TSG-RAN Working Group 1 Meeting #20 TSGR1#20 (01)0538
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Agenda Item:	AH24: High Speed Downlink Packet Access
Source:	**Wiscom Technologies**
Title:	Link Level Performance of HARQ with Chase Combining for Medium and High Vehicle Speed
Document for:	Discussion

1 Introduction

In previous HSDPA feasibility studies [1], most link level studies related to HARQ focused on the low-speed scenario. For low-speed scenario of HARQ with Chase combining, the frame error rate will be solely determined by the accumulated energy across *k* transmissions. In the last TSG-RAN WG1/WG2 joint meeting, it is agreed that as a requirement HSDPA should provide full mobility support, including low-speed, medium-speed and high-speed scenarios. Thus it is of interesting to study the link level and system level performance of HARQ for medium to high vehicle speed scenarios. In these scenarios, the frame error rate will depend on both the accumulated energy and the diversity gain from combining multiple independent fading signals. In this contribution, we present the link level performance of HARQ with Chase combining for medium and high vehicle speed. It is found that the diversity gain due to combining is significant in the lower FER region. Such link level simulation results can be further used in the system level performance study for mobility support of HSDPA.

2 Simulation Results

The simulation parameters are the same as those defined in Section 11.1.7 in HSDPA 3G TR25.848 [1]. We focus on the link level performance of HARQ with Chase combining in medium and high vehicle speed (30Kmph and 120Kmph) scenarios. For each retransmission, the mean SNR is assumed to be equal.

Figure 1 and 2 show the FER versus Ec/Ioc for QPSK in 30Kmph and 120Kmph case respectively. Here for HARQ with Chase combining, the Ec/Ioc represents the accumulated Ec/Ioc over *k* transmissions. Note that comparing with the low-speed case, there is not only the gain due to accumulated energy from Chase combining but also the diversity gain from combining multiple independent fading signals. The diversity gain is significant in the lower FER region. Thus the HARQ with Chase combining provides additional diversity gain in medium to high-speed cases. Figure 3 to 6 show the FER versus Ec/Ioc for 16QAM and 64QAM for 30Kmph and 120Kmph cases. Similar diversity gain is found in these cases.

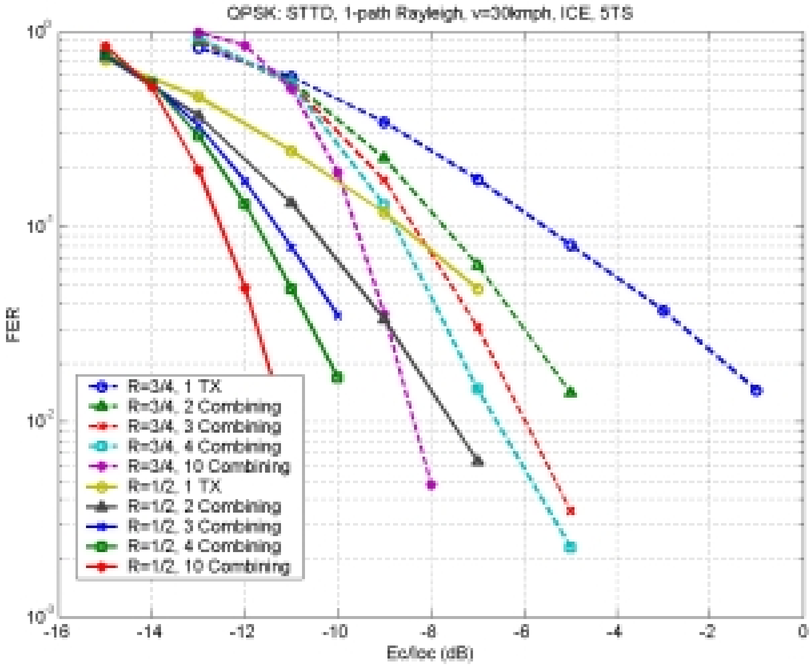

Figure 1. FER versus Ec/Ioc for QPSK. STTD on, 1-path Rayleigh channel, speed = 30Kmph, ideal channel estimation, frame length=3.33ms, HARQ with Chase Combining.

