



RF Test System TS8950G for GSM/GPRS/EDGE Mobiles

Reliable RF testing all the way from development to conformance testing

- ◆ Platform for RF tests according to 3GPP TS51.010-1
- ◆ Freely configurable RF test methods for R&D
- ◆ Supports GSM Ph2/Ph2+, GPRS, and EDGE
- ◆ Upgradable to WCDMA
- ◆ Open interfaces for easy integration into individual lab concept
- ◆ Control of custom equipment
- ◆ Full remote access
- ◆ Online measurement accuracy control



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Reliable RF testing

Characteristics

The TS8950 G is designed to perform RF tests of the transmitter and receiver of GSM mobile phones. These tests cover, for instance, measurements of the output spectrum produced by the mobile to evaluate the signal quality and to check possible interference with other services.

For the receiver tests, interfering signals are added and signal propagation conditions are simulated using a fading simulator. In this case, the TS8950 G measures the receiver sensitivity to these disturbances by calculating the information loss (BER, BLER, FER).

The test functionality of the TS8950 G is implemented as test methods. Each test method provides a generic test application and is fully configurable. Test cases are described by parameter sets. This provides significant benefits:

- ◆ Easy variation of test parameters for testing above and below the predefined test limits
- ◆ Fast definition of new tests (for development)
- ◆ Consistency between development tests and conformance tests
- ◆ Clearer view on the real performance of the mobile phone

Applications

The TS8950 G provides three test application packages:

- ◆ Transmitter tests
- ◆ Receiver tests
- ◆ Transceiver tests

Development of GSM mobile phones

Each of these test packages includes a fully configurable test method and example parameter sets.

All parameters can be freely varied through the graphical user interface. The measurement results can be analyzed either with the TS8950 G control center or with other customer-specific software tools.

Conformance testing of GSM mobile phones

Together with the test methods, the parameter sets for the relevant test cases to 3GPP TS51.010-1 are supplied as write-protected, frozen files. All test cases will be validated by independent test houses.

Platform concept

The TS8950 G test system has been developed as a true platform to cover the full range of mobile phone RF tests. The test philosophy of the TS8950 G is to have one core system for all extension levels.

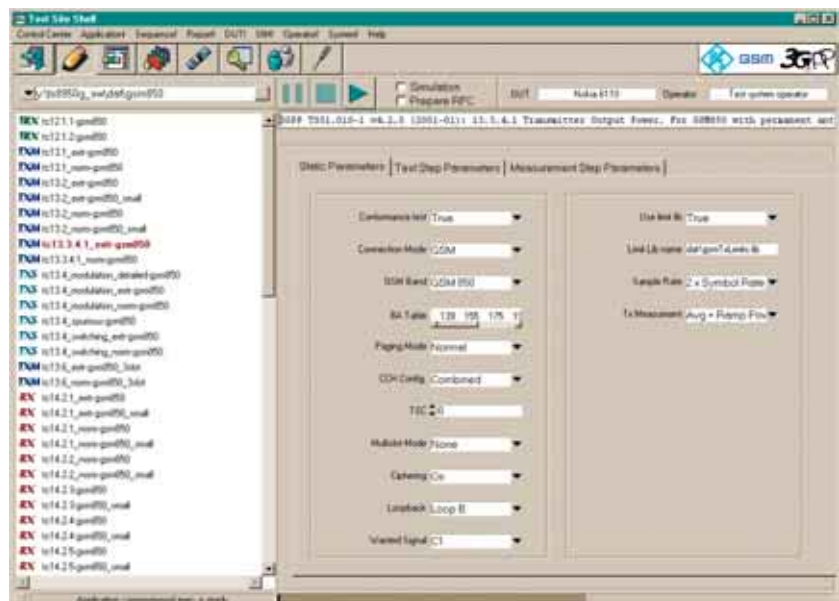
This core system ensures measurement accuracy and provides appropriate interfaces at the hardware and software level, allowing user friendly system configuration.

The TS8950 G is available with different extension levels:

Receiver performance test system

The lowest extension level of the TS8950 G includes a Universal Radio Communication Tester CMU200 as the signalling unit and BER tester, with one or more signal generators to produce interfering signals and with a baseband fading simulator. The purpose of this minimum configuration is to evaluate the performance of a mobile receiver.

