revendication 1, **caractérisé en ce que** l'étape consistant à déterminer s'il faut exécuter un partage de puissance parmi des systèmes de communication de différents modes partageant un même amplificateur de puissance, selon une demande de puissance des systèmes de communication d'au moins un mode parmi des systèmes de

communication d'au moins deux différents modes, comprend :

si une demande de puissance d'un système de communication ayant une priorité élevée dans les systèmes de communication de différents modes partageant le même amplificateur de puissance excède un seuil de charge prédéfini, déterminer d'exécuter un partage de puissance parmi les systèmes de communication d'au moins deux modes différents.

12. Station de base, dans laquelle des systèmes de communication d'au moins deux différents modes de communication partageant un même amplificateur de puissance dans ladite station de base, ladite station de base comprend :

un module de détermination de partage (11) configuré pour déterminer, selon une demande de puissance des systèmes de communication d'au moins un mode de communication parmi les systèmes de communication d'au moins deux différents modes de communication partageant un même amplificateur de puissance, s'il faut exécuter un partage de puissance parmi des systèmes de communication d'au moins deux différents modes de communication ;
un module d'ajustement de puissance (12) configuré pour, dans une situation de partage de puissance parmi les systèmes de communication d'au moins deux différents modes de communication devant être exécutés, ajuster une puissance disponible de systèmes de communication d'un ou plusieurs modes de communication ;
caractérisé en ce que ledit module de détermination de partage comprend :

une unité d'obtention de puissance (1101) configurée pour obtenir, selon une demande de puissance d'un système de communication d'un premier mode de communication et une puissance disponible dudit système de communication du premier mode de communication, une puissance restante partageable dudit système de communication du premier mode de communication ;
une unité de décision de réception (1102) configurée pour décider, selon une demande de puissance de systèmes de communication d'un ou plusieurs autres modes de communication, s'il faut accepter de recevoir la puissance restante partageable du système de communication du premier mode de communication ;
déterminer d'exécuter un partage de puissance parmi des systèmes de communication d'au moins deux différents modes de communication, si la puissance restante partageable dudit système de communication du premier mode de communication satisfait une condition de partage prédéfinie et si lesdits systèmes de communication d'un ou plusieurs autres modes de communication acceptent de recevoir la puissance restante partageable dudit système de communication du premier mode de communication ;
lesdits deux différents modes de communication comportant au moins deux des éléments suivants : système mondial de communication avec les mobiles (GSM), système universel de télécommunication avec les mobiles (UMTS) et technologie d'évolution à long terme (LTE).

13. Station de base selon la revendication 12, **caractérisée en ce que** ladite unité de décision de réception (1102) est configurée pour décider, selon une charge réseau de systèmes de communication d'un ou plusieurs autres modes de communication ou un temps restant durant lequel ladite puissance restante peut être partagée, s'il faut accepter de recevoir la puissance restante partageable du système de communication du premier mode de communication.

14. Station de base selon la revendication 11, **caractérisée en ce que** ledit module d'ajustement de puissance comprend :

une unité d'opération de puissance (1201) configurée pour soustraire ladite puissance restante partageable à partir de la puissance totale couramment configurée pour ledit système de communication du premier mode de communication, et utiliser une différence ainsi obtenue comme une puissance disponible dudit système de communication du premier mode de communication ;
une unité de distribution de puissance (1202) configurée pour affecter, sur une base de la puissance couramment configurée pour les systèmes de communication d'un ou plusieurs autres modes de communication, ladite puissance restante partageable aux systèmes de communication d'un ou plusieurs autres modes de communication selon une règle prédéfinie.

15. Station de base selon la revendication 11, **caractérisée en ce que** ladite station de base comprend en outre :

un module de détermination de puissance de récupération (13) configuré pour déterminer, dans une situation où la puissance disponible

dudit système de communication du premier mode de communication ne satisfait pas une demande de puissance requise par ledit système de communication du premier mode de communication, une puissance de récupération selon la demande de puissance dudit système de communication du premier mode de communication ;

un module de mise à jour de puissance (15) configuré pour mettre à jour, selon ladite puissance de récupération déterminée par le module de détermination de puissance de récupération, une puissance disponible du système de communication du premier mode de communication et des systèmes de communication d'un ou plusieurs autres modes de communication.

