R&S®TSMx
Radio Network Analyzers
Powerful scanner family
for mobile applications

Years of
Driving
Innovation

ROHDE&SCHWARZ

R&S®TSMx Radio Network Analyzers
At a glance

The R&S®TSML, R&S®TSMU and R&S®TSMQ form a family of radio network analyzers with scanner functionality. Their compact size and low power consumption make them ideal for mobile applications. Even a fully equipped backpack solution can easily be implemented in order to perform indoor measurements, for example.

When combined with the R&S®ROMES4 drive test software, the scanners provide their full-range functionality and maximum performance. Interference measurements, automatic neighborhood measurements or fast spectrum measurements can be performed in virtually no time. The software has been designed for multicore CPUs to enable simultaneous multiple measurements.

Key facts
▮ No band limiting – support of all frequencies from 80 MHz to 3(6) GHz
▮ Decoding of all broadcast information
▮ Small weight and low power consumption
▮ Suitable for GSM, WCDMA, CDMA2000® 1xEV-DO, spectrum, CW
▮ High measurement speed in all technologies

The R&S®TSMQ radio network analyzer: The R&S®ROMES4 drive test software runs on the notebook (not included in the equipment supplied).

R&S®TSMx Radio Network Analyzers Benefits and key features

No band limiting
▪ Worldwide deployment possible
▪ Flexible and cost-efficient if new frequencies are released
▪ Only one set of hardware required – no logistics problems
▷ page 4

Up to four technologies in one device
▪ Space and cost savings
▪ Parallel measurements eliminate the need for multiple drive tests
▷ page 5

Spectrum scan across the entire frequency range
▪ Overview of the entire spectrum
▪ Uplink and interference measurements
▪ Very fast measurements for high measurement density
▷ page 6

Wide-ranging product portfolio, scalable concept
▪ Wide-ranging product portfolio from cost-oriented to high-end solutions
▪ Scalable concept with numerous upgrade capabilities for future functional expansions
▷ page 7

Maximum performance with the R&S®ROMES4 drive test software
▪ GSM interference analysis based on BCH, TCH and timeslots
▪ Neighborhood analysis
▪ Estimate of the base station position
▷ page 8

For use in various configurations
▪ As an integrated suitcase solution
▪ With user-specific cabling
▪ As a backpack, especially for indoor measurements

Suitcase solution.

User-specific cabling.
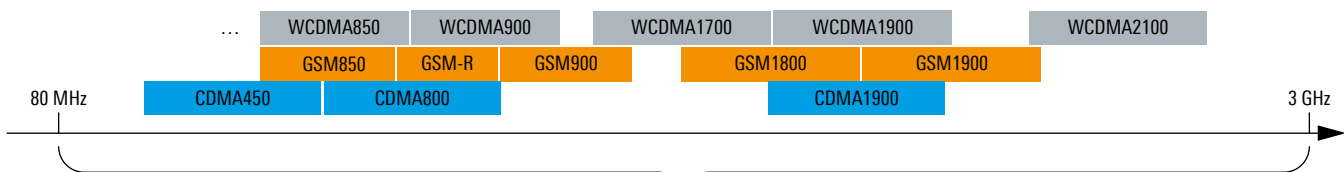

Backpack solution.

No band limiting

Owing to their unique wideband frontend, all radio network analyzers of the R&S®TSMx family can be used in all frequency bands between 80 MHz and 3 GHz. They can handle any combination of frequency or band and technology. For example, they are already capable of performing measurements on UMTS 850 MHz or CDMA 450 MHz. Entering the channel number or the center frequency is usually all that is required.

This feature provides high flexibility for the user and reduces costs. New scanner hardware is not required if new bands, e.g. WCDMA band V, become available. In addition, this approach decreases the logistics effort if several scanners per band must be used. It is even possible to measure multiple bands at the same time.

Covered bands

GSM850, GSM900, GSM1800, GSM1900 PCS, …
WCDMA850, WCDMA900, WCDMA1700, WCDMA1900, WCDMA2100, …
CDMA450, CDMA800, CDMA1900, …

…	WCDMA850	WCDMA900	WCDMA1700	WCDMA1900	WCDMA2100
	GSM850	GSM-R	GSM900	GSM1800	GSM1900
80 MHz	CDMA450	CDMA800		CDMA1900	3 GHz

R&S®TSMQ

R&S®TSMU

R&S®TSML-x*)

*) The R&S®TSML-CW supports CW measurements in the frequency range from 80 MHz to 6 GHz.