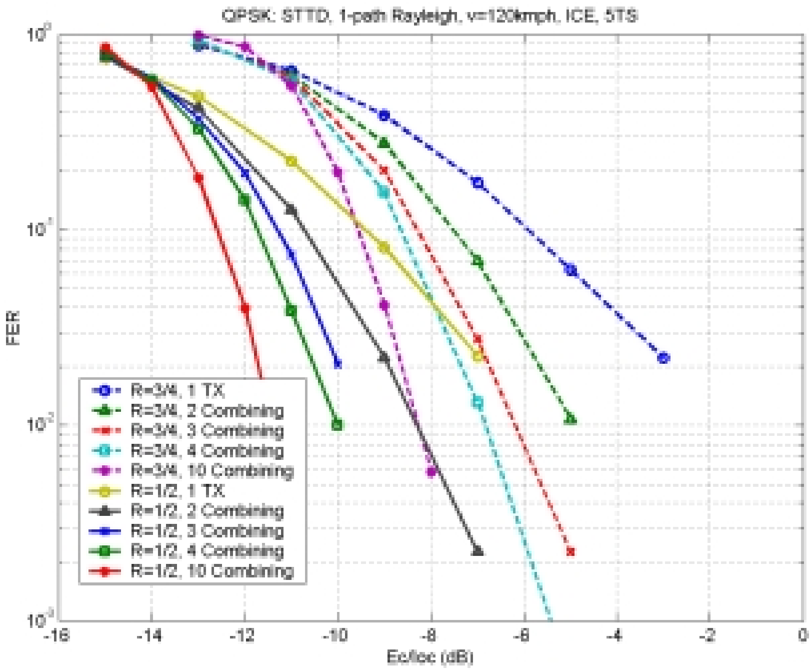

Figure 2. FER versus Ec/Ioc for QPSK. STTD on, 1-path Rayleigh channel, speed = 120Kmph, ideal channel estimation, frame length=3.33ms, HARQ with Chase Combining.

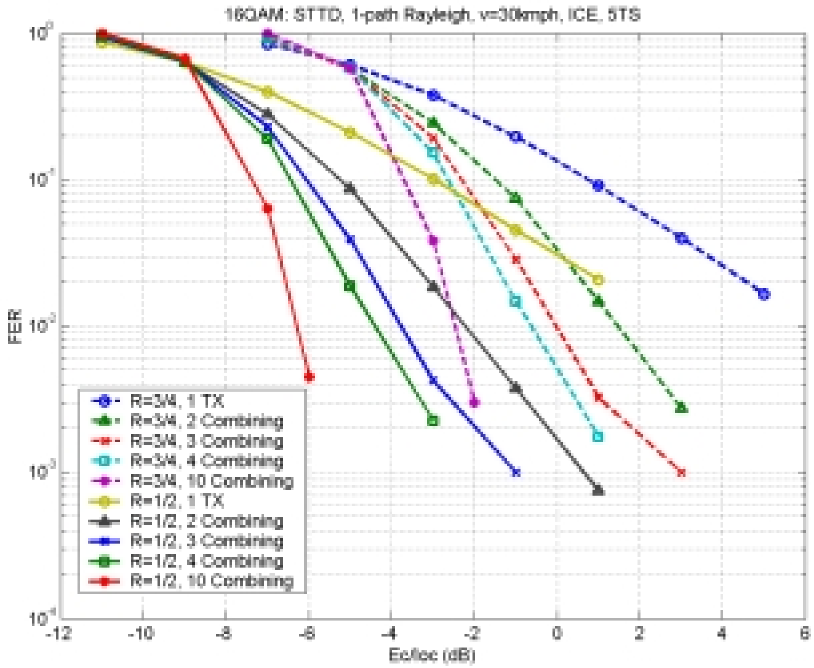

Figure 3. FER versus Ec/Ioc for 16QAM. STTD on, 1-path Rayleigh channel, speed = 30Kmph, ideal channel estimation, frame length=3.33ms, HARQ with Chase Combining.

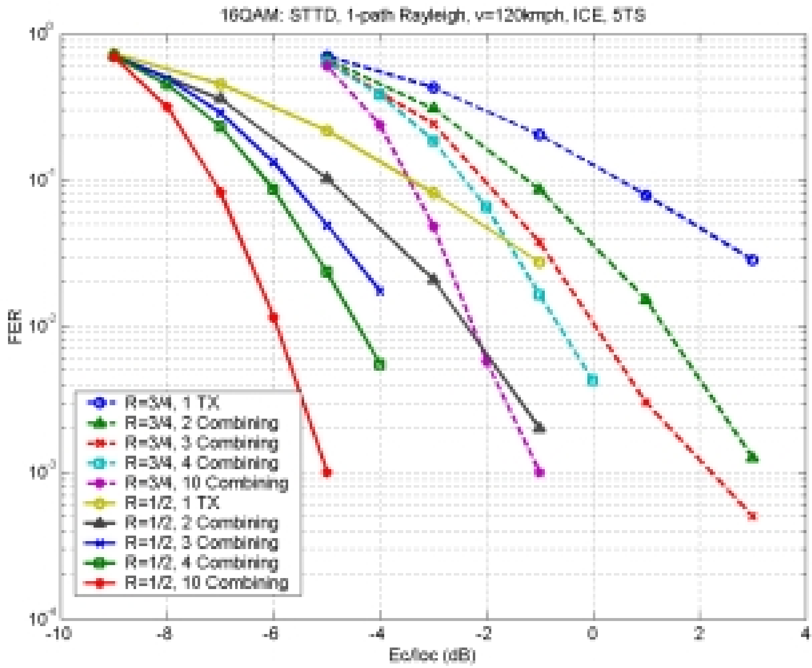

Figure 4. FER versus Ec/Ioc for 16QAM. STTD on, 1-path Rayleigh channel, speed = 120Kmph, ideal channel estimation, frame length=3.33ms, HARQ with Chase Combining.

