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(54) METHOD FOR SENDING, TRANSMITTING AND SCHEDULING SYSTEM MESSAGE IN LONG TERM EVOLUTION SYSTEM

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(57) **ABSTRACT**

A method for sending, transmitting and scheduling a system message in a long term evolution system is disclosed, said sending method includes the following steps: when a base station sends the system message, it takes a radio frame with which system frame number is SFN-M as a radio frame in which a master system information block (MIB) is sent for the first time in the repeat cycle of the master system information block, and sends a scheduling information unit SU-**1** in a fixed sub-frame of the radio frame with which system frame number is SFN-S**1**; wherein, the SFN-M is divisible by 4 and the SFN-S**1** is divisible by **8**. According to the technical scheme of the present invention, by fixing the relative scheduling relationship between the SU-**1** and the MIB, the scheduling information bit related to the SU-**1** can be omitted in the MIB, thus under the same sending condition, the coverage of the MIB can be increased and the reliability that the user equipment receives the MIB can be improved.

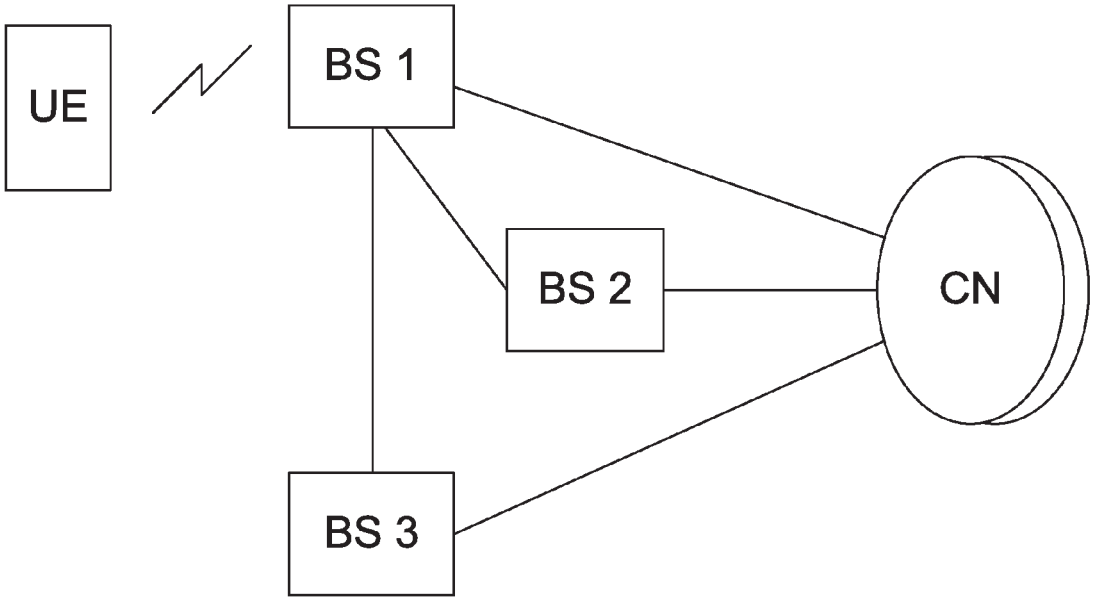


Fig. 1

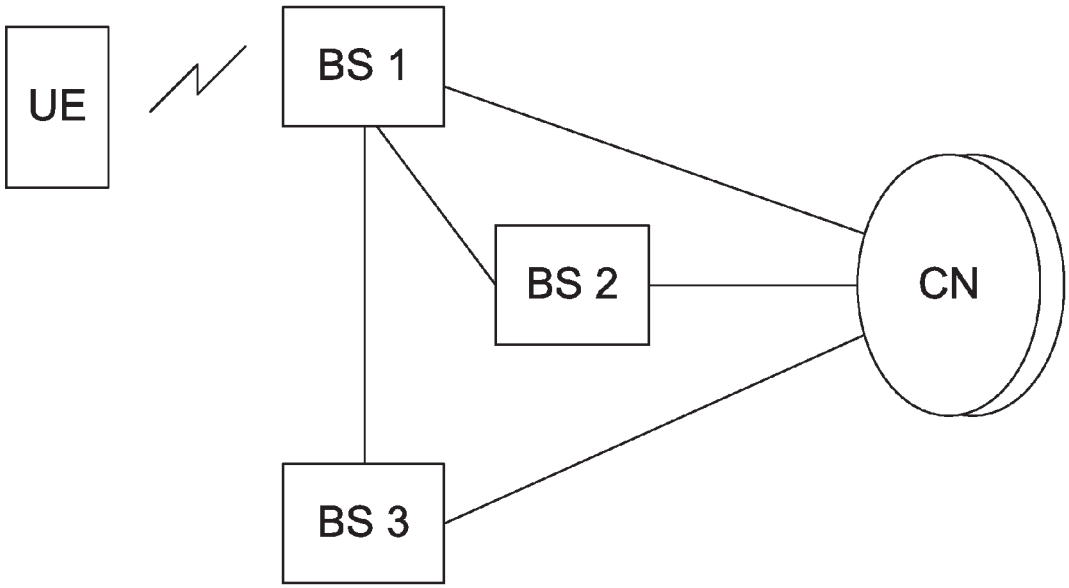


Fig. 2

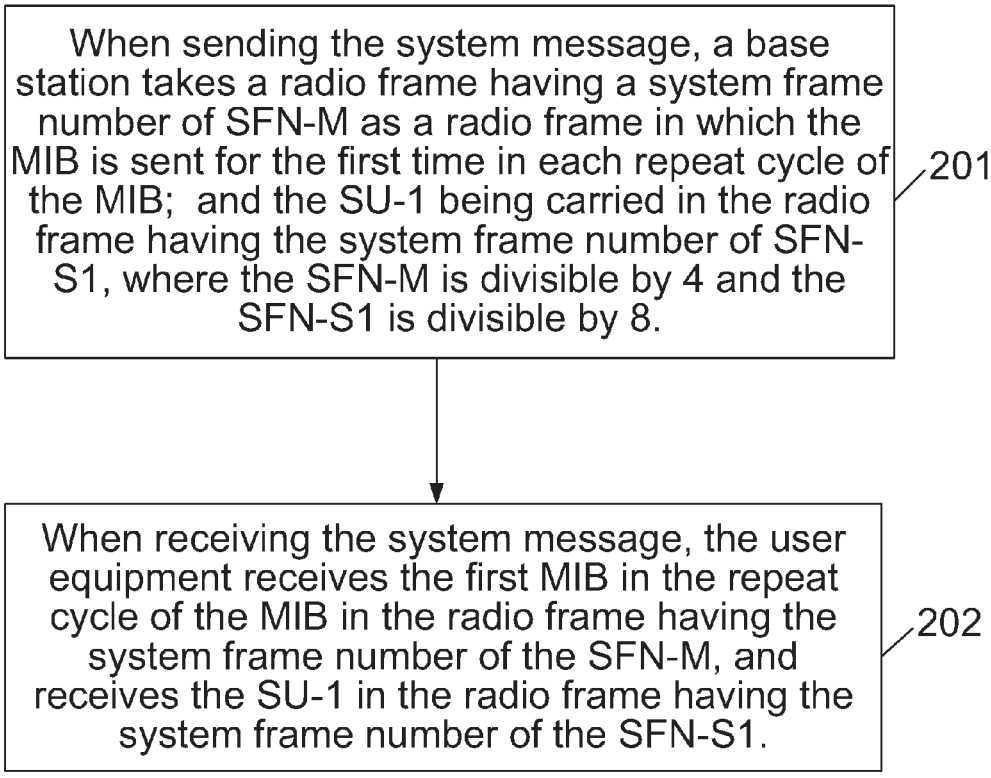
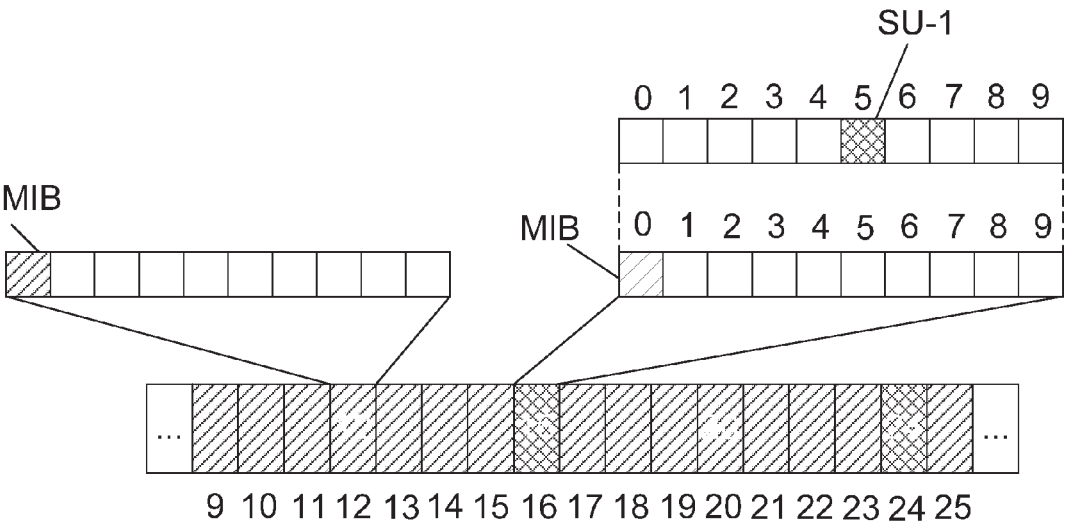

