GSM base station measurements

for Laboratory Work in Telecommunications

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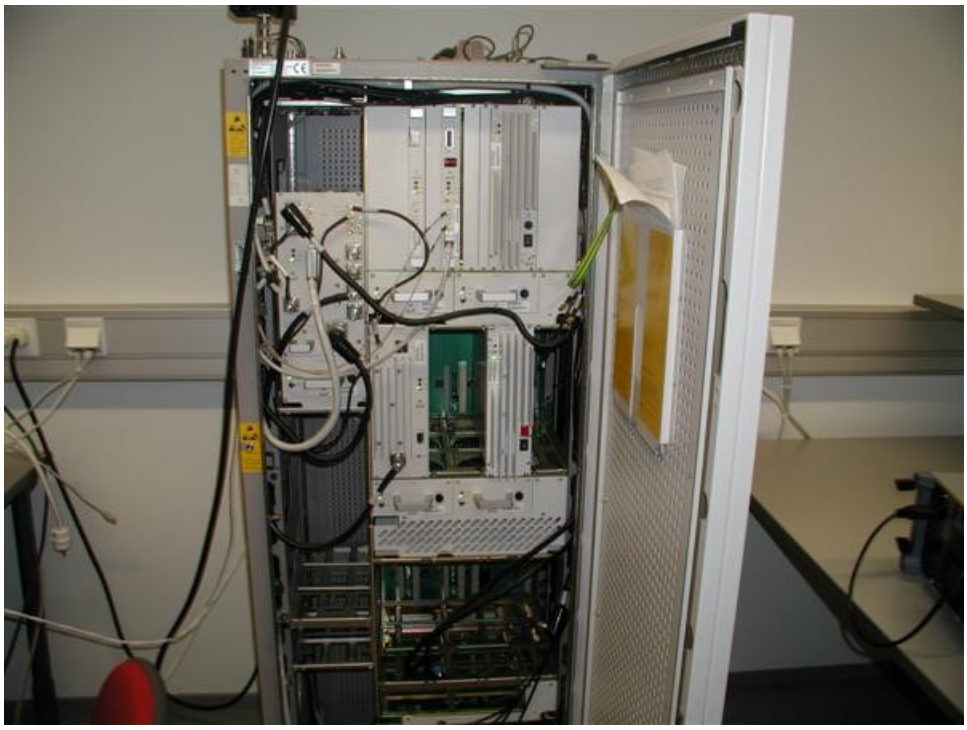

Figure 1: Nokia DE/DF 34 Talk-family base station

1 General information about MMI

The user via the BTS Nokia Man-Machine Interface can control the Base Transceiver Station (BTS) equipment. (fig. 1) Controlling can be done locally at the BTS site and also remotely from the Base Station Controller (BSC) or Network Management System (NMS/2000). The Talk-family and Nokia Prime Site BTS Man-Machine Interface software includes three applications: the MMI version 6.0.1, the MMIDATA version 6.0.1 and the HWINFO version 6.0.1. The MMI is used for controlling the BTS, whereas with the help of the Hardware Database Editor (MMIDATA), the database of the BTS can be configured and edited. The HW Info Editor (HWINFO) is used to manage BTS HW Info files. All of these applications are run in 32-bit Windows environment. The MMI uses a real-time operating system.

1.1 MMI Software Structure

We were using MMI to control the BTS. MMI software is needed to download SW and HW, DB or HW Info files, reset the BTS objects, control BTS tests and devices, and also manage alarms. With the Talk-family BTS MMI, there can be three different windows in the MMI mainframe. It is advisable to always have the Messages and Alarms window open. This makes working with the MMI more efficient.

1.2 Digital Radio Communications Tester CMD57

Digital Radio Communications tester CMD 57 is an advance top class instrument for measurements on base stations (BTS) and base station modules. (fig. 2) CMD 57 is designed for measurements in line with:

- GSM900
- E-GSM
- UIC-European train radiotelephony
- GSM1800

Figure 2: Rohde & Schwarz Digital Radio Communications Tester CMD 57

- GSM1900 optionally

The main applications are:

- Module testing in production
- Final testing with Abis control
- Installation with Abis control
- Service with test mobile functionality

CMD 57 allows measurements on transmitters and receivers of base station without affecting telephone calls in progress.

2 Calibrating Of the Cables Attenuators

Measurement equipment: CMD57 and spectrum analyser

The settings of the spectrum analyser:

- Set the frequency
- Span 0 Hz
- Sweep 10ms
- VBW 300kHz
- RBW 300kHz
- Trace average

Figure 3: SW Loading

Figure 4: BCF00 Supervisory

Settings of the CMD57:

- Module test
- RF Gen
  - Frequency
  - Offset 0 Hz
  - RF-level 50dBm
- Connect/ext att
  - Select ports and attenuation
- Select correct GSM network type

CMD sends when MENU is pressed.

