3GPP TSG RAN WG4 #8
Sophia Antipolis, France
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Agenda Item
Source: **Motorola**
Title: **Simulation results for UE downlink performance requirements**
Document for **Discussion**

1.0 Introduction

This paper provides link level simulation results in order to specify the performance requirements for Section 8 of TS25.101. Results are provided for the demodulation of the Dedicated Channel (DCH) in the static environment and the multi-path fading propagation conditions (Case 1/2/3) for 12.2 kbps, 64 Kbps, 144 Kbps and 384 Kbps

2.0 Simulation assumptions.

Simulation assumptions are listed in Annex A for reference and are inline with the agreed assumption in WG4#7 and the AH01 meeting in Noordwijkerhout.

3.0 Simulation results

Results are plotted for both the BLER and BER for the agreed values of Ior/Ioc.These results for the DCH_ Ec/Ior (dB at the agreed BLER rate and Ior/Ioc are summarised below for clarity. These results do not include any implementation margin which is for discussion in WG4. Some simulations for the 384 kbps information rate are in progress and will be provided during the meeting

Information rate	**Static (AWGN)**		**Multi-path Case 1**		**Multi-path Case 2**		**Multi-Path Case 3**		
	BLER @E-1	BLER @E-2	BLER @E-1	BLER @E-2	BLER @E-1	BLER @E-2	BLER @E-1	BLER @E-2	BLER @E-3

12.2 kbps	Ior/Ioc = -1 dB		Ior/Ioc = 9 dB		Ior/Ioc = -3 dB		Ior/Ioc = -3 dB		
DCH_Ec/Ior (dB)	-19.6	-18.6	-21.3	-17.6	-14.2	-10.8	-15.9	-14.8	-14.0

64 kbps	Ior/Ioc = -1 dB		Ior/Ioc = 9 dB		Ior/Ioc = -3 dB		Ior/Ioc = -3 dB		
DCH_Ec/Ior (dB)	-15.0	-14.8	-16.4	-12.5	-9.2	-5.7	-11.2	-10.5	-10.0

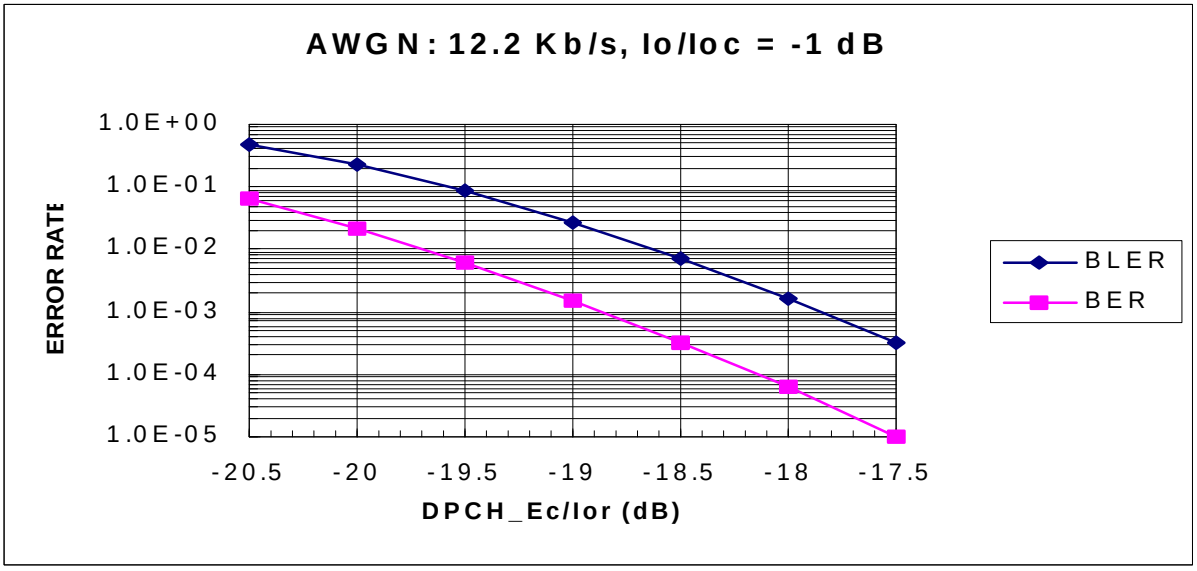
144 kbps	Ior/Ioc = -1 dB		Ior/Ioc = 9 dB		Ior/Ioc = +3 dB		Ior/Ioc = +3 dB		
DCH_Ec/Ior (dB)	-11.9	-11.8	-13.10	-9.40	-10.8	-7.9	-12.10	-11.6	-11.2