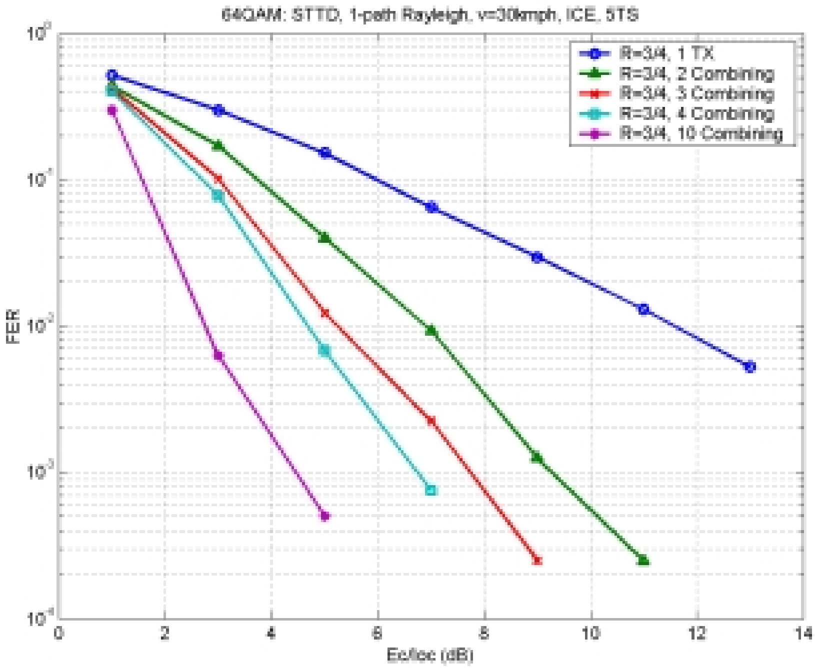

Figure 5. FER versus Ec/Ioc for 64QAM. STTD on, 1-path Rayleigh channel, speed = 30Kmph, ideal channel estimation, frame length=3.33ms, HARQ with Chase Combining.

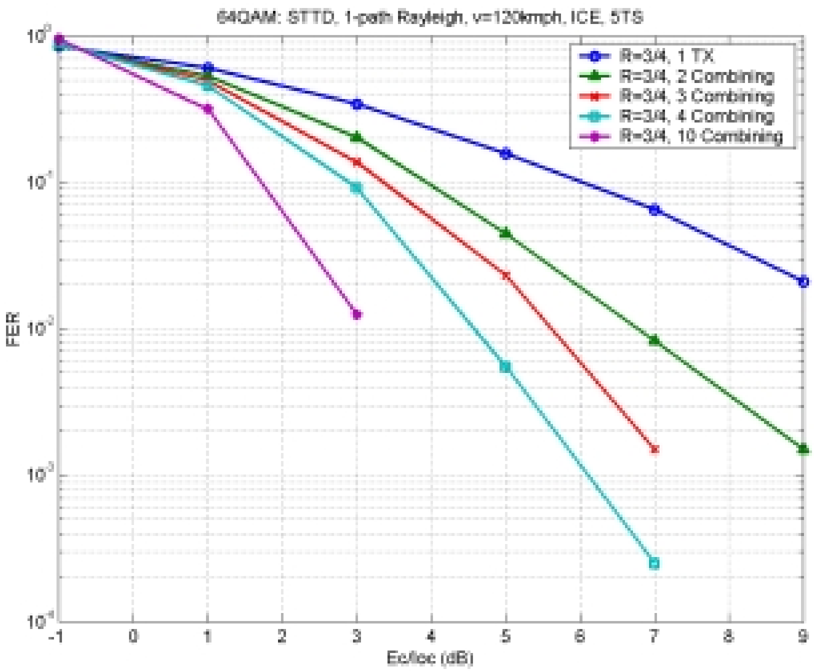

Figure 6. FER versus Ec/Ioc for 64QAM. STTD on, 1-path Rayleigh channel, speed = 120Kmph, ideal channel estimation, frame length=3.33ms, HARQ with Chase Combining.

3 Conclusion

We presented the present the link level performance of HARQ with Chase combining for medium and high vehicle speed scenarios. In these scenarios, the HARQ with Chase combining provides both SNR gain due to energy accumulation and diversity gain from combining multiple independent fading signals. The diversity gain is significant in low FER region. Such link level simulation results can be further used in the system level performance study for mobility support of HSDPA.

4 References

[1] 3GPP TR V0.6.0 (2000-05), Physical Layer Aspects of UTRA High Speed Downlink Packet Access, (Release 2000), TSG-RAN Working Group1 meeting#19, TSGR1#19, R1-01-0430, Las Vegas, USA, 27th Feb.-2nd March, 2001

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[6] TSG RAN R1-01-0050,Wiscom Technologies, "Performance of AMCS and HARQ for HSDPA in the non-ideal measurement and feedback situations", TSGR1#18, Boston, MA, USA, January 15-18, 2001.

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[11] TSG RAN R1-01-0539, Wiscom Technologies, "Use Long-Range Prediction to Improve the Performance of AMCS and HARQ in Mobility Support of HSDPA", TSGR1#20, Busan, Korea, May21-25, 2001.