If more detailed protocol functionality is required, a Universal Protocol Tester CRTU-G for GSM can be installed instead of the CMU200.



Basic RX/TX test system

This system is equipped with the basic RF equipment including a vector signal analyzer. The signalling unit in the basic RX/TX test system is either a Universal Radio Communication Tester CMU 200 or a CRTU-G protocol tester.

Full-performance RF test system

The full system with CRTU-G protocol tester and band-specific signal conditioning units (ASCUs) for each GSM band is the solution for conformance testing. It allows full comparison with measurement results obtained by means of one of the low-extension versions.

Customizing the system configuration

The TS8950 G control center allows flexible device handling: Instruments can be easily integrated into the system or removed from it without downtime. The instruments' capabilities are abstracted in a logical device layer, making the system widely independent of the individual instruments.

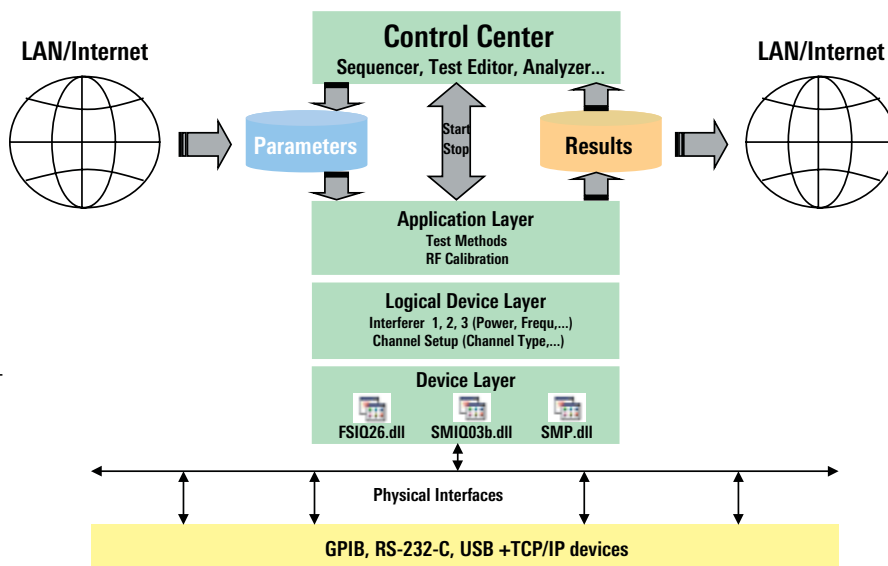
Custom control/analysis

The test methods in the TS8950 G are single executable files. This allows also the use of other software tools for system control, so that existing lab automation software can be extended to control the TS8950 G.

Parameter files and result files can be accessed from anywhere within the company network so that test design and analysis can be performed offline allowing optimum utilization of human and test resources.

Access to the signal path

The TS8950 G switch unit provides access to both transmit and receive signal paths. Multiple RF connectors at the rear of the switch unit allow the introduction of customer-specific signal conditioning elements whenever required.



TS8950 software structure

Measurement accuracy

RF Path Calibration

A very important parameter of an RF test system is the accuracy of the measurement results, because it determines the reproducibility of the results e.g. of the final conformance test that is decisive for the market introduction of the mobile phone.

The signals within the TS8950 G system are routed through a signal switching and conditioning unit. So no manual changes of the measurement setup, which can cause unpredictable path losses and phase shifts, are required. The switch unit has been optimized for reliability and accuracy. All signals paths used by the test applications are automatically calibrated for frequency-dependent losses. This includes connectors and different DUT (device under test) cables. The fixed internal cabling makes the switch unit insensitive to phase shifts.

The TS8950 G system monitors the performance of the RF paths to ensure optimum consistency and reproducibility of measurement results, which leads to a maximum confidence level.

Temperature monitoring

To further increase the information obtained by the tests executed, it is possible to monitor and record the temperature of the test site and the DUT with up to 3 PT100 probes.

Extensions/upgradability

The TS8950 G is designed for RF testing of GSM/GPRS/EDGE mobiles operating in the GSM850/900/1800 or GSM1900 frequency band. Extensions for other frequencies are easily possible. In the future, the TS8950 G will evolve to a dual-mode GSM/WCDMA test system.

Summary

The TS8950 G test system allows consistent testing from development to conformance level and thus improves the confidence level and reduces the time to market.