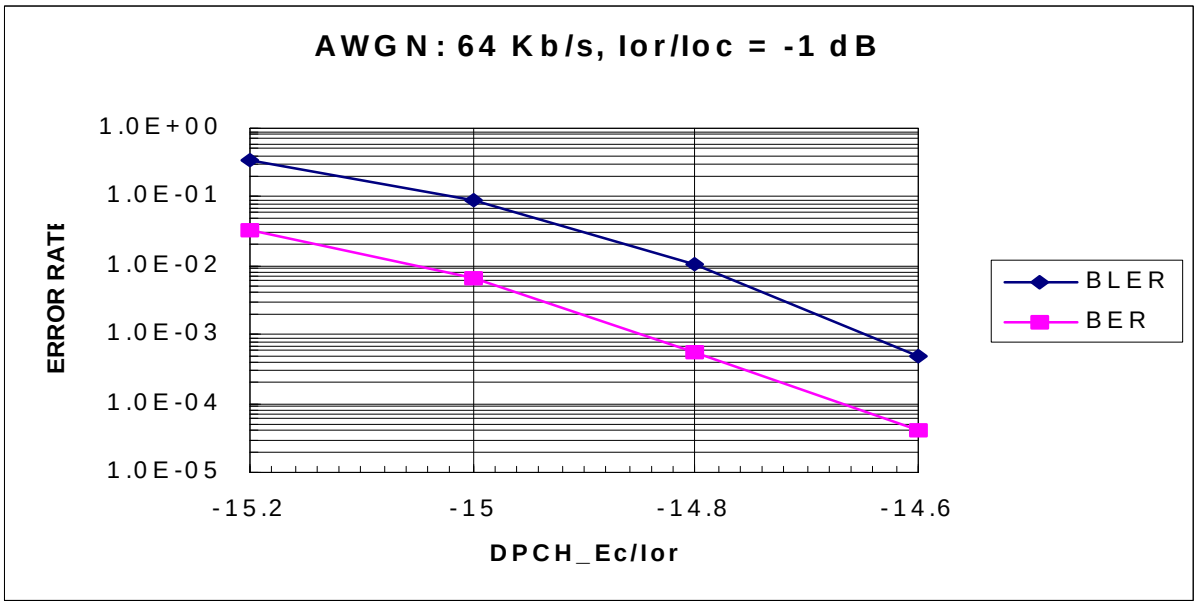
384 kbps	Ior/Ioc = -1 dB		Ior/Ioc = 9 dB		Ior/Ioc = +6 dB		Ior/Ioc = +6 dB		
DCH_Ec/Ior (dB)	-7.8	-7.7	-8.8	-5.0	-8.3	-6.0	-9.2		

