3GPP TSG RAN Plenary #25 **RP-040374**

Palm Springs, USA, 7th- 9th September 2004

Source: Nokia

Title: Improvements of HSDPA performance requirements for 10 code UEs

Agenda Item:

Document for: Discussion & Decision

1 Introduction

Under the Improved Receiver Performance Requirements for HSDPA WI RAN4 has defined enhanced HSDPA performance requirements based on receiver diversity for REL6. Receiver diversity has been shown to provide potential capacity and coverage improvements.

In this document we propose that RAN4 would start working on improvements for the HSDPA requirements of 10 code UEs in REL6 using the existing Improved Receiver Performance Requirements for HSDPA WI. Additionally we show system simulation results highlighting the potential system gains that the proposed improvement could provide.

2 Discussion

We believe that in addition to the receiver diversity requirements, that RAN4 is currently working on, it would be beneficial to improve in REL6 the HSDPA performance requirements for 10 code UEs (i.e. for the categories 7 & 8) as well. This would ensure higher population of HSDPA terminals having improved HSDPA performance while allowing categorisation of terminals (from low end to high end) based on market demand.

Performance requirements could be improved by changing the baseline receiver from RAKE to Equaliser (LMMSE) for these specific categories. By improving the performance requirements of category 7 and 8 and keeping the remaining categories unchanged we would allow low cost terminals with 5 codes to be implemented based on RAKE. This would enable the deployment of 10 codes to be extended, which on the other hand would increase the attractiveness of higher code capability classes.

We believe that LMMSE chip level equalizer would be a suitable reference receiver for this work as LMMSE offers gains in rich multipath conditions at high and moderate Îor/Ioc values. It also has a benefit of being a well-known advanced receiver structure.

In Figure 1 we show examples of system performance gains that could be achieved by changing a baseline receiver from RAKE to LMMSE chip equaliser. In these two figures we have compared cell throughputs for 10 code UEs in Vehicular A 3km/h propagation condition using Round Robin and Proportional Fair schedulers. FTP traffic model has been used in the simulations. The detailed simulation parameters are listed in Annex.

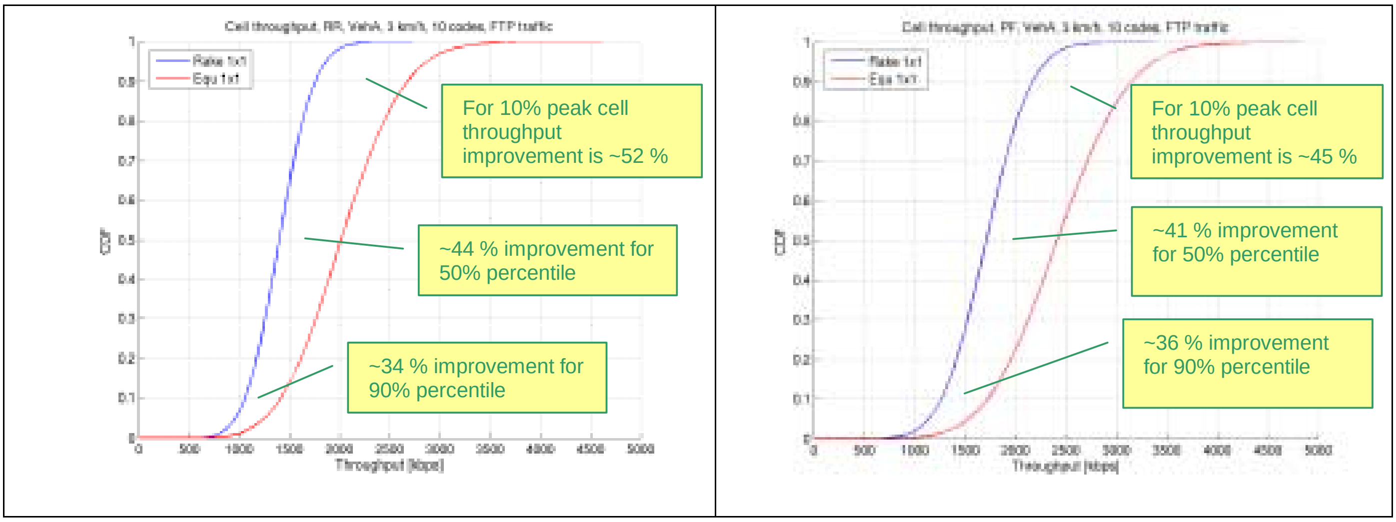

Figure 1 Cell throughputs in Vehicular A 3 km/h with Round Robin and Proportional Fair schedulers

3 Proposal

We propose that RAN4 defines improvements for HSDPA performance requirements of 10 code UEs in REL6 using the existing Improved Receiver Performance Requirements for HSDPA WI. Currently this WI has only one active work task: Performance requirements of Receive Diversity. Now we would like to initiate another work task under the same work item.

The HSPDA requirements for 10 code UEs would be improved by extending the existing 10 code UE HS-DSCH requirements to cover various propagation conditions in a similar manner as for the 5 code requirements and changing the baseline receiver from RAKE to LMMSE chip level equaliser.

We propose a following schedule for the second work task of the Improved Receiver Performance Requirements for HSDPA WI:

In RAN4#33 (prior to RAN#26)

- Simulation cases for HS-DSCH will be defined for category 7 and 8
- A reference receiver is defined as LMMSE chip level equalizer

In RAN4#34 (prior to RAN#27)

- Ideal simulation results will be presented and agreed

In RAN4#35 (prior to RAN#28)

- Requirements based on implementation margin analyses will be agreed

RAN4 is still continuing a work under the UE requirements under the Performance requirements of Receive Diversity work task in order to define the 10 code requirements based on receiver diversity. Hence, the timing of this new work task matches rather well with the one of the existing work task as the difference is only one RAN meeting. Furthermore, the proposed schedule is in line with the HSUPA RAN4 requirements, which are expected to be completed in RAN#28 (June 2005) and which are also targeted to REL6. Therefore no delay is expected for the finalisation of the REL6 specifications.

4 Annex: System Simulation parameters

Parameter	Explanation/Assumption	Comments
Cellular layout	Hexagonal cell grid, wrap-around	7 BSs and 21 sectors
Cell radius	933 m	Corresponds to the BS-to-BS distance of 2 800 m.
Propagation Model	$L = 128.1 + 37.6 Log_{10}(R_{km})$	
Radio propagation condition	Vehicular A 3 km/h	
Std. deviation of slow fading	8 dB	
Correlation between sectors	1.0	The correlation in the slow fading between the sectors. The UE experiences the same kind of slow fading in the area of the correlating sectors, i.e. the fading is not entirely random.
Correlation between BSs	0.5	The correlation in the slow fading between the BSs.
Correlation distance of slow fading	50 m	This parameter defines the maximum distance within which the UE experiences correlated slow fading to a sector.
Minimum path loss	70 dB	
BS antenna gain	18 dB	
Antenna front to back ratio	-20 dB	
BS total Tx power	43 dBm	Corresponds to 20 W.
Power resource for HS-DSCH	14 W	
HSDPA packet scheduling algorithm	Round robin and Proportional fair	
Used Redundancy Version	Chase Combining	
Maximum number of retransmissions	4	Maximum number of retransmission before the corresponding HARQ channel is cleared
Service	FTP	
HSDPA RLC PDU size	480 bits	
Code resource for HS-DSCH	10	SF=16
UE HS-DSCH receiver	RAKE and LMMSE equaliser	
Number Of HARQ channels in UE	6	