Digital Broadcast Analysis Options

Cell Master™

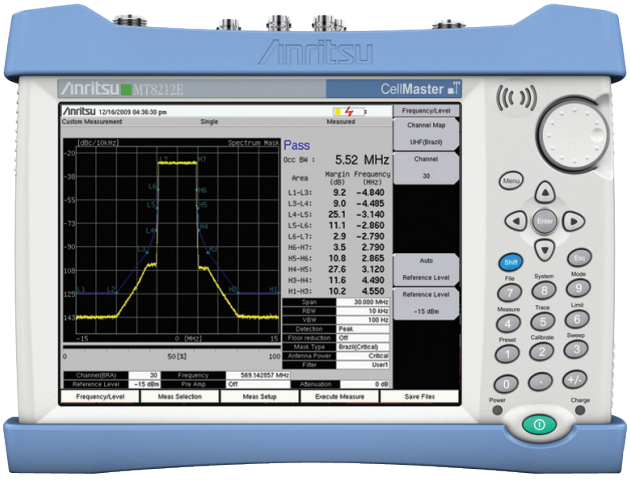
MT8212E-0030, MT8213E-0030
ISDB-T Digital Video Measurements
MT8212E-0079, MT8213E-0079
ISDB-T BER Measurements
MT8212E-0032, MT8213E-0032
ISDB-T SFN Measurements
MT8212E-0064, MT8213E-0064
DVB-T/H Digital Video Measurements
MT8212E-0057, MT8213E-0057
DVB-T/H BER Measurements
MT8212E-0078, MT8213E-0078
DVB-T/H SFN Measurements

Spectrum Master™

MS2712E-0030, MS2713E-0030
ISDB-T Digital Video Measurements
MS2712E-0079, MS2713E-0079
ISDB-T BER Measurements
MS2712E-0032, MS2713E-0032
ISDB-T SFN Measurements
MS2712E-0064, MS2713E-0064
DVB-T/H Digital Video Measurements
MS2712E-0057, MS2713E-0057
DVB-T/H BER Measurements
MS2712E-0078, MS2713E-0078
DVB-T/H SFN Measurements

Introduction

Anritsu's compact handheld Cell Master and Spectrum Master products can now be configured with a full suite of digital broadcast analysis options for both ISDB-T and DVB-T/H technologies and provide the broadcast professional the performance needed for the most demanding measurements in harsh RF and physical environments. Whether it is for spectrum monitoring, broadcast proofing, transmitter acceptance or regulatory compliance, the Cell Master and Spectrum Master are ideal instruments for making fast and reliable measurements.



Cell Master™ MT8212E Base Station Analyzer
Compact Size: 273 mm x 199 mm x 91 mm
Lightweight: 3.71 kg
For full specifications and functionality refer to the MT8212/13E Technical Data Sheet 11410-00485

Spectrum Master™ MS2712E Spectrum Analyzer
Compact Size: 273 mm x 199 mm x 91 mm
Lightweight: 3.45 kg
For full specifications and functionality refer to the MS2712/13E Technical Data Sheet 11410-00511

ISDB-T Measurements (Options 0030, 0079, 0032)

ISDB-T RF (Option 0030)	ISDB-T Signal Analysis (Option 0030)	ISDB-T BER Analysis (Option 0079)	ISDB-T SFN Analysis (Option 0032)
Signal Power Channel Power Termination Voltage Open Terminal Voltage Field Strength Spectrum Monitor Channel Power Zone Center Channel Zone Center Frequency Spectrum Mask Mask (Standard A) Japan Mask (Standard B) Japan Mask (Critical) Brazil Mask (Sub-critical) Brazil Mask (Non-critical) Brazil Phase Noise Spurious Emissions	Constellation (w/zoom) Layer A, B, C, TMCC Sub-carrier MER Delay Profile (w/zoom) Frequency Response Measured Data Frequency Frequency Offset MER (Total, Layer A/B/C, TMCC, AC1) Modulation (Layer A/B/C) Mode, GI Sub-carrier MER w/marker Delay w/marker Frequency Response w/ marker	Layer A, Layer B, Layer C BER and Error Count per Layer Before RS Before Viterbi PER and Error Count per Layer MPEG Bit Rate per Layer TMCC Information per Layer Modulation Code Rate Interleave Segments Channel Power Mode, GI Signal Sync Status ASI Out	Impulse Response (w/zoom) In-band Spectrum Measured Data Channel Power Delay DU Ratio Power Field Strength
ISDB-T Measurement Modes Custom User specified measurement and setup parameters Easy User specified measurements. Some setup parameters are automatically set or detected Batch User specified measurements and channels for automatic measurement, results' display and storage			

Setup Parameters

Channel Map	UHF (Japan), UHF (Brazil), IF (37.15 MHz), None
Channel Setting Range	13 to 62 (Japan) Center frequency = ((channel number –13) x 6 + 473.142857) MHz 14 to 69 (Brazil) Center frequency = ((channel number –14) x 6 + 473.142857) MHz
Frequency Range	35 MHz to 806 MHz
Setting Resolution	1 Hz
Bandwidth	6 MHz, 8 MHz*
Mode	Mode 2, Mode 3 Manual setting or setting by automatic detection
Guard Interval (GI)	1/4, 1/8, 1/16 Manual setting or setting by automatic detection
Modulation Scheme	QPSK, 16 QAM, 64 QAM Manual setting or setting by automatic detection
Spectrum Reverse	On, Off
Partial Reception	Recognized when layer A segment count is 1
One-Seg*	On: synchronizes with single segment transmission (Bandwidth 6 MHz only) Off: synchronizes with normal 13 segment signal
Maximum Input Level	+20 dBm (Preamp Off), –10 dBm (Preamp On)
Reference Level Setting	–25 dBm to +20 dBm/5 dB steps (Preamp Off), –50 dBm to –10 dBm/10 dB steps (Preamp On)