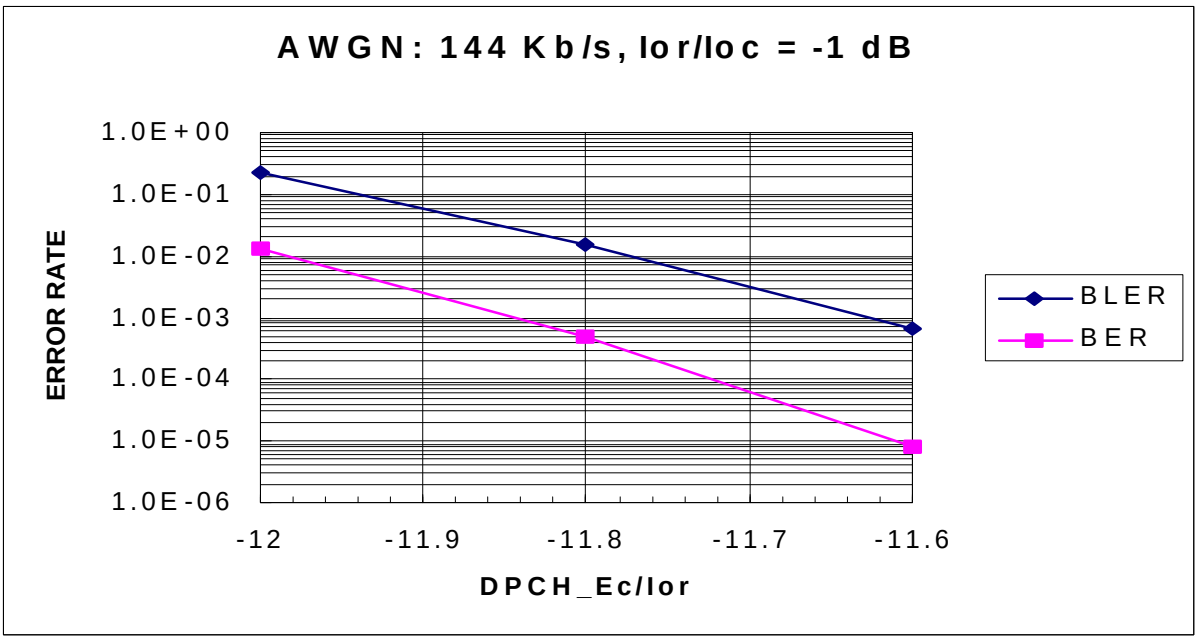
4.0 Conclusion

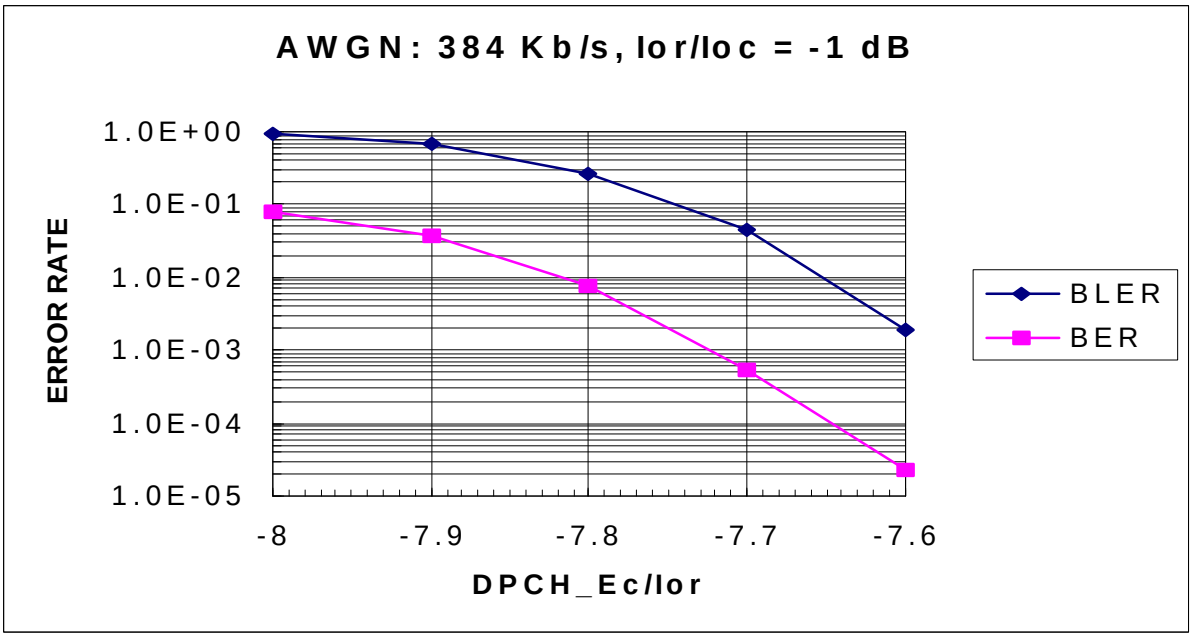
In this document simulation results are presented for the UE performance test for section 8 of TS 25.101. Based on these results implementation margin would need to be considered for each test case in order to derive the values for the specification.

