CMA
RADIO TEST SET

The reference in radio testing

Product Brochure
Version 06.00

ROHDE&SCHWARZ
Make ideas real

AT A GLANCE

The CMA is a radiocommunications tester for radio systems in the 100 kHz to 3 GHz range with technology based on digital signal processing and advanced computing. Intuitive operation and efficient measurement capabilities make the CMA ideal for radio measurements.

The CMA demodulates and modulates all common analog RF signals, making it ideal for transmitter and receiver testing. Audio signals from the internal generators or from external sources can be modulated onto the RF carrier for receiver tests. The audio signals demodulated by the device under test (DUT) are fed into the CMA via analog or digital inputs and then analyzed. The CMA demodulates received signals and measures demodulated audio signals and RF signals for transmitter tests.

In addition to analyzing analog signals, the CMA supports DMR, APCO P25, dPMR, NXDN and TETRA digital modulations as well as LTE, for testing state-of-the-art multimode radios. The tester also incorporates a digital signal generator and analyzer for digital receiver and transmitter measurements.

The ARB generator lets users play back nearly any type of signal. The signals can be generated with MATLAB® or R&S®WinIQSIM2 or with proprietary waveforms from software defined radios (SDR) and then loaded into the CMA and replayed. The advanced and efficient user interface makes the CMA easy to use. Users can quickly access all settings and easily perform measurements. Measurement results are clearly and conveniently displayed.

The R&S®CMA-XRT100 setup – a combination of the CMA and R&S®CMW100 communications manufacturing test set – can extend the bandwidth to 160 MHz and the frequency range up to 6 GHz, making the CMA ideal for broadband applications.

The optional ILS, VOR and marker beacon generator as well as voice over IP (VoIP) support in line with EUROCAE ED-137B/C make the CMA invaluable for air traffic control (ATC) and radio navigation. The CMA can be powered by batteries, making it independent and portable. Results are displayed clearly and the graphical user interface is easy to operate.

KEY FACTS

- Frequency range from 100 kHz to 3 GHz
- Analog modulation and demodulation (CW, AM, FM, PM, SSB)
- Up to 150 W peak input power and up to 100 W continuous input power
- Signal level for receiver measurements can be lowered to –140 dBm
- Integrated audio generators
- Audio quality tests (SINAD, THD, SNR)
- Integrated sweeping spectrum analyzer, tracking generator and oscilloscope
- Use of R&S®NRP and R&S®NRT power sensors – no configuration required
- I/Q recorder and ARB generator
- Digital signal analysis of proprietary waveforms
- ILS, VOR and marker beacon generator
- VoIP in line with EUROCAE ED-137B/C for ATC radios
- Digital receiver and transmitter measurements (DMR, APCO P25, dPMR, NXDN, TETRA, LTE)
- POCSAG and Zigbee™ receiver measurements
- Digital signal content analyzer and uplink bit error rate (DMR, APCO P25, TETRA)
- Bit error rate test
- Generic FSK generator

BENEFITS

ALL-PURPOSE DEVICE

Diverse, future-ready configuration options

The CMA has a frequency range from 100 kHz to 3 GHz, making it ideal for testing all common analog radio systems. Input levels up to 150 W are no problem for the test set. The flexible internal switching capabilities for the audio and RF paths make the CMA suitable for a wide range of test requirements.

Users can configure the internal generators, external audio sources, filters and measurements based on the application. The RF and audio paths are preconfigured in predefined receiver, transmitter and duplex test scenarios to save time with and eliminate configuration errors in standard test cases. If the CMA is used in non-standard test configurations, expert mode lets users access all configuration options.

Mobility

The CMA can be equipped with an AC power supply to operate at 110 V to 250 V or a DC power supply to operate at 10 V to 30 V. If equipped with a DC power supply, the CMA can also be powered from a vehicle's power supply. The DC power supply can be connected to an external AC/DC converter for AC operation at 110 V to 250 V.

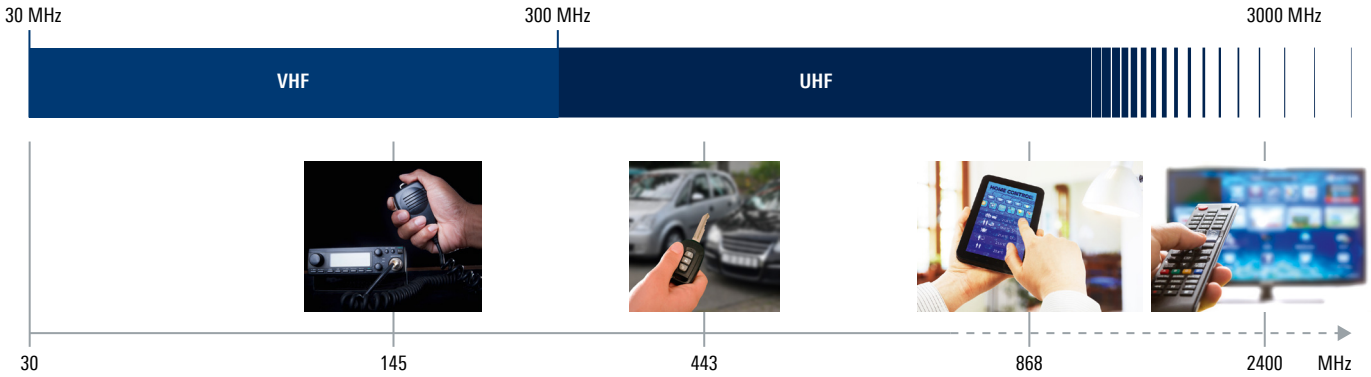
An optional battery pack ensures maximum mobility and turns a CMA with a DC power supply into a portable tester that can be brought directly to the DUT. When equipped with a battery pack, the portable, multifunctional radio test set is ideal for measurements in vehicles and aircraft.

An optional protective display cover can be easily attached to the front of the instrument to reliably protect the CMA display and front panel.

CMA – the RF testing solution for analog and digital radios

The CMA with optional battery pack for mobile applications

APPLICATIONS IN THE CMA FREQUENCY RANGE



ACCURATE AND FLEXIBLE

Top RF performance for transmitter and receiver testing

All relevant parameters are measured, including transmit power, transmit frequency, frequency error and modulation parameters for RF transmitter tests. The transmit power can be as high as 150 W. A spectrum analyzer is available for examining signals in the frequency domain. Harmonics and the adjacent channel power can also be measured.

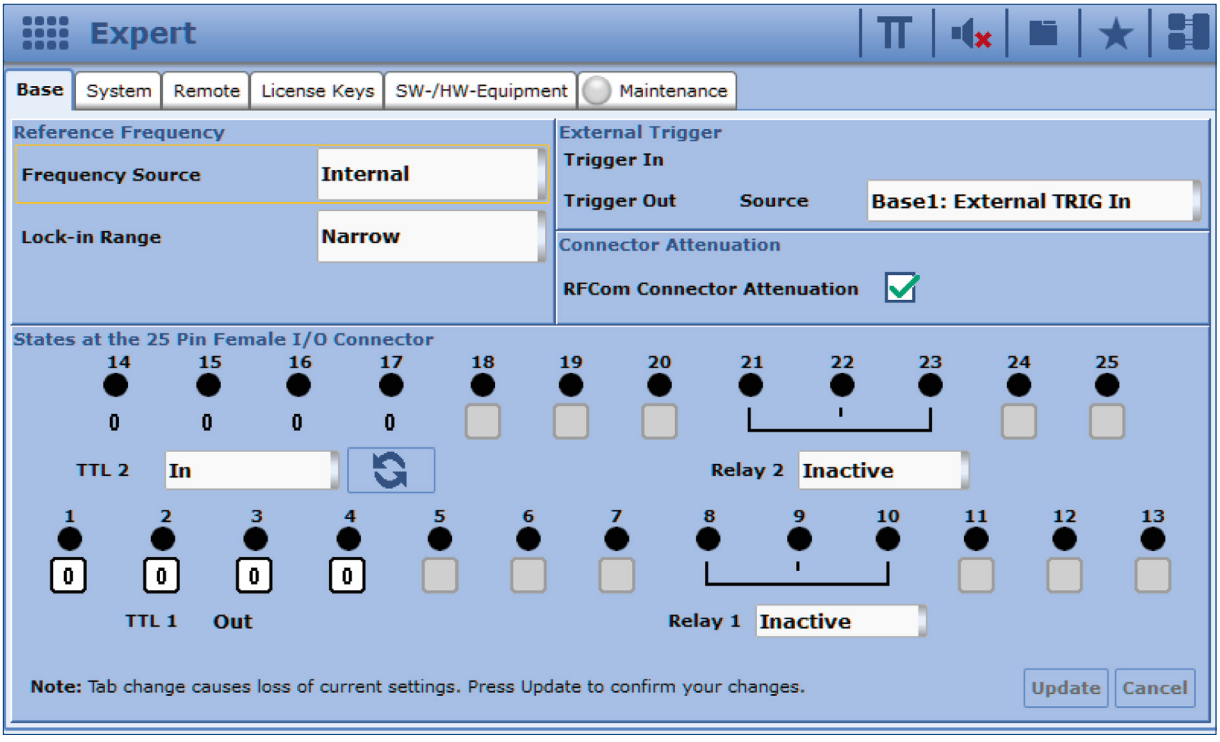
To test receiver sensitivity, very low-power RF signals are generated. Signal power can be reduced to as low as –140 dBm. To analyze audio signals, the signals demodulated by the DUT can be played back to the CMA via BNC or SPDIF.

Many different connectivity options

The CMA has many connectivity options for almost any type of application. USB ports on the front and rear panels are available for computer accessories such as mice or keyboards. The front panel has two additional analog audio outputs, two audio inputs and three RF connectors.

The CMA can be integrated into a LAN via the Gigabit Ethernet port on the rear panel for convenient software updates over the network. The CMA can also be remote controlled. Trigger, clock, SPDIF, TTL inputs/outputs and relay ports are located on the rear panel.

