High-Performance Coverage Measurement System TS9955

Coverage measurement for mobile communications

- Detection and localization of coverage gaps
- Determination of network quality
- Applicable to any kind of continuous wave (CW) measurements
- Time-triggered or distance-triggered measurements
- Both high-speed and high-accuracy measurements in one go
- Combined use of various navigation schemes (GPS, Travelpilot, pulse generator) is possible
- Single-frequency measurements at a rate of up to 1 ms (time-triggered)
- Field-strength measurements with an accuracy of up to 0.5 dB
- Distance-triggered measurements to avoid redundant data during drive stops
- ROMES measurement software with on-line graphics and alphanumeric data
- Software extensions for ROMES
- Route display with cartographic map underlay
- ROSEVAL evaluation software (optional)
- GPS navigation module

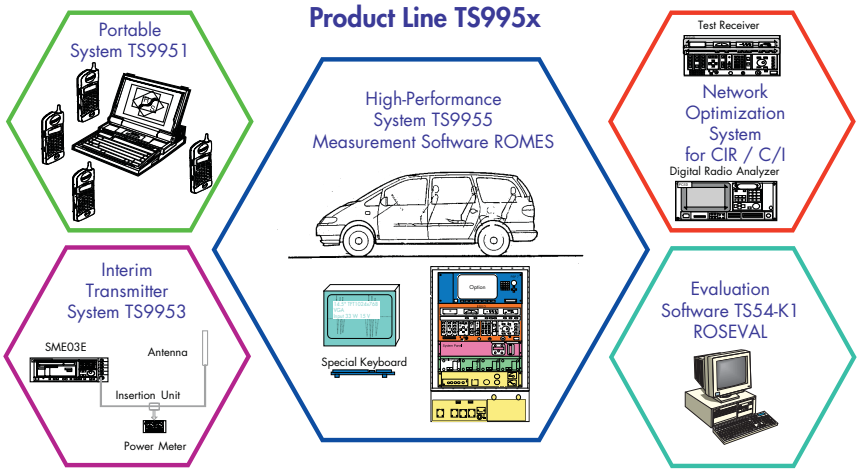
ROHDE&SCHWARZ

Mobile mobility: a system overview

Rohde&Schwarz offers a complete family of systems and subsystems for use in coverage measurements on operative networks or on networks which are about to be commissioned. Data exchange with other software tools is possible.

A separate evaluation station is conceived for complex evaluation of the huge amount of data. The results obtained will be used for statistical presentations. Furthermore special events can be created to identify areas with problems in RF coverage. This evaluation software is often integrated in a stationary system, but can also be used in a mobile system for immediate use directly after the measurement tour. The results can be printed or plotted.

The software is of modular design and runs under Windows 95. Thus its use is quite easy and there is no need for long training sessions. The user interfaces of all TS995x systems are identical so that you can switch from one system to another without requiring further familiarization.



Overview of product line TS995X

TS9955 is a high-performance measurement system designed primarily to verify the coverage of a certain area with any analog and/or digital radio signals. It is not only a powerful measurement tool during planning, installation and optimization of a mobile radio network, but it also serves as an unsurpassed tool for mobile network quality monitoring. The use of TS9955 is not at all limited to just cellular mobile networks, it is equally applicable for broadcast networks. Both analog and digital standards as well as multi-frequency and single-frequency networks are within the possibilities of TS9955.