Demodulation in the static (AWGN) propagation conditions

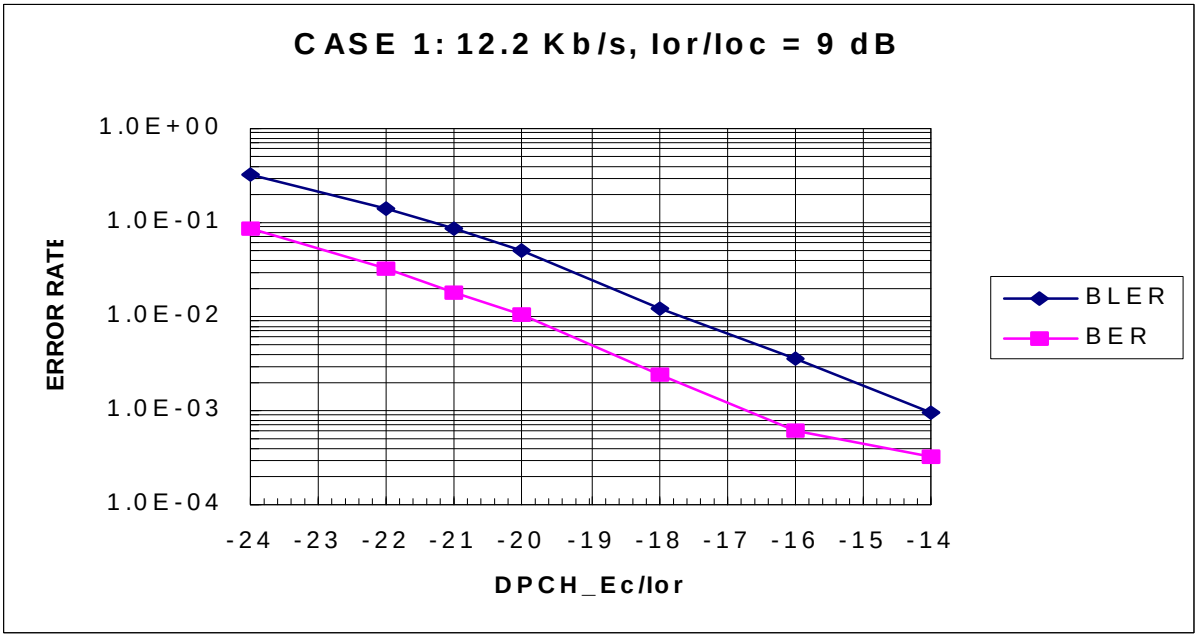


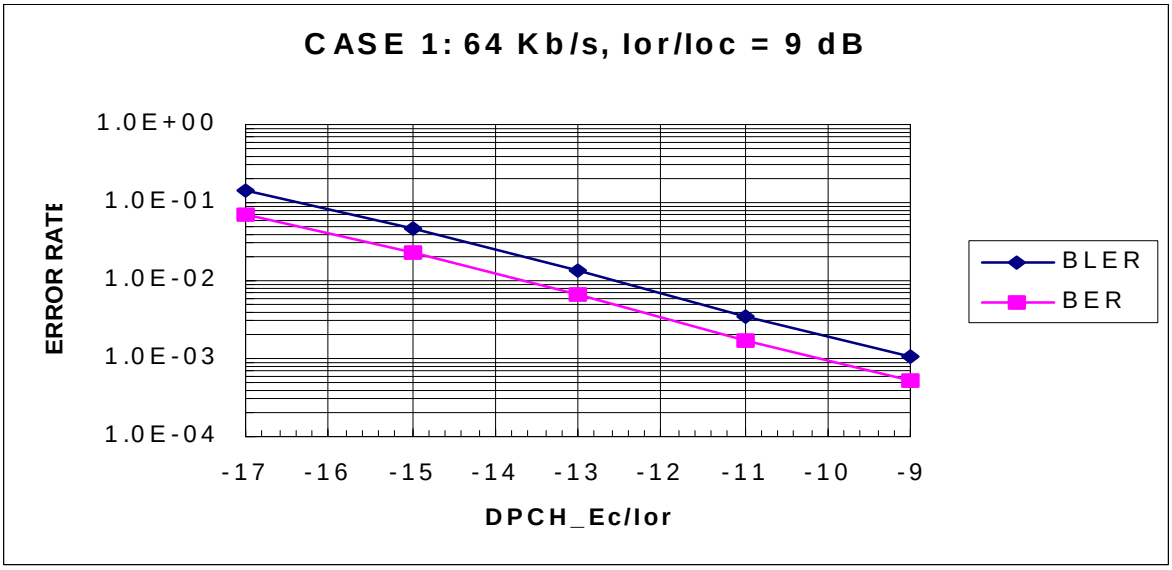


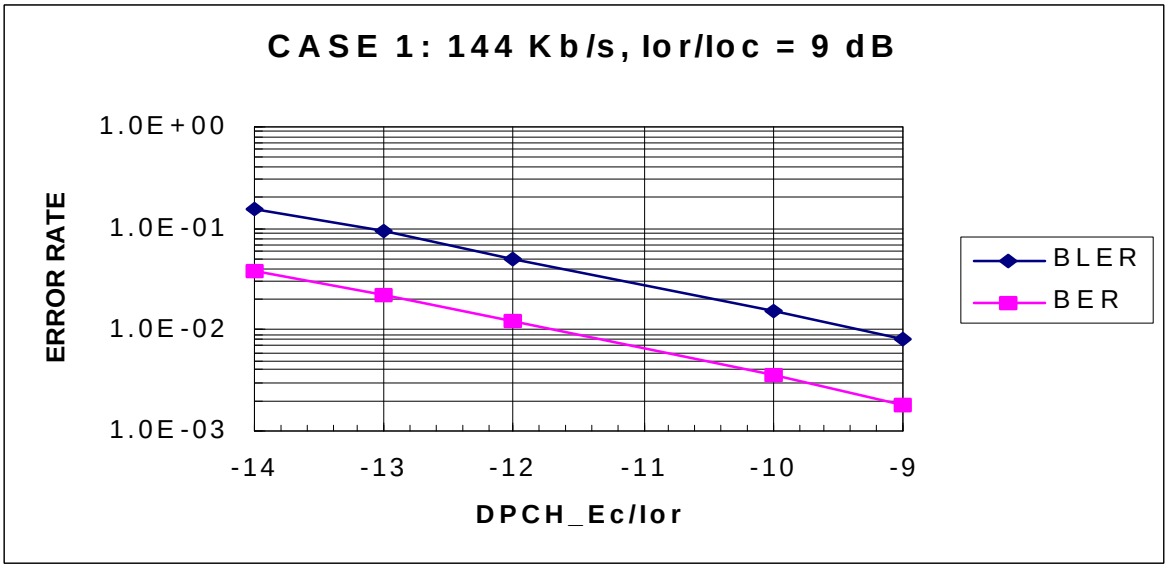