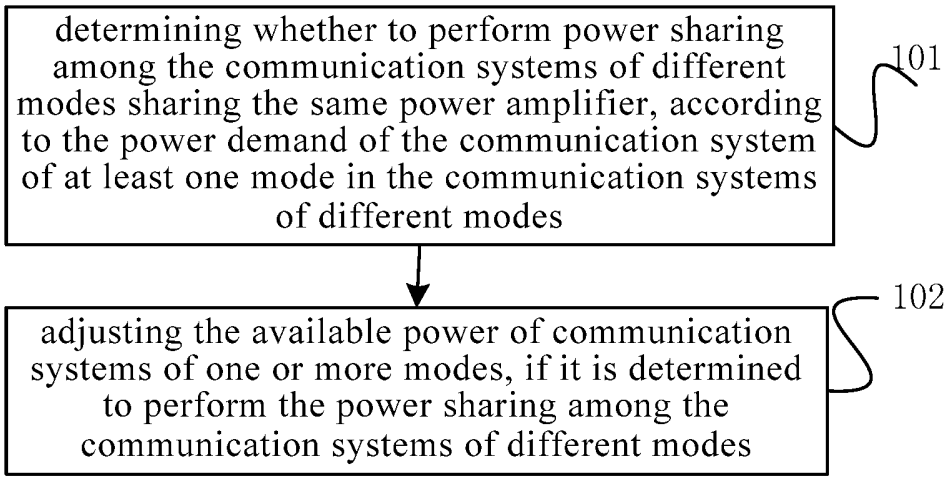
determining whether to perform power sharing among the communication systems of different modes sharing the same power amplifier, according to the power demand of the communication system of at least one mode in the communication systems of different modes
101
adjusting the available power of communication systems of one or more modes, if it is determined to perform the power sharing among the communication systems of different modes
102

Fig.1

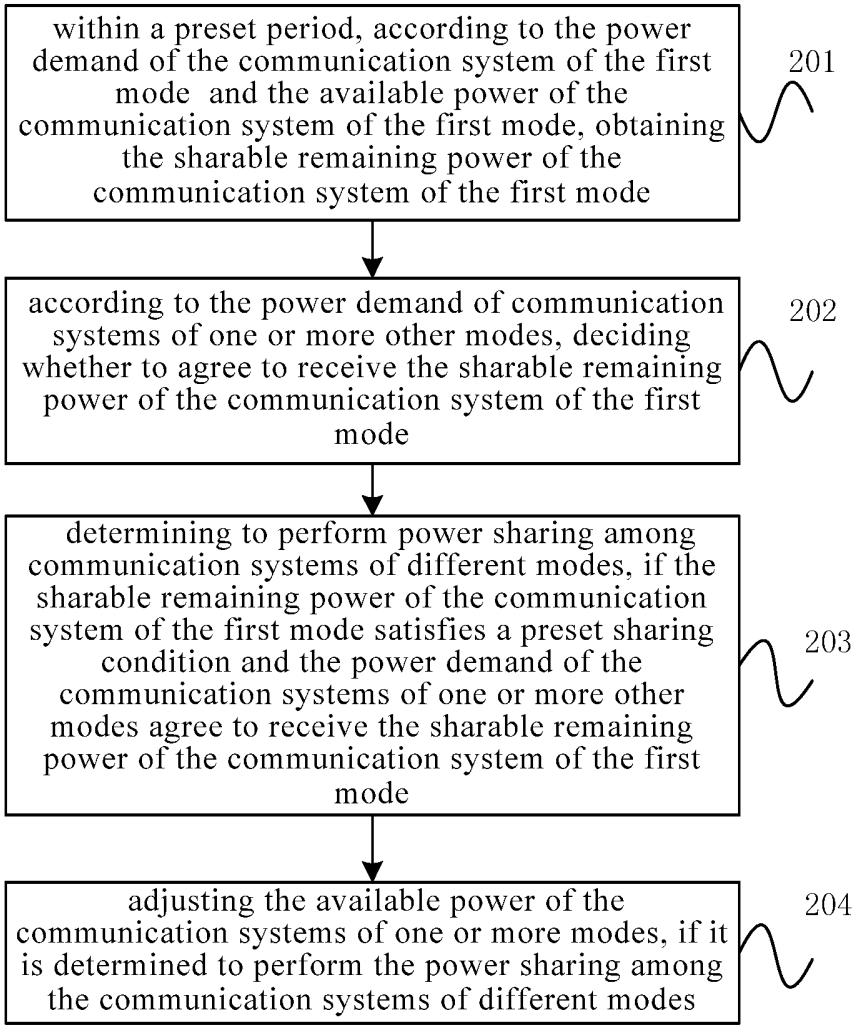
within a preset period, according to the power demand of the communication system of the first mode and the available power of the communication system of the first mode, obtaining the sharable remaining power of the communication system of the first mode
201
according to the power demand of communication systems of one or more other modes, deciding whether to agree to receive the sharable remaining power of the communication system of the first mode
202
determining to perform power sharing among communication systems of different modes, if the sharable remaining power of the communication system of the first mode satisfies a preset sharing condition and the power demand of the communication systems of one or more other modes agree to receive the sharable remaining power of the communication system of the first mode
203
adjusting the available power of the communication systems of one or more modes, if it is determined to perform the power sharing among the communication systems of different modes
204

