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NetHawk

Advanced radio interface optimisation and troubleshooting in 3G networks

Application Note

Introduction

In the launch of 3G services, operators are facing new kinds of QoS challenges due to the new WCDMA air interface technique. Their experience with second generation mobile networks such as GSM is not enough, as attention should be paid to totally new radio interface parameters, and new radio optimisation and tuning methods need to be applied.

Radio measurements in 3G networks

In the WCDMA system some radio parameters express the radio environment at the cell level, whereas some are strictly related to communication between UE and a NodeB. In both groups there are UL and DL-specific parameters, which all have to be examined if radio interface quality is your concern. These parameters are keys to radio resource management features such as admission control, load control or congestion control.

In the WCDMA system the Iub interface with its protocols (NBAP, RRC, etc.) provides perfect access to the parameters that pinpoint radio problems. For most 3G operators today, radio network optimisation is limited to the downlink radio path, even though this should not be the situation anymore, as UL information is available in the Iub in-terface. It is important to note that UL parameters can only be accessed via the Iub interface.

CELL-LEVEL PARAMETERS

The most important parameters in the cell-level view are received total wide band power (UL) and transmitted carrier power (DL). These parameters do not differentiate between UE, but they sum together the powers used within a particular frequency and give an indication of the load in the cell.

UE-DEDICATED PARAMETERS (UL)

Efficient power control mechanisms in the RNC are important in 3G networks, as they guarantee proper air interface connections and efficient radio resource utilisation. The RNC uses power control to minimise interference between UEs, a key issue in 3G networks, by advising them to use as low power levels as possible in particular circumstances.

The power control function is dependent on error level parameters such as UL BLER (block error rate), FER (frame error rate) and BER (bit error rate) values, which indicate a bad quality level. The BLER estimation is based on evaluating the CRC of each transport block associated

SOLUTION IN BRIEF:

1. **The NetHawk 3G Analyser's (v.2.6) ROM application is an advanced tool for radio interface quality and interference measurements, power control evalua-tion and DL/UL balancing.**
2. **Real-time and offline view of the most important cell-level and UE-specific radio parameters.**
3. **An easily understandable and clear picture of the conditions in the air interface with the GUI.**
4. **Individual UE can be selected with the help of IMSI, (P-)TMSI, etc. Cells can be identified with Cell IDs.**
5. **ROM measurement results can be combined with field measurements by using the Nemo Analyze post-processing solution.**

with the measured transport channel. The signalling interference ratio values such as SIR-T (target value), actual SIR and SIRerror (SIRerror = SIR – SIR-target), given in dB, tell about the efficiency of power control.

Transmitted code power is the power of one channelisation code of a given scrambling code on a given carrier. It is important to see the effect of power control on transmitted carrier power at the same time as round trip time, which tells about the distance between a NodeB and the UE.

UE-DEDICATED PARAMETERS (DL)
During communication the UE performs measurements of the air interface and reports the results to the RNC by using the RRC protocol. From the optimisation perspective it is informative to have simultaneous views of both the DL and UL parameters.

For the Common Pilot Channel (CPICH), the UE performs RSCP (Received Signal Code Power) and Ec/No measurements giving information about cell coverage.

Both the UTRA and GSM carrier's RSSI (Received Signal Strength Indicator, received power within the relevant channel bandwidth) is measured to see the received power. The GSM RSSI indicates the GSM coverage guiding the intersystem handover functions. As in the UL direction, for comprehensive quality analysis the BLER as well as path loss and UE transmitted power also have to be measured in the DL direction.

Measurements for radio optimisation with the NetHawk 3G Analyser

The NetHawk 3G Analyser's (v.2.6) ROM (Radio Optimisation Measurement) application enables you to evaluate radio interface quality and interference, power control and DL/UL balancing in your 3G network. It provides a view of the most important cell-level and UE-specific radio parameters. Measurements can be performed in real-time or offline from an earlier recorded trace file.

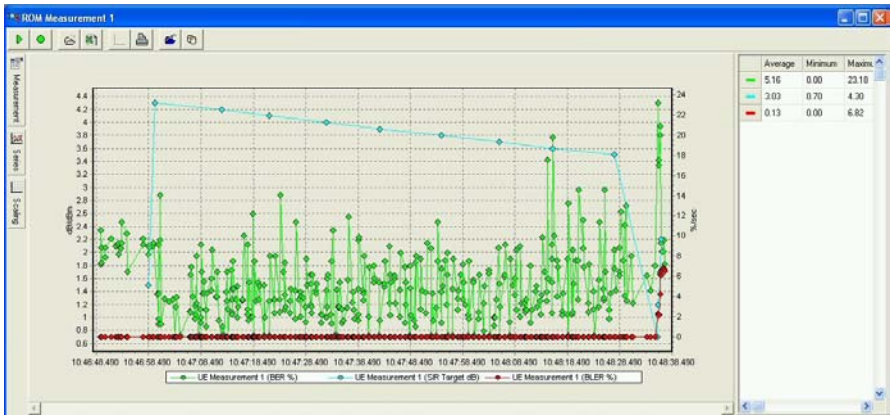

Figure 1: An example of measurements with the ROM application.

The graphical user interface (Figure 1) of the ROM application gives you an easily understandable and clear picture of the conditions in the air interface. You can see the minimum and maximum values, expressed by scaleable figures, adjust the intervals of your measurements, etc. The scale of your measurements only depends on how many Iub links you have decided to monitor.

With the help of the filtering function, measurements can be highlighted for a specific UE or cell. Any commercial UE (or field test tool) can be pointed, e.g., with IMSI, (P-)TMSI and cells with the cell ID.

Parameters provided by the ROM application include:

> Cell-level parameters:
- Received total wideband power
- Transmitted carrier power

> UE-specific UL parameters:
- Transmitted code power value
- Round Trip Time
- BLER (Block Error Rate)
- BER (Bit Error Rate)
- FER (Frame Error Rate)
- SIR Target
- SIR Value
- SIR Error

> UE-specific DL parameters (supported in a later release of ROM):
- CPICH RSCP
- CPICH Ec/N0,
- UTRA carrier RSSI
- GSM carrier RSSI
- BLER (Block Error Rate)
- UE transmitted power
- Path loss

COMBINING ROM AND FIELD MEASUREMENT RESULTS
To combine the ROM measurement results with field measurements, you can use the NEMO Outdoor tool as a drive test tool and collect the air interface UL parameters belonging to the test calls with the NetHawk 3G Analyser. With the NEMO Analyze post-processing tool, you can then combine the measurements and see both UL and DL graphs made of the parameter values in one view at accurate geographical locations.

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