R&S®TSMA
Autonomous Mobile Network Scanner
Walk and drive testing with flexible connectivity

LTE Advanced NB-IoT

3 year warranty

ROHDE&SCHWARZ
Mobile Network Testing

Product Brochure | Version 09.00

R&S®TSMA Autonomous Mobile Network Scanner

At a glance

The compact R&S®TSMA autonomous mobile network scanner offers all that is needed for walk tests and drive tests. WLAN or Bluetooth® connects the smartphones/tablets used for data collection. The autonomous mobile network scanner can also run comprehensive drive test software, such as R&S®ROMES or SwissQual Diversity Optimizer, on its built-in Corei5 processor. Multitechnology and multiband measurements provide full flexibility.

As in-building traffic in cellular networks grows, there is an increased need for indoor measurements. While traditional drive test systems consist of a laptop with test mobile phones and scanners, there are also walk test solutions that use tablets and smartphones. The R&S®TSMA enhances such solutions, providing the user with accurate insight into the RF environment.

The R&S®TSMA combines the technology of the R&S®TSME ultracompact drive test scanner with a high-performance Intel processor. The scanner can run PC-based drive test software, and smartphones can be connected via USB.

The scanner measures more than ten technologies simultaneously in the 350 MHz to 4.4 GHz wireless communications bands. It can be combined with an R&S®TSME to perform LTE MIMO measurements.

With its light weight of only 1180 g and optional hot-swappable batteries, the R&S®TSMA is the ideal companion on a walk test campaign or for remote or unattended operation. Easy-carrying bags for SISO and MIMO hardware configuration are available

Key facts

- Multiband support from 350 MHz to 4.4 GHz
- GSM, WCDMA, LTE FDD, LTE TDD, eMBMS, CDMA2000®, TD-SCDMA, 1xEV-DO, TETRA, WiMAX™, NB-IoT/Cat NB1 and spectrum analysis simultaneously in one scanner
- Connects to Windows PC, Android UE or tablet
- Integrated Intel PC can run Windows-based software with R&S®TSME support
- Compact, lightweight design
- Internal GPS/Glonass receiver

R&S®TSMA with R&S®TSMA-BP battery pack.

R&S®TSMA Autonomous Mobile Network Scanner

Benefits and key features

Highly functional, no compromises platform

- Simultaneous measurement of all technologies in all bands
- In-field upgrades
- SIB/L3 decoding
- Flexible band selection
- High-performance processor platform
- Easy operation via web interface
- Online software updates

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Wide range of applications

- Measurement software runs on smartphones and tablets
- Measurement software runs under Windows on the R&S®TSMA
- Operation without built-in computer
- Open interface and use as OEM

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Portable measurement solution

- Small and lightweight
- Battery-powered with rechargeable batteries and charging function
- Extensive accessories for mobile use

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Special features

- LTE network optimization
- Fast setup with automatic channel detection
- Position estimation of base stations
- LTE uplink and downlink allocation analyzer
- LTE eMBMS measurements
- NB-IoT/Cat NB1 measurements

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Highly functional, no compromises platform

Simultaneous measurement of all technologies in all bands

The R&S®TSMA autonomous mobile network scanner is based on the tried and tested RF technology of the R&S®TSME ultracompact drive test scanner, which it enhances with a high-performance processor platform.

The scanner can perform measurements in a user-configurable frequency range between 350 MHz and 4.4 GHz, making it possible to measure all current and future bands of any supported technology in this range. The LTE standard, in particular, specifies a large number of bands. The multitechnology, multiband R&S®TSMA provides excellent investment protection. Its measurement bandwidth of 20 MHz allows all wireless communications standards to be measured, including LTE and LTE-Advanced. Since the R&S®TSMA can simultaneously measure any combination of bands, it supports measurements in networks with LTE-Advanced carrier aggregation.

It is possible to use multiple bands in parallel and to measure multiple technologies simultaneously. At present, the R&S®TSMA can handle more than ten technologies at the same time. For each technology, it is possible to define multiple frequencies in different bands.

An R&S®TSME can be easily connected to the R&S®TSMA to perform LTE MIMO measurements.

In-field upgrades

The supported technologies can be installed via browser interface. Since no hardware is needed for upgrading, users are able to upgrade the scanner in the field and add more technologies.

SIB/L3 decoding

The R&S®TSMA performs RF measurements on the individual wireless communications technologies and also decodes the layer 3 information of the SIB broadcast messages from base stations. This feature makes it possible to determine the configuration of the wireless communications network in detail and to easily detect errors. All scanning options include SIB decoding.

Flexible band selection

The R&S®TSMA hardware simultaneously measures in all wireless communications bands from 350 MHz to 4.4 GHz. Using band licenses, more cost-efficient configurations are available for applications where only a limited number of bands need to be measured simultaneously. These configurations limit the number of bands that can be measured in parallel. Users can reconfigure the bands for each measurement as desired.

The R&S®TSMA-K2B option (2B stands for two bands) allows, for example, simultaneous measurement of any two wireless communications bands. Any licensed technology (e.g. GSM, WCDMA, LTE, NB-IoT/Cat NB [1)]) can be measured in any of the configured bands. This enables the user, for example, to perform simultaneous measurements in the GSM 900 and GSM 1800 bands and, after changing the configuration, in the UMTS 2100 MHz and the LTE 2600 MHz bands.

Should other bands be required in the future, users can order additional options to increase the number of bands in the field. This reduces investments to only those functionalities that are actually required.