When sending the system message, a base station takes a radio frame having a system frame number of SFN-M as a radio frame in which the MIB is sent for the first time in each repeat cycle of the MIB; and the SU-1 being carried in the radio frame having the system frame number of SFN-S1, where the SFN-M is divisible by 4 and the SFN-S1 is divisible by 8.
201
When receiving the system message, the user equipment receives the first MIB in the repeat cycle of the MIB in the radio frame having the system frame number of the SFN-M, and receives the SU-1 in the radio frame having the system frame number of the SFN-S1.
202

Fig. 3


SU-1
0 1 2 3 4 5 6 7 8 9
MIB
MIB
0 1 2 3 4 5 6 7 8 9
9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

METHOD FOR SENDING, TRANSMITTING AND SCHEDULING SYSTEM MESSAGE IN LONG TERM EVOLUTION SYSTEM

TECHNICAL FIELD

[0001] The present invention relates to the field of wireless communications, and particularly to a method for sending, transmitting and scheduling a system message in the LTE (Long Term Evolution) system of 3GPP (the 3rd Generation Partnership Project).

BACKGROUND

[0002] As shown in FIG. **1**, the LTE system is mainly composed of user equipments, base stations and core networks. A network composed of base stations is referred to as a Radio Access Network (RAN), which is responsible for the transactions of the access layer, e.g. the management of wireless resources. There may be a physical or logical connection between the base stations (e.g. between the base station **1** and the base station **2**, or between the base station **1** and the base station **3** as shown in FIG. **1**) depending on an actual situation. Each base station may be connected with one or more Core Network (CN) nodes. The core network is responsible for the transactions of the non-access layer, e.g. location updating and the like, and serves as a anchor point of a user plane. The user equipment refers to various devices that can communicate with cellular wireless communication networks, e.g. a mobile phone or a laptop computer, etc.

[0003] The basic component of the system time in the LTE system is the length of a radio frame, which is 10 ms. A radio frame includes 10 sub-frames, where each sub-frame corresponds to 1 ms.

