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Title: **System Level simulation results of HSDPA estimating downlink channel quality from the transmit power of DPCH**
Agenda Item: **AH24 (HSDPA)**
Document for: **Discussion**

1. Introduction

This contribution shows system level simulation results of HSDPA estimating downlink channel quality from the transmit power of DPCH. The simulation results show that the scheme works well and can achieve almost the same throughput without explicit UE's CIR reports.

2. Downlink channel quality estimation

For downlink channel estimation, several schemes have been discussed. [1][2]
- UE reports CIR information explicitly
- NodeB estimates down link channel quality from the transmit power of DPCH

Another option is the combination of them.
The first scheme can reflect the downlink channel quality explicitly. This scheme requires uplink resource for the transmission of CIR information and transmission error may cause the throughput degradation.
In this contribution we present the system level simulation results of the second method, where NodeB estimates downlink channel quality from the transmit power of DPCH for each UE and decides MCS and employs scheduling.

3. Downlink channel quality estimation from transmit power of DPCH

Downlink channel quality is estimated as the following procedure.
1. Power control command for downlink associated DPCH for HS-DSCH is sent from UE.
2. NodeB decides transmit power of associated DPCH according to the TPC command.
3. NodeB performs scheduling for HS-DSCH according to transmit power of associated DPCH. UEs, which require lower power, will be given higher priority in the scheduling.
4. NodeB selects MCS for each UE according to the transmit power of associated DPCH.
5. NodeB sends HS-DSCH packet.

We show the simulation results of proposed scheme. In order to compare the results, we ran the simulation of explicit CIR report scheme also.

4. Simulation assumptions

Table. 1 shows simulation parameters used in this simulation.

Table. 1 Simulation parameters

Parameter	Explanation/Assumption	Comments
Cellular layout	Hexagonal grid, 3-sector sites	7 cell with wrapping
Site to Site distance	2800 m	
Antenna pattern	As proposed in [4]	Only horizontal pattern specified
Propagation model	$L = 128.1 + 37.6\ Log_{10}(R)$	R in kilometres
CPICH power	-10 dB	
Other common channels	- 10 dB	
Power allocated to HSDPA transmission, including associated signaling	Max. 80% of total cell power HS-DSCH max 20ch (-14dB per code)	
Slow fading	Similar to UMTS 30.03, B 1.4.1.4	
Std. deviation of slow fading	8.0 dB	
Channel Model	3kph, single Rayleigh ray	
Specify Fast Fading model	Jakes spectrum	Generated by Filter approach
Correlation between sectors	1.0	
Correlation between sites	0.5	
Correlation distance of slow fading	50 m	See D,4 in UMTS 30.03.
Carrier frequency	2000 MHz	
BS antenna gain	14 dB	
UE antenna gain	0 dBi	
UE noise figure	9 dB	
BS total Tx power	44 dBm	
Active set size	3	Maximum size
STTD	Disabled	
Fast HARQ scheme	Chase combining	Dual stop-and-wait
Frame length of HARQ HARQ feedback erasure rate	3.33ms 0%	
Max. # of retransmissions	5	Retransmissions by fast HARQ
FCSS feedback erasure rate	1%	
HS-DSCH frame length	3.33ms	5slots
Scheduler	Maximum C/I scheduler Minimum DPCH power scheduler	See [3]
Call model	Modified ETSI	See [3]
Number of users	16 in each sector	

Table. 2 shows simulation parameters when UE reports CIR information explicitly to NodeB. CIR is calculated using CPICH.

Table. 2 Simulation parameters when UE reports CIR information

CPICH measurement transmission delay	3.33ms(one HS-DSCH frame length)	
CPICH measurement rate	once per 3.33 ms	
CPICH measurement report erasure rate	1%	

5. Simulation results

Table. 3 shows the throughput analysis of both methods with 16users in each sector. Throughput difference between two methods is only 3% and transmit power based scheme can achieve 3.7% better performance on packet call criteria.

Table. 3 Throughput Performance (16users in each sector)

Downlink channel quality estimation	Average Throughput	
	Service	Packet call
	(bps/cell)	(bps/call)
Explicit CIR report from UE	1,513,970	1,630,410
DPCH transmit power at NodeB	1,475,190	1,693,960

Fig. 1 shows the MCS level probability of both methods. The distribution of both methods doesn't differ so much. DPCH Tx power based scheme seems to select correct MCS levels.

