TSG-RAN Working Group 1 Meeting #19 ***TSGR1#19(01)0401***

Las Vegas, USA
February 27 - March 2, 2001

Source: NTT DoCoMo
Title: Revised Text Proposal for performance of MPIC in TR25.841
Agenda Item: AH24 (HSDPA)
Document for: Discussion

1. Introduction

In last TSG RAN WG1 meeting we introduced MPIC which mitigate severe multipath interference [1]. We also addressed the complexity analysis on the MPIC and text proposal for the performance of MPIC [2, 3]. Based on the comment on the text proposal, we addressed additional sentences about the complexity of MPIC. (Doppler frequency was also indicated.)

2. Text proposal for TR25.848

7.1.2 Complexity Evaluation

7.1.2.1.1 Complexity impacts to UE

7.1.2.1.1.1 Introduction

7.1.2.1.1.2 Detection of MCS applied by Node-B

… …

7.1.2.1.2.5 Measurement/Reporting delay

7.1.2.1.1.6 Advanced Technologies

7.1.2.1.1.6.1 Interference Canceller and Equalizers for Higher Modulation

In an actual propagation channel, multipath (frequency-selective) fading appears in a 5-MHz bandwidth. Although the multipath interference (MPI) of HS-DSCH is suppressed to 1/PG on average (PG denotes process gain), severe MPI degrades the SIR, and consequently the throughput performance since the PG must be nearly 1 to achieve throughput higher than 10 Mbps. Interference canceller and Equalizers are known as possible solutions to mitigate the severe multipath interference.

In WG1, throughput performance of the MPIC was evaluated as an example of this type of receiver. Table 1 shows the simulation conditions.

Table 1. simulation conditions

Spreading Factor	32
Number of codes for HS-DSCH	20
Modulation	16QAM (MCS 1), 64QAM (MCS 2)
HSDPA TTI length	0.667 ms
CPICH Ec/Ior	-9.54 dB (11% of Ior)
DSCH Ec/Ior	-0.51 dB (89% of Ior)
Antenna diversity	2-branch
Channel model MPIC structure	1 or 2-path Rayleigh fading (fD=80 Hz) 1) Perform despreading and rake combining for each code. (If iterated 4 times, then stop these process and output to turbo decoder) 2) Generate interference replica for each code by using hard-decision data sequence and each

	spreading code. 3) Remove the replica from received signal 4) Go to 1)

Figure 1 shows the throughput performance as a function of $I_{or}/(I_{oc}+N_0)$ in 1- and 2-path fading channel. In 2-path fading channel, throughput performance with and without 4-stage MPIC were plotted. In single-path channel, MCS2 which employs 64QAM can achieve higher maximum throughput compared with MCS1 with 16QAM in enough high $I_{or}/(I_{oc}+N_0)$ region. However in 2-path fading channel, throughput with MCS2 were severely degraded due to the severe MPI of its own channel without MPIC. As a result, MCS2 cannot improve throughput compared to that with MCS1 in any $I_{or}/(I_{oc}+N_0)$ region without MPIC in 2-path fading channel. On the other hand, when MPIC was applied, almost the same or higher throughput can be obtained in 2-path fading channel compared to that in single-path channel owing to accurate MPI cancelling and Rake diversity effect. Therefore 64QAM data modulation combined with MPIC can increase the maximum throughput even in multipath fading channels.

Complexity of MPIC was also studied in WG1. In the analysis, it was indicated that the complexity of MPIC is approximately 3-7 times larger compared with a conventional MF based Rake receiver w/o MPIC.

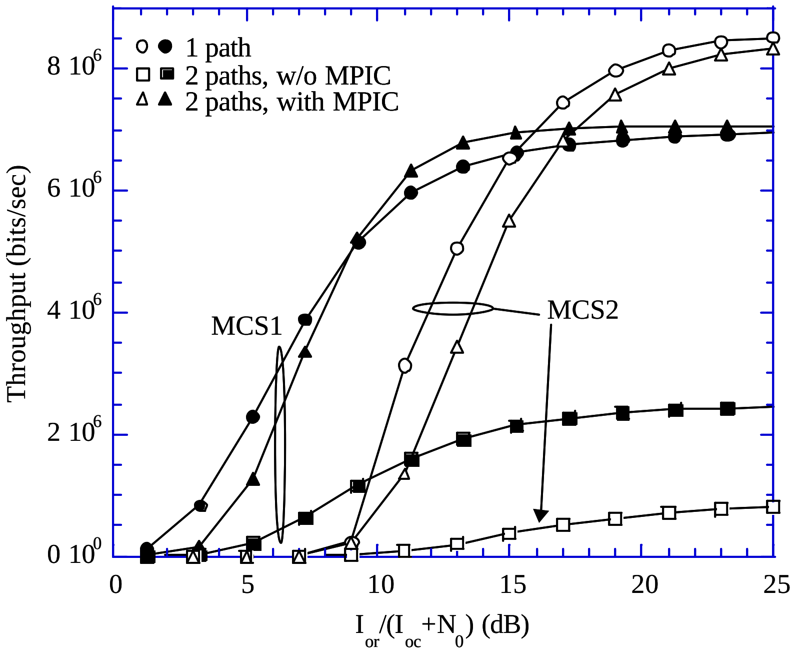

Fig. 1 Throughput performance

3. Conclusion

In last TSG RAN WG1 meeting we introduced MPIC which mitigate severe multipath interference [1]. We also addressed the complexity analysis on the MPIC and text proposal for performance of MPIC [2, 3]. Based on the comment for the text proposal, we addressed additional sentences about the complexity of MPIC. . (Doppler frequency was also indicated.)

References

[1] R1-01-0102, NTT DoCoMo, "Multipath Interference Canceller (MPIC) for HSDPA and Effect of 64 QAM Data Modulation," Boston, USA, January 15-18, 2001.

[2] R1-01-0329, NTT DoCoMo, "Complexity Analysis on MPIC for HSDPA," Las Vegas, USA, Feb 27th -Mar 2nd, 2001.
[3] R1-01-0329, NTT DoCoMo, "Text Proposal for performance of MPIC in TR25.841," Las Vegas, USA, Feb 27th -Mar 2nd, 2001.