Fig.2

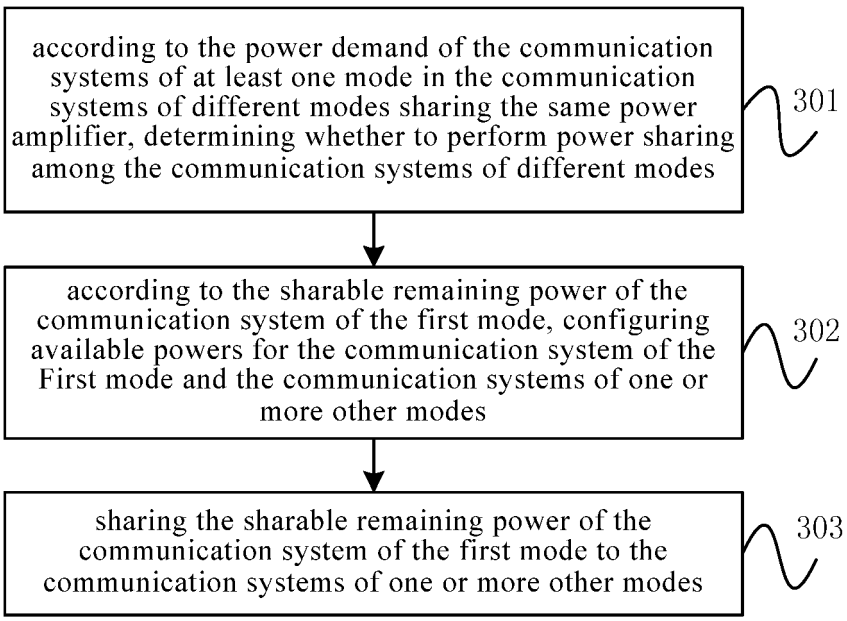
according to the power demand of the communication systems of at least one mode in the communication systems of different modes sharing the same power amplifier, determining whether to perform power sharing among the communication systems of different modes
301
according to the sharable remaining power of the communication system of the first mode, configuring available powers for the communication system of the First mode and the communication systems of one or more other modes
302
sharing the sharable remaining power of the communication system of the first mode to the communication systems of one or more other modes
303