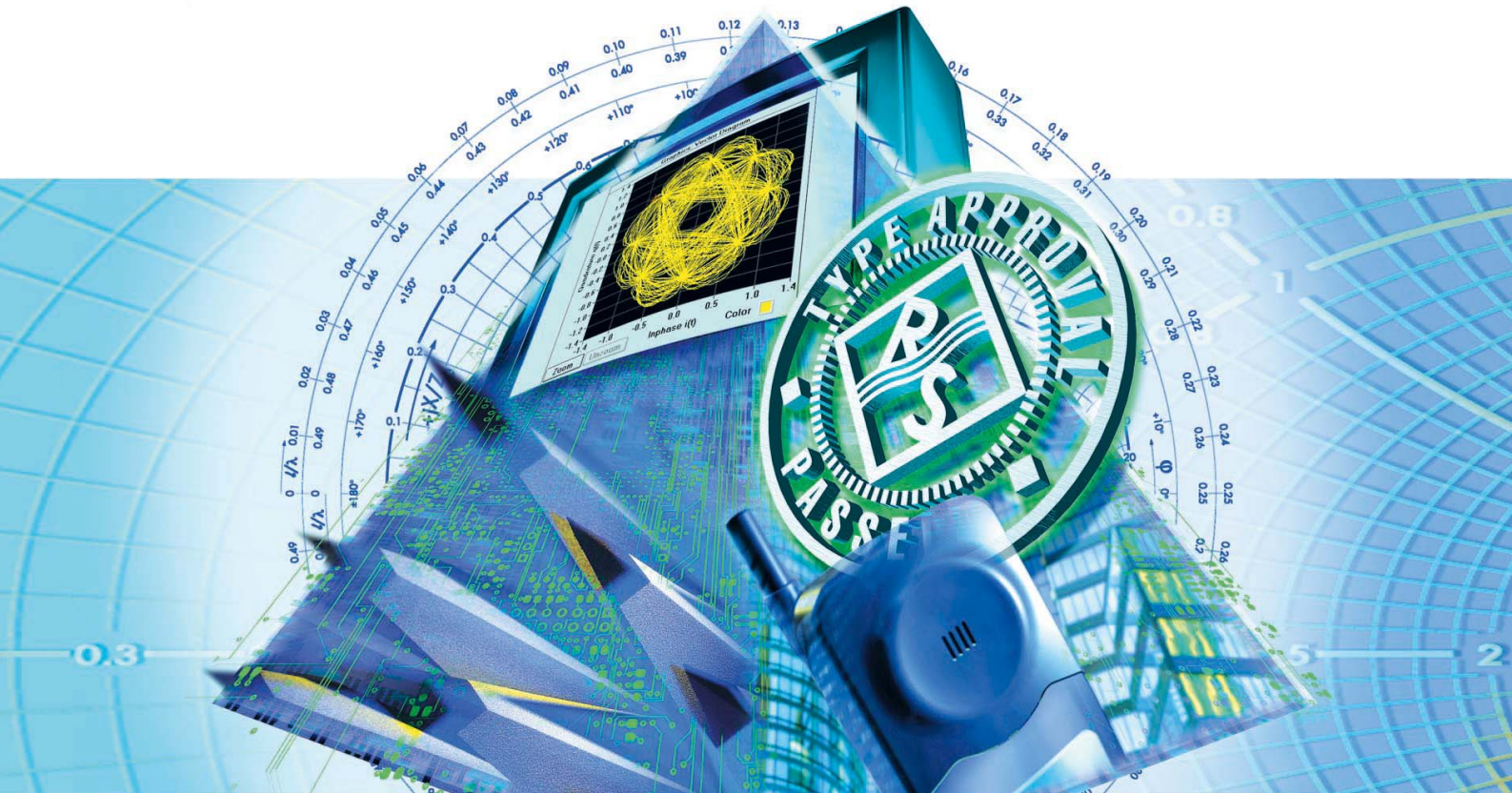
The hardware and software flexibility allows adaptive planning of test resources which helps to reduce the overall test time and cost.