External connection via relays and TTL inputs/outputs



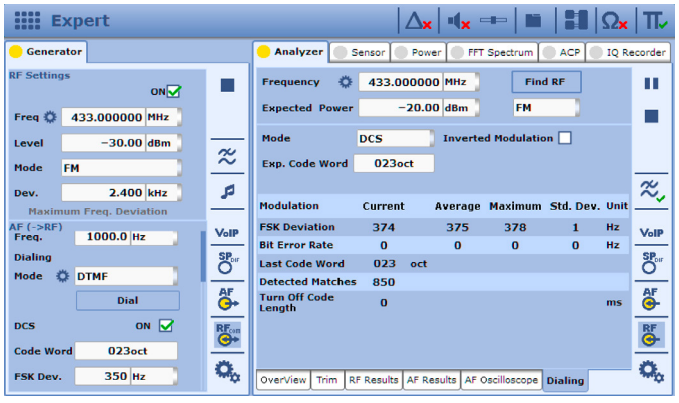
Switching and controlling external equipment

The rear panel has a D-Sub connector for controlling external equipment or DUTs. Two relays, four TTL outputs and four switchable TTL inputs/outputs are available.

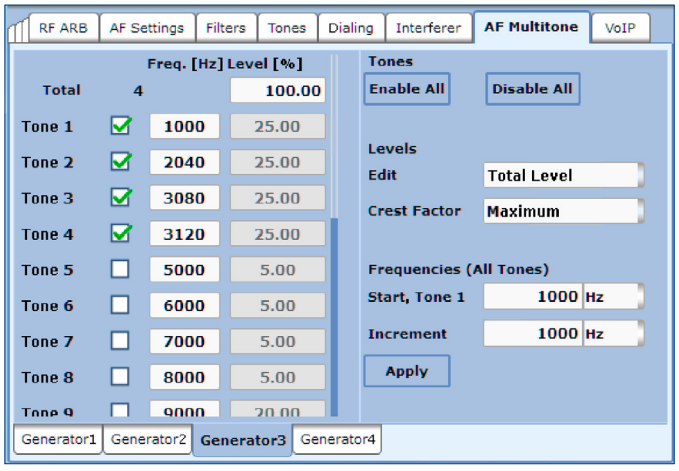
Remote control commands can address and evaluate relays and TTL inputs/outputs to switch instruments or query their status. The CMA performs both measurement and control tasks. Proprietary interfaces can also be addressed. These features make the CMA vital to any radiocommunications test system.

Rear view of the CMA

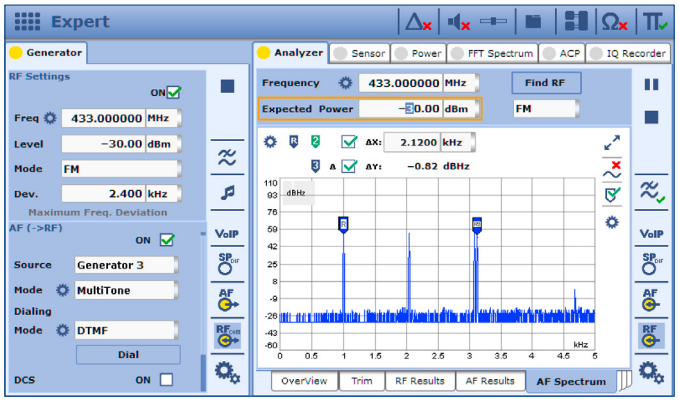
EXTENSIVE MEASUREMENT FUNCTIONS



Working with digital coded squelch (DCS)



The multitone generator offers versatile settings



The multitone generator generates up to 20 tones

Analog modulation and demodulation

The CMA supports CW, AM, FM, PM and SSB modulation and demodulation methods. Receiver measurements, external signals fed in via the analog or digital audio inputs, as well as internally generated signals and audio files, can be modulated onto an RF carrier.

Signals are demodulated and analyzed to measure transmitters. The spectrum analyzer displays demodulated audio signals. Depending on the type of modulation, either the modulation deviation or modulation depth is measured and displayed. The RF generator can produce signaling tones and bit sequences in addition to the wanted signal for receiver testing. Users can access a CTCSS and configurable subaudio tones. DTMF five-tone sequences and the digital coded squelch (DCS) technique are supported.

The test set also provides the necessary measurements to analyze the frequency, duration, frequency deviation and bit errors for generated signals.

Audio generators

The CMA has four internal audio generators that can propagate two tones simultaneously and modulate them onto the RF carrier. Depending on the generator, the signal can be available to the internal RF modulator or at the audio ports. If the signal is generated for an external application, the user choose between analog or digital output (SPDIF). The levels can be set as required. If the signal is modulated onto the RF carrier, the characteristics can be configured.

Multitone

In addition to single sine tones, the audio generators can propagate up to 20 tones simultaneously that can be fed to the AF connectors or used as a modulation source for FM, AM, PM and SSB. The frequency and level of each tone can be tuned individually.

Two tone

Two-tone measurements such as SSB linearity measurements can be performed using the two-tone measurement function.

Audio quality testing

All audio signals can be analyzed, both externally fed signals and demodulated audio signals. Highpass, lowpass and weighting filters can be applied to the audio signals. Audio signal quality is determined with SINAD, SNR and THD. Users can select any frequency as the test frequency. SINAD, SNR and THD can be determined and displayed simultaneously. Switching between SNR and SINAD measurements is no longer necessary. The spectrum analyzer examines signals in the frequency domain.

Automatic measurement routines

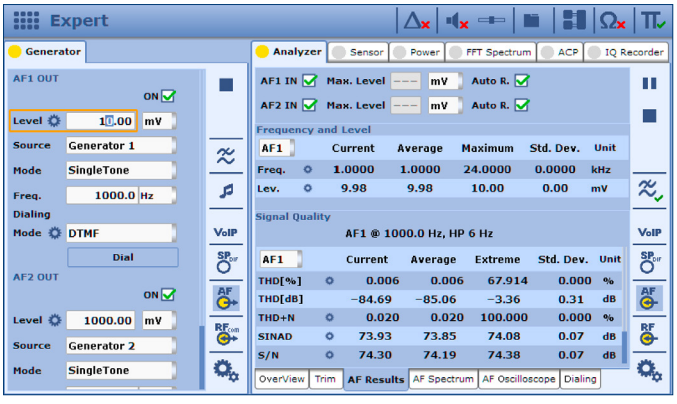
The CMA automatically performs measurements that used to require extensive manual setups. It provides automatic measurement routines for

- TX modulation sensitivity
- RX sensitivity
- RX squelch
- RX IF bandwidth

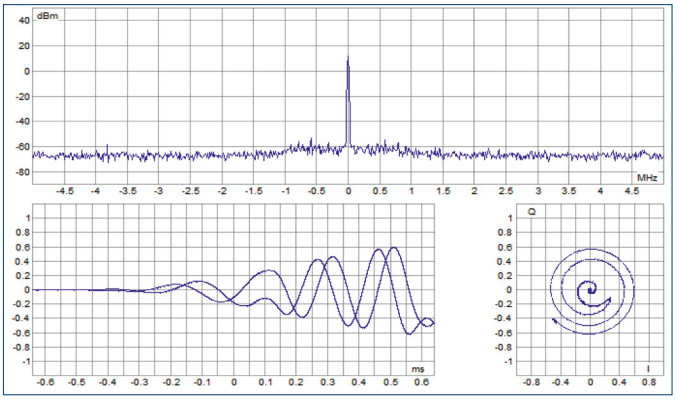
During the RX sensitivity measurement, for example, the RF level is reduced until a predefined SINAD value is reached. The measurement then ends and the RF level is displayed as the measured value.

FFT spectrum application

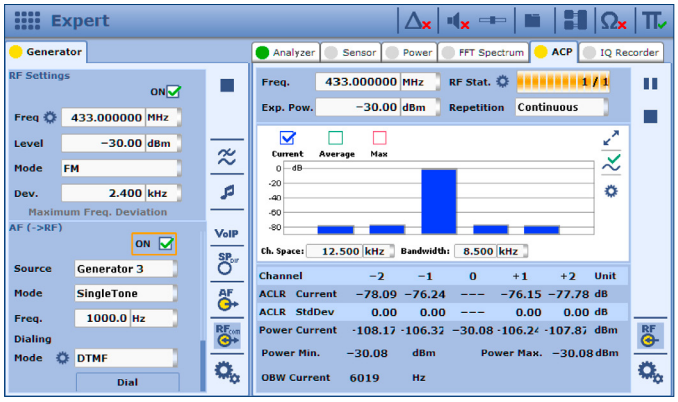
The integrated FFT spectrum application can be used to observe a test signal in the frequency domain. Users can set markers and insert minimum, maximum and average curves. Both the span and assessment bandwidths can be configured. In the zero span mode, triggers help users optimally display and investigate transients. The transient signals to be analyzed can be broken down into I and Q components and graphically displayed, simplifying the analysis of radio transients.



