Operator Logo

Power Control

WCDMA RAN

Feature Guide

Power Control Feature Guide

Version	Date	Author	Approved By	Remarks
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FIGURES

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1 Function Attribute

System version: [RNC V3.09, Node B V4.09, OMMR V3.09, OMMB V4.09]

Property: [basic functions + optional functions]

Related Network Element:

UE	NodeB	RNC	MSCS	MGW	SGSN	GGSN	HLR
√	√	√	-	-	-	-	-
Note: *-: Non-related network element *√: Related network element							

Dependent Function: [None]

Exclusive Function: [None]

Remarks: [None].

2 Overview

2.1 Function Overview

The uplink of the WCDMA system is interference limited, that is, the transmit power of all other user equipment (UE) acts as interference for a mobile station (MS). This is because the MSs are distributed randomly in a cell, some being far and some being near to the NodeB. If all MSs transmit with the same power, the high-power signals received near to the NodeB will cover up the low-power signals received far from the NodeB, and many error codes occur to the subscribers far from the NodeB, hence the far-near effect. In addition, the radio channel of mobile communication is available with a wide-band dynamic frequency, which is related with the features of mobile subscribers and usually affected by various Doppler fast fading effects along the radio link. Therefore, a fast and accurate power control mechanism is necessary to ensure the quality of service for all subscribers.

There are many power control algorithms: uplink open loop power control, downlink open loop power control, uplink inner loop power control, downlink inner loop power control, uplink outer loop power control, downlink outer loop power control, downlink power balancing. By the function evolution of WCDMA, the power control can be classified into R99, HSDPA, HSUPA and MBMS types.

2.1.1 Downlink Power Balance

In the soft handover or macro diversity status, a UE can communicate with all cells in the active set. The UE sends the same TPC command to the cells in the active set. But as each link is available with a different transmission path, error codes are produced in the TPC command and some NodeB receive wrong TPC command. As a result, some NodeB increases its transmit power and some NodeB decreases its transmit power, hence the power drifting. Power drifting is usually eliminated through the power balancing approach.

Downlink power balancing is originated by RNC. It allocates a power benchmark of reference or common reference for each radio link in the active set. NodeB calculates the power value of each link adjusted as a result of power balancing and adds the value into the power value used for downlink inner loop power control. In this way, the power drifting is overcome on the radio link.

This feature is implemented by RNC and NodeB and used together with the inner loop power control.

2.1.2 Power Control

Power control comprises uplink power control and downlink power control. Uplink power control is used to eliminate far-near effect to ensure system capacity and user QoS. Downlink power control is used to improve system capacity on condition that the user QoS is guaranteed. Power control comes in three types in two directions: open loop power control, outer loop power control and inner loop power control.

Open loop power control sets the initial transmit power of the physical channel. Inner loop power control is the major part of power control and is used to overcome the fast fading along the radio path. Both open and inner loop power control are realized on the physical layer of NodeB and UE. The parameters of inner loop power control is configured through RNC. Outer loop power control is used to ensure the quality of radio link by setting the SIR_{target} value as needed by inner loop power control. Uplink outer loop power control is realized through RNC and downlink outer loop power control is realized through UE.

Different types of power control are described as follows:

Inner loop power control is usually used on the dedicated physical channel. It increases SIR or makes the signaling-receiving power reach a target value so that the problem of channel fading is solved. The principle of uplink inner loop power control is: NodeB compares the received uplink SIR against the target SIR (SIR_{target}) and then sends the power control command to UE to adjust the transmit power, so that the SIR value changes quickly to approach the target SIR value. If the measured SIR is lower (higher) than the target SIR, NodeB uses the power control command to notify UE to increase (decrease) its transmit power. The downlink power control is the same as uplink power control, except that the power control command is sent by UE and executed in NodeB.

Inner loop power control has a higher precision than open loop power control and is the most fundamental power control.

Open loop power control is used to determine the initial transmit power of various physical channels.

The purpose of outer loop power control is to adjust the SIR_{target} used by inner loop power control based on the quality of service, thus adjusting the subscriber's transmit power. Here the quality of service is evalued through the check code of CRC carried in the frame protocol (FP). If the quality of radio channel deteriorates when a subscriber is making a call, outer loop power control can trace the quality status quickly and ensure the subscriber's call quality. If the quality of radio channel becomes very good, that is, even better than the $BLER_{target}$ required by the service, outer loop power control can make the SIR_{target} decrease so that subscriber's transmit power is decreased and system capacity is enhanced. With outer loop power control, the tranmit power of a subscriber in the process of ongoing communcation is adjusted to be as much as the $BLER_{target}$ required by the service. That is, no radio resource is wasted while the quality of service is guaranteed.

2.1.3 User Differentiated Power Control

When the UEs with same service, the user differentiated power control can make different basic priority UEs have different maximum allowed uplink or downlink DPCH transmission power. We realize it use the method that add the maximum allowed uplink or downlink DPCH transmission power based on service and a power offset based on basic priority. The higher basic priority of the UE the bigger power offset, so that the bigger actual maximum allowed uplink or downlink DPCH transmission power of the higher priority UE. when all UEs with same service.

2.1.4 Power Allocation for HSDPA

The power control of HSDPA includes the total power allocation of HSDPA and configuration of HS-PDSCH measurement power offset.

The allocation of HSDPA total power is performed in three modes: static allocation by RNC, dynamic allocation by RNC and free allocation by NodeB.

Static allocation by RNC means that RNC determines the maximum transmit power usable by HSDPA and the value does not change later.

Dynamic allocation by RNC means that RNC dynamically adjusts the maximum transmit power usable by HSDPA. In the following three cases, RNC is triggered to re-allocate the total power of HSDPA.

- If congestion is caused by limited HSDPA power, the total power quota can be increased.

- HSDPA total power is dynamically adjusted in light of actual power occupied by an R99 subscriber.
- HSDPA power is dynamically adjusted as a result of overload of a cell.

Free allocation by NodeB: NodeB allocates power to HSDPA service dynamically and quickly depending on the power occupied by the R99 service.

HS-PDSCH measurement power offset is used for the UE to calculate the CQI value for feedback. RNC can be configured with a reasonable HS-PDSCH measurement power offset based on the total power of a cell.

2.1.5 Power Allocation for HSUPA

HSUPA power control includes uplink open loop power control, uplink outer loop power control and downlink open loop power control.

The uplink open loop power control of HSUPA refers to determining the E-DCH MAC-d flow power offset and the power offset (PO) corresponding to the reference E-TFC and reference E-TFC.

The E-DCH MAC-d flow power offset is used to reflect the quality differences among varying services. For example, the power offset of a higher-priority service can be configured to be higher than that of a lower-priority service, so that the quality of the higher-priority service is better. Therefore, different E-DCH MAC-d flow power offsets are configured for different services to reflect differentiated services for configuration principle of E-DCH MAC-d Flow Power Offset.

PO corresponding to the reference E-TFC and reference E-TFC: Once UE selects an E-TFC, it calculates the power needed by the E-TFC on the basis of the reference E-TFC and reference PO.

The principle of uplink outer loop power control of HSUPA is similar to that of outer loop power control of R99, that is, the SIR_{target} used by inner loop power control is adjusted in light of service quality, so as to adjust a subscriber's transmit power. The difference is, however, the service quality here is evalued by the retransmission attempts of FP frames. That is, the more times the FP frame is retransmitted, the worse the channel quality is. In this case, higher SIR_{target} is needed to increase the transmit power; otherwise, lower SIR_{target} is needed to decrease the transmit power.

Downlink open loop power control of HSUPA

In the downlink of HSUPA, the information of E-DCH AG, RG and ACK/NACK is sent to UE. To make sure that UE receives such control information correctly, reasonable E-AGCH/E-RGCH/E-HICH power offset should be configured for these physical channels.

3 Technical Description

3.1 R99 Power Control

3.1.1 Uplink Open Loop Power Control of R99

3.1.1.1 Uplink open loop power control of R99 common channel

- Algorithm

The uplink open loop power control of common channel mainly refers to determining the PRACH transmit power.

In the FDD mode, UE peforms the following operations before it transmits signals to PRACH.

1 UE obtains “Primary CPICH DL TX Power” and “Constant Value” from System information Block type 6 (or System information Block type 5 if type 6 is not broadcast). UE obtains “UL Interference” from System information Block type 7.

2 UE measures and obtains CPICH_RSCP, the channel code power of CPICH.

3 UE calculates the transmit power of the first prefix using the following formula:

Preamble_Initial_Power = Primary CPICH DL TX power – CPICH_RSCP +UL interference + Constant Value (3.1-1)

Where,

– Primary CPICH DL TX power (*PcpichPwr*) is the transmit power of the main pilot channel.

– UL interference is the uplink interference, which is measured and obtained by NodeB and updated in real time in SIB7.

– Constant Value (*ConstVal*) is a value related with the cell environment. It is a value depends on the service rate and quality carried by PRACH.

If parameters in the system’s broadcast information changes, UE calculates the initial transmit power again and submit the result to the physical layer.

When the physical random access process gets started, UE sets the preamble transmit power as Preamble_Initial_Power. If the value of Preamble_Initial_Power exceeds the allowed maximum power *MaxRACHTxPwr,* UE sets the preamble transmit power as the allowed maximum power. If no response (+1 or -1) of AICH is received after the preamble composed of selected signature and scramble is sent out, PRACH selects a new signature in the next timeslot, uses it to form a preamble together with the scramble and sends the preamble again. Next, PRACH increases the preamble transmit power by Power Ramp Step[dB]. If the transmission counter is 0, the access process is existed. If the positive response is received from AICH, the random access message is transmitted. The power of the control part of the random access message is the last transmit power of the preamble plus the offset P p-m [dB].

From the preceding description we get to the formula for calculating the transmit power of the control part of the PRACH message:

$$PRACH\_C\_Power = Preamble\_Initial\_Power + \sum PowerRampStep + P\,p\text{-}m \quad (3.1\text{-}2)$$

Where,

- Power Ramp Step (*PRStep*) is the power offset between two continuous preambles.
- Pp_m (*POPpm[MAX_ PRACH _TFC]*) is the power offset between the control channel and the last preamble of the message part.

In addition, RACH is similar to the uplink DPCH. That is, its data domain and control domain are sent out after being multiplexed with I and Q channels and then added by scramble on the physical layer. Therefore, parameters β_c and β_d (gain factor of the control channel and data channel of the message part) also need to be determined. Either β_c (*BetaC[MAX_ PRACH _TFC]*) or β_d (*BetaD[MAX_ PRACH _TFC]*) is 15.

UL interference can be updated in SIB 7 in two ways, which can be selected with the parameter *SIB7Originator*.

- If *SIB7Originator* takes the value of RNC, NodeB reports the common measurement report of RTWP to RNC. When RNC detects that the change of RTWP is no less than the uplink interference update threshod (*UlInterUpdtTh*), it broadcasts it to UE through the broadcast channel.
- If *SIB7Originator* takes NodeB, NodeB updates the UL interference directly in the system message based on the change of RTWP.

3.1.1.2 Uplink open loop power control of R99 dedicated channel

Uplink open loop power control of the dedicated channel refers to determining the initial transmit power of DPCCH, and determining the gain factor β_c and β_d of the uplink control physical channel and uplink data physical channel.

1 Power configuration of DPCCH:

As required by related standard, UE should start uplink inner loop power control according to the following power level when the first DPCCH is being set up:

DPCCH_Initial_power = DPCCH_Power_offset - CPICH_RSCP (3.1-3)

Where,

– The value of DPCCH_Power_offset is determined by DPCCH open loop power control method.

– The value of CPICH_RSCP is the CPICH channel code power obtained by UE through measurement.

DPCCH_Power_offset is calculated using the following formula:

$$DPCCH\_Power\_Offset = E_b / N_0(dB) + (N_T + I_T)(dBm) - PG(dB) + CPICH\_TX\_Power$$

Where,

– Eb/No is the quality factor of the DPCCH PILOT domain (*DpcchPilotEbN0*).

– NT+IT is the uplink interference, which is obtained by NodeB through measurement and updated in real time in SIB7.

– PG is the spectrum spread gain, 256.

– CPICH_TX_Power(*PcpichPwr*) is the transmit power of the P-CPICH.

Description: The quality factor (*DpcchPilotEbN0*) of the DPCCH PILOT domain depends on the diversity mode and sub-types of service. To obtain *DpcchPilotEbN0*, first obtain the Diversity PC Index (*DivPcIndex*(Utran Cell)) from the configuration items of Utran Cell. Next, in “Power Control Related to Service and Diversity Mode”, query *DivPcIndex* (Power Control Related to Service and Diversity Mode), diversity mode (*TxDivMod*) and sub-service type (SrvType). All parameters related to power control, if depending on the diversity mode and sub-service, can be obtained in this way.

2 How βc and βd (gain factor of uplink control / data physical channel) are determined and configured:

Different strategies are adopted depending on the features of a single service and mixed services:

i For a single service, β_c and β_d are configured directly according to different service rates and different TFCs. It is usually required that either β_c or β_d must be 15. 0~0 list the β_c and β_d values configured in ZTE RNC for several common services in the case of different TFC formats. In the tables, 1×144 is the format of signaling transmission.

Table 3-1 β_c and β_d Values for the UL WAMR6.60k~23.85k Service

TFC Format	β_c	β_d
0×40, 0×405, 0×0, 0×144	15	1
1×40, 0×405, 0×0, 0×144	15	8
1×54, 1×78, 0×0, 0×144	15	11
1×64, 1×113, 0×0, 0×144	15	13
1×72, 1×181, 0×0, 0×144	15	15
1×72, 1×213, 0×0, 0×144	14	15
1×72, 1×245, 0×0, 0×144	14	15
1×72, 1×293, 0×0, 0×144	13	15
1×72, 1×325, 0×0, 0×144	12	15
1×72, 1×389, 0×0, 0×144	12	15
1×72, 1×405, 0×0, 0×144	11	15
0×40, 0×405, 0×0, 1×144	15	8
1×40, 0×405, 0×0, 1×144	15	11
1×54, 1×78, 0×0, 1×144	15	14
1×64, 1×113, 0×0, 1×144	15	15
1×72, 1×181, 0×0, 1×144	13	15
1×72, 1×213, 0×0, 1×144	13	15
1×72, 1×245, 0×0, 1×144	12	15
1×72, 1×293, 0×0, 1×144	12	15
1×72, 1×325, 0×0, 1×144	11	15
1×72, 1×389, 0×0, 1×144	11	15
1×72, 1×405, 0×0, 1×144	11	15

Table 3-2 β_c and β_d Values for the UL NAMR4.75k~12.2k Service

TFC Format	β_c	β_d
0×39, 0×103, 0×60, 0×144	15	1
1×39, 0×103, 0×60, 0×144	15	9
1×42, 1×53, 0×60, 0×144	15	12
1×49, 1×54, 0×60, 0×144	15	12
1×55, 1×63, 0×60, 0×144	15	13
1×58, 1×76, 0×60, 0×144	15	14
1×61, 1×87, 0×60, 0×144	15	14
1×75, 1×84, 0×60, 0×144	15	15
1×65, 1×99, 1×40, 0×144	14	15
1×81, 1×103, 1×60, 0×144	13	15
0×39, 0×103, 0×60, 1×144	15	12
1×39, 0×103, 0×60, 1×144	15	14

TFC Format	β_c	β_d
1×42, 1×53, 0×60, 1×144	14	15
1×49, 1×54, 0×60, 1×144	13	15
1×55, 1×63, 0×60, 1×144	13	15
1×58, 1×76, 0×60, 1×144	12	15
1×61, 1×87, 0×60, 1×144	12	15
1×75, 1×84, 0×60, 1×144	12	15
1×65, 1×99, 1×40, 1×144	11	15
1×81, 1×103, 1×60, 1×144	11	15

Table 3-3 β_c and β_d Values for the UL PS64k streaming/interactive/background Service

TFC Format	β_c	β_d
0×336, 0×144	15	1
1×336, 0×144	15	14
2×336, 0×144	11	15
4×336, 0×144	8	15
0×336, 1×144	15	8
1×336, 1×144	14	15
2×336, 1×144	10	15
4×336, 1×144	8	15

Table 3-4 β_c and β_d Values for the UL PS128k streaming/interactive/background Service

TFC Format	β_c	β_d
0×336, 0×144	15	1
1×336, 0×144	15	14
2×336, 0×144	11	15
4×336, 0×144	8	15
8×336, 0×144	6	15
0×336, 1×144	15	9
1×336, 1×144	14	15
2×336, 1×144	10	15
4×336, 1×144	8	15
8×336, 1×144	6	15

Table 3-5 β_c and β_d Values for the UL PS384k and services with higher rates streaming/ interactive/background Service

TFC Format	β_c	β_d
0×336, 0×144	15	1
1×336, 0×144	11	15
2×336, 0×144	8	15
4×336, 0×144	8	15
8×336, 0×144	6	15
12×336, 0×144	5	15
0×336, 1×144	15	8
1×336, 1×144	10	15
2×336, 1×144	8	15
4×336, 1×144	8	15
8×336, 1×144	6	15
12×336, 1×144	5	15

ii For mixed service, the β_c and β_d values are calculated by RNC and configured for UE.

3 Calculation of βc and βd for mixed services

Suppose to mix service A and service B (including signaling). (1) For the transmission combination (TFC_{multi}) when service A and B are being combined, calculate the number of bits per frame mapped to the transport channel by each service according to the transmission format indication (TFI_i) of each service corresponding to TFC_{multi}. (2) Select the service with the most bits transmitted by a frame as the reference service, and the service corresponding to the TFI that is corresponding to TFC_{multi} as the reference service. (3) Take β_c and β_d corresponding to TFC_{single} (formed by TFI_i of the selected reference service) as the reference β_c and β_d. (4) Use the following formula to calculate and obtain the β_c and β_d corresponding to this TFC_{multi}.

$$A_j = \frac{\beta_{d,ref}}{\beta_{c,ref}} \cdot \sqrt{\frac{L_{ref}}{L_j}} \sqrt{\frac{K_j}{K_{ref}}} \qquad (3.1\text{-}5)$$

- If $A_j > 1$, make $\beta_{d,j} = 1.0$, $\beta_{c,j}$ is of the maximum quantified value that satisfies the condition of $\beta_{c,j} \le 1 / A_j$. Note: If $\beta_{c,j}$ =0 is obtained, then make $\beta_{c,j}$ =1/15.
- If $A_j \le 1$, then $\beta_{d,j}$ is of the minimum quantified value that satisfies the condition of $\beta_{d,j} \ge A_j$, while $\beta_{c,j} = 1.0$.

Where,

– $\beta_{c,ref}$ and $\beta_{d,ref}$ are the gain factors corresponding to the above mentioned TFC_{single}; $\beta_{c,j}$ and $\beta_{d,j}$ are the gain factor corresponding to the j^{th} type of TFC_{multi}.

– L_{ref} is the number of dedicated physical channels needed by the number of bits to be sent out in the case of TFC_{single}.

– $L_{,j}$ is the number of dedicated physical channels needed by the number of bits to be sent out in the case of TFC_{multi}.

– $$K_{ref} = \sum_i RM_i \cdot N_i$$

Where: RM_i is the semi-static rate matching factor of transport channel i in the TFC_{single} combination; N_i is the number of bits mapped from transport channel i to a radio frame before rate matching is performed; ∑ refers to sum up all transport channels in the TFC.

– $$K_j = \sum_i RM_i \cdot N_i$$

Parameters in this formula take the same meanings as those in the previous formula. But ∑ refers to sum up all transport channels in the TFC_j (TFC_{multi}).

4 To ensure that the power of the data channel reaches the required value before data is sent out, the power control preamble is sent before data transmission on the uplink dedicated channel. In addition, closed loop power control is already being performed while the power control preamble is sent out. Length of the preamble depends on DpcchPcpLen. At the same time, while starts to send uplink DPDCH data, no signaling ranging RB0~RB4 is included in the first several frames. The number of delayed signaling frames depends on SrbDelay.

3.1.1.3 Uplink Open Loop Power Control of R99 in Compressed Mode

The gain factors $\beta_{c,C,j}$ and $\beta_{d,C,j}$ corresponding to a certain TFC used by the compressed frame in the compressed mode are obtained from β_c and β_d used by radio frames in normal mode. The formula for calculation is as follows:

$$A_{C,j} = A_j \cdot \sqrt{\frac{15 \cdot N_{pilot,C}}{N_{slots,C} \cdot N_{pilot,N}}} \qquad (3.1\text{-}21)$$

Where,

– A_j is the ratio of β_d and β_c in normal mode.

