



2G, 3G Network Planning and Optimization...

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Эт. день	724 195
От дней	136 47
Эч часа	94 11
Сегодня	14 3
Наплещ	78 4

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Постоянные читатели

четверг, 1 октября 2009 г.

4.3 Serial Parameters of Cell Selection and Reselection

4.3.1 cell\_bar\_access

I. Definition

In the SI broadcasted in each cell, a bit indicates whether the MS is allowed to access the network in the cell, namely, cell\_bar\_access.

II. Format

The value of cell\_bar\_access includes 1 and 0. The value 0 indicates that MS is allowed to access the network from the cell. The value 1 indicates that the MS is barred to access the network from the cell. Actually whether to allow MS to access the network from the cell is determined by both cell\_bar\_access and cell\_bar\_qualify.

III. Configuration and Influence

The cell\_bar\_access is configured by equipment room operators. Usually the MS is allowed to access the network from all the cells, so cell\_bar\_access is configured to 0. In special situations, the operators want some cell for handover service only, so cell\_bar\_access is configured to 1

The MS usually works in microcells (you can configure the priority of cells and reselection parameters to enable this). When the MS is calling while moving fast, the network force MS to hand over to the base station G. The signals of base station G are stronger than microcell base station in most areas. When the call terminates, the MS just camps near base station G and at edge of microcell cells, the MS will not reselect a cell according to GSM regulations, therefore the MS cannot return to microcell.

The capacity of base station G is usually small, so the previous phenomenon leads to congestion of base station G. To solve the problem, you can configure the cell\_bar\_access to 1, namely, to forbid MS directly accessing base station G. In area A, handover is allowed to base station G.

IV. Precautions

The cell\_bar\_access is used only in some special areas. For common cells, it is configured to 0.

4.3.2 cell\_bar\_qualify

I. Definition

The cell\_bar\_qualify determines the priority of cells, namely, it enables MS to select some cell by preference.

II. Format

The value of cell\_bar\_qualify includes 1 and 0. The cell\_bar\_qualify and cell\_bar\_access determine the priority state of cells, as listed in Table 1-4.

Table 7-1 Cell priorities

cell_bar_qualify	cell_bar_access	Cell selection priority	Cell reselection state
0	0	Normal	Normal
0	1	Barred	Barred
1	0	Low	Normal
1	1	Low	Normal

An exception is that the cell selection priority and cell reselection state are normal when the following conditions are met:

- The cell belongs to the PLMN which the MS belongs to.
- The MS is in cell test operation mode.
- The cell\_bar\_access is 1.
- The cell\_bar\_qualify is 0.
- The access control class 15 is disabled.

III. Configuration and Influence

The priority of all the cells are usually configured to **normal**, namely, cell\_bar\_qualify = 0. In microcell and dualband networking, operators might want MS to camps on the cell of

some type by preference. In this situation, the equipment room operators can configure the priority of these cells to **normal** and other cells to **low**.

During cell selection, when the proper cells with normal as the priority is not present (proper cells means that all parameters meet the conditions for cell selection, namely,  $C1 > 0$ , and the cell is allowed to access), the MS will select cells with low priority.

#### IV. Precautions

Pay attention to the following aspects:

- When cell priority is used as a method to optimize network, the `cell_bar_qualify` only affects cell selection, without any influence on cell reselection. You must optimize the network by combining `cell_bar_qualify` and `C2`.
- During cell selection, when the proper cells with normal as the priority is not present, the MS will select cells with low priority. Therefore when the level of the cell with normal priority is low, and cells with low priority and high level are present, the MS will access the network slowly while powering on.

### 4.3.3 Minimum Received Level Allowing MS to Access (`RXLEV_ACCESS_MIN`)

#### I. Definition

To avoid bad communication quality, call drop, and a waste of network radio resources due to MS accessing the network at low received signal level, GSM regulations prescribe that when an MS accesses the network the received level must be greater than the threshold level, namely, the minimum received level allowing MS to access.

#### II. Format

The value range of `RXLEV_ACCESS_MIN` is from  $-110$  dBm to  $-47$  dBm.

#### III. Configuration and Influence

The recommended `RXLEV_ACCESS_MIN` needs to be approximately equal to the receiving sensitivity of MS. The `RXLEV_ACCESS_MIN` affects cell selection parameter `C1`, so it is important to traffic adjustment and network optimization.