[0004] The system message is a message for broadcasting system configuration parameters. In the LTE, if being divided according to function, the system message mainly includes a Master system Information Block (MIB), a Scheduling Information Unit **1** (SU-**1**) and other Scheduling Information Units (SU-X). Each SU-X may include one or more System Information Blocks (SIBs), i.e. the SIB mapped to the same SU-X has the same scheduling rule as each other in time domain. The MIB includes parts of physical layer parameters, a system frame number (SFN), and the scheduling information of the SU-**1**. The SU-**1** includes the scheduling information of other SU-X, a Public Land Mobile Network List (PLMN LIST), a cell identifier, an access control parameter, etc. The SU-X includes other contents required to be broadcasted, including configuring information of common channels and cell reselecting information, etc.

[0005] The MIB is broadcasted over a system broadcast channel (e.g. PBCH), where the time-domain and frequency-domain resource allocation is static in PBCH. The repeat cycle of the MIB is fixed, i.e. the contents thereof are repeated one time per 40 ms. In order to increase the coverage of the MIB, the network may send the same MIB contents in each radio frame at each 40 ms. The herein-mentioned radio frame number where the MIB is located refers to the radio frame number where the MIB is sent for the first time in the repeat cycle of the MIB. The MIB is always sent in the No. 0 sub-frame of the radio frame where the MIB is located.

[0006] The SU-**1** and the SU-X are carried over a downlink shared channel. The scheduling cycle of the SU-**1** is also fixed, i.e. the SU-**1** is scheduled once per 80 ms. The SU-**1** may be resent many times within its scheduling cycle. The herein-mentioned radio frame number where the SU-**1** is located refers to the radio frame number where the SU-**1** is sent for the first time in the scheduling cycle of the SU-**1**. The SU-**1** occupies one sub-frame, and the location of the sub-frame is also fixed in the radio frame where the SU-**1** is located.

[0007] The system information block broadcasted in a sub-frame is carried over the wireless resource of the system. The control parameters, e.g. a Modulating and Coding Scheme (MCS) parameter, a transmission format, and the like, which are related to these wireless resources, are provided through a dedicated control channel (e.g. PDCCH) associated therewith, i.e. a dynamic scheduling method is used.

[0008] The sequence that the UE (User Equipment) reads the system message is as follows: firstly, reading the MIB to obtain the scheduling information of the SU-**1**, and then reading the contents of the SU-**1** subsequently. The user equipment can obtain the scheduling information of other SU-X from the SU-**1**, thereby reading the contents of these system information blocks subsequently.

[0009] In order to allow the user equipment to read the SU-**1** as soon as possible after reading the MIB, the radio frame carrying the SU-**1** and the radio frame carrying the MIB are in the same time-domain location. However, because the scheduling cycle of the SU-**1** is twice of the repeat cycle of the MIB, during the time period when the radio frame carries the MIB, the SU-**1** is carried in some time, and is not carried in other time. In the MIB, the scheduling information of the SU-**1** is actually a one-bit label, which is used for indicating whether the SU-**1** is carried during the time period when the radio frame carries the MIB.

[0010] In order to ensure the coverage of the MIB, the contents in the MIB should be as few as possible. Adding one bit means that it is required to increase the rate of the PBCH by 25 bits per second.

SUMMARY

[0011] The technical problem to be solved by the present invention is to overcome the drawbacks of the prior art and to provide a method for sending, transmitting and scheduling a system message in an LTE system, so as to achieve the object of sending, transmitting and scheduling the SU-**1** without needing to refer to scheduling information of the SU-**1** in the MIB.

[0012] To solve the above-mentioned problem, the present invention provides a method for sending a system message in a long term evolution system. When a base station sends the system message, a radio frame having a system frame number of SFN-M is taken as a radio frame in which a master system information block (MIB) is sent for the first time in a repeat cycle of the MIB, and a scheduling information unit SU-**1** is sent in a fixed sub-frame of the radio frame having the system frame number of SFN-S**1**; wherein the SFN-M is divisible by 4 and the SFN-S**1** is divisible by 8.

[0013] Additionally, the scheduling information of the SU-**1** is excluded from the MIB.

[0014] Additionally, the repeat cycle of the MIB is 40 ms, and a scheduling cycle of the SU-**1** is 80 ms; and the SU-**1** is sent repeatedly by the base station in the scheduling cycle of the SU-**1**; and the SFN-S**1** is the system frame number of the radio frame in which the SU-**1** is sent for the first time in one scheduling cycle.