– $A_{C,j}$ is the ratio of $\beta_{d,C}$ and $\beta_{c,C}$ in compressed mode.

- $N_{pilot,C}$ is the number of pilot bits per timeslot in the compressed frame in compressed mode
- $N_{pilot,N}$ is the number of pilot bits per timeslot in normal mode.
- $N_{slots,C}$ is the number of timeslots used for data sending in the compressed frame in compressed mode.

$A_{C,j}$ is obtained with the previous formula when the current frame is compressed. The following rules is then used to obtain the values of $\beta_{d,c,j}$ and $\beta_{c,C,j}$.

- If $A_{C,j} > 1$, then $\beta_{d,C,j} = 1.0$, $\beta_{c,C,j}$ is of the maximum quantified value that satisfies the condition $\beta_{c,C,j} \leq 1 / A_j$. Note: If $\beta_{c,C,j} = 0$ is obtained, then make $\beta_{c,C,j} = 1/15$.
- If $A_{C,j} \leq 1$, then $\beta_{d,j}$ is of the minimum quantified value that satisfies the condition $\beta_{d,j} \geq A_j$, while $\beta_{c,j} = 1.0$.

3.1.2 Downlink Open Loop Power Control of R99

3.1.2.1 Configuration of R99 downlink common channel initial power

In the downlink direction, the initial transmit power of P-CPICH, S-CPICH, P-CCPCH, SCH, AICH, PICH and S-CCPCH should be configured. These channels are downlink common physical channels.

The transmit power (*PcpichPwr*) of P-CPICH depends on the proportion of maximum transmit power of a cell. The values of P-CCPCH, P-SCH (*PschPwr*), S-SCH (*SschPwr*), AICH (*AichPwr*), and PICH (*PichPwr*) depend on the offset to P-CPICH (*PcpichPwr*). BCH is mapped one-to-one to P-CCPCH physical channel. P-CCPCH power is same with the power of BCH (*BchPwr*). Presently, S-CPICH power (*ScpichPwr*) S-CPICH power (*ScpichPwr*) is based on the coverage of MIMO cell.

As the physical channel S-CCPCH bears the transport channel of PCH and FACH, and the number of FACH channels beared is variable, the transmit power (*PchPwr*) of each PCH and the maximum transmit power (*MaxFachPwr*) allowed for each FACH beared by a certain S-CCPCH is specified in related protocol. As the data rate of PCH is invariable, the transmit power of PCH is determined by the fixed rate. The transmit power of FACH is determined by the maximum data rate beared by this FACH. For different rates, the transmit power can be measured in actual environment. The transmit power of the data domain of S-CCPCH depends on the PCH transmit power and the maximum value of the maximum transmit power of FACH beared on S-CCPCH. The transmit power of the TFCI domain and Pilot domain of S-CCPCH are indicated respectively by the offsets (*PO1* and *PO3*) as opposed to the transmit power of the data domain.

3.1.2.2 Downlink open loop power control of R99 dedicated channel

The transmit power of downlink dedicated physical channel is related with the load of cell, interference, path losses, and rate of bearer service. In related protocol, the initial transmit power of a specific dedicated channel is for physical channel. Therefore, the initial transmit power should be calculated separately for single services and mixed services. At present, the estimation power algorithm based on CPICH Ec/N0 is adopted for calculating the initial transmit power.

1 Initial power of downlink dedicated channel

When a subscriber is accessing or being handover, and a downlink dedicated physical channel should be set up for this subscriber. RNC should configure the downlink initial transmit power for NodeB. The strategy for configuring the initial transmit power of downlink dedicated channel affects the performance of links and capacity of the system.

The following formula is used to calculate the initial transmit power:

$$P_{tx,init} = \frac{\beta}{PG} \cdot \left[\frac{P_{tx,CPICH}}{E_{c-cpich}/N_0} - \left(\alpha_{\min} + \frac{\alpha_{\max} - \alpha_{\min}}{1 + k \cdot 10^{\frac{L-k1}{k2}}} \right) \cdot P_{tx,total} \right] + \mathrm{PowerOffset} \qquad (3.1\text{-}22)$$

Where,

– PG is the service processing gain, that is, W/R, W being 3.84M while R being the bit rate of the service.

– $P_{tx,CPICH}$ is transmission power of the CPICH (dBm)

– $E_{c-cpich}/N_0$ is CPICH Ec/N0(dB) reported by the UE.

– α min is the lower limit of the downlink orthogonal factor (MinOrthogFactor). Its description and value can be found in *ZTE UMTS Admission Control Feature Guide.*

– α max is the upper limit of the downlink orthogonal factor (MaxOrthogFactor). Its description and value can be found in *ZTE UMTS Admission Control Feature Guide.*

– k is the coefficient factor. Its fixed value is 0.01.

– *L* represents path loss. *L* is obtained from the measurement result reported by the UE. If *L* cannot be obtained from the measurement result, its value is 130dB.

The following table describes the rule for obtaining *L* from the measurement result reported from the UE.

If the reported value RptP of the UE is Pathloss, $L=Value_{pathloss}$.

If the reported value RptP of the UE is RSCP, $L= P_{PCPICH} - Value_{RSCP}$. The P_{PCPICH} refers to the transmit power of the PCPICH.

– k1 and k2 are scenario parameters. The values of parameters k1 and k2 vary with the specific scenarios, including densely-populated urban area, suburban area, rural area.

Dense Urban	Urban	Suburb	Rural
K1= -32.9116	K1=-53.5116	K1=-51.1716	K1=-48.8116
K2=-33.5849	K2=-25.8549	K2=-22.8249	K2=-21.5249

– $P_{tx,total}$ is the total transmit power of a cell before a subscriber accesses the cell. It is obtained from the common measurement report: TCP- Transmitted Carrier Power. Note: for HS cell, $P_{tx,total}$ is the valid load of TCP, and obtained through Node B common measurement report of HS-DSCH Required Power and Transmitted carrier power of all codes not used for HS ($NOHSDSCHPower + \sum_{Spi=0}^{MaxSpi} HSDSCHRequiredPower_{Spi}$).

– β=10^((Eb/N0)/10), where Eb/No is the Eb/No of the sub-service configured corresponding to the current rate of the access service. Typical values of Eb/No are:

Traffic Class	Data Rate	Downlink Traffic Eb/N0 (dB)
Conversational	DL WAMR6.60k~23.85k	7.5
Conversational	DL 64K(PS Conversational Video)	5.2
Conversational	DL NAMR4.75k~12.2k	7.5
Streaming	PS64k	1.7
Streaming	PS384k	0.9
Streaming	PS128k	0.9
Interactive	PS64k	4.8
Interactive	PS384k	0.9
Interactive	PS128k	4.5
Background	PS64k	1.7
Background	PS384k	4.7
Background	PS128k	0.9
Streaming	CS64k	1.7
Interactive	PS8k	6.9
Background	PS8k	6.9

– PowerOffset is different for different situation as following:

– i. Add RL in SRNC.

Situation of Adding RL in SRNC	PowerOffset
Call Setup	POSetup
Soft or Softer Handover	POSoftHO
RAB Hard Handover (RAB on DCH)	PORabHardHO
Incoming Relocation (RAB on DCH)	
CELL_FACH or CELL_PCH Transfer to CELL_DCH state (RAB on DCH)	
Hard Handover for only SRB on DPDCH	POSrbHardHO
Hard Handover for F-DPCH	
CELL_FACH or CELL_PCH Transfer to CELL_DCH state (RAB on HS-DSCH)	
Call Re-Establishment	POReEstablish

– ii. Add RL in DRNC.

Situation of Adding RL in DRNC	PowerOffset
Add RL with RAB on DPDCH	POSoftHO
Add RL for F-DPCH transmission and without service on this RL	
Add RL with SRB on DPDCH	POSrbHardHO
Add RL for F-DPCH transmission and with service on this RL	

– iii. For radio link reconfiguration, if need to calculate the initial power again, the PowerOffset is 0.

To avoid too large power occupation of the dedicated channel, the maximum (*MaxDlDpchPwr*) and minimum (*MinDlDpchPwr*) values of DPCH are specified in 3GPP protocol.

In order to show the differentiation of different basic priority users, the actual maximum allowed downlink DPCH transmission power is:

MaxDlDpchPwrBP = *MaxDlDpchPwr* + DL_Power_offset;

Where, DL_Power_offset is the power offset of the maximum downlink DPCH transmission power, it is decided by the basic priority of the service. For a service, after the basic priority is made sure, the DL_Power_offset can be obtained form the array of *MaxDlDpchPO[MAX_BP]*. The element of the *MaxDlDpchPO[MAX_BP]* array is configured based on basic priority. The higher basic priority of the user, the bigger power offset of the the maximum downlink DPCH transmission power.

To calculate the transmit power of downlink dedicated physical channel for mixed services, first obtain the transmit power (data part) ^{j}DPCH_POWER needed to transmit each service with the calculation method used for single service. Next calculate the initial transmit power of DPCH for mixed services based on the transmit power needed for each service. The formula is given as follows:

$$DPCH\_Initial\_Power = \sum_{j=1}^{N} {}^{j}DPCH\_Power \qquad (3.1\text{-}23)$$

On the DPCH, the bits of TFCI, TPC and PILOT are also multiplexed besides the data bits because the information carried by these bits is important. Therefore, the needed power is also a little higher than that of the data domain. The power value depends on the offset as opposed to the power of the data domain and is indicated with PO1 (*DpchPO1*), PO2 (*DpchPO2*) and PO3(*DpchPO3*) respectively.

In the condition that the dynamic update PO2 switch (*DynaUpdtPO2Stch*) turned on, dynamic update the PO2 as following: Get the PO2(*DpchPO2*)value based on DPCH data rate and traffic class, if DPCH bears multi-services, get the *DpchPO2* value respectively for each service, and then get the minimum value. And then the *DpchPO2* value is send to Node B through control frame. If the DPCH data rate is changed, then get the new PO2, and send the new PO2 to Node B. In this way, PO2 dynamic update is achieved.

The parameters involved in this section, such as *MaxDlDpchPwr*, *MinDlDpchPwr, DpchPO1, DpchPO2* and *DpchPO3,* are related with the diversity mode and sub-service types. To obtain the parameters, first, obtain the Diversity PC Index (*DivPcIndex* (Utran Cell)) from the configuration items of Utran Cell. Next, query *DivPcIndex* (Power Control Related to Service and Diversity Mode), *TxDivMod* and SrvType in “Power Control Related to Service and Diversity Mode”.

2 Related Measurement

TCP: Transmitted Carrier Power. The internal measurement value of NodeB is obtained from the public measurement report and reported to RNC. The measurement is started after the cell is set up and the public transport channel of cell is set up, and ended after the cell is deleted. CPICH Ec/N0 is the SNR for reception of CPICHWhen a service is set up, the measurement result carried in the RRC connection request is used. In the case of handover, the measurement result of intra-frequency or inter-frequency measurement report is used.

3.1.2.3 Downlink open loop power control of R99 in compressed mode

As the adjustment proportion of DPDCH transmit power is the same as that of the control domain for the downlink compressed mode, it is unnecessary to change the values of PO1, PO2 and PO3. That is, the power offset between the control part and data part in the compressed mode is the same as that in normal mode.

3.1.3 Uplink inner loop power control of R99

3GPP TS 25.214 specifies the following methods for calculating inner loop power control.

- At the receiving end, first, the SIR measurement (SIR=Eb/No) is done for each received radio link. Next, the measurement result is compared with the target SIR (SIR_{target}) required by the service.
- If SIR ≥ SIR_{target}, control information is returned to the sender with a transmit power command (Transmitted Power Control-TPC) whose bit value is 0.
- If SIR < SIR_{target}, a TPC command whose bit value being 1 is returned through the downlink control channel to the sender.
- The sender judges whether to increase or decrease the transmit power depending on the received TPC command and specified power control algorithm. The adjustment extent = TPC_cmd×TPC_STEP_SIZE (*TpcStepSize*).

This section discusses how to select the proper inner loop power control algorithm, as the principles of inner loop power control between uplink and downlink are same.

Description of TPC: When UTRAN and UE setup the first radio link, before uplink synchronization, UTRAN could not work out the TPC in normal way. So UTRAN send fixed TPC pattern in TPC bit of the downlink DPCH. The TPC pattern shall consist of *DlTpcN* instances of the pair of TPC commands ("0" ,"1"), followed by one instance of TPC command "1". The TPC pattern continuously repeat but shall be forcibly re-started at the beginning of each frame where CFN mod 4 = 0. And the TPC pattern shall terminate once uplink synchronisation is achieved, and the TPC command.

3.1.3.1 Uplink inner loop power control of R99 in normal mode

There are two uplink inner loop power control algorithms (*UlIlPcAlg*), which are described as follows.

- Algorithm 1 (*UlIlPcAlg* =1):

  With algorithm 1, the transmit power of sender can be adjusted in every timeslot. Each timeslot, the receiver judges, whether to increase or decrease the transmit power of the sender depending on the received TPC command,.

  Rules for UE to combine the TPC command are as follows:

  – Suppose the TPCs of all radio link sets are 1, then TPC_cmd=1 (to increase transmit power).

  – Suppose one TPC coming from any radio link set is 0, then TPC_cmd=-1 (TPC being 0 indicates the transmit power should be decreased).

- Algorithm 2 (*UlIlPcAlg* =2):

With algorithm 2, the transmit power of sender is adjusted once every five timeslots. Rules for UE to combine TPC command are (when single TPC or several TPCs are received in one timeslot):

When a single TPC is received: Transmit power is not adjusted in the first four timeslots (TPC_cmd=0). When the TPC command of the 5^{th} timeslot is received, a soft decision is made: TPC_cmd=1 if all five received TPC commands are 1; TPC_cmd=-1 if all five received TPC commands are 0; TPC_cmd=0 in other cases.

When several TPCs are received: Transmit power is not adjusted in the first four timeslots of the five continuous timeslots (TPC_cmd=0). At the 5^{th} timeslot, first determine TPC_i (i=1,2,…,N, N is the number of radio link TPC commands from different radio link sets). Next, combine the TPC command respectively as when a single TPC is received to obtain N number of temporary TPC commands (TPC_temp). Finally, combine TPC_cmd in the following rule:

– If $\frac{1}{N}\sum_{i=1}^{N} TPC\_temp_i > 0.5$, then TPC_cmd =1.

– If all TPC_temp_i is -1, then TPC_cmd = -1.

– In other cases, TPC_cmd =0.

Description: TPC_cmd =1 indicates to increase the transmit power; TPC_cmd =-1 indicates to decrease the transmit power; TPC_cmd =0 indicates not to adjust the transmit power.

Principle for selecting the inner loop power control algorithm:

- Algorithm 1 is to perform inner loop power control at each timeslot, while algorithm 2 is to perform inner loop power control only once every five timeslots. That is, the frequency is higher to perform inner loop power control in algorithm 1, When the environment of mobile communication is quite infavorable and the channel fades very quickly, algorithm 1 helps the transmit power to converge fast to meet the service quality requirement.

- With algorithm 2, the inner loop power control is performed every five timeslots, that is, the frequency is lower to perform inner loop power control in algorithm 2. So algorithm 2 is applicable when the environment of mobile environment is quite favorable (the MS is or will be in static state, for instance) and the channel fades slowly or hardly fade.

- With algorithm 1, when the TPC command is received, the transmit power is either increased or decreased. With algorithm 2, the transmit power is increased, decreased or not changed after a soft decision is made for the TPC command at five different timeslots. In the respect, algorithm 1 is more applicable in the case when the channel needs the transmit power to be increased or decreased fast since it is fading fast.

- In cases when the channel fades rather slowly, algorithm 2 is more applicable because the BLER is good enough in a long period even if the transmit power is not changed during this period and the measured SIR changes very little as opposed to the target SIR.

Description:

- When uplink inner loop power control is being performed, the transmit power calculated by UE can exceed the maximum transmit power of uplink DPCH (*MaxUlDpchPwr*). In this case, UE can only transmit with this configured maximum transmit power. In order to show the differentiation of different basic priority users, the actual maximum allowed uplink DPCH transmission power is:

MaxUlDpchPwrBP = *MaxUlDpchPwr* + UL_Power_offset;

Where, UL_Power_offset is the power offset of the maximum uplink DPCH transmission power, it is decided by the basic priority of the service. For a service, after the basic priority is made sure, the UL_Power_offset can be obtained form the array of *MaxUlDpchPO[MAX_BP]*. The element of the *MaxUlDpchPO[MAX_BP]* array is configured based on basic priority. The higher basic priority of the user, the bigger power offset of the the maximum uplink DPCH transmission power.

- *UlIlPcAlg* depends on sub-service types and it is obtained in this way: First, the service-related power control parameter configuration index (*TrfPcIndex* (Utran Cell)) is obtained from the configuration item of Utran Cell. Next, query *TrfPcIndex* (Traffic-Related Power Control) and SrvType in "Traffic-Related Power Control". All service-related power control parameters can be obtained in the same way.

3.1.3.2 Uplink inner loop power control of R99 in compressed mode

The principle of inner loop power control in compressed mode is the same as that in normal mode. That is, a service cell (a cell in the active set) estimates the received SIR_{est} of uplink DPCH, and one TPC command is produced and sent in each timeslot except the downlink transmission gap according to following rules. The rules are: If $SIR_{est} > SIR_{cm\_target}$, then the TPC command is 0; if $SIR_{est} < SIR_{cm\_target}$, then the TPC command is 1. SIR_{cm_target} is the target SIR value during the period when the compressed mode is adopted.

Way to determine SIR_{cm_target}:

$$SIR_{cm\_target} = SIR_{target} + \Delta SIR_{PILOT} + \Delta SIR1\_coding + \Delta SIR2\_coding \qquad (3.1\text{-}24)$$

Where,

- SIR_{target} is the target SIR in normal mode.
- $\Delta SIR_{PILOT} = 10Log_{10} (N_{pilot,N}/N_{pilot,curr\_frame})$:
  - $N_{pilot,curr\_frame}$ is the number of pilot bits per timeslot in the current uplink link frame.
  - $N_{pilot,N}$ is the number of pilot bits per timeslot in normal mode without transmission gap.
- ΔSIR1_coding and ΔSIR2_coding are obtained from the parameters of high-level signal configuration, that is, DeltaSIR1, DeltaSIR2, DeltaSIRafter1 and DeltaSIRafter2 can be calculated using the following methods.
  - If the current uplink link frame contains the start of the first transmission gap of the “transmission gap pattern”, then: ΔSIR1_coding = DeltaSIR1 (2.3dB).
  - If the current uplink link frame contains the next frame to the start of the first transmission gap of the ”transmission gap pattern”, then: ΔSIR1_coding = DeltaSIRafter1 (0.3dB).
  - If the current uplink link frame contains the start of the second transmission gap of the ”transmission gap pattern”, then: ΔSIR2_coding = DeltaSIR2 (0dB).
  - If the current uplink link frame contains the next frame to the start of the second transmission gap of the ”transmission gap pattern”, then: ΔSIR2_coding = DeltaSIRafter2 (0dB).
  - In other cases, ΔSIR1_coding = 0 dB and ΔSIR2_coding = 0 dB.

As one TGPS (transmission gap pattern sequence) can have only one measurement value but UE can measure several values at the same time, multi compressed modes can be activated at the same time in one radio frame. In this case, the ΔSIR1_coding and ΔSIR2_coding corresponding to each compressed mode can be calculated first and then summed up to obtain the final available ΔSIR1_coding and ΔSIR2_coding.

$$\Delta SIR1\_coding = \sum_{i=1}^{N} \Delta SIR1\_coding, i$$

$$\Delta SIR2\_coding = \sum_{i=1}^{N} \Delta SIR2\_coding, i$$

Where: N is the type of compressed modes activated at the same time in one radio frame.

Because no TPC command is sent in the timeslot of the transmissin gap in the downlink compressed frame, UE sets TPC_cmd to 0 in corresponding receiving timeslot.

Because of the existence of transmission gap of compressed frame in compressed mode, the format of timeslot used in compressed mode is different from that in normal mode. As a result, the number of pilots of each timeslot of the uplink DPCCH may differ between compressed mode and non- compressed mode. To offset the changes in total power of pilot signals, the transmit power of uplink DPCCH should be changed. Therefore, at the start of each timeslot, UE calcualtes the power adjustment volume Δ_{PILOT}.

