R&S®TSMA6B AUTONOMOUS MOBILE NETWORK SCANNER

Drive and walk testing with maximum flexibility

Product Brochure
Version 06.00

ROHDE&SCHWARZ
Make ideas real

AT A GLANCE

The compact R&S®TSMA6B autonomous mobile network scanner is an integrated solution for efficient drive and walk testing. With an integrated high-performance PC and a mobile network scanner to comply with the latest requirements for state-of-the-art mobile network testing, it offers maximum performance, autonomy and connectivity.

In-building and urban hotspot traffic is growing tremendously, and with it mobile network testing requirements. A typical measurement setup no longer consists of a network scanner and a mobile phone. It is now a high-performance setup of scanners and smartphones/devices processing a huge amount of measurement data to obtain deep real-time network insights and analyze user experience. Accurate scanner based RF measurements and device based user experience analysis complement each other, creating a perfectly aligned ecosystem.

The R&S®TSMA6B combines the technology of the R&S®TSME6 multitechnology network scanner with an ultra-high-performance Intel® CPU based PC. The system can run Windows PC based drive test software, which supports multiple external devices such as smartphones connected via USB.

With its ultrabroadband frontend, the integrated scanner measures all supported technologies from 350 MHz to 6 GHz simultaneously. The future-proof architecture and in-field upgradeability for both hardware and software make it possible to combine several frontends and downconverters to achieve extremely high measurement speeds and to cover the FR1 and FR2 ranges.

With a sophisticated design and optional hot-swappable batteries, the test and measurement equipment can be stowed in a carrying bag. This makes it the ideal companion for remote and unattended operation during drive and walk test campaigns.

R&S®TSMA6B with R&S®TSMA6B-BP battery pack.

KEY FACTS

- No limitations in 3GPP (e.g. 5G NR, including FRMCS, 5G RedCap, LTE, C-V2X, WCDMA, GSM, NB-IoT) frequency bands up to 6 GHz, including a multi-GNSS receiver for uninterrupted location tracking
- Measure more than ten technologies simultaneously in one scanner
- Supports R&S®TSME44DC and R&S®TSMS53DC downconverters for mmWave measurements
- Compact and lightweight with customized mechanical concept for cascading multiple scanners
- Maximum connectivity, with support for additional scanner hardware, Windows based PCs, Android based UE and tablets using wireless and wired connections
- Direct R&S®TSME6 scanner access (bypassing the internal PC)
- Integrated high-performance Intel® Core™ i7/i5 CPU (8th generation quad core)

BENEFITS

High-performance multifunctional platform

- Simultaneous measurements with no limitations in 3GPP frequency bands and technologies with SIB/L3 decoding support (up to 3GPP Release 17)
- Cascading and upward/downward compatibility for maximum freedom
- Proof of upgradeability: 5G NR measurements on the R&S®TSMA6B, including FRMCS and 5G RedCap support
- 5G RedCap (5G NR-Light) support
- Advanced 5G NR measurements
- Cellular V2X support
- Mission-critical voice and data (MCX) network support (P25 and TETRA measurements)
- Maximum connectivity for challenging measurement campaigns
- Portable solution to simplify measurement campaigns

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Advanced measurements for deep network insights during measurement campaigns

- Power spectrum measurement up to 6 GHz for spectrum clearance
- NB-IoT/Cat NB1 measurements
- LTE-M measurements
- Reduced setup time to increase efficiency of drive and walk tests
- LTE subband measurements
- Position estimation of base stations

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Wide range of applications

- Controlling and monitoring measurements with smartphones and tablets
- Running Windows based measurement software on the integrated high-performance PC
- Open interface and use as OEM

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HIGH-PERFORMANCE MULTIFUNCTIONAL PLATFORM

Simultaneous measurements with no limitations in 3GPP frequency bands and technologies with SIB/L3 decoding support (up to 3GPP Release 17)

The core of the R&S®TSMA6B consists of a very fast signal processing unit with proven algorithms on a high-performance PC and a receiver frontend that seamlessly supports the frequency range from 350 MHz to 6 GHz. Decades of Rohde&Schwarz RF experience allow both to be combined in an extremely compact autonomous scanner. The R&S®TSMA6B is fully user-configurable and enables simultaneous measurements. It covers all major wireless communications standards and offers deep RF and network insights with SIB/layer 3 (SIB/L3) decoding support and advanced LTE measurements such as allocation analysis. With well-established LTE-Advanced network features such as carrier aggregation, the scanner is designed for high measurement speeds – even in multicarrier, multitechnology configurations.

Multitechnology measurements are mandatory for 5G NR non-standalone networks. Since information necessary to access the 5G NR carrier is transmitted on LTE, the R&S®TSMA6B can decode the latest Release 15/16/17 SIB messages for LTE-5G NR dual connectivity and LTE sidelink information to perform these measurements simultaneously at high speed.

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, LTE-M	600 MHz/ 700 MHz	850 MHz	1900 MHz	2100 MHz/ AWS	LTE-LAA: 5300 MHz	700 MHz/ 800 MHz	1800 MHz	2100 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		
5G NR	sub6 GHz/FR1 (native); mmWave/FR2 (24 GHz to 44 GHz with R&S®TSME44DC, 17 GHz to 53 GHz with R&S®TSMS53DC), non-standalone/EN-DC, standalone							

Technology support at a glance

	Technologies supported	MIB, SIB decoding
GSM	•	•
WCDMA	•	•
CDMA2000®	•	•
1xEV-DO (Rel. 0/Rev. A/Rev. B)	•	•
WiMAX™ IEEE 802.16e	•	•
TD-LTE	•	• (Release 17, up to SIB32)
LTE-FDD	•	• (Release 17, up to SIB32)
LTE-M	•	•
NB-IoT/Cat NB1	•	•
C-V2X LTE	•	•
TETRA, TETRA DMO	•	•
Project 25 (P25)	• (phase 1, phase 2)	not yet
RF power scan	•	–
CW channel power RSSI scan	•	–
5G NR (FR1, FR2 with downconverter, FDD/TDD up to Release 17)	•	operation mode detection (NSA, SA), MIB, SIB1, OSI (SIB2 to SIB21, posSIBs); if broadcast

Additionally, the 5G NR demodulator is upgraded continously and currently supports up to SIB21. This enables the detection of special network configurations such as operation mode, RAN slicing, bandwidth part configurations.

Cascading and upward/downward compatibility for maximum freedom

Each investment in measurement tools should be long-term, ensuring maximum investment protection. The R&S®TSMA6B achieves this by offering upward and downward compatibility. The synchronization interface can interact with the predecessor R&S®TSME and with an R&S®TSME6 [1] for MIMO measurements and can also control the R&S®TSME44DC/R&S®TSMS53DC downconverter when measuring above 6 GHz for 5G NR applications. The result is a future-proof product that offers users maximum freedom. See the R&S®TSME44DC/R&S®TSMS53DC product brochure (PD 3607.9608.12) for more details.

A software upgrade allows the R&S®TSMA6B to perform 5G NR and C-V2X measurements and achieve upward compatibility. Software options for existing technologies such as TETRA, GSM, WCDMA, LTE, LTE-M and NB-IoT ensure downward compatibility.

Multiple units can be conveniently cascaded thanks to a customized mechanical concept. A click-in mechanism creates a vibration-proof stack of seamlessly and mechanically connected R&S®TSMA6B scanners.

[1] Firmware version 5.8 or higher required.

R&S®TSMA6B with battery pack and R&S®TSMS53DC on top.