Fig.3

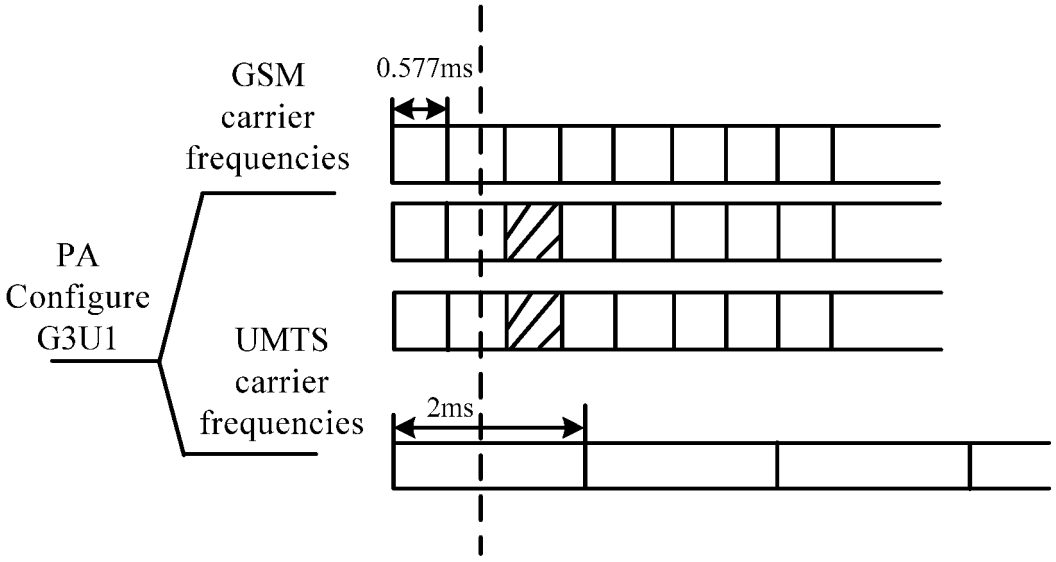
GSM carrier frequencies
0.577ms
PA Configure G3U1
UMTS carrier frequencies
2ms

Fig.4

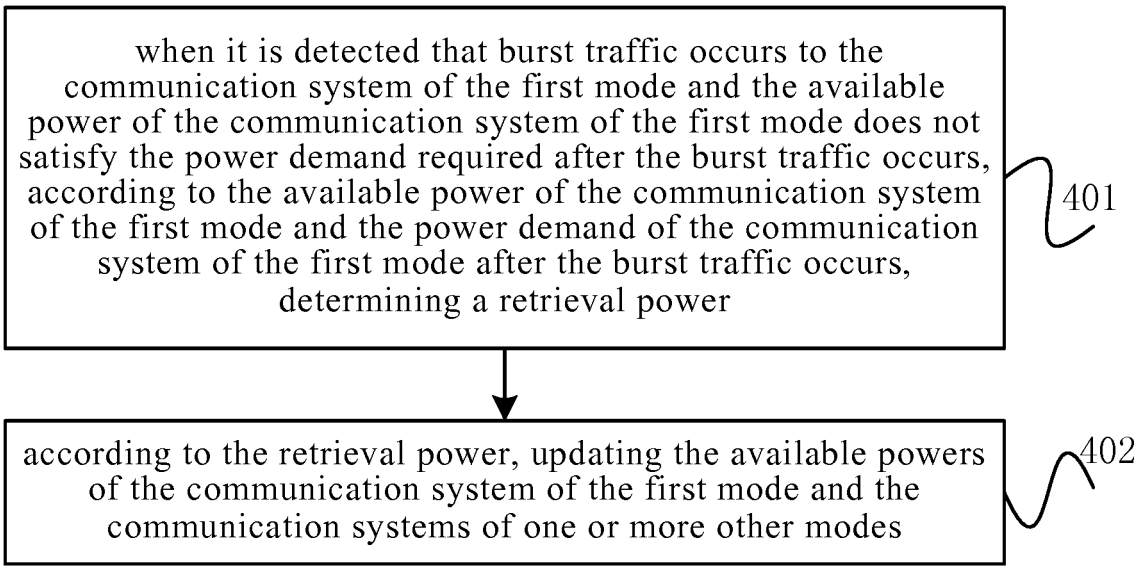
when it is detected that burst traffic occurs to the communication system of the first mode and the available power of the communication system of the first mode does not satisfy the power demand required after the burst traffic occurs, according to the available power of the communication system of the first mode and the power demand of the communication system of the first mode after the burst traffic occurs, determining a retrieval power
401
according to the retrieval power, updating the available powers of the communication system of the first mode and the communication systems of one or more other modes
402

