Radiocommunication Tester CMT, Radiocommunication Analyzer CMTA

0.1 to 1000 MHz
(CMT55: 2 GHz, DECT)

Radiocommunication Testers CMT and CMTA not only provide the ultimate in radio measurements but also novel measuring facilities and in-depth testing

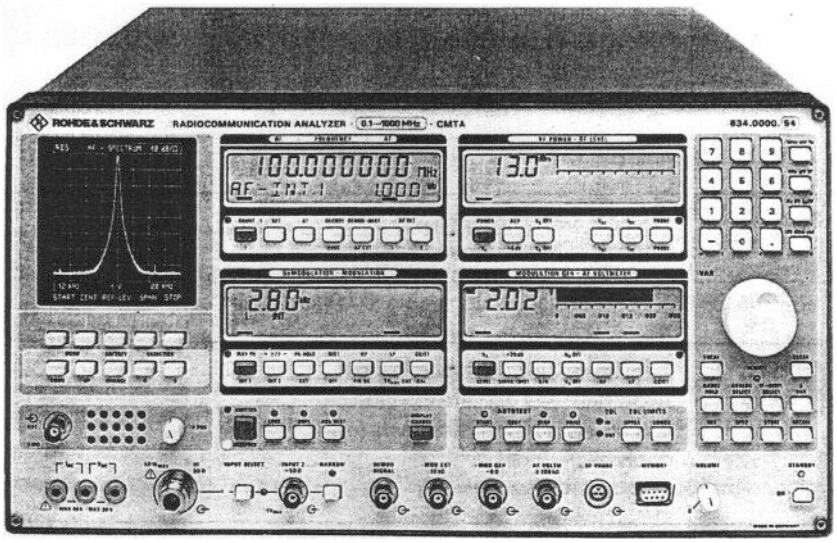


Photo: CMTA

Uses

The various models of Radiocommunication Analyzer CMTA and Radiocommunication Tester CMT from Rohde&Schwarz form a tester family for all applications in radio measurements including related fields. The instruments feature the same operating philosophy and a similar concept. Their differences lie mainly in test depth and measurement capabilities.

CMT and CMTA are able to perform any measurements on AM, FM, φM and SSB transceivers as well as on mobile and base stations in modern radio networks including cellular radio. Future-proof design is ensured by providing a variety of options. A wide choice of accessories including probes, detectors and VSWR insertion units, various printers as well as plug-in RF filters allow adaptation even to the more exotic DUTs.

General-purpose radio tester CMT
Its range of measurement facilities makes the CMT ideal for radio testing in production, simple development tasks and in mobile or stationary service. Applications also include maintenance and fast go/nogo testing for incoming inspection.

High-tech radio tester CMTA
CMTA provides radio measurements of the highest quality. It contains all the facilities required for precision measurements. Its unusual variety of measurement capabilities provides exceptional test depth. This means that the CMTA will mainly be used in development, quality assurance, type approval and acceptance testing.

2-GHz radio tester CMT55
Like the CMT, the CMT55 provides full radio measurement capabilities in an extended frequency range up to 2 GHz for directional-radio applications. The Modification Kits CMT-U26 (broadband modulation/demodulation) and CM-U20 (power burst measurement) make the CMT55 a favourably priced, fast and full-featured tester for DECT (Digital European Cordless Telephone) in production and service.

Signalling measurements
Special tester configurations with integrated signalling unit are available for signalling measurements on radio-network mobile phones including those for cellular radio.

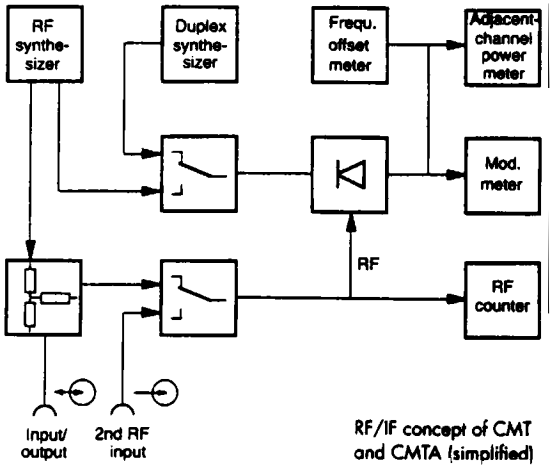
Variety of models
- CMT54: 1-GHz basic model with integrated oscilloscope
- CMT55: 2-GHz model with integrated oscilloscope, broadband modulator and demodulator, DECT RF measurements
- CMT84: same as CMTA54, plus integrated signalling unit
- CMTA52: 1-GHz basic model without oscilloscope
- CMTA84: same as CMTA54, plus integrated signalling unit