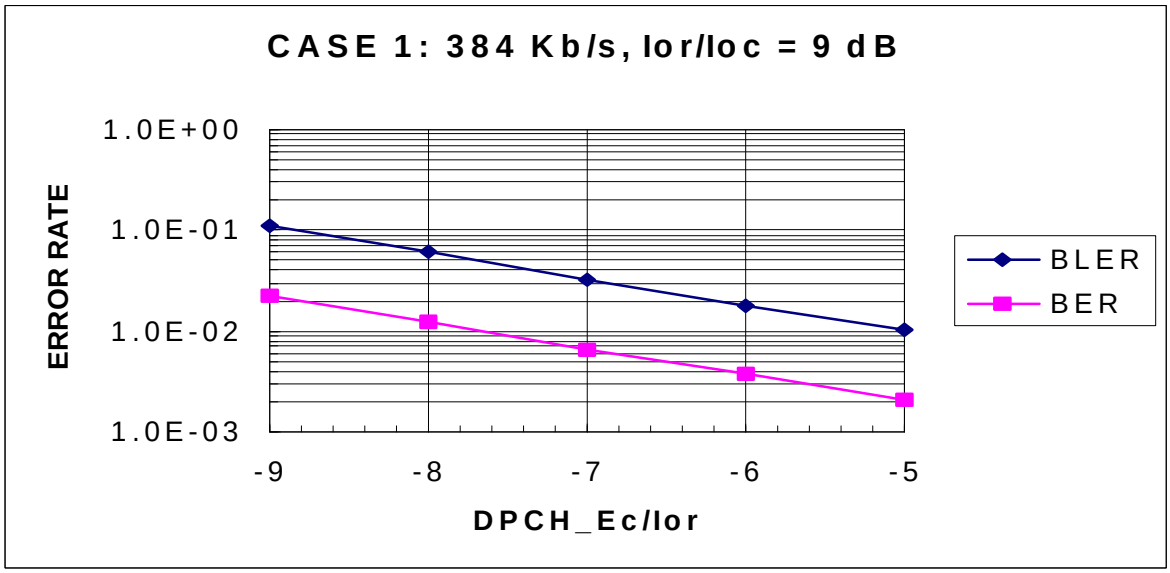

AWGN: 384 Kb/s, Ior/Ioc = -1 dB
ERROR RATE
1.0E+00
1.0E-01
1.0E-02
1.0E-03
1.0E-04
1.0E-05
-8
-7.9
-7.8
-7.7
-7.6
DPCH_Ec/Ior
BLER
BER