If the R&S®TSMA is equipped with the R&S®TSMA-KAB option, there are no band restrictions.

Examples of simultaneous use of multiple frequencies in different bands for each technology

	North America				Europe		
GSM	850 MHz	1900 MHz			900 MHz	1800 MHz	–
WCDMA	850 MHz	1900 MHz	2100 MHz/AWS		900 MHz	2100 MHz	
LTE-FDD	700 MHz	850 MHz	1900 MHz	2100 MHz/AWS	800 MHz	1800 MHz	2600 MHz
LTE-TDD	2500 MHz	3400 MHz			2500 MHz	3400 MHz	–
NB-IoT/Cat NB1	700/800/900/1800/1900/2100 MHz				700/800/900/1800/1900/2100 MHz		
Spectrum	UL and DL frequencies				UL and DL frequencies		

High-performance processor platform

The R&S®TSMA features a high-performance i5 processor, which makes it suitable for more than just walk tests. It is also ideal for drive tests involving high measurement rates. The instrument has an internal SSD to ensure top data processing speeds and sufficient memory (128 Gbyte) for measurement data. Four USB ports (two USB 3.0) are provided for additional storage media.

The scanner offers many different connection options. In addition to an Ethernet port, users can connect wirelessly via WLAN and Bluetooth® to control the instrument from a tablet or smartphone.

The R&S®TSMA features a highly sensitive GPS receiver.

Easy operation via web interface

The R&S®TSMA is easily configurable via a web interface, allowing users, for example, to load new software options and modify settings. The web interface is accessible via Ethernet or WLAN.

Online software updates

Rohde&Schwarz provides online software updates to ensure the R&S®TSMA can always support the latest features. These updates are simply loaded into the scanner.

Technology	Technology supported	MIB, SIB decoding
GSM	•	•
WCDMA	•	•
CDMA2000®	•	•
1xEV-DO (Rel. 0/Rev. A/Rev. B)	•	•
WiMAX™ IEEE 802.16e	•	•
TD-LTE	•	•
LTE-FDD	•	•
NB-IoT/Cat NB1	•	MIB, SIB1
TETRA, TETRA DMO	•	•
TD-SCDMA	•	•
RF power scan	•	–
CW channel power RSSI scan	•	–

R&S®TSMA controlled from a SwissQual QualiPoc Android smartphone.

Wide range of applications

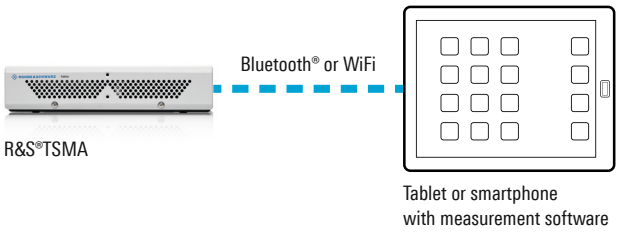
Measurement software runs on smartphones and tablets

The R&S®TSMA connects with smartphones and tablets via Bluetooth® or WLAN. Measurement software on the smartphone or tablet records and processes the values measured by the scanner. As it records this data, the smartphone simultaneously carries out voice and data tests.

The R&S®TSMA is supported, for example, by QualiPoc Android products from SwissQual.

Configuring the R&S®TSMA is fast and easy with a QualiPoc Android smartphone or tablet. The R&S®TSMA records the current RF environment, while QualiPoc Android carries out extensive service tests, including evaluation of voice and video quality. QualiPoc Android displays captured measurement values from the scanner on a straightforward monitor and stores them in a separate measurement file. Coupled with the R&S®TSMA, QualiPoc delivers all required measurement data. It offers easy operation for precise and efficient implementation of complicated tasks such as optimization in multistorey buildings.

Measurement software runs on smartphones and tablets



R&S®TSMA running R&S®ROMES for tests with scanner and test phone.

Measurement software runs under Windows on the R&S®TSMA

The R&S®TSMA features a fully functional computer with Microsoft Windows. Any drive test software that supports the R&S®TSME can be installed, e.g. R&S®ROMES or the SwissQual Diversity Optimizer. Installation is as simple as connecting a monitor, keyboard and mouse. External storage media containing software to be installed can be connected via USB.

No cabling or accessories are required for mobile use. The software running on the scanner can be controlled via WLAN from a tablet with any Windows Remote Desktop application. The app is available for iPad, Android and Windows tablets.

Test phones can also be connected for voice and data tests, since the drive test software runs on the R&S®TSMA computer. This makes the R&S®TSMA scanner a fully functional compact mobile measuring system.

In addition to mobile operation, the R&S®TSMA can be used as a fixed probe in this configuration. Remote access is provided via an IP network. Multiple devices can be integrated into such a system.

Operation without built-in computer

It is also possible to operate the R&S®TSMA without using the built-in computer. In this case, the scanner is connected to a computer via Ethernet and used like an R&S®TSME. This can be practical if the instrument is sometimes to be operated with smartphone software and at other times with computer-based drive test software.

Open interface and use as OEM

Many manufacturers have firmly integrated Rohde&Schwarz scanners into their drive test tool chain.

The outstanding signal processing capabilities and the easy-to-use API virtual communications (ViCom) interface with sample code make it very easy for users to get the maximum out of every Rohde&Schwarz drive test scanner.