Fig.5

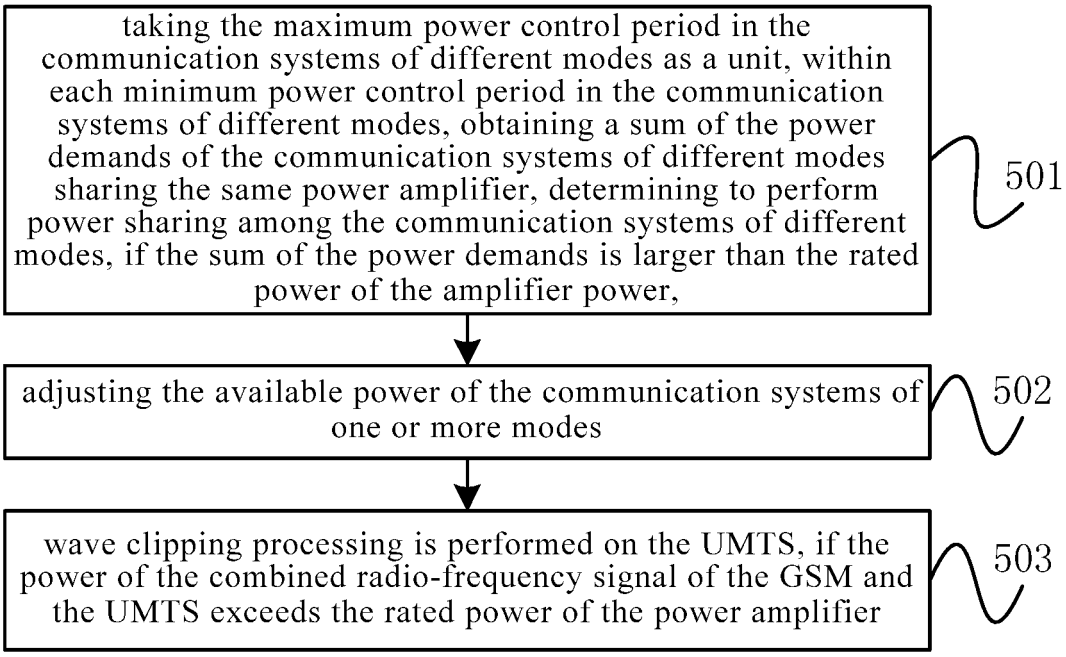
taking the maximum power control period in the communication systems of different modes as a unit, within each minimum power control period in the communication systems of different modes, obtaining a sum of the power demands of the communication systems of different modes sharing the same power amplifier, determining to perform power sharing among the communication systems of different modes, if the sum of the power demands is larger than the rated power of the amplifier power,
501
adjusting the available power of the communication systems of one or more modes
502
wave clipping processing is performed on the UMTS, if the power of the combined radio-frequency signal of the GSM and the UMTS exceeds the rated power of the power amplifier
503

