TSG-RAN Working Group 4 (Radio) Meeting #8
Sophia Antipolis, France, 26th – 29th October 1999

TSGR4#8(99)638

Agenda Item: 8.2

Source: Nokia

Title: Simulation results for UE performance tests

Document for: Discussion

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1. INTRODUCTION

This document shows simulations results for UE performance tests specified in Section 8 of S25.101 v3.0.0. Results are shown for 144 kbps and 384 kbps measurement channels in static and multi-path fading propagation conditions as well as results for 12.2 kbps and 64 kbps measurement channels in dynamic propagation conditions.

2. SIMULATION ASSUMPTIONS

Simulations assumptions that were used can be found in Annex A. All assumptions are align with decision in previous RAN4 meetings and decisions in AH01 meeting in Amsterdam. New assumptions have not been introduced in this contribution.

3. SIMULATIONS RESULTS

Simulations were performed for 144 kbps and 384 kbps measurement channels in static propagation conditions and in multi-path fading propagation conditions. Note that simulations were performed only for the geometry factors, which were agreed for specification in AH01 meeting in Amsterdam.

Also simulations results for 12.2 kbps and 64 kbps measurement channels in dynamic propagation conditions are presented.

3.1 Static propagation conditions (Table 24: Test 4 and Test 5)

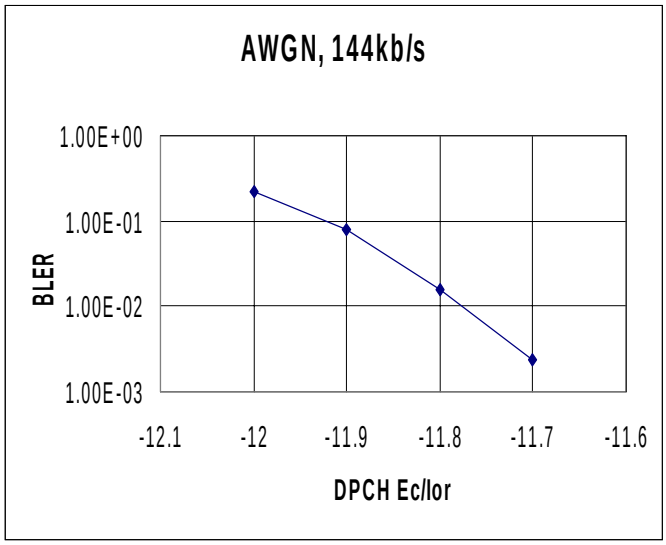

Figure 1: Demodulation performance in AWGN channel, 144 kbps.

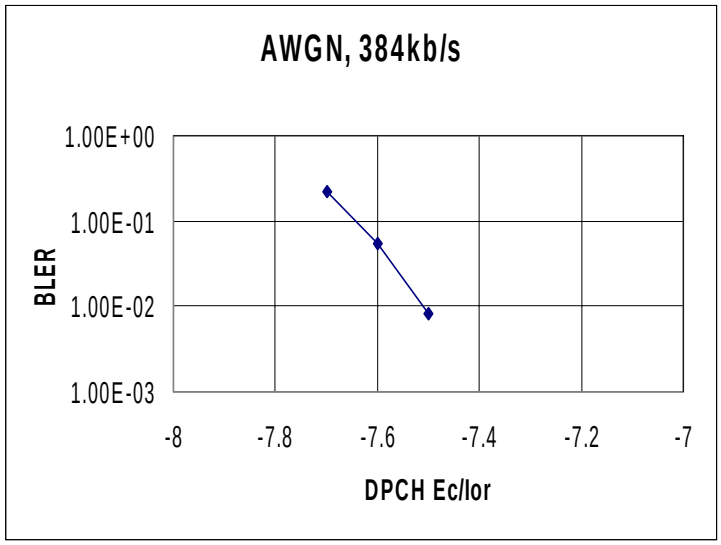

Figure 2: Demodulation performance in AWGN channel, 384 kbps.