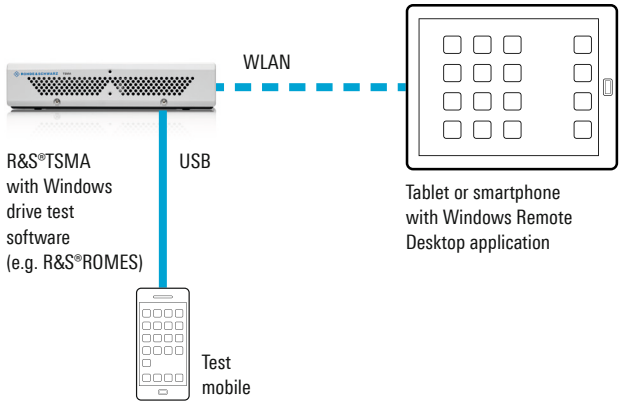
As a member of this family, the R&S®TSMA provides an open remote ViCom interface that allows integration into Windows and Android based software tools. The remote ViCom interface provides additional capabilities to cope with the conditions of the Bluetooth® and WLAN connections. These capabilities include data compression, buffering, filtering of measurement result data and storage of raw data on the R&S®TSMA built-in SSD or external USB media for later retrieval.

The API delivers all the data that the scanner can measure. The performance and quality parameters of the cells are measured at high speed, and the GSM, WCDMA, LTE (FDD/TDD), TD-SCDMA, CDMA2000®, 1xEV-DO and WiMAX™ system information transmitted via the air interface is collected. TETRA networks are exclusively measured using R&S®ROMES4.

In addition to cell measurements, it is possible to simultaneously perform in-depth spectrum analysis in all bands. GPS information and scanner status are also transmitted via the interface.

For ViCom details, please contact your local Rohde&Schwarz sales office.

Measurement software runs under Windows on the R&S®TSMA



Portable measurement solution

Small and lightweight

The R&S®TSMA was specifically designed as a portable instrument. Thanks to its low weight and small size, the scanner can be taken along for every measurement to collect valuable data. Optimization of in-building wireless networks is gaining in importance. The equipment needed for these measurements has to be powerful, yet lightweight and small. The R&S®TSMA autonomous mobile network scanner can also be operated from a backpack or the optional carrying bag.

Battery-powered with rechargeable batteries and charging function

The R&S®TSMA can be optionally equipped with a battery pack, which is seamlessly attached to its housing. The R&S®TSMA-BP battery pack features two easily accessible rechargeable hot-swappable batteries. No separate charger is required to charge the batteries as they can be charged directly in the instrument. Charging takes place automatically when the R&S®TSMA is connected to power, e.g. in a vehicle or an external power supply. This ensures that the R&S®TSMA is always ready for operation, and users do not have to carry an additional charger.

Extensive accessories for mobile use

The optional R&S®TSMA-ZCB carrying bag simplifies mobile scanner operation. The bag has room for the R&S®TSMA with battery pack, two spare batteries, a mobile phone and the R&S®TSME-Z7 antenna (frequency range: 700 MHz to 2.6 GHz). The battery pack is easily accessible, for fast replacement of batteries during operation. For a MIMO 2x2 measurement setup with the R&S®TSMA and one additional R&S®TSME connected, the optional R&S®TSMA-ZCB2 carrying bag helps operating the setup during walktesting.

R&S®TSMA with R&S®TSMA-BP battery pack.

Special features

LTE network optimization

The R&S®TSMA delivers all measurement results required for optimizing LTE networks. These include power and SINR measurements on PSYNC and SSYNC signals as well as power and quality measurements (RSRP, RSRQ, SINR) on reference signals for all eNodeB TX ports. This makes it possible to detect radio dead zones or locations with too much interference. This interference can be caused when there is more than one strong cell. The scanner can be used to find this "pilot pollution" effect. Another possible cause is a violation of the OFDM guard interval, also known as intersymbol interference. The R&S®TSMA can also identify this cause of interference by analyzing the receive signal and comparing it to the cyclic prefix used.

The R&S®TSMA automatically determines the transmission bandwidth of the base station (1.4 MHz to 20 MHz) and carries out subband measurements within a grid of 12 LTE subcarriers. In addition to RSRP power, the SINR is also determined to identify external interference. The scanner results can also be used to identify network setup errors. Typical mistakes made during base station installation include mixing up antenna cables. RSRP measurements can help detect such errors. The R&S®TSMA automatically decodes all SIB network configuration information from the broadcast channel, and can also identify configuration errors.

Fast setup with automatic channel detection

In combination with the R&S®ROMES4ACD or alternatively the R&S®TSMA-K40 automatic channel detection feature, the R&S®TSMA automatically detects active channels in a specified band. LTE, UMTS and CDMA2000®/1xEV-DO networks are supported. This feature can be optionally enhanced by a spectrum scan that significantly speeds up the detection process. With this feature, channel lists no longer have to be set up before a measurement campaign; the measurement system dynamically identifies new channels and adds them to the workspace during the drive. This is particularly relevant in networks deployed in a shared spectrum with other cellular standards, where frequent channel frequency and channel bandwidth changes can occur. The feature is also useful in benchmarking to analyze competitor networks, and in country border situations to manage frequency plans and avoid interference.

Position estimation of base stations

During a drive test, R&S®ROMES when running on the instrument, can use the measurement and GPS data delivered by the R&S®TSMA to estimate the geographic position of the base stations. This calculation is fast and accurate.

