**Planning report for examination thesis at IDA**

**Authors**

Paul Nedstrand

Razmus Lindgren

**Preliminary title**

Test Data Post-Processing and Analysis of LA & HARQ

**Problem formulation**

How can it be verified how efficient The HARQ (Hybrid Automatic Repeat Request) and LA (Link Adaptation) algorithm is? There is no good current way to see the efficiency of it and how well they are meeting the 3GPP standard for different channel models.   
This master thesis involves developing a tool to visualize and measure the efficiency of LA and HARQ in LTE in comparison to not having them. Are they both meeting the 3GPP standard in aspect to SNR (Signal-to-Noise-Ratio), SINR (Signal-to-Interference-plus-Noise-Ratio) and throughput?

**Our approach**

We will receive data from Ericsson in form of log file, on a disk. We will analyze this data (with the help of i.e. Matlab or some other suitable tool) in the perspective of SNR, (Signal-to-noise ratio), SINR (Signal-to-interference-noise ratio), throughput among other things to see if the data meets the requirement of the 3GPP standards. We will interview relevant employees at Ericsson and ask them what the most important tasks are to accomplish, how they will use our work, the purpose etc. When the work is done we will compare the things we have analyzed with the 3GPP standard.

**Literature base**

The main source of information will come from Ericsson internal documents, lectures and online lectures. The online lectures we will be able to find at Ericsson’s web page with learning material. The lectures will be held at Ericsson in Linköping. To find information that will not be handed out by Ericsson, and that we feel is necessary to complement, we will use the web and also use Linköpings TekNat-library to get the information.

Possible keywords: HARQ , Up/downlink, Link Adaptation, SINR, SNR, QAM, eNodeB, Channel Layers, CQI, Throughput, FDD, TDD, Scheduling, Ofdm, Ofdma, Channel Models.

We will need literature that explains the LA (Link Adaptation) and HARQ (Hybrid Automatic repeat request) algorithms. For this we have the document 36.300-C20, Part V, p. 42-53. This section describes the HARQ and LA algorithm. This information is important for us to understand when we develop the analyzer tool.

We will look at the SINR, SNR, and throughput for different channel models so we will have to find information about different channel models. Since we haven’t got any literature about this from Ericsson we will search the web for it.

We will need manuals about how to use the UE’s (user equipment) when connecting a UE to a base station.

List of commands about how to configure the lab equipment

Books available at Ericsson:

Academic Press 3G Evolution HSPA and LTE for Mobile Broadband 2nd Edition Oct 2008 eBook-DDU, Part IV

This part describes more in depth the transfer protocols in the physical layer. It also lists the requirements for LTE under different circumstances.

Ericsson Academy LTE L11 Air Interface

This compendium gives us all information about the physical layer (transmission between UE and eNB).

It will also give us an understanding about how signal are sent in the physical layer.

**Time plan**

Preliminary halftime report date: 2014-11-19

Preliminary Oral presentation: 2015-02-01

By the end of the halftime report we expect to have a not complete (but mostly working ) analyzer tool. We expect to have deep knowledge about mostly all LTE knowledge that is useful to us in our project.

We also expect to have written around half of the final report.

See attached file “Project Time Plan” for the actual time plan in excel format.