3 Powering Up the Base Station

We turned the power on both PSUA-units on the base station.

4 Base Station and MMI Software

We connected the 13MHz Test signal of the BTS to the REF-port of the CMD57 and CMD57 RF In/Out to the ANT. 1 connector of the base station. Also connected a serial cable from PCs serial port to the BTSs MMI-test-port. When the power is on there is a text 0005 at the display of BCF and POFF/HOP at the display of TRX.

Then, we started the MMI-program: Start/Programs/BTS MMI Software/BTS MMI and disabled Abis-interface: Object/Disable A-bis.

When device status is BCF00 SW Loading (fig. 3), we selected BTS SW/Use Current SW Packet. BTS is ready for testing, when device status is BCF00 Supervisory. (fig. 4)

5 TRX Loop Test

MMI: From the MMI program we chose: Test / Send BCCH Carrier (fig. 6)

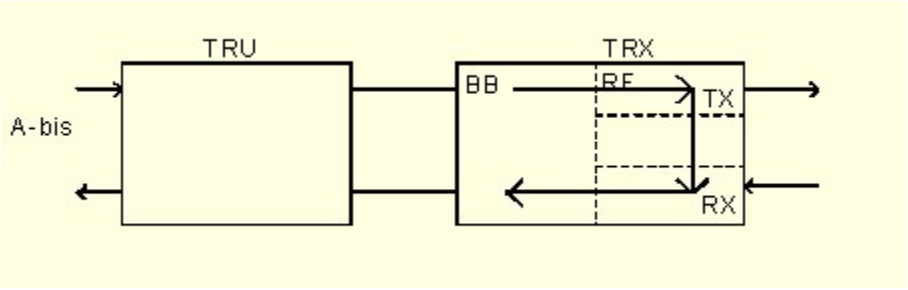

Figure 5: TRX loop scheme

Figure 6: Options for BCCH Carrier