GSM, WCDMA, LTE, CDMA2000®/1xEVDO, TETRA and WiMAX™ networks are supported in parallel. This unique feature enables users to quickly generate a base station list for export or graphic display. Base station location information is of interest for operator benchmarking to analyze competitor networks, or to explore site sharing opportunities. It is also of interest in country border situations to manage frequency plans and avoid interference.

LTE uplink and downlink allocation analyzer

The R&S®TSMA offers a unique feature that allows analysis of the UL and DL allocations of the strongest eNodeBs during measurement. The information includes the following: the number of RNTIs (UEs) that have been scheduled data by the eNodeB, the MCS and throughput for each detected UE, and the occupation of the cell. Information is provided per TTI and per resource block. The data can be statistically evaluated to assess the overall load of the cell in terms of throughput and number of users. This information is important during network optimization and troubleshooting as it helps users acquire network data without accessing O&M network information such as base station counters. Uplink and downlink allocation analyzer can be run simultaneously; the balance of uplink and downlink allocation can be analyzed. LTE allocation analysis requires the R&S®TSMA-K31 option for downlink analysis and the R&S®TSMA-K33 option for uplink analysis.

For example, the LTE uplink and downlink allocation analysis result can explain a limited UE throughput if the scanner shows that the cell load is already high and therefore not enough resources are available for the test UE. In a benchmarking environment, this feature provides deep insight into networks, allowing comparison of traffic and available capacity between different operators. The tool can also be used as a network probe to measure the cell load in a stationary situation, for example when a site owner wants to know the importance of a site before renewing the lease with the network operator.

LTE eMBMS measurements

The LTE evolved multimedia broadcast multicast service (eMBMS) uses several base stations to broadcast the same content at the same time to all users. This poses new challenges for RAN engineers, such as base station synchronization and managing the coverage and quality of the multimedia single frequency network. eMBMS scanner measurements provide the needed insight to the SFN's RF performance, such as eMBMS reference signal power, quality and SINR. The channel impulse response provided by the scanner allows detection of intersymbol interference as well as the interfering base station. The complete MBSFN configuration is decoded from SIB messages 2 and 13 from the broadcast channel. eMBMS measurements are enabled by the R&S®TSMA-K32 option.

NB-IoT/Cat NB1 measurements

With R&S®TSMA-K34 option, the R&S®TSMA is enabled to measure in NB-IoT/Cat NB1 networks. NB-IoT/Cat NB1 is a 3GPP standard for connecting a huge number of devices like smart meters to the internet (IoT). While traditional LTE standards mainly enhance throughput and network capacity, NB-IoT/Cat NB1 is focused on low power consumption for IoT devices and highest availability of the connection, especially indoors.

Indoor measurements require lightweight and ultra-compact scanners with low power consumption. For coverage validation, troubleshooting and optimization, the R&S®TSMA allows signal power, quality and power to interference and noise ratio measurements of each available Physical Cell ID based on synchronization and reference signals. During NB-IoT/Cat NB1 measurements, it is possible to demodulate the layer 3 broadcast information (MIB and SIB1) to check the network configuration.

The standard allows multiple operation modes to integrate the NB-IoT carrier efficiently into the available spectrum. All three modes are supported by the R&S®TSMA. The most spectrum efficient mode is the LTE in-band operation mode, where the NB-IoT carrier uses the spectrum of one LTE PRB.

The operation modes guard-band and stand-alone allow NB-IoT deployments independently from the LTE spectrum.

NB-IoT measurements can be run simultaneously to measurements of other technologies like GSM, LTE, (W)CDMA (with the appropriate R&S®TSMA option). For optimization or in case of troubleshooting, the impact of NB-IoT spectrum on adjacent GSM/LTE/(W)CDMA spectrum and vice versa can be validated.

Specifications

Specifications of the R&S®TSMA autonomous drive test scanner		
RF characteristics		
Frequency range		350 MHz to 4.4 GHz
Level measurement uncertainty	350 MHz to 3 GHz	< 1 dB
	3 GHz to 4.4 GHz	< 1.5 dB
Maximum operating measurement range input level		–10 dBm
Maximum extended measurement range input level		+10 dBm
Maximum safe permissible input level		+20 dBm/10 V DC
Noise figure	900 MHz	typ. 5 dB
	2100 MHz	typ. 6 dB
	3500 MHz	typ. 7 dB
Intermodulation-free dynamic range (TOI)	900 MHz	typ. –2 dBm
	2100 MHz	typ. –1 dBm
	3500 MHz	typ. –9 dBm
RF receive paths		1
VSWR	350 MHz ≤ f ≤ 650 MHz	typ. < 3.5
	650 MHz ≤ f ≤ 1.95 GHz	typ. < 2.0
	1.95 GHz ≤ f ≤ 3.0 GHz	typ. < 2.25
	3.0 GHz ≤ f ≤ 4.4 GHz	typ. < 1.9
LTE characteristics		
Frequency bands supported		no restrictions
Measurement modes	automatic detection of carrier bandwidth	LTE-FDD and TD-LTE
Measurement speed	automatic detection of all 504 physical cell IDs with SIB decoding active/two adjacent channels	max. 330 Hz
Physical decoding accuracy		
Sensitivity for initial physical cell ID decoding	SYNC signal power	–128 dBm
	SYNC signal RE power	–145.9 dBm
	RSRP	–147 dBm
Sensitivity after successful physical cell ID decoding	SYNC signal power	–130 dBm
	SYNC signal RE power	–147.9 dBm
	RSRP	–149 dBm
RS SINR dynamic range		–20 dB to +42 dB
SYNC SINR dynamic range		–20 dB to +42 dB
PCI false detection (ghost code)		$< 10^{-8}$
NB-IoT/Cat NB1 characteristics		
Frequency bands supported		no restrictions
NB-IoT/Cat NB1 measurement modes		stand-alone
		guard-band
		in-band
Sensitivity for initial physical cell ID decoding	sync signal power (NSSS power)	–132 dBm
	reference signals power (NRSRP)	–143 dBm
Sensitivity after successful physical cell ID decoding	sync signal power (NSSS power)	–135 dBm
	reference signals power (NRSRP)	–146 dBm
CINR dynamic range	sync signals (NSSS CINR)	–15 dB to +30 dB
	reference Signals (NRS CINR)	– 15 dB to +30 dB
Measurement speed		5 Hz (single channel)