Demodulation in the Multipath propagation conditions Case 1

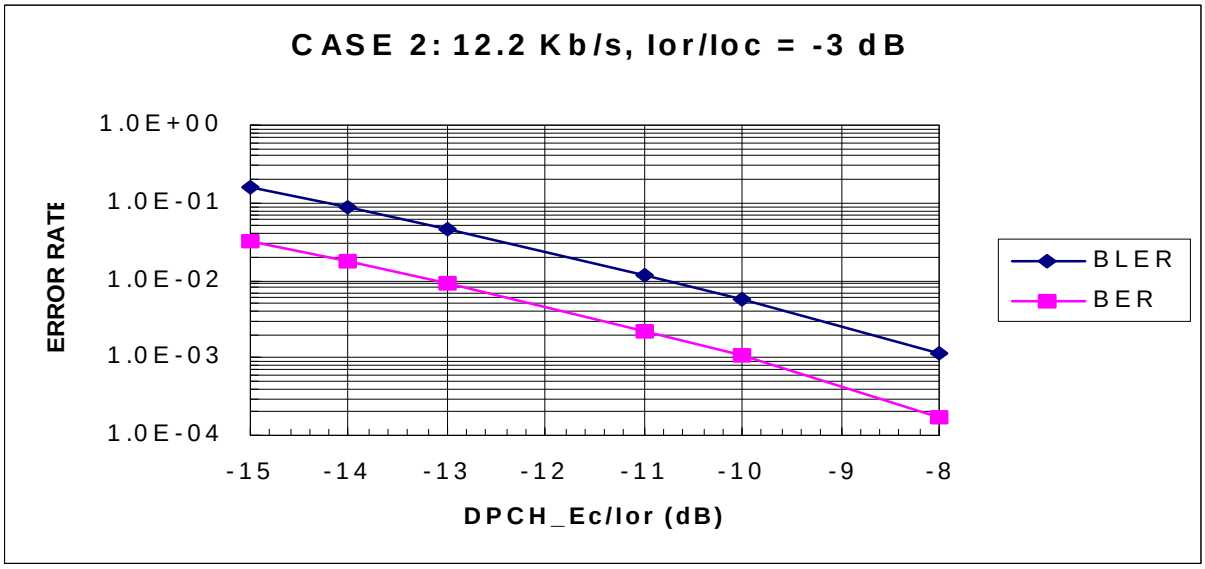


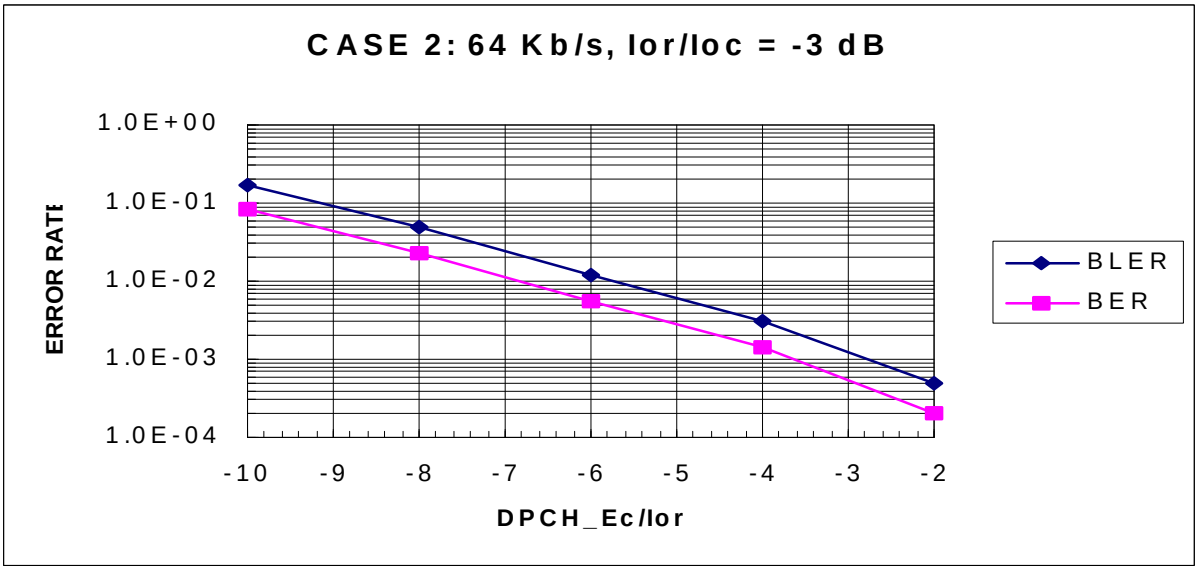


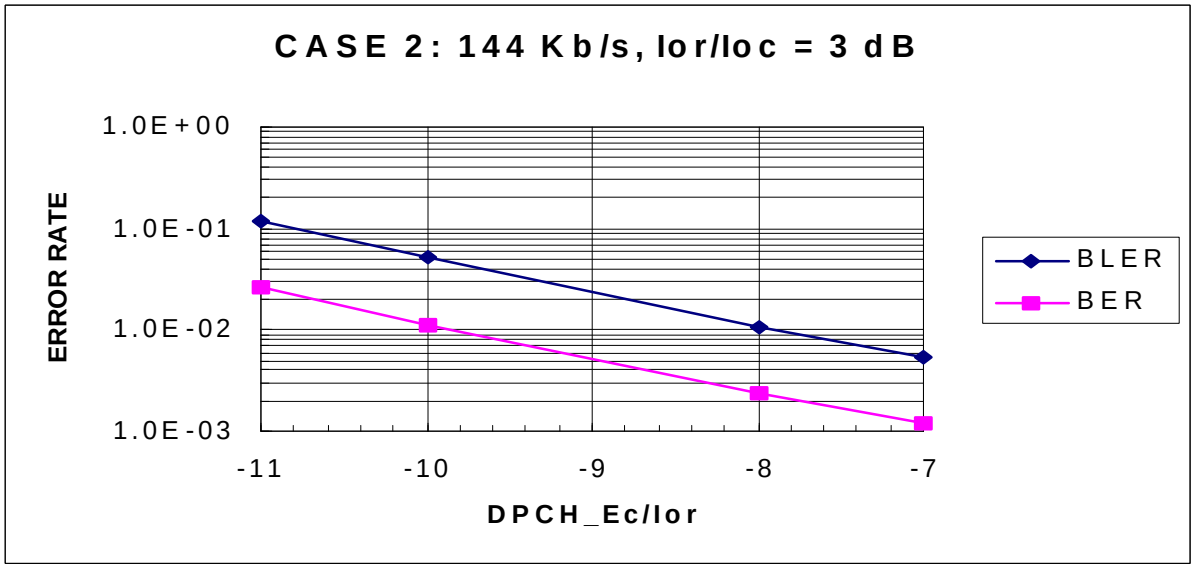


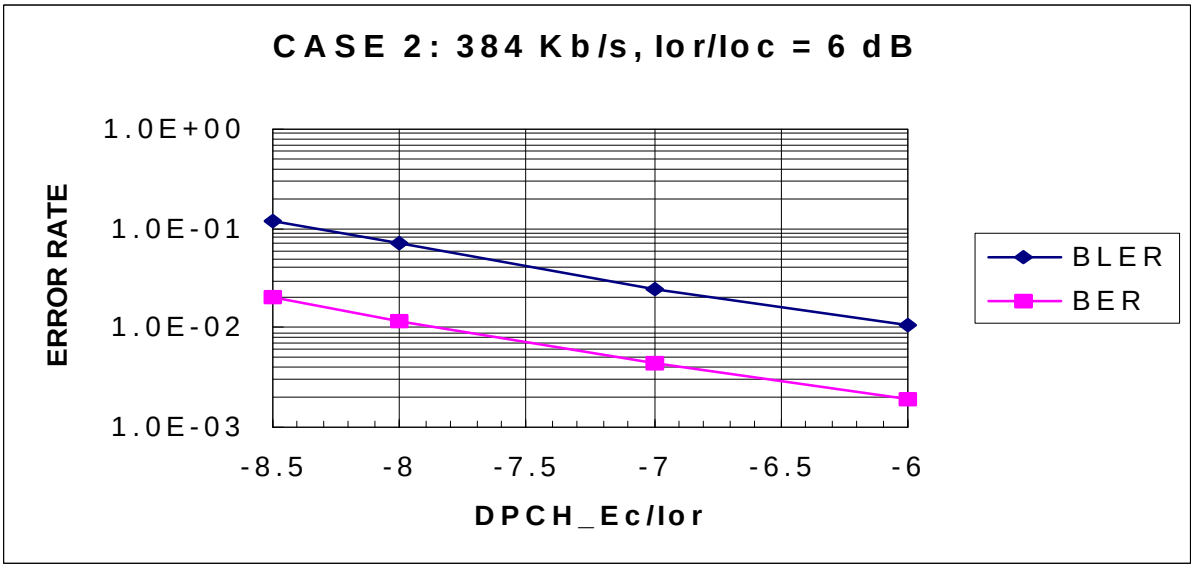

CASE 1: 384 Kb/s, Ior/Ioc = 9 dB
ERROR RATE
1.0E+00
1.0E-01
1.0E-02
1.0E-03
-9
-8
-7
-6
-5
DPCH_Ec/Ior
BLER
BER