[0015] The present invention further provides a method for transmitting a system message in a long term evolution system. When the system message is sent by a base station, a radio frame having a system frame number of SFN-M is taken as a radio frame in which a master system information block (MIB) is sent for the first time in a repeat cycle of the MIB,

and a scheduling information unit SU-1 is sent in a fixed sub-frame of the radio frame having the system frame number of SFN-S1; and

[0016] when receiving the system message, a user equipment may receive the MIB sent for the first time in the repeat cycle of the MIB in the radio frame having the system frame number of the SFN-M, and may receive the SU-1 in the fixed sub-frame of the radio frame having the system frame number of the SFN-S1;

[0017] wherein, the SFN-M is divisible by 4 and the SFN-S1 is divisible by 8.

[0018] Additionally, the scheduling information of the SU-1 is excluded from the MIB.

[0019] Additionally, the repeat cycle of the MIB is 40 ms and a scheduling cycle of SU-1 is 80 ms; and

[0020] the SU-1 is sent repeatedly in the scheduling cycle of the SU-1; and the SFN-S1 is the system frame number of the radio frame in which the SU-1 is sent for the first time in one scheduling cycle.

[0021] The present invention further provides a method for scheduling a system message in a long term evolution system, a radio frame having a system frame number of SFN-M is taken as a radio frame in which a master system information block (MIB) is sent for the first time in a repeat cycle of the MIB, and a scheduling information unit SU-1 is sent in a fixed sub-frame of the radio frame having the system frame number of SFN-S1;

[0022] wherein the SFN-M is divisible by 4 and the SFN-S1 is divisible by 8.

[0023] Additionally, the scheduling information of the SU-1 is excluded from the MIB.

[0024] Additionally, the repeat cycle of the MIB is 40 ms, and a scheduling cycle of the SU-1 is 80 ms; and the SU-1 is sent repeatedly in the scheduling cycle of the SU-1, and the SFN-S1 is the system frame number of the radio frame in which the SU-1 is sent for the first time in one scheduling cycle.

[0025] According to the technical solutions of the present invention, by fixing the relative scheduling relationship between the SU-1 and the MIB, the scheduling information bit related to the SU-1 can be omitted in the MIB, thus under the same sending condition, the coverage of the MIB can be increased and the reliability that the user equipment receives the MIB can be improved.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] FIG. 1 is a schematic diagram illustrating a configuration of an LTE system in the prior art;

[0027] FIG. 2 is a flowchart illustrating specific implementation of a method for transmitting a system message in an LTE system according to the present invention; and

[0028] FIG. 3 is a schematic diagram illustrating a configuration of the system message in an application example of the present invention.

DETAILED DESCRIPTION

[0029] The core idea of the present invention is that: the scheduling rule of the SU-1 relative to the MIB is fixed, i.e. the SU-1 is carried in the fixed radio frame, where the radio frame carrying the SU-1 overlaps in time domain with the radio frame in which the MIB is sent for the first time in the repeat cycle of the MIB; and when receiving the system message, the user equipment receives the MIB and the SU-1 over the fixed radio frame, thus the bit for indicating the scheduling information of the SU-1 in the MIB can be omitted.

[0030] The present invention will be described in detail with reference to the accompanying drawings and the embodiments as follows.

[0031] FIG. 2 is a flowchart illustrating a method for transmitting a system message in an LTE system. As shown in FIG. 2, the method includes steps as follows:

[0032] 201: when the system message is sent by the base station, the SU-1 sent for the first time in a scheduling cycle is carried in a fixed radio frame, where the radio frame carrying the SU-1 overlaps in time domain with the radio frame in which the MIB is sent for the first time in the repeat cycle of the MIB.