Specifications of the R&S®TSMA autonomous drive test scanner		
WCDMA characteristics		
Frequency bands supported		no restrictions
Number of RF carrier frequencies		max. 32
Measurement speed	high speed/high dynamic range, automatic detection of all 512 scrambling codes	300 Hz/80 Hz with BCH demodulation
Scrambling code detection sensitivity (RSCP)		
Sensitivity for initial SC detection	high speed/high dynamic range	–119 dBm/–127 dBm
Sensitivity after successful SC detection	high speed/high dynamic range	–124 dBm/–132 dBm
Scrambling code false detection (ghost code)		$< 10^{-9}$
Dynamic range E_c/I_0 for initial detection	high speed/high dynamic range	–20 dB/–26 dB
Dynamic range E_c/I_0 after successful detection	high speed/high dynamic range	–23 dB/–31 dB
Min. BCH demodulation threshold E_c/I_0	high speed/high dynamic range	> –14 dB/–20 dB
GSM characteristics		
Frequency bands supported		no restrictions
Measurement modes	in parallel	DB/TCH/SCH code power, TCH total in-band power, timeslot power, GSM spectrum, BCH demodulation for all system information types
Measurement speed	with SI decoding active	800 channels/s
Sensitivity	detection/BSIC decoding/BCH decoding	–124 dBm/–122 dBm/–117 dBm
BSIC decoding dynamic range		
Sensitivity for initial BSIC detection		C/I > –2 dB
Sensitivity after successful BSIC detection		C/I > –24 dB
BCCH decoding dynamic range		C/I > 0 dB
CDMA2000® characteristics		
Frequency bands supported		no restrictions
Number of RF carrier frequencies		max. 32
Measurement speed	automatic detection of all 512 PN codes	max. 70 Hz, with BCH demodulation
PN detection sensitivity		–125 dBm
1xEV-DO characteristics (Rel.0/Rev.A/Rev.B)		
Frequency bands supported		no restrictions
Number of RF carrier frequencies		max. 32
Measurement speed		max. 20 Hz, with BCH demodulation
PN detection sensitivity		–122 dBm
TD-SCDMA characteristics		
Frequency bands supported		no restrictions
Number of RF carrier frequencies		max. 32
Measurement speed	high speed	50 Hz, with BCH demodulation
	high sensitivity	15 Hz, with BCH demodulation
Automatic detection of all 128 scrambling codes		
Scrambling code detection sensitivity		
Sensitivity for initial BTS detection (DwPTS)	high speed/high sensitivity	–119 dBm/–118 dBm RSCP
Sensitivity for initial SC detection (midamble)	high speed/high sensitivity	–119 dBm/–119 dBm RSCP
Sensitivity after successful BTS detection	high speed/high sensitivity	–120 dBm/–121 dBm
TETRA characteristics		
TETRA bands supported		350 MHz to 4.4 GHz
Number of RF carrier frequencies	within a 10 MHz downlink band	max. 400
Channel resolution		25 kHz (QPSK)
Measurement speed		max. 8000 channels/s, 20/s for a 10 MHz block
Sensitivity (RSSI)	RSSI measurements	–128 dBm
	TETRA BSCH decoding (BSCH decoding for channels with an SNR > 8 dB)	–123 dBm
	BER measurements	–128 dBm