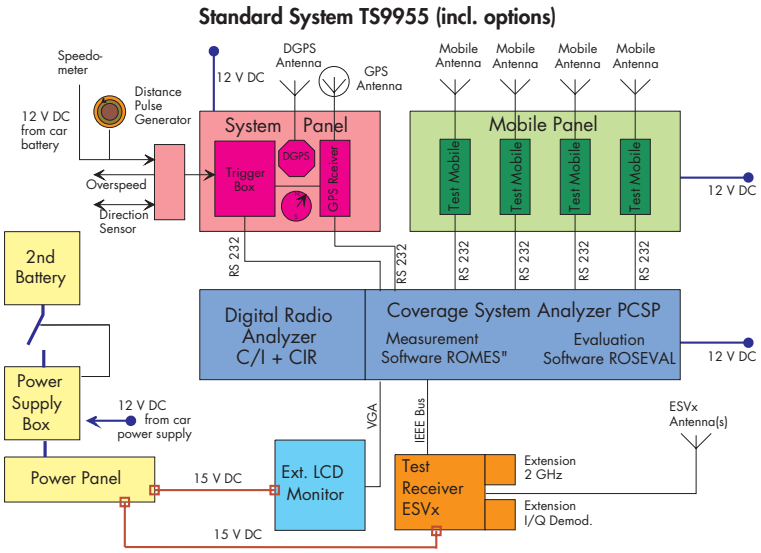
Basic system configuration

The core of TS9955 is a test receiver of the Rohde & Schwarz ESxx family. You can choose between ESVD, ESVB, ESN, ESVS, ESVN, ESPC. The test receiver is integrated into the system via IEC/IEEE bus by a process controller with ultralow RFI. A GPS (Global Positioning System) navigation module is also part of the system. Thus the system collects simultaneously field-strength data from the test receiver and position data from the GPS module.

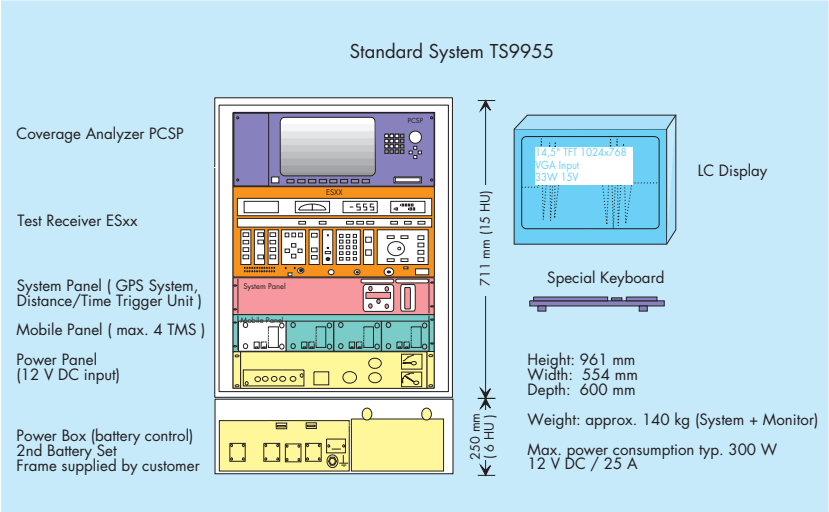
Extensions to the basic system

The modularity of the system software is the essential feature that makes TS9955 so flexible. The basic CW system can be easily extended by integrating additional test equipment into the core system. TS9955 can be upgraded into a multistandard measurement system combining CW measurements with any of the following network standards:

- GSM 900/1800/1900
- ETACS
- DAB (one Philips 452 receiver)
- CDMA 800/1900



Block diagram of TS9955



TS9955 system rack layout with sizes and weight

System components

TS9955 is a complete system for field-strength measurements in a wide range of frequencies (with Test Receiver ESVD: 20 MHz to1000/ 2050 MHz).

For measurements in digital networks it can be expanded with test mobiles for standards like GSM 900 / 1800 / 1900, ETACS, CDMA 800/1900, DAB. Its system layout and software architecture make it possible to integrate functionality for other digital networks which may be introduced in future. This system is the right choice especially for network operators, who have to be absolutely certain about network quality in terms of field-strength and signalling parameters.

The hardware can be configured for different fields of application:

- Field-strength measurements only
- Measurements of digital signalling parameters (GSM, ETACS, CDMA,DAB)
- GSM network quality measurements: C/I (carrier/interferer) or CIR (channel impulse response)

All components are installed in an aluminium rack, well protected and easy to operate.

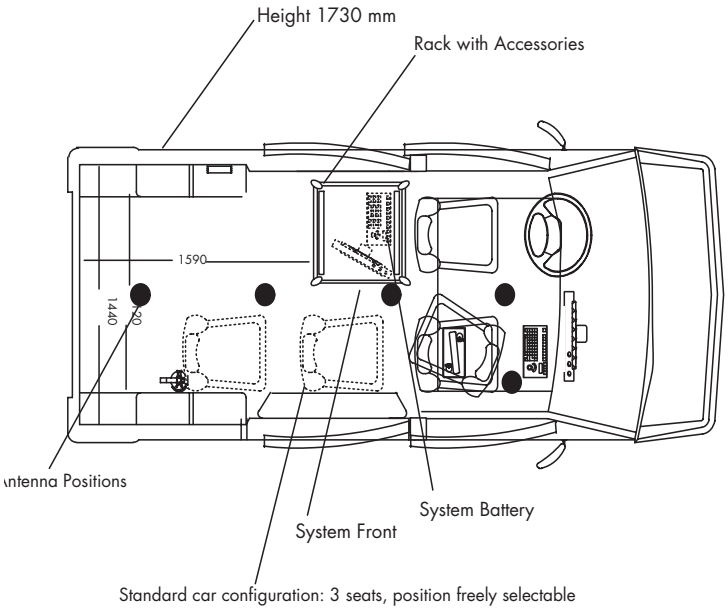
Coverage Analyzer PCSP
The unit takes care of the complete automatic system control and provides the measurement data in several output formats. It acts as the MMI for configuration of the controller's colour screen and for the selection of parameters to be presented in various display windows.