Characteristics

Concept

Due to the clearcut separation into generator, measurement and control section, CMT and CMTA are ideal for testing all kinds of electronic modules and units. Numerous built-in RF and AF measuring facilities replace the variety of individual instruments otherwise required and associated cabling. These radio testers, and in particular the CMTA, are a sort of full-featured electronic minilab.

- Additional RF attenuator for signal to be measured, yielding maximum dynamic range
- Synthesizer-accurate RF and SSB analyzer
- Synthesizer-accurate AF analyzer
- Storage oscilloscope with universal trigger facilities
- IEC/IEEE-bus interface, relay matrix
- Two independent AF synthesizers
- V/I DC meter
- DTMF coder and decoder
- Transient recorder



RF/IF concept of CMT and CMTA (simplified)

Cost effectiveness

A minimum of investment and software make the radio testers particularly economical, even in testing small quantities and different types of DUTs, eg in automatic testing.

Basic configuration of CMTA 54

- OCXO reference oscillator with high immunity to temperature effects and little aging
- Programmable highpass and lowpass filters
- Programmable notch and resonance filters
- Distortion and SINAD meter with Variable test frequency

Operation

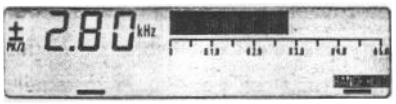
Even beginners will be quickly familiar with the tester

The logically organized front panel guarantees errorfree, self-explanatory operation and fast access to all measuring facilities. Even the execution of complex routines remains transparent. Test parameters and results are updated continually and the alphanumeric display provides information on the individual steps of a sequence. Keypad polling and result displays operate in a multitasking mode to ensure extremely fast response of the tester.

Alphanumeric display as communication aid between test set and user. Here: request to enter RF frequency of receiver

Result displays

Four large, illuminated LCDs simultaneously indicate all results and parameters. Additional quasi-analog displays with clear scaling, selectable range hold and resolution of 1% facilitate adjustments. Time constants can be selected to match the displays perfectly to various requirements. The full-scale values of the quasi-analog displays are optimally matched to the particular measurement and can also be preset for special adjustments.



Measured modulation displayed in both digital and analog form: RANGE HOLD for optimum adjustment

The tester saves the user a lot of work

Switchover between transmitter and receiver tests can be triggered either manually or automatically by the transmitter power of the transceiver. Parts of transmitter and receiver tests can be combined as desired, each individual measuring facility being directly addressable.

Autorun control and printer interface allow automatic runs for complete transceiver testing to be generated, stored, recalled and printed out.

Radiocommunication Tester CMT, Radiocommunication Analyzer CMTA

Two related results simultaneously shown on same display: AF-voltage measurement (digital) with associated distortion (analog)

Integration into automatic test systems
The IEC/IEEE bus is the key to expanding the testers into a fully automatic, computer-controlled universal radio test system.

Simple IEC/IEEE-bus commands as well as the use of internal, automatic test routines ensure fast generation of test runs. Basic software packages make program generation extremely simple, since only individual routines have to be called up for which no programming knowledge is required. Up to eight integrated relays are provided for transceiver settings and for controlling additional devices.

Measurement capabilities

RF synthesizers
The RF synthesizers in CMT and CMTA provide CW, AM, FM or φM signals with excellent signal/noise ratio. CMTA features extremely low residual FM, 1-Hz frequency resolution over the full frequency range and an overrange up to +16 dBm. Electronic fine level variation is without carrier interrupt.

AF synthesizers
Two independent AF synthesizers with different level settings offer universal modulation capabilities by allowing any combination, even with external modulation.

The two AF signals feature excellent S/N ratio, low and frequency-independent output impedance and smallest levels down to 10 µV. Eight presettable, fixed frequencies can be stored and recalled for a fast test of the transmission range. Even the lowest modulation frequencies are transmitted precisely.