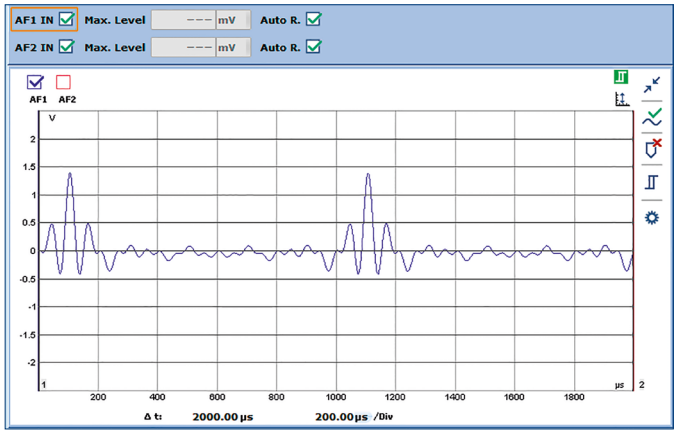
Detailed analysis of audio quality



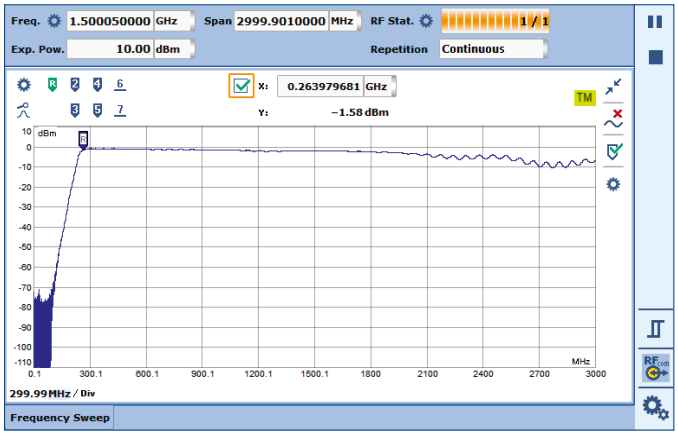
I/Q view of FFT spectrum



Adjacent channel power measurement with adjustable channel and measurement bandwidths



Audio signal analysis with built-in oscilloscope



Highpass filter measurement with the built-in tracking generator

Adjacent channel power (ACP) and occupied bandwidth

The ACP measurement determines the power that a transmitter emits into adjacent channels. This key measurement for channel based radiocommunications helps to minimize interference in adjacent channels. Channel and measurement bandwidth settings can be adjusted as needed. Results are presented in graphical and tabular form. The occupied bandwidth can be measured to determine the bandwidths occupied by an adjustable percentage of the power.

Oscilloscope

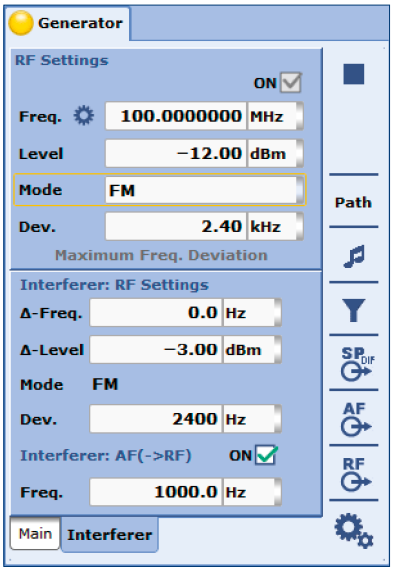
The integrated oscilloscope shows the audio signals that are fed into the audio ports, including the demodulated audio signals for transmitter testing. Marker functions make it easier to analyze such audio signals. The signals can be viewed in both the time domain and in the frequency domain thanks to FFT for easy and comprehensive analysis of all audio signals.

Built-in sweeping spectrum analyzer with time domain analysis (zero span)

The CMA features a built-in sweeping spectrum analyzer. Extensive configuration options make this analyzer a universal tool for testing all types of DUTs. The spectrum analyzer has two operating modes: full span and user-defined spans. The zero span mode enables analysis in the time domain. In combination with the triggers, it is possible to display transients.

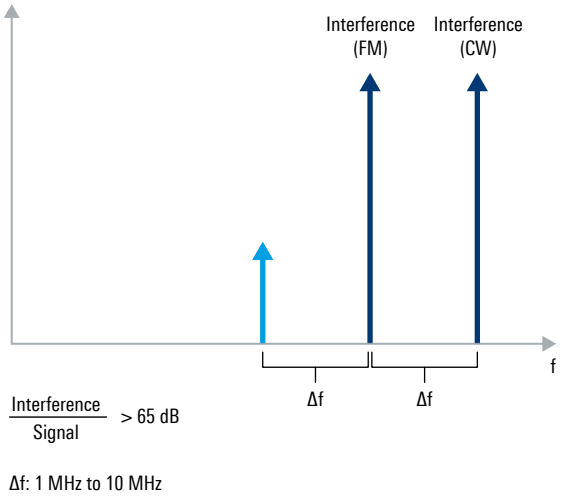
Burst signals can also be analyzed in the spectrum analyzer time domain. Depending on the sweep time, the video trigger lets users display one or more bursts. The burst duration is set in the time domain view.

The signal edges of burst signals can also be analyzed. Acquisition begins with the rising edge with the video trigger and configurable trigger offset. Setting the sweep time lets you display exactly one burst. Setting markers makes signal analysis easier and quickly delivers precise measurement results.



Frequency modulation with an integrated interfering signal

Intermodulation with integrated interfering signal



The max function in the spectrum analyzer is used to examine the hopping range when analyzing radio systems. Even when a hopping sequence is unknown, information can be derived about the frequency range. Gaps indicate unused frequencies. Each burst can also be analyzed in the time domain.

Tracking generator

The built-in tracking generator makes it easy to determine the frequency response for passive and active RF components. With an external VSWR bridge, the tracking generator can also be used for VSWR measurements, extending the range of applications to include antenna measurements. The n-dB-down markers help easily determine the signal bandwidth.

Built-in interferer

The CMA can generate two RF signals. Receiver quality can be assessed if the signals are positioned outside of the DUT's receive window so that at least one intermodulation product lies within the receive window. The built-in interferer lets users measure co-channel rejection and adjacent channel suppression, eliminating the need for an additional generator to propagate the interfering signal.

The CMA simplifies intermodulation measurements since users can generate two RF signals at different levels within the available 20 MHz bandwidth. Both signals – the wanted one and the interferer – can be modulated independently of one another. The levels of the two signals can also be set independently. No additional equipment is needed for complex measurements.

Location services – GPS, Galileo, GLONASS, Beidu

Many of today's radios have GPS, Galileo, GLONASS or Beidu receivers. These can be easily tested using the CMA. The test set outputs a position signal that is received and analyzed by the DUT. The position on the DUT can then be compared to the position sent by the CMA.

CONVENIENT OPERATION

Advanced touchscreen plus rotary knob

Users can completely operate the CMA via the touchscreen, where all functions can be quickly accessed. Measurement results are clearly and conveniently displayed. Users can also use the rotary knob to change settings, allowing them to scroll through the frequencies and levels and immediately see their impact on measurement results.

Predefined test scenarios for minimal configuration effort or expert mode for maximum freedom

Predefined scenarios for standard measurement tasks let users configure CMA software and hardware at the press of button. Predefined scenarios are provided for TX measurements, RF measurements, spectrum analysis, etc. In expert mode, users can configure the CMA as needed. Audio and RF paths can also be switched as needed. All generators and analyzers can be accessed and configured. The CMA can perform tasks that go far beyond standard analog measurements in this mode.

Various parameter and measurement result displays

Users can choose between two modes for displaying parameters and measurement results. The tab mode is best for displaying values in detail. All generator and analyzer values are displayed in separate full-screen tabs.

The split-screen mode provides a complete overview, displaying generator and analyzer values simultaneously. Generator settings can be changed on the left side of the screen and results are instantly displayed on the right. The spectrum analyzer operating controls can be hidden and results displayed across the entire screen for optimum viewing.

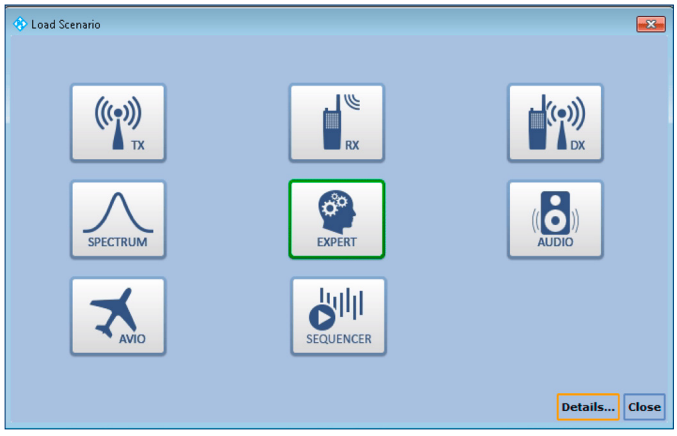
Special trim view

The trim view graphically displays selected measurement values and their limits. In contrast to scalar displays, the view makes it easier to recognize when values fall below or exceed limits and helps when comparing transmitters and receivers.

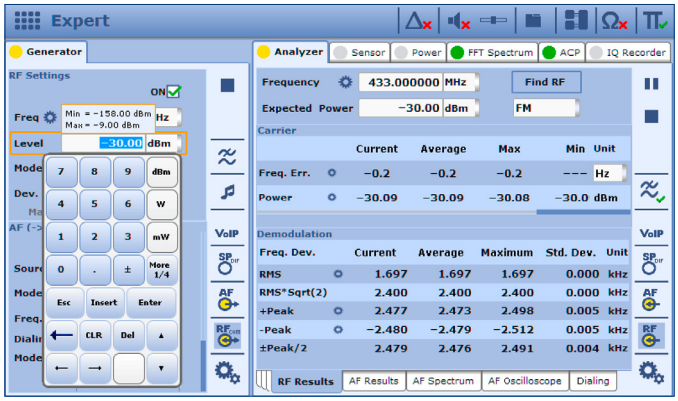
Remote control for easy integration into automated test environments via LAN or GPIB

Remote controls via Ethernet or optional GPIB interface let CMA seamlessly integrate into automated test environments for round-the-clock testing.