If the number of pilots per timeslot of uplink DPCCH is different from that already sent in the previous timeslot, then Δ_{PILOT} (dB) is obtained using the following formula:

$$\Delta_{PILOT} = 10\mathrm{Log}_{10}(N_{pilot,prev}/N_{pilot,curr});$$

Where,

– $N_{pilot,prev}$ is the number of pilot bits of the previous timeslot.

– $N_{pilot,curr}$ is the number of pilot bits of the current timeslot.

Otherwise, $\Delta_{PILOT}=0$.

3.1.4 Downlink Inner Loop Power Control Of R99

3.1.4.1 Downlink inner loop power control of R99 in normal mode

In the case of the downlink inner loop power control, UTRAN adjusts the current downlink power $P(k\text{-}1)$ to the new transmit power $P(k)$ according to the following formula when it estimates the k^{th} number of TPC command.

$$P(k) = P(k - 1) + P_{TPC}(k) + P_{bal}(k) \qquad (3.1\text{-}25)$$

Where,

– $P_{TPC}(k)$ is the k^{th} number of power adjustment volume in the process of inner loop power control.

– $P_{bal}(k)$ is a correction value obtained according to the downlink power control process. It is used to balance the power of radio link so that the value can approach a common reference power.

Two power control modes are also available to determine $P_{TPC}(k)$:

- Mode 1: UE sends a TPC command at each timeslot. The UTRAN adjusts the transmit power at each timeslot according to the TPC command.

- Mode 2: UE sends the same TPC command for three timeslots. The UTRAN adjusts the transmit power once every three timeslots according to the TPC command.

ZTE RNC also considers the requirement of power increase limits at the same time for downlink inner loop power control. The value of $P_{TPC}(k)$ is determined according to the following principle:

$$P_{TPC}(k) = \begin{cases} +\Delta_{TPC} & \text{if } \mathrm{TPC_{est}}(k) = 1 \text{ and } \Delta_{sum}(k) + \Delta_{TPC} < \mathrm{Power\_Raise\_Limit} \\ 0 & \text{if } \mathrm{TPC_{est}}(k) = 1 \text{ and } \Delta_{sum}(k) + \Delta_{TPC} \geq \mathrm{Power\_Raise\_Limit} \\ -\Delta_{TPC} & \text{if } \mathrm{TPC_{est}}(k) = 0 \end{cases}$$

$$\Delta_{sum}(k) = \sum_{i=k-\mathrm{DL\_Power\_Averaging\_Window\_Size}}^{k-1} P_{TPC}(i)$$

(3.1-26)

Where, Δ_{TPC} is the power adjustment step (*TpcDlStep*), and Power_Raise_Limit is *PwrRaisLim*.

Since for the algorithm of downlink inner loop power control, the transmit power is also adjusted once for one or three timeslots, the selection of this algorithm also depends on the channel fading status. That is, algorithm 1 is for fast channel fading and algorithm 2 for slow channel fading. The reason for such selection principle is similar to that of uplink inner loop power control. At present, ZTE RNC is only support UE send TPC command at each timeslot.

3.1.4.2 Downlink inner loop power control in compressed mode

The inner loop power control of UE in compressed mode works in the same way as that in normal mode, except that both downlink DPDCH and DPCCH stop transmission during the transmission gap of compressed frames.

The transmit power of the first timeslot after the transmission gap of DPCCH is the same as that of the timeslot prior to the transmission gap.

During the period when the compressed mode is adopted, the UTRAN adjusts the current downlink transmit power $P(k\text{-}1)$ [dB] of each timeslot except the downlink transmission gap to a new power value $P(k)$ [dB] based on the TPC command received at the number $k\text{-}1^{th}$ timeslot and the following formula.

$P(k) = P(k - 1) + P_{TPC}(k) + P_{SIR}(k) + P_{bal}(k)$ (3.1-27)

Where,

– $P_{TPC}(k)$ is the k^{th} time of power adjustment value according to inner loop power control.

– $P_{SIR}(k)$ is the k^{th} time of power adjustment value used for the reason that in compressed mode, the downlink SIR_{Target} changes as opposed to that in normal mode (this change is reflected in inner loop instead of outer loop).

– $P_{bal}(k)$ [dB] is a correction value obtained according to the downlink power control process. It is used to balance the power of radio link so that the value can approach a common reference power.

Because of the existence of transmission gap in uplink compressed frames, the uplink TPC command may fail to be received. In this case, NodeB sets $P_{TPC}(k)$ as 0. Otherwise, $P_{TPC}(k)$ is calculated in the same way as that in normal mode except that Δ_{TPC} is replaced with Δ_{STEP} in the formula.

During the recovery period (RPL number of timeslots) of the transmission gap, the common power transmission control algorithm is adopted but $\Delta_{STEP}=\Delta_{RP\text{-}TPC}$. In a non-recovery period, $\Delta_{STEP} = \Delta_{TPC}$.

Where,

– RPL is the length of the recovery period that is expressed in number of timeslots. RPL=minimum (out of the transmission gap length, 7). If the next transmission gap starts again before the recovery period ends, then the recovery period ends at the start of the next transmission gap. RPL depends on the length of the new transmission gap. RPL=7.

– $\Delta_{RP\text{-}TPC}$ is the step (dB) of power control during the recovery period. $\Delta_{RP\text{-}TPC}$ =minimum (3dB, $2\Delta_{TPC}$).

Power offset $P_{SIR}(k) = \delta P_{curr} - \delta P_{prev}$, δP_{curr} and δP_{prev} respectively indicate the δP value of the current timeslot and the latest transmission timeslot. The formula for calculating δP is as follows:

δP=max (ΔP1_compression,…,ΔPn_compression) + ΔP1_coding + ΔP2_coding

Where: n is the type of TTI length of all TrCHs multiplexed to a CCTrCH. ΔP1_coding and ΔP2_coding are obtained from the uplink parameters, including DeltaSIR1, DeltaSIR2, DeltaSIRafter1 and DeltaSIRafter2, which are notified by the upper level and also according to following relations:

– If the current frame contains the start of the first transmission gap, then ΔP1_coding = DeltaSIR1 (2.3dB).

– If the current frame is next to the frame that contains the start of the first transmission gap, then ΔP1_coding = DeltaSIRafter1 (0.3dB).

- If the current frame contains the start of the second transmission gap, then ΔP2_coding = DeltaSIR2 (0dB).
- If the current frame is next to the frame that contains the start of the second transmission gap, then ΔP2_coding = DeltaSIRafter2 (0dB).
- In other cases, ΔP1_coding = 0 dB, ΔP2_coding = 0 dB.

ΔPi_compression is defined as follows:

- If the compressed mode with half spectrum spread factor is adopted, ΔPi_compression = 3 dB.
- In other cases, ΔSIR_compression = 0.

When several compressed modes are used at the same time, δP of each compressed mode is calculated separately. The δP adopted for the current frame is the summation of all δP values.

No transmit power of any timeslot in compressed mode can be higher than the allowed maximum transmit power or lower than the allowed minimum transmit power.

ΔSIR_compression is used to offset the influence of high SIR needed by the rate increase of transmission bit in compressed mode.

3.1.5 Uplink Outer Loop Power Control of R99

Outer loop power control differs between uplink and downlink directions. The downlink outer loop power control is realized in the UE and it is unrelated with RNC. This section describes the uplink outer loop power control algorithm in the UTRAN only. The principle is: The initial SIR_{Target} value (*ULInitSIR*) is determined upon service access, and the quality information (such as CRCI and BLER) is obtained from the measurement report and produce the decision command. If adjustment is necessary, SIR_{Target} is adjusted slowly and the signaling OUTER LOOP PC is used to notify NodeB. NodeB compares the SIR in the dedicated measurement report with the latest SIR_{Target} and makes the single link SIR approach to SIR_{Target} through inner loop power control. In this way, the service quality will not fluctuate drastically in a changing radio environment. The outer loop power control algorithm based on threshold report is adopted in ZTE RNC. The threshold report algorithm is described as follows.

1 CRC-based outer loop power control algorithm

The principle of the CRC-based outer loop power control algorithm is: The number of error blocks is counted acording to the CRC result of transport channel. In addition, total number of transmitted data blocks is also counted (referred to as error block tolerance counter).

Principle for increase: When the tolerance BLER period (*BLERAccpPeriod*) (with its unit being number of data blocks, instead of a time measurement unit) has not expired yet, but the number error blocks has already exceeded the error transport block number threshold (*ErrorThresh*), now increase SIR_{Target} (meanwhile, clear the error block counter and error block tolerance counter to 0).

Principle for decrease: When the error block tolerance counter is no less than the tolerance BLER period (*BLERAccpPeriod*), (1)decrease SIR_{Target} if now the received number of error blocks is less than the error transport block number threshold (*ErrorThresh*);(2)keep the SIR_{Target} same if now the received number of error blocks equals to the error transport block number threshold (*ErrorThresh*). The principle of configuring error block tolerance period is related with *BLERtarget*. The error transport block number threshold (*ErrorThresh*) is the number of error blocks that satisfies comunication quality requirement within the tolerance BLER period (*BLERAccpPeriod*). After SIR_{Target} is decreased, it is necessary to clear the error block counter and error block tolerance counter to 0.

ErrorThresh. and *BLERAccpPeriod* corresponding to different *BLERtarget* values and different uplink traffic are listed in the following table.

Traffic	BLERtarget	ErrorThresh	BLERAccpPeriod
UL 3.4k Signaling	1%	1	200
UL 64K(PS Conversational Video)	0.1%	1	700
UL384K(PS)	1%	2	500
Other uplink services	1%	2	250

Here the step (*UlSirTargUpStep*) for increasing SIR_{Target} can be set to a value greater than the step (*UlSirTargDnStep*) for decreasing the SIR_{Target}. For example, the increase step is 0.3dB, the decrease step is 0.1dB. Different QoS are reflected in the values of tolerance BLER period (*BLERAccpPeriod*) and error transport block number threshold (*ErrorThresh*).

As the loop delay is at least 4~5 frames, the effect of increase will be shown after 4~5 frames. Therefore, if CRC indication error occurs again in 4~5 frames after the increase, no error block is counted (a shield period (*CoverPrd*) is used here to shield out the adjustment function). If the CRCI indication error occurs again after the shield period expires, the error blocks are counted again. If no CRC error is detected during the shield period, the counter is decreased by 1. Next the decrease counter is checked to see whether it has reached the period of SIR_{Target} decrease. If yes, SIR_{Target} is decreased; if no, SIR_{Target} is kept unchanged.

To prevent that SIR_{Target} is increased or decreased too much, the maximum value (*ULMaxSIR*) and minimum value (*ULMinSIR*) of SIR_{Target} is configured in the OMCR. If the calculated SIR_{Target} is greater than *ULMaxSIR* or smaller than *ULMinSIR*, *ULMaxSIR* or *ULMinSIR* will be taken as a result.

2 Outer loop power control combination strategy for mixed services

The common outer loop power control algorithm described above is designed for one transport channel. For mixed services (that is, several transport channels are multiplexed to one CCtrCH), some special treatment is needed for the outer loop power control algorithm.

For mixed services (that is, several transport channels are multiplexed to one CCtrCH), if any one service type fails to satisfy the service quality requirement, SIR_{Target} is increased. SIR_{Target} is not decreased unless all services valid for statistics indicate to decrease SIR_{Target}. Services invalid for statistics are excluded from the combination of power control. Services invalid for statistics are those services that cannot serve as the reference for SIR_{Target} adjustment because their data volume is not enough. If a service do not have enough data volume, it means the total number of packets received in the valid time window (*ValidTimeWin*) is smaller than the error block tolerance period for the service.

3.1.6 Downlink Outer Loop Power Control of R99

The downlink outer loop power control is realized in the UE. RNC provides *BLERtarget* to UE.

BLERtarget corresponding to different downlink traffic are listed in the following table.

Traffic	BLERtarget
DL CS 64kbps Conversational	0.1%
DL PS Conversational Video	0.1%
Other downlink services	1%

For F-DPCH, TPC command error rate target (*TpcErrTarget*) should be provided, it is used for adjusting SIR target of F-DPCH.

3.1.7 R99 CS AMR Service BLER Target Adjustment

Adjust the BLER target of the R99 CS AMR service based on the cell load is aimed at balancing the service quality and cell capacity. When cell load is low, reduce the BLER target of AMR service, it will make the best of the resource, and the service performance quality is good. And when cell load is high, increase the BLER target of AMR service, it will decrease the power and reduce the resource be used, in this way, more users can be admitted.

3.1.7.1 Algorithm Description

When the switch for R99 CS AMR service BLER target adjustment (*BlerAdjustSwitch*) is open, the outer loop power control (OLPC) parameters of R99 AMR service are get based on the cell load, in this way R99 CS AMR service adjust its BLER target dynamically. The cell load thresholds and the OLPC parameters related to cell load status is described as following.

i. Uplink;

Uplink Load	Error Transport Block Number Threshold	Tolerance BLER Period
Uplink Load< *DlHighLd*	*ErrorThresh*	*BLERAccpPeriod*
Uplink Load >= *DlHighLd*	*ErrorThreshHLd*	*BLERAccpPerHLd*

ii. Downlink;

Downlink Load	Downlink BLER Target
Downlink Load< *DlHighLd*	*BLERtarget*
Downlink Load >= *DlHighLd*	*BLERtargetHLd*

For R99 cell, the uplink load is calculated based on TCP from the common measurement report, and downlink load is calculated based on RTWP. For HSDPA cell, the downlink load is calculated based on NoHsPower+Σ HsRequiredPower. And for HSUPA cell, the uplink load is uplink effective load. The load calculation please refer to *ZTE UMTS Overload Control Feature Guide.*

When the switch for R99 CS AMR service BLER target adjustment (*BlerAdjustSwitch*) is closed, it means no need to adjust the BLER target of R99 AMR service. In this condition, the error transport block number threshold is *ErrorThresh*, tolerance BLER period is *BLERAccpPeriod*, and downlink BLER target is *BLERtarget.*

3.1.7.2 Related measurement

- *Transmitted Carrier Power*
- *Transmitted carrier power of all codes not used for HS-PDSCH HS-SCCH E-AGCH E-RGCH or E-HICH transmission*
- *Received Total Wide Band Power*
- *Received Scheduled E-DCH Power Share*

3.1.8 Downlink Power Balancing of R99

3.1.8.1 Algorithm Description

In the soft handover or macro diversity status, a UE can communicate with all cells in the active set. With downlink inner loop power control, the UE sends the same TPC command to the cells in the active set. But because each link is available with a different transmission path, error codes will be produced in the TPC command and some cells will receive wrong TPC command. As a result, some cells increase downlink transmit power and some cells decrease downlink transmit power, hence the drifting power. Power drifting is usually eliminated through the downlink power balancing approach.

The purpose of downlink power balancing is to balance the downlink transmit power of one or more radio links used by the NodeB of related RRC connection. In the case a single link is involved, the downlink average power will be insensitive to the central value of a power control range if the downlink power control balancing is adopted. In the case that several links are involved, power balancing can help overcome power drifting.

A simple formula for calculating P_{bal} is as follows:

$$\sum P_{bal} = (1-r)(P_{ref} + P_{P-CPICH} - P_{init}) \text{ precision}\pm 0.5 \text{ dB} \qquad (3.1\text{-}28)$$

Where,

- P_{ref} is a reference power, which equals to DL Reference Power.
- $P_{P\text{-}CPICH}$ is the transmit power of the primary CPICH(*PcpichPwr*).
- P_{init} is the code power of the last timeslot in the previous adjustment period. If the last timeslot in the previous adjustment period coincidentially is included in the transmission gap (in compressed mode), then P_{init} equals to the code power of the timeslot prior to the transmit gap.
- r is the adjustment convergence coefficient (*AdjRatio*) that ranges 0~1.

A simple method for calculating DL Reference Power is as follows:

The downlink transmit power of each radio link, needed for calculating DL Reference Power, can be obtained indirectly from the Transmitted code power (TCP: transmit power of PILOT domain of DPCH) periodically reported by NodeB using the following formula:

$$^{j}P_{DPDCH}(dBm) = TCP - PO3 \qquad (3.1\text{-}29)$$

Where,

$^{j}P_{DPDCH}$ is the downlink transmit power of j:th radio link;

PO3 is the power offset between the DL DPCH PILOT domain and the DPCH data domain (*DpchPO3*);

The downlink reference power of i:th radio link is:

$$^{j}DL\_Refer\_Power(dB) = {}^{j}P_{DPDCH} - P\_CPICH\_Power \qquad (3.1\text{-}30)$$

Where, P_CPICH_POWER is P-CPICH power (*PcpichPwr*).

Next, RNC takes the average value of the reference power of each radio link as the DL Reference Power needed:

$$DL\_Refer\_Power = \frac{\sum_{j=1}^{N} {}^{j}DL\_Refer\_Power}{N} \qquad (3.1\text{-}31)$$

Where: N is the number of radio links used by the NodeB.

Method to realize power balancing:

- The dedicated TCP values of all links are obtained from the dedicated measurement report. The DL Reference Power is obtained by computing the reported values.
- When the absolute value of the difference between the DL Reference Power obtained in the new adjustment period and that obtained in the previous period exceeds the downlink reference power adjustment threshold (*DlRefPowUpdtTh*), the signaling of DL Power Control Request message which contains the information of DL Reference Power sent to NodeB.
- NodeB uses this value to implement link balancing through the inner loop power control algorithm.

Adjustment Type (*AdjType*):

AdjType is used to select whether to perform downlink power balancing adjustment and the adjustment type. Power Adjustment Type can take the value of “None”, “Common” or “Individual”.

When the value of *AdjType* is “None”,it means NodeB not need to balance the DL power.

When the value of *AdjType* is “Common”, it means NodeB balance the DL power but the balanced radio links use common reference power.

When the value of *AdjType* is “Individual”, it means NodeB balance the DL power but the balanced radio links use Individual reference power.

Adjustment Period (*AdjPeriod*):

The value of *AdjPeriod* usually does not change once it is selected. It is a value determined through actual tests.

Adjustment Ratio r (*AdjRatio)*:

AdjRatio can be 0.96 by default. The smaller the value of *AdjRatio* is, the quicker the offsets of transmit power of base stations are converged to be as the power offset as opposed to the common pilot channel of cells. But as the adjustment volume of power balancing is limited by the maximum adjustment step, the value of convergence is also limited. The *AdjRatio* can be set as a fixed value while the period is adjusted as Max Adjustment Step, which never change after configuration.

Max Adjustment Step (1~10 slots) (*MaxAdjStep*):

MaxAdjStep defines a time period, in terms of number of slots, in which NodeB can make power adjustment for balancing purpose by no more than 1dB .

3.1.8.2 Related measurement

The measurement of TCP (transmit code power) is reported periodically. The measurement of TCP gets started after UE changes status from macro diversity to non-macro diversity, and is terminated after UE changes status from non-macro diversity to macro diversity.

3.2 HSDPA Power Control

The HSDPA-related power control involves two aspects: (1) RNC performs total power allocation for HSDPA; and (2) power calculation of physical channels, including HS-PDSCH, HS-SCCH and HS-DPCCH. Only when the subscriber is allocated with the HS-DSCH and there is data being transmitted, the physical channels are of real meanings to the subscriber. The power of HS-SCCH can be determined using either of the following two ways:

- The power of HS-SCCH is determined with the HS-SCCH power offset provided by RNC.
- NodeB calculates the power of HS-SCCH.

The second way is adopted by ZTE, and In this way, HS-SCCH power is calculated by NodeB, thus the way to determine the HS-SCCH power is not described in this article.

3.2.1 Ways to Determine the Power Offsets of HS-DPCCH-related Domains

If only HS-DPCCH carries the ACK, NACK and CQI information, its power control works in the way as that of UL DPCCH except that the power gain factor β_{hs} is different.

In normal mode, β_{hs} is inferred by UE according to Δ_{ACK}, Δ_{ACK} and Δ_{CQI} using the following formula:

$$\beta_{hs} = \beta_c \cdot 10^{\left(\frac{\Delta_{HS-DPCCH}}{20}\right)} \qquad (3.2—1)$$

Where: β_c is the power gain factor of UL DPCCH.

When HS-DPCCH is activated, each slot of HS-DPCCH, $\Delta_{HS\text{-}DPCCH}$ is set with the following methods:

– When HS-DPCCH carries the HARQ ACK information: If ACK = 1, then $\Delta_{HS\text{-}DPCCH} = \Delta_{ACK}$; if ACK = 0, then $\Delta_{HS\text{-}DPCCH} = \Delta_{NACK}$.

– When HS-DPCCH carries the CQI information: $\Delta_{HS\text{-}DPCCH} = \Delta_{CQI}$.