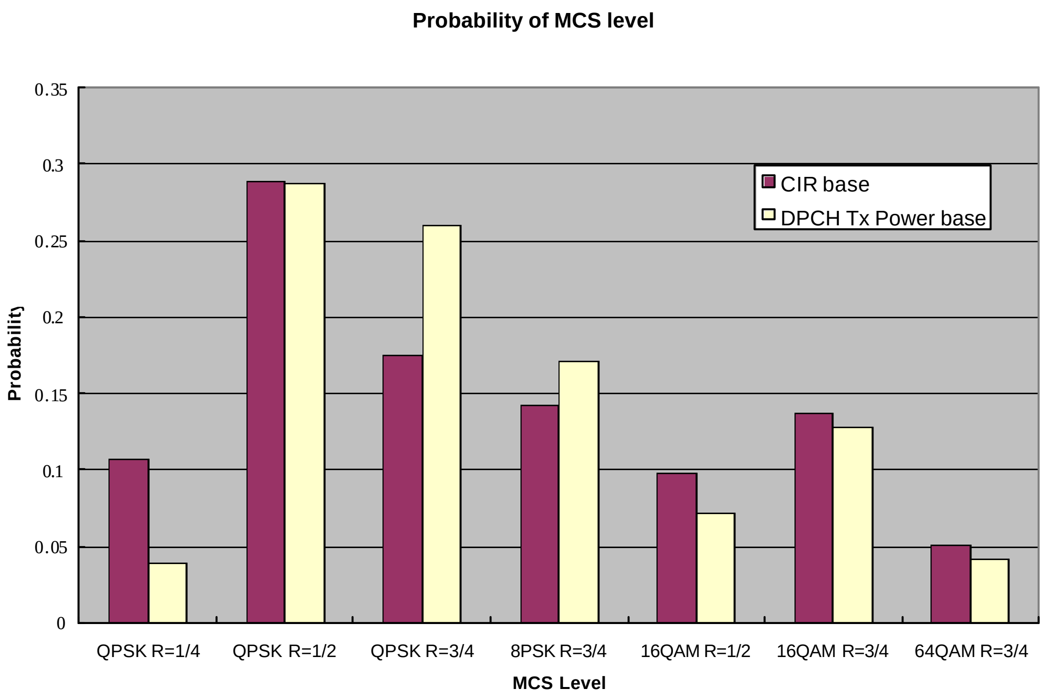

Fig. 1 Distribution of MCS level

Distribution of DPCH transmission power is shown in Figure3.

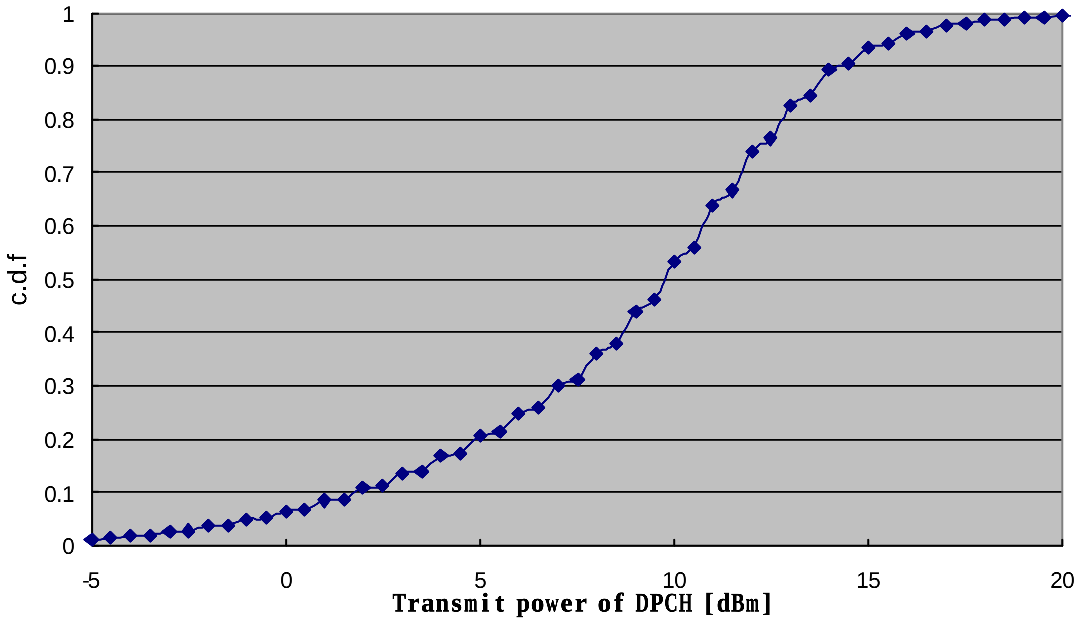

Fig. 2 Distribution of DPCH transmission power

6. Conclusion

We showed system level simulation results of HSDPA estimating downlink channel quality from the transmit power of DPCH. In this simulation FCSS, MCS selection and scheduling were performed according to the transmit power of NodeB's without CIR information from UE.

Simulation results showed that transmit power based scheme can achieve almost the same throughput of CIR based scheme.

References

[1] R1-00-1399, Motorola "Comments on Lucent's proposal on HSDPA" Stockholm, Sweden, November 21-24, 2000

[2] R1-00-1434, Ericsson "Comments and discussion on HSDPA proposals" Stockholm, Sweden, November 21-24, 2000

[3] R1-00-1094, Nokia, Ericsson, Motorola "Common HSDPA system simulation assumptions" Berlin, Germany, August 22-25, 2000

[4] R1-00-0909, Motorola "Evaluation Methods for High Speed Downlink Packet Access (HSDPA) " Oulu, Finland, July 4 -7, 2000