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R&S®TSMQ Radio Network Analyzer

2007

Just one drive test covers all standards

- Simultaneous multitechnology measurements in a single drive test
- ◆ WCDMA, GSM, CDMA2000[®] and CW
- Fastest scanner worldwide
- 3G multicarrier use for demodulating broadcast information
- Low weight and low power consumption: ultra-portable backpack
- Perfect for indoor use



Unmatched capabilities for network analysis

Radio Network Analyzer	R&S®TSML-W/-G/-C/-CW		
Technologies (WCDMA, GSM, CDMA, CW)	dedicated single technology	one at a time	several in parallel (except CW, which is separate)
VICOM interface for customer-specific software	yes	no	no
Performance	basic	fast	very fast

The R&S®TSMQ provides unmatched capabilities for cellular network analysis and optimization. The distinctive, compact-sized R&S®TSMQ allows WCDMA PN scanning, GSM network scanning, and CDMA2000® PN scanning simultaneously and with unsurpassed performance. In addition, analog RF power level measurements (CW) are supported. The wideband RF frontend offers maximum measuring flexibility in all frequency bands irrespective of the standard involved. Less common technology/frequency combinations such as UMTS900 are no problem for the R&S®TSMQ RF frontend architecture.

In combination with the R&S®ROMES software, the R&S®TSMQ is a powerful instrument for cellular network optimization. Neighborhood analysis is performed with just one receiver. Plus, the R&S®TSMQ can measure two or three technologies in parallel and monitor other networks during a single drive test. Network operators monitor not just the quality of their own networks, but also the quality of competitor networks.



R&S® TSMQ radio network analyzer for benchmark applications

The analyzer's low weight and low power consumption allow easy indoor use as a backpack system with a battery power supply. The mobile network characteristics of pedestrian malls, train stations, or shopping centers can be detected at the same quality as with drive-test vehicles.

Features

Fastest scanner on the market

- WCDMA PN scanning with up to 20 ms per measurement (50 Hz) in high speed mode
- GSM network scanning with up to 10 ms per channel (100 Hz)
- CDMA PN scanning with up to 100 ms per measurement (10 Hz)
- Analog CW power measurements with up to 1.6 ms per measurement (fulfilling Lee criterion even at high speeds)

Multitechnology measurements in a single drive test

- Parallel operation of WCDMA PN scan, CDMA2000[®] PN scan, and GSM network scan
- Wideband RF frontend covering all bands for every R&S®TSMQ type
- WCDMA PN scanner for bands I to IX with user-defined 200 kHz resolution
- GSM network scanner for GSM 450/850/900/1700/1800/1900, GSM-E, GSM-R
- CDMA2000[®]1x PN scanner (SR1 band classes 1 to 10, including US Cellular, PCS 1900, European 450)
- RF receiver for power measurements from 80 MHz to 3 GHz



In combination with the R&S®ROMES software, the R&S®TSMQ is a powerful instrument for cellular network optimization

Multicarrier use and broadcast information demodulation

- 12 carriers in parallel in WCDMA/ CDMA2000[®]
- Broadcast information decoding included (SIB 1-18 for WCDMA, MCC/MNC/LAC/CI/BSIC for GSM)
- Measurement of GSM and WCDMA neighborhoods in parallel
- Neighborhood analysis with just one receiver

Low weight and low power consumption

- Solid, RF-shielded case
- Low power consumption: 8 W
- Compact: 150 mm × 80 mm × 170 mm (5.51 in × 3.15 in × 6.69 in)
- Low weight: 1.5 kg (3.31 lb)
- Ideal as backpack system and for indoor applications

Benefits

- Multiple technologies in parallel
 - Neighborhood analysis in one unit
 - Benchmarking competitor analysis for free
 - Reduced measurement time and costs
- Unsurpassed performance
 - Best accuracy even at high driving speed
 - Time-saving tests
- All-in-one solution
 - All options included
- No further investments needed
 Widebard receiver
- Wideband receiver
 - One unit covers all bands
- R&S®ROMES software featuring reduced startup time, powerful optimization applications
- Modular hardware and software requirements-specific purchase
 Buy only what you need
- Backpack concept
 - Unrestricted performance
 - Easy indoor measurements

Simultaneous multitechnology measurements

All major mobile network technologies, WCDMA, GSM, and CDMA2000[®]1x, are supported in parallel. CW measurements can be done separately.

The R&S®TSMO can deliver measurement results for up to three different technologies. For network optimization, you measure interference, coverage, and carrier-to-noise ratio in one technology while scanning another technology for survey purposes. You analyze a UMTS network during a drive test while simultaneously monitoring a GSM network for offline analysis or post-processing. You even analyze a competitor's network during a major measurement within a single trip. As a mobile network operator, you always stay informed about competitor networks without incurring any additional costs.

