Archives

среда, 2 сентября 2009 г.

1.9 Power Control

1.9.1 Power Control Overview

Power control is to change the transmission power of MS or BTS (or both) in radio mode within certain area. Power control can reduce the system interference and improve the spectrum utilization and prolong the service time of MS battery. When the Relev and quality is good, the transmission power of the peer end can be reduced to lower the interference to other calls.

In GSM, power control can be used in uplink and downlink respectively. The power control range for uplink MS is 20 dB–30dB. Based on the power class of MS (most MSs belongs to class 4, which means the maximum transmission power is 33 dbm), each step can change 2 dB. The downlink power control range is decided by equipment manufacturer. Although whether to adopt uplink or downlink power control function is decided by network operators, all MSs and BTS equipments must support this function. BSS manages the power control in the two directions.

To facilitate BCCH frequency pull-in and the measurement of Relev (including the Relev of neighbor cell BCCH frequency), GSM protocol specifies that no power control is allowed for the timeslots in the downlink of BCCH TRX

1.9.2 MS Power Control

The power control of MS includes two adjustment stages: stable adjustment stage and initial adjustment stage. Stable adjustment is the common way to implement power control algorithm. Initial adjustment is used at the beginning of call connection. When a connection occurs, MS sends signals with nominal power (before receiving power adjustment commend, the nominal transmission power of MS is the maximum transmission power on BCCH of the cell. If MS does not support this power level, it will adopt other power level most close to this level, such as the maximum power level supported by the classmark of MS in indication message establishment). Therefore, MS accesses to network through RACH with the maximum power broadcast on BCCH. When MS power is lower than this value, it will transmit with its maximum transmission power. The system specifies that the power level of the first message that MS sends on DCH is also this value. The system control begins after MS receives the power control command in SACCH information block from SDCCH or TCH.

Since BTS can support multi-call at the same time, the Rxlev should be quickly reduced in the new connection. Otherwise, other calls supported by this BTS will deteriorate and the calls in other cells will also be affected. The purpose of initial adjustment stage is to quickly reduce the transmission power of MS to get the stable MR, so MS can be adjusted according to stable power control algorithm.

The required parameters in uplink power control, the expected uplink Rxlev, and the uplink received quality can be adjusted according to the situation of the cell. After receiving a certain number of uplink MRs, the system compares the actual uplink Rxlev and received quality obtained by interpolation, filtering, and other methods with the expected values and calculate the power level that the MS should be adjusted to through power control algorithm. If the calculated power level differs from the output power level of MS and meets certain limit conditions (such as step limit of power adjustment and range limit of MS output power), the system will send power adjustment command.

The command of changing MS power and the required time advance will be sent to MS in the layer 1 header of each downlink SACCH information block. MS will configure the power level it uses now in its uplink SACCH information block and send it to BTS in measurement report. This level is the power level of the last burst in the previous SACCH measurement cycle. When MS receives the power control information in SACCH information block from DCH, it will transmit with this power level. One power control message does not make the MS switch to the required level immediately. The maximum change rate of MS power is 2 dB for every 60 ms. For 12 dB, before MS receives the next power control message, it will not end as one SACCH measurement cycle takes 480 ms. In addition, it takes three measurement cycles to send power control message and execute the command. Therefore, the power control cycle should not be too short in order to ensure its accuracy. See Figure 1-10.

Figure 1-1 Execution of power control command

The purpose of uplink power control adjustment is to minimize the difference between the actual uplink Rxlev and received quality and the expected uplink Rxlev and received quality. The purpose of interpolation and filtering is to process the lost measurement reports and remove temporary nature to ensure the stability of power control algorithm.

The difference between initial adjustment and stable adjustment is that the expected uplink Relev and received quality and the length of filter in initial adjustment are different from that of stable adjustment, and the initial adjustment only has downlink adjustment.

1.9.3 BTS Power Control

BTS power control is an optional function. It is similar to MS power control, but it only uses stable power control algorithm. The required parameters are Rxlev threshold (lower limit), and the maximum transmission level can be received (upper limit). The Relev is divided into 64 levels ranging from 0 to 63. Level 0 is the lowest Rxlev, level 63 is the highest Rxlev.

BTS power control is divided into static power control and dynamic power control. Dynamic power control is the fine tuning based on static power control. There are six steps (2 dB/step) of static power control according to Protocol 0505. If the maximum output power is 46 dBm (40W), the step 6 is 34 dBm.

Static power control step is defined in the cell distributes list of data management system, which specifies the maximum output power (suppose this value is Pn) of static power control. For step 15 of dynamic power control, the corresponding value range is Pn dB–Pn-30dB. When the maximum power control still cannot satisfy the requirement, adjust static power control step to improve the maximum output power of dynamic power control Pn.

1.9.4 Power Control Processing

2G&3G Planning an Optimization

Live

Hit

Постоянные читатели

I. Measurement Report Interpolation
Each measurement report has a sequence number. If network detects incontinuous sequence numbers, it means some of the measurement reports are missing. The network will complete the reports based on interpolation algorithm.
The network receives measurement reports n and n+4. It detects the sequence numbers are not continuous, so it uses an algorithm to add n+1, n+2, and n+3 to complete the reports.
The purpose of measurement report interpolation is to avoid call loss when the power is too low.
II. Measurement Report Filtering
Network will not judge the state of MS based on only one measurement result, because that is too incomprehensive, in addition, the MS may be fluctuating. Therefore, filtering is required. Filtering combines several continuous measurement results together to determine the state of MS during this period of time. TA has filters for Rxlev and received quality of uplink and downlink
The purpose of measurement report filtering is to remove temporary nature and ensure the algorithm stability.
III. Power Control Adjustment
Calculate the power adjustment value based on the difference between the Rxlev and the expected value.
Power control adjustment based on Rxlev
Power control module compares the estimate value of Rxlev obtained through pre-processing of measurement report with the expected value, and calculates the step length of adjustment. In power control algorithm, variable step is often used for quick power control.
Power control adjustment based on received quality
Power control module compares the estimate value of received quality obtained through pre-processing of measurement report with the expected value, and calculates the step length of adjustment. When the received quality is bad, improve the transmit power; when the received quality is good, reduce the transmit power. This kind of power control adopts fixed step.
Comprehensive decision for power control
Consider both Rxlev and received quality and adopt different power control strategies in different conditions to keep the stability and efficiency of power control algorithm.
When the received quality requires the improving of transmit power while the Rxlev requires the reducing of it, the system will make a comprehensive decision to perform no power control adjustment, because bad received quality and good Rxlev represent strong network interference. Under such circumstances, improving transmit power will further increase the interference.
Автор: ourdot на 0:20

0 коммент.:

Отправить комментарий

Подпись комментария: Выбрать профиль...

Отправить комментарий Просмотр

Следующее Главная страница Предыдущее

Подписаться на: Комментарии к сообщению (Atom)