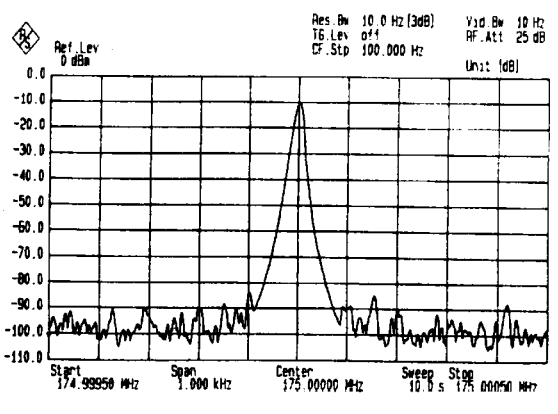
RF power meters
RF power meters with a wide dynamic range are provided in CMT and CMTA both for measurements on high-power transmitters and also for accurate determination of the output power of mobile phones of the lowest power class.

- VSWR Insertion Unit CM-Z20 is available for measurement of forward and reflected power as well as VSWR
- Modification Kit CM-U20 enables GSM power burst measurements and TDMA applications in general

Adjacent-channel power meters
The adjacent-channel power meters determine the power transmitted by the transceiver in the upper and lower adjacent channels referred to the useful-channel power or as absolute power. Double conversion using oscillators with particularly high spectral purity results in a wide dynamic range of more than 80 dB for measurements in the radiotelephone bands.

RF millivoltmeters
Selective RF millivoltmeters are integrated for measuring extremely low levels. They detect signals down to the µV range; thanks to simple calibration, their accuracy is comparable to that of the RF power meters. The RF millivoltmeter operates independently of the other measuring facilities and allows connection of high-impedance probes as well as of insertion units for match-terminated measurements. A wide choice of probes and insertion units is available (chapter 7).

RF counters
The RF counters operate independently of the internal RF synthesizer. They also allow measurements on transceivers whose transmit and receive frequencies are in different bands.



RF synthesizer spectrum of CMTA: extremely high spectral purity (low SSB phase noise and low spurious content) as well as excellent short- and long-term stability

AF counters

The AF counters can be switched to operate as a period or a gate-time counter to measure the frequency of a demodulated signal, of the AF-voltmeter input signal or the RF frequency offset (internal IF measurement). In this way both high measurement rate for fast frequency adjustment with 0.1 Hz resolution and high immunity to superimposed noise, as may occur in off-air measurements, can be achieved.

Demodulators

The built-in AM, FM and φM demodulators are automatically tuned by periodic measurement of the RF frequency; they can also be preset to reduce transients to an absolute minimum. Any type of peak weighting is possible, supported by a peak-hold function (detection of short-term, transient peak modulation) and RMS weighting (S/N-ratio measurement).

A deemphasis of 750 µs can be switched on for special FM measurements. The demodulator outputs are DC-coupled and have a wide dynamic range corresponding to a frequency deviation of ±125 kHz. In conjunction with trigger outputs, transmitter transients can thus be measured quite simply.

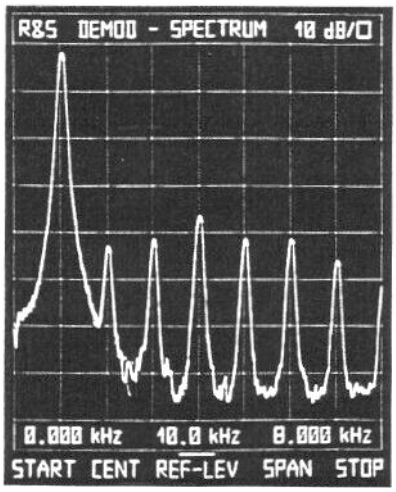
Duplex modulation meter and synthesizer

The duplex modulation meter and synthesizer enables the modulators, frequency-offset meters, adjacent-channel power meters and selective RF level meters to operate independently of the RF synthesizer. It covers the entire RF range and is ideal for measurements on transceivers or modules whose transmit and receive frequencies or input and output frequencies are in different bands. The low spurious FM enables all transmitter measurements to be carried out without any restrictions.

