Product Brochure

Anritsu

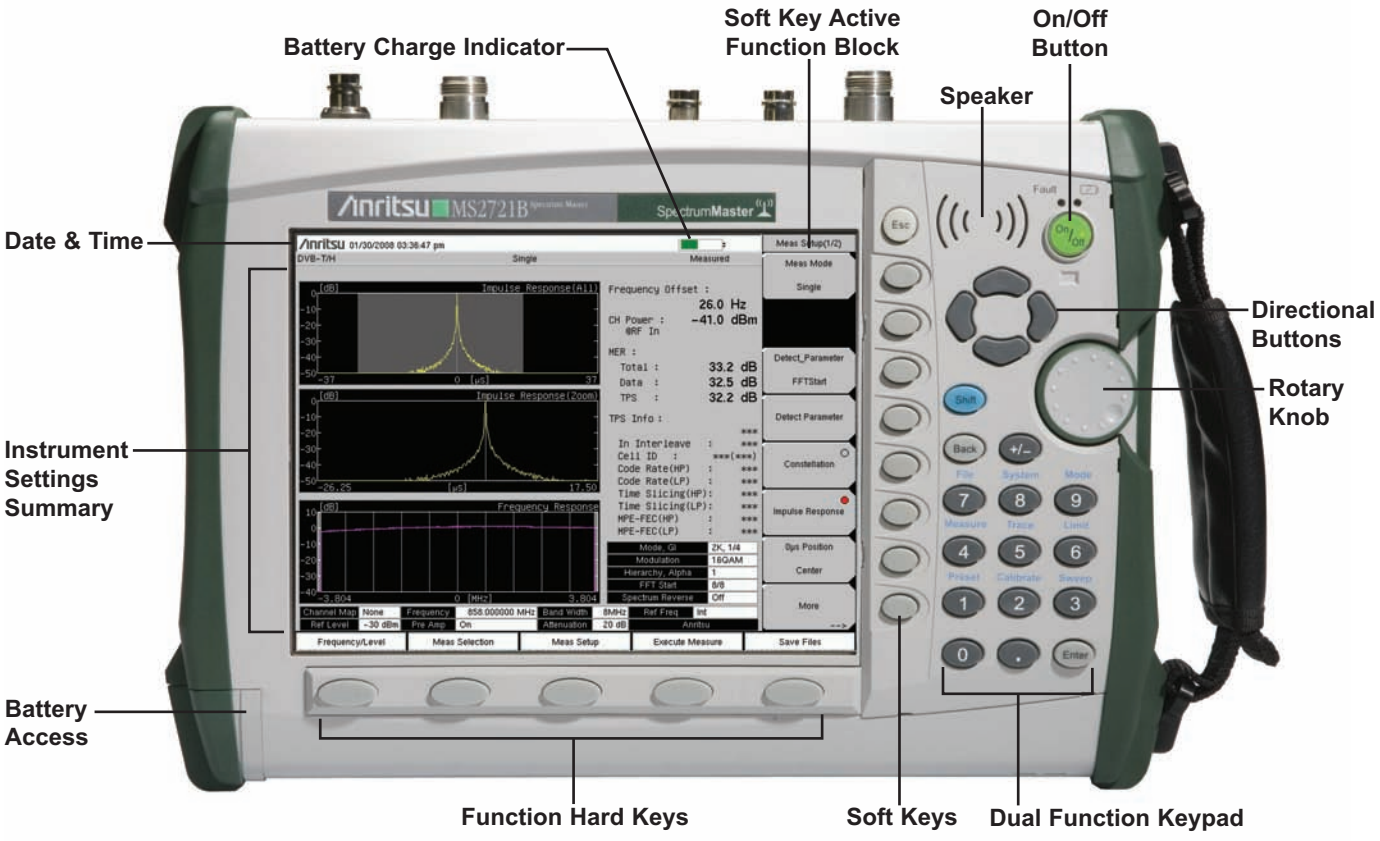
DVB-T/H Options

MS2721B Spectrum Master and MT8222A BTS Master

Option 064 DVB-T/H – Measurements 30 MHz to 990 MHz
Option 078 DVB-T/H – SFN Field Measurements
Option 057 DVB-T/H – BER Unit

The DVB-T/H Options for the MS2721B and MT8222A

The DVB-T/H options for the MS2721B and MT8222A feature high-performance in a compact, battery-operated unit. These options are very useful for area surveys and field maintenance of digital broadcasting equipment.