Proof of upgradeability: 5G NR measurements on the R&S®TSMA6B, including FRMCS and 5G RedCap support

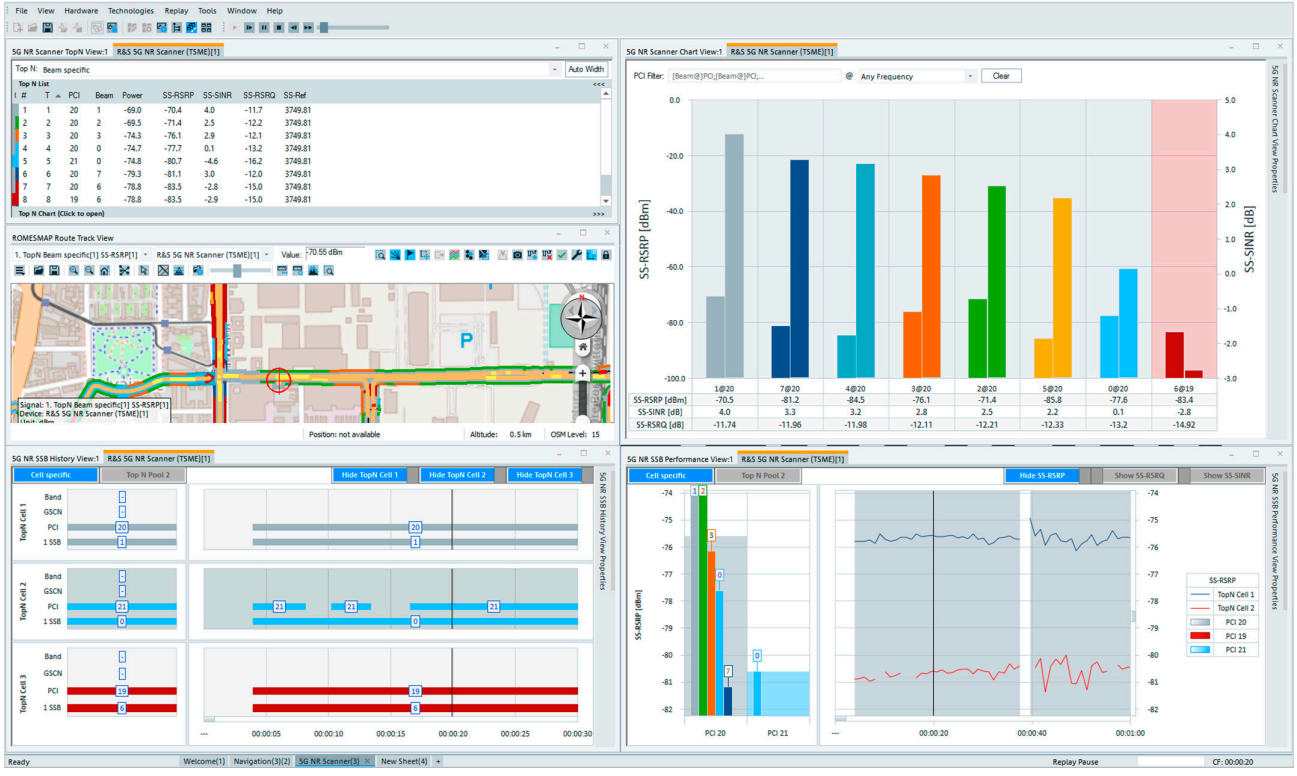
5G NR has become the leading radio access technology in mobile networks. New use cases such as ultra-high-speed internet access, massive numbers of connected devices and low latency connections require a completely different radio interface to LTE. This leads to a very flexible physical layer that can be adapted to different use cases to enhance network availability and maximize quality of service – from low latency to ultra high data rate applications. One example of flexibility is the position of synchronization signal blocks (SSB). SSBs do not necessarily have to be at the center of the 5G NR carrier. It is almost impossible to detect them manually without having detailed information about the network configuration. The automatic channel detection (ACD) feature finds the frequency and transmission case of 5G NR SSBs without any user input except the frequency range where the algorithm should search for 5G NR SSBs.

A special network configuration in the frequency domain is dynamic spectrum sharing between 5G NR and LTE. The configuration helps operators rapidly deploy 5G NR and use their spectrum even more efficiently. This puts additional requirements on receivers. The R&S®TSMA6B can identify and accurately measure such carriers. Additionally, the Future Railway Mobile Communication System (FRMCS) is on the horizon. FRMCS is a communications standard based on 5G NR that is optimized for railway voice and data communications operating on narrowband carriers. The R&S®TSMA6B can perform RF measurements on such carriers and decode SIB/layer 3 information.

Another essential building block of the 5G NR physical layer is the use of beamforming technology. It is key to overcoming the issue of higher path loss due to operation at higher frequencies. Beamforming is even used for synchronization signals that UE traditionally uses to synchronize with the network. 5G NR synchronization signals are also used for channel quality estimations, which are the basis for establishing effective data transmissions.

The R&S®TSMA6-K50 5G NR scanning option enables the R&S®TSMA6B to measure 5G NR synchronization signal blocks on both sub6 GHz and mmWave spectra with an R&S®TSME44DC (24 GHz to 44 GHz) or R&S®TSMS53DC (17 GHz to 53 GHz) downconverter. 5G NR SSB measurements help verify 5G NR coverage and the effect of beamforming, which is a very complex technology involving several components. Each SSB can be transmitted on different beams (depending on the network configuration), which can be measured by the scanner. The scanner can also read the MIB content of each SSB and SIB1 to SIB21 if broadcast by the network. Using different SSBs and beams makes the scanner results three dimensional – power and signal-to-noise and interference measurements for each PCI and SSB/beam index deliver a complete set of data to verify the transmission of each SSB/beam. 5G NR SSB measurements are supported for all SSB subcarrier spacings and transmission cases defined for sub6 GHz

ROMES drive test software supports the R&S®TSMA6B.



bands. ROMES drive test software provides new views and signals, giving a clear overview of different PCIs and SSBs for all evaluation tasks during measurement and replay.

5G RedCap (5G NR-Light) support

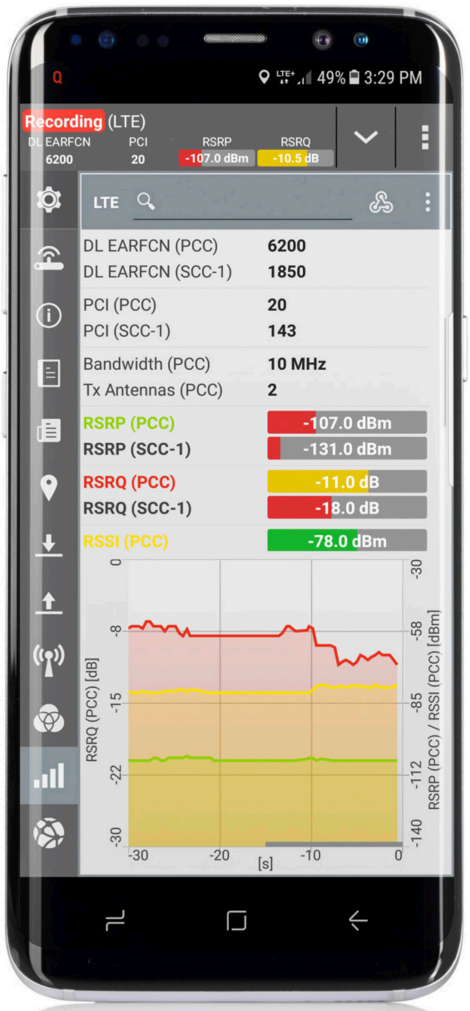
5G Reduced Capabilty (RedCap), also known as 5G NR-Light, is a 5G standard for the vast and growing internet of things (IoT) landscape based on 5G technology. 5G RedCap aims to meet the requirements of IoT devices that need smaller, less complex RF solutions with better battery life than existing 5G offerings and lower costs. The R&S®TSMx mobile network scanners enable the user to easily detect 5G RedCap carriers with the automatic channel detection (ACD) feature, verify their network coverage and decode related SIB/layer 3 information.

Advanced 5G NR measurements

Network synchronization in the time domain becomes even more important with the introduction of 5G NR in TDD mode. Perfectly synchronized networks in the time domain offer better performance because they do not suffer from overlapping uplink and downlink timeslots. The R&S®TSMA6B measures the time of arrival offset between the PPS pulse (or the internal receiver clock) and the received 5G NR and LTE synchronization signal blocks (SSB) to determine the quality of network synchronization.

While the time of arrival offset between the PPS pulse and the SSB is a relative value, some measurements require the absolute time of arrival of the 5G NR SSB. Absolute times of arrival are mandatory to measure the time alignment error of a specific site. The entire signal chain, including the baseband, signal processing, cables and antenna elements with phase shifters and filters, can add significant time delays until the signal is transmitted over the air. The receiver can provide absolute and calibrated time of arrival values (UTC time), allowing these delays to be detected and optimized. Time alignment error measurements require an extremely precise timebase and stationary measurements to avoid multipath propagation and Doppler shift. Any deviation of a network's timebase will lead to a frequency drift. The precise SSB center frequency is therefore measured to detect drifting cells in the frequency domain.