This is particularly interesting for measurements on repeater stations and mobile phones of modern radio networks since these can often only be held in transmit mode by the presence of a receive signal; the duplex modulation meter should therefore always be used for transmitter measurements.

Distortion and SINAD meter

Meter rectifiers operating in parallel make for a very high measurement rate. The test frequency of CMT is 1 kHz, while that of CMTA can be continuously adjusted between 100 Hz and 5 kHz. Noise and distortion products are displayed on the integrated oscilloscope of models CMTA54 and CMTA84.



Distortion products, displayed on integrated oscilloscope

S/N meter

The S/N meter determines signal/noise ratio at the AF output of the transceiver by cyclically switching the modulation on and off. It is possible here to exempt pilot tones from being switched off.

AF voltmeter

The AF voltmeters measure AF voltages from 100 µV to 30 V with high input impedance. RMS weighting is used and peak weighting can be selected to detect pulse noise. Various time constants and result averaging factors can be set, eg for stabilizing the result displays for adjustments.

Filters

The testers contain a large variety of filters. They include, for instance, a 150-Hz highpass filter for hum suppression, a 300-Hz highpass filter for pilot-tone suppression and a CCITT filter for psophometric weighting of noise. Standard filters in CMTA are continuously tunable highpass, lowpass, narrowband bandpass (resonance filter) and notch filters. Most of the filters can be used in any combination, thus allowing measurement of complex, distorted or even multi-frequency signals via the AF-voltmeter input or using the demodulated signal.

All filter combinations selected are also effective for the other AF measuring facilities like analyzer, storage oscilloscope, frequency meter or selective-call decoder. As a result, the dynamic range is increased and the application field of the tester further enhanced.

A switchable narrowband filter is provided in both types of tester to increase sensitivity and selectivity of RF measurements. This is particularly useful at the second RF input for off-air measurements.

SSB and AF analyzer

The SSB and AF analyzer is a narrowband analyzer for signals applied to the RF input as well as for AF and demodulated signals. It enables measurement of suppressed carrier, vestigial sidebands and intermodulation products in the transmitter test on SSB transceivers, while selective measurement of all AF spectral components is possible in the receiver test. In addition to the SSB application, the SSB and AF analyzer can also be used as a selective level meter for analyzing the spectral components of demodulated and AF-voltmeter input signals.

AF spectrum analyzer

In CMTA, the measurement capabilities of the SSB and AF analyzer are supported by screen display of the spectra. The dynamic display range is more than 70 dB; extremely narrowband filters even resolve strong, closely adjacent signals. RF and AF voltages down to the mV range or spurious FM to below 1 Hz can be displayed and analyzed.

RF spectrum analyzer

The integrated spectrum analyzers feature high accuracy, user-selectable start and stop frequencies with span, zero span and different bandwidths. Their dynamic range approaches that of stand-alone units. A special vector method together with the use of a fine beam is employed for producing a crisp screen display as well as curves without discontinuities.

The RF spectrum analyzer has a user-selectable span of up to 10 MHz in the full frequency range, the filter bandwidths being selected automatically. As an SSB analyzer it displays a frequency spectrum of up to ±10 kHz about the center frequency with very high frequency resolution. All RF signals up to 1 GHz are resolved with a filter bandwidth of as low as 150 Hz (SSB analysis) or a filter bandwidth matched to the span (RF analysis).

Digital storage oscilloscope

The digital storage oscilloscope with transient-recorder capabilities has excellent trigger facilities such as pretrigger, trigger delay, trigger level with switchover and selectable period of recording.

All parameters can be preset with high resolution, the amplitude scale being matched to the signal to be measured. In addition to continuous display, single-shot mode is also possible. The recording period can be selected between 3.2 and 3200 ms, with a remarkable maximum resolution of 3.2 µs.

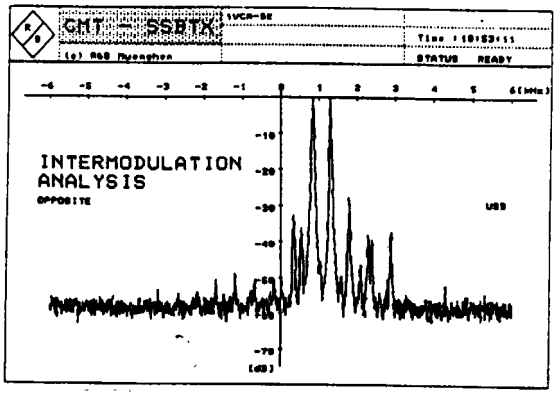
Two variable cursor lines can be used for time-interval measurements referred to the trigger signal; the time difference can be indicated at a keystroke.