High-Performance Handheld Spectrum Analyzer

This high-performance spectrum analyzer covers the frequency band from 9 kHz to 7.1 GHz.

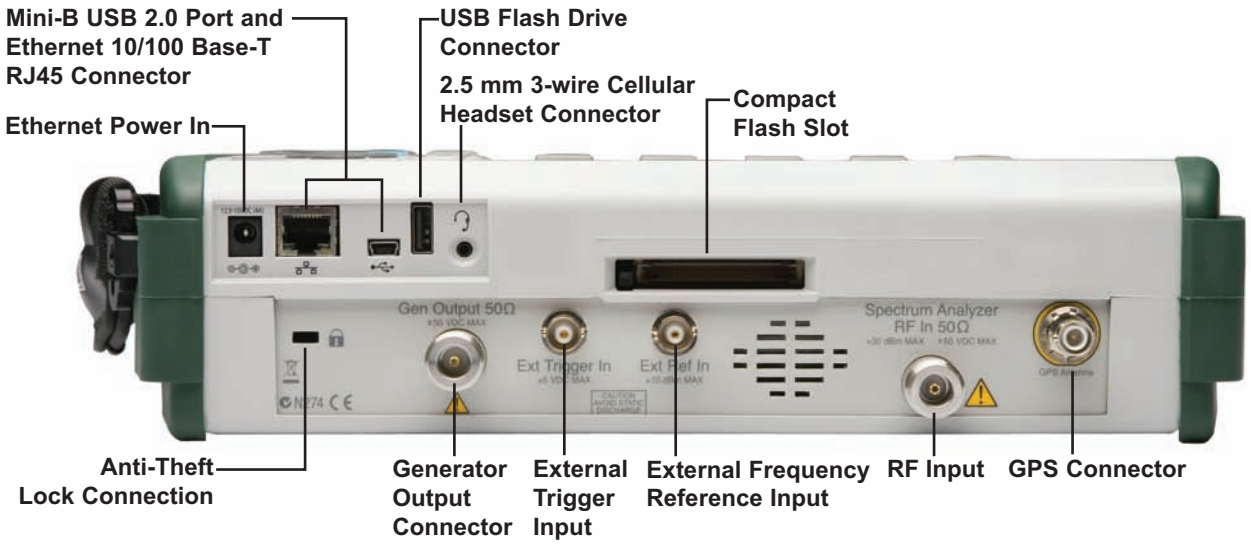
Option 64 – DVB-T/H Analysis Option

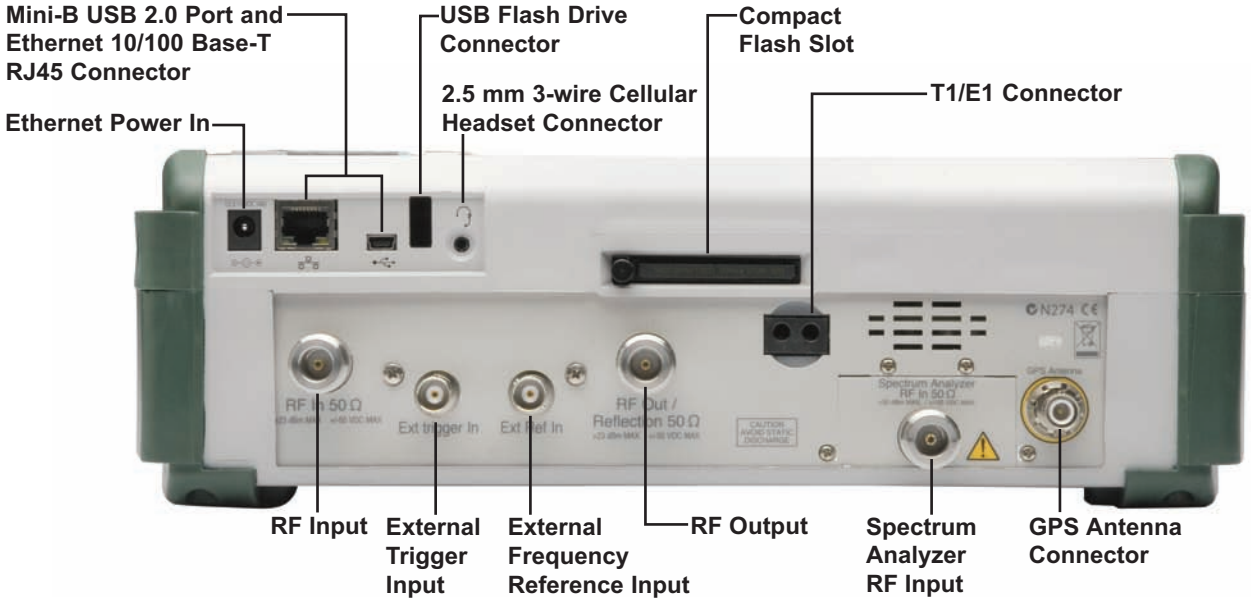
DVB-T/H Terrestrial Digital Broadcasting Measurements