A lack of network synchronization can cause interference in uplink and downlink slots. Internal interference comes from the network itself. But multiple external factors can also cause interference. The impact on network performance is the same: a reduced signal-to-noise ratio and a sharp decline in network performance. The uplink is the weak path and, if affected, it can completely prevent connections between the network and the phone. OSS data tells network operators which cells are experiencing interference, so they can focus on finding the source and powering it down. The R&S®TSMA6B can measure the uplink and downlink spectrum by applying a time gate. The time gate can be automatically configured if the uplink/downlink configuration is broadcast in the system information messages. Otherwise, users can manually configure the uplink and downlink slots of interest. The result is a real-time spectrum of the configured time gate with a panoramic of the entire spectrum or focused on interference to quickly locate the sources.



The Android based QualiPoc application running on a smartphone controls the R&S®TSMA6B.

Cellular V2X support

For several years, vehicle manufacturers and government agencies have sought ways to increase road safety, manage traffic efficiently and, in the future, make driving more comfortable. Vehicle-to-everything (V2X) is a new generation of information and communications technology that connects vehicles to everything and can support these goals. V2X offers low latency vehicle-to-vehicle (V2V), vehicle-to-roadside infrastructure (V2I) and vehicle-to-pedestrian (V2P) communications to add a new dimension to future driver assistance systems.

In 3GPP Release 14, there is a specification for V2X communications referred to as cellular V2X (C-V2X), which uses LTE technology as the physical interface for communications.

The standard describes two modes. The vehicle-to-network (V2N) mode, with communications over the Uu interface, uses traditional cellular links to enable cloud services to be integrated into end-to-end solutions, e.g. to allow road and traffic information for a given area to be distributed to vehicles. The R&S®TSMA6B autonomous mobile network scanner with the R&S®TSMA6-K29 LTE scanning option is frequently used to validate and optimize the Uu interface in LTE networks.

The second mode is referred to as direct or sidelink mode (V2V, V2I, V2P), where communications take place over the PC5 interface. In this mode, C-V2X does not necessarily require a network infrastructure. It can operate without a subscriber identity module (SIM), without network assistance and uses GNSS as its primary source for time synchronization.

With the R&S®TSMA6-K36 C-V2X LTE scanning option, the R&S®TSMA6B measures the coverage and quality of the C-V2X direct communications between vehicles, infrastructure and vehicles, and vehicles and pedestrians. The scanner provides a neutral reference RF measurement that is independent of the suppliers of the commercial V2X transmitters and receivers, which serves as a baseline for the assessment of the system.

In addition, the scanner can decode ITS stack messages, which enables validation of a correct ITS implementation as well as verification of ITS applications in the field. By parsing the ITS messages and taking into account the location of the scanner and the arrival time of the signal, the distance and elevation difference between the C-V2X source and the scanner is calculated. If the C-V2X source broadcasts message generation time, the delay between when the message is generated and when it is received (one-way latency) can also be measured. This is particularly important for emergency braking events.

Visualization of C-V2X scanner measurements with ROMES.

The network scanner contributes to road safety and efficient traffic management, as illustrated in the following three use cases:

Roadside infrastructure deployment
As part of a C-V2X ecosystem, roadside units (RSU) will be deployed to inform vehicles about traffic conditions, road infrastructure and safety-relevant conditions. Vehicles can receive the layout of crossroads and traffic light conditions, speed limit information and warnings about construction sites. RSUs can be deployed permanently or temporarily and the information provided can be changed dynamically. To ensure that vehicles receive the information correctly, the RSU locations and coverage area must be planned as part of the rollout, similar to network planning in cellular networks. In dense urban environments with street canyon effects, challenges close to 6 GHz include radio transmission and reception and, in particular, reflections. A reference RF measurement with the scanner validates the planning result and helps improving the planning process for future sites. Following successful validation, owners and operators of critical RSU infrastructure can be sure that the system performs properly and contributes to road safety as expected.

Roadside infrastructure maintenance
Cities and road infrastructure are constantly changing, as is the RF environment in which the C-V2X system operates. The RSU hardware and connected antennas are also subject to wear in adverse environmental conditions, which is why RSUs need to be checked regularly.

The R&S®TSMA6B autonomous mobile network scanner can validate coverage and function of the transmitted signal during a drive test and can rule out the presence of any interference that could affect the operation of V2X communications.

Validation of V2V scenarios
The vehicle-to-vehicle application undergoes rigorous testing in the development and deployment phase.

During development, tests are conducted in proving grounds using real and simulated vehicles to validate functions such as emergency electronic brake light, left turn assist and intersection movement assist. The RF signals of all present real or virtual vehicles can be analyzed with the C-V2X scanner to validate the test setup.

Very dense traffic situations can occur in the field, leading to high spectrum occupancy and possible interference. The C-V2X scanner can analyze the RF environment in such situations and detect possible issues.

Software solutions
With the R&S®TSMx-API for R&S®TSMx mobile network scanners, the R&S®TSMA6B can be used with any software in the fields of roadside infrastructure and traffic management testing, planning, deployment and maintenance.

The ROMES software supports C-V2X scanning for engineering use cases and as a reference implementation.

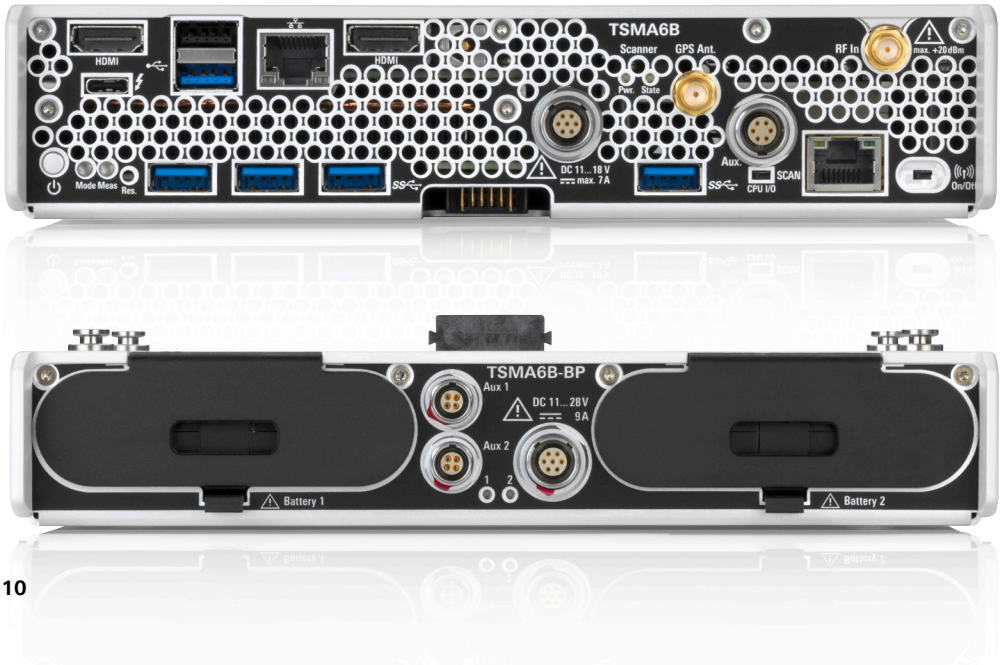
Mission-critical voice and data (MCX) network support (P25 and TETRA measurements)

Another safety-relevant use case of the R&S®TSMA6B is coverage and interference measurement in mission-critical voice and data networks. Such networks are used by fire departments, police and other emergency services and are designed for maximum coverage and reliability in emergency situations. Sufficient RF coverage and quality affects everyone's safety. Depending on the region, TETRA/TETRA DMO and/or P25 networks are deployed. The R&S®TSMA6B supports TETRA/TETRA DMO and P25 phase 1 and 2. Demodulation of system information is supported in TETRA/TETRA DMO.