2nd RF input

All operating modes can also be used via the 2nd RF input with high sensitivity. The built-in second RF attenuator of CMTA in conjunction with the duplex synthesizer is the prerequisite for high-precision twoport measurements. Input and output frequencies may vary in any way for measurements on frequency-converting modules or units. CMTA can thus even be used for scalar network analysis of frequency-converting DUTs.

3rd RF input/output

For receiver measurements requiring two RF generators, the radio testers are provided with an additional RF input/output on the rear panel with high isolation, where a second RF signal can be applied. All two-signal measurements can thus be carried out without requiring any additional devices. Thanks to its high spectral purity and high output level, CMTA itself may even be used as a noise source.



Hardcopy printout of computer-controlled SSB transmitter measurement with two-tone modulation and analysis using CMT-SSB and AF analyzer. It clearly shows intermodulation products as well as carrier and vestigial-sideband suppression

DC ammeter and voltmeter
This measuring facility (standard in CMTA) is connected to the power supply of the transceiver. The high common-mode rejection of current and voltage measurement path allows error-free measurement under any operating conditions.

DC current and voltage measurements are performed in CMT via a detached DC Test Adapter CMT-Z6 available as an accessory.

Selective-call encoder and decoder (DTMF)
Built-in selective-call encoder and decoder generate and decode signals to all major standards including Europaging as well as user-specific standards. The range of application can be extended by numerous variables such as extended first tone, switch-selectable automatic repeat, adjustable pauses, etc. Inadmissible frequency variations and excessively long pauses are marked; the bandwidth to be evaluated can be preset for tolerance investigations. For mobile phones with touch-tone dialling, a DTMF encoder/decoder is additionally integrated.

Signalling measurements

To ensure compatibility of a mobile phone with the radio network, signalling must be generated and assessed; conventional analog test parameters must also meet network specifications. Optional signalling units can be integrated (see overviews of options, page 34, 36) to enable transmitter and receiver measurements to PTT regulations on mobile stations as well as on base stations of all major radio networks including their national versions. For testing a mobile station, they can simulate the base stations of the following radio networks:

- C Net (Germany, Portugal,...)
- Radiocom 2000
- NMT450/900 (Nordic Mobile Telephone)
- AMPS, E-AMPS (Advanced Mobile Phone Service)
- TACS (J-TACS, E-TACS, TACS Issue 4) Total Access Communication System
- MPT1327, MPT1343 (trunked radio)
- POCSAG/Cityruf
- ZVEI/VDEW digital
- FMS-BOS

The built-in signalling unit can handle all network-specific features so that no extra equipment is necessary for high-quality testing. For NMT networks, in-depth base-station testing is also possible. Fitted with the relevant option, the radio testers have special interfaces adapted to base-station requirements as well as the suitable signalling software.

Design and function
The signalling unit has a triple-microprocessor control unit which performs all network-specific signalling in full-duplex mode at the generator and analyzer end and also carries out all conventional radio measurements. Since the complete network-specific signalling and evaluation is integrated into the signalling unit, almost all the test facilities of the basic unit can be used separately even while signalling is being continued.

Operation
The mobile station can reliably be checked for system conformity and all performance features be determined with a minimum of effort. All routines can be selected with the spinwheel and started by pressing a button. All relevant information is indicated in plain text on the alphanumeric display. The large amount of network information is reduced to a manageable minimum. As the tester knows which network type it is testing, the operator cannot select other than network-specific routines; this prevents errors and makes operation easier.

In addition to extremely versatile sequences, the large signalling test depth gives a comprehensive overview of signalling with display of data-telegram timing, telegram contents, telegram parameters, telegram bits and type of error. Error injection to check the error-correction facilities of subscriber phones is also possible.

When used for testing trunked radio (MPT1327/1343), CMT and CMTA allow free definition of all system-specific parameters and signalling sequences, since the guidelines for private trunked radio networks are extremely liberal.