For cells with over high traffic and severe congestion, you can increase `RXLEV_ACCESS_MIN`. In this way, the `C1` and `C2` of the cells decrease, and the effective coverage range decreases. You must not configure `RXLEV_ACCESS_MIN` over great, because this might cause non-seamless coverage and complaints for signal fluctuation. It is recommended that the `RXLEV_ACCESS_MIN` is smaller than or equal to  $-90$  dBm.

#### IV. Precautions

Except for areas of high density of base stations and of qualified coverage, adjusting cell traffic by `RXLEV_ACCESS_MIN` is not recommended.

### 4.3.4 Additional Reselection Parameter Indicator

#### I. Definition

The cell selection and reselection by MS depends on the parameters `C1` and `C2`. Whether `C2` is the cell reselection parameter is determined by network operators. Additional reselection parameter indicator (`ADDITIONAL_RESELECT`) informs MS of whether to use `C2` in cell reselection.

#### II. Format

`ADDITIONAL_RESELECT` consists of 1 bit. In `SI3`, it is meaningless, and equipment manufacturers configure it to `N`. The MS uses `ADDITIONAL_RESELECT` of `SI4`.

- When `ADDITIONAL_RESELECT` is configured to `N`, the meaning is: if the rest bytes of `SI4` (`SI4RestOctets`) are present, the MS must abstract and calculate parameters related to `C2` and related cell reselection parameter `PI`.
- When `ADDITIONAL_RESELECT` is configured to `Y`, the meaning is that the MS must abstract and calculate parameters related to `C2` and related cell reselection parameter `PI`.

#### III. Configuration and Influence

Cells seldom use `SI7` and `SI8`, so you can configure `ADDITIONAL_RESELECT` to `N`. When cells use `SI7` and `SI8`, and the parameter `C2` is used in cell reselection, you can configure `ADDITIONAL_RESELECT` to `Y`.

### 4.3.5 Cell Reselection Parameter Indicator

#### I. Definition

The cell reselection parameter indicator (`CELL_RESELECT_PARAM_IND`) is used in informing MS of whether `C2` is a cell reselection parameter and whether `C2` is present.

#### II. Format

The value of `CELL_RESELECT_PARAM_IND` includes `Y` and `N`, with the meanings as follows:

- `Y`: The MS must calculate `C2` by abstracting parameters from `Sis` of cell broadcast, and set `C2` as the standard for cell reselection.
- `N`: The MS must set `C1` as the standard, namely,  $C2 = C1$ .

#### III. Configuration and Influence

The equipment room operators determine the value of `PI`. Configure `PI` to `Y` if related cells

set C2 as the standard for cell reselection; otherwise, configure it to N.

### 4.3.6 Cell Reselection Offset, Temporary Offset, and Penalty Time

#### I. Definition

After the MS selects a cell, without great change of all the conditions, the MS will camp on the selected cell. Meanwhile, it does as follow:

- Starts measuring signals level of BCCH carrier in neighbor cells.
- Records the 6 neighbor cells with greatest signal level.
- Abstract various SI and control information of each neighbor cell from the 6 cells.

When conditions are met, the MS hands over from the selected cell to another. This process is called cell reselection. The conditions include:

- Cell priority
- Whether the cell is barred to access
- Radio channel level (important)

When the signal level of neighbor cells exceeds that of the serving cell, cell reselection occurs. The channel level standard used in cell reselection is C2, with the calculation as follows:

1) When PENELTY\_TIME  $\neq$  11111:

$$C2 = C1 + \text{CELL\_RESELECT\_OFFSET} - \text{TEMPORARY\_OFFSET} * H(\text{PENALTY\_TIME} - T)$$

Wherein, if  $\text{PENALTY\_TIME} - T(x) < 0$ , the function  $H(x) = 0$ ; if  $x \geq 0$ ,  $H(x) = 1$ .

2) When PENELTY\_TIME = 11111:

$$C2 = C1 - \text{CELL\_RESELECT\_OFFSET}$$

T is a timer, with 0 as the initial value. When a cell is listed by MS in the list of cells with maximum signal level, start T with step of 4.62ms (a TDMA frame). When the cell is removed from the list, the associated T is reset.

After cell reselection, the T of original cell works as PENALTY\_TIME. Namely, temporary offset is not performed on the original cell.

CELL\_RESELECT\_OFFSET (CRO) modifies cell reselecting time C2.

TEMPORARY\_OFFSET (TO) is supplemented to C2 from starting working of T to the prescribed time.