Certified Environmental System
ISO 14001
REG. NO 1954

Certified Quality System
ISO 9001
DQS REG. NO 1954



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Conformance test system for WCDMA

WCDMA Test System R&S® TS8950W



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WCDMA Test System R&S®TS 8950 W

Conformance test system for WCDMA

The WCDMA Test System

R&S®TS 8950 W expands the Rohde & Schwarz portfolio of RF conformance test systems and provides an all-in-one solution suitable for development tests as well as for the certification of terminal equipment. The new test system for manufacturers and independent test laboratories performs all transmitter, receiver and performance tests according to the 3GPP test specification TS34.121 fully automatically.

All tests for certification

The new test system performs not only tests in line with R&TTE (Europe) and FCC (USA) but also all RF tests prescribed by the GCF (Global Certification Forum) for the certification of terminal equipment. A unit will not be approved for use on the market until all these tests have been passed. The test system is based on the hardware and software platform of the well-known GSM Test System R&S®TS 8950 G [1], which can also be upgraded to the R&S®TS 8950 W. The fully configured Test System R&S®TS 8950 G/W makes it possible to test 2G (GSM), 2.5G (GPRS) and 3G mobile phones.

Configuration and characteristics

The 3GPP standard TS34.121, which describes the conformance tests, divides the tests into transmitter, receiver, performance and radio-resource-management (RRM) tests. The Test System R&S®TS 8950 W supports transmitter, receiver and performance tests; for RRM test cases Rohde & Schwarz offers a separate test system.

FIG 1 shows the block diagram of the R&S®TS 8950 W. For testing terminal equipment, the test system simulates a WCDMA base station and a number of interference signal sources. The WCDMA base station is simulated by the WCDMA Protocol Tester R&S®CRTU-W [2], whose two independent RF channels ensure that even complex test cases such as diversity tests can be performed. The analyzer sets up a connection to the DUT and switches

it to the loopback mode, in which all data received from the protocol tester is returned to the test system. The data is then available in the test system for the different measurements. Among other measurements, the Spectrum Analyzer R&S®FSU determines the output power and the modulation characteristics.

The system includes a Vector Signal Generator R&S®SMIQ03 B, which generates the WCDMA-modulated interference signal, and by a Microwave Generator R&S®SMP02, which generates the unmodulated interference signal for the blocking and the intermodulation test.

The Baseband Fading Simulator R&S®ABFS simulates signal fading that results from multipath propagation and Doppler shift. Like the protocol tester, it is equipped with two channels, so that fading characteristics can be added to two signals independently of each other.

The signal switching and conditioning unit (SSCU) and the advanced signal conditioning unit (ASCU) – two modules containing relays, directional couplers, combiners, amplifiers and several filters – amplify and filter all signals. The SSCU is independent of the standard, whereas the ASCU contains standard-specific components.

The test system is rounded out by a Rubidium frequency standard used as a time reference and a power meter with two probes for path calibration. A system controller controls all test units via diverse interfaces.

The new test system is based on the Test System R&S®TS 8950 G introduced in News from Rohde & Schwarz 174. Both have virtually the same appearance.



Key features of the new test system

- ◆ Existing Test Systems R&S®TS8950 G can be upgraded to a combined GSM/WCDMA Test System R&S®TS8950 G/W
- ◆ High measurement accuracy for conformance test cases and other test cases as well
- ◆ Calculation of measurement accuracy for every test case in realtime
- ◆ Flexible, convenient user interface
- ◆ Generation of user-defined test cases without additional programming
- ◆ Wide range of logging and analysis tools

Cost-efficient modular design

The Test System R&S®TS8950 W is based on the hardware and software platform of the GSM Test System R&S®TS8950 G, which has been used in a wide range of applications. The main difference in the hardware of the two systems lies in the different protocol testers and in the ASCUs. By adding a WCDMA protocol tester and one or more ASCUs, a GSM Test System R&S®TS8950 G can be upgraded to a full-compliance Test System R&S®TS8950 G/W for 2G (GSM), 2.5G (GPRS) and 3G tests. When fully configured, a test system of this kind supports four GSM bands (850, 900, 1800 and 1900 MHz) and three WCDMA bands (FDD I, FDD II and FDD III).