[0033] Specifically, when the base station sends the system message, the radio frame having the system frame number of SFN-M is taken as a radio frame in which the MIB is sent for the first time in the repeat cycle of the MIB, and the SU-1 sent for the first time in a scheduling cycle is carried in the radio frame having the system frame number of SFN-S1, i.e. the SFN-S1 is the system frame number of the radio frame in which the SU-1 is sent for the first time in a scheduling cycle;

[0034] wherein, the SFN-M is divisible by 4 and the SFN-S1 is divisible by 8.

[0035] As a preferred embodiment: the repeat cycle of the MIB is 40 ms and the scheduling cycle of the SU-1 is 80 ms; the base station broadcasts the MIB over the PBCH, where the MIB is carried in the No. 0 sub-frame of the radio frame; the SU-1 and the SU-X is carried over the downlink shared channel; the SU-1 is carried in the fixed sub-frame of the radio frame; and the scheduling information of the SU-X is carried in the SU-1.

[0036] This step is also the method for sending the system message in the LTE system.

[0037] 202: the user equipment receives the system message, where the MIB and the SU-1 are received over the fixed radio frame.

[0038] Specifically, the user equipment receives the MIB sent for the first time in the repeat cycle of the MIB over the radio frame having the system frame number of the SFN-M, and may subsequently receive the MIB sent repeatedly in the repeat cycle of the MIB over the succeeding radio frame; and the user equipment receives the SU-1 sent for the first time in the scheduling cycle of the SU-1 over the radio frame having the system frame number of the SFN-S1; and

[0039] the user equipment may obtain the scheduling information of other SU-X from the SU-1, thus to receive the system information block contained in the SU-X.

[0040] With the above-mentioned method, there is no need to employ a bit to indicate whether the SU-1 is carried during the time period when the radio frame carries the MIB, thus, under the same sending condition, the coverage of the MIB can be increased.

[0041] A method for scheduling a system message in an LTE system includes:

[0042] the SU-1 sent for the first time in a scheduling cycle being carried in the fixed radio frame, where the radio frame carrying the SU-1 overlaps in time domain with the radio frame in which the MIB is sent for the first time in the repeat cycle of the MIB; and

[0043] specifically, the radio frame having the system frame number of SFN-M is taken as a radio frame in which the MIB is sent for the first time in the repeat cycle of the MIB, and the SU-1 sent for the first time in a scheduling cycle is carried in the radio frame having the system frame number of SFN-S1; the SFN-M is divisible by 4 and the SFN-S1 is divisible by 8.

[0044] As a preferred embodiment: the repeat cycle of the MIB is 40 ms and the scheduling cycle of the SU-**1** is 80 ms; the MIB is broadcasted over the PBCH, and is located in the No. 0 sub-frame of each radio frame; the SU-**1** and the SU-X are carried over the downlink shared channel; and the SU-**1** is located in the fixed sub-frame of the radio frame, and the scheduling information of the SU-X is carried in the SU-**1**.

[0045] Hereinbelow, the present invention is described in further detail by way of an application example.

[0046] As shown in FIG. **3**, in the system message sent by the base station, the radio frame having the system frame number of the SFN-M is taken as a radio frame in which the MIB is sent for the first time in the repeat cycle of the MIB, and the MIB is carried in the No. 0 sub-frame of the radio frame; wherein the SFN-M is divisible by 4. That is, the radio frames having the system frame number of . . . , 12, 16, 20, 24, . . . are the radio frames in which the MIBs are sent for the first time in the repeat cycle of the MIBs. The repeat cycle of the MIB is 40 ms.

[0047] The scheduling cycle of the SU-**1** is 80 ms. The SU-**1** sent for the first time in a scheduling cycle is carried in the No. 5 sub-frame of the radio frame having the system frame number of the SFN-S**1**. The SFN-S**1** is divisible by 8. That is, the base station has the SU-**1** carried in the No. 5 sub-frame of the radio frame having the system frame number of . . . , 16, 24, . . .

[0048] Taking the radio frame having the system frame number of 16 as an example, that radio frame is the radio frame in which the MIB is sent for the first time in this repeat cycle of the MIB, wherein the MIB is carried in the No. 0 sub-frame of the PBCH and the SU-**1** is carried in the No. 5 sub-frame of the downlink shared channel.