3.2 Multi-path fading propagation conditions, Case 1 (Table 26: Test 4 and Test 5)

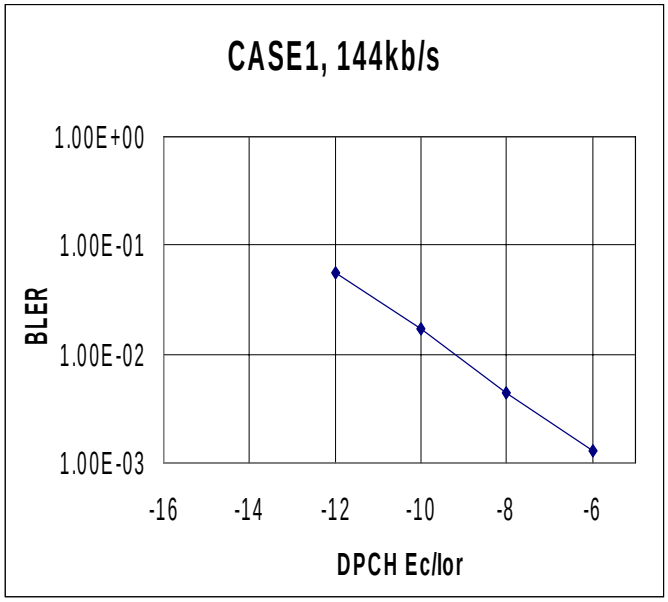

Figure 3: Demodulation performance in Propagation Condition Case 1, 144 kbps.

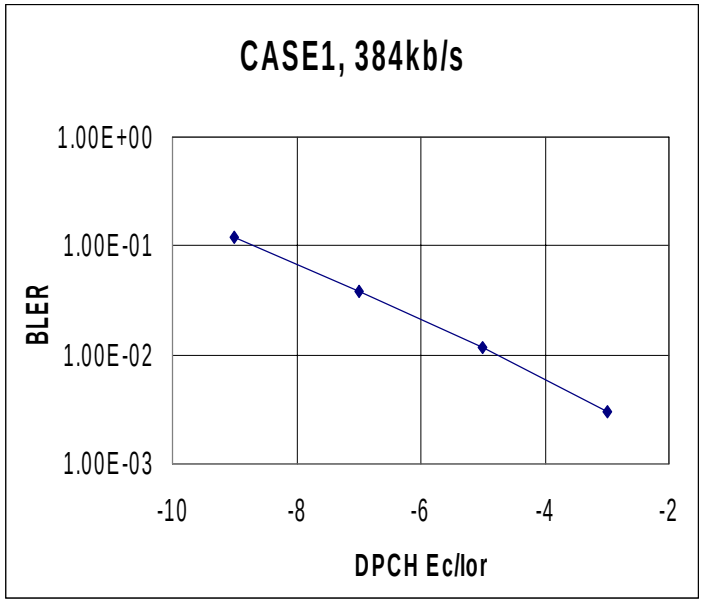

Figure 4: Demodulation performance in Propagation Condition Case 1, 384 kbps.

3.3 Multi-path fading propagation conditions, Case 2 (Table 28: Test 9 and Test 10)

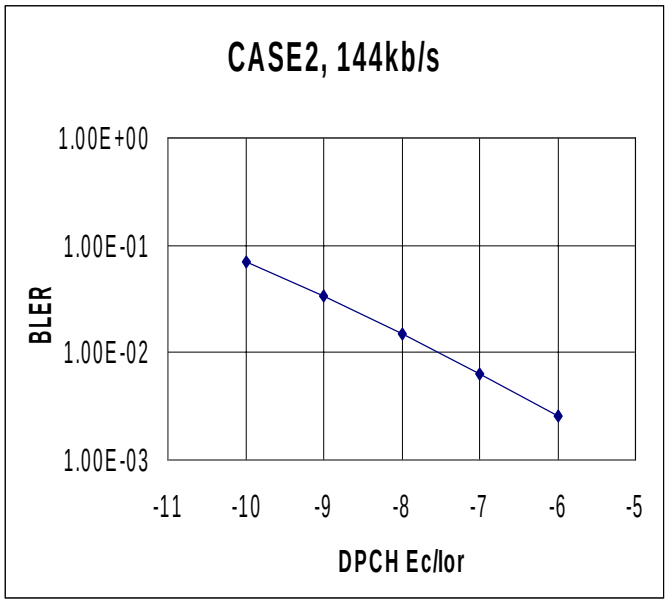

Figure 5: Demodulation performance in Propagation Condition Case 2, 144 kbps.