DVB-T/H field strength, modulation analysis MER, constellation, frequency offset, impulse response, and frequency response measurements are supported, making this analyzer the ideal solution for area surveys and maintenance of DVB-T/H equipment.

Usability

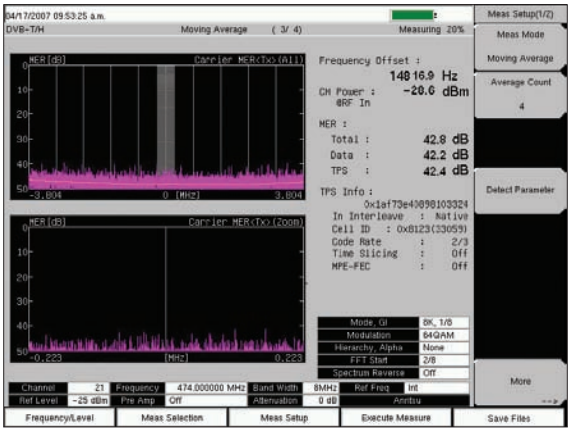
The design of the DVB-T/H analysis option minimizes the number of steps required to measure DVB-T/H signals, so that even novices can analyze signals easily and quickly.





High-Performance Handheld Spectrum Analyzer Functions

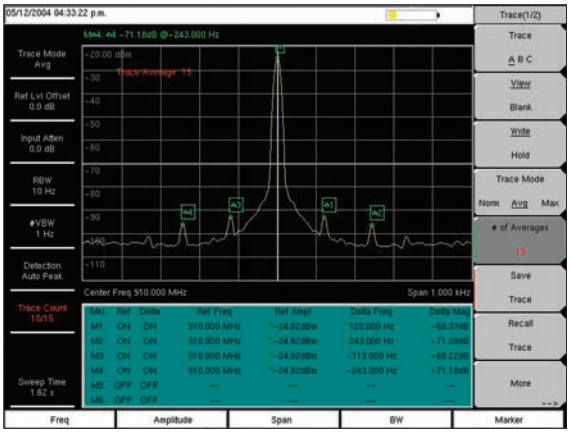
Option 64 DVB-T/H Analysis firmware covers 30 MHz to 990 MHz.



Measuring small signal in presence of very large signal

Field Measurements

The MS2721B and MT8222A shorten field measurement time while covering a wide dynamic range. User can save measurement results to internal memory, Compact Flash or USB Flash drive.



Power-line related sidebands on synthesized signal generator

R&D Measurements

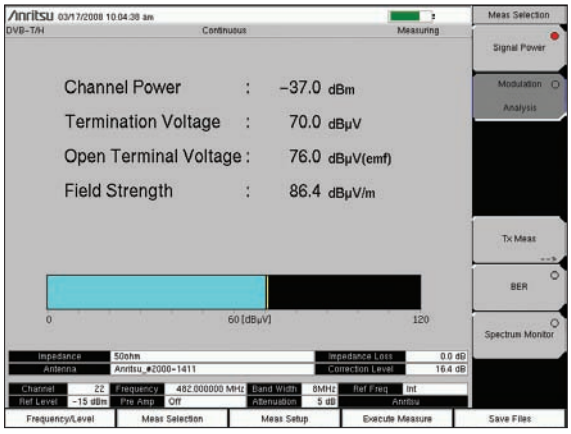
This analyzer has a full range of versatile functions, including RBW, VBW, and span. It can be used as a high-performance spectrum analyzer for R&D, manufacturing and field measurements. For example, the power-line sideband noise of a signal source can be measured.