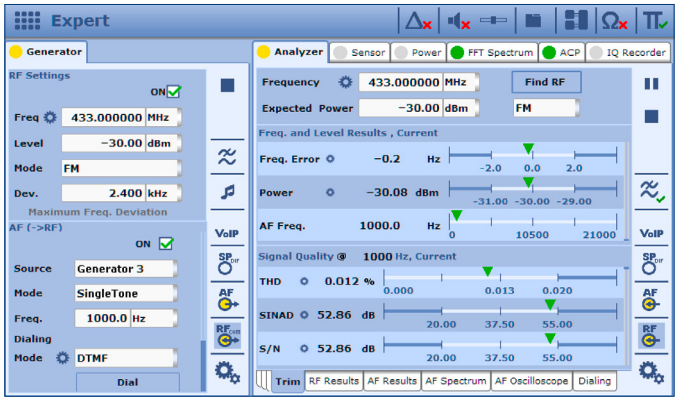
Select predefined test scenarios or switch to expert mode



Clearly organized touchscreen



Special trim view



DIGITAL RECEIVER AND TRANSMITTER MEASUREMENTS

Digital receiver measurements

The CMA can generate test signals for digital radio standards. Signal content can be configured to match test requirements. Signals can carry audio test tones or pseudo random bit sequences (PRBS), for example. Signaling parameters such as DMR color code can be configured on the intuitive GUI, making receiver testing easier for digital standards such as DMR, NXDN, APCO P25 and dPMR.

The digital signal generator can be used for testing digital communications systems and also supports POCSAG and Zigbee™. TETRA and the play back of LTE signals generated with R&S®WinIQSIM2 simulation software.

Digital transmitter measurements

The integrated vector signal analyzer demodulates digital signals and delivers results, including eye diagrams, symbol distribution and scalar values such as frequency deviation and EVM.

The CMA can analyze a wide range of digital signals. The user simply selects the standard to be tested and the test set automatically determines the required analyzer parameters. The CMA supports DMR, dPMR, NXDN, APCO P25, TETRA and LTE. Digital and analog measurements start at the push of a button. Results are displayed in an overview and in detailed graphs and diagrams.

Custom mode

In custom mode, users can define and measure their own signals. Signals are defined with the signal analyzer. The CMA then tests the signals. This is particularly important with tactical radios, where the waveform is often classified.

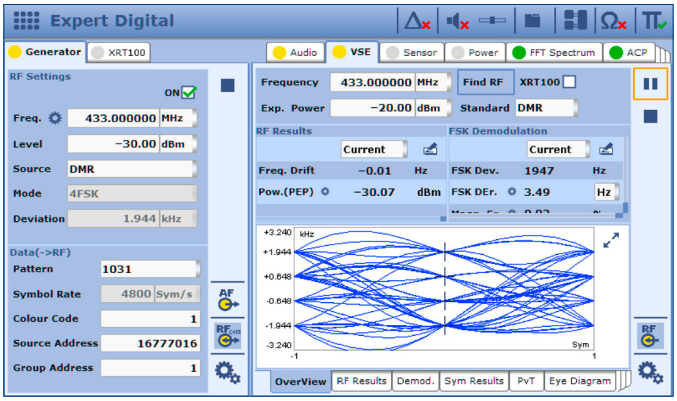
Signal content analyzer and uplink bit error rate (BER) measurements

The CMA supports the analysis of DMR, APCO and TETRA signal content, allowing radio settings to be easily determined using the air interface without having to determine the transmitter with software. During transmission, the CMA decodes the signal and displays parameters such as color code, subscriber ID and much more. The information can then be used directly in the CMA digital generator to open the receiver for testing. The CMA can also perform uplink BER measurements for DMR and APCO P25 as well as loopback BER measurements for TETRA.

Bit error rate (BER) test

Demodulated, digital signals for a radio in the form of a bitstream can be entered via the TTL interface to calculate a BER. The process is used for radios with a proprietary waveform. A PRBS signal that can be generated with R&S®WinIQSIM2 is transmitted to the radio with the ARB generator in the CMA. The radio demodulates the signal and sends the demodulated bits to the CMA, where the BER is calculated.

Digital signal generator for receiver tests and overview of digital measurements



TESTING MULTIMODE RADIOS

Modern public safety radios support LTE, Wi-Fi® and Bluetooth® in addition to the classic trunked radio standards, e.g. TETRA, APCO and DMR. Testing must also cover these technologies. The CMA supports the measurement of classic analog and digital radio signals as well as LTE.

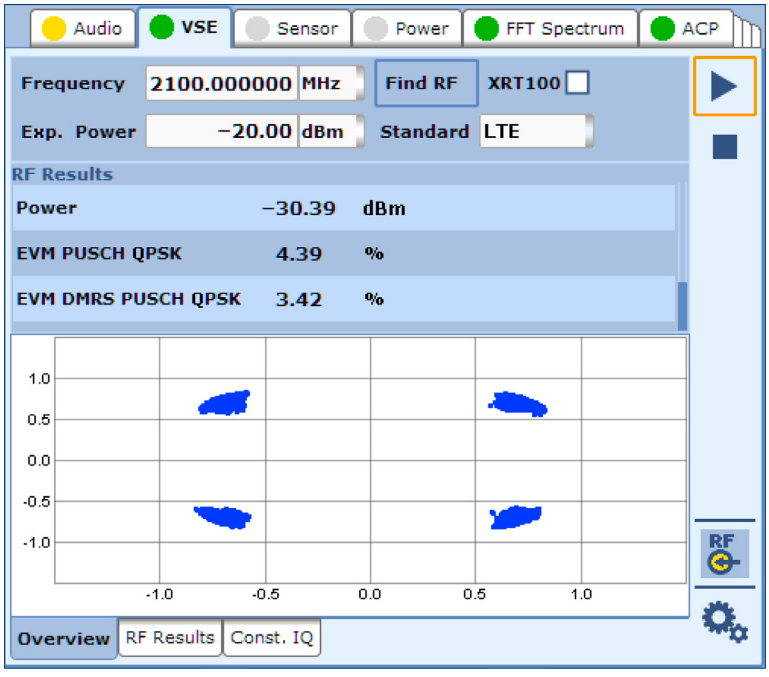
LTE transmitter measurement

The CMA uses an integrated vector signal analyzer to measure transmitters. This signal analyzer is set up for LTE by selecting the required standard and automatically configured. If the LTE test object is set to transmit mode, the CMA displays the measured power and EVM values. Other measurement images such as the constellation diagram are also shown.

LTE receiver measurement

The LTE receivers are measured with the ARB generator. This generator supports LTE waveforms that can be generated with R&S®WinIQSIM2 or MATLAB®. The LTE receiver can evaluate these signals and determine sensitivity.

LTE transmitter measurement



HIGH-PERFORMANCE EXTENSION

The CMA covers all common analog and digital standards with a frequency range of 100 kHz to 3 GHz and measurement bandwidth of 20 MHz. The CMA can be equipped with a high-performance frontend (R&S®CMA-XRT100 setup) for measurements outside this range. The instrument has integrated operations and can be fully controlled via the CMA.

Frequency range and bandwidth extension

Waveforms that operate at a bandwidth of up to 160 MHz and in a frequency range up to 6 GHz can be measured with the R&S®CMA-XRT100. A standalone ARB generator is available for receiver tests. RF information is sent to the integrated vector signal analyzer, where it is evaluated for transmitter tests. The integrated operations enable seamless work on the CMA and R&S®CMA-XRT100.

Increased throughput with parallel testing

If multiple radios need to be measured, parallel testing is an efficient option: up to eight radios can be connected to the R&S®CMA-XRT100 at the same time and measured. This saves a lot of time, particularly with receiver measurements, since they take much longer than transmitters.

Parallel testing with the R&S®CMA-XRT100

R&S®CMA-XRT100 setup

TEST FEATURES FOR SPECIAL APPLICATIONS

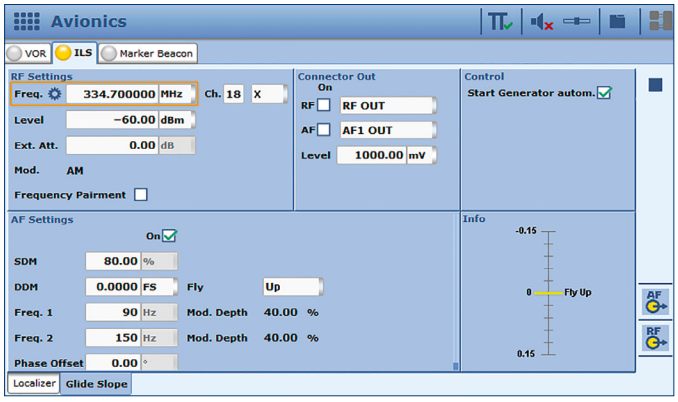
Avionics generator for ILS, VOR and marker beacon signals

The outstanding signal quality of the CMA makes it a highly versatile aircraft radio tester. The test set can analyze ILS, VOR and marker beacon signals for aircraft landing systems and airborne radio signals. Equipped with a battery pack and antenna, the CMA is a standalone instrument that is ideal for aircraft maintenance.

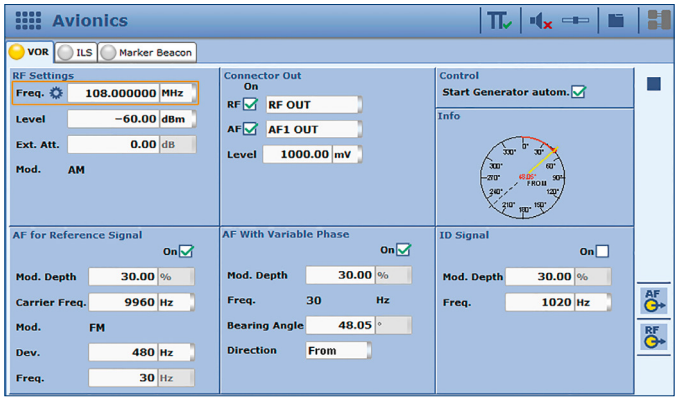
Both a glide slope and localizer are available for ILSs. The signal parameters can be modified to meet test requirements. DDM, SDM, modulation frequencies can be set. The settings are displayed on simulated on-board instruments, making it easy to compare target and actual values.

Numerous signal parameters are also available for VOR and marker beacon signals. ID signaling is possible for all avionics signals. The audio signal can be fed to the audio ports to generate the signal with an external signal generator for avionics signals.