Specifications of the R&S®TSMA autonomous drive test scanner

WiMAX™ characteristics		
Frequency bands supported		no restrictions
Measurement speed	automatic detection of all 114 preamble indices	9 channels/s
Preamble decoding accuracy	frame duration: 5 ms, FFT size: 1024, bandwidth: 10 MHz/2.657 GHz	±1 dB (–20 dBm to –110 dBm)
Sensitivity for initial preamble decoding (10 MHz bandwidth)	RSSI	–103 dBm
Sensitivity after successful preamble decoding (10 MHz bandwidth)	RSSI	–129 dBm
SINR dynamic range		–23 dB to +26 dB
RF power scan		
Frequency range		350 MHz to 4.4 GHz
Frequency resolution		140 Hz to 1.438 MHz
Sensitivity	22.46 kHz (RMS) frequency resolution, at 900 MHz	–126 dBm
	140 Hz RBW, RMS, at 900 MHz	–145 dBm
Scan speed	180 kHz resolution, 100 MHz span, 20 MHz bandwidth/FFT size: 128	135 Hz
	11.23 kHz resolution, 10 MHz span, 10 MHz bandwidth/FFT size: 1024	800 Hz
	140 Hz resolution, 1 MHz span, 1 MHz bandwidth/FFT size: 8192	70 Hz
RSSI scan speed	20 MHz span, 20 MHz bandwidth/FFT size: 1024	99 GSM channels: max. 950 Hz (94050 channels/s)
	20 MHz span, 20 MHz bandwidth/FFT size: 256	4 WCDMA channels: max. 970 Hz (38800 channels/s)
	20 MHz span, 20 MHz bandwidth/FFT size: 256	1 LTE channel (100RB): max. 975 Hz (975 channels/s)
Max. number of frequency ranges		20
Detectors		max., min., RMS, auto
CW scanning		
Sensitivity channel power RSSI scan	200 kHz channel (GSM), 5 MHz channel (UMTS), 20 MHz channel (LTE)	–119 dBm, –104 dBm, –98 dBm
Scan rate	200 kHz channel (GSM), 5 MHz channel (UMTS), 20 MHz channel (LTE)	2540 Hz (254000 channels/s), 11010 Hz (44040 channels/s), 11780 Hz (11780 channels/s)
CPU		
Processor		Intel® Core™ i5-4250U, 1.3 GHz/Turbo Boost 2.6 GHz, 3 Mbyte L3 Cache, memory controller: SATA 6 Gbit/s
Memory		8 Gbyte DDR3L/1600 MHz (2 × SO-DIMM)
Graphics		Intel® HD-Graphic 5000
Hard disk		128 Gbyte SSD (MLC, mSATA)
Connectivity		
LAN		1 × Gigabit Ethernet SCANNER LAN, 1 × Gigabit Ethernet CPU LAN (Intel® I218V), 1 × 100 Mbit Ethernet WAN
USB		2 × USB 2.0, 2 × USB 3.0
WLAN		IEEE802.11n, IEEE802.11ac
Bluetooth®		Bluetooth® 4.0
Video		1 × HDMI Mini, 1 × Mini DisplayPort
User interface		Web GUI (via LAN or integrated WiFi hotspot); three multi-color status LEDs: power, scanner, device
GPS		active 3 V, max. 25 mA, SMA female
RF		SMA female

Specifications of the R&S®TSMA autonomous drive test scanner		
GPS/Glonass receiver		
Sensitivity	cold start	–148 dBm
	tracking	–162 dBm
Acquisition	cold start	26 s
	hot start	< 1 s
Channels		50
General data		
Environmental conditions		
Temperature range	operating	+5 °C to +45 °C, in R&S®TSMA-ZCB/-ZCB2 carrying bag : +5 °C to +40 °C
	permissible	0 °C to +50 °C, in R&S®TSMA-ZCB/-ZCB2 carrying bag: +0 °C to +40 °C
	storage	–25 °C to +70 °C
Damp heat		+25 °C/+40 °C, 95 % rel. humidity, cyclic, in line with EN 60068-2-30
Mechanical resistance		
Vibration	sinusoidal	5 Hz to 55 Hz, 0.15 mm amplitude const., 55 Hz to 150 Hz, 0.5 g const., in line with EN 60068-2-6
	random	10 Hz to 500 Hz, acceleration 1.9 g RMS, in line with EN 60068-2-64
Shock		40 g shock spectrum, in line with MIL STD-810E, method 516.4, procedure I
Power rating		
Supply voltage		11 V to 18 V DC – 0 %/+ 10 %
Max. input current		4 A
Power consumption during operation		typ. 30 W
Product conformity		
Electromagnetic compatibility	EU	in line with EMC Directive 2004/108/EC, applied harmonized standards: EN 61326-1 (industrial environment), EN 61326-2-1, EN 55011 (class B), EN 61000-3-2, EN 61000-3-3, EN 50498
	Korea	KC mark
Calibration interval		24 months
Dimensions	W × H × D	207 mm × 46 mm × 158 mm (8.15 in × 1.81 in × 6.22 in)
Weight		1140 g (2.51 lb)