Other Features

- Automatically sweep as fast as possible, consistent with accurate measurements: 10 µs to 600 seconds.
- Maximum safe input level +43 dBm (20 W) (Maximum measurable signal +30 dBm, Zero Span)
- Limit Lines
- Remote operation using Ethernet with Master Software Tools

Option 64 DVB-T/H Measurement Functions

Option 64 analyzes terrestrial digital broadcast (DVB-T) and mobile terminal (DVB-H) signals. This is very useful for area surveys, and installation and maintenance of terrestrial digital broadcasting equipment.



Signal Power Measurement

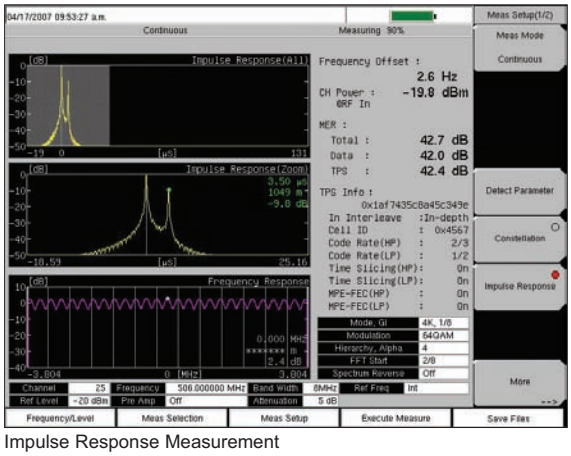
Option Measurements

- Terminal voltage, channel power, and field strength Impulse response
- MER, constellation, and frequency offset
- Detection of Mode, GI, and TPS parameters

Signal Power Measurement

This function measures terminal voltage, channel power, and field strength (dBµV/m) accurately.

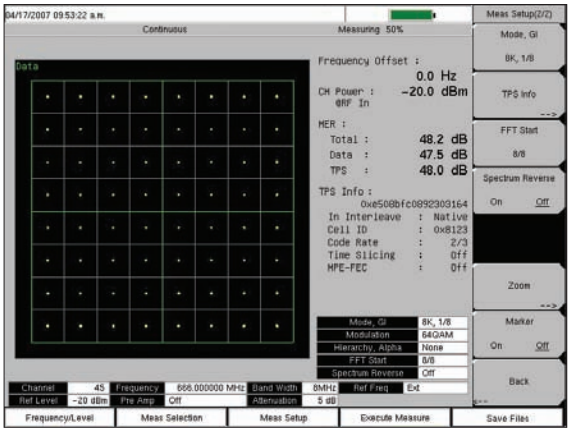
The results are displayed as numeric values and bar graphs. It is useful for adjusting antenna angles and when doing area surveys.



Impulse Response Measurement

Impulse Response Measurement

This function measures the difference in time and frequency of multi-path signals. By measuring the channel frequency response, the multi-path effect or frequency selective fading can be observed, which is useful for adjusting the timing of SFN repeaters.



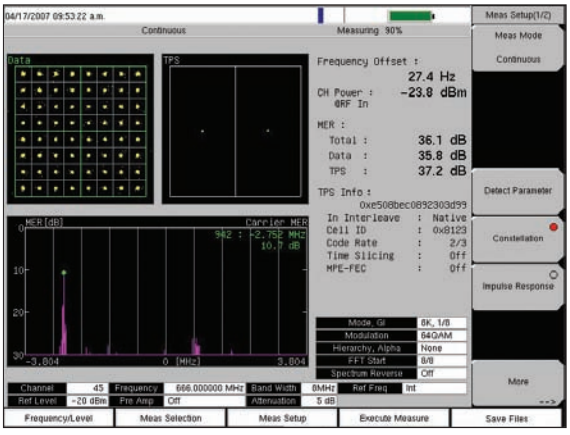
MER/Constellation Measurement

MER/Constellation Measurement

The MER measurement function quantifies the modulation signal quality of digital broadcasting signals directly. It is essential for managing signal margin and the fixed deterioration of equipment with time, as well as for maintaining stable broadcast services.

The constellation function is very useful for analyzing the condition of the received signal by monitoring the modulation symbol movement.