*Not available in option 0032

ISDB-T Digital Video Measurements (Option 0030)

Field Strength, Terminal Voltage, Channel Power (ISDB-T Signal, 1 Channel Input)

Input Level Range	+20 dBm to DANL (Preamp Off) –20 dBm to DANL (Preamp On)
Resolution	0.1 dB
Accuracy	Average count 10, VSWR ≤1.5, 50 Ω ±2.0 dB, typical (+20 dBm to –10 dBm), ±2.0 dB (–10 dBm to –60 dBm) (Preamp Off) ±2.0 dB (–10 dBm to –84 dBm) (Preamp On)
Displayed Average Noise Level (DANL)	RF input 50 Ω terminated, Average count 50, +20 ºC to +30 ºC, 5.6 MHz bandwidth ≤–70 dBm (Preamp Off) ≤–90 dBm (Preamp On)
Unit	dBm, dBµV, dBµV(emf), dBµV/m
Antenna Correction Table	Antenna level correction data table for measuring field strength saved in instrument
Impedance	50 Ω, 75 Ω (requires 12N50-75B, 50 Ω to 75 Ω matching pad))
Measurement Mode	Single, Continuous, Average, Moving average, Max hold, Average count 1 to 100

Spectrum Monitor

Horizontal Display Range	1, 3, 5, 11, 31, 51 channels
Vertical Display Range	100 dB between –150 dBm to 20 dBm
Channel Power Measurement	Channel Zone Marker measures channel power at RF In
Resolution	0.1 dB
Measurement Mode	Single, Continuous

Modulation Analysis (ISDB-T Signal, 1 Channel Input)

Frequency Lock Range	±90 kHz
Input Range	+20 dBm to (DANL + 20) dBm (Preamp Off) –20 dBm to (DANL + 20) dBm (Preamp On)
Displayed MER	Total, Layer A, Layer B, Layer C, TMCC, AC1
Resolution	0.1 dB
Residual MER	Total, Mode 3, GI 1/8, 64 QAM, Average count 10, internal attenuator 0 dB ≥42 dB, typical (Preamp Off, Reference level –20 dBm, –20 dBm input) ≥37 dB, typical (Preamp On, Reference level –50 dBm, –50 dBm input)
Interference Wave Effect	Total, Mode 3, GI 1/8, 64 QAM, Average count 10, ±2 channels, 0 dBm interference wave ≥30 dB, typical (Preamp Off, –35 dBm input)
Constellation Display	Layer A, Layer B, Layer C, TMCC
Sub-carrier MER Display Range	±2.785 MHz from center frequency (Bandwidth 6 MHz) ±3.714 MHz from center frequency (Bandwidth 8 MHz)
Sub-carrier MER Marker	Reads sub-carrier number, offset frequency, MER
Frequency	Measures center frequency of modulated signal
Unit	Hz, ppm
Frequency Resolution	0.1 Hz
Frequency Accuracy	–20 dBm, MER >40 dB, Preamp Off, Average count 10, Mode 3, GI 1/8, 64 QAM ±((measurement frequency x reference frequency accuracy*) ±0.3) Hz
Measurement Mode	Single, Continuous, Average, Moving average, Overwrite (Constellation only) Average count 1 to 100

Delay Profile (ISDB-T Signal, 1 Channel Input)

Frequency Lock Range	±90 kHz
Input Range	+20 dBm to (DANL + 20) dBm (Preamp Off) –20 dBm to (DANL + 20) dBm (Preamp On)
Horizontal Axis	Delay Time, maximum level signal displayed at 0 µs
Display Range	Full display: –1/24 of valid symbol length to 7/24 of valid symbol length Zoom display: arbitrary 24.6 µs width within full display range
Valid Range	0.12 µs to Guard Interval length (Bandwidth 6 MHz) 0.09 µs to Guard Interval length (Bandwidth 8 MHz)
Resolution	0.12 µs (Bandwidth 6 MHz) 0.09 µs (Bandwidth 8 MHz)
Vertical Axis	Relative level, displays maximum level signal at 0 dB
Vertical Axis Display Range	5 dB, 10 dB, 25 dB, 50 dB selectable
Display Resolution	0.1 dB
Marker	Reads Delay time, Distance and Relative level from 0 µs response
Measurement Mode	Single, Continuous, Average, Moving average, Average count 1 to 100

* refer to product technical data sheet

ISDB-T Digital Video Measurements (Option 0030) (continued)

Frequency Response (ISDB-T Signal, 1 Channel Input)

Frequency Lock Range	±90 kHz
Input Range	+20 dBm to (DANL + 20) dBm (Preamp Off) –20 dBm to (DANL + 20) dBm (Preamp On)
Horizontal Axis	Frequency, displays center frequency as 0 MHz
Display Range	±2.785 MHz (Bandwidth 6 MHz) ±3.714 MHz (Bandwidth 8 MHz)
Valid Range	±2.74 MHz (Mode 2), ±2.76 MHz (Mode 3) (Bandwidth 6 MHz)
Resolution	1 kHz
Vertical Axis	Relative level, displays average value of frequency response as 0 dB
Vertical Axis Display Range	5 dB, 10 dB, 25 dB, 50 dB selectable
Display Resolution	0.1 dB
Measurement Mode	Single, Continuous, Average, Moving average, Average count 1 to 100

Spectrum Mask (ISDB-T Signal, 1 Channel Input)