After the individual signalling sequences have been defined, they are loaded into the test set via the IEC/IEEE bus and executed. Various modes of operation are possible: PC control, manual, autorun control or IEC/IEEE bus. The data detected by the test set are automatically loaded into the PC, where they are analyzed and a comprehensive protocol is compiled. The PC program supports screen windows and a help menu.

Radiocommunication Tester CMT, Radiocommunication Analyzer CMTA

Specifications

Data refer to CMTA, lower specs in parentheses for CMT. For DECT measurements, please see data sheet CMTA55

Reference

Oscillator	OCXO (standard)
Aging	<1×10^{-9}/day (<1×10^{-6}/month), after 30 days of operation typ. <2×10^{-7}/year
Temperature effect	<2×10^{-9}/° C (<2×10^{-6}/° C)
Warmup time	none, because of standby-mode heating (60 min)

Receiver measurements

Signal generator	
Frequency range	0.1 to 1000 MHz (CMT55: 2 GHz)
Resolution	1 Hz (<25/50/100 Hz)
Frequency error	reference + 0.5 x resolution
Level CW, FM, φM	−137 to +13 dBm, AM: +7 dBm
Overrange without specification	adjustable to +16 dBm
Resolution	0.1 dB
Fine variation	0 to −19.9 dB, non-interrupting
Level error for P ≥−127 dBm	<±1.5 dB
Spectral purity	
Harmonics	<−30 dBc (1 to 2 GHz: 20 dBc)
Nonharmonics	<−70 to −80 dBc, frequency-dependent (<−60 dBc, CMT55: <−54 dBc)
Spurious AM, rms at 0.03 to 20 kHz	<0.02%, CCITT-weighted
Modulation modes	AM, FM, φM, internal/external, AC or DC, multiple modulation, multitone modulation
Amplitude modulation	
Modulation depth	0 to 99% (95%)
Modulation frequency range	DC to 50 kHz (DC to 30 kHz)
Resolution	0.5%
Modulation distortion	<1% for 30% AM
Error for m <0.8	<5% of setting + spurious AM
Frequency modulation	
Max. deviation	50 to 800 kHz (CMT55: 1600 kHz), frequency-dependent
Resolution	10 Hz at Δf <1kHz (25 Hz at Δf <2kHz) ≤1% at Δf >1kHz (Δf ≥5kHz)
Modulation frequency range	
FM DC	DC to 100 kHz (not CMT)
FM AC	10 Hz to 100 kHz (150 Hz to 30kHz, usable: 20 Hz to 100 kHz, with option SCM-U1: 2 Hz to 30 kHz, CMT55: external to 130 kHz)
Modulation distortion	<1% (via MOD EXT, typ. 0.1%)
Error	<5% of setting + residual FM of signal generator
Phase modulation	
Phase deviation	0 to 80 rad (CMT55: 160 rad)
Modulation frequency range	300 Hz to 6 kHz
Error	same as FM + 2% frequency response
AF voltmeter	
Frequency range	50 Hz to 20 kHz
Weighting	rms, peak +, peak − (not CMT)
Weighting filter	see transmitter and receiver measurements
Measurement range	35 V
Resolution	100 µV for V <10 mV 1% for V ≥10 mV
Error	<±3% of reading + resolution
Input impedance	≥100 kΩ
AF frequency counter	
Frequency range	20 Hz to 500 kHz
Resolution	0.1 Hz/1 Hz, selectable
Error	same as reference + resolution
S/N meter	
Dynamic range	see AF voltmeter
Resolution	0.1 dB
Error	<0.5 dB + error due to residual FM/AM of signal generator