Numerous interfaces serve as the communication link between the coverage analyzer and the controlled devices.

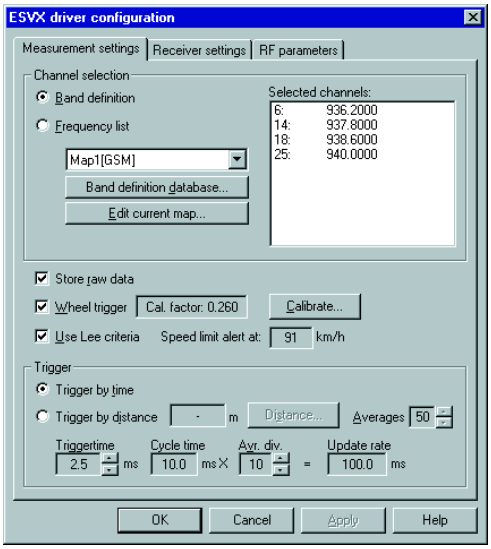
Test Receiver ESxx
For planning and operation of mobile radio networks it is essential to know the propagation conditions in the area to be covered. Test receivers from the ESxx family feature optimal bandwidths for mobile radio services and high measurement rates, so that they are ideal for mobile coverage measurements.

Advanced GPS system
This system uses external sensors in addition to the GPS receiver. An automatic electronic compass sends bear-

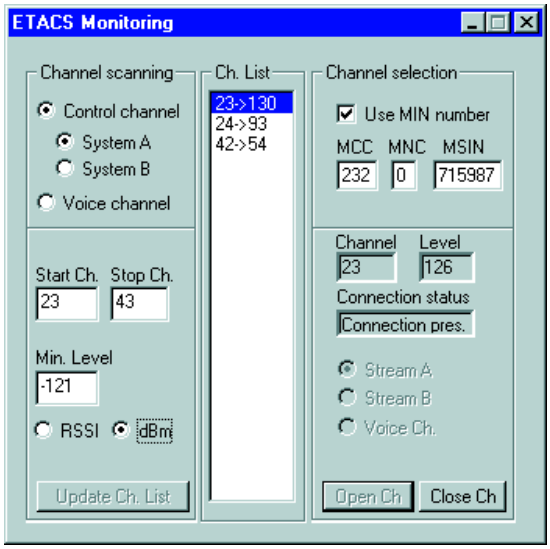
Customer-specific TS9955 system mounted in rack



Proposal for the integration of a complete TS9955 system into a van (here: VW-Sharan)



Receiver configuration for measurement: Wheel trigger, Lee criteria



Configuration of ETACS monitoring

ing information together with distance pulses from the wheel trigger system to the GPS core module. So the navigation is able to send continuous positioning information to the measurement system, even if it receives no signals from the satellites (eg in tunnels or urban areas)