Meanwhile, as the power offset of HS-DPCCH is based on DPCCH, DPCCH has soft handover gain in the macro diversity status and HS-DPCCH exists only in service cell. When DPCCH decreases the transmit power due to the soft handover gain, the single link configuration will affect the correct reception probability of HS-DPCCH. That is, configurations should be made different between the cases of macro diversity and non-macro diversity. Δ_{ACK} takes the values of *AckPwrOffset* and *InterAckPwrOfst* respectively in non-macro diversity and macro-diversity cases. Δ_{ACK} takes the values of *NackPwrOffset* and *InterNackPwrOfst* respectively in non-macro diversity and macro-diversity cases. Δ_{CQI} takes the values of *CqiPwrOffset* and *InterCqiPwrOfst* respectively in non-macro diversity and macro-diversity cases.

In addition, RNC needs to configure CQI feedback cycle (*CqiCycle*) and times of repeated CQI transmission, that is, CQI repetition factor (*CqiRepFactor*) so that CQI feedback can be performed. RNC should also configure ACK-NACK repetition factor (*AnackRepFactor*) so that ACK-NACK feedback can be performed.

The parameters described above are obtained and optimized through tests according to the performance indexes for certain reception success probability.

3.2.2 Way to Determine HS-PDSCH Measurement Power Offset

HS-PDSCH uses the adaptive modulation coding (AMC) scheme and HARQ, instead of closed loop power control, to improve link performance. For the physical channel of HS-PDSCH, RNC should configure measurement power offset for NodeB and UE.

When measuring CQI, UE supposes the power of HS-PDSCH is:

$$P_{HSPDSCH} = P_{CPICH} + \Gamma + \Delta \quad \text{in dB} \qquad (3.2\text{--}2)$$

Where,

– Γ is the measurement power offset (*MeasPwrOffset*) of RRC signaling configuration.

– Δ is obtained by UE through querying the table depending on the UE category. UE category and the relationchip between UE category and Δ is described in table 7a, 7A, 7B, 7C, 7D, 7E, 7F, 7G, 7H,7I and 7J of 3GPP TS 25.214 protocol.

– P_{CPICH} is the receiving power of pilot channel.

– $P_{HSPDSCH}$ is the total receiving power evenly distributed on the HS-PDSCHs that perform CQI measurement and evaluation.

Based on the above mentioned receivable power and the benchmark of BLER =10% of the quality of received data, UE determines the CQI and reports it to NodeB.

Based on the relation between UE-reported CQI and the measurement power offset, NodeB determines the power allocatable to the UE and transmittable number of bits.

The change of UE service cell will trigger the update of HS-PDSCH measuement power offset.

3.2.3 HSDPA Power Control in Compressed Mode

In compressed mode, HSDPA is involved with the β_{hs} used by uplink HS-DPCCH and the formula is as follows:

$$\beta_{hs} = \beta_{c,C,j} \cdot 10^{\left(\frac{\Delta_{HS-DPCCH}}{20}\right)} \cdot \sqrt{\frac{N_{pilot,C}}{N_{pilot,N}}}$$

Where,

– $N_{pilot,C}$ is the number of bits occupied by the pilot domain of UL DPCCH in compressed mode.

– $N_{pilot,N}$ is the number of bits occupied by the pilot domain of UL DPCCH in normal mode.

– Frame format in compressed mode is corresponding to that in normal mode. Once the frame format in normal mode is determined, the frame format once the compressed mode gets started is also determined.

– When at least one DPDCH is configured, $\beta_{c,C,j}$ is the gain factor of uplink dedicated control physical channel of R99 for a specific TFC in compressed mode. For calculation of $\beta_{c,C,j}$, refer to the uplink open loop power control of R99 in compressed mode as described in Section 3.1.1.3. If no DPDCH is configured, $\beta_{c,C,j}$ can be configured as described in Section 5.1.2.5C of 3GPP TS 25.214, that is, $\beta_{c,C,j}$=1.

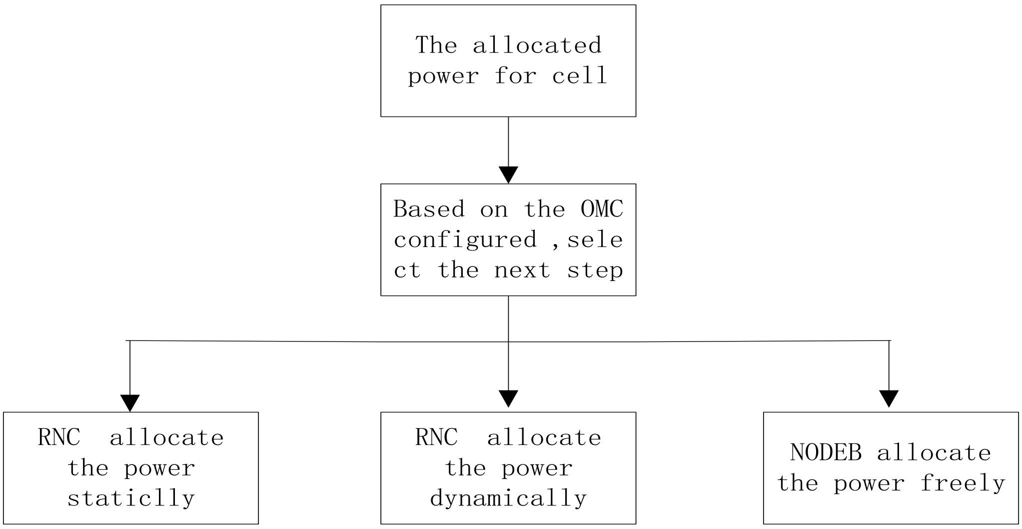
3.2.4 Total Power Allocation of HSDPA

The total power occupied by HSDPA can be assigned by RNC and NodeB is notified of the value with the *HS-PDSCH+HS-SCCH total power* message of PHYSICAL SHARED

CHANNEL RECONFIGURATION REQUEST. Hence when power is being allocated, NodeB will ensure that the power used by HSDPA (HS-PDSCH+HS-SCCH total power) will not exceed the configured value of the signal cell. RNC can configure this power value in an either static or dynamic way. RNC may also leave the HSDPA power not specified so that NodeB will allocate the power freely accoring to the actual availability status of the resource.

The system determines which allocation method applies according to the parameter *HsdschTotPwrMeth* configured in OMCR. The three methods: static allocation by RNC, dynamic allocation by RNC and dynamic allocation by NodeB, are described in the following.

Figure 3-1 The frame of HSDPA power allocated



3.2.4.1 Static allocation by RNC

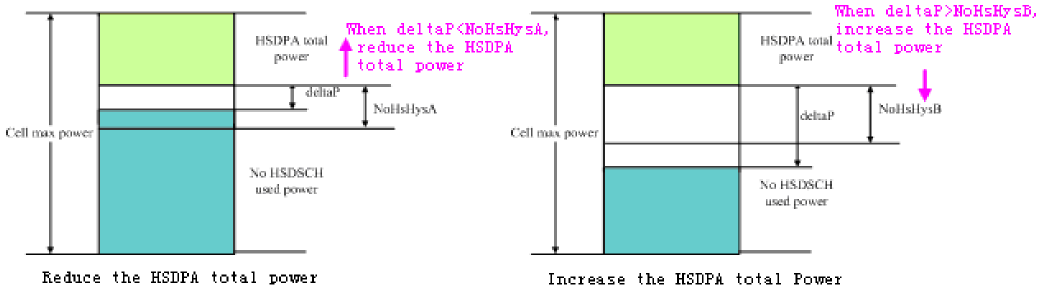
The static power allocation by RNC is described as follows:

- Count beforehand the average data throughput in a related area, and estimate the number of HS-PDSCHs to be configured and needed power (the code resource should match the power resource).
- Configure the percentage of power occupied by HSDPA: *HspaPwrRatio* in OMCR.
- If the resource has to be reallocated due to changes in the average data throughput in this area, make the configuration in OMCR again and trigger the software to notify NodeB.

3.2.4.2 Dynamic allocation by RNC

The dynamic power allocation by RNC refers to the process: (1) Initial HS-PDSCH and HS-SCCH total power (*HspaPwrRatio*) are configured in OMCR according to the number of physical HS-PDSCH+HS-SCCH channels configured for the cell. (2) During the system operation, the software algorithm has the *HspaPwrRatio* dynamically adjusted according to the following triggering condition and principle. Figure 3-2shows the strategy of adjustment:

Figure 3-2 Dynamic Power Adjustment for HSDPA and DPCH



Power adjustment is described as follows (Note: The variables used in this section are measured in percentages).

1 *HspaPwrRatio* is adjusted dynamically along with the system's all non-HSDPA code power and power occupation ratio by HS-DSCH users.

- Because DPCH and HSDPA users use the allocated power independently, rather than the non-HSDPA physical channel takes priority to use the power resource, the condition for making a *HspaPwrRatio* decrease decision can be set to:

  iii The power occupied by non-HSDPA code power has reached a threshold as compared to the power resource allocated to it.

  When all non-HSDPACodePower ≥ OverLoadThd - *HspaPwrRatio*, and the HSDPA total power is allowed to be decreased (HSDPA Total Power > max (*MinHspaPwrRto*, $\sum_{Priority}$ HS-DSCH Required Power)), some power allocated to the HSDPA physical channel can be spared to be used by the non-HSDPA phsyical channel. (the *OverLoadThd* is equivalent to *CellMaxPower- NoHSDPAHysteresisA* in the preceding diagram).

  iv If there are HS users, the minimum total power of HSDPA is subject to Max (*MinHspaPwrRto*, $\sum_{Priority}$ HS-DSCH Required Power); otherwise the minimum total power of HSDPA is not subject to Max (*MinHspaPwrRto*, $\sum_{Priority}$ HS-DSCH Required Power).

- When OverLoadCovThd – allnonHSDPACodePower > Max(*MinHspaPwrRto*, $\sum_{Priority}$ HS-DSCH Required Power), the adjustment quota is: AdjustP = *HspaPwrRatio* –(OverLoadCovThd – allnonHSDPACodePower).
- (Where, *OverLoadCovThd* is equivalent to *CellMaxPower-NoHSDPAHysteresisB* is the preceding diagram.)
- Otherwise, *HspaPwrRatio* = Max(*MinHspaPwrRto*, $\sum_{Priority}$ HS-DSCH Required Power).
- For applications of OverLoadThd and OverLoadCovThd, refer to *ZTE UTMS Overload Control Feature Guide*

- Another important purpose for HSDPA is to make full use of cell power, that is, when the non-HSDPA physical channel needs little power, the power of HSDPA can be increased as much as possible to improve the system's throughput. Way to increase HSDPA total power: when allnon-HSDPACodePower < (*OverLoadCovThd* - *HspaPwrRatio*):
  - If there are HS users, some power of non-HSDPA physical channel can be spared to HSDPA physical channel as the non-HSDPA physical channel does not need all the power allocated to it. The quota of adjustment is: AdjustP = OverLoadCovThd - allnon-HSDPACodePower – *HspaPwrRatio*. If AdjustP < 0, no adjustment is performed. After any adjustment, it should be guaranteed that *HspaPwrRatio* ≤ *MaxHspaPwrRto*.
  - If there is no HS user, no adjustment is necessary.
- To prevent ping-pong adjustment resulted from fluctuation of *HspaPwrRatio*, the times of pending is applied while the preceding status decisions are being made. That is, *HspaPwrRatio* is decreased or increased only when the threshold for decrease is exceeded or the threshold for increase times is no less than the pending times threshold (*PbPendTimeThd*).

2 *HspaPwrRatio* is dynamically adjusted according to the software algorithm when the HSDPA resource congestion occurs. The probability of congestion-driven adjustment can be decreased as much as possible if the first strategy is implemented (*HspaPwrRatio* is adjusted dynamically along with the system's all non-HSDPA code power and power occupation ratio by HS-DSCH users).

- When the power resource of HSDPA users is limited, the dynamic adjustment of HSDPA power is triggered.
  - Now the *HspaPwrRatio* is increased with the principle that the available maximum power of a cell reaches the overload recovery threshold. The

adjustment quota AdjustP = OverLoadCovThd - allnon-HSDPACodePower - *HspaPwrRatio*, but after the ajustment, it should be guarateed that *HspaPwrRatio* ≤ *MaxHspaPwrRto*.

– If the power occupation of current non-HSDPA physical channel no longer allows the increase of *HspaPwrRatio* and also HspaPwrRatio < MinHspaPwrRto, then make HspaPwrRatio = MinHspaPwrRto. Otherwise no more increase is allowed.

- When the total HS-DSCH required power reported by NodeB is detected to exceed *HspaPwrRatio* configured by RNC to NodeB, the HSDPA total power can be adjusted dynamically to guarantee the QoS of real-time services.

  – The adjustment principle is also that the available maximum power of a cell reaches the overload recovery threshold. The adjustment quota AdjustP = OverLoadCovThd - allnon-HSDPACodePower - *HspaPwrRatio*, but after the ajustment, it should be guaranteed that *HspaPwrRatio* ≤ *MaxHspaPwrRto*.

  – If the power occupation of current non-HSDPA physical channel no longer allows the increase of *HspaPwrRatio*, *HspaPwrRatio* cannot be increased. That is, no increase is allowed when AdjustP ≤ 0. But now it should be guaranteed that *HspaPwrRatio* ≥ *MinHspaPwrRto*.

3 The overload control module triggers *HspaPwrRatio* to decrease in the event of overload.

- The load control is responsible for *HspaPwrRatio* decrease only. The conditions for triggering power increase are described in strategy 1 and 2.

- When the *load* decreases, *HspaPwrRatio* is triggered to decrease.

  – As the HSDPA power is limited by the allowed maximum power of HSDPA and there is still surplus power for DPCH, now if the cell is overloaded, this indicates the non-HSDPA power overload. If HSDPA total power is allowed to be decreased (that is, *HspaPwrRatio* > max (*MinHspaPwrRto*, $\sum_{Priority}$ HS-DSCH Required Power)), it is advisable to spare some HSDPA power to DPCH so that the load can be decreased: the HSDPA total power is decreased. *HspaPwrRatio* = actual power used by HSDPA (RealHsPower) – load of excessive part (deltaLP = current TCP –OverLoadCovThd), where: RealHsPower = TCP – allnonHSDPACodePower.

  – If the calculated *HspaPwrRatio* < max (*MinHspaPwrRto*, $\sum_{Priority}$ HS-DSCH Required Power) [there are HS users] or *HspaPwrRatio* < 0 [there is no HS user], then return Not Adjustable to the load control module. The load control module will execute later. In addition, the QoS of PS real-time service should be guaranteed, that is, *HspaPwrRatio* ≥ max(*MinHspaPwrRto*, $\sum_{Priority}$ HS-DSCH Required Power).

4 When there is no HS-DSCH user, *HspaPwrRatio* can only be decreased (not increased) along with the power change of non-HS.

3.2.4.3 Free allocation of NodeB

Free power allocation is determined by algorithm of NodeB based on available power, service priority and QoS. RNC should have the allowed available power of HSDPA configured as 100%.

3.3 HSUPA Power Control

3.3.1 Way to Determine Uplink E-DPCCH/DPCCH Power Offset

The uplink E-DPCCH open loop power control of HSUPA is realized by setting a reasonable E-DPCCH power offset relative to that of DPCCH.

The E-DPCCH power offset relative to that of DPCCH should satisfy the BER requirement of E-DPCCH control signaling. The power offset value is obtained through emulation or test and configured in OMCR (*EdpcchPOTti2* or *EdpcchPOTti10*, depending on different TTIs). According to 25.214 standard, the gain factor β_{ec} of E-DPCCH is calculated using the following formula in non-compressed mode:

$$\beta_{ec} = \beta_c \cdot A_{ec} \qquad (3.3\text{-}1)$$

Where,

– β_c is the gain factor of uplink dedicated control physical channel of R99. For the configuration of details of β_c, refer to Section 3.1.1.2.

– A_{ec} is obtained from E-DPCCH power offset ($\Delta_{E\text{-}DPCCH}$) that is configured at high level and then mapped in 0.

$\Delta_{E\text{-}DPCCH}$ can be configured for UE through the radio bearer establishment message, or configured again through the radio bearer re-configuration message. It is generally not dynamically updated after being configured for the first time. Table 3-6 lists the relation between A_{ec} and $\Delta_{E\text{-}DPCCH}$.

Table 3-6 Quantified Amplitude Relation between A_{ec} and $\Delta_{E\text{-}DPCCH}$

Signalled values for $\Delta_{E\text{-}DPCCH}$	Quantified amplitude ratios $A_{ec} = \beta_{ec}/\beta_c$
8	30/15
7	24/15
6	19/15
5	15/15
4	12/15
3	9/15
2	8/15
1	6/15
0	5/15

The power of E-DPCCH is configured once and for all and does not need dynamic adjustment, so it is relative simply. E-DPCCH can use different TTIs (2ms, 10ms) for transmission. If the 10ms TTI is used, the content of the first 2ms timeslots is repeatedly transmitted for four times to improve uplink reception performance. The power configuration of this channel is similar to that of downlink physical channel except that different TTI applications should be differentiated.

3.3.2 Way to Determine Power Offset of Uplink E-DPDCH/DPCCH

3.3.2.1 Way to determine reference E-TFC and $\beta_{ed,ref}$

As many types of E-TFC exists in the TB SIZE of E-DCH, and RNC cannot notify NodeB and UE of the β_{ed} corresponding to each type of E-TFC, the 3GPP specifies that RNC notifies UE and NodeB of a group of reference E-TFC and the corresponding E-DPDCH power offset relative to DPCCH, to be used by UE and NodeB to calculate the power needed by other non-reference E-TFC.

RNC needs to determine a group of E-TFC as the reference for other E-TFC. Principle for determining the reference E-TFC is as follows:

The E-TFC types that have the same combination feature of SF and number of code channels are taken as a group before the position where both physical channel and SF turns transientare. The largest E-TFC is selected as the reference. The E-DPDCH power offset at the reference E-TFC point can be obtained and optimized through tests while other values can be obtained through formula-based calculation. This is a practical approach to the selection of reference E-TFC.

$\beta_{ed,ref}$ is the reference gain factor of the reference E-TFC, and for each reference E-TFC, the $\beta_{ed,ref}$ can be calculated using the following formula.

$$\beta_{ed,ref} = \beta_c \cdot A_{ed} \qquad (3.3\text{-}2)$$

Where,

– β_c is the gain factor of uplink dedicated control physical channel of R99. For the configuration of details of β_c, refer to Section 3.1.1.2.

– A_{ed} is obtained from E-DPCCH power offset ($\Delta_{E\text{-}DPCCH}$) that is configured at high level and then mapped in Table 3-7.

Table 3-7 Quantified Amplitude Relation between $\Delta_{E\text{-}DPDCH}$ and A_{ed}

Signalled values for $\Delta_{E\text{-}DPDCH}$	**Quantified amplitude ratios A_{ed}**
29	168/15
28	150/15
27	134/15
26	119/15
25	106/15
24	95/15
23	84/15
22	75/15
21	67/15
20	60/15
19	53/15
18	47/15
17	42/15
16	38/15
15	34/15
14	30/15
13	27/15
12	24/15
11	21/15
10	19/15
9	17/15
8	15/15
7	13/15
6	12/15
5	11/15
4	9/15
3	8/15
2	7/15
1	6/15
0	5/15

Note:

- The selection of reference E-TFC and corresponding PO value vary with different TTIs and TB SIZE tables.

  - For 2ms E-TTI and Table0, E-DPDCH puncturing limit is *EplTti2T0*, number of reference E-TFCI is *REtfcNumTti2T0*, set of reference E-TFCIs is *REtfciTti2T0[MAX_REF_ETFC]*, and the power offset of reference E-TFCIs is *REtfciPOTti2T0[MAX_REF_ETFC]*.

  - For 2ms E-TTI and Table1, E-DPDCH puncturing limit is *EplTti2T1*, number of reference E-TFCI is *REtfcNumTti2T1*, set of reference E-TFCIs is *REtfciTti2T1[MAX_REF_ETFC]*, and the power offset of reference E-TFCIs is *REtfciPOTti2T1[MAX_REF_ETFC]*.

  - For 10ms E-TTI and Table0, E-DPDCH puncturing limit is *EplTti10T0*, number of reference E-TFCI is *REtfcNumTti10T0*, set of reference E-TFCIs is *REtfciTti10T0[MAX_REF_ETFC]*, and the power offset of reference E-TFCIs is *REtfciPOTti10T0[MAX_REF_ETFC]*.