Transmitter measurements

Power meter	
Frequency range	1.5 to 1000 MHz (CMT55: 2 GHz)
Measurement range	5 mW to 50 W, usable up to 75 W
Resolution, display in dBm	0.1 dBm
display in watts	0.1 mW for P <10 mW (<0.1 W) 1% for P ≥10 mW (≥0.1 W)
Error	typ. 0.4 dB + resolution (CMT55: typ. 1 dB)
RF frequency counter	
Frequency measurement range	1 MHz to 1 GHz (CMT55: 2 GHz)
Resolution	1 Hz/10 Hz, selectable
Error	reference + resolution
AM meter	
Specification for duplex off mode	
Operating modes	+PK, −PK, PK/2, PK HOLD, MAX PK or RMS
Frequency range	1.5 to 1000 MHz (CMT55: 2 GHz)
Measurement range	0.01 to 99%
Resolution for m <10%	0.01% AM
for m ≥10%	0.1% AM
Demodulation frequency range	50 Hz to 20 kHz
Residual AM	<0.03% to CCITT
Error for m <0.8	<5% (CMT55: >1GHz typ. 5%) of reading + residual AM
Weighting filters	see transmitter and receiver measurements; 300-Hz highpass filter (can be switched into modulation path)
Frequency deviation meter	
Operating modes	same as AM meter
Frequency range	4 to 1000 MHz (CMT55: 2 GHz)
Deviation range	100 kHz
Demodulation frequency range	
Display	20 Hz to 20 kHz
Resolution for Δf <1kHz	1 Hz
for Δf ≥1 kHz	1% of reading
Output for demod. signal	DC to 20 kHz
Residual FM for f_c <500 MHz	≤3 (≤4) Hz to CCITT, ref. to 6 Hz
for f_c ≥500 MHz	≤5 (≤8) Hz to CCITT, ref. to 12 Hz
Error	3% + error due to residual FM + resolution
Weighting filters	750 µs deemphasis, see transmitter and receiver measurements for more weighting filters
FM broadband demodulator	CMT55 only
RF range	40 to 2000 MHz
Modulation frequency range	up to 130 kHz
Deviation (presettable range limits)	130/260/520 kHz
Error (AF <20 kHz)	<3% + residual FM + resolution
Phase deviation meter	
Operating modes	same as AM meter
Phase deviation measurement range	25 rad
Demodulation frequency range	300 Hz to 10 kHz
Resolution for <0.1 rad	0.001 rad
for ≥0.1 rad	1%
Error	≤3% + resolution + 2% frequency response
Weighting filters, switchable	see transmitter and receiver measurements

Mobile Radio Measurements

Transmitter and receiver measurements

CCITT filter	to CCITT specifications
Programmable notch filter	(not CMT)
Progr. notch frequencies	100 Hz $\leq f_{notch} \leq$ 5 kHz
Error in passband	≤0.5 dB
Maximum attenuation for input voltage >100 mV	≥60 dB
Programmable highpass filter	(CMT: switchable 300-Hz highpass for demodulation))
Progr. passband cutoff frequencies (0.5 dB)	107 Hz to 10.6 kHz, in 60 steps
Upper cutoff frequency	21 kHz or approx. 10 times the passband cutoff frequency
Error in passband	≤0.5 dB
Inherent distortion	<0.3%
Maximum attenuation for input voltages >100 mV	≥50 dB
Programmable lowpass filter	(not CMT)
Progr. passband cutoff frequencies (0.5 dB)	235 Hz to 21 kHz, in 60 steps
Error in passband	≤0.5 dB
Inherent distortion	<0.3%
Maximum attenuation for input voltages >100 mV	≥50 dB
Programmable bandpass filter	combination of highpass and lowpass filters (not CMT)
Distortion measurement	
Test frequency range	100 Hz to 5 kHz (1 kHz)
Measurement range	to 50%
Resolution	0.1%
Inherent distortion	≤0.3%
Error	<5% of reading + inherent distortion
SINAD measurement	
Test frequency range	100 Hz to 5 kHz (1 kHz)
Measurement range	1 to 50 dB (1 to 46 dB)
Resolution	0.1 dB
Error	<0.5 dB
Modulation generators	(2nd generator: option CMT-B7)
Operating modes	single-tone modulation, dual-tone modulation (optional)
Frequency range	20 Hz to 25 kHz, usable up to 30 kHz
Resolution: f <1/3/6/10/20 kHz	0.1/0.2/1/2.5/10 Hz
Frequency error	<0.5 x resolution
Fixed frequencies	8, presettable
Output voltage	10 µV to 5 V
Error (V_O >1 mV)	<3%
Selective call encoder/decoder	
Standard tone sequences	ZVEI1, 2/CCIR/EIA/EEA/EURO/ VDEW/CCITT, NATEL and user-specific sequences
Digits	0 to 9, A to F
Call length	1 to 25 tones
Automatic repeat	selectable
Encoder	
Frequency offset	can be set to ±10%
Tone/pause duration	to standard or programmable
Decoder	tolerances to standard or programmable with out-of- tolerance display
DTMF decoder	(option CM-B11)
Standard	DTMF
Display	tones 0 to 9, A to D, *, #
Call length	25 digits
Dual-tone encoder	(option CMT-B7, to DTMF and user-specific sequences)
Digits	0 to 9, A to D, *, #
Call length	25 dual tones
Tone/pause duration	to standard or programmable
DC measurement	(option CMT-Z6)
Voltage measurement	0 to ±30 V
Error	<3% (CMT-Z6: 5%)
Current measurement	0 to ±10 A, for a short time 15 A
Error	<3% (CMT-Z6: 5%)