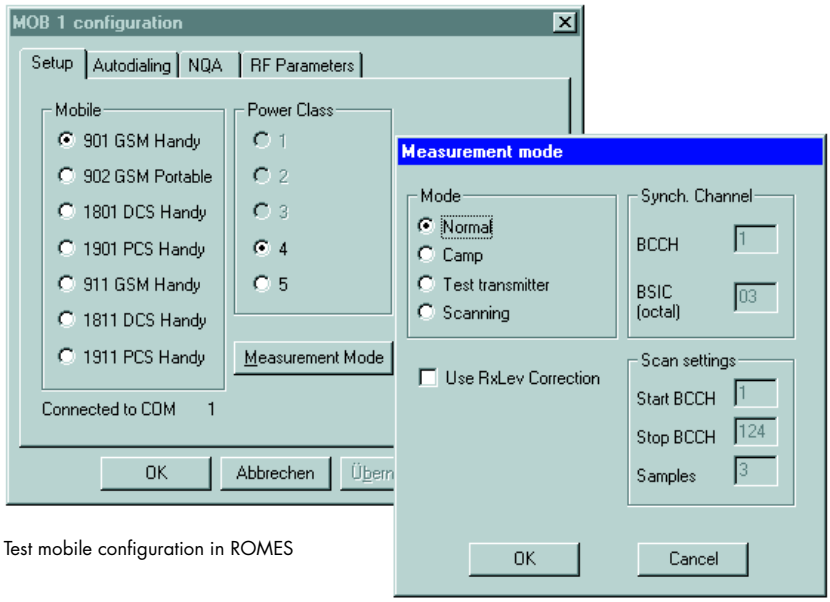
Power supply

Since the High-performance Coverage Measurement System TS9955 needs to be independent on the van's power supply, the necessary 12 V DC is supplied by an extra power supply.

The Coverage Measurement System TS9955 contains a 12 V DC system battery, which is connected to the van's battery by means of a special power box unit.

The power panel supervises all important actions in order to provide operational reliability. This unit delivers 12 V DC to the various system components (like TMS panel, System panel with GPS receiver, coverage analyzer, etc) and 15 V DC for the test receiver and LCD monitor.

An alarm circuit continuously monitors the supply voltage. In case of the voltage being too low the circuit generates an acoustic alarm and, if the voltage drops below 11 V DC, it cuts the coverage measurement system from the system battery.



Test mobile configuration in ROMES

Test mobiles

The available test mobiles are a derivative of the commercial version with additional engineering functionality and have full type approval (FT).

- 1 to 4 test mobiles and suitable antenna with magnetic mount
- Test mobiles available for GSM 900/1800/1900, ETACS, CDMA 800/1900
- DAB receiver

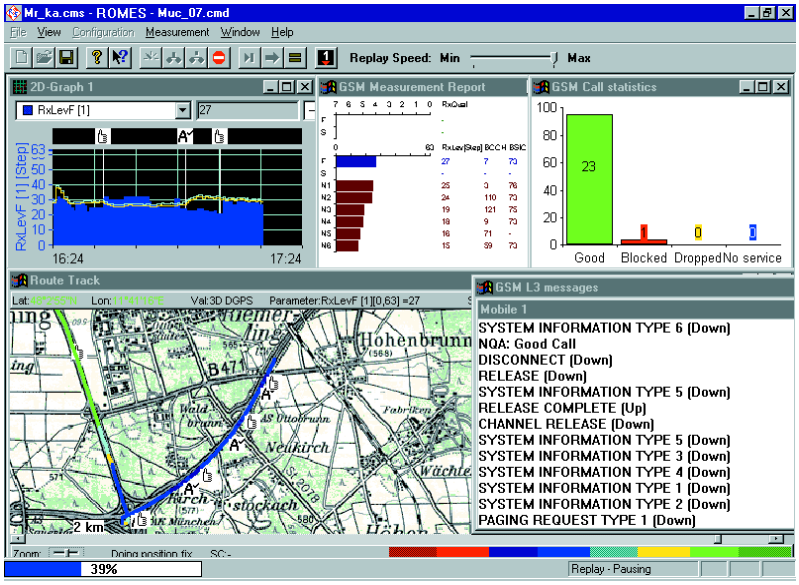
For testing the quality of digital networks, signalling parameters have to be measured, logged and analyzed. The signalling procedure can only be measured using a test mobile.

The test mobiles collect and send the protocol information to the coverage analyzer via RS232 interface. These data together with geographical data

and time information are stored on the harddisk. At most four test mobiles of mixed technology/standard can be used simultaneously.

Available test mobiles:

- GSM 900 mobile 2W
- GSM 1800 mobile 1W
- ETACS mobile 2W
- GSM 900 module 2W with separate data/fax connector
- GSM 1800 module 1W with separate data/fax connector
- GSM 1900 module 1W
- CDMA 800 mobile (IS95A)
- CDMA1800 mobile (J-STD-008)