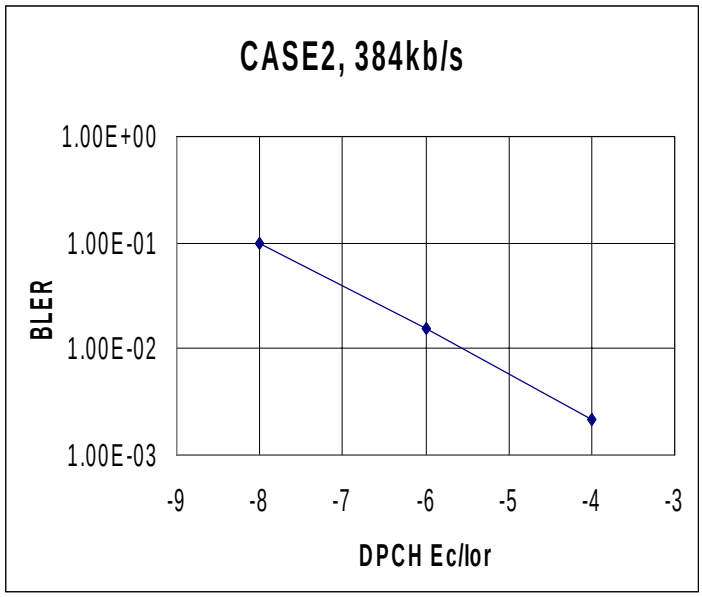

Figure 6: Demodulation performance in Propagation Condition Case 2, 384 kbps.

3.4 Multi-path fading propagation conditions, Case 3 (Table 30: Test 14 and Test 15)

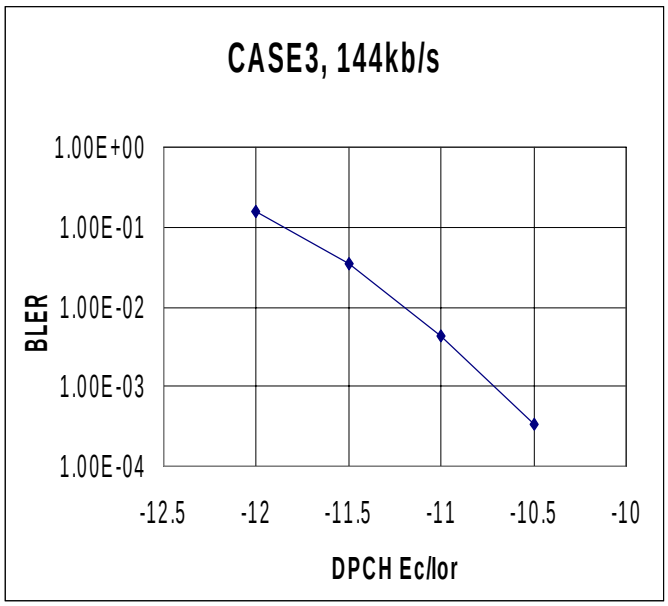

Figure 7: Demodulation performance in Propagation Condition Case 3, 144 kbps.

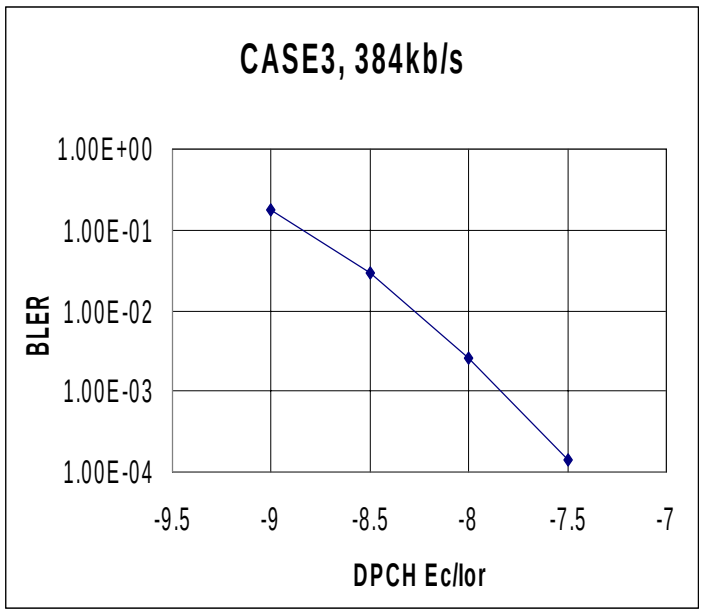

Figure 8: Demodulation performance in Propagation Condition Case 3, 384 kbps.