Input Level Range	+20 dBm to -15 dBm
Resolution Bandwidth	10 kHz
Video Bandwidth	300 Hz
Detection	Peak
Selectable Masks	Channel Map UHF (Japan) Standard A (according to ARIB STD-B31) Standard B (according to ARIB STD-B31) Channel Map UHF (Brazil) Critical (according to ABNT NBR 15601) Sub-critical (according to ABNT NBR 15601) Non-critical (according to ABNT NBR 15601)
Measurement Points	4001 (Standard A) 6001 (Standard B, Critical, Sub-critical, Non-critical)
Pass/Fail Judgement	The measured waveform is compared with the standard mask Pass or Fail indicated accordingly
Margin	Displays frequency and minimum value of the difference between the measured waveform and mask standard line between each break point of the mask standard line
Floor Reduction	Deducts the floor noise from the measured spectrum waveform and displays the result
Antenna Power	For Standard B only Settable when antenna power is >0.025 W and ≤2.5 W Mask automatically adjusted for set antenna power For antenna power ≤0.025 W, standard line "≤0.025 W" is displayed For antenna power >2.5 W, standard line >2.5 W is displayed For antenna power = 0.25 W, standard line "0.25 W" is displayed
Filter Selection	Default, User 1, User 2, User 3 (Critical, Sub-critical, Non-critical only) User memories can be used to download specific transmitter output filter characteristics to compensate measured data
Selectable Displayed Trace	Filter Data, Corrected Data, Uncorrected Data (Critical, Sub-critical, Non-critical only)
Marker Function	Relative level and offset frequency of measured waveform
Occupied Frequency Bandwidth	Displays the frequency bandwidth in which 99% of the total power is received
Resolution	0.01 MHz
Measurement Mode	Single

ISDB-T Digital Video Measurements (Option 0030) (continued)

Phase Noise (ISDB-T Signal, 1 Channel Input)

Frequency Lock Range	±2 kHz
Input Level Range	+20 dBm to –10 dBm
Horizontal Axis Range	100 kHz to 6 MHz
Vertical Axis Range	–40 dBc/Hz to –140 dBc/Hz
Marker	Frequency, phase noise, integrated phase noise between two arbitrary points
Fixed Point Display	Displays phase noise at offset frequencies 1 kHz, 10 kHz, 100 kHz Displays integrated phase noise from 100 Hz to 6 MHz
Residual Phase Noise	–10 dBm input power, Average count 10 –100 dBc/Hz (10 kHz offset) –105 dBc/Hz (100 kHz offset) -115 dBc/Hz (1 MHz offset)
Frequency Accuracy	–10 dBm input power, Average count 10 ±((measurement frequency x reference frequency accuracy*) ±0.20) Hz
Frequency Resolution	0.01 Hz
Measurement Mode	Single, Continuous, Average, Average count 1 to 100
Vertical Axis Display Range	5 dB, 10 dB, 25 dB, 50 dB selectable
Display Resolution	0.1 dB
Marker	Delay time, Distance and Relative level read with marker function
Measurement Mode	Single, Continuous, Average, Moving average, Average count 1 to 100

Spurious Emissions (ISDB-T Signal, 1 Channel Input)

Input Level Range	+20 dBm to 0 dBm
Search Range	5 MHz to 5x input signal frequency
Search Conditions	RBW 10 kHz (5 MHz to 30 MHz), 100 kHz (30 MHz to 1 GHz), 1 MHz (1 GHz to 4 GHz) Detection mode RMS
Measurement Method	5 MHz to 1 GHz, and > 1 GHz (input signal frequency x 5) High-pass filter required to attenuate input signal for measuring >1 GHz
Results Display	Frequency, Absolute level, Relative level, RBW and Detection mode for five spurious
Measurement Mode	Single

Batch Measurement Mode

Function	Specifies measurement items and channels for continuous measurement and saves each measurement result to JPEG file
Channel Setting Range	UHF (Japan) 13 to 62 UHF (Brazil) 14 to 69
Maximum Number of Channels	10
Measured Item	Field strength, Channel power, MER, Frequency error, Spectrum mask evaluation, Occupied frequency bandwidth

* refer to product technical data sheet

ISDB-T BER Measurements (Option 0079)

These specifications become effective when option 0079 is installed in the Cell Master or Spectrum Master. It can only be used when option 0030 is also installed. Operating temperature when option 0079 is installed is restricted to 0 °C to 40 °C

BER

Hierarchy Layers	Layer A, Layer B, Layer C
BER Measurement Display per Layer	Rate: x.xxE-yy x.xx: Mantissa, resolution 0.01 yy: Exponent, resolution 1 Before Viterbi, Before RS Error Count: Displays total number of errors Before Viterbi, Before RS
PER Measurement Display per Layer	Rate: x.xxE-yy x.xx: Mantissa, resolution 0.01 yy: Exponent, resolution 1 Error Count: Displays total number of packet errors
TMCC Information Display per Layer	Modulation: QPSK, 16 QAM, 64 QAM Code Rate: 1/2, 2/3, 3/4, 5/6, 7/8 Interleave: 0, 4, 8, 16 (Mode 1); 0, 2, 4, 8 (Mode 2); 0, 1, 2, 4 (Mode 3) Number of segments: 1 to 13. If layer is unused, *** is displayed
MPEG TS Bit Rate per Layer	Unit: kbps or Mbps Resolution: 2 decimal places
Channel Power Indication	Current, Maximum, Moving average, Minimum Unit: dBm Resolution: 0.1 dB
Real Time Monitor Indication	Signal Sync: Locked, Unlocked Mode: 1, 2, 3 GI: 1/4, 1/8, 1/16, 1/32
Elapsed Measurement Time Indication	hh: mm: ss, hh: hour, mm: minute, ss: second
Spectrum Reverse	On, Off Selection not available in Easy mode: defaults to Off
ASI Output Connector	BNC-J 75 Ω
ASI Output Level	800 mVp-p (nominal)
Measurement Mode	Continuous: Measurement of up to 10^{12} bits unless measurement is manually stopped. Measurement stops automatically after 10^{12} bits measured