Specifications of the R&S®TSMA-BP battery pack unit		
Autonomous power path switching	DC IN path/battery path	yes
Number of battery bays	form factor: type RRC2054 batteries	2
Hot swap support	battery replacement without DC OUT voltage interruption (one battery has to be in bay)	yes
Charging/discharging mode	battery bay 1/bay 2	simultaneous charging, SM bus interface for each single battery
Charging time for two batteries in parallel	R&S®TSMA switched off	2.5 h
	R&S®TSMA executing typical measurement setup	typ. 5 h
Autonomy	tow fully charged batteries in bay, typical measurement setup for R&S®TSMA	typ. 3.5 h
User interface	in combination with R&S®TSMA	two battery state LEDs, acoustic battery error alarm
Power rating		
Supply voltage		11 V to 28 V DC – 0 %/+ 10 %
Maximum input current		6 A
Power consumption	powering R&S®TSMA, two batteries charging	max. 65 W
	R&S®TSMA powered off, two batteries charging	max. 50 W
Standby power	R&S®TSMA powered off, batteries charged or not in bay	max 1 W
Output voltage; output power	R&S®TSMA/ext. DC IN	18 V; max. 50 W
	R&S®TSMA/battery powered	15 V nominal voltage; max. 50 W
	AUX (second R&S®TSME)/ext. DC IN	18 V; max 18 W
	AUX (second R&S®TSME)/battery powered	15 V nominal voltage; max. 18 W
Efficiency	DC/DC mode	> 85 %
Connectors		DC IN, DC OUT R&S®TSMA, DC OUT for second R&S®TSME
Environmental conditions		
Temperature range	operating	+5 °C to +40 °C
	permissible	+0 °C to +45 °C
	charging	+0 °C to +35 °C, in n R&S®TSMA-ZCB/-ZCB2 carrying bag: +0 °C to +25 °C
Damp heat		+25 °C/+40 °C, 95 % rel. humidity, cyclic, in line with EN 60068-2-30
Mechanical resistance		
Vibration	sinusoidal	5 Hz to 55 Hz, 0.15 mm amplitude const., 55 Hz to 150 Hz, 0.5 g const., in line with EN 60068-2-6
	random	10 Hz to 500 Hz, acceleration 1.9 g RMS, in line with EN 60068-2-64
Shock		40 g shock spectrum, in line with MIL STD-810E, method 516.4, procedure I
Product conformity		
Electromagnetic compatibility	EU	in line with Directive 2004/108/EC, applied harmonized standard, EN 61326-1 (industrial environment), EN 61326-2-1, EN 55011 (class B), EN 61000-3-2, EN 61000-3-3, EN 50498
Electrical safety	EU	in line with Directive 2014/35/EU, EN 61010-1
Dimensions	W × H × D	207 mm × 43 mm × 158 mm (8.15 in × 1.69 in × 6.22 in)
	W × H × D, R&S®TSMA-BP plus R&S®TSMA stacked	207 mm × 84 mm × 169 mm (8.15 in × 3.31 in × 6.65 in)
Weight	R&S®TSMA-BP without batteries	630 g (1.389 lb)
	R&S®TSMA-BP plus 2 × R&S®TSMA-BAT in bay	1105 g (2.436 lb)

Specifications of the R&S®TSMA-BAT battery		
Live expectancy	at +25 °C (1.6 A charge/1.6 A discharge)	> 300 cycles, with min. 80 % of initial capacity
Charging options		inside R&S®TSMA-BP or with separate R&S®TSMA-BC2
Electrical characteristics		
Nominal voltage		15.0 V
Nominal capacity		3200 mAh
Initial impedance		270 mΩ at 1 kHz
Max charge current		2240 mA
Max. charge voltage		17.4 V
Peak discharge current		10 000 mA
Cont. discharge current		4 000 mA
Environmental conditions		
Temperature range	operating	+0 °C to +45 °C (charging), –20 °C to +55 °C (discharging)
	storage	max. –20 °C to +50 °C, –20 °C to +25 °C (recommended)
Product conformity		in line with CE, UL2054, UL1642, FCC, IEC 62133, EN 60950, ROHS, UN 38.3, PSE, RCM
Dimensions	W × H × D	77.6 mm × 23.0 mm × 85.4 mm (3.06 in × 0.91 in x 3.36 in)
Weight		238 g (0.524 lb)

Specifications of the R&S®TSMA-Z1 AC supply		
Input voltage	at +25 °C (1.6 A charge/1.6 A discharge)	100 V to 240 V AC
Input frequency		50 Hz to 60 Hz
Input current		max. 1.8 A
Efficiency		> 85 %
Standby power	no load/230 V AC	0.5 W
Output voltage		12 V DC
Output current		max. 5 A
Load regulation		max. ±5 %
Standard output connector		TSMA (male)
Standard output cable length		120 cm (3.9 ft)
Protections		OCP, OVP, over power and short circuit
Environmental conditions		
Temperature range	operating	–10 °C to +50 °C (derated linearly from 100 % load at +40 °C to 75 % load at +50 °C)
	storage	–20 °C to +85 °C,
Product conformity		in line with EN 61000-3-2, 3, EN 61000-4-2/3/4/5/6/8/11, EN 55024, CE, IEC/UL/EN 60950-1, CB
Electromagnetic compatibility		in line with EN 55022, CISPR 22, FCC Part 15 Class B
Dimensions	W × H × D	450 mm × 300 mm × 1150 mm (17.72 in × 11.81 in × 45.28 in)
Weight		520 g (1.14 lb)