3.5 Moving propagation conditions (Table 32: Test 2 and Test 3)

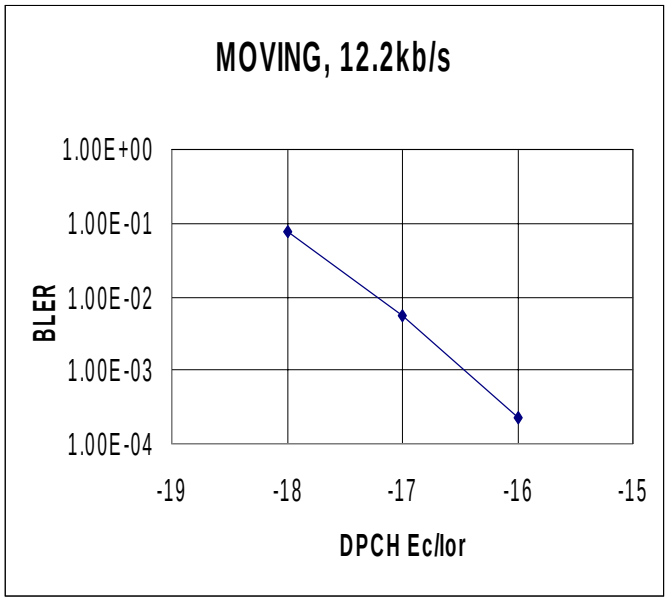

Figure 9: Demodulation performance in moving propagation condition, 12.2 kbps.

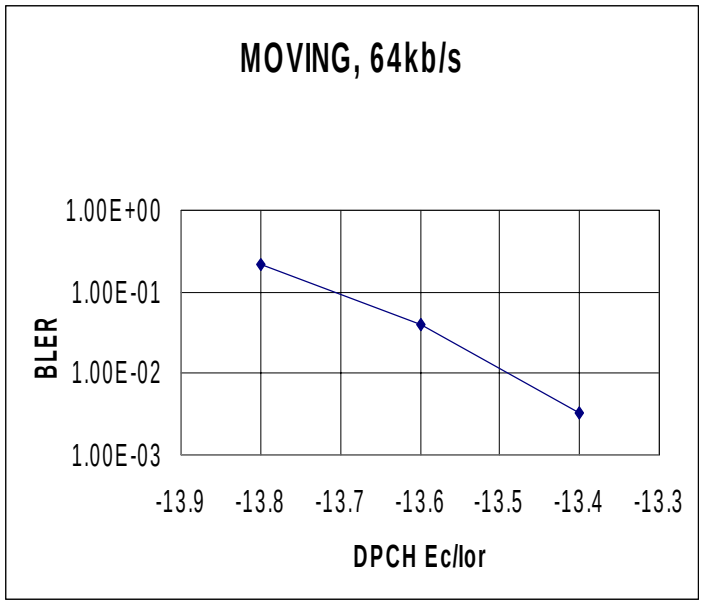

Figure 10: Demodulation performance in moving propagation condition, 64 kbps.