Maximum connectivity for challenging measurement campaigns

Data collection in current measurement campaigns is not limited to a single data source. Multitechnology, multi-scanner measurements (MIMO) and user equipment based measurement data complement each other, yielding a full set of data for deep RF insights and KPIs for user experience measurements such as video quality. Seven USB ports (5 × USB 3.1, 1 × USB-C, 1 × USB 2.0) enable additional data sources to be connected such as smartphones, IoT chipsets and additional frontends, for example for 4x4 MIMO measurements. The R&S®TSMA6B accepts all other wired connections from a PC such as HDMI™ or an Ethernet connection for network access. The scanner also has a dedicated LAN port for a second scanner frontend (R&S®TSME6). If required, the integrated PC can be bypassed and the R&S®TSMA6B turns into a purely passive receiver with direct access to its LAN port. An external and extremely powerful PC can run the measurement software for this special purpose, ensuring maximum flexibility and freedom.

Wireless connections such as Wi-Fi® and Bluetooth® allow portable devices to set up, control and run measurement campaigns on the R&S®TSMA6B via Windows Remote Desktop with access to Windows based software running on the R&S®TSMA6B and the Android based QualiPoc application running on a smartphone. For maximum efficiency and convenience, users can perform measurements by controlling the R&S®TSMA6B from a mobile device.



R&S®TSMA6B rear view with connectors.

R&S®TSMA6B-BP battery pack with two batteries (R&S®MNT-BP99WH).

Portable solution to simplify measurement campaigns

Getting the equipment ready and handling the equipment during measurements has a considerable impact on the length of the measurement campaign. The goal is to seamlessly collect all data as quickly as possible.

For precise and uninterrupted location tracking even in critical dense urban and in-vehicle environments, the R&S®TSMA6B includes a multi-GNSS receiver with exceptionally high sensitivity for position fixing and position tracking that supports all major satellite navigation systems. Using up to three satellite systems in parallel for precise location tracking, the multi-GNSS chip uses the results from the integrated gyro/acceleration sensor to bridge gaps in satellite based data. This is useful for example when driving through road tunnels in a vehicle (requires a specific mounting solution).

For mobile operation, the R&S®TSMA6B can optionally be equipped with the R&S®TSMA6B-BP battery pack. This is attached to the scanner's housing via a vibration-proof mechanical connection and has two easily accessible rechargeable and hot-swappable batteries. The R&S®TSMA6B is always ready for operation and no separate charger is required since the batteries can be charged directly in the instrument. Charging takes place automatically when the R&S®TSMA6B is connected to a power supply, e.g. in a vehicle or an external power supply.

The optional R&S®TSMA6-ZCB2 carrying bag offers convenience when performing measurements. The bag has room for the R&S®TSMA6B with a battery pack, two spare batteries, a mobile phone or tablet, a one-port (R&S®TSME-Z10) or two-port antenna (R&S®TSME-Z11) and an R&S®TSME6 for 2x2 MIMO measurements or an R&S®TSME44DC/R&S®TSMS53DC and a mmWave antenna mounting kit. The battery pack is easily accessible so its charge level can be checked at any time and batteries can be quickly replaced during operation.

R&S®TSMA6-ZCB2 carrying bag with R&S®TSMA6B, battery pack and tablet.

ADVANCED MEASUREMENTS FOR DEEP NETWORK INSIGHTS DURING MEASUREMENT CAMPAIGNS

Power spectrum measurement up to 6 GHz for spectrum clearance

To overcome capacity problems in mobile networks, additional spectra will be acquired. In the latest frequency plans, the spectrum from 3.2 GHz to 6 GHz will be used for additional LTE carriers as well as for the fifth generation of mobile networks, which is ready to become the main technology and is expected to grow significantly over the next few years. To provide the best quality of service following a commercial network rollout, spectrum measurements during the early engineering phase must ensure that the new spectrum is free of interference. Especially when it comes to spectra that overlap with Wi-Fi® and are heavily occupied by Wi-Fi® access points, a general picture of spectrum occupancy is needed to detect the noise floor and identify areas with a critical signal to interference and noise ratio (SINR) before network rollout.

NB-IoT/Cat NB1 measurements

The R&S®TSMA6-K34 option enables the R&S®TSMA6B to measure in NB-IoT/Cat NB1 networks. NB-IoT/Cat NB1 is a 3GPP standard for connecting a huge number of devices, such as smart meters, to the internet of things (IoT). While traditional LTE standards mainly enhance throughput and network capacity, NB-IoT/Cat NB1 focuses on low power consumption for IoT devices and maximum availability of the connection, especially indoors.

Indoor measurements require lightweight and ultracompact scanners with low power consumption. For coverage validation, troubleshooting and optimization, the R&S®TSMA6B measures signal power and quality and the SINR on each available physical cell ID based on synchronization and reference signals.

To efficiently integrate the NB-IoT carrier into the available spectrum, the standard provides three operating modes. The R&S®TSMA6B supports all three modes. The most spectrum-efficient mode is the LTE in-band operating mode, where the NB-IoT carrier uses the spectrum of one LTE physical resource block (PRB). The guard band and standalone operating modes allow NB-IoT deployments independent of the LTE spectrum.

With the appropriate R&S®TSMA6 options, NB-IoT measurements can be run simultaneously with measurements on other technologies such as GSM, LTE and (W)CDMA. For optimization or when troubleshooting, the impact of the NB-IoT spectrum on adjacent GSM/LTE/(W)CDMA spectra and vice versa can be validated.

LTE-M measurements

LTE-M is another 3GPP standard for connecting things to the internet. LTE-M addresses use cases other than NB-IoT, for instance voice (VoLTE) and mobility. It also provides higher data rates than NB-IoT. LTE-M is based on legacy LTE and reuses some of the cell-specific signals. Like NB-IoT, LTE-M uses smart mechanisms to enlarge the link budget. One of these mechanisms is frequency hopping to overcome fading and areas of bad SINR (resulting from LTE traffic and other interference) across the LTE spectrum. This is achieved by dividing the LTE carrier into several LTE-M narrowbands that can handle LTE-M traffic in a manner that suits the RF environment. The R&S®TSMA6B supports LTE-M measurements that deliver RF parameters (SINR, RSRP, RSRQ and RSSI) on each of these LTE-M narrowbands via a PCI interface to identify, for example, the best narrowband for LTE-M data transmission.

In the ROMES drive test software, all narrowbands can be compared at a glance to evaluate the RF environment in the surrounding narrowbands. Fading and interference from LTE traffic and other pilot signals can cause the RF parameter differences between the narrowbands to be quite remarkable. Scanner based and module based results can also be compared to verify whether the LTE-M module is using the best narrowband for data transmission.

Reduced setup time to increase efficiency of drive and walk tests

Setting up the measurement campaign is the most time-consuming process before valuable field data can be captured during drive and walk tests. To reduce costs and setup time, the R&S®TSMA6B provides a helpful channel configuration feature for major 3GPP standards such as 5G NR, NB-IoT, LTE, LTE-M, WCDMA, GSM and CDMA2000®/1xEV-DO. In combination with the R&S®ROMES4ACD or the R&S®TSMA6-K40 automatic channel detection option, the R&S®TSMA6B automatically detects active channels in a specified 3GPP band or frequency range.

The results obtained during automatic channel detection can be directly added to the workspace, even during the measurement campaign. Technologies, frequency bands and carrier bandwidths are no longer static in shared spectrum networks. LTE can be deployed in a spectrum traditionally used for GSM or WCDMA, for example. During drive and walk tests in such networks, frequent bandwidth and channel changes can regularly occur in all environments depending on the rollout strategy. To speed up the detection process and release signal processing capacity for other parallel measurement tasks, users can enhance the automatic channel detection feature with an optional spectrum scan.

LTE subband measurements

Passive scanner measurements are no longer limited to measuring specific signals and channels and decoding SIB/L3 information. The R&S®TSMA6B uses uses intelligent and optimized signal processing algorithms to provide deep network insights that go beyond purely RF parameters.

Dedicated measurements on reference signals of each LTE resource block deliver a complete picture of broadband carriers. They also provide insights into fading effects, wideband and narrowband interference and in-band operation of advanced IoT technologies. These technologies occupy LTE resource blocks such as LTE-M and NB-IoT/Cat NB1 and might affect adjacent subbands. To estimate the upper limit of data throughput based on the current RF conditions, the scanner delivers an estimated throughput value, which is visualized by ROMES for each data layer in MIMO measurement setups.