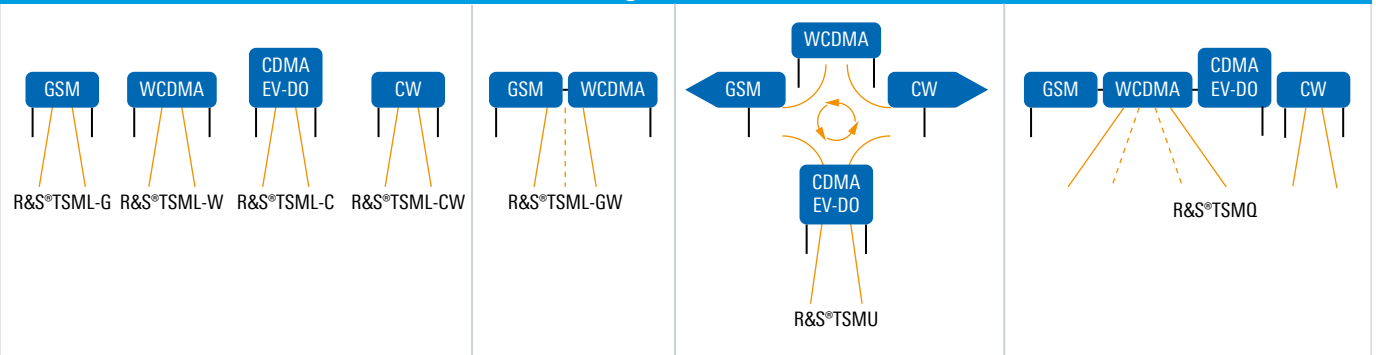# Up to four technologies in one device

The radio network analyzers offer the right solution for every application scenario. The product range includes scanners for one, two or all mobile radio technologies. The R&S®TSMQ enables the user to select whether measurements are to be performed simultaneously in all technologies.

The user has the choice and can use the R&S®TSML-G scanner only for GSM, for example, and thus reduce costs. If two technologies such as GSM and WCDMA have to be handled by one device, the R&S®TSML-GW is the best solution. If users also wish to perform CDMA® and EV-DO measurements or if they require extremely high measurement speed, they should decide in favor of the R&S®TSMQ. The R&S®TSMQ makes it possible to measure all technologies – with the exception of CW – in parallel and simultaneously.

Device	GSM	WCDMA	CDMA2000® 1×EV-DO	CW
R&S®TSML-G	•	–	–	–
R&S®TSML-W	–	•	–	–
R&S®TSML-C	–	–	•	–
R&S®TSML-CW	–	–	–	•
R&S®TSML-GW	•	•	–	–
R&S®TSMU	•	•	•	•
R&S®TSMQ	•	•	•	•

Simultaneous or single measurement possible.

Scanner for one, two or all mobile radio technologies

Spectrum scan across the entire frequency range

All scanners provide an integrated spectrum scan. This feature allows signal analysis as well as analysis of the air interface independent of the technology used. The spectrum scan makes it possible to perform measurements throughout the entire frequency range from 80 MHz to 3 GHz – and with the R&S®TSML-CW even up to 6 GHz. As a result, mobile radio bands as well as the uplink ranges can be measured, and detecting interference on the uplink frequencies becomes very easy.

Using the R&S®ROMES4 drive test software, the measurements are presented in a straightforward manner by means of both the classic spectrum display and the waterfall diagram. The user can set as many as 32 frequency ranges and measure them simultaneously.

The spectrum scan function is based on an FFT measurement that allows extremely fast scanning at up to 2 Gsample/s. The measurement speed is especially important for drive tests in order to achieve a good measurement result density without having to reduce the drive speed.

Spectrum measurement

Five user-selectable frequency ranges for spectrum measurements

Zoom display of one of the five ranges
(here the first range "1" from 80 MHz to 2.5 GHz)

Waterfall display of selected range

Wide-ranging product portfolio, scalable concept

The radio network analyzers of the R&S®TSMx family offer the right solution for every application, the R&S®TSML being the most cost-efficient one for a single technology. The R&S®TSML is available in four different versions: GSM, WCDMA, CDMA2000® 1xEV-DO or CW. An upgrade to another technology is very easy by simply establishing a FireWire connection with another scanner. The R&S®TSML-GW is a special solution because it offers both GSM and WCDMA capability in a single device.