Fig.6

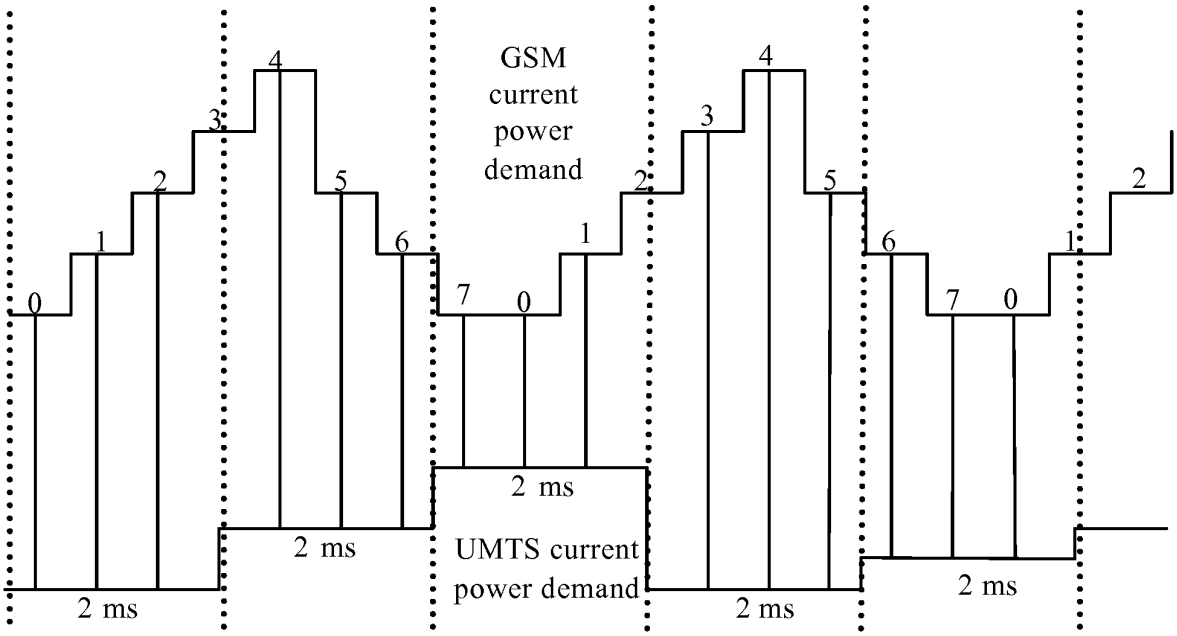

Fig.7

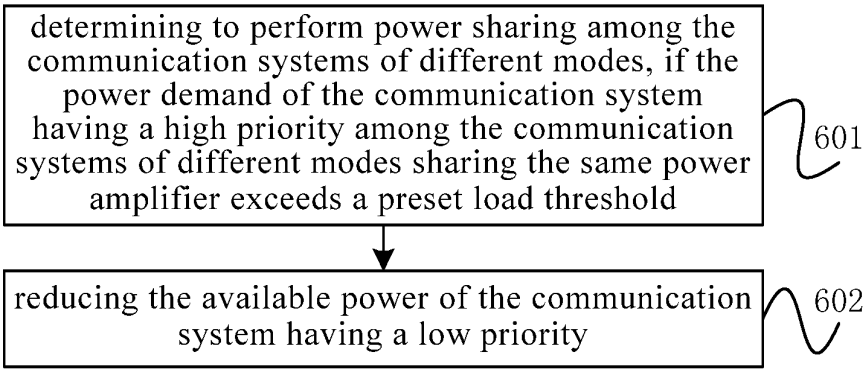

Fig.8

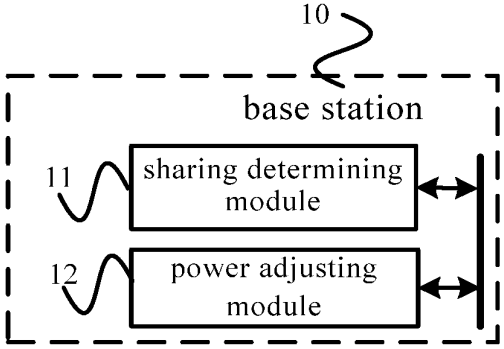

Fig.9

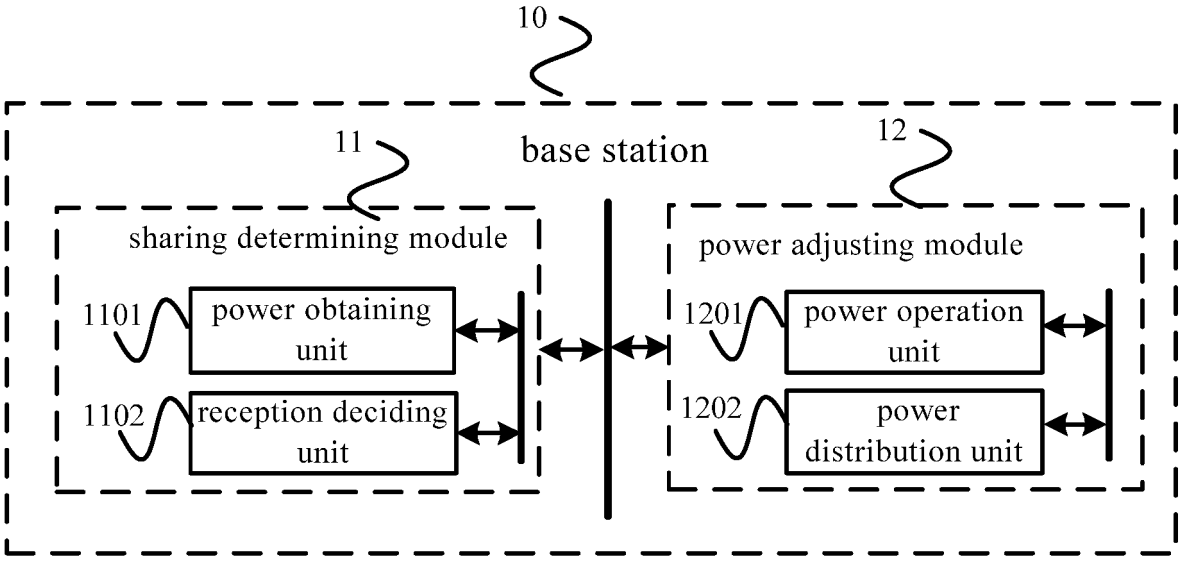
10
base station
11
sharing determining module
1101
power obtaining unit
1102