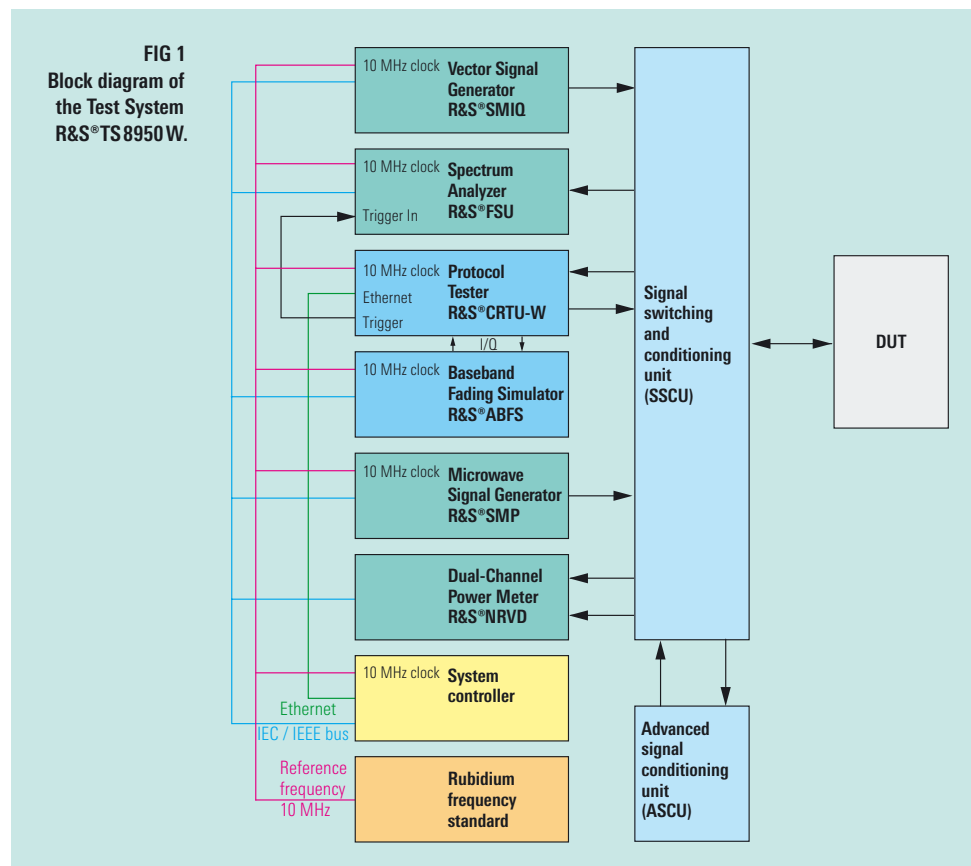
Of course, it is also possible the other way around: an R&S®TS8950 W can be expanded into a combined GSM and WCDMA Test System R&S®TS8950 G/W by adding on a protocol tester and appropriate ASCUs.

High measurement accuracy

An outstanding feature of the R&S®TS8950 W is its high measurement accuracy. Through the use of complex mathematical operations and a sophisticated calibration concept based on Rohde & Schwarz's many years of experience in the development of conformance test systems, the measurement uncertainties are well below the maximum permissible limit specified by the 3GPP standard TS34.121. Accuracy is maintained not only in conformance tests but also when the user has changed the tests. This is ensured by a special algorithm that – depending on the actual measurement parameters, such as frequency, level, etc – automatically finds the most favourable path through the SSCU and subsequently calculates the measurement uncertainty for the selected path by taking the instrument settings into account.

GCF test cases and user-specific adaptation

Besides the fully automatic tests according to GCF test specification and requirements, test cases can be adapted and modified to suit the user's specific needs. Using the PASS software (parametric application software for test systems) from Rohde & Schwarz, all test cases are based on a few test methods. The nearly 40 WCDMA test cases are mapped onto just eight test methods. Receiver tests, for example, are covered by only one test method with some 50 parameters. Test cases are defined by means of parameter sets. Besides the frequency and level of payload and interfering signals, channel configurations, fading profiles or the number of measured samples are available as parameters. FIG 2 shows the parameter list for the Spectrum Emission Mask test case. The parameter sets can be modified, expanded or completely



- ▶ redefined at any time on a user-friendly interface. In addition to a comprehensive test report, there is also a wide range of logging and analysis tools available for quickly localizing faults on the DUT. Users can thus develop their own test scenarios and perform fast, accurate analyses of problems that may occur during the development of mobile phones.