The R&S®TSMU is the right choice for customers who plan to introduce a new technology in the near future and wish to use only one device for reasons of space. This scanner can be configured as required and easily upgraded by means of software. Upgrading can be performed in the field because users only need the appropriate option key for this purpose. The R&S®TSMU can be equipped with all options, but in contrast to the R&S®TSMQ, it is not able to carry out all measurements in parallel.

The R&S®TSMQ was developed for especially challenging applications involving, for example, maximum measurement speed and the parallel measurement of up to four technologies at the same time. Even when two technologies such as GSM and WCDMA are combined, the R&S®TSMQ offers top measurement speed. In this case, it is still faster than two R&S®TSML or R&S®TSMU, which makes it unique on the market.
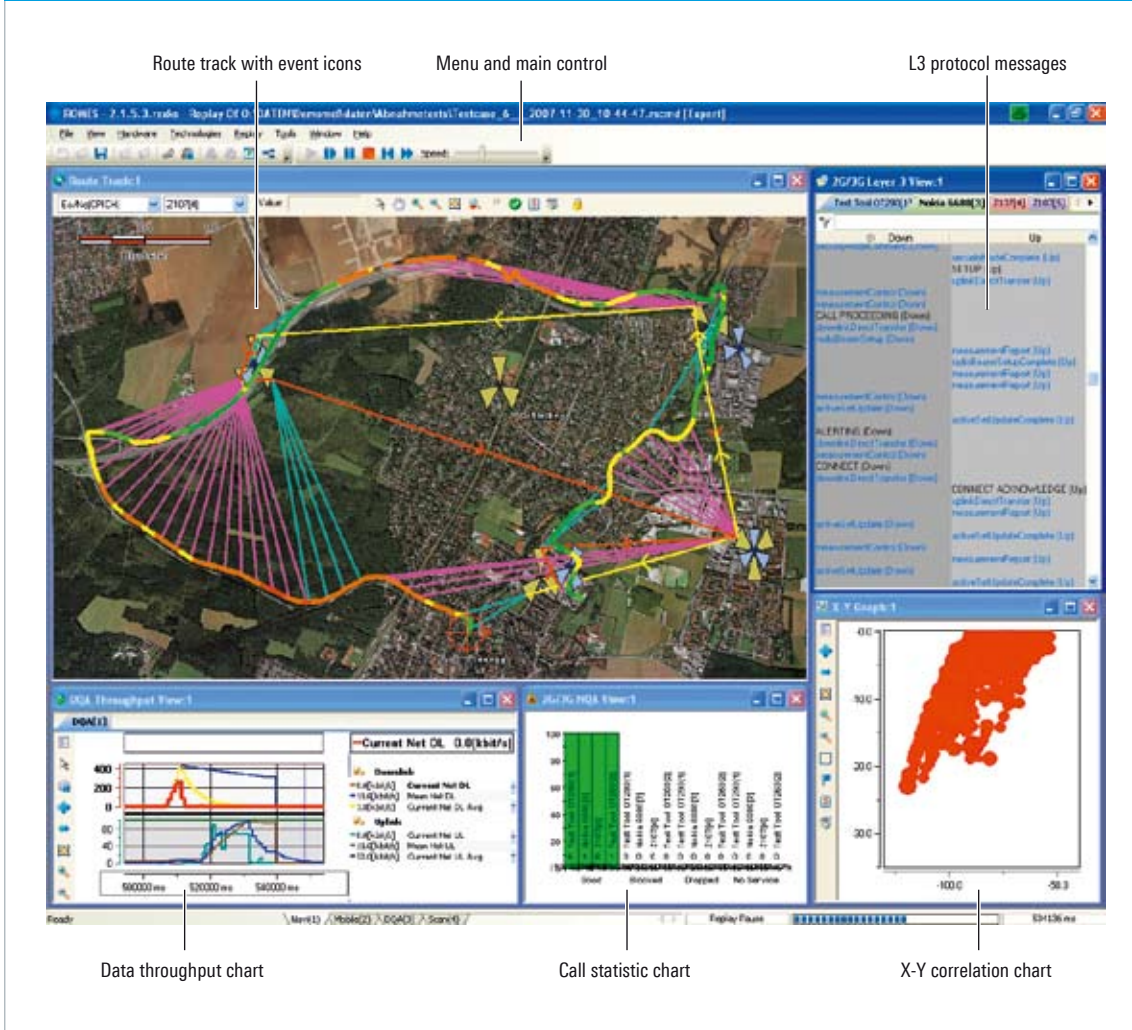
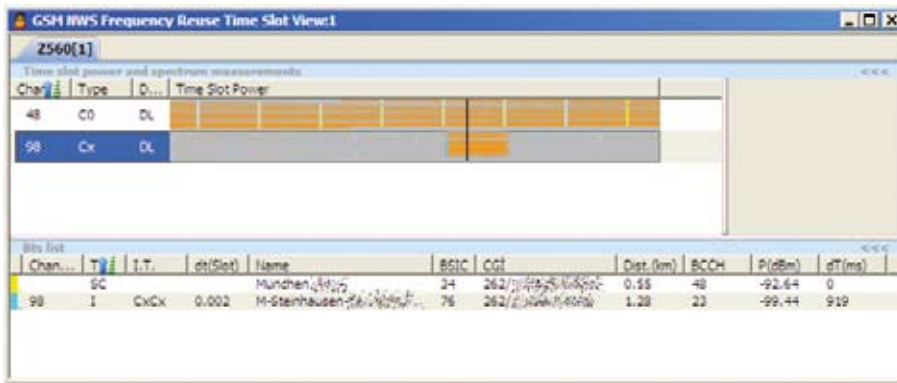| Radio network analyzer	R&S®TSML-W/-G/-C/-CW R&S®TSML-GW	R&S®TSMU	R&S®TSMQ
Technologies: WCDMA, GSM, CDMA2000® 1xEV-DO, CW, spectrum	Dedicated single technology	User-configurable single technology	Multiple technologies in parallel (except CW, requires separate measurement)
Performance	Normal	Fast	Very fast