ISDB-T Single Frequency Network (SFN) Measurements (Option 0032)

Field Strength, Terminal Voltage, Channel Power (ISDB-T Signal, 1 Channel Input)

Input Level Range	+20 dBm to DANL (Preamp Off) –20 dBm to DANL (Preamp On)
Resolution	0.1 dB
Accuracy	Average count 10, VSWR ≤1.5, 50 Ω ±2.0 dB, typical (+20 dBm to –10 dBm) ±2.0 dB (–10 dBm to –60 dBm) (Preamp Off) ±2.0 dB (–10 dBm to –84 dBm) (Preamp On)
Displayed Average Noise Level (DANL)	RF input 50 Ω terminated, Average count 50, +20 ºC to +30 ºC, 5.6 MHz bandwidth ≤–70 dBm (Preamp Off) ≤–90 dBm (Preamp On)
Unit	dBm, dBµV, dBµV(emf), dBµV/m
Antenna Correction Table	Antenna level correction data table for measuring field strength saved in instrument
Impedance	50 Ω, 75 Ω (requires 12N50-75B, 50 Ω to 75 Ω matching pad)
Measurement Mode	Single, Continuous

Delay Profile (ISDB-T Signal, 1 Channel Input)

Frequency Lock Range	±90 kHz
Input Range	+20 dBm to (DANL + 10) dBm (Preamp Off) –20 dBm to (DANL + 10) dBm (Preamp On)
Horizontal Axis	Delay Time, maximum level signal displayed at 0 µs
Display Range	Full display: ±1008 µs Zoom display: arbitrary 74 µs width within full display range
Resolution	0.12 µs
Vertical Axis	Relative level, displays maximum level signal at 0 dB
Vertical Axis Display Range	5 dB, 10 dB, 20 dB, 40 dB selectable
Resolution	0.1 dB
Marker	Reads Delay time, Relative level (DU ratio), absolute power and either field strength (dBµV/m) or termination voltage (dBµV)
Marker Mode	Main wave to center of zoom, path wave to center of zoom, peak search When Active Marker on Zoom graph Normal: Reads 1-point marker Zone: Reads the maximum value within the 1/10 width zone marker
Measurement Mode	Single, Continuous

Delay Profile: Path Level Estimation

Main Wave Level Accuracy 2 Wave Model[*1]	Mode 3, GI 1/8, VSWR ≤ 1.5, 50 Ω ±2.5 dB, typical (–10 to –55 dBm, Preamp Off) ±2.5 dB, typical (–20 to –79 dBm, Preamp On)
3 Wave Model[*3,*5]	±2.5 dB, typical (–10 to –55 dBm, Preamp Off) ±2.5 dB, typical (–20 to –79 dBm, Preamp On)
Delayed Wave Level Accuracy 2 Wave Model[*2]	Mode 3, GI 1/8, VSWR ≤ 1.5, 50 Ω ±2.5 dB, typical (–10 to –55 dBm, Preamp Off) ±2.5 dB, typical (–20 to –79 dBm, Preamp On)
3 Wave Model[*4,*5]	±2.5 dB, typical (–10 to –55 dBm, Preamp Off) ±2.5 dB, typical (–20 to –79 dBm, Preamp On)
DU Ratio Accuracy 2 Wave Model[*2]	Mode 3, GI 1/8, VSWR ≤ 1.5, 50 Ω ±1.0 dB, typical (–10 to –55 dBm, Preamp Off) ±1.0 dB, typical (–20 to –70 dBm, Preamp On)
3 Wave Model[*4,*5]	±1.0 dB, typical (–10 to –55 dBm, Preamp Off) ±1.0 dB, typical (–20 to –70 dBm, Preamp On)
Main Wave Level Accuracy with Interference[*6]	±2.5 dB, typical (-35 dBm, Preamp Off) (Mode 3, GI 1/8, 64 QAM, Reference level –25 dBm, ±2 channels from desired signal, 0 dBm CW interfering wave)
Sidelobe Suppression	Automatically suppresses the sidelobe centered on the main wave

*1 Time difference between main and delayed wave is 5 µs to 1000 µs, DU ratio is 3 dB or more
*2 Time difference between main and delayed wave is 5 µs to 1000 µs, DU ratio is 3 dB to 20 dB
*3 Time difference between main and delayed wave is 5 µs to 500 µs, DU ratio is 6 dB or more
*4 Time difference between main and delayed wave is 5 µs to 500 µs, DU ratio is 6 dB
*5 When main wave is set to 0 µs
-Delay time (absolute value) of one delayed wave is different from that of the other by 2 µs or more
-When delay time difference between delayed waves is different from delay time (absolute value) by 2 µs or more
*6 Time difference between main and delayed wave is 5 µs to 1000 µs and DU ratio is 3 dB or more with 2-wave model

ISDB-T Single Frequency Network (SFN) Measurements (Option 0032) (continued)

In-band Spectrum

Input Range	+20 dBm to DANL (Preamp Off) –20 dBm to DANL (Preamp On)
Horizontal Axis	Frequency, center frequency displayed as 0 MHz
Display Range	±2.785 MHz
Valid Range	±2.74 MHz (Mode 2), ±2.76 MHz (Mode 3)
Display Resolution	1 kHz
Vertical Axis	Level, displays average value of frequency response as 0 dB
Vertical Axis Display Range	5 dB, 10 dB, 25 dB, 50 dB selectable
Display Resolution	0.1 dB
Marker	Reads marker frequency and relative level Delta Marker reads relative level, distance and frequency difference
Measurement Mode	Single, Continuous