3.6 Birth-Death propagation conditions (Table 34: Test 2 and Test 3)

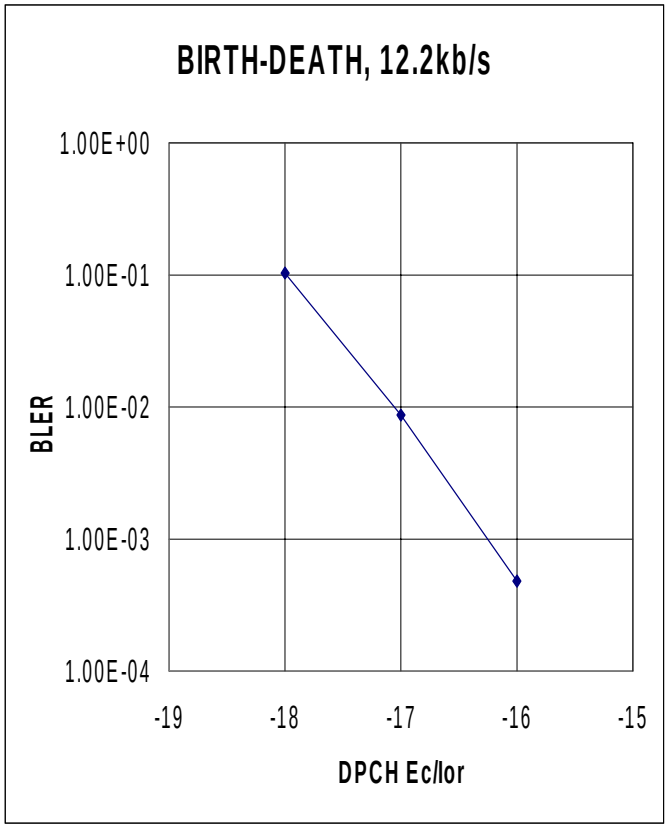

Figure 11: Demodulation performance in birth-death propagation condition, 12.2 kbps.

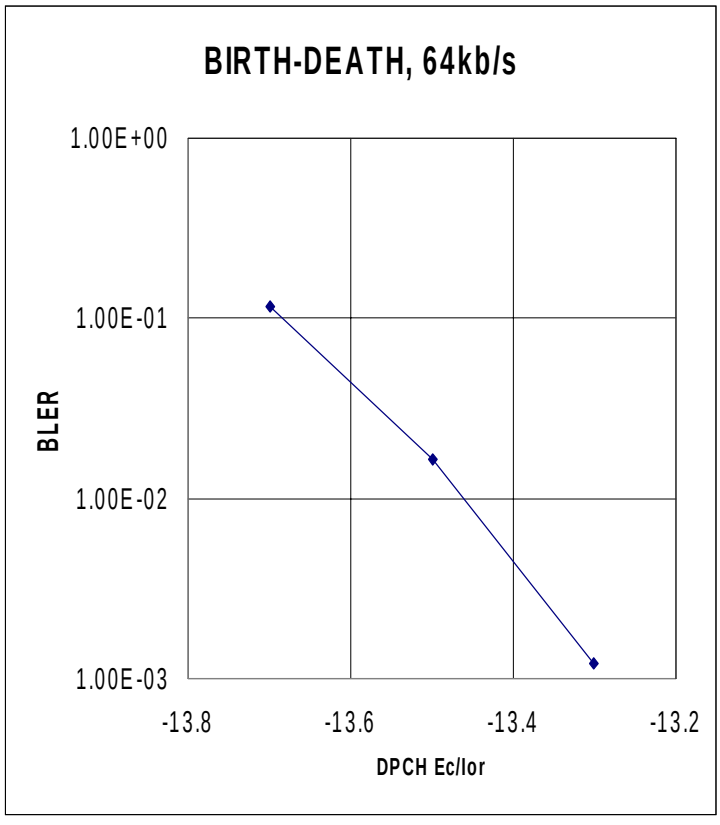

Figure 12: Demodulation performance in birth-death propagation condition, 64 kbps.

4. CONCLUSIONS

Tables 1 shows the required DPCH Ec/Ior for target BLER values specified in [1]. Table 1 includes also results from simulations presented in previous RAN4 meetings [2]. Bold values are derived from curves presented in this contribution. Required DPCH Ec/Ior values do not include implementation margins, which need to be discussed separately case by case in coming days.