Maximum performance with the R&S®ROMES4 drive test software

When combined with the R&S®ROMES4 drive test software, the scanners provide their full-range functionality and maximum performance. The software is used for collecting the measurement data as well as for analyzing and evaluating this data. Test mobile phones can be connected to combine the data from the software with the data from the scanners. Automatic neighborhood analysis and interference analysis are typical application scenarios.

In addition, R&S®ROMES4 provides functions such as BTS position location, which only requires a scanner and a GPS device with pulse-per-second (PPS) output. Driving through a specific area is sufficient in order to estimate the positions of the base stations. Position location does not require any interaction with the network. The base station list created in this way can be exported or displayed on the R&S®ROMES4 map.
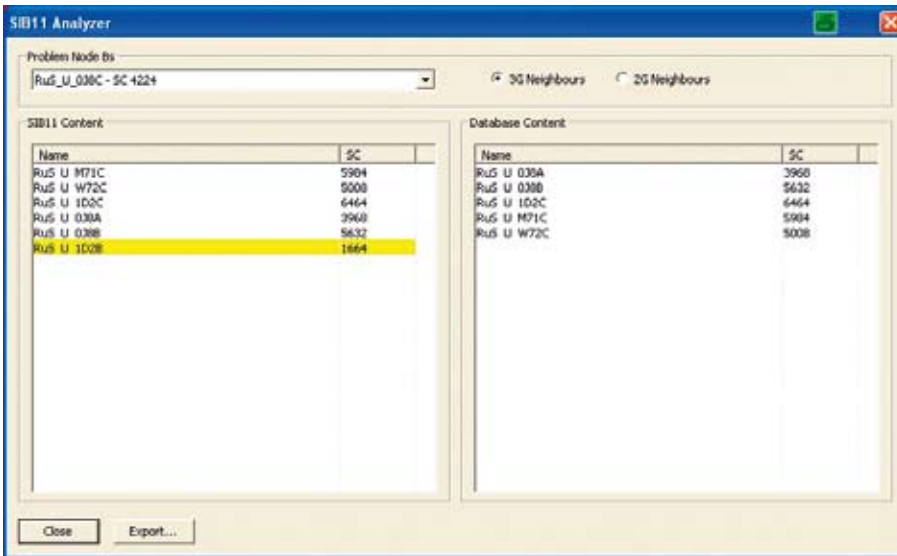
Overview of the R&S®ROMES4 graphical user interface