Demodulation in the Multipath propagation conditions Case 2

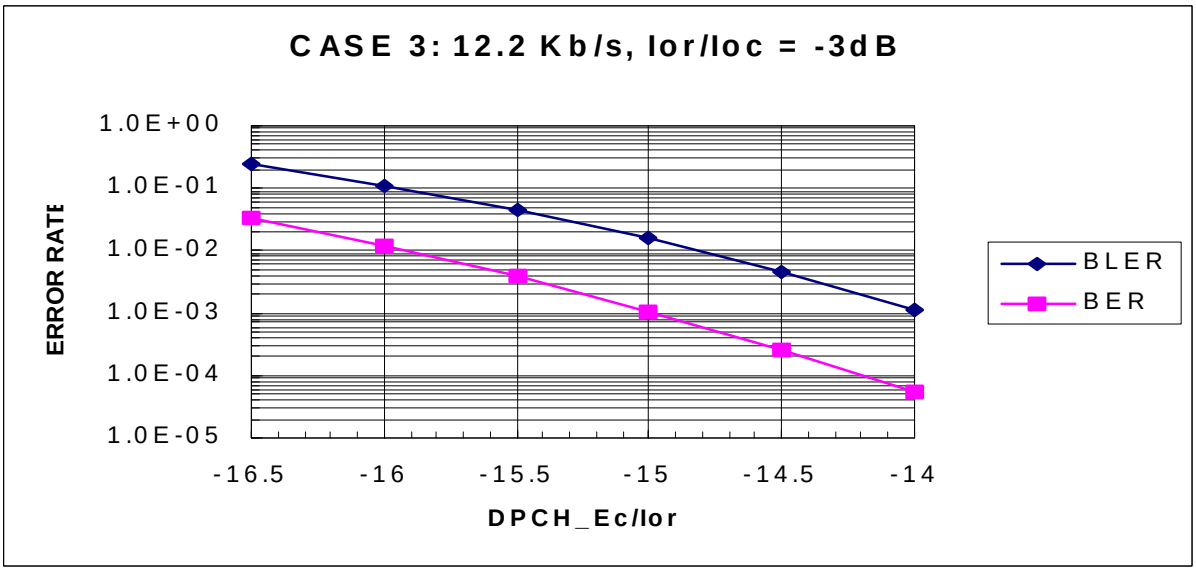


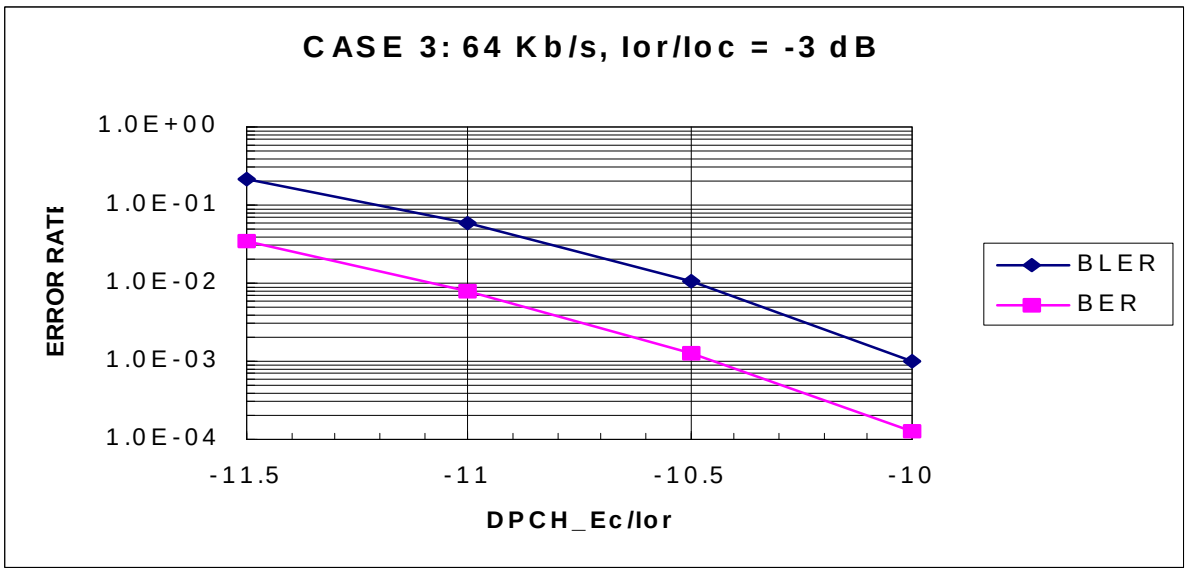


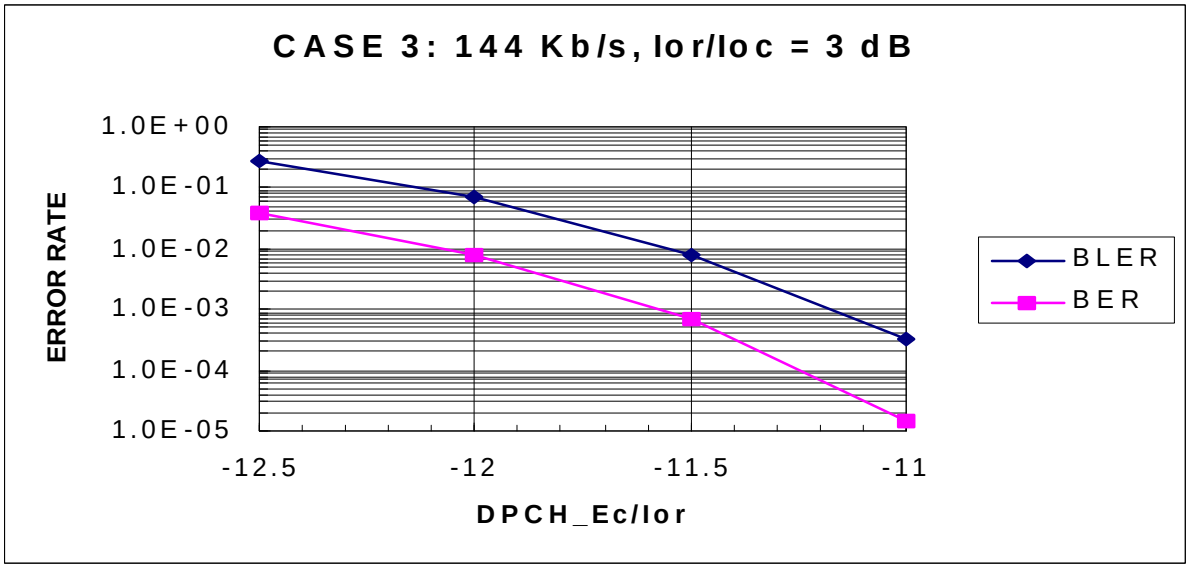



CASE 2: 384 Kb/s, Ior/Ioc = 6 dB
ERROR RATE
1.0E+00
1.0E-01
1.0E-02
1.0E-03
-8.5
-8
-7.5
-7
-6.5
-6
DPCH_Ec/Ior
BLER
BER

Demodulation in the Multipath propagation conditions Case 3







Annex A Simulation assumptions

Simulation assumptions are presented in Table 1

Table 1. Simulation assumptions

<table>
<tr><th>Parameter</th><th colspan="7">Explanation/Assumption</th></tr>
<tr><td>Chip Rate</td><td colspan="7">3.84 Mcps</td></tr>
<tr><td>Closed loop Power Control</td><td colspan="7">OFF</td></tr>
<tr><td>AGC</td><td colspan="7">OFF</td></tr>
<tr><td>Channel Estimation</td><td colspan="7">Ideal</td></tr>
<tr><td>Number of samples per chip</td><td colspan="7">1</td></tr>
<tr><td>Propagation Conditions</td><td colspan="7">As specified in Annex B of TS 25.101 v.3.0.0.</td></tr>
<tr><td>Number of bits in AD converter</td><td colspan="7">Floating point simulations</td></tr>
<tr><td>Number of Rake Fingers</td><td colspan="7">Equals to number of taps in propagation condition models</td></tr>
<tr><td rowspan="6">Downlink Physical Channels and Power Levels</td><td>CPICHP_Ec/Ior</td><td colspan="6">= -10 dB</td></tr>
<tr><td>PCCPCH_Ec/Ior</td><td colspan="6">= -12 dB</td></tr>
<tr><td>SCH_Ec/Ior</td><td colspan="6">= -12 dB
(Combined energy of Primary and Secondary SCH)</td></tr>
<tr><td>PICH_Ec/Ior</td><td colspan="6">= -15 dB</td></tr>
<tr><td>OCNS_Ec/Ior.</td><td colspan="6">= Power needed to get total power spectral density (Ior) to 1.</td></tr>
<tr><td>DPCH_Ec/Ior</td><td colspan="6">= power needed to get meet the required BLER target</td></tr>