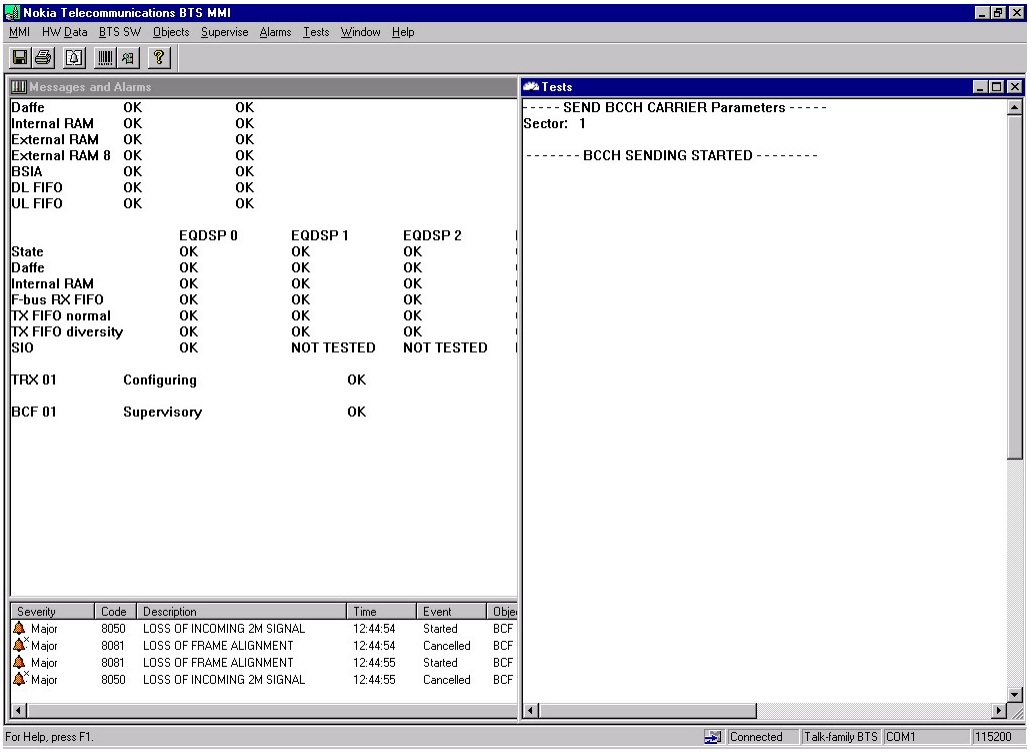

Figure 7: BCCH sending started

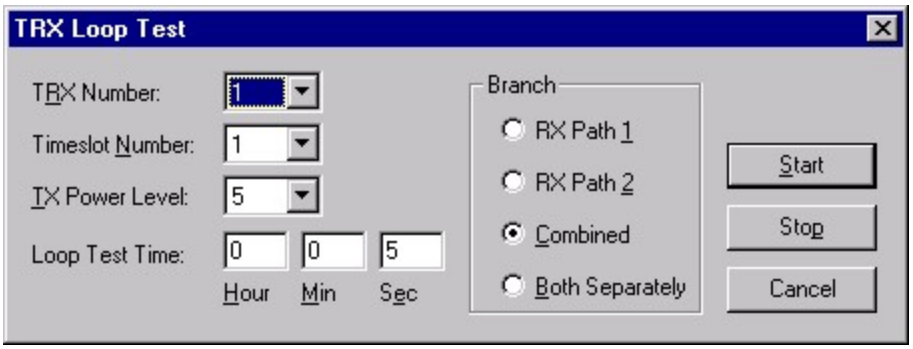

Figure 8: TRX Loop Test Example

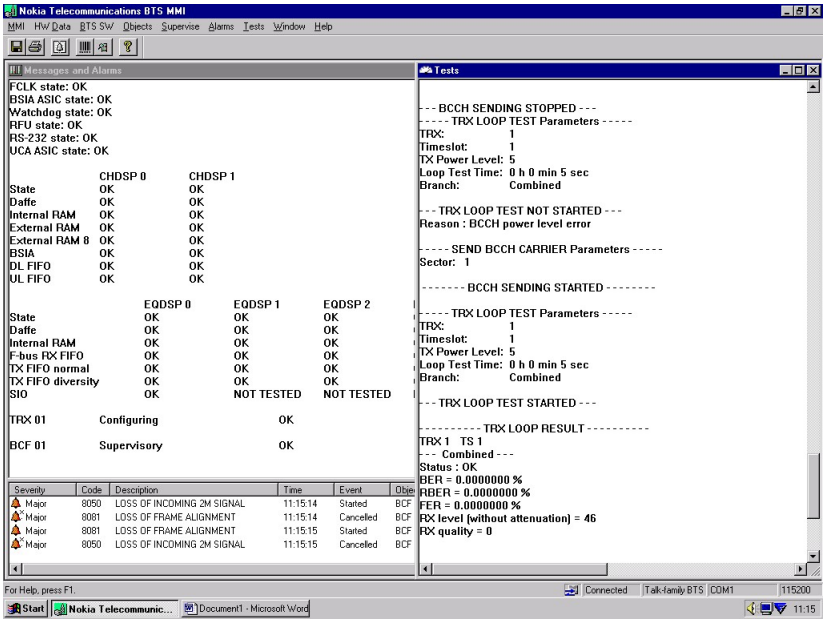

Figure 9: TRX Loop test result

5.1 MMI: Test/ TRX Loop Test

After choosing values we pressed Start and then we tested both of the TRXs and used different timeslots and TX Power Levels and at the end of the TR LOOP test we chose Test / Send BCCH Carrier and clicked Stop.

6 Test Pattern Transmission

MMI:

- Tests / Send BCCH Carrier
- Test / Test Pattern Transmission

We chose the ARFN number 521 (GSM1800) and set only the one timeslot using different TX Power levels, bit patterns and timeslots. (Fig. 10)

CMD: Module test Also we have done Power Ramp Test, and checked that power ramp is correct. (fig. 11) and phase frequency test. There, we checked that phase frequency is correct. (fig. 12) In the end of measurement we went