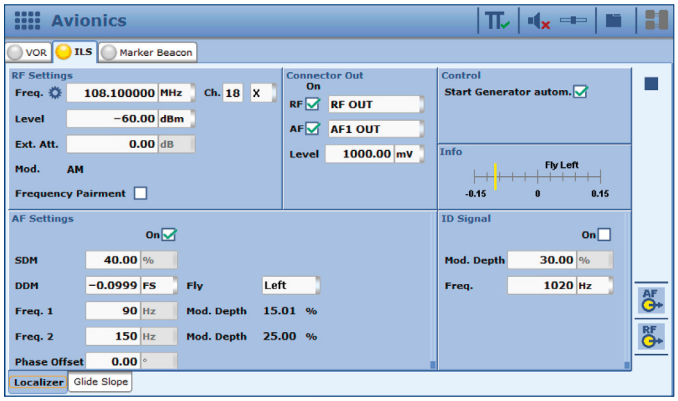
ILS glide slope generator



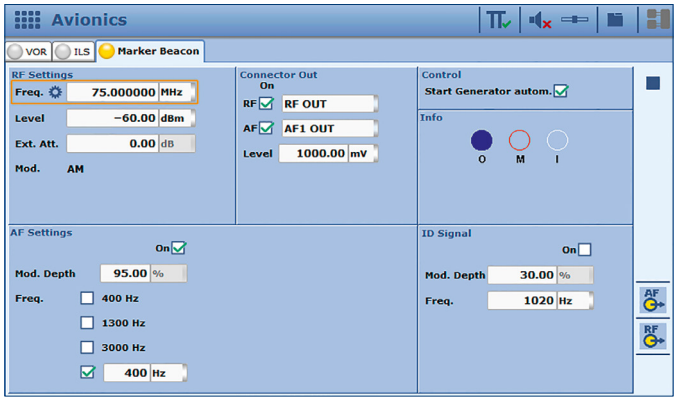
Configuration of VOR generator



Generator settings for ILS localizer



Marker beacon settings

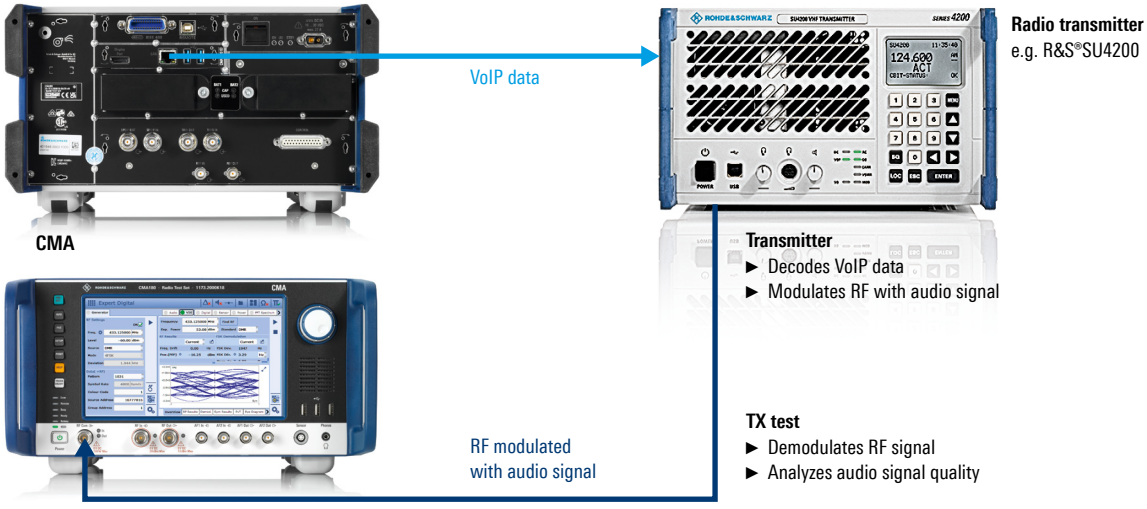


Avionics VoIP generator and analyzer

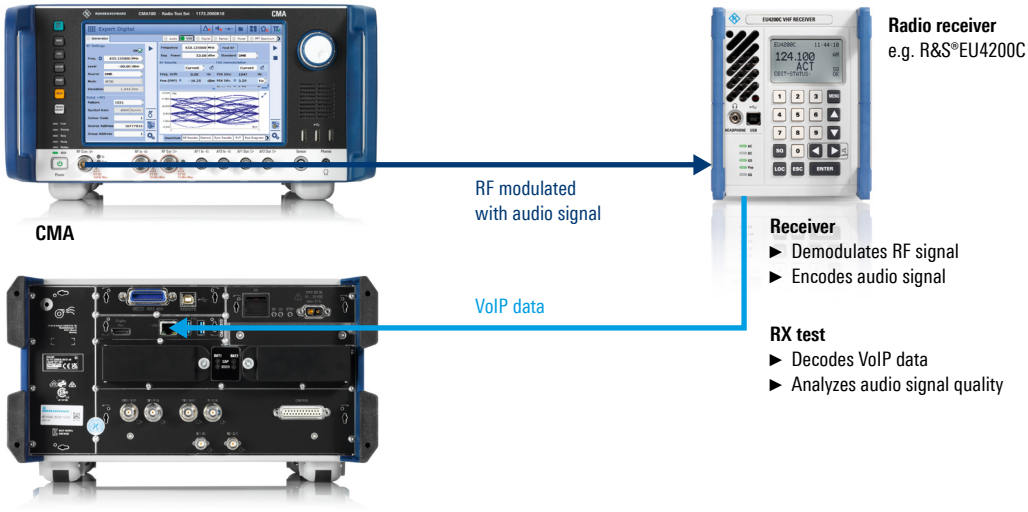
The CMA incorporates a VoIP generator and analyzer in line with EUROCAE ED-137B/C. The VoIP interface is fully integrated in the CMA and users can switch between analog audio and VoIP testing at the push of a button. Easy and extensive airborne radio testing is possible via both the VoIP (LAN) and analog audio (RF COM) interfaces.

VoIP connection configuration is straightforward and intuitive, and connection status displays provide an excellent overview. The radio for testing is connected to the test set via the integrated LAN interface. Multiple transmitters or receivers can be connected via an optional LAN switch powered by a USB cable that lets the CMA be operated independently of the mains supply.

VoIP generator test setup



VoIP analyzer test setup



VoIP delay analysis for enhancing communications reliability

Comprehensive VoIP capabilities for advanced communications systems

The CMA is a distinguished leader with ready-to-deploy and EUROCAE ED-137B/C-compliant VoIP functions. The technology is vital for sectors that manage critical communications such as air traffic control and supports the shift from traditional analog systems to more sophisticated digital solutions.

Accurate measurement of VoIP transmission delays

Understanding and minimizing VoIP transmission delays is vital for maintaining clear and reliable communications channels. The CMA test sets come with advanced features to precisely measure these delays, ensuring communication integrity and clarity in high-stakes environments.

VoIP delay explained

VoIP delay represents the time taken for voice signals to travel through the internet to the transmitter, including all processing stages. Proper management of such delays is critical for the intelligibility and efficiency of communication systems. The CMA test sets provide detailed insights into these delays, facilitating system improvements and ensuring compliance with industry standards.

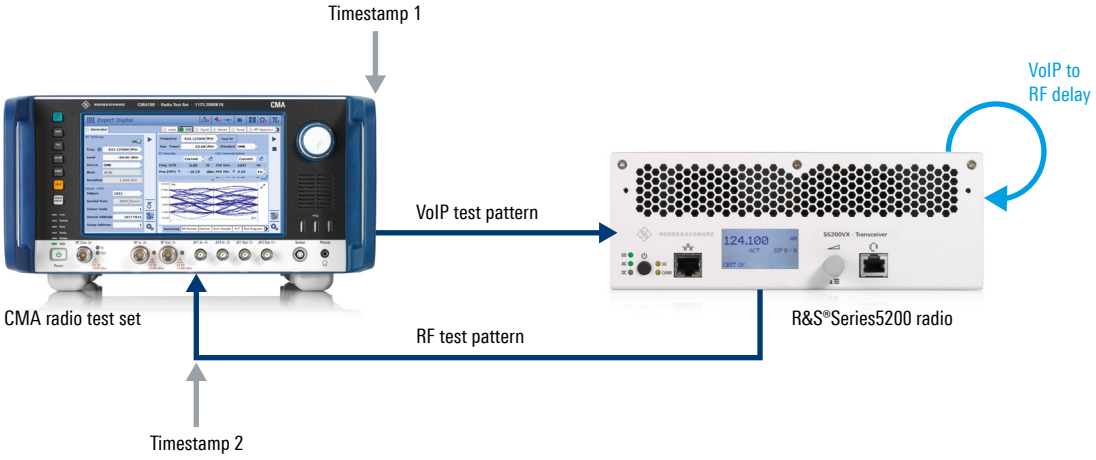
Feature availability

Our test sets include dedicated software that provides accurate measurements of VoIP delays, supported on compatible operating systems to maintain high precision in testing environments.

Extensive application across radio systems

The adoption of VoIP technology is widespread across modern radio systems and is enhancing communications capabilities across all sectors. Our solutions are designed to seamlessly integrate with contemporary communications technologies with broad compatibilities and enhanced operational capabilities.