DVB-T/H Measurements (Options 0064, 0057, 0078)

ISDB-T RF (Option 0030)	DVB-T/H Signal Analysis (Option 0064)	DVB-T/H BER Analysis (Option 0057)	DVB-T/H SFN Analysis (Option 0078
Signal Power Channel Power Termination Voltage Open Terminal Voltage Field Strength Spectrum Monitor Channel Power Zone Center Channel Zone Center Frequency Shoulder Attenuation Channel Power Zone Center Channel Zone Center Frequency Lower Shoulder Attenuation Upper Shoulder Attenuation	Composite or Individual Views Constellation Impulse Response (w/zoom) Carrier MER (w/zoom) Freq Response (composite view only) Measured Data Mode, GI Modulation Hierarchy Freq Offset Channel Power MER (Total/Data/TPS) TPS Warning Message TPS Info Interleave Type Cell ID Code Rate (HP/LP) Time Slicing (HP/LP) MPE-FEC (HP/LP)	BER Before RS Before Viterbi PER (Packet) Channel Power MER (Quick) Bit Rate TPS Info Length Indicator Mode, GI Modulation Hierarchy Interleave Type Cell ID Code Rate Time Slicing MPE-FEC TPS Warning Message ASI Out	Impulse Response (w/zoom) Inband Spectrum Measured Data Channel Power Delay DU Ratio Power Field Strength

Setup Parameters

Frequency Range	Specified: 30 MHz to 990 MHz when Channel Map is None Tunable: 30 MHz to 2400 MHz
Setting Resolution	1 Hz
Channel Map	UHF (Australia), UHF (Europe), VHF (Europe), None
Channel	28 to 69 UHF (Australia) Center frequency = ((channel number - 28) x 7 + 529.5) MHz 21 to 69 UHF (Europe) Center frequency = ((channel number - 21) x 8 + 474) MHz 5 to 12 VHF (Europe) Center Frequency = ((channel number – 5) x 7 + 177.5) MHz
Channel Frequency Offset	±166.666 kHz, ±333.333 kHz, ±499.999 kHz, None
Bandwidth	5 MHz*, 6 MHz, 7 MHz, 8 MHz
Mode	2K, 4K, 8K Manual setting or setting by automatic detection
Guard Interval (GI)	1/4, 1/8, 1/16, 1/32 Manual setting or setting by automatic detection
Modulation Scheme	QPSK, 16 QAM, 64 QAM Manual setting or setting by automatic detection
Hierarchy	None, α=1, 2, 4 Manual setting or setting by automatic detection
Spectrum Reverse	On, Off
Maximum Input Level	+20 dBm (Preamp Off) –10 dBm (Preamp On)
Reference Level Setting	–25 dBm to +20 dBm/5 dB steps (Preamp Off) –50 dBm to –10 dBm/10 dB steps (Preamp On)

*BER measurements not available at 5 MHz bandwidth

DVB-T/H Digital Video Measurements (Option 0064)

Field Strength, Terminal Voltage, Channel Power (DVB-T/H Signal, 1 Channel Input)

Input Level Range	+20 dBm to DANL (Preamp Off) –20 dBm to DANL (Preamp On)
Resolution	0.1 dB
Accuracy	Channel Map UHF (Europe), Channel 21 to 69, Average count 10, VSWR ≤1.5, 50 Ω ±2.0 dB, typical (+20 dBm to –10 dBm), ±2.0 dB (–10 dBm to –60 dBm) (Preamp Off) ±2.0 dB (–10 dBm to –84 dBm) (Preamp On)
Displayed Average Noise Level (DANL)	Channel Map UHF (Europe), Channel 21 to 69, Bandwidth 8 MHz, RF input 50 Ω terminated, Average count 50, +20 ºC to +30 ºC ≤–69 dBm (Preamp Off) ≤–89 dBm (Preamp On)
Unit	dBm, dBµV, dBµV(emf), dBµV/m
Antenna Correction Table	Antenna level correction data table for measuring field strength saved in instrument
Impedance	50 Ω, 75 Ω (requires 12N50-75B, 50 Ω to 75 Ω matching pad)
Measurement Mode	Single, Continuous, Average, Moving average, Max hold, Average count 1 to 100

Spectrum Monitor

Horizontal Display Range	1, 3, 5, 11, 31, 51 channels
Vertical Display Range	100 dB between –150 dBm to 20 dBm
Channel Power	Channel Zone Marker measures channel power at RF In
Channel Power Resolution	0.1 dB
Measurement Mode	Single, Continuous

Shoulder Attenuation (DVB-T/H Signal, 1 Channel Input)

Vertical Display Range	100 dB between –150 dBm to 20 dBm
Upper/Lower Shoulder Attenuation	Measured and displayed according to ETSI TR 101 290
Shoulder Attenuation Resolution	0.1 dB
Channel Power	Channel Zone Marker measures channel power at RF In
Channel Power Resolution	0.1 dB
Measurement Mode	Single, Continuous

Modulation Analysis (DVB-T/H Signal, 1 Channel Input)