  - For 10ms E-TTI and Table1, E-DPDCH puncturing limit is *EplTti10T1*, number of reference E-TFCI is *REtfcNumTti10T1*, set of reference E-TFCIs is *REtfciTti10T1[MAX_REF_ETFC]*, and the power offset of reference E-TFCIs is *REtfciPOTti10T1[MAX_REF_ETFC]*.

  Each HSUPA sevice has a E-DCH reference configuration index (*EdchRefConfigIdx*), used to index a list of E-DPDCH puncturing limit (*EplTti2T0, EplTti2T1, EplTti10T0, EplTti10T1*), number of reference E-TFCI (*REtfcNumTti2T0, REtfcNumTti2T1, REtfcNumTti10T0, REtfcNumTti10T1*), set of reference E-TFCIs (*REtfciTti2T0[MAX_REF_ETFC], REtfciTti2T1[MAX_REF_ETFC], REtfciTti10T0[MAX_REF_ETFC], REtfciTti10T1[MAX_REF_ETFC]*), and the power offset of reference E-TFCIs (*REtfciPOTti2T0[MAX_REF_ETFC], REtfciPOTti2T1[MAX_REF_ETFC], REtfciPOTti10T0[MAX_REF_ETFC], REtfciPOTti10T1[MAX_REF_ETFC]*). According to this index, the reference E-TFC and the E-DPDCH Power Offset of the sevice can be found.

- Ways for other E-TFCs to select reference E-TFC are:

  Make $E\text{-}TFCI_{ref,m}$ indicate the E-TFCI of number mth reference E-TFC. Here m=1,2,…,M, where M is the number of reference E-TFCs for signaling notification and $E\text{-}TFCI_{ref,1} < E\text{-}TFCI_{ref,2} < \ldots < E\text{-}TFCI_{ref,M}$. Make $E\text{-}TFCI_j$ indicate the E-TFCI of number jth E-TFC. For the number jth E-TFC:

  - If $E\text{-}TFCI_j \geq E\text{-}TFCI_{ref,M}$, then the reference E-TFC is the mth reference E-TFC.

  - If $E\text{-}TFCI_j < E\text{-}TFCI_{ref,1}$, then the reference E-TFC is the first reference E-TFC.

– If E-TFCI$_{ref,1}$ ≤ E-TFCI$_j$ < E-TFCI$_{ref,M}$, then the reference E-TFC is the mth reference E-TFC that satisfies E-TFCI$_{ref,m}$ ≤ E-TFCI$_j$ < E-TFCI$_{ref,m+1}$.

3.3.2.2 Way to determine β_{ed}

The gain factor of E-DPDCH is defined as β_{ed}, which can be of a different value for each E-TFC and HARQ offset. With the reference E-TFC and corresponding power offset notified by RNC and the information related to HARQ offset, UE and NodeB can calculate β_{ed} of other non-reference E-TFCs, and in turn the power of related E-DPDCHs.

Make $L_{e,ref}$ indicate the number of E-DPDCHs used by reference E-TFC. Make $L_{e,j}$ indicate the number of E-DPDCHs used by the number jth E-TFC. If SF2 is used, $L_{e,ref}$ and $L_{e,j}$ are the equivalent numbers of physical channels of the supposed SF4. Make $K_{e,ref}$ indicate the number of data bits of reference E-TFC. Make $K_{e,j}$ indicate the number of data bits of the number jth E-TFC. For the number jth E-TFC, the gain factor $\beta_{ed,j,harq}$ of the related E-DPDCH can be calculated using the following formula.

$$\beta_{ed,j,harq} = \beta_{ed,ref}\sqrt{\frac{L_{e,ref}}{L_{e,j}}}\sqrt{\frac{K_{e,j}}{K_{e,ref}}}\cdot 10^{\left(\frac{\Delta_{harq}}{20}\right)} \qquad (3.3\text{-}3)$$

Where: HARQ power offset Δ_{harq} is of the value configured by cell E-DCH HARQ power offset FDD (*EdchHarqPOFdd*). Δ_{harq} is configured through the radio link establishment request or radio link increase request, and re-configured through the radio link re-configuration request.

The power of E-DPCCH is configured once and for all and does not need dynamic adjustment. E-DPCCH can use different TTIs (2ms, 10ms) for transmission. If the 10ms TTI is used, the reception performance is different and in cases where different TB SIZE tables are used, the number of E-TFCIs and TB SIZE tables are also different. To improve uplink reception performance, different TTI and TABLE applications should be differentiated.

Note:

- When MAC-e PDU does not include MAC-d PDU, UE uses the configured scheduling information power offset (*ScheInfoPOTti2* or *ScheInfoPOTti10*, depending on different TTIs) as the HARQ power offset to calculate E-DPDCH transmit power.
- In the case that MAC-e PDU is not decoded, NodeB uses the quantified value (*EdchRefPO*) of E-DCH reference power offset configured by RNC to estimate the E-DPDCH power of E-TFCI.

3.3.3 Way to Determine Downlink E-AGCH/RGCH/HICH Power

Downlink open loop power control is to configure or re-configure the power offset of physical channels such as E-AGCH, E-RGCH and E-HICH. The power offset is relative to DL DPCH pilot domain. NodeB uses the offset and the inner loop power control of DPCCH to dynamically adjust the transmit power of these physical channels.

The following factors should be considered when the power offset is being configured.

- In the event of soft handover, the reception performance of E-RGCH and E-HICH is better by a gain of about 7~14 dB than the E-AGCH without soft handover.
- The required decoding error probability of the information carried by these channels is usually 0.1~0.01. The power should be configured to a suitable value to meet the error probability requirement so power configuration should never be too larger or too small.

The principles for configuring E-AGCH power offset (*EagchPOTti2* or *EagchPOTti10*, depending on different TTIs*)*, E-RGCH power offset (*ErgchPOTti2* or *ErgchPOTti10*, depending on different TTIs*)* and E-HICH power offset (*EhichPOTti2* or *EhichPOTti10*, depending on different TTIs*)* are described as follows.

- The configuration of the power offsets in OMCR are related with different services. When the control plane detects changes (establishment, addition, deletion and modification) in the sub-services carried by DPCH, the new power offset is obtained from the database according to the number of sub-service and then configured again.
- When TTIs change, the power offsets are configured again.
- In the macro diversity status, the power offset is updated. A comparatively high macro diversity gain can be obtained through performance emulation of UE as specified in 25.101 protocol. To save power and guarantee the channel quality of E-AGCH at the same time, E-AGCH power offset is adjusted when changes of UE status (macro diversity and non-macro diversity) is detected. For a single link, E-AGCH Power Offset takes the value as configured in OMCR. For a multi-link case, it is E-AGCH Power Offset + *MacroDivGain*.
- When DPCH carrier mixed services, the TTI used by E-DCH should be determined first. Then, E-AGCH power offset, E-RGCH power offset and E-HICH power offset (each power comes with several offsets) corresponding to the TTI are obtained respectively according to the different services carried on DPCH. Finally, from several corresponding offsets, the minimum offset values Min (E-AGCH Power Offset), Min (E-RGCH Power Offset) and Min (E-HICH Power Offset) are selected as the power offsets of E-AGCH, E-RGCH and E-HICH respectively. (If both UE and service cell support 2ms TTI, the 10ms TTI is used as long as one service uses 10ms TTI, otherwise the 2ms TTI is used)

Description: The above description is based on downlink F-DPCH is not configured. This time E-AGCH power offset, E-RGCH power offset and E-HICH power offset are relative to the power of downlink DPCH pilot domain, and get the value based on the service over DPCH. But if downlink F-DPCH is configured, E-AGCH power offset, E-RGCH power offset and E-HICH power offset are relative to the power of downlink F-DPCH TPC domain, and get the value based on the service type of F-DPCH (SrvType=7).

3.3.4 HSUPA Power Control in Compressed Mode

During the compressed frame period, the gain factor β_{ec} of E-DPCCH when E-DCH TTI is 2ms can be calculated using the following formula.

$$\beta_{ec} = \beta_{c,C,j} \cdot 10^{\left(\frac{\Delta_{E-DPCCH}}{20}\right)} \cdot \sqrt{\frac{N_{pilot,C}}{N_{pilot,N}}}$$

Where,

When at least one DPDCH is configured, $\beta_{c,C,j}$ is the gain factor of uplink dedicated control physical channel of R99 for a specific TFC in compressed mode. For calculation of $\beta_{c,C,j}$, refer to the uplink open loop power control of R99 in compressed mode as described in Section 3.1.1.3.If no DPDCH is configured, $\beta_{c,C,j}$ can be configured as described in Section 5.1.2.5C of 3GPP TS 25.214, that is, $\beta_{c,C,j}$=1.

- $N_{pilot,C}$ is the number of pilot bits per slot on DPCCH in compressed frame.
- $N_{pilot,N}$ is the number of pilot bits per slot on DPCCH in non-compressed frame.
- $N_{slots,C}$ is the number of non DTX slots in compressed frame.

During the compressed frame period, gain factor β_{ec} of E-DPCCH when E-DCH TTI is 10ms can be calculated using the following formula.

$$\beta_{ec} = \beta_{c,C,j} \cdot 10^{\left(\frac{\Delta_{E-DPCCH}}{20}\right)} \cdot \sqrt{\frac{15 \cdot N_{pilot,C}}{N_{slots,C} \cdot N_{pilot,N}}}$$

Where, $N_{slots,C}$ is the number of non DTX slots in compressed frame.

3.3.5 HSUPA Uplink Outer Loop Power Control

After the introduction of E-DCH, uplink outer loop power control is still needed in some cases although RNC has configured power offset for E-DPDCH. For example, although the current outer loop power control is stable, and the SIR is basically converged to

SIR_{target} through inner loop power control, but user plane of NodeB still sends HARQ failure indication to RNC through data frames because of the unreasonable PO or unreasonable maximum retransmission times. In this case, the failure indication and the number of HARQ retransmission (NHR) can be used to trigger uplink outer loop power control to guarantee the QoS of E-DCH. The outer loop power control algorithm after the introduction of E-DCH will affect the current outer loop power control algorithm to some extent and hence coupling treatment is necessary.

3.3.5.1 Implementation of HSUPA uplink outer loop power control algorithm

1 In ZTE RNC, HSUPA OLPC is based on NHR and HARQ failure indication.

When the total number of HARQ failure indication is bigger than a threshold (*ThrHarqFailTti2* or *ThrHarqFailTti10*), the SIR_{target} should be increased. And at the same time, the SIRtarget can be increased or deceased based on NHR.

The principle of SIR_{target} adjustment based on NHR as following: The service quality is evaluated on the basis of NHR carried by the FP frame transferred by NodeB to RNC. The greater the NHR is, the poorer the quality of channel is and hence the need to increase SIR_{target} for higher transmit power, otherwise decrease SIR_{target} for lower transmit power. Steps for making the decision are:

Set NHR_i as the retransmission times carried by each FP. i is the number i^{th} FP frame (i=1… I , I is the maximum number of FPs). When the HARQ failure indication is received, the NHR of data block transmission is converted to an approximate value. The formula for converting the HARQ failure indication to NHR as follows.

NHR= CorrNumHarqToNhr * MaxRetransEdch;

Where: *CorrNumHarqToNhr* is correction coefficient for converting HARQ failure to NHR;

MaxRetransEdch is the maximum number of retransmissions for E-DCH.

To better reflect the channel quality, the average NHR value during a statistical period is usually taken as the basis for decision. The average NHR (average retransmission times of each FP frame) during a statistical period is defined as NumReTransDiffAve= $\sum_{i=1}^{I} NHR_i / I$.

Once outer loop power control is started for a service, the number of received FP frames and NHR are counted within the valid statistical time window of NHR (*StatWinSizeTti2* for 2ms TTI, or *StatWinSizeTti10* for 10ms TTI). The threshold of sample number to adjust SIR_{target} upward (*UpThresSampleNum* for 10ms TTI*, or UpThrSampNumTti2* for 2ms TTI) and the threshold of sample number to adjust SIR_{target} downward (*DwThresSampleNum* for 10ms TTI, or *DwThrSampNumTti2* for 2ms TTI) are respectively configured. When the received number of FP frames reaches the minimum number of FP frames that allows SIR_{target} adjustment, compare the average NHR (NumReTransDiffAve) within the statistical period with the NHR threshold for SIR_{target} increase(*NhrThrUp* for 10ms TTI, or *NhrThrUpTti2* for 2ms TTI), and the NHR threshold for SIR_{target} decrease(*NhrThrDown* for 10ms TTI, or *NhrThrDownTti2* for 2ms TTI) respectively, and then judge whether to adjust SIR_{target}, and how to adjust it.

2 The following describes the details of HSUPA OLPC for single service:

When: statistical time ≤ NHR valid statistical time window,

i. SIR_{target} increase :

- If the number of HARQ failure ≥ the threshold of HARQ failure number to increase SIR_{target} (*ThrHarqFailTti2* or *ThrHarqFailTti10*), increase SIR_{target} by one adjustment step. The increase step = basic step (that is, *UlSirTargUpStep* of R99);

- If the counted number of FP frames ≥ the threshold of FP number to adjust SIR_{target} upward(*UpThresSampleNum* for 10ms TTI*, or* *UpThrSampNumTti2* for 2ms TTI), and NumReTransDiffAve > the NHR threshold for SIR_{target} increase(*NhrThrUp* for 10ms TTI, or *NhrThrUpTti2* for 2ms TTI), increase SIR_{target} by one adjustment step. The increase step = basic step (that is, *UlSirTargUpStep* of R99);

ii. SIR_{target} decrease :

- If the counted number of FP frames ≥ the threshold of FP number to adjust SIR_{target} downward (*DwThresSampleNum* for 10ms TTI, or *DwThrSampNumTti2* for 2ms TTI), and NumReTransDiffAve < the NHR threshold for SIR_{target} decrease(*NhrThrDown* for 10ms TTI, or *NhrThrDownTti2* for 2ms TTI), decrease SIR_{target} by one adjustment step. The decrease step =*UlSirTargDnStep* of R99;

iii. In other case, SIR_{target} remains unchanged.

When: statistical time ≥ NHR valid statistical time window,

- Increase or decrease SIR_{target} according to the principles described above.

- If the counted number of FP frames < the threshold of FP number to adjust SIR_{target} , which is Minimum(*UpThresSampleNum*, *DwThresSampleNum*) for 10ms TTI or Minimum(*UpThrSampNumTti2*, *DwThrSampNumTti2*) for 2ms TTI, this indicates the data volume of the service is quite small and the counted NHR is not enough to serve as the basis for making a SIR_{target} adjustment decision. Now the channel is in a status of invalid NHR count.

- For 10ms TTI, If Minimum(*UpThresSampleNum*, *DwThresSampleNum*)< the counted number of FP frames < Minimum(*UpThresSampleNum*, *DwThresSampleNum*), and NumReTransDiffAve < Minimum(*NhrThrUp*, *NhrThrDown*), this indicates the data volume of the service is relative small and NHR is also small, so this time, the channel is also in a status of invalid NHR count.

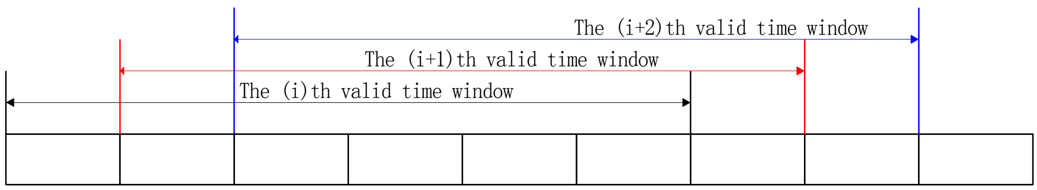
– For 2ms TTI, If Minimum(*UpThrSampNumTti2*, *DwThrSampNumTti2*)< the counted number of FP frames < Minimum(*UpThrSampNumTti2*, *DwThrSampNumTti2*), and NumReTransDiffAve < Minimum(*NhrThrUpTti2*, *NhrThrDownTti2*), this indicates the data volume of the service is relative small and NHR is also small, so this time, the channel is also in a status of invalid NHR count.

– In other case, SIR_{target} remains unchanged.

Note:

– When the statistical time reaches the NHR valid statistical time window, and if SIR_{target} is not adjusted, then the slide window statistics gets started. That is, an outer loop power control decision is made whenever the slide window slides for one step. To reflect the channel quality in due time, the slide step is usually short. It is 20ms by ZTE RNC. 0 shows a schematic diagram of the slide window statistics:

Figure 3-3 Schematic Diagram of Slide Window Statistics



– Every time after making a decision to adjust SIR_{target}, the number of FP frames, NHR statistics and the number of HARQ failure should be cleared to 0 and new statistics is made again.

– If the counted number of FP frames ≥ Maximum(*DwThresSampleNum*, *UpThresSampleNum*) for 10ms TTI, or the counted number of FP frames ≥ Maximum(*UpThrSampNumTti2*, *DwThrSampNumTti2m*) for 2ms TTI, the number of FP frames, NHR statistics and the number of HARQ failure also need to be cleared to 0 and made new statistics again.

3 SIR_{target} adjustment in the case of concurrent services:

- SIR_{target} is increased as long as one service triggers it to be increased.

- SIR_{target} is not decreased unless all services with valid NHR statistics indicate to decrease SIR_{target}. Services with invalid NHR statistics are excluded from the combination of power control.
- Some services need to decrease SIR_{target} while some others need SIR_{target} to remain the same, In this way, SIR_{target} is not adjusted to guarantee QoS of all services.

3.3.5.2 Coupling implementation of HSUPA and R99 outer loop power control

As the outer loop power control event algorithm of E-DCH introduced, it may affect the current outer loop power control algorithm in some cases. For example, at some TTI, the decisions of outer loop power control between HSUPA and R99 are different. In this case, a final decision should be made by RNC.

The following table shows the coupling result of outer loop adjustment of DCH and E-DCH.

Table 3-8 Combination of Outer Loop Adjustmetn of DCH and E-DCH

E-DCH	DCH	State	Combination Result
↑	↑	1	↑
↑	↓	2	↑
↓	↑	3	↑
↑	-	4	↑
-	↑	5	↑
↓	-	6	-
-	↓	7	-
-	-	8	-
↓	↓	9	↓
↑	×	10	↑
↓	×	11	↓
×	↑	12	↑
×	↓	13	↓
-	×	14	-
×	-	15	-
×	×	16	× (invalid NHR statistics, no adjustment)

In the above table,↑ indicates increase, ↓ for decrease, - for no adjustment (remain unchanged), × for invalid NHR statistics.

The coupling function is implemented in a simple way using the following principle:

- E-DCH HARQ power offset is not reconfigured again once it is configured for the first time. Adjustment can be made using the following principle:

  – Increase the offset as long as either DCH or E-DCH meets the condition for triggering increase.

  – Decrease the offset immediately if both DCH and E-DCH trigger decrease.

  – Services with invalid NHR statistics are excluded from the combination.