The R&S®TSMQ's compact design and low weight make for simple integration into a backpack for indoor measurements. This enables you to analyze exhibitions, train stations, shopping malls, or public buildings at an unsurpassed level of performance and with maximum accuracy, just like when using drive-test tools installed in a vehicle. Moreover, the instrument's low power consumption supports battery operation for up to four hours.





Specifications

General RF data		
RF range		80 MHz to 3 GHz
Noise figure	$f \le 2.2$ GHz, preamplifier on	typ. 10 dB
Reference frequency accuracy	GPS pulse per second (PPS) synchronization	±0.01 ppm
Reference frequency aging		1 ppm/year
Reference frequency temperature drift	0 °C to +30 °C	2 ppm
	+30 °C to +40 °C	additional 2 ppm/10 °C
IP3	PreAmp On	typ. –9 dBm
	PreAmp Off	typ. +3 dBm
1dB compression point		—15 dBm
WCDMA		
Bands	200 kHz resolution	WCDMA bands I to IX and user-defined
Pilot scan		up to 512 pilot channels
Multifrequency scan		max. 12 carriers
IF bandwidth		4.12 MHz
Measurement rate	single mode, HS / HD / UHS	variable 1 Hz to 50 Hz / 8 Hz / 333 Hz
	dual mode, HS / HD	variable 1 Hz to 18 Hz / 6 Hz
	triple mode, HS / HD	variable 1 Hz to 8 Hz / 3 Hz
Power measurement dynamic range		-114 dBm to -20 dBm
Power measurement accuracy E_c/I_o	$E_c/I_o > -12 \text{ dB}$	tур. <1.5 dB
	RSCP	tур. <1 dВ
Sync. acquisition time	5 pilots, HS / HD	typ. 10 ms / 24 ms
Sync. level E _c /I _o	HS / HD	<-14.5 dB / <-25 dB
Dynamic range E _c /I _o	HS / HD	20 dB / 29 dB
BCH demodulation E_c/I_o	HS / HD	≥–14 dB / ≥–25 dB
Adjacent channel rejection		typ. >70 dB
Number of rake fingers	5000 multipath measurement	max. 2500
Ghost code rate		<10-9
Time base for synchronization	internal	GPS PPS/GSM, WCDMA network
GSM		
Bands		GSM 420/450/750/850/900/1700/1800/1900, GSM-E, GSM-R
Measurement modes		SCH code power measurement TCH total in-band power measurement demodulation of BCCH system information type 3
Measurement rate	single mode	up to 100 channels/s with SCH demodulation typ. 1.2 s; max. 1.9 s for GSM 900 band typ. 3.8 s; max. 5.3 s for GSM 1800 band
	dual mode	up to 50 channels/s with SCH demodulation typ. 3.2 s; max. 4 s for GSM 900 band typ. 10 s; max. 14 s for GSM 1800 band
	triple mode	up to 25 channels/s with SCH demodulation typ. 5.2 s; max. 6.5 s for GSM 900 band typ. 16 s; max. 22 s for GSM 1800 band
Power measurement dynamic range		–112 dBm to –20 dBm
Power measurement accuracy		typ. ±1 dB
Probability of first BSIC detection	vs. co-channel C/I	98 % for C/I $> +2$ dB