VoIP delay setup

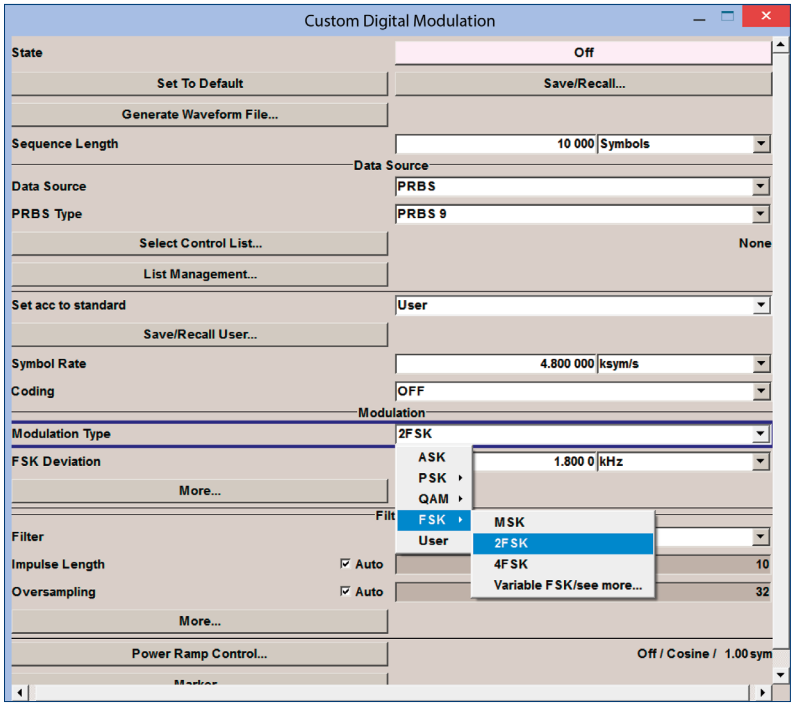


Waveforms (ARB)

In ARB waveform mode, the CMA can process I/Q data as waveform files and can generate any application-specific modulation signals. The R&S®WinIQSIM2 waveform creation tool lets users create waveform files directly and conveniently. I/Q data can also be generated with commercial software tools such as MATLAB®, Mathcad® and ADS®. The data must then be converted into the waveform file format with the Rohde&Schwarz MATLAB® transfer toolbox or the Rohde&Schwarz I/Q wizard.

The R&S®WinIQSIM2 graphical user interface also can be used to create digital waveforms very quickly. FSK, PSK and QAM modulated test signals can be generated and then replayed with the CMA.

GPS, Galileo and GLONASS satellite navigation signals can also be generated with R&S®WinIQSIM2 and then loaded onto the CMA and replayed.

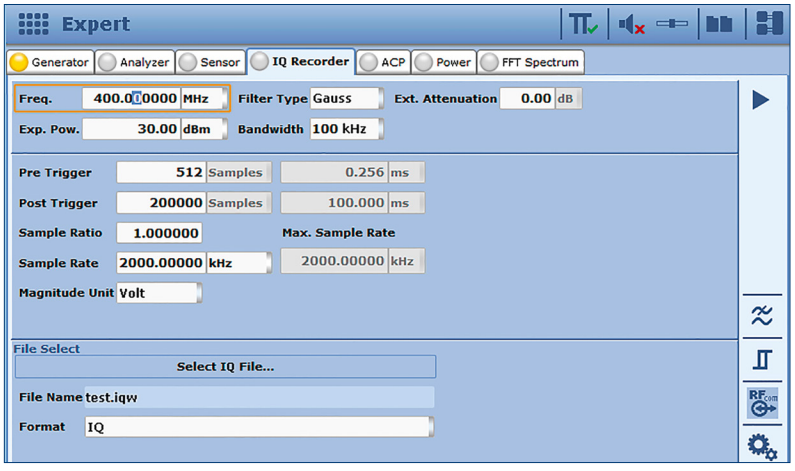


ARB file generation with R&S®WinIQSIM2

Field to lab

The I/Q recorder lets RF signals be recorded via the RF ports. Signals can be recorded over a wired line or via an antenna thanks to the wide dynamic range of the CMA. The signals are recorded and stored as I/Q data. The recorded data can be replayed on the ARB generator or analyzed with R&S®VSE vector signal explorer software.

Triggers and adjustable sample rates turn the I/Q recorder into a universal tool to simulate real-life scenarios in the lab or generate reference signals.



Recording RF signals for playback in the lab

TEST AUTOMATION WITH R&S®CMArun SOFTWARE

Ready-to-use solution for configuring application test sequences

R&S®CMArun is for test sequence control. The software has a GUI for programming test sequences. Individual settings and measurement tasks can be configured and arranged in a specific sequence. Sequences, loops and conditional queries help users easily create and execute complex test sequences. Each setting and measurement value is logged and then summarized and stored in a report. For measurements with limit values, pass or fail indicators can be displayed for each measurement. The CMA can also be controlled using VISA drivers and SCPI commands.

R&S®CMArun offers a separate run environment in which test sequences are created and executed using a mouse and keyboard. A R&S®CMArun component has been integrated into the CMA touchscreen, mainly to execute previously created test sequences.

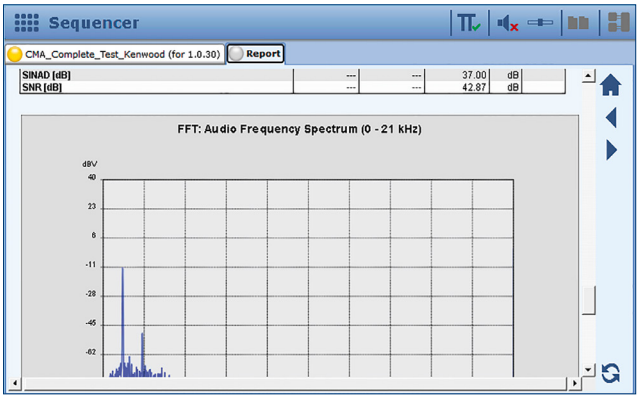
Extensive function library

The R&S®CMArun function library contains numerous test functions that range from analog and digital receiver and transmitter tests to sensitivity measurements and loading and starting waveforms in the ARB generator.

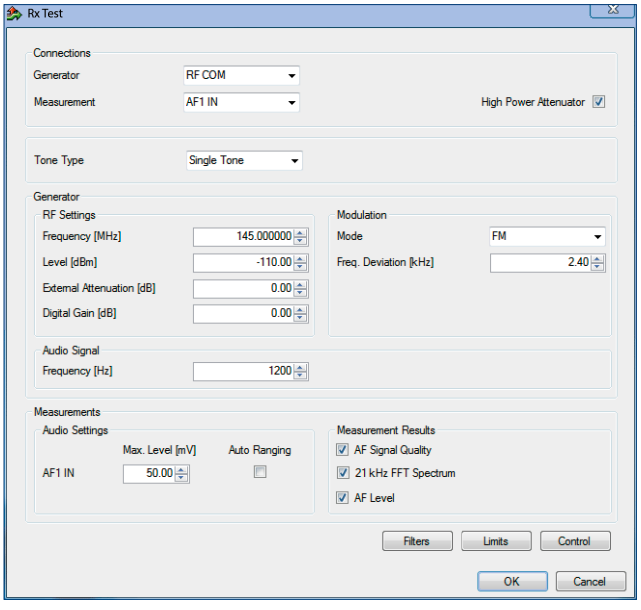
Control via SNMP, serial interfaces and SCPI

Radios with an SNMP interface can also be controlled by R&S®CMArun and handled like DUTs with a serial interface. Entire test environments can be automated since other equipment such as power supplies can also be integrated via SCPI.

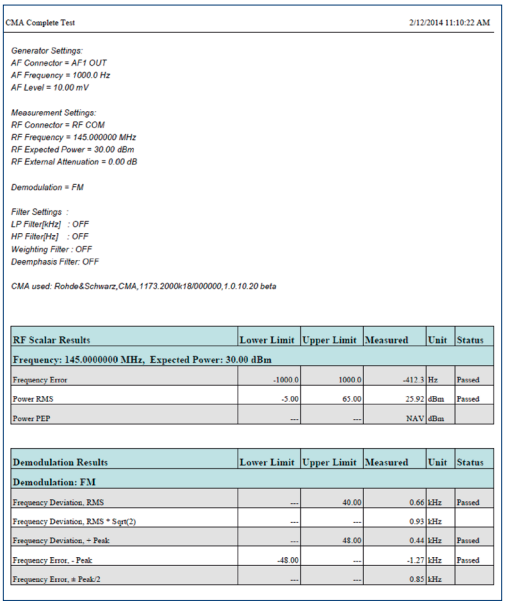
R&S®CMArun running on the CMA



Configuration of R&S®CMArun test items



Automatically generated test report from R&S®CMArun



CMA Complete Test 2/12/2014 11:10:22 AM

Generator Settings:
AF Connector = AF1 OUT
AF Frequency = 1000.0 Hz
AF Level = 10.00 mV

Measurement Settings:
RF Connector = RF COM
RF Frequency = 145.000000 MHz
RF Expected Power = 30.00 dBm
RF External Attenuation = 0.00 dB

Demodulation = FM

Filter Settings :
LP Filter[kHz] : OFF
HP Filter[Hz] : OFF
Weighting Filter : OFF
Deemphasis Filter: OFF

CMA used: Rohde&Schwarz,CMA,1173.2000k18/000000,1.0.10.20 beta

RF Scalar Results	Lower Limit	Upper Limit	Measured	Unit	Status
Frequency: 145.0000000 MHz, Expected Power: 30.00 dBm					
Frequency Error	-1000.0	1000.0	-412.3	Hz	Passed
Power RMS	-5.00	65.00	25.92	dBm	Passed
Power PEP	---	---	NAV	dBm	

Demodulation Results	Lower Limit	Upper Limit	Measured	Unit	Status
Demodulation: FM					
Frequency Deviation, RMS	---	40.00	0.66	kHz	Passed
Frequency Deviation, RMS * Sqrt(2)	---	---	0.93	kHz	
Frequency Deviation, + Peak	---	48.00	0.44	kHz	Passed
Frequency Error, - Peak	-48.00	---	-1.27	kHz	Passed
Frequency Error, ± Peak/2	---	---	0.85	kHz	

Battery life testing

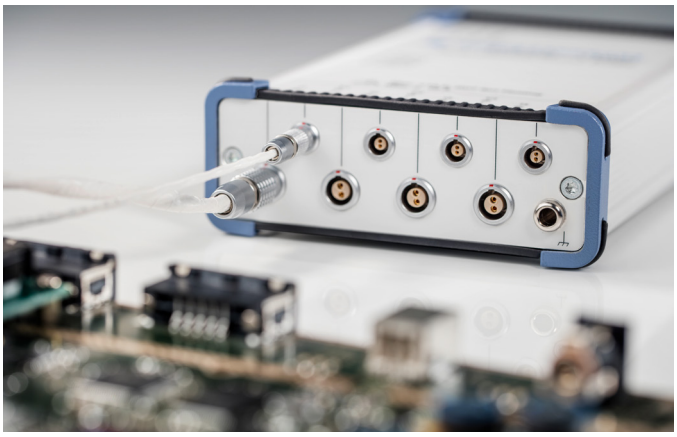
Battery life is crucial for all handheld radios and rescue beacons. To ensure a specific battery life; radio battery size, components and software must be properly designed.