  With this principle:

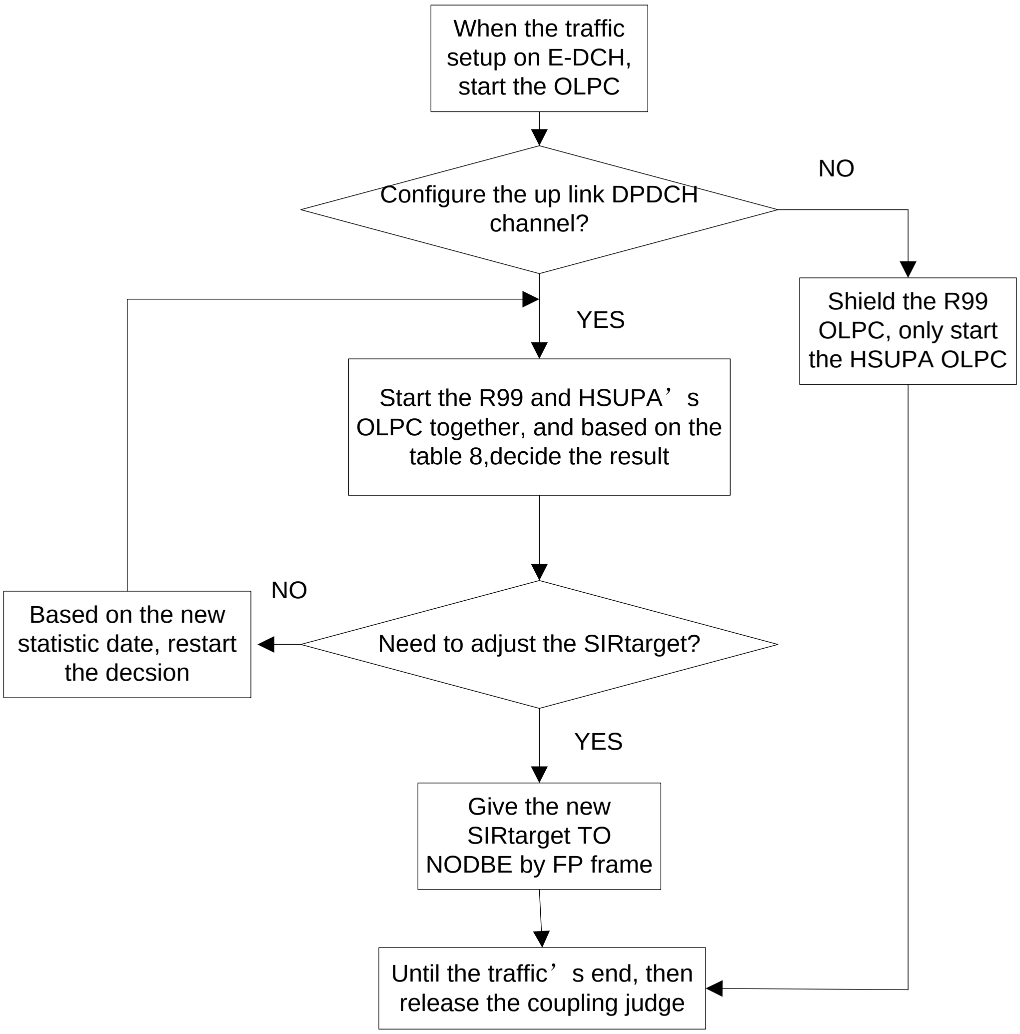
  – In status 1, 2, 3, 4, 5, 10, 12, SIR_{target} is increased.

  – In status 6, 7, 8, 14, 15, 16, SIR_{target} remains unchanged.

  – In status 9, 11, 13, SIR_{target} is decreased.

- The length of period can be the same as that with the R99 algorithm, to make sure the synchronous judgement.

Figure 3-4 Coupling OLPC for HSUPA and R99



3.4 MBMS Power Control

The technical description of MBMS power control is given in *ZTE UMTS MBMS Feature Guide*.

4 Parameters and Configuration

4.1 Common Parameters

4.1.1 List of Common Parameters

Abbreviated name	Parameter name

BetaC[MAX_ PRACH _TFC]	Control Part Gain Factor
BetaD[MAX_ PRACH _TFC]	Data Part Gain Factor
POPpm[MAX_ PRACH _TFC]	Power Offset between PRACH Control Part and PRACH Data Part
SIB7Originator	SIB7 Originator
UlInterUpdtTh	Uplink Interference Write Back Threshold
ConstVal	PRACH Initiation Tx Power Constant Value
PRStep	PRACH Preamble Power Ramp Step
MaxRACHTxPwr	Maximum Allowed UL TX Power of RACH
PcpichPwr	P-CPICH Power
ScpichPwr	S-CPICH Power
PichPwr	PICH Power
AichPwr	AICH Power
MaxFachPwr	Maximum FACH Power
BchPwr	BCH Power
PschPwr	Primary SCH Power
SschPwr	Secondary SCH Power
PchPwr	PCH Power
PO1	S-CCPCH TFCI Field Power Offset
PO3	S-CCPCH Pilot Field Power Offset
DpcchPcpLen	DPCH PC Preamble Length
SrbDelay	SRB Delay
MaxDlDpchPO[MAX_BP]	Power Offset of the Maximum Downlink DPCH Showing Different Basic Priority
MaxUlDpchPO[MAX_BP]	Power Offset of the Maximum Uplink DPCH Showing Different Basic Priority
MacroDivGain	Macro Diversity Gain of Downlink Dedicated Channel (Power Offset for HSPA Downlink Control Channel)
CoverPrd	Shield Period for Increasing SIR Target in Threshold Algorithm
PwrRaisLim	Power Raise Limit
DlTpcN	DL TPC Pattern 01 Count
BLERtarget	BLER Target

4.1.2 Configuration of Common Parameters

4.1.2.1 Control Part Gain Factor

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter->Transmission Format Composition Set of PRACH

- Parameter configuration

  Default configuration.

4.1.2.2 Data Part Gain Factor

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management-> Modify Advanced Parameter ->Transmission Format Composition Set of PRACH

- Parameter configuration

  Default configuration.

4.1.2.3 Power Offset between PRACH Control Part and PRACH Data Part

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management-> Modify Advanced Parameter ->Transmission Format Composition Set of PRACH

- Parameter configuration

  Default configuration.

4.1.2.4 SIB7 Originator

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->UtranCell->UtranCell xx-> Modify Advanced Parameter ->UtranCell

- Parameter configuration

  Originated by NodeB by default.

4.1.2.5 Uplink Interference Write Back Threshold

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->UtranCell->UtranCell xx-> Modify Advanced Parameter ->Power Control not Related Service

- Parameter configuration

Default configuration.

4.1.2.6 PRACH Initiation Tx Power Constant Value

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->UtranCell->UtranCell xx-> Modify Advanced Parameter ->PRACH

- Parameter configuration

  This parameter is related with cell radius: the longer the radius, the greater the correction value.

4.1.2.7 Maximum Allowed UL TX Power of RACH

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->UtranCell->UtranCell xx-> Modify Advanced Parameter ->PRACH

- Parameter configuration

  This value indicates the maximum power transmit level of uplink RACH.

4.1.2.8 PRACH Preamble Power Ramp Step

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->UtranCell->UtranCell xx-> Modify Advanced Parameter ->PRACH

- Parameter configuration

  This value indicates the speed of power adjustment while UE is sending the preamble. The greater the value is, the faster the power is increased.

4.1.2.9 P-CPICH Power

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->UtranCell->UtranCell xx->CellSetupParameters

- Parameter configuration

This parameter indicates the power level of downlink PCPICH. It is a basic power value to be configured and is 33dbm by default.

4.1.2.10 S-CPICH Power

- OMC Path

View->Configuration Management->RNC NE->Rnc Radio Resource Management->UtranCell->UtranCell xx-> Modify Advanced Parameter ->SCPICH

- Parameter configuration

The value of this parameter is based on the requirement of MIMO cell coverage. The bigger this parameter is, the bigger coverage, but too bigger S-CPICH power will generate unnessary interference, and reduce the capacity. The smaller this parameter is, the smaller coverage.

4.1.2.11 PICH Power

- OMC Path

View->Configuration Management->RNC NE->Rnc Radio Resource Management->UtranCell->UtranCell xx-> Modify Advanced Parameter -> Power Control not Related to Service

- Parameter configuration

The greater the value is, the greater the power offset is as relative to PCPICH, or the PICH transmits at higher power level.

4.1.2.12 AICH Power

- OMC Path

View->Configuration Management->RNC NE->Rnc Radio Resource Management->UtranCell->UtranCell xx-> Modify Advanced Parameter -> Power Control not Related to Service

- Parameter configuration

The greater the value is, the greater the power offset is as relative to PCPICH, or the AICH transmits at higher power level.

4.1.2.13 Maximum FACH Power

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->UtranCell->UtranCell xx-> Modify Advanced Parameter ->SCCPCH

- Parameter configuration

  This value indicates the transmit power level of FACH. The greater the value is, the greater the power offset is as relative to PCPICH and the higher the power is.

4.1.2.14 BCH Power

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->UtranCell->UtranCell xx->CellSetupParameters

- Parameter configuration

  This value indicates the transmit power level of BCH. The greater the value is, the greater the power offset is as relative to PCPICH and the higher the power is.

4.1.2.15 Primary SCH Power

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->UtranCell->UtranCell xx->CellSetupParameters

- Parameter configuration

  This value indicates the transmit power level of P-SCH. The greater the value is, the greater the power offset is as relative to PCPICH and the higher the power is.

4.1.2.16 Secondary SCH Power

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->UtranCell->UtranCell xx->CellSetupParameters

- Parameter configuration

This value indicates the transmit power level of S-SCH. The greater the value is, the greater the power offset is as relative to PCPICH and the higher the power is.

4.1.2.17 PCH Power

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->UtranCell->UtranCell xx->PCH

- Parameter configuration

  For PCH channel, the date rate is fixed, so the power shoud ensure the PCH date rate at the cell margin. Too big PCH power is waste power, and too small PCH power cannot ensure the UE be paged at the cell margin.

4.1.2.18 S-CCPCH TFCI Field Power Offset

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->UtranCell->UtranCell xx->SCCPCH

- Parameter configuration

  The paramter value is configured based on the requirement on coverage and capacity of system. If the parameter value is too small, the SCCPCH TFCI domain power will be so small that the UE's probability of right receieve will be bad when it is in the edge of the cell. If the parameter value is too large, it will incease the interference unnecessary, waste the downlink power and decrease the downlink capacity.

4.1.2.19 S-CCPCH Pilot Field Power Offset

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->UtranCell->UtranCell xx->SCCPCH

- Parameter configuration

  The paramter value is configured based on the requirement on coverage and capacity of system. If the parameter value is too small, the SCCPCH Pilot domain power will be so small that the UE's probability of right receieve will be bad when it is in the edge of the cell. If the parameter value is too large, it will incease the interference unnecessary, waste the downlink power and decrease the downlink capacity.

4.1.2.20 DPCH PC Preamble Length

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->UtranCell->UtranCell xx-> Modify Advanced Parameter ->Power Control not Related to Service

- Parameter configuration

  The value of this parameter should ensure the DPDCH power is suitable at the beginning of the DPDCH transmission. If this parameter is too big, the DPDCH transmission is not begin while the DPCCH power is already in a suitable level, it waste power. If this parameter is too small, it might begin DPDCH transmission at a low power, and it might make the BLER high in the beginning of DPDCH transmission. But ZTE RNC has configured the parameter of SrbDelay, it can run power control to several RFs before transmitting signaling,that improve the radio link quality and increase the successful receive rate of signaling.

4.1.2.21 SRB Delay

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->UtranCell->UtranCell xx-> Modify Advanced Parameter ->Power Control not Related to Service

- Parameter configuration

  The value of this parameter should ensure the DPDCH power is change to a suitable level before sending RB0~RB4 message.If this parameter is too small, it might begin to send RB0~RB4 message at a low power, and it might make message be decode mistakenly.

4.1.2.22 Power Offset of the Maximum Downlink DPCH Showing Different Basic Priority

- OMC Path

  View -> Configuration Resource Tree –> OMC -> UTRAN SubnetworkXXX -> RNC Managed ElementXXX -> RNC Config SetXXX (Choose the used config set) -> QoS ConfigurationXXX -> Priority and Rate Segment of QoS Advanced Parameter

- Parameter configuration

  The parameter value is configured based on the system demand on whether different basic priority users need have different maximum downlink power. The bigger this parameter is ,the bigger actual maximum downlink power. The smaller this parameter is ,the smaller actual maximum downlink power.

4.1.2.23 Power Offset of the Maximum Uplink DPCH Showing Different Basic Priority

- OMC Path

  View -> Configuration Resource Tree –> OMC -> UTRAN SubnetworkXXX -> RNC Managed ElementXXX -> RNC Config SetXXX (Choose the used config set) -> QoS ConfigurationXXX -> Priority and Rate Segment of QoS Advanced Parameter

- Parameter configuration

  The parameter value is configured based on the system demand on whether different basic priority users need have different maximum uplink power. The bigger this parameter is ,the bigger actual maximum uplink power. The smaller this parameter is ,the smaller actual maximum uplink power.

4.1.2.24 Macro Diversity Gain of Downlink Dedicated Channel (Power Offset for HSPA Downlink Control Channel)

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Hspa Configuration Information

- Parameter configuration

  If the value is too large, it will waste the DL power, increase the interference and reduce the capacity of the cell. If the value is too small, it will affect the receiving quality of service.

4.1.2.25 Shield Period for Increasing SIR Target in Threshold Algorithm

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->UtranCell->UtranCell xx-> Modify Advanced Parameter ->Power Control not Related to Service

- Parameter configuration

It is relative to the parameter TimeDelay, The value of CoverPrd must bigger than the round-trip time, It means that the value of CoverPrd must bigger than double of TimeDelay. If parameter is too big, it will waste the time of SIRtarget adjustment, and make SIRtarget adjust too slowly. And if parameter is too small, it might be smaller than the double of TimeDelay, the result of SIRtarget adjustment last time had not been reflected in.

4.1.2.26 Power Raise Limit

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->UtranCell->UtranCell xx->Modify Advanced Parameter ->UtranCell

- Parameter configuration

  Bigger this parameter is, more power can be raise during the downlink power averaging window. Smaller this parameter is, less power can be raise, and the DPCH power change more smoothly.

4.1.2.27 DL TPC Pattern 01 Count

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->UtranCell->UtranCell xx->Modify Advanced Parameter ->UtranCell

- Parameter configuration

  This parameter is used to ensure the TPC command is "0" and "1" by turns before the uplink is synchronized when first radio link is setup, it avoid the power be adjusted by mistake. The bigger this parameter is, the longer initial power be kept. The smaller this parameter is, the shorter initial power be kept, and higher probabilty of the power be affect by error TPC.

4.1.2.28 BLER Target

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Service Basic Configuration Information

- Parameter configuration

  Based on the need of services quallity. The parameter is bigger,the service needed quality is higher. The parameter is smaller,the service neededquality is lower.

4.2 Related Parameters of R99 downlink Power Balancing

4.2.1 List of Related Parameters of R99 Downlink Power Balancing

Abbreviated name	Parameter name
AdjType	Adjustment Type for DL Power Balance
MaxAdjStep	Max Adjustment Step for DL Power Balance
AdjPeriod	Adjustment Period for DL Power Balance
AdjRatio	Adjustment Ratio for DL Power Balance
DlRefPowUpdtTh	DL Reference Power Update Threshold

4.2.2 Configuration Related Parameters of R99 Downlink Power Balancing

4.2.2.1 Adjustment Type for DL Power Balance

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->NodeB Configuration Information xx-> Modify Advanced Parameter

- Parameter configuration

  Three values for the field. *Common* by default.

4.2.2.2 Max Adjustment Step for DL Power Balance

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->NodeB Configuration Information xx-> Modify Advanced Parameter

- Parameter configuration

  This value indicates when power is being balanced, the maximum power adjustment step is 1db within the number of timeslots of the value.

4.2.2.3 Adjustment Period for DL Power Balance

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->NodeB Configuration Information xx-> Modify Advanced Parameter

- Parameter configuration

  This value indicates the adjustment period. The greater the value is, the slower the power is adjusted on condition that the power adjustment volume is fixed.

4.2.2.4 Adjustment Ratio for DL Power Balance

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->NodeB Configuration Information xx-> Modify Advanced Parameter

- Parameter configuration

  This parameter indicates the adjustment ratio of the downlink power balancing. The larger the value is, the smaller the balance range in the balancing cycle will be.

4.2.2.5 DL Reference Power Update Threshold

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->NodeB Configuration Information xx-> Modify Advanced Parameter

- Parameter configuration

  This parameter is a threshold. The greater the value is, the greater the offset range is allowed for the reference power that is calculated in neighboring adjustment period, while RNC does not originate the power control request again.

4.3 Related Parameters of R99 Power Control

4.3.1 List of Related Parameters of R99 Power Control

Abbreviated name	Parameter name
TrfPcIndex(Utran Cell)	Traffic PC Index
TrfPcIndex(Traffic-Related Power Control)	Traffic PC Index
UlIlPcAlg	Uplink Inner Loop Power Control Algorithm
TpcStepSize	Step Size of Uplink Inner Loop Power Control
UlSirTargUpStep	Uplink SIR Target Up Step Size
UlSirTargDnStep	Uplink SIR Target Down Step Size
TpcDlStep	Step Size of Downlink Inner Loop Power Control

DivPcIndex(Utran Cell)	Diversity Mode and Traffic Related Power Control Parameters Index
DivPcIndex(Power Control Related to Service and Diversity Mode)	Diversity Mode and Traffic Related Power Control Parameters Index
TxDivMod	Transmit Diversity Mode
MaxDlDpchPwr	DPCH Maximum DL Power
MinDlDpchPwr	DPCH Minimum DL Power
DpchPO1	DPCH PO1
DpchPO2	DPCH PO2
DpchPO3	DPCH PO3
DpcchPilotEbN0	DPCCH Pilot Field Eb/N0
MaxUlDpchPwr	Maximum Allowed Uplink DPCH Transmission Power
ULInitSIR	Uplink Initial SIR Target
ULMaxSIR	Maximum Uplink SIR Target
ULMinSIR	Minimum Uplink SIR Target
ErrorThresh	Error Transport Block Number Threshold
BLERAccpPeriod	Tolerance BLER Period
ValidTimeWin	Valid Time Window
DynaUpdtPO2Stch	Dynamic Update PO2 Switch
TpcErrTarget	TPC Command Error Rate Target
POSetup	Power Offset for Downlink DPCH Initial Power Calculation when Call Setup
POSoftHO	Power Offset for Downlink DPCH Initial Power Calculation when Soft or Softer Handover
PORabHardHO	Power Offset for Downlink DPCH Initial Power Calculation when RAB Hard Handover
POSrbHardHO	Power Offset for Downlink DPCH Initial Power Calculation when SRB Hard Handover
POReEstablish	Power Offset for Downlink DPCH Initial Power Calculation when RAB Re-Establishment
BlerAdjustSwitch	R99 CS AMR Services BLER Target Adjustment Switch
UlHighLd	Uplink High Load Threshold for R99 CS AMR Services BLER Target Adjustment
DlHighLd	Downlink High Load Threshold for R99 CS AMR Services BLER Target Adjustment
ErrorThreshHLd	R99 CS AMR Services Error Transport Block Number Threshold in High Load Status for BLER Target Adjustment
BLERAccpPerHLd	R99 CS AMR Services Tolerance BLER Period in High Load Status for BLER Target Adjustment
BLERtargetHLd	R99 CS AMR Services BLER Target in High Load Status for BLER Target Adjustment

4.3.2 Configuration of Related Parameters of R99 Power Control

4.3.2.1 Traffic PC Index(Utran Cell)

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->UtranCell->UtranCell xx->Modify Advanced Parameter ->UtranCell

- Parameter configuration

  Configuration index which indicates a set of service related power control parameters.

4.3.2.2 Traffic PC Index(Traffic-Related Power Control)

- OMC Path

  View->Configuration Management->RNC NE-> Rnc Radio Resource Management->Modify Advanced Parameter ->Traffic-Related Power Control

- Parameter configuration

  Configuration index which indicates a set of service related power control parameters.

4.3.2.3 Uplink Inner Loop Power Control Algorithm

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Traffic-Related Power Control

- Parameter configuration

  The parameter indicates inner loop power control algorithm.

4.3.2.4 Step Size of Uplink Inner Loop Power Control

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Traffic-Related Power Control

- Parameter configuration

The value is meaningful only if *1* is selected for the the uplink inner loop power control algorithm. The greater the adjustment step is, the SIR is calculated to converge faster to approach SIRtarget and the adjustment is done faster.

4.3.2.5 Uplink SIR Target Up Step Size

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Traffic-Related Power Control

- Parameter configuration

  The greater the parameter is, the larger the increase step will be when the increase decision is output and SIRTarget is increased faster. This parameter can be queried by the current uplink sub-service type.

4.3.2.6 Uplink SIR Target Down Step Size

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Traffic-Related Power Control

- Parameter configuration

  The smaller the parameter is, SIRTarget is decreased more slowly when the decrease decision is output. This parameter can be queried by the current uplink sub-service type

4.3.2.7 Step Size of Downlink Inner Loop Power Control

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Traffic-Related Power Control

- Parameter configuration

  This parameter is usualy configured as a small value for stable channel conditions, or as a large value for bad radio environment.

4.3.2.8 Diversity Mode and Traffic Related Power Control Parameters Index (Utran Cell)

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->UtranCell->UtranCell xx->Modify Advanced Parameter ->UtranCell

- Parameter configuration

  This parameter is a configuration index which indicates a set of diversity mode and service related power control parameters. Fixed value.

4.3.2.9 Diversity Mode and Traffic Related Power Control Parameters Index (Power Control Related to Service and Diversity Mode)

- OMC Path

  View->Configuration Management->RNC NE-> Rnc Radio Resource Management->Modify Advanced Parameter ->Power Control Related to Service and Diversity Mode

- Parameter configuration

  This parameter is a configuration index which indicates a set of diversity mode and service related power control parameters. Fixed value.