reception deciding unit
12
power adjusting module
1201
power operation unit
1202
power distribution unit

Fig.10

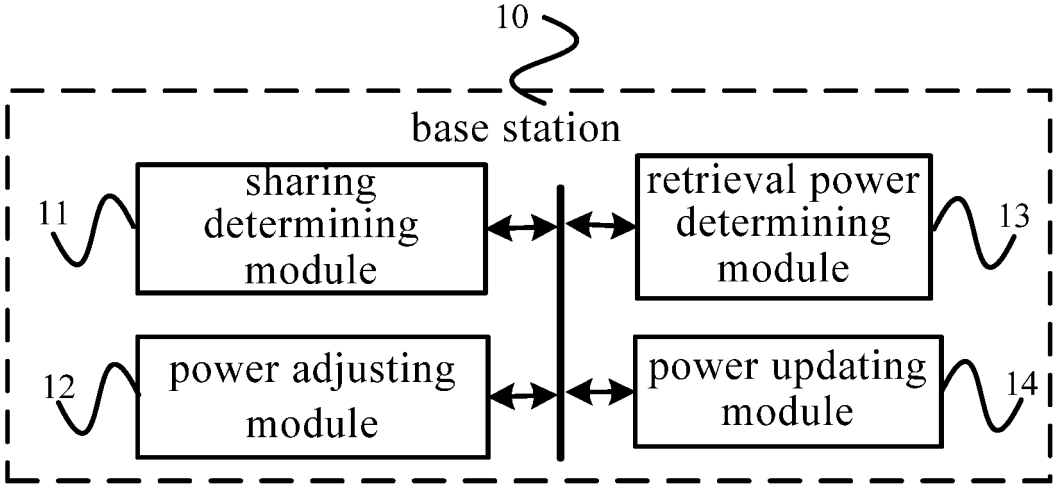
10
base station
11
sharing determining module
retrieval power determining module
13
12
power adjusting module
power updating module
14