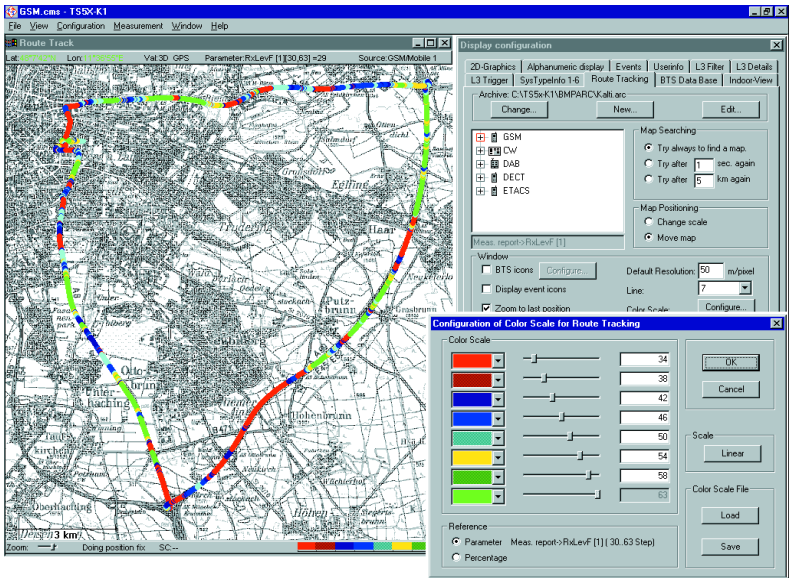


ROMES GSM Route track, 2 D graph and other views

Software

Coverage Measurement Software ROMES

Unique features ensure that measurements are fast, efficient and thus economical. The intuitive menu-driven Windows-based user interface requires no special expertise for operation.



ROMES CDMA Route track display with display and color configuration

The benefits at a glance:

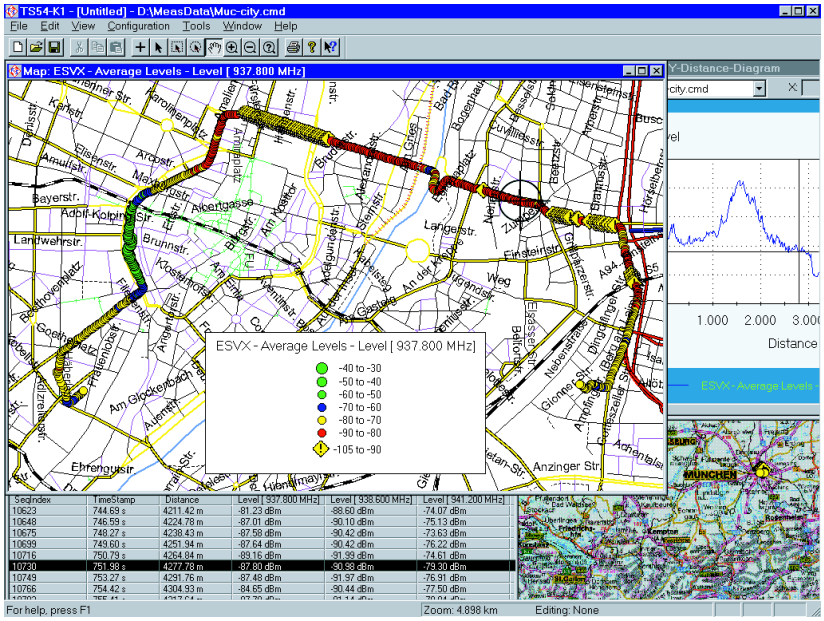
- Supports simultaneous measurements with any combination of test hardware (for different network standards) with high modularity
- Simple and reliable operation, thus enhanced productivity
- Clear presentation of measurement results
- Immediate information about the coverage along the test route
- Immediate confirmation of completed measurement
- All functions selectable via menus, toolbar buttons or keyboard short cuts
- Complete control measurement and recording
- Recording and display of signalling data of up to 4 test mobiles simultaneously for quick and easy network quality comparison

Coverage Measurement Software ROMES with various CDMA measurement displays

- Check of progress and quality of measurements
- Window selection and sizing at any time, even during measurement or replay
- Freely definable colours for on-screen presentation of measurement parameters
- Replay of recorded measurement files (or selected parts) with individual choice of specific views
- Position of test vehicle can be followed on road map during test tour or replay
- Automatic map-splitting for large maps with high quantity of data
- List of all BTS (base transmitter stations) can be loaded
- Measurement with/without recording
- Free definition of 10 events to be set manually
- Configuration of system events with graphical icons (like “handover”, “connect”, “disconnect”, “assignment”, “location update”, etc)
- Freely configurable upper and lower thresholds