Battery life measurements allow users to monitor radio current, voltage and power. The CMA provides a detailed overview of the power consumed for transmission and standby, making it possible to optimize operations. This application requires the battery life testing (R&S®CMA-KT061) and R&S®CMArun analog radio testing (R&S®CMA-KT051) options.

Battery life testing with R&S®RT-ZVC02/R&S®RT-ZVC04 multi-channel power probe

Battery life measurements require monitoring both current and voltage over time, as well as calculating instantaneous power at high sampling rates. The power a device consumes based on a real use case needs to be measured; the device must be powered by a real battery, or via a USB interface or from the mains with an AC/DC power supply.

The R&S®RT-ZVC02 and R&S®RT-ZVC04 multi-channel power probes are designed to cover precisely such use cases with two (R&S®RT-ZVC02) and four (R&S®RT-ZVC04) voltage channels plus two/four current channels.



The R&S®RT-ZVC04 multi-channel power probe

Fully automated test solution for R&S®Series4000 and R&S®Series5000 radios

A fully automated test solution based on R&S®CMArun is available for R&S®Series4200 radios with an SNMP interface and R&S®Series4100 radios with an SNMP or serial interface. R&S®Series5000 radios are controlled by REST API. The specially developed radio test and remote control options (R&S®CMA-KT420/-KT410/-KT440/-KT520) together with the radio adapter (R&S®CMA-Z421A) used to physically connect the radio to the CMA, make it possible to instantly test R&S®Series4200, R&S®Series4100, R&S®Series4400 and R&S®Series5200 radios without any hardware modifications or programming.

The test plans created in R&S®CMArun can be executed via a LAN-connected PC or loaded and run directly on the test set. The latter option is ideal for mobile use. Test reports can be stored on the CMA or exported via USB or LAN.

The R&S®Series5200 radios

WIDE RANGE OF OPTIONS AND ADD-ONS

The CMA comes with a wide range of options and add-ons. Below you will find an overview of the most important products.

SOFT CASE AND TRANSIT CASE

A soft case and a transit case are available for the CMA. The transit case has wheels and a foam insert that accommodates the test set and accessories. It has an integrated pressure equalizing valve, is waterproof and complies with MIL-STD-810F.

The soft case protects the CMA during transport. The CMA can be operated from inside the case since the front panel remains accessible. Air compartments next to the CMA protect it from overheating. The test set is portable and instantly ready to use.

Soft case

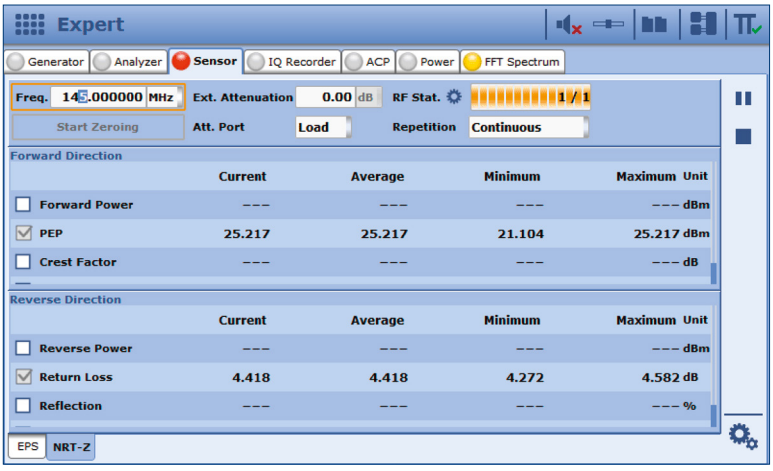
Transit case

R&S®NRP AND R&S®NRT POWER SENSORS

The high-precision R&S®NRP power sensors can be connected directly to the dedicated sensor input and used immediately without any additional configuration.

The R&S®NRT directional power sensors can also be connected. These sensors can be used to measure VSWR.

R&S®NRP power sensors



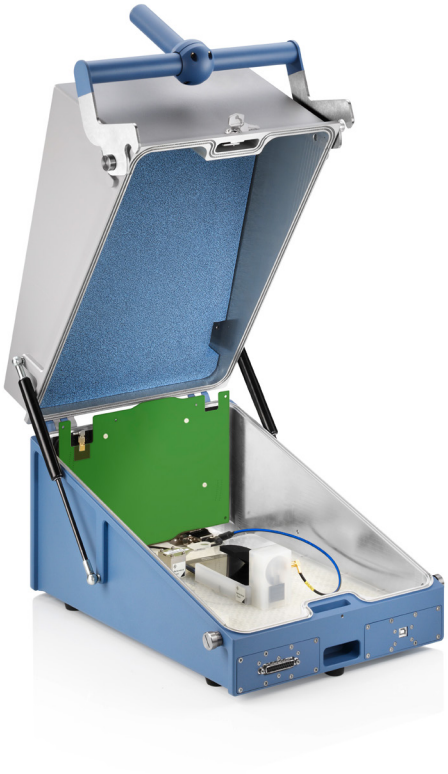
Measurements with R&S®NRT power sensor connected to the CMA

SHIELD BOX, ANTENNA COUPLER AND AUDIO ACCESSORIES

The R&S®CMW-Z10 RF shield box together with the R&S®CMW-Z11 antenna coupler are an excellent combination for wireless analog radio testing.

The R&S®CMW-Z10 RF shield box has outstanding characteristics for protection from ambient emissions. The numerous shielded connector feedthroughs make it ideal for all types of applications.

The R&S®CMW-Z15 audio measurement option has a loudspeaker and a microphone for the shield box, enabling wireless testing of radio systems including loudspeakers and microphones.

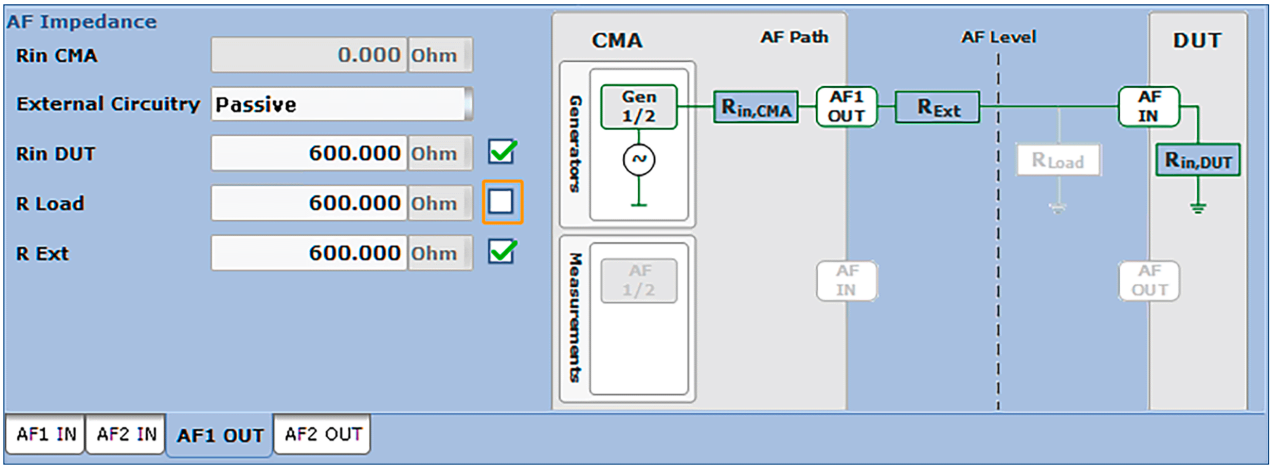


The R&S®CMW-Z10 RF shield box with the R&S®CMW-Z11 antenna coupler and the R&S®CMW-Z15 audio measurement option

HANDLING OF EXTERNAL AUDIO IMPEDANCES

The CMA supports all external audio impedances. The external circuitry and the impedances of the radio under test can be configured in a menu. Individual values can be set for each audio input and output.

The audio ports on the CMA can be adapted with external BNC feedthroughs with an integrated 600 Ω impedance (R&S®CMA-Z651A). The settings and configurations made are taken into account in the measurements.