AF spectrum analyzer	CMTA54/84 only
Displayable signals	AF voltmeter input, demodulated signals, beat signals, external signals (Zin approx. 1 MΩ)
Frequency range	to 20 kHz (crystal accurate)
Level range (reference level)	
AF	1.6 mV to 35 V (rms)
Demodulated FM	50 Hz to 100 kHz (peak)
Demodulated AM	0.1 to 100% (peak)
Demodulated φM	0.1 to 25 rad (peak)
External signals	5 mV to 14 V (rms)
Dynamic range for V_{in} >10 mV	66 dB
Scale	log 10 dB/div, log 2 dB/div or linear
Level error (f >50 Hz)	±2 dB to 60 dB below ref. level
Automatic test filter selection	as a function of span (3 test filters)
SSB spectrum analyzer	CMTA54/84 only
SSB receiver test	AF analysis via AF input
SSB transmitter test	AF analysis after internal RF IF conversion
RF frequency	400 kHz to 1000 MHz
Level range (reference level)	–24 to +47 dBm (RF input/output) –64 to +17 dBm (2nd input)
Span	0 to 16 kHz (8 kHz)
Dynamic range	typ. 66 dB
Level error	typ. 3 dB
RF spectrum monitor	CMTA54/84 only
Frequency range	400 kHz to 1000 MHz
Level range (reference level)	–24 to +47 dBm (RF input/output) –64 to +17 dBm (2nd input)
Dynamic range for input level	>60 dB
Scale	log 10 dB/div, log 2 dB/div or linear
Level error	<3dB
Automatic test filter selection	as a function of span (4 test filters)
Oscilloscope, CMTA54/84 only	CMTA: digital storage oscilloscope
Displayable signals	external signal (Z_{in} approx. 1 MΩ, AC/DC coupling), AF, demod. signals (AM, FM, φM) beats (AC coupling)
Amplitude	1/2/5 steps for CMTA
External	2 (5) mV/div to 5 (10) V/div
AF voltmeter	1 mV/div to 20 V/div
Demodulated AM	0.1%/div to 40%/div
Demodulated FM	20 (5) Hz/div to 40 kHz/div
Demodulated φM	0.01 rad/div to 10 rad/div
Time base CMTA	crystal accurate
Divisions	1/2/5; 0.05 to 50 ms/div
Bandwidth CMTA	DC to 20 kHz (usable to 100 kHz)
CMT, ext. DC/AC	DC/5 Hz to 100 KHz
Trigger slope CMTA	+ or –
Trigger level	full screen height, in 60 steps
Main operating modes CMTA	scope or single-shot
Scope mode	repeat mode with automatic free-running
Single-shot mode	3.2 to 3200 ms
Recording time	1/8 of the recording
Screen display	(15 overlapping ranges)
Trigger sources	signal or EXT connector

General data

Power supply	88 to 132 V/194 to 264 V, 47 to 420 Hz, 200 VA (CMT: 100 VA)
Battery, CMT	11 to 30 V (approx. 80 W)
Dimensions (W x H x D); weight	420 mm x 220 mm x 460 (340) mm; 26 kg

Ordering information

Radiocommunication Tester	CMT54	0802.2020.54
	CMT55	0802.2020.55
	CMT84	0802.2020.84
Radiocommunication Analyzer	CMTA52	0834.0000.52
	CMTA54	0834.0000.54
	CMTA84	0834.0000.84
Modification Kits for CMT55		
Power Burst Measurement	CM-U20	0860.1852.02
Broadband Modulator/ Demodulator	CMT-U26	1001.9008.02