Route track with event icons   Menu and main control   L3 protocol messages

Data throughput chart   Call statistic chart   X-Y correlation chart
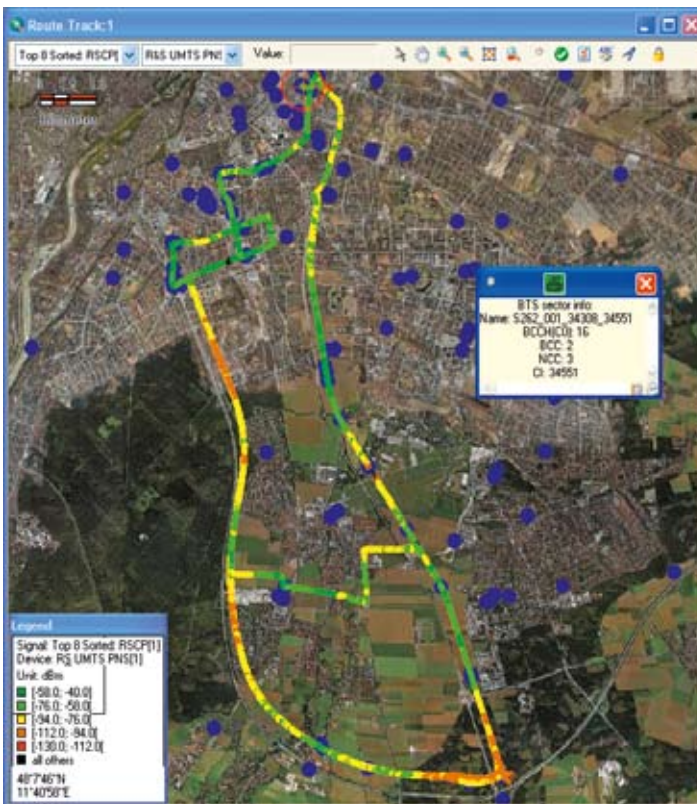
Interference analysis taking into account traffic channels

R&S®ROMES can identify and display co-channel interference in GSM easily and reliably – irrespective of whether the BCCH or the TCH causes the interference.

Detecting a missing neighborhood at a glance

Comparison between neighboring cells measured by the scanner and those in the base station list. Neighboring cells that were detected but do not appear on the list are highlighted in yellow.

Detecting the geographic position of base stations

The scanners not only measure the most important BTS levels (2G: RxLev, 3G: RSCP) but also demodulate the broadcast channels (BCH). Important time information as well as details of the transmitting BTS are obtained in this way.

Specifications

RF data, measurement speed

Frequency range	R&S®TSML-G/-W/-C/-GW, R&S®TSMU, R&S®TSMQ	80 MHz to 3 GHz
	R&S®TSML-CW	80 MHz to 6 GHz
Noise figure	f ≤ 2.2 GHz, preamplifier on	typ. 10 dB
Frequency accuracy	GPS/PPS synchronization	±0.01 ppm
Frequency aging		1 ppm/year
Frequency temperature drift	0 °C to +30 °C	2 ppm
	+30 °C to +40 °C	additional 2 ppm/10 °C
IP3	preamplifier on	typ. –9 dBm
	preamplifier off	typ. +3 dBm
1 dB compression		–15 dBm
Sensitivity	GSM	–112 dBm
	WCDMA	–114 dBm
	CDMA2000® 1xEV-DO	–131 dBm
	spectrum	–115 dBm
Dynamic range	GSM (C/I)	30 dB
	WCDMA (E_c/I_0: high speed/high dynamic range)	20 dB/29 dB
	CDMA2000® 1xEV-DO (E_c/I_0)	30 dB
R&S®TSML		
Measurement speed	R&S®TSML-G (GSM)	40 channels/s [1]
	R&S®TSML-W (WCDMA)	10 measurements/s [2]
	R&S®TSML-C (CDMA2000® 1xEV-DO)	5 measurements/s [3]
	R&S®TSML-CW (CW)	625 measurements/s
	R&S®TSML-GW (GSM and WCMDA)	40 channels/s [1] (GSM), 10 measurements/s (WCDMA)
R&S®TSMU		
Measurement speed	GSM	80 channels/s [1]
	WCDMA	20 measurements/s [2]
	CDMA2000® 1xEV-DO	10 measurements/s [3]
	CW	625 measurements/s
R&S®TSMQ		
Measurement speed	GSM	100 channels/s [1]
	WCDMA	50 measurements/s [2]
	CDMA2000® 1xEV-DO	10 measurements/s [3]
	CW	625 measurements/s