[0049] The user equipment may receive the MIB and the SU-**1** just following such rule, and then obtains the scheduling information of other SU-X from the SU-**1**, thus subsequently receives the system information block contained in the SU-X; therefore, it is unnecessary to carry the scheduling information of the SU-**1** in the MIB.

[0050] Certainly, other various embodiments may also be available for the present invention, and those skilled in the art are capable of devising various modifications and variations according to the present invention without departing from the spirit and essence of the present invention. However, such corresponding modifications and variations should all be included within the protection scope of the appended claims of the present invention.

INDUSTRIAL APPLICABILITY

[0051] According to the technical solutions of the present invention, by fixing the relative scheduling relationship between the SU-**1** and the MIB, the scheduling information bit related to the SU-**1** can be omitted in the MIB, thus under the same sending condition, the coverage of the MIB can be increased and the reliability that the user equipment receives the MIB can be improved.

What is claimed is:

1. A method for sending a system message in a long term evolution system, comprising:

when a base station sends the system message, a radio frame having a system frame number of SFN-M being taken as a radio frame in which a master system information block (MIB) is sent for the first time in a repeat cycle of the MIB, and a scheduling information unit SU-**1** being sent in a fixed sub-frame of the radio frame having the system frame number of SFN-S**1**;

wherein, the SFN-M is divisible by **4** and the SFN-S**1** is divisible by **8**.

2. The method according to claim **1**, wherein,

the scheduling information of the SU-**1** is excluded from the MIB.

3. The method according to claim **1**, wherein,

the repeat cycle of the MIB is 40 ms, and a scheduling cycle of the SU-**1** is 80 ms; and

the SU-**1** is sent repeatedly by the base station in the scheduling cycle of the SU-**1**; and the SFN-S**1** is the system frame number of the radio frame in which the SU-**1** is sent for the first time in one scheduling cycle.

4. A method for transmitting a system message in a long term evolution system, comprising:

when a base station sending the system message, a radio frame having a system frame number of SFN-M being taken as a radio frame in which a master system information block (MIB) is sent for the first time in a repeat cycle of the MIB, and a scheduling information unit SU-**1** being sent in a fixed sub-frame of the radio frame having the system frame number of SFN-S**1**; and

when receiving the system message, a user equipment receiving the MIB sent for the first time in the repeat cycle of the MIB over the radio frame having the system frame number of the SFN-M, and receiving the SU-**1** in the fixed sub-frame of the radio frame having the system frame number of the SFN-S**1**;

wherein, the SFN-M is divisible by 4 and the SFN-S**1** is divisible by 8.

5. The method according to claim **4**, wherein,

the scheduling information of the SU-**1** is excluded from the MIB.

6. The method according to claim **4**, wherein,

the repeat cycle of the MIB is 40 ms and a scheduling cycle of SU-**1** is 80 ms; and

the SU-**1** is sent repeatedly in the scheduling cycle of the SU-**1**, wherein the SFN-S**1** is the system frame number of the radio frame in which the SU-**1** is sent for the first time in one scheduling cycle.

7. A method for scheduling a system message in a long term evolution system, comprising:

taking a radio frame having a system frame number of SFN-M as a radio frame in which a master system information block (MIB) is sent for the first time in a repeat cycle of the MIB, and sending a scheduling information unit SU-**1** in a fixed sub-frame of the radio frame having the system frame number of SFN-S**1**;

wherein, the SFN-M is divisible by 4 and the SFN-S**1** is divisible by 8.

8. The method according to claim **7**, wherein,

the scheduling information of the SU-**1** is excluded from the MIB.

9. The method according to claim **7**, wherein,

the repeat cycle of the MIB is 40 ms, and a scheduling cycle of the SU-**1** is 80 ms; and

the SU-**1** is sent repeatedly in the scheduling cycle of the SU-**1**, wherein the SFN-S**1** is the system frame number of the radio frame in which the SU-**1** is sent for the first time in one scheduling cycle.

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