BSIC detection after first decoding	vs. co-channel C/I	C/I > -11 dB	
Minimum C/I for SCH code power measurement	after first BSIC decoding	C/I > -11 dB	
Minimum C/I for first BCCH demodulation	CI, MNC, MCC, LAC	C/I > 2.5 dB	
Time base for synchronization	internal	GPS pulse per second (PPS) signal GSM (sync. channel)	
CDMA2000®1x			
Bands		SR1 band classes (1 to 10), including US Cellular, PCS 1900, European 450	
Pilot scan		up to 512 pilot channels	
Input bandwidth		1.22 MHz	
Scan length		12288 chips (10 ms)	
Measurement rate	single mode (512 pilot channels, F-PICH — single channel)	10 Hz	
	dual mode	10 Hz	
	triple mode	5 Hz	
Power measurement dynamic range	P total F-PICH	-12 dBm to -131 dBm	
Measurement accuracy	without fading	$Ec/lo > -10 dB$, typ. $\pm 0.4 dB$	
	with fading	$Ec/lo > -10 dB$, typ. $\pm 0.7 dB$	
Sync. level E_c/I_o	CDMA2000® interference, fast mode	typ. <-16.5 dB (F-PICH) typ. <-25.5 dB (F-SYNC)	
	white Gaussian noise, fast mode	typ. <-20.2 dB (F-PICH) typ. <-29.2 dB (F-SYNC)	
Synchronization speed	single mode, $E_c/I_o > -15 \text{ dB}$	100 ms	
	single mode, $E_c/I_o \leq -15 \text{ dB}$	200 ms	
	dual mode, $E_c/I_o > -15 \text{ dB}$	200 ms	
	dual mode, $E_c/I_o \leq -15 \text{ dB}$	400 ms	
	triple mode, $E_c/I_o > -15 \text{ dB}$	240 ms	
	triple mode, $E_c/I_o \leq -15 \text{ dB}$	480 ms	
Demodulation	synchronous channel demodulation	<0.5 s	
	fast synchronous channel demodulation	<0.1 s	
Dynamic range E_c/I_o		typ. 30 dB	
Ghost code rate		<10-9	
Number of rake fingers	5000 multi-path measurement	max. 2500	
Time base for synchronization	internal	GPS PPS/GSM, CDMA network	
RF power			
Measurement modes		single frequency, multi-channel	
Frequency entry		single frequency, frequency list, frequency band	
Level uncertainty	\leq 3 GHz	typ. ±1.0 dB	
Bandwidth (3 dB)	single frequency mode	12.5 kHz to 4000 kHz	
	multi-channel mode	200 kHz to 4000 kHz	
Channel power measurement dynamic range	GSM	-110 dBm to -20 dBm	
	WCDMA	–95 dBm to –20 dBm	
Sample acquisition time	multi-channel mode	100 µs to 650 µs	
Measurement time		0.1 ms to 1000 ms	
Minimum cycle time		1.6 ms	
Frequency setting time		9.3 ms to 25 ms	
Typical measurement rate	multi-channel mode	1.6 ms for 19 GSM-R channels	
		76 ms for 124 GSM 900 channels 208 ms for 373 GSM 1800 channels	
Adjacent channel rejection	GSM	30 dB	
	WCDMA	60 dB	

Detectors		peak, average, RMS	
Trigger modes	internal time base	time-triggered	
	external trigger event	distance-triggered	
IF attenuation		0 dB, 10 dB, 15 dB	
Preamplifier		10 dB automatic/manual	
Time base for synchronization		GPS pulse per second (PPS) signal	
Rear-panel interfaces	FireWire I + II	IEEE 1394 female, 6-pin	
	RF input (RF IN)	N female, input impedance 50 $\Omega,$ VSWR typ. 2.0	
	power supply input (DC IN)	snap and lock jack, 3-pin, 9 V to 18 V DC	
	PPS IN	BNC female, 3 V to –5 V TTL input for GPS pulse per second (PPS, falling edge with high precision)	
	PULSE IN	BNC female, multifunctional (e.g. distance-triggered input), valid input range: 3 V to 15 V	
General data			
Operating temperature range		0 °C to +45 °C	
Storage temperature range		-20 °C to +70 °C	
Humidity	relative humidity at +40 °C	95 %	
Sinusoidal vibration	5 Hz to 150 Hz	max. 2 g at 55 Hz	
Random vibration		10 Hz to 500 Hz	
Shock		40 g shock spectrum	
EMC		EN 61326-1: 1997 + A1: 1998 + A2: 2001 E1 95/54/EC E1 ECE-R10	
Electrical safety		EN 61010-1: 1993 + A2: 1005	
Quality standard		developed and manufactured in line with ISO 9000	
Power supply		9 V to 18 V DC	
Power consumption		650 mA at 12 V DC	
Dimensions (W \times H \times D)		150 mm \times 80 mm \times 170 mm (5.9 in \times 3.15 in \times 6.69 in)	
Weight		1.5 kg (3.31 lb)	

Ordering information

Designation	Туре	Order No.			
Radio Network Analyzer	R&S®TSMQ	1153.6000.50			
Firmware/Software					
Drive Test Software Platform	R&S®ROMES3NG	1143.7991.40			
Replay Software	R&S®ROMES3REP	1143.7991.42			
3NG TSMx Options	R&S®ROMES3T1Q	1508.1588.02			
Accessories					
Power Supply 230 V AC / 12 V DC / 6 A	R&S®TSMU-Z1	1166.3786.02			
Rack Adapter 19" for max. 2 \times R&S®TSMO	R&S®TSMU-Z2	1153.6700.02			
Indoor Backpack System	R&S®TSMU-Z3	1153.6900.02			

 $^{\rm 1)}\,{\rm CDMA2000}^{\rm *}$ is a registered trademark of the Telecommunications Industry Association (TIA -USA).



Rear view of the R&S® TSMQ



More information at www.rohde-schwarz.com (search term: TSMQ)



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