Position estimation of base stations

During a drive test, ROMES uses measurement and location data provided by the R&S®TSMA6B to quickly and accurately estimate the geographic position and sector orientation of the base stations. 5G NR, GSM, WCDMA, LTE, NB-IoT, CDMA2000®/1xEV-DO and TETRA networks are supported in parallel. This unique feature enables users to quickly generate a base station list for export or graphical display.

WIDE RANGE OF APPLICATIONS

Controlling and monitoring measurements with smartphones and tablets

During a measurement campaign, the R&S®TSMA6B records the current RF environment while the Android based QualiPoc application carries out extensive service tests on smartphones, including evaluation of voice and video quality. QualiPoc Android clearly displays the measured values recorded by the scanner on a monitor. Coupled with the R&S®TSMA6B, QualiPoc delivers all the required measurement data. User-friendly operation enables complicated tasks such as optimization in multi-story buildings to be performed precisely and efficiently.

Running Windows based measurement software on the integrated high-performance PC

The R&S®TSMA6B features a fully functional computer running Windows 10 IoT Enterprise x64. Any Rohde&Schwarz drive test software that supports the R&S®TSMA6B can be installed. External storage media containing software to be installed can be connected via USB.

No cables or accessories are required for mobile use. The software running on the scanner can be controlled via Wi-Fi® 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®TSMA6B computer. This makes the R&S®TSMA6B scanner a compact, fully functional mobile measuring system. In addition to mobile operation, the R&S®TSMA6B 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.

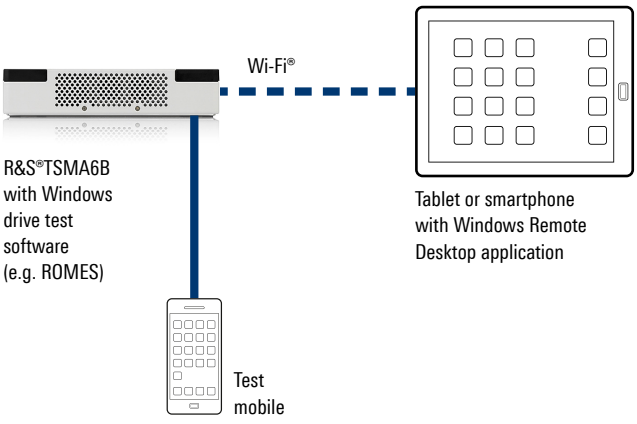
Open interface and use as OEM

Many manufacturers have integrated Rohde&Schwarz scanners permanently into their drive test toolchain. The application programming interface R&S®TSMx-API for R&S®TSMx mobile network scanners makes it easy to integrate the R&S®TSMA6B and create individual solutions for mobile network testing and cellular network analysis.

The native Windows based ViCom API supports all technologies provided by the network scanner. The new R&S®ViComWeb runs an API server under Windows that is queried via the web, which makes integration simpler than with the native Windows API.

For details about R&S®ViComWeb, see the R&S®TSMx-API for R&S®TSMx mobile network scanners product brochure (PD 3684.1366.12).

Windows based measurement software on the R&S®TSMA6B



SPECIFICATIONS

Specifications		
RF characteristics		
Frequency range		350 MHz to 6 GHz
Level measurement uncertainty	350 MHz to 3 GHz	< 1 dB
	3 GHz to 6 GHz	< 1.5 dB
Maximum operating measurement range input level		–10 dBm (nom.)
Maximum extended measurement range input level	in extended range mode: not 100 % compliant with measured values	+10 dBm (nom.)
Maximum safe permissible input level		+20 dBm/10 V DC
Noise figure	900 MHz	5 dB (meas.)
	2100 MHz	5 dB (meas.)
	3500 MHz	6 dB (meas.)
	5100 MHz	7 dB (meas.)
Intermodulation-free dynamic range	900 MHz	–2 dBm (meas.)
	2100 MHz	–2 dBm (meas.)
	3500 MHz	–9 dBm (meas.)
	5100 MHz	–14 dBm (meas.)
RF receive paths		1
VSWR (preselection on/off)	350 MHz ≤ f ≤ 1.6 GHz	< 2.7/2.0 (meas.)
	1.6 GHz ≤ f ≤ 2.45 GHz	< 2.6/1.7 (meas.)
	2.45 GHz ≤ f ≤ 3.6 GHz	< 3.0/2.3 (meas.)
	3.6 GHz ≤ f ≤ 6.0 GHz	< 3.4/2.6 (meas.)
Frequency accuracy	GPS locked	0.03 ppm
	GPS unlocked	< 1 ppm
LTE/LTE-M characteristics		
Frequency bands supported		no restrictions
Measurement modes	automatic detection of carrier bandwidth: 1.4/3/5/10/15/20 MHz	LTE-FDD, LTE-TDD, LTE-M
Measurement speed (LTE/LTE-M)	automatic detection of all 504 physical cell IDs with SIB decoding active/two adjacent channels	max. 390 Hz/25 Hz (meas.)
Physical decoding accuracy		
Sensitivity for initial physical cell ID decoding	sync signal power (LTE)	–128 dBm (meas.)
	RSRP (LTE/LTE-M)	–147 dBm/–132 dBm (meas.)
Sensitivity after successful physical cell ID decoding	sync signal power (LTE)	–130 dBm (meas.)
	RSRP (LTE/LTE-M)	–149 dBm/–132 dBm (meas.)
WB RS SINR dynamic range		–20 dB to +42 dB (meas.)
Sync SINR dynamic range		–20 dB to +42 dB (meas.)
PCI false detection (ghost code)		$< 10^{-8}$
LTE C-V2X characteristics		
Measurements supported	PSCCH and PSSCH	RS-RSRP, RS-CINR, RSSI
Regions supported		EU, NA, CN
Transmission mode supported		TM4 (GNSS reception required)
Sensitivity		–110 dBm
Measurement speed		2 Hz to 4 Hz
CINR dynamic range		–5 dB to +30 dB
NB-IoT/Cat NB1 characteristics		
Frequency bands supported		no restrictions
NB-IoT/Cat NB1 measurement modes		▶ standalone ▶ guard band ▶ in-band
Sensitivity for physical cell ID decoding (initial decoding)	sync signal power (NSSS power)	–132 dBm (meas.)
	reference signal power (NRSRP)	–143 dBm (meas.)