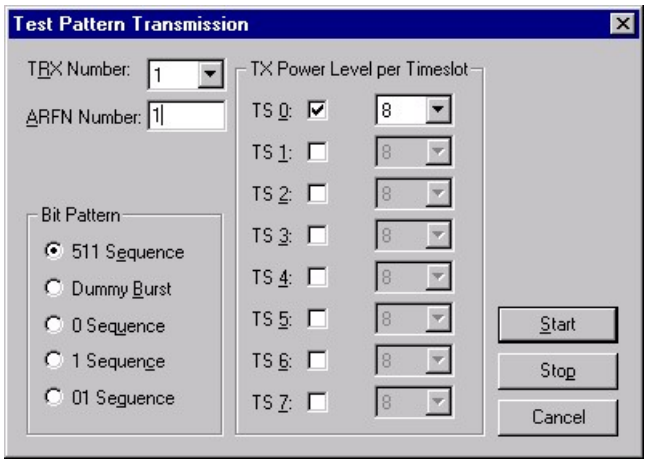

Figure 10: Test Pattern Transmission

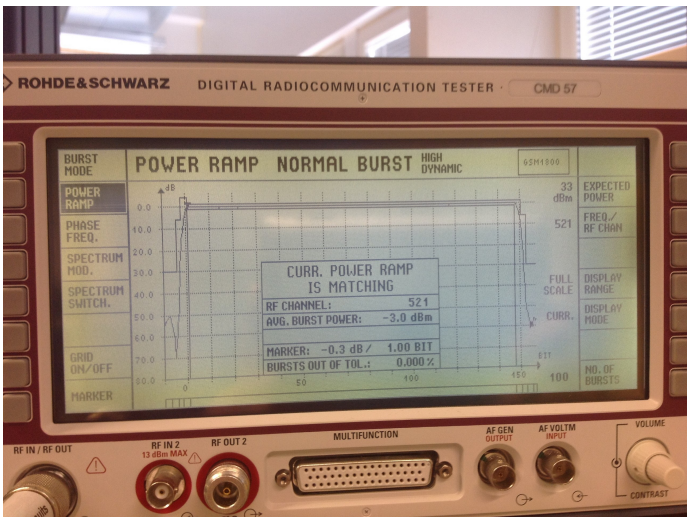

Figure 11: Power Ramp Test result

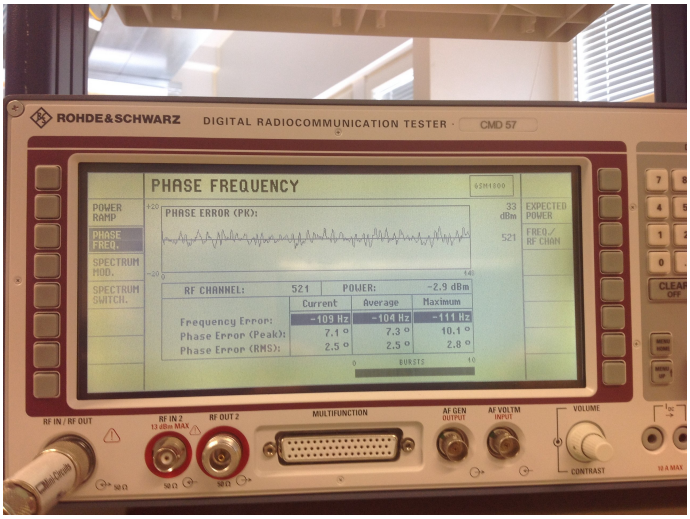

Figure 12: Phase Frequency Test result

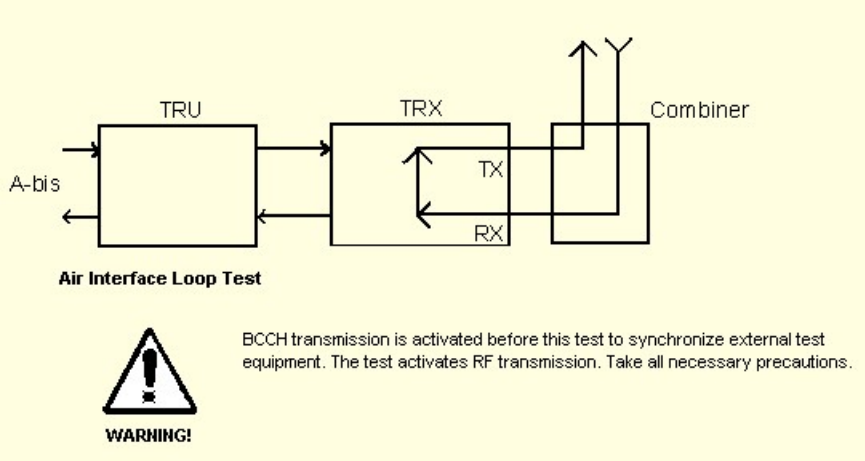

Figure 13: Air Interface Loop scheme

back to MMI Program and chose Tests/Test Pattern Transmission and clicked Stop and Tests/Send BCCH Carrier and clicked Stop.

7 Air Interface Loop Tests

- MMI: TestSend BCCH carrier
- We set the correct timeslot and the channel.
- CMD57: Manual tests
- Pressed Try to sync

Display has to show search for signals and BTS power level. Unfortunately, we had difficulty synchronizing, so we couldnt finish this test.

8 BER (Bit Error Rate) Test

Also, we couldnt make BER test due to synchronization.