4.3.2.10 Transmit Diversity Mode

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Power Control Related to Service and Diversity Mode

- Parameter configuration

  The configure of this parameter is based on whether the transmit diversity mode is used, and which mode is in use.

4.3.2.11 DPCH Maximum DL Power

- OMC Path

View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Power Control Related to Service and Diversity Mode

- Parameter configuration

The parameter indicates the maximum transmit power level allowed for DPCH downlink. It is related with sub-service types.

4.3.2.12 DPCH Minimum DL Power

- OMC Path

View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Power Control Related to Service and Diversity Mode

- Parameter configuration

The parameter indicates the minimum transmit power level allowed for DPCH downlink. It is related with sub-service types.

4.3.2.13 DPCH PO1

- OMC Path

View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Power Control Related to Service and Diversity Mode

- Parameter configuration

The parameter indicates the power offset of TFCI relative to DPDCH domain. The greater the value is, the higher the relative power will be. It is related with sub-service types.

4.3.2.14 DPCH PO2

- OMC Path

View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Power Control Related to Service and Diversity Mode

- Parameter configuration

The parameter indicates the power offset of TPC relative to DPDCH domain. The greater the value is, the higher the relative power will be. It is related with sub-service types.

4.3.2.15 DPCH PO3

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Power Control Related to Service and Diversity Mode

- Parameter configuration

  The parameter indicates the power offset of PILOT relative to DPDCH domain. The greater the value is, the higher the relative power will be. It is related with sub-service types.

4.3.2.16 DPCCH Pilot Field Eb/N0

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Power Control Related to Service and Diversity Mode

- Parameter configuration

  This parameter is used in calculating uplink DPCCH open loop power control. The greater the value is, the greater the calculated initial DPCCH power will be. It is related with uplink sub-service types

4.3.2.17 Maximum Allowed Uplink DPCH Transmission Power

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Power Control Related to Service and Diversity Mode

- Parameter configuration

  The parameter is configured in OMC. The greater the value is, the higher the maximum transmit power will be allowed for the uplink.

4.3.2.18 Uplink Initial SIR target

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Power Control Related to Service and Diversity Mode

- Parameter configuration

  This paramter is of the SIR TARGET value initially delivered by RNC to NodeB after initial service access. It is related with uplink sub-service types

4.3.2.19 Maximum Uplink SIR target

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Power Control Related to Service and Diversity Mode

- Parameter configuration

  The parameter is the adjustable maximum value of SIRtarget if the SIRtarget increase decision is output when RNC is performing uplink outer loop power control. It is related with uplink sub-service types.

4.3.2.20 Minimum Uplink SIR target

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Power Control Related to Service and Diversity Mode

- Parameter configuration

  The parameter is the adjustable minimum value of SIRtarget if the SIRtarget decrease decision is output when RNC is performing uplink outer loop power control. It is related with uplink sub-service types.

4.3.2.21 Error Transport Block Number Threshold

- OMC Path

View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Service Basic Configuration Information

- Parameter configuration

Bigger value of this parameter, harder to increase SIR target.And if this parameter is too big, it will reduce the service quality. Smaller value of this parameter, more easy to increase SIR target. And if this parameter is too small, it will waste power.

4.3.2.22 Tolerance BLER Period

- OMC Path

View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Service Basic Configuration Information

- Parameter configuration

The parameter is bigger, it is more difficult for the UE to decrease the SIRtarget and accordingly easier to waste power rescource. The parameter is smaller, it is easier for the UE to decrease the SIRtarget and accordingly easier to affect service quality.

4.3.2.23 Valid Time Window

- OMC Path

View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Service Basic Configuration Information

- Parameter configuration

The Valid Time Window must long enough to ensure receive no less than M/BLERtarget TBs. The parameter is bigger, it is easier for UE to receive enough TBs.The parameter is smaller, it is more difficult for UE to receive enough TBs.

4.3.2.24 Dynamic Update PO2 Switch

- OMC Path

View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter -> RNC Configuration Supplement Information

- Parameter configuration

This function can be open when the capacity of the cell is limited by downlink power.

4.3.2.25 TPC Command Error Rate Target

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Hspa Configuration Information

- Parameter configuration

  This parameter is TPC error rate used for F-DPCH OLPC. If the parameter value is too large, the performance requirement of the control channel might not be meet. If the parameter value is too small, it would be very difficult to meet this TPC error target, and generate unnessary waste power.

4.3.2.26 Power Offset for Downlink DPCH Initial Power Calculation when Call Setup

- OMC Path

View->Configuration Management->RNC NE->Rnc Radio Resource Management->UtranCell->UtranCell xx-> Modify Advanced Parameter ->Power Control not Related to Service

- Parameter configuration

  Bigger this parameter is, bigger the initial power when call setup.

4.3.2.27 Power Offset for Downlink DPCH Initial Power Calculation when Soft or Softer Handover

- OMC Path

View->Configuration Management->RNC NE->Rnc Radio Resource Management->UtranCell->UtranCell xx-> Modify Advanced Parameter ->Power Control not Related to Service

- Parameter configuration

  Bigger this parameter is, bigger the initial power when soft or softer handover.

4.3.2.28 Power Offset for Downlink DPCH Initial Power Calculation when RAB Hard Handover

- OMC Path

View->Configuration Management->RNC NE->Rnc Radio Resource Management->UtranCell->UtranCell xx-> Modify Advanced Parameter ->Power Control not Related to Service

- Parameter configuration

Bigger this parameter is, bigger the initial power when RAB hard handover.

4.3.2.29 Power Offset for Downlink DPCH Initial Power Calculation when SRB Hard Handover

- OMC Path

View->Configuration Management->RNC NE->Rnc Radio Resource Management->UtranCell->UtranCell xx-> Modify Advanced Parameter ->Power Control not Related to Service

- Parameter configuration

Bigger this parameter is, bigger the initial power when SRB hard handover.

4.3.2.30 Power Offset for Downlink DPCH Initial Power Calculation when RAB Re-Establishment

- OMC Path

View->Configuration Management->RNC NE->Rnc Radio Resource Management->UtranCell->UtranCell xx-> Modify Advanced Parameter ->Power Control not Related to Service

- Parameter configuration

Bigger this parameter is, bigger the initial power when RAB re-establishment.

4.3.2.31 R99 CS AMR Services BLER Target Adjustment Switch

- OMC Path

View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter -> RNC Configuration Supplement Information

- Parameter configuration

The switch for R99 CS AMR services BLER target adjustment function.

4.3.2.32 Uplink High Load Threshold for R99 CS AMR Services BLER Target Adjustment

- OMC Path

View->Configuration Management->RNC NE->Rnc Radio Resource Management->UtranCell->UtranCell xx-> Modify Advanced Parameter ->Load Control Relationship

- Parameter configuration

Smaller this parameter is, easier for uplink AMR service to use bigger BLER target.

4.3.2.33 Downlink High Load Threshold for R99 CS AMR Services BLER Target Adjustment

- OMC Path

View->Configuration Management->RNC NE->Rnc Radio Resource Management->UtranCell->UtranCell xx-> Modify Advanced Parameter ->Load Control Relationship

- Parameter configuration

Smaller this parameter is, easier for downlink AMR service to use bigger BLER target.

4.3.2.34 R99 CS AMR Services Error Transport Block Number Threshold in High Load Status for BLER Target Adjustment

- OMC Path

View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Service Basic Configuration Information

- Parameter configuration

Bigger this parameter is, harder for uplink AMR service to increase the SIR target in uplink high load status.

4.3.2.35 R99 CS AMR Services Tolerance BLER Period in High Load Status for BLER Target Adjustment

- OMC Path

View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Service Basic Configuration Information

- Parameter configuration

Smaller this parameter is, harder for uplink AMR service to decrease the SIR target in uplink high load status.

4.3.2.36 R99 CS AMR Services BLER Target in High Load Status for BLER Target Adjustment

- OMC Path

View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Service Basic Configuration Information

- Parameter configuration

  Bigger this parameter is, bigger BLER for downlink AMR service.

4.4 Related Parameters of HSDPA Power Control

4.4.1 List of Related Parameters of HSDPA Power Control

Abbreviated name	Parameter name
AckPwrOffset	HS-DPCCH ACK Power Offset for Single Radio Link or Intra-NodeB Handover
NackPwrOffset	HS-DPCCH NACK Power Offset for Single Radio Link or Intra-NodeB Handover
CqiPwrOffset	HS-DPCCH CQI Power Offset for Single Radio Link or Intra-NodeB Handover
InterAckPwrOfst	HS-DPCCH ACK Power Offset for Inter-NodeB Handover
InterNackPwrOfst	HS-DPCCH NACK Power Offset for Inter-NodeB Handover
InterCqiPwrOfst	HS-DPCCH CQI Power Offset for Inter-NodeB Handover
CqiCycle	CQI Feedback Cycle
CqiRepFactor	CQI Repetition Factor
AnackRepFactor	ACK-NACK Repetition Factor
PbPendTimeThd	Pending Times Threshold for Power Balance Between DPCH and HSDPA
HsdschTotPwrMeth	HSPA Total Downlink Power Allocation Method
HspaPwrRatio	HSPA Total Downlink Power
MinHspaPwrRto	Minimum HSPA Total Downlink Power
MaxHspaPwrRto	Maximum HSPA Total Downlink Power
MeasPwrOffset	HS-PDSCH Measurement Power Offset

4.4.2 Configuration of Related Parameters of HSDPA Power Control

4.4.2.1 HS-DPCCH ACK Power Offset for Single Radio Link or Intra-NodeB Handover

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Hspa Configuration Information

- Parameter configuration

RNC delivers this value in the case of UE downlink HSDPA channel reception and also when UE has a single radio link or in softer macro diversity.

4.4.2.2 HS-DPCCH NACK Power Offset for Single Radio Link or Intra-NodeB Handover

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Hspa Configuration Information

- Parameter configuration

  RNC delivers this value in the case of UE downlink HSDPA channel reception and also when UE has a single radio link or in softer macro diversity.

4.4.2.3 HS-DPCCH CQI Power Offset for Single Radio Link or Intra-NodeB Handover

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Hspa Configuration Information

- Parameter configuration

  RNC delivers this value in the case of UE downlink HSDPA channel reception and also when UE has a single radio link or in softer macro diversity.

4.4.2.4 HS-DPCCH ACK Power Offset for Inter-NodeB Handover

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Hspa Configuration Information

- Parameter configuration

  RNC delivers this value in the case of UE downlink HSDPA channel reception and also when UE has a single radio link or in inter-NodeB macro diversity.

4.4.2.5 HS-DPCCH NACK Power Offset for Inter-NodeB Handover

- OMC Path

View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Hspa Configuration Information

- Parameter configuration

RNC delivers this value in the case of UE downlink HSDPA channel reception and also when UE is in inter-NodeB macro diversity.

4.4.2.6 HS-DPCCH CQI Power Offset for Inter-NodeB Handover

- OMC Path

View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Hspa Configuration Information

- Parameter configuration

RNC delivers this value in the case of UE downlink HSDPA channel reception and also when UE is in inter-NodeB macro diversity.

4.4.2.7 CQI Feedback Cycle

- OMC Path

View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Hspa Configuration Information

- Parameter configuration

This parameter indicates the feedback period. The greater the value is, the lower the feedback frequency will be.

4.4.2.8 CQI Repetition Factor

- OMC Path

View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Hspa Configuration Information

- Parameter configuration

CQI Feedback Cycle and CQI Repetition Factor determine the time of same CQI to be feed back. The bigger the CQI Repetition Factor is, the longer time to wait to send the new CQI, the less exact of the schedualing, and less system capacity. But the smaller the CQI Repetition Factor is, the less probabilty of CQI be decoded rightly.

4.4.2.9 ACK-NACK Repetition Factor

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Hspa Configuration Information

- Parameter configuration

  The bigger the ACK-NACK Repetition Factor is, the less ACK or NACK of new data would be feed back to network,the less system capacity. The smaller the ACK-NACK Repetition Factor is, the less probabilty of ACK or NACK be decoded rightly.

4.4.2.10 Pending Times Threshold for Power Balance Between DPCH and HSDPA

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Hspa Configuration Information

- Parameter configuration

  The parameter value is congfigured based on the system requirement on power assingment on HSDPA or R99. If the parameter value is too small, the HSDPA power will be occupied easily affecting the HSDPA capacity. If the parameter value is too large, it is difficult to balance the power between the HSDPA and R99 and will affect the cell capacity.

4.4.2.11 HSPA Total Downlink Power Allocation Method

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Hspa Configuration Information

- Parameter configuration

  This parameter indicates three types of allocations and it is NodeB free allocation by default, indicating that RNC notifies NodeB of the allowed power range (maximum and minimum) for transmission. NodeB determines the specific transmit power value.

4.4.2.12 HSPA Total Downlink Power

- OMC Path

View->Configuration Management->RNC NE->Rnc Radio Resource Management->UtranCell->UtranCell xx-> Modify Advanced Parameter ->Hspa Configuration Information In A Cell

- Parameter configuration

This parameter is invalid if the default configuration (NodeB free allocation) is adopted.

4.4.2.13 Minimum HSPA Total Downlink Power

- OMC Path

View->Configuration Management->RNC NE->Rnc Radio Resource Management->UtranCell->UtranCell xx-> Modify Advanced Parameter ->Hspa Configuration Information In A Cell

- Parameter configuration

This parameter is invalid if the default configuration (NodeB free allocation) is adopted.

4.4.2.14 Maximum HSPA Total Downlink Power

- OMC Path

View->Configuration Management ->Rnc Radio Resource Management->UtranCell->UtranCell xx-> Modify Advanced Parameter ->Hspa Configuration Information In A Cell

- Parameter configuration

This parameter is invalid if the default configuration (NodeB free allocation) is adopted.

4.4.2.15 HS-PDSCH Measurement Power Offset

- OMC Path

View->Configuration Management->RNC NE->Rnc Radio Resource Management->UtranCell->UtranCell xx-> Modify Advanced Parameter ->Hspa Configuration Information In A Cell

- Parameter configuration

The principle is to control the CQI in the range form 1 to 30. If this parameter is configured too big, the service might get big CQI, and get big power, but it will reduce the cell capacity.But if this parameter is configured too small, it might not satisfy the requirment of CQI.

4.5 Related Parameters of HSUPA Power Control

4.5.1 List of Related Parameters of HSUPA Power Control

Abbreviated name	Parameter name
EdpcchPOTti2	Quantified E-DPCCH/DPCCH Power Offset **(2ms TTI)**
EdpcchPOTti10	Quantified E-DPCCH/DPCCH Power Offset (10ms TTI)
ScheInfoPOTti2	Power Offset for Scheduling Info (2ms TTI)
ScheInfoPOTti10	Power Offset for Scheduling Info (10ms TTI)
NhrThrUp	NHR Threshold to Adjust SIR Target Upward(10ms E-TTI)
NhrThrDown	NHR Threshold to Adjust SIR Target Downward(10ms E-TTI)
NhrThrUpTti2	NHR Threshold to Adjust SIR Target Upward(2ms E-TTI)
NhrThrDownTti2	NHR Threshold to Adjust SIR Target Downward(2ms E-TTI)
EdchHarqPOFdd	E-DCH HARQ Power Offset FDD
EagchPOTti2	E-AGCH Power Offset for TTI 2ms
EagchPOTti10	E-AGCH Power Offset for TTI 10ms
ErgchPOTti2	E-RGCH Power Offset for TTI 2ms
ErgchPOTti10	E-RGCH Power Offset for TTI 10ms
EhichPOTti2	E-HICH Power Offset for TTI 2ms
EhichPOTti10	E-HICH Power Offset for TTI 10ms
EdchRefPO	E-DCH Reference Power Offset
MaxRetransEdch	Maximum Number of Retransmissions for E-DCH
CorrNumHarqToNhr	Correction Coefficient for Converting HARQ Failure to NHR
StatWinSizeTti10	Statistics Window Size of E-DCH Quality (10ms E-TTI)
StatWinSizeTti2	Statistics Window Size of E-DCH Quality (2ms E-TTI)
DwThresSampleNum	Threshold of Sample Number to Adjust SIR Target Downward(10ms E-TTI)
UpThresSampleNum	Threshold of Sample Number to Adjust SIR Target Upward(10ms E-TTI)

DwThrSampNumTti2	Threshold of Sample Number to Adjust SIR Target Downward(2ms E-TTI)
UpThrSampNumTti2	Threshold of Sample Number to Adjust SIR Target Upward(2ms E-TTI)
EdchRefConfigIdx	E-DCH Reference Configuration Index
EplTti2T0	E-DPDCH Puncturing Limit (2ms E-TTI, E-TFCI Table0)
EplTti2T1	E-DPDCH Puncturing Limit (2ms E-TTI, E-TFCI Table1)
EplTti10T0	E-DPDCH Puncturing Limit (10ms E-TTI, E-TFCI Table0)
EplTti10T1	E-DPDCH Puncturing Limit (10ms E-TTI, E-TFCI Table1)
REtfcNumTti2T0	Number of Reference E-TFCI (2ms E-TTI, E-TFCI Table0)
REtfciTti2T0[MAX_REF_ETFC]	Set of Reference E-TFCIs (2ms E-TTI, E-TFCI Table0)
REtfciPOTti2T0[MAX_REF_ETFC]	Power Offset of Reference E-TFCIs (2ms E-TTI, E-TFCI Table0)
REtfcNumTti2T1	Number of Reference E-TFCI (2ms E-TTI, E-TFCI Table1)
REtfciTti2T1[MAX_REF_ETFC]	Set of Reference E-TFCIs (2ms E-TTI, E-TFCI Table1)
REtfciPOTti2T1[MAX_REF_ETFC]	Power Offset of Reference E-TFCIs (2ms E-TTI, E-TFCI Table1)
REtfcNumTti10T0	Number of Reference E-TFCI (10ms E-TTI, E-TFCI Table0)
REtfciTti10T0[MAX_REF_ETFC]	Set of Reference E-TFCIs (10ms E-TTI, E-TFCI Table0)
REtfciPOTti10T0[MAX_REF_ETFC]	Power Offset of Reference E-TFCIs (10ms E-TTI, E-TFCI Table0)
REtfcNumTti10T1	Number of Reference E-TFCI (10ms E-TTI, E-TFCI Table1)
REtfciTti10T1[MAX_REF_ETFC]	Set of Reference E-TFCIs (10ms E-TTI, E-TFCI Table1)
REtfciPOTti10T1[MAX_REF_ETFC]	Power Offset of Reference E-TFCIs (10ms E-TTI, E-TFCI Table1)
ThrHarqFailTti2	Threshold of HARQ Failure Indication Number to Adjust SIR Target Upward (2ms E-TTI)
ThrHarqFailTti10	Threshold of HARQ Failure Indication Number to Adjust SIR Target Upward (10ms E-TTI)

4.5.2 Configuration of Related Parameters of HSUPA Power Control

4.5.2.1 Quantified E-DPCCH/DPCCH Power Offset(2ms TTI)

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Hspa Configuration Information

- Parameter configuration

  This parameter is of the power value relative to the power of DPCCH.

4.5.2.2 Quantified E-DPCCH/DPCCH Power Offset(10ms TTI)

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Hspa Configuration Information

- Parameter configuration

  This parameter is of the power value relative to the power of DPCCH.

4.5.2.3 Power Offset for Scheduling Info (2ms TTI)

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Hspa Configuration Information

- Parameter configuration

  The value of this parameter is used to ensure the 2ms TTI scheduling information be demodulated rightly, and avoiding unnecessary power waste. If this parameter is too big, it will waste power, and reduce the system capacity. If this parameter is too small, the scheduling information will not be demodulated, and affect the service quality.

4.5.2.4 Power Offset for Scheduling Info (10ms TTI)

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Hspa Configuration Information

- Parameter configuration

  The value of this parameter is used to ensure the 10ms TTI scheduling information be demodulated rightly, and avoiding unnecessary power waste. If this parameter is too big, it will waste power, and reduce the system capacity. If this parameter is too small, the scheduling information will not be demodulated, and affect the service quality.

4.5.2.5 NHR Threshold to Adjust SIR Target Upward(10ms E-TTI)

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Service Basic Configuration Information

- Parameter configuration

  This parameter is related with uplink sub-service types. The greater the value is, the more difficult it is to output the SIRtarget increase decision.

4.5.2.6 NHR Threshold to Adjust SIR Target Downward(10ms E-TTI)

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Service Basic Configuration Information

- Parameter configuration

  This parameter is related with uplink sub-service types. The smaller the value is, the more difficult it is to output the SIRtarget decrease decision.