Specifications		
Sensitivity for physical cell ID decoding (after successful decoding)	sync signal power (NSSS power)	–135 dBm (meas.)
	reference signal power (NRSRP)	–146 dBm (meas.)
Sync CINR dynamic range	sync signals (NSSS CINR)	–15 dB to +30 dB (meas.)
	reference signals (NRS CINR)	–15 dB to +30 dB (meas.)
Demodulation threshold	sync signal power (NSSS power)	–120 dBm (meas.)
Measurement speed		5 Hz (single channel) (meas.)
PCI false detection (ghost code)		$< 10^{-8}$
5G NR characteristics		
Frequency bands supported		FR1 (sub6 GHz), FR2 (24 GHz to 44 GHz), FDD/TDD up to Release 16/17
SSB subcarrier spacings supported		15 kHz, 30 kHz, 120 kHz, 240 kHz
SSB periodicities supported		5 ms, 10 ms, 20 ms, 40 ms, 80 ms, 160 ms
SSB index detection threshold (single PCI)	SS-RSRP (10 ms periodicity, 30 kHz subcarrier spacing)	–145 dBm (meas.)
	SS-RSRP (40 ms periodicity, 30 kHz subcarrier spacing)	–140 dBm (meas.)
	SS-RSRP (5 ms periodicity, 15 kHz subcarrier spacing)	–153 dBm (meas.)
	SS-RSRP (20 ms periodicity, 15 kHz subcarrier spacing)	–146 dBm (meas.)
	SS-RSRP (20 ms periodicity, 120 kHz subcarrier spacing)	–136 dBm (meas.)
	SS-RSRP (20 ms periodicity, 240 kHz subcarrier spacing)	–135 dBm (meas.)
SINR dynamic range	against AWGN	
	20 ms periodicity, 30 kHz subcarrier spacing	–21 dB to +40 dB (meas.)
	20 ms periodicity, 240 kHz subcarrier spacing	–18 dB to +33 dB (meas.)
	against interfering cell	
	20 ms periodicity, 30 kHz subcarrier spacing	–40 dB to +40 dB (meas.)
	20 ms periodicity, 240 kHz subcarrier spacing	–40 dB to +33 dB (meas.)
Measurement speed (single PCI)	20 ms periodicity, 30 kHz subcarrier spacing	49 Hz (meas.)
	40 ms periodicity, 30 kHz subcarrier spacing	26 Hz (meas.)
	20 ms periodicity, 120 kHz subcarrier spacing	49 Hz (meas.)
	80 ms periodicity, 120 kHz subcarrier spacing	14 Hz (meas.)
Minimum MIB demodulation threshold	SS-RSRP (30 kHz subcarrier spacing)	–144 dBm (meas.)
	SS-SINR (30 kHz subcarrier spacing)	–21 dB (meas.)
Minimum SIB demodulation threshold	SS-RSRP (30 kHz subcarrier spacing)	–123 dBm (meas.)
	SS-SINR (30 kHz subcarrier spacing)	–5 dB (meas.)
Timebase accuracy (for time alignment measurements)	depending on quality of GNSS signal	5 ns to 30 ns (meas.)
WCDMA characteristics		
Frequency bands supported		no restrictions
Number of RF carrier frequencies		max. 32
Measurement speed	high speed/high dynamic mode, automatic detection of all 512 scrambling codes	300 Hz/80 Hz with BCH demodulation (meas.)
Scrambling code detection sensitivity (RSCP)		
Sensitivity for initial SC detection	high speed/high dynamic mode	–119 dBm/–127 dBm (meas.)
Sensitivity after successful SC detection	high speed/high dynamic mode	–124 dBm/–132 dBm (meas.)
Scrambling code false detection (ghost code)		$< 10^{-9}$
Dynamic range E_c/I_0 for initial detection	high speed/high dynamic mode	–20 dB/–26 dB (meas.)
Dynamic range E_c/I_0 after successful detection	high speed/high dynamic mode	–23 dB/–31 dB (meas.)
Minimum BCH demodulation threshold E_c/I_0	high speed/high dynamic mode	> –14 dB/–20 dB (meas.)
GSM characteristics		
Frequency bands supported		no restrictions
Measurement modes	in parallel	DB/TCH/SCH code power, TCH total in-band power, TCH timeslot power, GSM spectrum, BCH demodulation for all system information types

Specifications		
Measurement speed	with SI decoding active	780 channels/s (meas.)
Sensitivity	detection/BSIC decoding/BCH decoding	–124 dBm/–122 dBm/–117 dBm (meas.)
BSIC decoding dynamic range		
Sensitivity for initial BSIC detection		C/I > –2 dB (meas.)
Sensitivity after successful BSIC detection		C/I > –24 dB (meas.)
BCCH decoding dynamic range		C/I > 0 dB (meas.)
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 (meas.)
PN detection sensitivity (initial decoding)	RSCP without/with demodulation	–130 dBm/–125 dBm (meas.)
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 (meas.)
PN detection sensitivity (initial decoding)	RSCP with demodulation	–122 dBm (meas.)
TETRA characteristics		
Measurement type		RF parameters, constellation diagram/EVM measurements
TETRA bands supported		350 MHz to 6 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, 17/s for a 10 MHz block (meas.)
Sensitivity (RSSI)	RSSI measurements	–128 dBm (meas.)
	TETRA BSCH decoding (BSCH decoding for channels with SNR > 8 dB)	–121 dBm (meas.)
	BER measurements	–121 dBm (meas.)
Project 25 (P25) characteristics		
Sensitivity (RSSI)		–130 dBm to –25 dBm (meas.)
Dynamic range (SNR)		3 dB to 50 dB (meas.)
Measurement rate		max. 5 Hz (meas.)
WiMAX™ characteristics		
Frequency bands supported		no restrictions
Measurement speed	automatic detection of all 114 preamble indices	9 channels/s (meas.)
Preamble decoding accuracy	frame duration: 5 ms, FFT size: 1024, bandwidth: 10 MHz/2.657 GHz	±1 dB (–20 dBm to –110 dBm) (meas.)
Sensitivity for initial preamble decoding	RSSI, bandwidth: 10 MHz	–105 dBm (meas.)
Sensitivity after successful preamble decoding	RSSI, bandwidth: 10 MHz	–129 dBm (meas.)
SINR dynamic range		–22 dB to +26 dB (meas.)
RF power scan		
Frequency range		350 MHz to 6 GHz
Frequency resolution		140 Hz to 1.438 MHz
Sensitivity	22.46 kHz (RMS) frequency resolution, at 900 MHz	–126 dBm (meas.)
	140 Hz resolution bandwidth, RMS, at 900 MHz	–147 dBm (meas.)
Scan speed	180 kHz resolution, 100 MHz span, 20 MHz bandwidth, FFT size: 128	312 Hz (meas.)
	11.23 kHz resolution, 10 MHz span, 10 MHz bandwidth, FFT size: 1024	1000 Hz (meas.)
	140 Hz resolution, 1 MHz span, 1 MHz bandwidth, FFT size: 8192	130 Hz (meas.)
RSSI scan speed	20 MHz span, 20 MHz bandwidth, FFT size: 1024	99 GSM channels: max. 5770 Hz (94050 channels/s) (meas.)
	20 MHz span, 20 MHz bandwidth, FFT size: 256	4 WCDMA channels: max. 5800 Hz (3800 channels/s) (meas.)
	20 MHz span, 20 MHz bandwidth, FFT size: 256	1 LTE channel (100 RB): max. 5700 Hz (950 channels/s) (meas.)

Specifications		
Maximum number of frequency ranges		20
Detectors		max., min., RMS, auto
CW scanning		
Sensitivity channel power RSSI scan	200 kHz channel (GSM)	–119 dBm (meas.)
	5 MHz channel (UMTS)	–104 dBm (meas.)
	20 MHz channel (LTE)	–98 dBm (meas.)
Scan rate	200 kHz channel (GSM)	2450 Hz (254000 channels/s) (meas.)
	5 MHz channel (UMTS)	13100 Hz (52400 channels/s) (meas.)
	20 MHz channel (LTE)	12995 Hz (12995 channels/s) (meas.)
Multitechnology, scenario 1		
GSM		
Active channels		183
Cycle time [1]		4.2 s (meas.)
WCDMA		
Active channels		3
Cycle time		2.1 s (meas.)
LTE		
Active channels		16
Cycle time		5.3 s (meas.)
5G NR		
Active channels		4
Cycle time		1.8 s (meas.)
Multitechnology, scenario 2		
LTE		
Active channels		16
Cycle time		4.8 s (meas.)
5G NR		
Active channels		4
Cycle time		1.5 s (meas.)
Integrated PC		
Processor		R&S®TSMA6B with either: Intel® Core™ i7-8665U, quad core, 4.4 GHz turbo, 8 Mbyte cache; or Intel® Core™ i5-8365U, quad core, 4.1 GHz turbo, 6 Mbyte cache
Memory	standard hardware configuration R&S®TSMA6B-BST	16 Gbyte DDR4 RAM
	extended hardware configuration R&S®TSMA6B-B1T	32 Gbyte DDR4 RAM
Graphics		integrated Intel® UHD 620 graphics
Hard disk	standard hardware configuration R&S®TSMA6B-BST	256 Gbyte (M.2, 2280 form factor)
	extended hardware configuration R&S®TSMA6B-B1T	1 Tbyte (M.2, 2280 form factor)
Operating system		Windows 10 IoT Enterprise x64
Connectivity		
Scanner link		integrated (1 × Gigabit Ethernet) or external access
LAN		2 × Gigabit Ethernet
USB		► 1 × USB 3.1 Gen2 (type C), 0.9 A ► 1 × USB 3.1 Gen2 (type A), 0.9 A ► 4 × USB 3.1 Gen1 (type A), 2 × 1.7 A/2 × 0.9 A ► 1 × USB 2.0 (type A), 0.5 A
Thunderbolt™		1 × Thunderbolt™ 3 (combined with USB 3.1 Gen2 (type C))
WLAN		IEEE 802.11a/b/g/n/ac/ax (access point limited to 2.4 GHz)
Bluetooth®		Bluetooth® 5.0

[1] Cycle time: time in seconds for one scanning cycle or the time needed to generate at least one measurement result for all configured channels.