Frequency Lock Range	±90 kHz
Input Level Range	+20 dBm to (DANL + 20) dBm (Preamp Off) –20 dBm to (DANL + 20) dBm (Preamp On)
Selectable Measurement Views	Composite (comprises Constellation, Impulse Response, Carrier MER, Frequency Response) Individual (Constellation, Impulse Response or Carrier MER)
Center Frequency Offset Accuracy	-20 dBm, MER >40 dB, Preamp Off, Average count 10, Channel Map UHF (Europe), Channel 21 to 69, Mode 8K, GI 1/8, 64 QAM, Hierarchy None ±((measurement frequency x reference frequency accuracy*) ±0.3) Hz
Frequency Offset Resolution	0.1 Hz
Channel Power	Measures channel power at RF In
Channel Power Resolution	0.1 dB
MER Measurement	Total, Data, TPS
MER Resolution	0.1 dB
Residual MER	Total, Average count 10, Channel Map UHF (Europe), Channel 21 to 69, Mode 8K, GI 1/8, 64 QAM, Hierarchy None ≥42 dB, typical (Preamp Off, Reference Level –20 dBm, –20 dBm input) ≥37 dB, typical (Preamp On, Reference Level –50 dBm, –50 dBm input)
Interference Wave Effect	Total, Average count 10, Channel Map UHF (Europe), Channel 21 to 69, Mode 8K, GI 1/8, 64 QAM, Hierarchy None, ±2 channels, 0 dBm interference wave ≥30 dB, typical (Preamp Off, –35 dBm input)
TPS Information	68 bit TPS data showed in hexadecimal, TPS warning messages
Inner Interleave	Native, In-depth
Cell ID	16 bits displayed in hexadecimal and decimal
Code Rate	HP, LP
Time Slicing	Off, On, HP and LP in hierarchical mode
MPE-FEC	Off, On, HP and LP in hierarchical mode
Constellation Display	Data, TPS
Symbol Decision Annotation	On, Off
Measurement Mode	Single, Continuous, Average, Moving average, Average count 1 to 100

* refer to product technical data sheet

DVB-T/H Digital Video Measurements (Option 0064) (continued)

Impulse Response (DVB-T/H Signal, 1 Channel Input)

Frequency Lock Range	±90 kHz
Input Range	+20 dBm to (DANL + 20) dBm (Preamp Off) –20 dBm to (DANL + 20) dBm (Preamp On)
Horizontal Axis	Delay time, maximum level signal displayed at 0 µs
Display Range	Full display –1/24 of valid symbol length to 7/24 of valid symbol length (0 µs position Left) –4/24 of valid symbol length to 4/24 of valid symbol length (0 µs position Center) –7/24 of valid symbol length to 1/24 of valid symbol length (0 µs position Right) Zoom display Arbitrary x µs width within full display range where x is the following 43.75 µs (Bandwidth 8 MHz) 50.00 µs (Bandwidth 7 MHz) 58.33 µs (Bandwidth 6 MHz) 70.00 µs (Bandwidth 5 MHz)
Valid Range	0 µs to Guard Interval length
Resolution	0.11 µs (Bandwidth 8 MHz) 0.13 µs (Bandwidth 7 MHz) 0.15 µs (Bandwidth 6 MHz) 0.18 µs (Bandwidth 5 MHz)
Vertical Axis	Relative level, displays maximum level signal at 0 dB
Vertical Axis Display Range	5 dB, 10 dB, 25 dB, 50 dB selectable
Resolution	0.1 dB
Marker	Reads Delay time, Distance and Relative level from 0 µs response
Delta Marker	Reads Delay time, Distance and Relative level from reference marker
Measurement Mode	Single, Continuous, Average, Moving average, Average count 1 to 100

Carrier MER (DVB-T/H Signal, 1 Channel Input)

Frequency Lock Range	±90 kHz
Input Range	+20 dBm to (DANL + 20) dBm (Preamp Off) –20 dBm to (DANL + 20) dBm (Preamp On)
Measurement Type	Speed, Accuracy
Horizontal Axis	Frequency offset from center frequency displayed at 0 MHz
Display Range	Full display ±3.804 (Bandwidth 8 MHz) ±3.328 (Bandwidth 7 MHz) ±2.853 (Bandwidth 6 MHz) ±2.377 (Bandwidth 5 MHz) Zoom display Arbitrary x MHz width within full display range where x is the following Bandwidth 8 MHz Mode 2K: ±0.893 MHz, Mode 4K: ±0.446 MHz, Mode 8K: ±0.223 MHz Bandwidth 7 MHz Mode 2K: ±0.781 MHz, Mode 4K: ±0.391 MHz, Mode 8K: ±0.195 MHz Bandwidth 6 MHz Mode 2K: ±0.670 MHz, Mode 4K: ±0.335 MHz, Mode 8K: ±0.167 MHz Bandwidth 5 MHz Mode 2K: ±0.558 MHz, Mode 4K: ±0.279 MHz, Mode 8K: ±0.140 MHz
Resolution	Carrier spacing (determined by Mode and Bandwidth)
Vertical Axis	MER
Vertical Axis Display Range	20 dB, 30 dB, 40 dB, 50 dB selectable
Resolution	0.1 dB
Marker	Reads carrier number, offset frequency, MER, peak search
Measurement Mode	Single, Continuous, Average, Moving average, Average count 1 to 100

Frequency Response (DVB-T/H Signal, 1 Channel Input)

Frequency Lock Range	±90 kHz
Input Range	+20 dBm to (DANL + 20) dBm (Preamp Off) –20 dBm to (DANL + 20) dBm (Preamp On)
Horizontal Axis	Frequency, displays center frequency as 0 MHz
Display Range	±3.804 (Bandwidth 8 MHz) ±3.328 (Bandwidth 7 MHz) ±2.853 (Bandwidth 6 MHz) ±2.377 (Bandwidth 5 MHz)
Vertical Axis	Relative level, displays average value of frequency response as 0 dB
Vertical Axis Display Range	–40 dB to +10 dB
Measurement Mode	Single, Continuous, Average, Moving average, Average count 1 to 100

DVB-T/H BER Measurements (Option 0057)

These specifications become effective when option 0057 is installed in the Cell Master or Spectrum Master. It can only be used when option 0064 is also installed. Operating temperature when option 0057 is installed is restricted to 0 °C to 40 °C