Table 1. Simulated DPCH Ec/Ior values for different test cases

Propagation condition	*12.2 kbps*	*64 kbps*	*144 kbps*	*384 kbps*
Static				
$\hat{I}_{or} / I_{oc}$	-1 dB	-1 dB	-1 dB	-1 dB
BLER E-1	-19.5 dB	-15.1 dB	**-11.9 dB**	**-7.7**
BLER E-2	-18.6 dB	-14.9 dB	**-11.8**	**-7.5**
Case 1				
$\hat{I}_{or} / I_{oc}$	9 dB	9 dB	9 dB	9 dB
BLER E-1	-21.3 dB	-16.2 dB	**-13.0 dB**	**-8.8**
BLER E-2	-17.5 dB	-12.5 dB	**-9.3 dB**	**-4.8**
Case 2				
$\hat{I}_{or} / I_{oc}$	-3 dB	-3 dB	3 dB	6 dB
BLER E-1	-13.5 dB	-8.9 dB	**-10.5 dB**	**-8.0**
BLER E-2	-10.3 dB	-5.3 dB	**-7.5 dB**	**-5.6**
Case 3				
$\hat{I}_{or} / I_{oc}$	-3 dB	-3 dB	3 dB	6 dB
BLER E-1	-15.7 dB	-11.0 dB	**-11.8 dB**	**-8.8**
BLER E-2	-14.6 dB	-10.2 dB	**-11.2 dB**	**-8.2**
BLER E-3	Not required	-9.6 dB	**-10.7 dB**	**-7.8**
Moving			Not tested	Not tested
$\hat{I}_{or} / I_{oc}$	- 1 dB	-1 dB		
BLER E-1	**-18.1 dB**	**-13.7 dB**		
BLER E-2	**-17.2 dB**	**-13.5 dB**		
Birth-Death			Not tested	Not tested
$\hat{I}_{or} / I_{oc}$	-1	-1		
BLER E-1	**-18.0 dB**	**-13.7 dB**		
BLER E-2	**-17.1 dB**	**-13.5 dB**		

When 144 kbps results are compared to results from Ericsson and DoCoMo [3] it can be seen that achieved DPCH Ec/Ior values are relatively close to results achieved by them, though Nokia results seem to be bit closer to DoComo's results than to Ericsson's results.

When 384 kbps results are compared to results from DoCoMo [3] it can be seen that achieved DPCH Ec/Ior values differ at most 0.2 dB in static, case1 and in case 2. However, results are different by more than 1 dB in case 3.

Results in dynamic propagation conditions can not be compared to other results since such results have not been presented in previous RAN4 meetings.

REFERENCES

[1] TS 25.101 v3.0.0 (1999-10). UE Radio transmission and reception (FDD).

[2] R4-99494. Simulations results for UE Performance Tests.

[3] TSGR4(99)596. Summary of link level simulation results FDD UE rev. 1.0

ANNEX A SIMULATION ASSUMPTIONS

Table 1 shows assumptions used in simulations.

Table 1. Simulation assumptions

Parameter	Explanation/Assumption
Chip Rate	3.84 Mcps
Closed loop Power Control	OFF
AGC	OFF
Channel Estimation	Ideal delay, amplitude and phase estimation
Number of samples per chip	1
Propagation Conditions	As specified in Annex B of TS 25.101 v.3.0.0. Note that path delays in Case 1 and Case 2 have been moved to positions that are integer number of chips. The reason for this is the number of samples per chip used in simulations (1).
Number of bits in AD converter	Floating point simulations
Number of Rake Fingers	Equals to number of taps in propagation condition models
Downlink Physical Channels and Power Levels	As specified in Annex C of TS 25.101 v3.0.0
BLER target	Results for BLER from 0.5 to 10-3 are presented
BLER calculation	BLER has been calculated by comparing with transmitted and received bits. So CRC is not used for BLER estimation. Note that both methods give same results in practice, when 16 bit CRC is used.
PCCPCH model	Random symbols transmitted, ignored in a receiver
PICH model	Random symbols transmitted, ignored in a receiver
DCCH model	Random symbols transmitted, ignored in a receiver
TFCI model	Random symbols, ignored in a receiver but it is assumed that receiver gets error free reception of TFCI information.
Used OVSF and scrambling codes	Codes are chosen from the allowed set.
$\hat{I}_{or} / I_{oc}$ values	Bit Rate / AWGN / Case 1 / Case 2 / Case 3 / Moving / Birth-Death 12.2 kbps / - / - / - / - / -1 / -1 64 kbps / - / - / - / - / -1 / -1 144 kbps / -1 / 9 / 3 / 3 / - / - 384 kbps / -1 / 9 / 6 / 6 / - / -
Turbo decoding	MaxLogMap algorithm is used with 8 iterations
SCH position	Offset between SCH and DPCH is zero chips meaning that SCH is overlapping with the first symbols in DPCH in the beginning of DPCH slot structure
Measurement Channels	As specified in Annex A of TS 25.101 v3.0.0
Other L1 parameters	As Specified in latest L1 specifications (October 1999 versions)