Specifications		
Video		2 × HDMI™ 2.0, 1 × USB-C 3.1
GPS	antenna supply	active 3 V, max. 25 mA, SMA female
RF		SMA female
User interface		web GUI (via LAN or integrated Wi-Fi® hotspot); LEDs: 2 × scanner, 1 × firmware based/from microcontroller (power-on, error, warning), 1 × controlled by measurement software
GPS/GLONASS receiver		
Type	max. three in parallel, combinations depend on software implementation	multi-GNSS: GPS, GLONASS, BeiDou, Galileo
Sensitivity (GPS, Galileo, GLONASS)	cold start	–148 dBm
	tracking/reacquisition	–160 dBm
Acquisition (GPS, Galileo, GLONASS)	cold start/hot start	26 s/< 1 s
Channels		50
General data		
Environmental conditions		
Temperature range	operating	0 °C to +50 °C
	in R&S®TSMA6-ZCB2 carrying bag	+5 °C to +40 °C
	storage	–25 °C to +70 °C
Damp heat		+25 °C/+55 °C, 95 % relative humidity, noncondensing, cyclic, in line with EN 60068-2-30
Mechanical resistance		
Vibration	sinusoidal	5 Hz to 55 Hz, 0.15 mm amplitude constant, 55 Hz to 150 Hz, 0.5 g constant, in line with EN 60068-2-6
	random	10 Hz to 300 Hz, acceleration 1.9 g (RMS), 300 Hz to 500 Hz, acceleration 1.2 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	DC	11 V to 18 V – 0 %/+ 10 %
Maximum input current		8.5 A
Rated power	no external interface devices (USB, HDMI™)	60 W
Product conformity		
Electromagnetic compatibility	EU: in line with Radio Equipment Directive 2014/53/EU	applied harmonized standards: ETSI EN 300 328, ETSI EN 303 413, EN 61010-1:2010/A1:2019, ETSI EN 301 489-1, ETSI EN 301 489-17, ETSI EN 301 489-19, EN 300 339, EN 55032:2015, EN 50498:2010
	international	UN ECE R 10
Electrical safety	EU: in line with Radio Equipment Directive 2014/53/EU	applied harmonized standard: EN 61010-1
	international	IEC 61010-1
Restriction of the use of hazardous substances	EU: in line with 2011/65/EU (RoHS)	applied harmonized standard: EN IEC 63000:2018
International approvals	USA, Canada	FCC, IDES
Calibration interval		24 months
Dimensions	W × H × D	204 mm × 45 mm × 171 mm (8.03 in × 1.77 in × 6.73 in)
Weight		1149 g (2.53 lb)

R&S®TSMA6-Z1 AC power supply		
Power rating		
Input voltage	at +25 °C (1.6 A charge/1.6 A discharge)	100 V to 264 V AC
Input frequency		47 Hz to 63 Hz
Input current	230 V AC	0.7 A
Inrush current		70 A
Efficiency		CEC VI
Standby power		0.15 W
Output voltage		15 V DC
Output current	> 100 V AC	7 A
Load regulation		max. ±5 %
Standard output connector		7-pin ODU, snap-in male
Standard output cable length		120 cm (3.9 ft)
Temperature range	operating	–10 °C to +70 °C
	derating 230 V AC	derated linearly from +45 °C at 100 % load to +70 °C at 50 % load
	derating 110 V AC	derated linearly from +40 °C at 100 % load to +60 °C at 50 % load
	storage	–40 °C to +85 °C
Product conformity		
Electromagnetic compatibility	EU: in line with Radio Equipment Directive 2014/53/EU	applied harmonized standards: ETSI EN 300489-1, ETSI EN 300489-17, ETSI EN 300489-22, ETSI EN 300328, ETSI EN 301893, ETSI EN 300440, EN 55032, EN 300339, EN 50498
	international	CISPR 32, UN ECE R 10
Electrical safety	EU: in line with Radio Equipment Directive 2014/53/EU	applied harmonized standard: EN 61010-1
	international	IEC 61010-1
Restriction of the use of hazardous substances	EU: in line with 2011/65/EU (RoHS)	applied harmonized standard: EN 50581
Dimensions	W × H × D	67 mm × 35 mm × 167 mm (2.64 in × 1.38 in × 6.57 in)
Weight		583 g (1.29 lb)

R&S®TSMA6B-BP battery pack unit		
Autonomous power path switching	DC IN path/battery path	yes
Number of battery bays	form factor: battery type	2
Type of supported batteries		R&S®MNT-BP99WH only
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, simultaneous discharging
SMB interface to host (R&S®TSMA6B)		yes
Charging time for two batteries in parallel	R&S®TSMA6B powered off	typ. 4.0 h
Autonomy	two fully charged batteries in bay, typical CPU load, no external USB devices	typ. 3.5 h
User interface	in combination with the R&S®TSMA6B (one dual color LED per bay)	charging state indicator LED, acoustic battery low charge alarm
	standalone or R&S®TSMA6B powered off (one LED per bay)	charging state indicator LED
General data		
Power rating		
Supply voltage		11 V to 28 V DC – 0 %/+ 10 %
Maximum input current		11 A
Input power	R&S®TSMA6B connected, two batteries charging	110 W
	R&S®TSMA6B powered off, two batteries charging	60 W

R&S®TSMA6B-BP battery pack unit		
Standby power	R&S®TSMA6B powered off, no batteries charging	1 W
Output voltage, output power		
	docking connector (R&S®TSMA6B)	
	DC IN powered	18.5 V at 65 W
	battery powered	15 V at 65 W (nom.)
	Aux 1/2 connector	
	DC IN powered	18.5 V at 30 W
	battery powered	15 V at 30 W (nom.)
	overall output power (R&S®TSMA6B + Aux 1 + Aux 2)	105 W
Efficiency		> 85 %
Connectors		DC IN (ODU 7-pin, female), DC OUT (6-pin docking connector), DC Aux (ODU 6-pin, female)
Environmental conditions		
Temperature range	operating	–10 °C to +55 °C
	charging	0 °C to +35 °C
	in R&S®TSMA6-ZCB2 carrying bag	0 °C to +25 °C
	storage [1]	–20 °C to +60 °C
Damp heat		+25 °C/+55 °C, 95 % relative humidity, non-condensing, 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
Shock		40 g shock spectrum, in line with MIL-STD-810E, method 516.4, procedure I
Product conformity		
Electromagnetic compatibility	EU: in line with Radio Equipment Directive 2014/53/EU	applied harmonized standards: ETSI EN 300489-1, ETSI EN 300489-17, ETSI EN 300489-22, ETSI EN 300328, ETSI EN 301893, ETSI EN 300440, EN 55032, EN 300339, EN 50498
	international	CISPR 32, UN ECE R 10
Electrical safety	EU: in line with Radio Equipment Directive 2014/53/EU	applied harmonized standard: EN 61010-1
	international	IEC 61010-1
	UN transportation testing for lithium batteries	UN DOT 38.3
Restriction of the use of hazardous substances	EU: in line with 2011/65/EU (RoHS)	applied harmonized standard: EN 50581
Dimensions (W × H × D)	R&S®TSMA6B-BP	204 mm × 45 mm × 171 mm (8.03 in × 1.77 in × 6.73 in)
	stacked R&S®TSMA6B-BP plus R&S®TSMA6B	204 mm × 81 mm × 171 mm (8.03 in × 3.19 in × 6.73 in)
Weight	R&S®TSMA6B-BP without batteries	677 g (1.49 lb)
	R&S®TSMA6B-BP plus two batteries in bay	1554 g (3.43 lb)

[1] Note: Extended exposure to temperatures above +45 °C could degrade battery performance and life.

R&S®MNT-BP99WH battery		
Life expectancy	at +25 °C (3.0 A charge/1.2 A discharge)	> 300 cycles, with min. 63 % of initial capacity
Charging options		inside the R&S®TSMA6B-BP or with separate R&S®TSMA-BC2 or R&S®TSMA6-BC4 charger
Electrical characteristics		
Nominal voltage		14.4 V
Initial capacity		> 6900 mAh
Maximum charge current	allowed ambient temperature: 0 °C to +45 °C	4.8 A
Maximum charge voltage		16.8 V ± 50 mV
Maximum discharge current		10 A
Peak discharge current		20 A
Continuous discharge current	–20 °C to +25 °C	8.5 A
	–10 °C to +10 °C	linear degradation (0 A to 8.25 A)
Temperature range	operating	0 °C to +40 °C (charging), –10 °C to +55 °C (discharging)
	storage [1)]	–20 °C to +50 °C
Product conformity		in line with CE, UL2054, FCC, PSE, KC, Gost, EAC, CQC, RCM, IEC 62133, UN 38.3, RoHS, Reach, BIS, BSMI
Dimensions	W × H × D	77.4 mm × 22.5 mm × 150.4 mm (3.05 in × 0.89 in × 5.92 in)
Weight		430 g (0.95 lb)

Measured values (meas.)
Characterize expected product performance by means of measurement results gained from individual samples.