BER

Bit Count Setting	xE+yy x: 1 to 9, setting resolution 1 yy: 6 to 12, setting resolution 1 Range 1E+6 to 1E+12
Service Type	In Service BER measurement of normal in-service data traffic Simultaneous BER measurement Before Viterbi and Before RS error correction Out of Service BER measurement of a PRBS23 data sequence BER measurement point can be selected Before Viterbi, Before RS or After RS
Stream	HP, LP
Result Display	Current: current measured value is continually updated Last: previous measured value is displayed while current measurement is being completed
TS Packet	Measurement point Before RS or After RS 1 + [187] + 16, 4 + [184] + 16 (Out of Service only)
Spectrum Reverse	On, Off
Real Time Monitor Indication	Signal Sync: Locked, Unlocked TPS Parity: OK, NG PRBS Sync (PRBS23): Locked, Unlocked (Out of Service only)
TPS Information	Length indicator: 23, 31, 33 Mode: 2K, 4K, 8K GI: 1/4, 1/8, 1/16, 1/32 Modulation: QPSK, 16 QAM, 64 QAM Hierarchy: None, α = 1, α = 2, α = 4 Inner Interleave: Native, In-depth Cell ID: 0 x 0~0 x FFFF (Hexadecimal, Decimal) Code Rate: 1/2, 2/3, 3/4, 5/6, 7/8 (HP, LP) Time Slicing: On, Off (HP, LP) MPE-FEC: On, Off (HP, LP) It is possible to display TPS warning message details
Elapsed Measurement Time Indication	hh: mm: ss, hh: hour, mm: minute, ss: second
BER Measurement Display	Rate: x.xxE-yy x.xx: Mantissa, display resolution 0.01 yy: Exponent, display resolution 1 In Service: Before Viterbi, Before RS Out of Service: Before Viterbi, Before RS, After RS Error Count: Displays total number of errors In Service: Before Viterbi, Before RS Out of Service: Before RS, After RS
PER Measurement Display	Rate: x.xxE-yy x.xx: Mantissa, display resolution 0.01 yy: Exponent, display resolution 1 Error Count: Displays total number of packet errors
MER (Quick)	Instant, Maximum, Moving average, Minimum
MER Resolution	0.1 dB
Display Range	< 27 dB
Channel Power at RF In	Instant, Maximum, Moving average, Minimum
Channel Power Resolution	0.1 dB
ASI Output Connector	BNC-J 75 Ω
ASI Output Level	800 mVp-p (nominal)
Measurement Mode	Single, Continuous

DVB-T/H Single Frequency Network (SFN) Measurements (Option 0078)

Field Strength, Terminal Voltage, Channel Power (DVB-T/H Signal, 1 Channel Input)

Input Level Range	+20 dBm to DANL (Preamp Off) –20 dBm to DANL (Preamp On)
Resolution	0.1 dB
Accuracy	Channel Map UHF (Europe), Channel 21 to 69, Average count 10, VSWR ≤1.5, 50 Ω ±2.0 dB, typical (+20 dBm to –10 dBm), ±2.0 dB (–10 dBm to –60 dBm) (Preamp Off) ±2.0 dB (–10 dBm to –84 dBm) (Preamp On)
Displayed Average Noise Level (DANL)	Channel Map UHF (Europe), Channel 21 to 69, Bandwidth 8 MHz, RF input 50 Ω terminated, Average count 50, +20 ºC to +30 ºC ≤–69 dBm (Preamp Off) ≤–89 dBm (Preamp On)
Unit	dBm, dBµV, dBµV(emf), dBµV/m
Antenna Correction Table	Antenna level correction data table for measuring field strength saved in instrument
Impedance	50 Ω, 75 Ω (requires 12N50-75B, 50 Ω to 75 Ω matching pad)
Measurement Mode	Single, Continuous

Impulse Response (DVB-T/H Signal, 1 Channel Input)

Frequency Lock Range	±90 kHz
Input Range	+20 dBm to (DANL + 10) dBm (Preamp Off) –20 dBm to (DANL + 10) dBm (Preamp On)
Horizontal Axis	Delay time, maximum level signal displayed at 0 µs
Display Range	Full display ±896 µs (Bandwidth 8 MHz) ±1024 µs (Bandwidth 7 MHz) ±1195 µs (Bandwidth 6 MHz) ±1434 µs (Bandwidth 5 MHz) Zoom display Arbitrary x µs width within full display range where x is the following 66 µs (Bandwidth 8 MHz) 75 µs (Bandwidth 7 MHz) 87 µs (Bandwidth 6 MHz) 105 µs (Bandwidth 5 MHz)
Resolution	0.11 µs (33 m) (Bandwidth 8 MHz) 0.13 µs (37 m) (Bandwidth 7 MHz) 0.15 µs (44 m) (Bandwidth 6 MHz) 0.18 µs (52 m) (Bandwidth 5 MHz)
Vertical Axis	Relative level, displays maximum level signal at 0 dB
Vertical Axis Display Range	5 dB, 10 dB, 20 dB, 40 dB selectable
Resolution	0.1 dB
Marker	Reads Delay time, Relative level (DU ratio), absolute power and either field strength (dBµV/m) or termination voltage (dBµV)
Marker Mode	Main wave to center of zoom, path wave to center of zoom, peak search When Active Marker on Zoom graph Normal: Reads 1-point marker Zone: Reads the maximum value within the 1/10 width zone marker
Measurement Mode	Single, Continuous

DVB-T/H Single Frequency Network (SFN) Measurements (Option 0078) (continued)