<tr><td>BLER target</td><td colspan="7">Thus results for BER / BLER from 0.5 to 10-3 are presented</td></tr>
<tr><td>BLER calculation</td><td colspan="7">BLER has been calculated by comparing with transmitted and received bits.</td></tr>
<tr><td>PCCPCH model</td><td colspan="7">Random symbols transmitted, ignored in a receiver</td></tr>
<tr><td>PICH model</td><td colspan="7">Random symbols transmitted, ignored in a receiver</td></tr>
<tr><td>DCCH model</td><td colspan="7">Random symbols transmitted, ignored in a receiver</td></tr>
<tr><td>TFCI model</td><td colspan="7">Random symbols, ignored in a receiver but it is assumed that receiver gets error free reception of TFCI information.</td></tr>
<tr><td>Used OVSF and scrambling codes</td><td colspan="7">Codes are chosen from the allowed set.</td></tr>
<tr><td rowspan="5">$\hat{I}_{or} / I_{oc}$ values</td><td rowspan="2">Information data rate</td><td rowspan="2">Static</td><td colspan="3">Multi-path</td><td rowspan="2">Moving</td><td rowspan="2">Birth / death</td></tr>
<tr><td>Case1</td><td>Case 2</td><td>Case 3</td></tr>
<tr><td>12.2 kbps</td><td>-1</td><td>9</td><td>-3</td><td>-3</td><td></td><td></td></tr>
<tr><td>64 kbps</td><td>-1</td><td>9</td><td>-3</td><td>-3</td><td></td><td></td></tr>
<tr><td>144 kbps</td><td>-1</td><td>9</td><td>+3</td><td>+3</td><td></td><td></td></tr>
<tr><td>384 kbps</td><td>-1</td><td>9</td><td>+6</td><td>+6</td><td></td><td></td></tr>
<tr><td>Turbo decoding</td><td colspan="7">MaxLogMap algorithm is used with 8 iterations</td></tr>
<tr><td>SCH position</td><td colspan="7">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</td></tr>
<tr><td>Measurement Channels</td><td colspan="7">As specified in Annex A of TS 25.101 v3.0.0</td></tr>
</table>