Nominal values (nom.)
Characterize product performance by means of a representative value for the given parameter, e.g. nominal impedance. In contrast to typical data, a statistical evaluation does not take place and the parameter is not tested during production.

[1)] Note: Extended exposure to temperatures above +45 °C could degrade battery performance and life.

ORDERING INFORMATION

Designation	Type	Order No.
Base unit (includes accessories such as power cable, manual)		
Autonomous mobile network scanner, standard hardware configuration	R&S®TSMA6B	4900.8005.20
Standard hardware configuration: 256 Gbyte SDD and 16 Gbyte RAM	R&S®TSMA6B-BST	4901.0514.20
NUC PC hardware with either Intel® Core™ i5 or i7 processor	TSMA6B-BN2	4901.4055.02
Scope of delivery: R&S®TSMA6B, Ethernet patch cable, R&S®TSME-Z7 multiband antenna, 4 collar screws, 12 V DC power cable (cigarette lighter plug), active GPS antenna, quick start guide, hinged ferrite		
Hardware options (only available ex factory)		
Removable solid-state drive (SSD)	R&S®TSMA6B-BEB	4901.4310.02
Hardware upgrade for integrated PC: 1 Tbyte SDD and 32 Gbyte RAM	R&S®TSMA6B-B1T	4901.0520.20
Recommended hardware options		
Battery pack, includes two batteries (R&S®MNT-BP99WH)	R&S®TSMA6B-BP	4900.9001.20
Software options (firmware)		
P25 scanning	R&S®TSMA6-K19	4901.5280.02
WCDMA scanning	R&S®TSMA6-K21	4901.0789.02
CDMA2000® scanning	R&S®TSMA6-K22	4901.0766.02
GSM scanning	R&S®TSMA6-K23	4901.0795.02
1xEV-DO scanning	R&S®TSMA6-K24	4901.0750.02
CW scanning	R&S®TSMA6-K25	4901.0814.02
TETRA scanning	R&S®TSMA6-K26	4901.0743.02
RF power scan	R&S®TSMA6-K27	4901.0720.02
WiMAX™ scanning	R&S®TSMA6-K28	4901.0737.02
LTE scanning	R&S®TSMA6-K29	4901.0772.02
LTE MIMO scanning	R&S®TSMA6-K30	4901.0714.02
LTE eMBMS scanning	R&S®TSMA6-K32	4901.0643.02
NB-IoT/Cat NB1 scanning	R&S®TSMA6-K34	4901.0808.02
LTE-M scanning	R&S®TSMA6-K35	4901.0208.02
C-V2X LTE scanning	R&S®TSMA6-K36	4901.0272.02
5G NR scanning	R&S®TSMA6-K50	4901.0966.02
5G NR scanning add-ons	R&S®TSMA6-K51	4901.0250.02
5G RedCap scanning	R&S®TSMA6-K52	4901.0295.02
Automatic channel detection	R&S®TSMA6-K40	4901.0614.02
MNT software installation	R&S®TSMA6-K61	4901.0820.02
R&S®NESTOR software installation	R&S®TSMA6-K62	4901.0266.02
Block I/Q data	R&S®TSMA6-K10	Contact your local Rohde&Schwarz sales office
Simultaneous measurement in 1 band	R&S®TSMA6-K1B	4901.0695.02
Simultaneous measurement in 2 bands	R&S®TSMA6-K2B	4901.0689.02
Simultaneous measurement in 3 bands	R&S®TSMA6-K3B	4901.0672.02
Simultaneous measurement in 4 bands	R&S®TSMA6-K4B	4901.0666.02
Simultaneous measurement in 5 bands	R&S®TSMA6-K5B	4901.0650.02
Simultaneous measurement in all bands	R&S®TSMA6-KAB	4901.0708.02
Upgrade with one additional band (in-field)	R&S®TSMA6-KUB	4901.0950.02
Additional software		
ROMES drive test software	ROMES	1117.6885.04
R&S®TSME6 driver, for ROMES drive test software	R&S®ROMES4T1E	1117.6885.82
ROMES option, base station position estimation	R&S®ROMES4LOC	1117.6885.32
ROMES option, automatic channel detection	R&S®ROMES4ACD	1506.9869.03
Cellular network analysis software	R&S®NESTOR	1522.8870.02

Designation	Type	Order No.
Extras		
Downconverter (24 GHz to 44 GHz)	R&S®TSME44DC	4901.2600.02
Downconverter (17 GHz to 53 GHz)	R&S®TSMS53DC	4902.0001.02
Carrying bag	R&S®TSMA6-ZCB2	3630.7695.02
Carrying box	R&S®TSMA6-Z5	3630.7689.02
19" rack adapter for up to two R&S®TSMA6B scanners	R&S®TSMA6-Z2	4900.8940.02
AC power supply	R&S®TSMA6-Z1	4901.0550.02
2-bay charger for R&S®MNT-BP99WH batteries	R&S®TSMA6-BC2	1523.8015.02
4-bay charger for R&S®MNT-BP99WH batteries	R&S®TSMA6-BC4	3630.7708.02
Power cable for R&S®TSMA6B battery pack	R&S®TSMA6-BPPT	4900.1730.02
Dual power cable for R&S®TSMA6B battery pack	R&S®TSMA6-BP2T	4901.0566.02
Additional lithium-ion battery pack	R&S®MNT-BP99WH	3660.9109.02
Synchronization cable for one R&S®TSMA6B and one R&S®TSME6	R&S®TSME6-ZC2	4900.1800.02
Synchronization cable for one R&S®TSMA6B and up to three R&S®TSME6 scanners	R&S®TSME6-ZC4	4900.1817.02
Synchronization port to BNC port cable	R&S®TSME6-ZCS	4901.1540.02
Synchronization port to BNC and SMA cable	R&S®TSME6-ZCS2	4901.1704.02
R&S®NESTOR dongle lock for R&S®TSMA6B, incl. installation manual	R&S®TSMA6B-Z62	4901.4332.02
Antennas		
Antenna mount, magnetic	R&S®TSME-ZA1	1506.9817.02
Antenna mount, fixed	R&S®TSME-ZA2	1506.9823.02
Antenna mount, magnetic, with integrated GPS antenna	R&S®TSME-ZA3	1506.9830.02
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
Antenna emitter, 600 MHz to 6000 MHz	R&S®TSME-ZE17	3666.1574.02
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
4-port MIMO antenna, 698 MHz to 3500 MHz (2x2 MIMO) + 5150 MHz to 5850 MHz (2x2 MIMO) for drive testing	R&S®TSME-Z14	4900.1952.02
2-port antenna, 698 MHz to 3800 MHz, with magnetic mount	R&S®TSME-Z15P2	3657.5770.02
Ultrawideband antenna, 615 MHz to 6000 MHz (for walk testing)	R&S®TSME-Z17	4900.1969.02
Basic handheld directional antenna	R&S®HE400BC	4104.6000.04
Log-periodic antenna module, 450 MHz to 8 GHz	R&S®HE400LP	4104.8402.02
N (m) to SMA (m) adapter	R&S®TSMA6-ZHE4	4900.9660.02
PC accessories		
USB 3.0 to Gbit LAN adapter	R&S®TSPC-U2L	3593.8430.02
USB-C to 4 × Gbit LAN adapter (2 ports usable)	R&S®TSPC-U2L4	3718.2423.02
5-port USB or AC-powered LAN switch	R&S®TSPC-LS	3624.8364.02
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

Warranty		
Base unit		3 years
All other items [1]		1 year
Service options		
Extended warranty, one year	R&S®WE1	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 one year. Exception: all batteries have a one-year warranty.

Your local Rohde&Schwarz expert will help find the best solution for you.
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