Analysis – online and offline

The user interface of the PASS software runs as a separate process and is thus independent of the test application. During a test run it is therefore possible to compose the next sequence, analyze earlier results or define new tests without interfering with the ongoing test. FIG 3 shows the result of the Spectrum Emission Mask measurement. The specified limit lines are shown in red, the measurement result in blue. Via the LAN interface, the measurement results can be transferred from the measurement system to the company network, for example. A copy of the analyzer tool then makes it possible to analyze the measurement results on any workstation PC.

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More information and data sheet at www.rohde-schwarz.com (search term: TS 8950 W)

REFERENCES

- [1] RF Test Systems R&S®TS 8950 G / TS 8955 G – Reliable RF testing of GSM, GPRS and EDGE mobile phones. News from Rohde & Schwarz (2002) No. 174, pp 4–7
- [2] Protocol Tester R&S®CRTU-W – Future-proof tool for testing WCDMA terminals. News from Rohde & Schwarz (2002) No. 175, pp 4–7

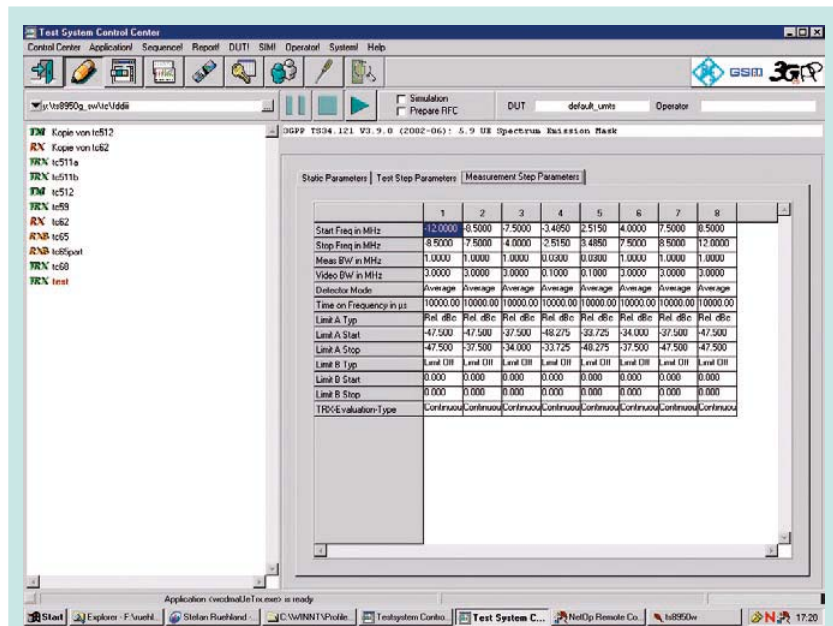


FIG 2 Parameters of the Spectrum Emission Mask test case.

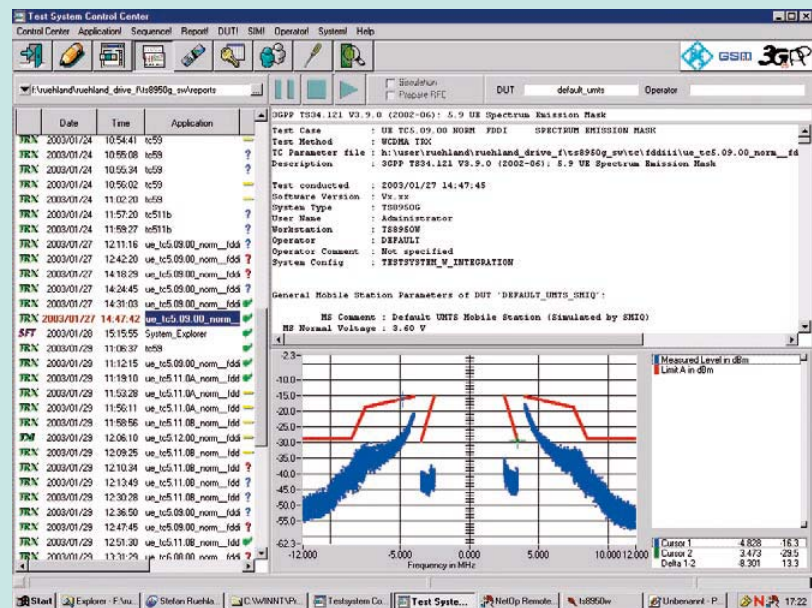


FIG 3 Results of the Spectrum Emission Mask measurement.