Configuring external audio impedances

SPECIFICATIONS IN BRIEF

Specifications in brief		
RF frequency range		0.1 MHz to 3000 MHz
Output level range	RF generator	up to +16 dBm (max.)
Maximum allowed input power	RF input	up to 150 W
Modulation		CW, AM, FM, PM, SSB
Arbitrary waveform generator (ARB)	with R&S®CMA-B110D option	RF bandwidth up to 20 MHz
	with R&S®CMA-B110D option	4 Gbyte memory
Spectrum analyzer	with R&S®CMA-K120 option	0.1 MHz to 3000 MHz
FFT spectrum analyzer	span	10 kHz to 20 MHz
Audio signals		analog inputs/outputs, SPDIF, internal AF generators/analyzers
Power supply	AC	100 V to 240 V
	DC	10 V to 30 V or battery
		85 W
Connectivity		RF, AF, LAN, USB, DVI, Rohde&Schwarz power meters, reference frequency in/out, trigger in/out, TTL in/out, GPIB (R&S®CMA-B612A)
Dimensions	W × H × D	¾ 19", 4 RU, 360.5 mm × 195.4 mm × 351 mm (14.2 in × 7.7 in × 13.8 in)
Weight	fully equipped	13 kg (28.7 lb)
	base unit without options	10.9 kg (24 lb)

CMA ports			
Connector	**Type**	**Position**	**Use**
3 × USB	USB port, type A	front	mouse, keyboard, USB flash drive for software updates and screenshots
1 × power sensor	Rohde&Schwarz sensor port	front	power measurement with high-precision R&S®NRP/R&S®NRT power sensors
2 × audio in	BNC	front	analog audio, e.g. receiver measurements
2 × audio out	BNC	front	analog audio, e.g. transmitter measurements
1 × bidirectional RF	N female	front	standard RF port for the DUT
1 × RF out	N female	front	RF port for high output power
1 × RF in	N female	front	sensitive RF input
2 × USB 3.0	USB port, type A	rear	mouse, keyboard, USB flash drive for software updates and screenshots
1 × Gigabit LAN	RJ-45 port	rear	integration into a network, e.g. for software updates; remote control of the CMA; remote desktop operation
1 × SPDIF in	BNC	rear	digital audio, e.g. receiver measurements
1 × SPDIF out	BNC	rear	digital audio, e.g. transmitter measurements
1 × trigger in	BNC	rear	for external triggers
1 × trigger out	BNC	rear	trigger for external equipment
1 × parallel port	D-Sub	rear	TTL in/out and relays for custom applications

ORDERING INFORMATION

Designation	Type	Order No.
Base unit		
Radio test set	CMA 180	1173.2000K18
Selections		
Solid-state disk	R&S®CMA-S052R	1173.5100.19
AC power supply	R&S®CMA-S054B	1173.5151.03
DC power supply	R&S®CMA-S054M	1173.5151.14
Options and extras		
Hardware options		
Baseband generator, 4 Gbyte memory	R&S®CMA-B110D	1173.5751.05
IEC/IEEE bus interface	R&S®CMA-B612A	1173.5800.02
OCXO reference oscillator	R&S®CMA-B690A	1173.5851.02
OCXO reference oscillator, high-performance	R&S®CMA-B690M	1173.5851.14
Battery compartment	R&S®CMA-B060A	1209.5003.02
Software options, general purpose		
Signal analyzer (SA), tracking generator (TG), oscilloscope (scope)	R&S®CMA-K120	1173.6206.02
ILS/VOR generator	R&S®CMA-K130	1209.5703.02
I/Q recorder	R&S®CMA-K220	1209.6200.02
VoIP support in line with EUROCAE ED-137B/C	R&S®CMA-K610	1209.7058.02
VoIP delay measurements	R&S®CMA-K611	1209.9509.02
Software options, R&S®CMArun		
Analog radio tests	R&S®CMA-KT051	1209.5603.02
Analog radio tests, advanced	R&S®CMA-KT052	1209.7412.02
Battery life test	R&S®CMA-KT061	1209.6300.02
VOR/ILS tests	R&S®CMA-KT130	1209.7393.02
Digital tests (DMR/APCO/NXDN)	R&S®CMA-KT200	1209.8619.02
R&S®Series4100 radio test	R&S®CMA-KT410	1209.7764.02
R&S®Series4200 radio test	R&S®CMA-KT420	1209.6422.02
R&S®Series4400 radio test	R&S®CMA-KT440	1209.7358.02
R&S®Series5200 radio test	R&S®CMA-KT520	1209.9521.01
VoIP support	R&S®CMA-KT610	1209.7335.02
Software options, waveforms		
Waveform library, GPS tests	R&S®CMA-KV140	1209.5855.02
Waveform library, GLONASS tests	R&S®CMA-KV141	1209.7206.02
Waveform library, Galileo tests	R&S®CMA-KV142	1209.7229.02
Waveform library, Beidou tests	R&S®CMA-KV143	1209.7241.02
Waveform library, APCO fading tests	R&S®CMA-KV240	1209.7087.02
Software options, waveforms, with R&S®WinIQSIM2		
LTE tests	R&S®CMA-KW500	1209.8677.02
Bluetooth® tests	R&S®CMA-KW610	1209.8925.02
GPS tests	R&S®CMA-KW620	1209.6222.02
GLONASS tests	R&S®CMA-KW621	1209.6245.02
Galileo tests	R&S®CMA-KW622	1209.6268.02
WLAN tests	R&S®CMA-KW656	1209.8919.02
TETRA Rel. 2 tests	R&S®CMA-KW668	1209.6874.02
Software options, digital		
Signal analyzer, base	R&S®CMA-K300	1209.8990.02
Signal analyzer, digital (APCO, DMR, NXDN, dPMR, TETRA)	R&S®CMA-K305	1209.9009.02
Signal analyzer, LTE FDD	R&S®CMA-K320	1209.8877.02
POCSAG generator	R&S®CMA-KG260	1209.7487.02
Zigbee™ generator	R&S®CMA-KG250	1209.7506.02

Designation	Type	Order No.
FSK generator	R&S®CMA-K210	1209.8654.02
BER test	R&S®CMA-K230	1209.8631.02
FSK signal content analysis	R&S®CMA-KS200	1209.8819.02
APCO signal content analysis	R&S®CMA-KS201	1209.9515.02
MMI		
MMI language Russian	R&S®CMA-KL007	1209.6468.02
MMI language French	R&S®CMA-KL033	1209.6480.02
MMI language Chinese	R&S®CMA-KL086	1209.6500.02
Extras		
Transit case	R&S®CMA-Z020A	1209.5555.02
Soft case	R&S®CMA-Z025A	1209.5510.02
Display protective cover	R&S®CMA-Z030A	1209.9796.00
External power supply	R&S®CMA-Z053A	1173.6058K00
Protective caps	R&S®CMA-Z059	1209.6445.02
Lithium-ion battery pack (two batteries)	R&S®CMA-Z061A	1209.5303.02
Dual charger for CMA batteries	R&S®CMA-Z062B	1216.0532K02
Radio adapter (box and cables) for R&S®Series4100, R&S®Series4200, R&S®Series4400 and R&S®Series5200 radios	R&S®CMA-Z421A	1209.6522.02
AF impedance matching unit	R&S®CMA-Z600A	1173.6406.02
VoIP kit, EUROCAE ED-137	R&S®CMA-Z610A	1209.7293.02
Feedthrough termination, BNC, 600 Ω (2 × parallel)	R&S®CMA-Z650A	1209.6700.02
Feedthrough, BNC, 600 Ω (1 × serial, 1 × parallel)	R&S®CMA-Z651A	1209.7170.02
DC block, N type, 10 MHz to 6 GHz	R&S®CMA-Z670A	1209.6780.02
Antenna set	R&S®CMA-Z680A	1209.6745.02
Accredited calibration (DKD)	R&S®CMA-ACA	1209.6368.02

The CMA can be controlled in different ways:
remotely, via PC or directly on the tester

Designation	Type	Order No.
Recommended extras		
19" rack adapter for CMA	R&S®ZZA-KN10B	1703.1381.00
Power sensors	R&S®NRPxxx, R&S®NRT-Z14/-Z44	Contact your local Rohde&Schwarz sales office.
Directional power sensors	R&S®FSH-Z14/-Z44	Contact your local Rohde&Schwarz sales office.
RF shield box	R&S®CMW-Z10	1204.7008.02
Antenna coupler, up to 6 GHz	R&S®CMW-Z11	1204.7108.02
Audio accessory	R&S®CMW-Z15	1204.7508.02
RF cable, up to 6 GHz, N to N	R&S®CMW-Z110	1204.7608.02
Attenuator, 3/6/10/20/30 dB, 100 W, 50 Ω	R&S®RBU100	1073.8495.xx (xx = 03/06/10/20/30)
50 W load	R&S®CTH-Z30	1207.1700.02
Handset	R&S®CMW-Z50	1208.7602.02
Headphones	–	0708.9010.00
IEC/IEEE bus cable, length: 1 m	R&S®PCK	0292.2013.10
IEC/IEEE bus cable, length: 2 m	R&S®PCK	0292.2013.20
Supplementary products		
Multi-channel power probes		
Multi-channel power probe with autoranging, 2 × voltage and 2 × current channels	R&S®RT-ZVC02A	1326.0259.32
Multi-channel power probe with autoranging, 4 × voltage and 4 × current channels	R&S®RT-ZVC04A	1326.0259.34
Accessories for multi-channel power probes		
Extended cable set, PCB, length: 32 cm	R&S®RT-ZA30	1333.1686.02
Extended cable set, 4 mm, length: 32 cm	R&S®RT-ZA31	1333.1692.02
Extended cable set, 4 mm, length: 100 cm	R&S®RT-ZA34	1333.1892.02
Extended cable set, PCB, length: 100 cm	R&S®RT-ZA35	1333.1905.02
Solder-in cable set	R&S®RT-ZA36	1333.1911.02

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, three years	R&S®WE3	
Extended warranty, four years	R&S®WE4	
Extended warranty, nine years	R&S®WE9	
Extended warranty with calibration coverage, one year	R&S®CW1	
Extended warranty with calibration coverage, two years	R&S®CW2	
Extended warranty with calibration coverage, three years	R&S®CW3	
Extended warranty with calibration coverage, four years	R&S®CW4	
Extended warranty with accredited calibration coverage, one year	R&S®AW1	
Extended warranty with accredited calibration coverage, two years	R&S®AW2	
Extended warranty with accredited calibration coverage, three years	R&S®AW3	
Extended warranty with accredited calibration coverage, four years	R&S®AW4	

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

Rohde&Schwarz

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- Energy efficiency and low emissions
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CMA Radio Test Set
Data without tolerance limits is not binding | Subject to change