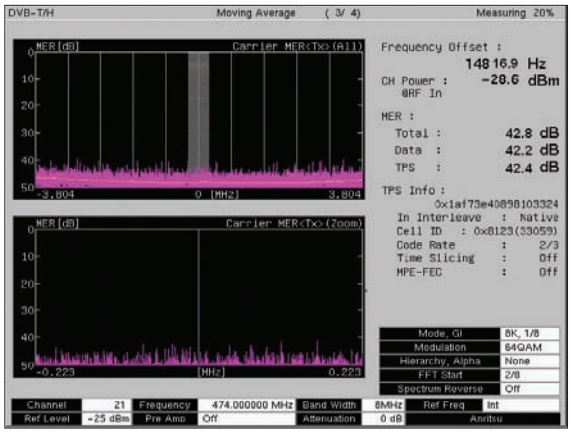
In addition, this function measures the center frequency accurately by using a proprietary advanced signalprocessing technique.



Merits of Measuring MER

Merits of Measuring MER

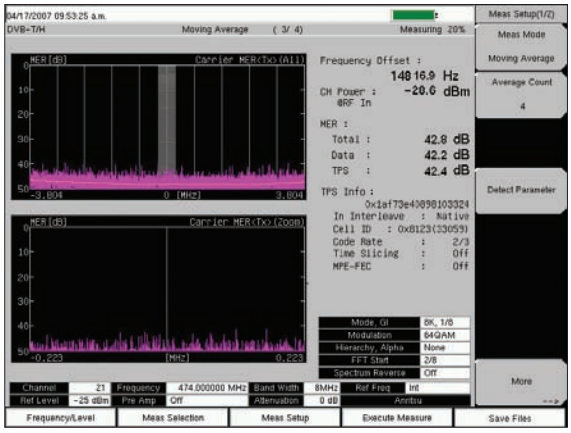
- MER indicates the signal deterioration even when BER measurement does not detect errors (error-free range), making it possible maintain margin quality.
- MER is unrelated to modulation parameters, so one MER results are easily compared with other MER results.



Carrier MER Graph

In-Band Interference Measurement

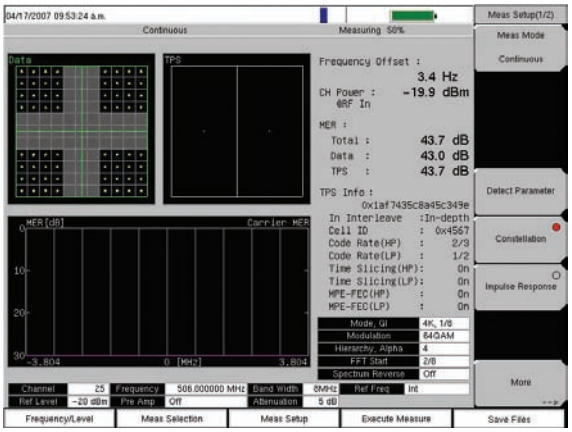
This function identifies the frequency of interference or spurious signals hiding in the bandwidth of the DVB-T/H signal, using the Carrier vs MER function.



Carrier vs MER

Tx Meas Mode: Carrier vs MER

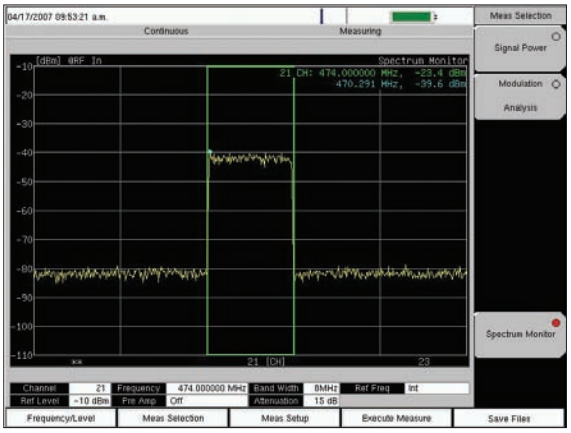
This function is very useful for transmitter installation or maintenance because it offers a very wide dynamic range (50 dB) for high-performance transmitters on the vertical scale and very precise checks of each carrier by zooming all carriers on the horizontal scale.



Constellation Display

Troubleshooting

Option 64 uses Anritsu's proprietary analysis technology for monitoring problems, such as AM or PM. Impairments are visible on the constellation display.