General data

Operating temperature range		0 °C to +45 °C
Storage temperature range		–20 °C to +70 °C
Relative humidity	at +40 °C	95 %
RF input	SNAP-N connector	50 Ω
Data interface		FireWire
Voltage supply		9 V to 18 V DC
Current drain		650 mA at 12 V DC
Dimensions	W × H × D	150 mm × 80 mm × 170 mm (5.90 in × 3.15 in × 6.69 in)
Weight		1.5 kg (3.3 lb)
System requirements	R&S®ROMES4 drive test software, laptop/PC (multicore processor 2 GHz, 2 Gbyte RAM, FireWire, USB)	

[1] With SCH demodulation.
[2] With SIB decoding.
[3] With demodulation of CDMA2000® and EV-DO system information messages.

Ordering information

Designation	Type	Order No.
R&S®TSML		
Scanner for GSM	R&S®TSML-G	1153.6000.13
Scanner for WCDMA	R&S®TSML-W	1153.6000.11
Scanner for CDMA2000® 1xEV-DO	R&S®TSML-C	1153.6000.12
Scanner for GSM and WCDMA	R&S®TSML-GW	1153.6000.20
Scanner for CW	R&S®TSML-CW	1153.6000.15
R&S®TSMU		
Radio Network Analyzer	R&S®TSMU	1153.6000K02
R&S®TSMU Option for GSM	R&S®TSMU-K13	1153.4572.02
R&S®TSMU Option for WCDMA	R&S®TSMU-K11 R&S®TSMU-K14	1153.4550.02 1153.4614.02
R&S®TSMU Option for CDMA2000® 1xEV-DO	R&S®TSMU-K12	1153.4608.02
R&S®TSMU Option for CW	R&S®TSMU-K15	1153.4595.02
R&S®TSMQ		
Radio Network Analyzer for GSM, WCDMA, CDMA2000® 1xEV-DO and CW	R&S®TSMQ	1153.6000.50
Accessories		
Power Supply (2.5 A)	R&S®TSML-Z1	1503.4320.02
Power Supply (6.5 A)	R&S®TSMU-Z1	1166.3786.02
Rack Adapter	R&S®TSMU-Z2	1153.6700.02
Backpack System	R&S®TSMU-Z3	1153.6900.02
Additional software options		
Drive Test Software	R&S®ROMES4	1117.6885.04
R&S®TSMx Driver	R&S®ROMES4T1Q	1117.6885.40

CDMA2000® is a registered trademark of the Telecommunications Industry Association (TIA - USA).

Your local Rohde & Schwarz expert will help you find the optimum solution for your requirements and will be glad to provide you with a customized quotation. You will find your local contact at
www.sales.rohde-schwarz.com

About Rohde & Schwarz

Rohde & Schwarz is an independent group of companies specializing in electronics. It is a leading supplier of solutions in the fields of test and measurement, broadcasting, radiomonitoring and radiolocation, as well as secure communications. Established 75 years ago, Rohde & Schwarz has a global presence and a dedicated service network in over 70 countries. Company headquarters are in Munich, Germany.

Environmental commitment
◗ Energy-efficient products
◗ Continuous improvement in environmental sustainability
◗ ISO 14001-certified environmental management system

Certified Quality System
ISO 9001

Rohde & Schwarz GmbH & Co. KG
www.rohde-schwarz.com

Regional contact
◗ Europe, Africa, Middle East
  +49 89 4129 137 74
  customersupport@rohde-schwarz.com
◗ North America
  1 888 TEST RSA (1 888 837 87 72)
  customer.support@rsa.rohde-schwarz.com
◗ Latin America
  +1 410 910 79 88
  customersupport.la@rohde-schwarz.com
◗ Asia/Pacific
  +65 65 13 04 88
  customersupport.asia@rohde-schwarz.com