Impulse Response: Path Level Estimation

Main Wave Level Accuracy 2 Wave Model[*1]	Mode 8K, GI 1/8, Bandwidth 8 MHz, VSWR ≤ 1.5, 50 Ω ±2.5 dB, typical (–10 to –55 dBm, Preamp Off) ±2.5 dB, typical (–20 to –79 dBm, Preamp On)
3 Wave Model[*3,*5]	±2.5 dB, typical (–10 to –55 dBm, Preamp Off) ±2.5 dB, typical (–20 to –79 dBm, Preamp On)
Delayed Wave Level Accuracy 2 Wave Model[*2]	Mode 8K, GI 1/8, Bandwidth 8 MHz, VSWR ≤ 1.5, 50 Ω ±2.5 dB, typical (–10 to –55 dBm, Preamp Off) ±2.5 dB, typical (–20 to –79 dBm, Preamp On)
3 Wave Model[*4,*5]	±2.5 dB, typical (–10 to –55 dBm, Preamp Off) ±2.5 dB, typical (–20 to –79 dBm, Preamp On)
DU Ratio Accuracy 2 Wave Model[*2]	Mode 8K, GI 1/8, Bandwidth 8 MHz, VSWR ≤ 1.5, 50 Ω ±1.0 dB, typical (–10 to –55 dBm, Preamp Off) ±1.0 dB, typical (–20 to –70 dBm, Preamp On)
3 Wave Model[*4,*5]	±1.0 dB, typical (–10 to –55 dBm, Preamp Off) ±1.0 dB, typical (–20 to –70 dBm, Preamp On)
Main Wave Level Accuracy with Interference[*6]	±2.5 dB, typical (–35 dBm, Preamp Off) (Mode 8K, GI 1/8, 64 QAM, Reference level –25 dBm, ±2 channels from desired signal, 0 dBm CW interfering wave)
Sidelobe Suppression	Automatically suppresses the sidelobe centered on the main wave

*1 Time difference between main and delayed wave is 5 µs to 850 µs, DU ratio is 3 dB or more
*2 Time difference between main and delayed wave is 5 µs to 850 µs, DU ratio is 3 dB to 20 dB
*3 Time difference between main and delayed wave is 5 µs to 420 µs, DU ratio is 6 dB or more
*4 Time difference between main and delayed wave is 5 µs to 420 µs, DU ratio is 6 dB
*5 When main wave is set to 0 µs
-Delay time (absolute value) of one delayed wave is different from that of the other by 2 µs or more
-When delay time difference between delayed waves is different from delay time (absolute value) by 2 µs or more
*6 Time difference between main and delayed wave is 5 µs to 850 µs and DU ratio is 3 dB or more with 2-wave model

In-band Spectrum

Input Range	+20 dBm to DANL (Preamp Off) –20 dBm to DANL (Preamp On)
Horizontal Axis	Frequency, center frequency displayed as 0 MHz
Display Range	±3.804 MHz (Bandwidth 8 MHz) ±3.328 MHz (Bandwidth 7 MHz) ±2.853 MHz (Bandwidth 6 MHz) ±2.377 MHz (Bandwidth 5 MHz)
Display Resolution	1.116 kHz (Bandwidth 8 MHz) 0.977 kHz (Bandwidth 7 MHz) 0.837 kHz (Bandwidth 6 MHz) 0.698 kHz (Bandwidth 5 MHz)
Vertical Axis	Level, displays average value of frequency response as 0 dB
Vertical Axis Display Range	5 dB, 10 dB, 25 dB, 50 dB selectable
Display Resolution	0.1 dB
Marker	Reads marker frequency and relative level Delta Marker reads relative level, distance and frequency difference
Measurement Mode	Single, Continuous

Cell Master™ and Spectrum Master™ Specifications

Digital Broadcast Analysis Options Ordering Information

	MT8212E	MT8213E	Description
	2 MHz to 4 GHz	2 MHz to 6 GHz	Cable and Antenna Analyzer
	100 kHz to 4 GHz	100 kHz to 6 GHz	Spectrum Analyzer
	100 kHz to 4 GHz	100 kHz to 6 GHz	Power Meter
	Options	**Options**	
	MT8212E-0030	MT8213E-0030	ISDB-T Digital Video Measurements
	MT8212E-0079	MT8213E-0079	ISDB-T BER Measurements*
	MT8212E-0032	MT8213E-0032	ISDB-T SFN Measurements
	MT8212E-0064	MT8213E-0064	DVB-T/H Digital Video Measurements
	MT8212E-0057	MT8213E-0057	DVB-T/H BER Measurements**
	MT8212E-0078	MT8213E-0078	DVB-T/H SFN Measurements
			* Requires Option 0030 **Requires Option 0064

For full specifications and functionality of the Cell Master refer to the MT8212/13E Technical Data Sheet 11410-00485

	MS2712E	MS2713E	Description
	100 kHz to 4 GHz	100 kHz to 6 GHz	Spectrum Analyzer
	Options	**Options**	
	MS2712E-0009	MS2713E-0009	20 MHz BW Demod
	MS2712E-0030	MS2713E-0030	ISDB-T Digital Video Measurements †
	MS2712E-0079	MS2713E-0079	ISDB-T BER Measurements* †
	MS2712E-0032	MS2713E-0032	ISDB-T SFN Measurements †
	MS2712E-0064	MS2713E-0064	DVB-T/H Digital Video Measurements †
	MS2712E-0057	MS2713E-0057	DVB-T/H BER Measurements** †
	MS2712E-0078	MS2713E-0078	DVB-T/H SFN Measurements †
			* Requires Option 0030 **Requires Option 0064 †Requires Option 0009

For full specifications and functionality of the Spectrum Master refer to the MS2712/13E Technical Data Sheet 11410-00511

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