PENALTY\_TIME is the time for TEMPORARY\_OFFSET having effect on C2. When PENALTY\_TIME = 11111, the MS is informed of using  $C2 = C1 - \text{CRO}$ .

CELL\_RESELECT\_OFFSET, TEMPORARY\_OFFSET, and PENALTY\_TIME are cell reselection parameters.

- When the cell reselection parameter PI is 1, the MS is informed of receiving values of three parameters on BCCH.
- If PI is 0, the MS judges that the previous three parameters are 0, namely  $C2 = C1$ .

If the C2 of a cell (in the same location area as the serving cell) calculated by MS is greater than the C2 of the cell where MS camps, and this lasts for over 5s, the MS reselects to camp on the cell.

If the C2 of a cell (in different location area as the serving cell) calculated by MS is greater than the sum of C2 of the cell where MS camps and cell reselect hysteresis, and this lasts for over 5s, the MS reselects to camp on the cell.

The interval between two reselections is at least 15s, and this avoids frequent cell reselection by MS.

C2 is formed on the combination of C1 and artificial offset parameters. The artificial offset parameters help MS camp on or prevent MS from camping on some cell. This balances the traffic of the network.

#### II. Format

- 1) The cell reselection offset (CRO) is in decimal, with unit of dB. It ranges from 0 to 63, which means 0 to 126 dB (2 dB as the step). The recommended value is 0.
- 2) The temporary offset (TO) is in decimal, with unit of dB. It ranges from 0 to 7, which means 0 to 70 dB (10 dB as the step). The recommended value is 0.
- 3) The penalty time (PT) is in decimal, with unit of second. It ranges from 0 to 31. The value 0 to 30 means 20s to 620s (20s as the step). The value 31 is reserved for changing the effect direction of C2 by CRO. The recommended value is 0.

#### III. Configuration and Influence

The previous parameters can be adjusted accordingly in the following three situations:

- 1) When the communication quality is bad due to heavy traffic or other causes, change the parameters to enable MS not camps on the cell (the cell is exclusive from the MS). For this situation, configure PT to 31, so TO is ineffective.  $C2 = C1 - \text{CRO}$ . The C2 is artificially lowered. So the probability for MS to reselect the cell decreases. In addition, the equipment room operators can configure CRO to a proper value according to the exclusive level of the cell by MS. The greater the exclusion is, the greater the CRO is.
- 2) For cells with low traffic and equipment of low utilization, change the parameters to enable MS to camp on the cell (the cell is prior). In this situation, configure CRO to 0–20 dB according to the priority. The higher the priority is, the greater the CRO is. TO is configured the same as or a little greater than CRO. PT helps avoid over frequent cell reselection, the recommended value of PT is 20s or 40s.
- 3) For cell with average traffic, configure CRO to 0, PT to 11111 so that  $C2 = C1$ . No artificial influence is on the cell.

#### IV. Precautions

In whatever situations, the CRO must not be greater than 30 dB, because over great CRO leads to unstable network, such as complaints about signal fluctuation.

### 4.3.7 Cell Reselection Hysteresis (CRH)

#### I. Definition

CRH affects cell reselection of cross location area. The MS starts cell reselection if the following conditions are met:

- The signal level of neighbor cell (in different location area) is greater than that of the serving cell.
- The difference between the signal levels of the neighbor cell and the serving cell must be greater than the value prescribed by cell reselection hysteresis.

The difference is based on the cell reselection methods used by MS. If the MS reselects a cell with C2, then compare values of C2.

#### II. Format

CRH is in decimal, with unit of dB. The range is 0 to 14, with step of 2 dB. The recommended value is 4.

#### III. Configuration and Influence

If the original cell and target cell belongs to different location areas, the MS must originate a location updating process after cell reselection. Due to the attenuation feature of radio channels, the C2 of two cells measured at the bordering area of neighbor cells fluctuates much, so the MS reselect cells frequently. The interval between two reselections is over 15s, which is rather short for location updating. The signal flow of network increases sharply, radio resources cannot be fully utilized.

During location updating, the MS cannot respond to paging, so the connection rate decreases. Adjust CRH according to signal flow and coverage. When signal flow overloads or location updating of cross location area is frequent, the cell reselection hysteresis is increased as recommended. You must avoid abnormal coverage due to over large location area.

#### IV. Precautions

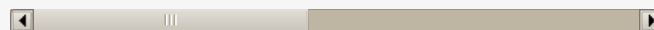
Do not configure CRH to 0 dB.

Автор: ourdot на 1:09

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