Fig.11

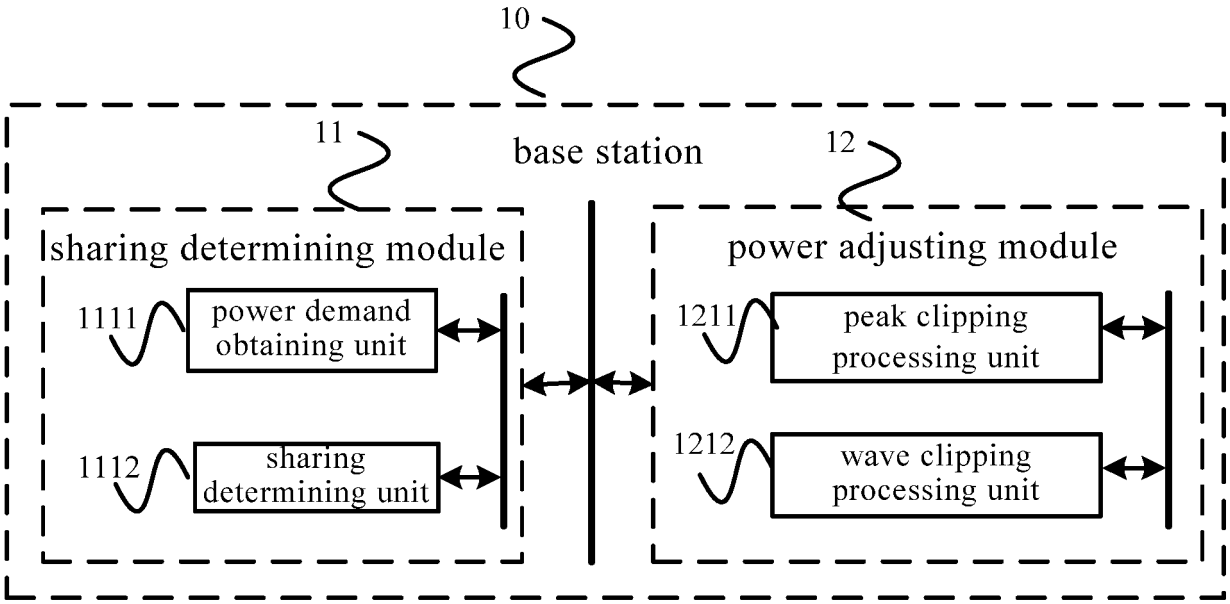
10
11
base station
12
sharing determining module
power adjusting module
1111
power demand obtaining unit
1112
sharing determining unit
1211
peak clipping processing unit
1212
wave clipping processing unit

Fig.12

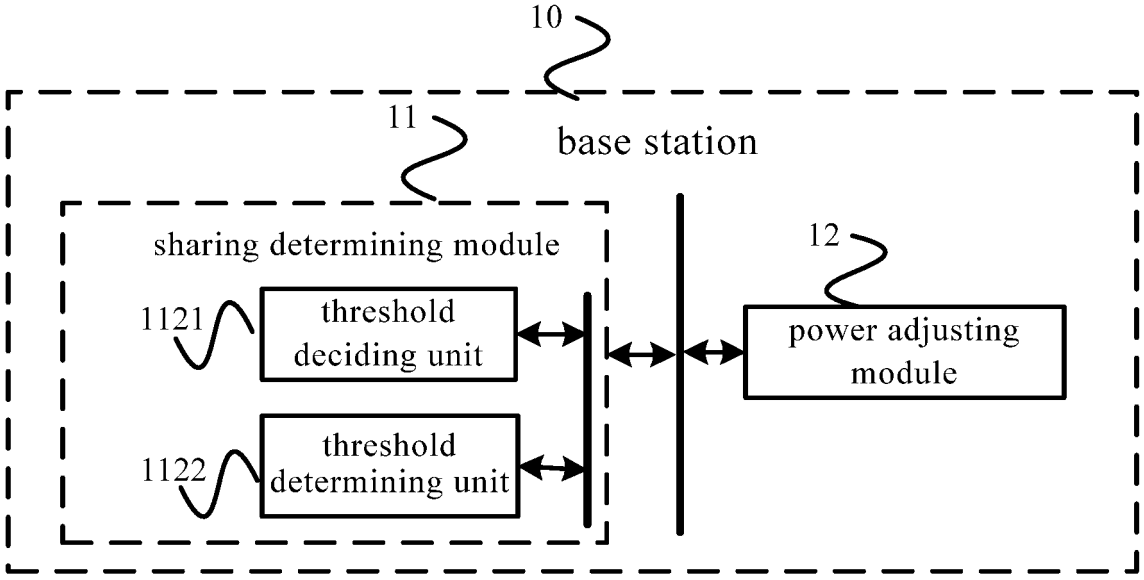
10
11
base station
sharing determining module
12
1121
threshold deciding unit
1122
threshold determining unit
power adjusting module

Fig.13

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 2075923 A1 **[0004]**