Evaluation Software ROSEVAL

- Generation of structured meta files
- Highly effective evaluation through the use of filtered and selected data
- Efficient file management of measurement data (central server)
- Fast access to all local temporary data
- Freely definable legends and comments
- Selection and evaluation of multiple measurement files in database only limited by system resources
- Exact reference of measured points to the measurement device they originate from
- Statistical evaluation and area data mapping



Evaluation Software ROSEVAL: Parallel displays (table, 2D chart, map) with global cursor

- SQL (Structured Query Language) data selection and evaluation
- User-definable derived signals
- Global data selection (interactive and SQL)
- Wide range of attributes assignable to each signal (colour, icons, pattern, ranges) to get the most efficient visualization of parameters

Additional equipment

In the planning phase, fieldstrength (CW) measurements with test receivers are not conclusive. What is needed are real-life digital signals. TS9953 is the test transmitter that can be configured to this needs of the customer. All in all it is the ideal support in the calibration of planning tools.

General data of TS9955

Max. power consumption typ.300 W
(12 V DC / 25 A)
Weight: approx. 140 kg (System + Monitor)
Depth: 600 mm
Width: 554 mm
Height: 961 mm

Related data sheets:

Solutions for Coverage Measurements
PD 757.1925
Portable Coverage Measurement System TS9951
PD 757.2109
Evaluation Software ROSEVAL
PD 757.4082
TS51-K1/TS55-K1 Coverage Measurement Software (ROMES)
PD 757.2415
Interim Test Transmitter TS9953
PD 757.2115

For special applications in the field of TV, FM, DAB, DVB and satellite coverage measurement technology see data sheet PD757.2644

Interim Test Transmitter TS9953

Features of ROMES (excerpt)

Network Standard	Recorded Parameters	Special Features	Max. No. of Devices
GSM 900/ 1800/1900	• RxLev Full/Sub • RxQual Full/Sub • Rxlev N1-N6 • BCCH • BSIC, BCC, NCC • Mode • RxQual Idle • C1 • MCC, MNC, LAC • CI • Timeslot • Timing advance • Training seq. code • TxPower • RLT • DTX • Hopping, MAIO, HSN • TCH • All layer 3 messages (including their details) • NQA data	Views • Measurement report (bargraph) • Layer 3 messages (scroll view) and details • System Information Type 1-6 Details (fully user-configurable) • Network Quality Analysis (NQA) view: call statistics • Scan view (in combination with the scan mode) • Layer 2 messages Actions • Handover forcing • Autodial mechanism: definable phone number, idle and connect time • Handset dialog Mobile modes • Normal • Camp mode: to determine cell boundaries • Scan mode: to check band occupancy by field strength • Test transmitter mode on request (in conjunction with TS9953) Events • Layer 3 messages: connect, disconnect, handover command/complete/failure, assignment command/complete/failure, location update request • RxLev/RxQual thresholds (definable upper and lower threshold values)	Up to 4 test mobiles in any combination
ETACS	• FOCC • FVC • RECC • RVC • RSSI • Uplink channel • Downlink channel • Signalling state • SAT • BIS • ST tone • Power level • VMAC • DCC • SCC	Views • Signalling view for data stream (scroll window) with the possibility to switch to detail decoding during measurement • Scan view (in combination with scan mode) Actions • Handset • Channel monitoring Mobile modes • Normal • Scanner a) to check band occupancy • Scanner b) to scan adjacent channel (second mobile required for this mode) • Channel monitoring: to scan and select available control channel Events • Connect, Disconnect, Handoff, no service • Thresholds (definable upper and lower threshold values) for RSSI, POWER, DCC, VMAC.	Up to 3 test mobiles
CDMA	• Log code • Good frames • Code channel • Center channel • Cell Pilot PN • System ID • Network ID • CDMA MIN 1 / 2 • Receive state • RF HW mode • Entry reason • Phone state	Views· • Raw data • Pilot sets • Measurement	Up to 3 test mobiles

Fax Reply
(High-Performance Coverage Measurement System TS9955)

❑ **Please send me an offer**

❑ **I would like a demo**

❑ **Please call me**

❑ **I would like to receive your free-of-charge CD-ROM catalog**
(including Test&Measurement Products +
Sound and TV Broadcasting)

Others: _____
_____
_____

Name: _____
Company/Department: _____
Position: _____
Address: _____
_____
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Country: _____
Telephone: _____
Fax: _____
E-mail: _____

Certified Quality System
ISO 9001
DQS REG. NO 1954-04

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