Ordering information

Designation	Type	Order No.
Base unit		
Autonomous Drive Test Scanner	R&S®TSMA	1514.6520.20
Scope of delivery: R&S®TSMA, LAN cable, GPS antenna, Bluetooth®/Wi-Fi antennas, 12 V DC power cable (cigarette lighter plug), quick start guide, 700 MHz to 2600 MHz paddle antenna		
Options		
TD-SCDMA Scanning	R&S®TSMA-K20	1524.6080.02
WCDMA Scanning	R&S®TSMA-K21	1524.6097.02
CDMA2000® Scanning	R&S®TSMA-K22	1524.6100.02
GSM Scanning	R&S®TSMA-K23	1524.6116.02
EV-DO Scanning	R&S®TSMA-K24	1524.6122.02
CW Scanning	R&S®TSMA-K25	1524.6422.02
TETRA Scanning	R&S®TSMA-K26	1524.6145.02
RF Power Scan	R&S®TSMA-K27	1524.6151.02
WiMAX™ Scanning	R&S®TSMA-K28	1524.6168.02
LTE Scanning	R&S®TSMA-K29	1524.6174.02
LTE-MIMO Scanning, 2 × 2, 4 × 2, 4 × 4	R&S®TSMA-K30	1524.6197.02
LTE Downlink Allocation Analyzer	R&S®TSMA-K31	1524.6322.02
LTE eMBMS Scanning	R&S®TSMA-K32	1524.6416.02
LTE Uplink Allocation Analyzer	R&S®TSMA-K33	4900.5106.02
NB-IoT/Cat NB1 Scanning	R&S®TSMA-K34	1524.6468.02
Automatic Channel Detection (ViCom only, not for R&S®ROMES4)	R&S®TSMA-K40	1524.6339.02
QualiPoc Support	R&S®TSMA-K61	1524.6345.02
Simultaneous Measurement in 1 band	R&S®TSMA-K1B	1524.6068.02
Simultaneous Measurement in 2 bands	R&S®TSMA-K2B	1524.6180.02
Simultaneous Measurement in 3 bands	R&S®TSMA-K3B	1524.6200.02
Simultaneous Measurement in 4 bands	R&S®TSMA-K4B	1524.6216.02
Simultaneous Measurement in 5 bands	R&S®TSMA-K5B	1524.6222.02
Simultaneous Measurement in all bands	R&S®TSMA-KAB	1524.6297.02
Upgrade by one additional band	R&S®TSMA-KUB	1524.6300.02
External accessories		
Battery Pack Unit (batteries not included)	R&S®TSMA-BP	1523.8009.02
Battery for battery pack	R&S®TSMA-BAT	1523.8021.03
Dual Charger for R&S®TSMA-BAT	R&S®TSMA-BC2	1523.8015.02
AC Power Supply	R&S®TSMA-Z1	1523.8450.02
Antenna Mount, magnetic	R&S®TSME-ZA1	1506.9817.02
Antenna Mount, fixed	R&S®TSME-ZA2	1506.9823.02
Antenna Mount, fixed, with integrated GPS antenna	R&S®TSME-ZA4	1506.9846.02
Antenna Emitter, 406 MHz to 440 MHz (requires antenna mount)	R&S®TSMW-ZE2	1117.8165.00
Antenna Emitter, 380 MHz to 430 MHz (requires antenna mount)	R&S®TSMW-ZE7	1519.5709.02
Antenna Emitter, 698 MHz to 2700 MHz (requires antenna mount)	R&S®TSMW-ZE8	1506.9852.02
Antenna Emitter, 430 MHz to 470 MHz	R&S®TSMW-ZE9	1519.5709.03
Ultrawideband Antenna, 350 MHz to 6000 MHz	R&S®TSME-Z9	3590.8039.02
Single Port Ultrawideband Antenna 698 MHz to 6000 MHz	R&S®TSME-Z10	4900.1917.02
3-Port Antenna 698 MHz to 2690 MHz (MIMO) + GPS	R&S®TSME-Z11	4900.1923.02
2-Port MIMO Reference Antenna 698 MHz to 2700 MHz	R&S®TSME-Z12	4900.1930.02
3-Port MIMO Antenna 698 MHz to 3800 MHz (MIMO) + GPS/GNSS for drive testing	R&S®TSME-Z13	4900.1946.02
4-Port MIMO Antenna 698 MHz to 3500 MHz (MIMO2x2) + 5150 MHz to 5850 MHz (MIMO2x2) for drive testing	R&S®TSME-Z14	4900.1952.02
Single Port Ultrawideband Antenna 698 MHz to 3800 MHz with magnetic mount	R&S®TSME-Z15	3652.7281.02

Designation	Type	Order No.
Display Port Adapter to DVI/HDMI™	R&S®TSPC-DPDH	3592.4060.02
Display Port Adapter to VGA	R&S®TSPC-DPVG	3592.4076.02
External DVD Drive	R&S®TSPC-DVDD	3592.4053.02
Mini HDMI™ Cable	R&S®TSPC-MHDM	3592.4082.02
10" Portable Monitor, HDMI™	R&S®TSPC-MMON	3592.4047.02
Compact Keyboard, US, with trackball, USB	R&S®TSPC-KEYB	1508.1607.02
Surface Pro 4, remote tablet	R&S®TSPC-SF4P	3623.3981.02
Carrying Box for R&S®TSMA	R&S®TSMA-Z5	3593.3909.02
Carrying Bag for R&S®TSMA for walk testing (MIMO 2x2/SISO configuration)	R&S®TSMA-ZCB2	3626.8649.02

Warranty		
Base unit		3 years
All other items [1]		1 year
Options		
Extended Warranty, one year	R&S®WE1	Please contact your local Rohde&Schwarz sales office.
Extended Warranty, two years	R&S®WE2	
Extended Warranty with Calibration Coverage, one year	R&S®CW1	
Extended Warranty with Calibration Coverage, two years	R&S®CW2	
Extended Warranty with Accredited Calibration Coverage, one year	R&S®AW1	
Extended Warranty with Accredited Calibration Coverage, two years	R&S®AW2	

[1] For options that are installed, the remaining base unit warranty applies if longer than 1 year. Exception: all batteries have a 1 year warranty.

Your local Rohde&Schwarz expert will help you determine the optimum solution for your requirements.
To find your nearest Rohde&Schwarz representative, visit www.sales.rohde-schwarz.com

Service that adds value

- Worldwide
- Local and personalized
- Customized and flexible
- Uncompromising quality
- Long-term dependability

Rohde&Schwarz
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Mobile network testing
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Certified Quality Management
ISO 9001

Certified Environmental Management
ISO 14001

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R&S®TSMA Autonomous Mobile Network Scanner
Data without tolerance limits is not binding | Subject to change

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