TSG-RAN Working Group 4 (Radio) meeting #6
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Title: Benchmark results for UTRA-FDD downlink

Document for: Discussion

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1 Introduction

It was agreed in the RAN4 meeting #5, to perform Benchmarking simulations for UTRA-FDD downlink. Based on these simulations, the simulation chains of all interested companies can be aligned. The simulation assumptions are defined in [1].

In this contribution, results from Ericsson benchmark simulations for the downlink are presented. The simulation setup and assumptions are clarified and results are presented.

2 Simulation assumptions

2.1 Given assumptions

The simulation setup is given in [1], and the same table and assumptions are shown below. The definitions of the parameters are given in [2].

Table 1: simulation setup

Parameter	Unit	Test 1	Test 2	Test 3	Test 4
$\frac{PCCPCH\_E_c}{I_{or}}$	dB	-10	-10	-10	-10
$\hat{I}_{or}/I_{oc}$	dB	3	9	3	9
Information Data Rate	kbps	12.2	12.2	64	64
Channel Symbol Rate	ksps	32	32	128	128
TFCI	-	On	on	On	On

1. Orthogonal channel noise simulator (OCNS) is used (one additional orthogonal user). Set up the power of it so that the total power of BS equals to 1 always. (if power of DPCH increases, the power of OCNS decreases).
2. Power control is switched off.
3. Automatic Gain Control (AGC) is not used.
4. Two tap equal gain propagation model with rayleigh fading. Taps are 2 chips apart from each other. Speed of a terminal is 120 km/h in test 1 and 2 and 3 km/h in test 3 and 4.
5. Ideal channel estimation from PCCPCH is used.

6. Floating point chip level simulations, one sample per chip.

7. 2 Rake fingers is used.

8. In test 1 & 2 use downlink reference measurement channel (12.2 kbps) as in Annex A.2.2. In test 3 & 4 use same principles for 64 kbps measurement channel as for 12.2 kbps case . Draw a figure describing reference measurement channel for 64 kbps that have been used in simulations.

2.2 Ericsson assumptions

The simulation chain is shown in Figure 1, the power level I_{or} is transmitted into the multipath channel and the same power is transmitted out from the multipath channel.

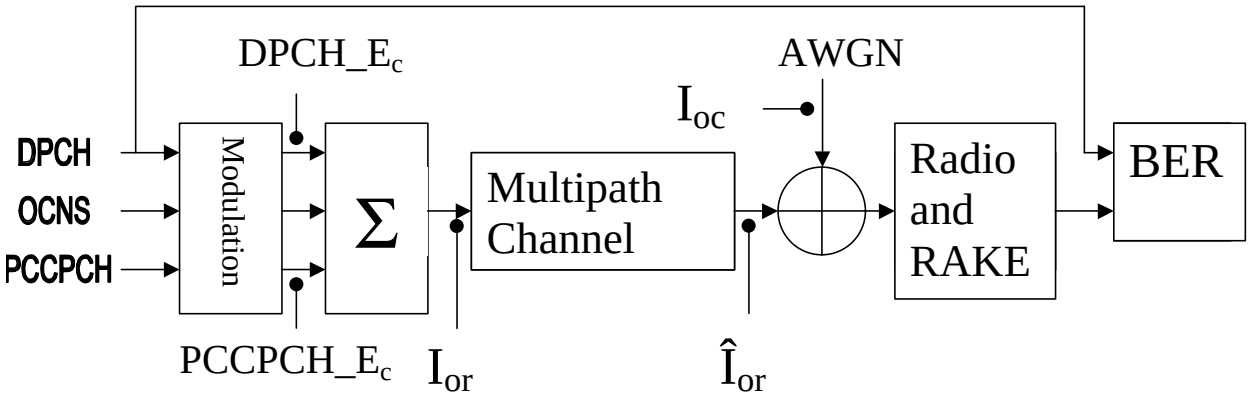

Figure 1: The simulation chain

The benchmark simulations are performed on uncoded bits and channel estimations are optimum. The output from this benchmark simulation is only dependent on how much energy is transmitted in the data bits, not on how much overhead power is transmitted in pilots and coding. Therefore no multiplexing and mapping is needed for these simulations. Instead the table below is enough for setting up these benchmark simulations.

Table 2: Simulation setups

Parameter	Unit	Test 1	Test 2	Test 3	Test 4
$\frac{PCCPCH\_E_c}{I_{or}}$	dB	-10	-10	-10	-10
$\hat{I}_{or}/I_{oc}$	dB	3	9	3	9
Channel Symbol Rate	ksps	32	32	128	128

The assumptions used for these simulations are therefore slightly modified. Below are some remarks given on the given assumptions above.

5. Ideal channel estimation with information from the simulated channel is used with one sample per symbol.

6. Floating point chip level simulations, one sample per chip, perfectly synchronized with the received signal.

8. No specified measurement channel is used because these simulations do not apply to any specific measurement channel. Therefore no measurement channel is proposed here for 64kbps.

3 Simulation results

Simulations have been performed for the cases given in Table 2. In Figure 2 the simulation results for test case 1 and 2 are shown and in Figure 3 the results for test case 3 and 4 are given. The plots are given as BER versus DPCH_E_c/I_{or}.

Figure 2: Simulation results from Benchmark test 1 and 2

In the results, shown in Figure 2, it is seen that the difference between test case 1 and 2 is about 4 dB at BER=10^{-2}.

Figure 3: Simulation results for testcases 3 and 4.

The results shown in Figure 3 are similar as in Figure 2. Here it is seen that the degradation compared with test cases 1 and 2 is about 5 to 6 dB, due to less processing gain. At BER=10-2 the difference between test case 3 and 4 is slightly smaller than between testcase 1 and 2.

4 Conclusions

The Ericsson results of benchmarking simulations for UTRA-FDD downlink are presented. They should be used for comparison with other companies to validate and align the simulation chains.

References

[1] R4-99341, “Simulation assumptions for benchmarking simulation platforms”, Ericsson, Nokia

[2] 25.101, “UE Radio transmission and reception (FDD)”