2G, 3G Network Planning and Optimization...

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5.2 Network Optimization Tools

5.2.1 Test MS

Test MS is a daily must for engineers to perform network test. The test MS can display the service cell of a mobile telecommunication network and the six neighbor cells. It can also be used to test network parameters. The test MS can be connected to a computer, so it can collect and analyze data with the help of drive test software.

The functions of a SAGEM test MS are listed below:

- View the IMSI of the SIM card
- Scan BCCH

The SAGEM test MS can scan the BCCH, and it will provides the Rxlev and BSIC of the scanned BCCH in each cell.

- View network parameters

The SAGEM test MS can display network parameters of the service cell of and the six neighbor cells when it is idle or in conversation state.

- Forced cell selection

The test MS can be forced to reselect the designated cell for dialing test and handover test.

- Forced handover

The test MS can be forced to hand over to the designated cell to analyze whether the handover is normal during conversation.

- Frequency selection
- GPRS function test (The MSs of SAGEM OT96 support this function)

5.2.2 Drive Test Software

ANT, TEMS, and SAFCO are the GSM drive test software in common use. Generally, the drive test software consists of two parts: foreground data collection software and background data analysis software.

I. Foreground Data Collection Software

The foreground data collection software is mainly responsible for collecting the uplink and downlink data at the Um interface of the GSM mobile network. If the BTSs and the landform map of the test areas are imported, the track of the drive test, the radio parameters of each test point, and the main information of the service cell, neighbor cell, and the Um interface can be observed.

The functions of foreground data collection software are listed below:

- Test functions

Test functions include call test, scan test, call interference test, double-network synchronization test, dialing record test, dual-band comparison test, and MS selection test.

- Topical test

Topical test is responsible for forced handover and frequency locking (call) test, BCCH frequency locking (standby) test, forced location update test, and band locking test.

- Interference test

Interference aims to locate the BCCH same-frequency and neighbor frequency interference and TCH neighbor frequency interference within the same network in time.

- Parameter collection

The field strength of the service cell and the neighbor cells, bit error ratio, frame error rate, and various radio parameters of the cell need to be collected.

- Geographic navigation

The foreground data collection software can be used to display the geographic navigation through combing the digital map and BTS resources.

- SQI (Speech Quality Index) test

SQI test aims to evaluate the speech quality experienced by mobile users.

- Traffic statistics

The foreground data collection software can be used for CQT traffic statistics. It enables the call setup, call duration, and call release to be recorded respectively. In addition, it is also responsible for recording call drop rate and congestion rate.

- Data record

The foreground data collection software can record and store the test data of the test MS synchronously, and can record and store the scanned data of the 900MHz and 1800MHz synchronously.

- Scanning test

Scanning test aims to test and record the field strength of the channels of the GSM 900MHz network and GSM1800MHz network.

- Competitive test

The comparison between real-time field strength and speech quality is available. In addition, real-time check of cell parameters is allowed.

II. Bachground Data Analysis Software

The background data analysis software can geographically present the radio network test data and reflect the distribution of network parameters on the electronic map visually. It can locate the problem cell by fully considering the drive test data, network resource data, digital frequency sweep receiver data, and GSM signaling characteristics, thus guiding engineers to evaluate and optimize the network rationally and effectively.

The functions of background data analysis software are listed below:

- Radio coverage evaluation and analysis
- Interference analysis
- Neighbor cell analysis
- Handover analysis
- Signaling analysis
- Speech record and analysis

5.2.3 Signaling Analyzer

MA-10 and K1205 are the GSM signaling analyzer in common use. This section introduces the functions of the signaling analyzer.

MA-10 signaling analyzer can test the Abis interface signaling messages, the A-G interface signaling messages, and the SS#7 interface signaling messages of ISUP, TUP, and INAP when it is on line. In addition, it can perform PCM BERT (bit error rate test) and GSM BERT. Furthermore, it can enable the signaling message files saved during on-line monitoring when it is off-line.

The MA-10 signaling analyzer has five sub-applications. They are listed below:

- MA-10 control (It is used to test Abis interface signaling messages, A-G interface signaling messages, and bit errors when it is on line.)
- MONITOR ABIS offline (It is used to analyze the Abis interface signaling messages when it is off line.)
- MONITOR MSC offline (It is used to analyze the A-G interface signaling messages when it is off line.)
- GSM-BERT offline (It is used to analyze GSM BERT when it is off line.)
- PCM-BERT offline (It is used to analyze PCH BERT when it is off line.)

With the help of MA-10 signaling analyzer, network optimization engineers can collect and analyze Abis interface data and A-interface data, view the whole signaling procedure, and obtain the measurement report, and then compare the information with the downlink signals obtained from drive test. These means can help network optimization engineers have an overall understanding of the operation of the network. In this case, the causes and places for the problems, such as call drop, handover failure, and congestion can be located.

5.2.4 Network Optimization Software

Good network optimization software can work as a platform for radio projects and maintenance personnel. NASTAR, Huawei network planning and optimization tool, can deeply analyze GSM network by integrating OMCR traffic statistics, configuration data, alarm data, engineering data, and so on. In addition, it also provides the interfaces for network planning, performance analysis, alarm analysis, and geography conditions.

The functions of NASTAR are listed below:

- Import static traffic statistics data (import the traffic statistics files of the maintenance console into database)
- Import static traffic statistics data according to time
- Import dynamic Huawei traffic statistics
- Import BSC data configuration
- Display the geographic view of BTSs
- Cancel, add, and move the cells based on the geographic view of BTSs
- Record spectrum utilization and analyze idle channel number
- Check same-frequency BSIC
- Analyze neighbor cells
- Measure distance and azimuth angle
- Display navigation window and legend
- Query performance analysis tasks in common use
- Make performance analysis task
- Query network optimization tasks in common use
- Make network optimization tasks
- Perform tasks and alarms automatically
- Import and export tasks
- Display task result and site view
- Query traffic statistics inversely from the cell set selected by site view
- Display the traffic tasks in direct views, including linear figure, column, pie

(support the display of double y-axis and the simultaneous display of multiple indexes; support 2D and 3D.)

- Export electronic table (Excel) for query results.

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