4.5.2.7 NHR Threshold to Adjust SIR Target Upward(2ms E-TTI)

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Service Basic Configuration Information

- Parameter configuration

  This parameter is related with uplink sub-service types. The greater the value is, the more difficult it is to output the SIR target increase decision.

4.5.2.8 NHR Threshold to Adjust SIR Target Downward(2ms E-TTI)

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Service Basic Configuration Information

- Parameter configuration

  This parameter is related with uplink sub-service types. The smaller the value is, the more difficult it is to output the SIR target decrease decision.

4.5.2.9 E-DCH HARQ Power Offset FDD

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Service Basic Configuration Information

- Parameter configuration

  No description.

4.5.2.10 E-AGCH Power Offset for TTI 2ms

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Power Control Related to Service and Diversity Mode

- Parameter configuration

  This parameter is related with sub-service types.

4.5.2.11 E-AGCH Power Offset for TTI 10ms

- OMC Path

  View->Configuration Management ->Rnc Radio Resource Management->Modify Advanced Parameter ->Power Control Related to Service and Diversity Mode

- Parameter configuration

  This parameter is related with sub-service types.

4.5.2.12 E-RGCH Power Offset for TTI 2ms

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Power Control Related to Service and Diversity Mode

- Parameter configuration

  This parameter is related with sub-service types.

4.5.2.13 E-RGCH Power Offset for TTI 10ms

- OMC Path

  View->Configuration Management ->Rnc Radio Resource Management->Modify Advanced Parameter ->Power Control Related to Service and Diversity Mode

- Parameter configuration

  This parameter is related with sub-service types.

4.5.2.14 E-HICH Power Offset for TTI 2ms

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Power Control Related to Service and Diversity Mode

- Parameter configuration

  This parameter is related with sub-service types.

4.5.2.15 E-HICH Power Offset for TTI 10ms

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Power Control Related to Service and Diversity Mode

- Parameter configuration

  This parameter is related with uplink sub-service types.

4.5.2.16 E-DCH Reference Power Offset

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Hspa Configuration Information

- Parameter configuration

  This parameter is used to estimate the uplink load increase caused by the MAC-e PDUs which is not decoded. The bigger this parameter is, the bigger E-DPDCH power, and less systerm capacity. The smaller this parameter is, the smaller E-DPDCH power, and lower quality of the service.

4.5.2.17 Maximum Number of Retransmissions for E-DCH

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Service Basic Configuration Information

- Parameter configuration

  This parameter is used to incarnate the gain of retransmission. Usually this parameter is configured with a larger value. The parameter is bigger, there is more times of retransmisson. The parameter is smaller, there is less times of retransmission.

4.5.2.18 Correction Coefficient for Converting HARQ Failure to NHR

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Service Basic Configuration Information

- Parameter configuration

  Configure the parameter value based on the system demand on the adjusting timeliness and avoiding unnessary power waste. If the parameter value is too large, it will waste power unnessary, generate more interference and decrease the uplink capasity because of SIR target inceasing. If the parameter value is too small, it will not adjust transmission power immediately and affect service quality.

4.5.2.19 Statistics Window Size of E-DCH Quality (10ms E-TTI)

- OMC Path

View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Service Basic Configuration Information

- Parameter configuration

The value of this parameter must satisfy that 10ms E-TTI service transfer E-DCH FP number no less than maximum(DwThresSampleNum，UpThresSampleNum). The parameter is bigger, it is easier for UE to receive enough FPs. But if the parameter is smaller, it is more difficult for UE to receive enough FPs.

4.5.2.20 Statistics Window Size of E-DCH Quality (2ms E-TTI)

- OMC Path

View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Service Basic Configuration Information

- Parameter configuration

The value of this parameter must satisfy that 2ms E-TTI service transfer E-DCH FP number no less than maximum(DwThrSampNumTti2，UpThrSampNumTti2). The parameter is bigger, it is easier for UE to receive enough FPs. But if the parameter is smaller, it is more difficult for UE to receive enough FPs.

4.5.2.21 Threshold of Sample Number to Adjust Downward(10ms E-TTI)

- OMC Path

View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Service Basic Configuration Information

- Parameter configuration

Outer loop power control run in the principle of rapid increasing and slow decreasing the uplink SIR target.So usually DwThresSampleNum is bigger than UpThresSampleNum. The parameter is bigger,it is more difficult to decrease the SIRtarget and easier to waste power. The parameter is smaller,it is easier to decrease the SIRtarget and to affect the service quality.

4.5.2.22 Threshold of Sample Number to Adjust Upward(10ms E-TTI)

- OMC Path

View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Service Basic Configuration Information

- Parameter configuration

  Outer loop power control run in the principle of rapid increasing and slow decreasing the uplink SIR target.So usually DwThresSampleNum is bigger than UpThresSampleNum.

4.5.2.23 Threshold of Sample Number to Adjust SIR Target Downward(2ms E-TTI)

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Service Basic Configuration Information

- Parameter configuration

  Outer loop power control run in the principle of rapid increasing and slow decreasing the uplink SIR target.So usually DwThrSampNumTti2 is bigger than UpThrSampNumTti2.

  The parameter is bigger,it is more difficult to decrease the SIRtarget and easier to waste power.

  The parameter is smaller,it is easier to decrease the SIRtarget and to affect the service quality.

4.5.2.24 Threshold of Sample Number to Adjust SIR Target Upward(2ms E-TTI)

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Service Basic Configuration Information

- Parameter configuration

  Outer loop power control run in the principle of rapid increasing and slow decreasing the uplink SIR target.So usually DwThrSampNumTti2 is bigger than UpThrSampNumTti2.

  The parameter is bigger,it is more difficult to increase the SIRtarget and affect the service quality. easier to waste power.

  The parameter is smaller,it is easier to increase the SIRtarget and easier to waste power.

4.5.2.25 E-DCH Reference Configuration Index

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->E-DCH Reference Configuration Information

- Parameter configuration

  This parameter is a configuraiton number, which is used for index, and its value is fixed.

4.5.2.26 E-DPDCH Puncturing Limit (2ms E-TTI, E-TFCI Table0)

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->E-DCH Reference Configuration Information

- Parameter configuration

  If the parameter is too large, the amount of actual puncturing will be too samll, uplink power will be too high which generate unnecessary interfrence, and reduce the uplink capacity.

  If the parameter is too samll, the amount of actual puncturing will be too large, uplink power will be too low, and affect the quality of service.

4.5.2.27 E-DPDCH Puncturing Limit (2ms E-TTI, E-TFCI Table1)

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->E-DCH Reference Configuration Information

- Parameter configuration

  If the parameter is too large, the amount of actual puncturing will be too samll, uplink power will be too high which generate unnecessary interfrence, and reduce the uplink capacity.

  If the parameter is too samll, the amount of actual puncturing will be too large, uplink power will be too low, and affect the quality of service.

4.5.2.28 E-DPDCH Puncturing Limit (10ms E-TTI, E-TFCI Table0)

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->E-DCH Reference Configuration Information

- Parameter configuration

  If the parameter is too large, the amount of actual puncturing will be too samll, uplink power will be too high which generate unnecessary interfrence, and reduce the uplink capacity.

  If the parameter is too samll, the amount of actual puncturing will be too large, uplink power will be too low, and affect the quality of service.

4.5.2.29 E-DPDCH Puncturing Limit (10ms E-TTI, E-TFCI Table1)

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->E-DCH Reference Configuration Information

- Parameter configuration

  If the parameter is too large, the amount of actual puncturing will be too samll, uplink power will be too high which generate unnecessary interfrence, and reduce the uplink capacity.

  If the parameter is too samll, the amount of actual puncturing will be too large, uplink power will be too low, and affect the quality of service.

4.5.2.30 Number of Reference E-TFCI (2ms E-TTI, E-TFCI Table0)

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->E-DCH Reference Configuration Information

- Parameter configuration

  The power of a E-TFCI will be calculated most accurately based on the reference E-TFCI with same SF，otherwise it will not accurately. So we should ensure the referece E-TFCIs are choosed on the SF turning point in the E-TFCI table.

  Bigger this parameter is, more reference E-TFCIs, and more accurately the power be calculated.

4.5.2.31 Set of Reference E-TFCIs (2ms E-TTI, E-TFCI Table0)

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->E-DCH Reference Configuration Information

- Parameter configuration

  The number of REtfciTti2T0 is determined by the parameter REtfcNumTti2T0. The power of a E-TFCI will be calculated most accurately based on the reference E-TFCI with same SF，otherwise it will not accurately. So we should ensure the referece E-TFCIs are choosed on the SF turning point in the E-TFCI table.

  Inappropriate reference E-TFCI will make the power calculation is not accurate.

4.5.2.32 Power Offset of Reference E-TFCIs (2ms E-TTI, E-TFCI Table0)

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->E-DCH Reference Configuration Information

- Parameter configuration

  The value of this parameter is configured based on the requirement on the service quality and system capacity. Larger this parameter is, higher power of the reference E-TFCI, and bigger uplink interfrence, smaller system capacity. Smaller this parameter is, lower power of the reference E-TFCI, and worse the service quality.

4.5.2.33 Number of Reference E-TFCI (2ms E-TTI, E-TFCI Table1)

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->E-DCH Reference Configuration Information

- Parameter configuration

  The power of a E-TFCI will be calculated most accurately based on the reference E-TFCI with same SF，otherwise it will not accurately. So we should ensure the referece E-TFCIs are choosed on the SF turning point in the E-TFCI table.

  Bigger this parameter is, more reference E-TFCIs, and more accurately the power be calculated.

4.5.2.34 Set of Reference E-TFCIs (2ms E-TTI, E-TFCI Table1)

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->E-DCH Reference Configuration Information

- Parameter configuration

  The number of REtfciTti2T1 is determined by the parameter REtfcNumTti2T1. The power of a E-TFCI will be calculated most accurately based on the reference E-TFCI with same SF，otherwise it will not accurately. So we should ensure the referece E-TFCIs are choosed on the SF turning point in the E-TFCI table.

  Inappropriate reference E-TFCI will make the power calculation is not accurate.

4.5.2.35 Power Offset of Reference E-TFCIs (2ms E-TTI, E-TFCI Table1)

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->E-DCH Reference Configuration Information

- Parameter configuration

  The value of this parameter is configured based on the requirement on the service quality and system capacity. Larger this parameter is, higher power of the reference E-TFCI, and bigger uplink interfrence, smaller system capacity. Smaller this parameter is, lower power of the reference E-TFCI, and worse the service quality.

4.5.2.36 Number of Reference E-TFCI (10ms E-TTI, E-TFCI Table0)

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->E-DCH Reference Configuration Information

- Parameter configuration

  The power of a E-TFCI will be calculated most accurately based on the reference E-TFCI with same SF，otherwise it will not accurately. So we should ensure the referece E-TFCIs are choosed on the SF turning point in the E-TFCI table.

  Bigger this parameter is, more reference E-TFCIs, and more accurately the power be calculated.

4.5.2.37 Set of Reference E-TFCIs (10ms E-TTI, E-TFCI Table0)

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->E-DCH Reference Configuration Information

- Parameter configuration

  The number of REtfciTti10T0 is determined by the parameter REtfcNumTti10T0. The power of a E-TFCI will be calculated most accurately based on the reference E-TFCI with same SF，otherwise it will not accurately. So we should ensure the referece E-TFCIs are choosed on the SF turning point in the E-TFCI table.

  Inappropriate reference E-TFCI will make the power calculation is not accurate.

4.5.2.38 Power Offset of Reference E-TFCIs (10ms E-TTI, E-TFCI Table0)

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->E-DCH Reference Configuration Information

- Parameter configuration

  The value of this parameter is configured based on the requirement on the service quality and system capacity. Larger this parameter is, higher power of the reference E-TFCI, and bigger uplink interfrence, smaller system capacity. Smaller this parameter is, lower power of the reference E-TFCI, and worse the service quality.

4.5.2.39 Number of Reference E-TFCI (10ms E-TTI, E-TFCI Table1)

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->E-DCH Reference Configuration Information

- Parameter configuration

  The power of a E-TFCI will be calculated most accurately based on the reference E-TFCI with same SF，otherwise it will not accurately. So we should ensure the referece E-TFCIs are choosed on the SF turning point in the E-TFCI table.

  Bigger this parameter is, more reference E-TFCIs, and more accurately the power be calculated.

4.5.2.40 Set of Reference E-TFCIs (10ms E-TTI, E-TFCI Table1)

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->E-DCH Reference Configuration Information

- Parameter configuration

  The number of REtfciTti10T1 is determined by the parameter REtfcNumTti10T1. The power of a E-TFCI will be calculated most accurately based on the reference E-TFCI with same SF，otherwise it will not accurately. So we should ensure the referece E-TFCIs are choosed on the SF turning point in the E-TFCI table.

  Inappropriate reference E-TFCI will make the power calculation is not accurate.

4.5.2.41 Power Offset of Reference E-TFCIs (10ms E-TTI, E-TFCI Table1)

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->E-DCH Reference Configuration Information

- Parameter configuration

  The value of this parameter is configured based on the requirement on the service quality and system capacity. Larger this parameter is, higher power of the reference E-TFCI, and bigger uplink interfrence, smaller system capacity. Smaller this parameter is, lower power of the reference E-TFCI, and worse the service quality.

4.5.2.42 Threshold of HARQ Failure Indication Number to Adjust SIR Target Upward (2ms E-TTI)

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Service Basic Configuration Information

- Parameter configuration

  Bigger the number of HARQ fail threshold for increasing SIR target, harder to increase SIR target.And if this parameter is too big, it will reduce the service quality.

  Smaller the number of HARQ fail threshold for increasing SIR target, more easy to increase SIR target. And if this parameter is too small, it will waste power.

4.5.2.43 Threshold of HARQ Failure Indication Number to Adjust SIR Target Upward (10ms E-TTI)

- OMC Path

  View->Configuration Management->RNC NE->Rnc Radio Resource Management->Modify Advanced Parameter ->Service Basic Configuration Information

- Parameter configuration

  Bigger the number of HARQ fail threshold for increasing SIR target, harder to increase SIR target.And if this parameter is too big, it will reduce the service quality.

  Smaller the number of HARQ fail threshold for increasing SIR target, more easy to increase SIR target. And if this parameter is too small, it will waste power.

4.6 Related Parameters of MBMS Power Control

Refer to *MBMS Feature Guide* for details of related parameters of MBMS power control.

5 Counter And Alarm

5.1 Counter List

5.1.1 Statistic of Cell TCP

Counter No.	Description
C310444435	Configured Maximum DL Power
C310444436	Current utilizing rate of TCP
C310444437	Maximum utilizing rate of TCP
C310446508	Minimum utilizing rate of TCP
C310444439	Sum of utilizing rate of TCP
C310444440	Current TCP
C310444441	Maximum TCP
C310446510	Minimum TCP
C310444443	Sum of TCP
C310444444	Reported times of TCP

5.1.2 Distribution of TCP

Counter No.	Description

C310444445	Times of TCP less than 30.0dBm
C310444446	Times of TCP between[30.0,31.0)dBm
C310444447	Times of TCP between[31.0,32.0)dBm
C310444448	Times of TCP between[32.0,33.0)dBm
C310444449	Times of TCP between[33.0,34.0)dBm
C310444450	Times of TCP between[34.0,35.0)dBm
C310444451	Times of TCP between[35.0,36.0)dBm
C310444452	Times of TCP between[36.0,37.0)dBm
C310444453	Times of TCP between[37.0,38.0)dBm
C310444454	Times of TCP between[38.0,39.0)dBm
C310444455	Times of TCP between[39.0,40.0)dBm
C310444456	Times of TCP between[40.0,41.0)dBm
C310444457	Times of TCP between[41.0,42.0)dBm
C310444458	Times of TCP between[42.0,43.0)dBm
C310444459	Times of TCP between[43.0,44.0)dBm
C310444460	Times of TCP between[44.0,45.0)dBm
C310444461	Times of TCP between[45.0,46.0)dBm
C310444462	Times of TCP more than 46.0dBm

5.1.3 Statistic of HS Cell DL Configured TCP

Counter No.	Description
C310454484	Configured Maximum DL R99 Power
C310454485	Configured Maximum DL HSDPA Power

5.1.4 Statistic of Cell NonHsTcp

Counter No.	Description
C310454486	Current utilizing rate of nonhsTCP
C310454487	Maximum utilizing rate of nonhsTCP
C310456516	Minimum utilizing rate of nonhsTCP
C310454489	Sum of utilizing rate of nonhsTCP
C310454490	Current nonhsTCP
C310454491	Maximum nonhsTCP
C310456517	Reported times of nonhsTCP
C310456518	Minimum nonhsTCP
C310454493	Sum of nonhsTCP

5.1.5 Distribution of Cell NonHsTcp

Counter No.	Description
C310454495	Times of NONHSDPA TCP less than 30.0dBm

C310454496	Times of NONHSDPA TCP between[30.0,31.0)dBm
C310454497	Times of NONHSDPA TCP between[31.0,32.0)dBm
C310454498	Times of NONHSDPA TCP between[32.0,33.0)dBm
C310454499	Times of NONHSDPA TCP between[33.0,34.0)dBm
C310454500	Times of NONHSDPA TCP between[34.0,35.0)dBm
C310454501	Times of NONHSDPA TCP between[35.0,36.0)dBm
C310454502	Times of NONHSDPA TCP between[36.0,37.0)dBm
C310454503	Times of NONHSDPA TCP between[37.0,38.0)dBm
C310454504	Times of NONHSDPA TCP between[38.0,39.0)dBm
C310454505	Times of NONHSDPA TCP between[39.0,40.0)dBm
C310454506	Times of NONHSDPA TCP between[40.0,41.0)dBm
C310454507	Times of NONHSDPA TCP between[41.0,42.0)dBm
C310454508	Times of NONHSDPA TCP between[42.0,43.0)dBm
C310454509	Times of NONHSDPA TCP between[43.0,44.0)dBm
C310454510	Times of NONHSDPA TCP between[44.0,45.0)dBm
C310454511	Times of NONHSDPA TCP between[45.0,46.0)dBm
C310454512	Times of NONHSDPA TCP more than 46.0dBm

5.1.6 Statistic of Cell HsTcp

Counter No.	Description
C310454513	Current utilizing rate of Hsdpa TCP
C310454514	Maximum utilizing rate of Hsdpa TCP
C310456520	Minimum utilizing rate of Hsdpa TCP
C310454516	Sum of utilizing rate of Hsdpa TCP
C310454517	Current Hsdpa TCP
C310454518	Maximum Hsdpa TCP
C310456522	Minimum Hsdpa TCP
C310454520	Sum of Hsdpa TCP

5.2 Alarm List

This feature has no related alarm.

6 Glossary

A

ACK Acknowledge

AMC Adaptive Modulation and Coding

B

BER	Bit Error Rate
BLER	Block Error Rate

C

CPICH	Common Pilot Channel
CQI	Channel Quality Indicator

D

DCH	Dedicated Channel
DL	Downlink (Forward link)
DPCCH	Dedicated Physical Control Channel
DPCH	Dedicated Physical Channel
DPDCH	Dedicated Physical Data Channel

E

E-AGCH	E-DCH Absolute Grant Channel
E-RGCH	E-DCH Relative Grant Channel
E-HICH	E-DCH Hybrid ARQ Indicator Channel
E-TFC	Enhanced Transport Format Combination
E-TFCI	Enhanced Transport Format Combination Indicator

H

HARQ	Hybrid Automatic Retransmission Request
HS-DPCCH	High Speed Dedicated Physical Control Channel
HS-DSCH	High Speed Downlink Shared Channel
HS-PDSCH	High Speed Physical Downlink Shared Channel
HS-SCCH	High Speed Shared Control Channel
HSDPA	High Speed Downlink Packet Access

HSPA	High Speed Packet Access
HSUPA	High Speed Uplink Packet Access
M	
MBMS	Multimedia Broadcast Multicast Service
N	
NACK	No Acknowledge
R	
RNC	Radio Network Controller
RSCP	Received Signal Code Power
RTWP	Received Total Wide Band Power
S	
SIR	Signal to Interference Ratio
T	
TB	Transmission Block
Tcp	Transmit Code Power D-TCP)
TCP	Transmitted Carrier Power (C-TCP)
TFC	Transport Format Combination
TFCI	Transport Format Combination Indicator
TPC	Transmit Power Control
TTI	Transmission Time Interval
U	
UE	User Equipment
W	
WCDMA	Wideband Code Division Multiple Access