Spectrum Monitor (Span = 5 Channels)

Spectrum Monitor

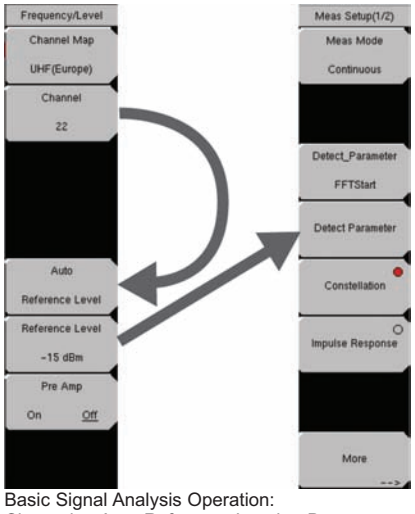
This function displays the frequency response around the desired channel. The variable span supports display of up to 51 channels simultaneously, so broadcast service signals can be checked at a glance.

Ease of Use

Field measurements are restricted by time, place, and the user's level of skill. Option 64 makes operation easy, so even novices can make measurements just by setting the required channel number.

The Auto Reference Level and Detect Parameter buttons set the reference level and transmission parameters automatically.

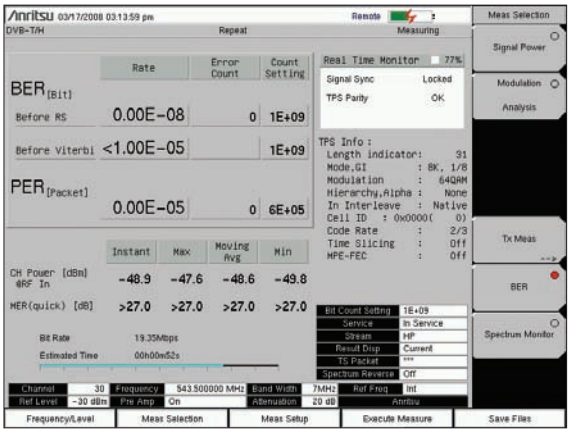
Option 64 makes operation easy



Basic Signal Analysis Operation:
Channel to Auto Reference Level to Detector Parameter

Option 57 BER

The Option 57 BER option adds BER measurement to the Option 64 DVB-T/H Measurements.



BER Measurement

BER Measurement

This function measures the BER of actual broadcast signals. Measurement of BER is a useful index for evaluating the quality of a broadcast signal. The BER and PER can be measured simultaneously along with channel power and MER.

DVB-ASI

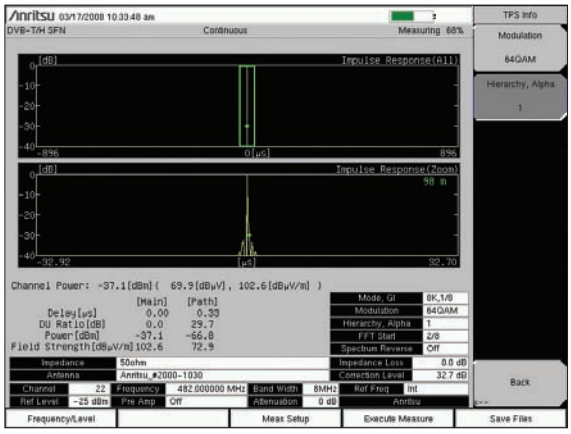
This function provides an MPEG-TS output from the DVB-ASI connector during demodulation (BER measurement).

Functions

- BER (Bit Error Ratio) Measurement
- PER (Packet Error Ratio) Measurement
- DVB-ASI Output

Option 78 DVB-T/H SFN Field Measurement

Option 78 DVB-T/H Single Frequency Network (SFN) Field Measurement accurately calculates the field strength of each incoming signal in single frequency network (SFN) environments.



SFN Measurement

SFN Measurement

Measurement of field strength of each base station or broadcast station in an SFN environment becomes more difficult as the number of broadcast locations increases because the signals appear to be mixed up. This option simplifies field strength measurements of incoming signals without needing to stop broadcasts coming from non-target stations.

Long-Term Delay

Previously, impulse response was measured as the difference in the delay time exceeding the measurement range from the actual delay time. Using this software, the measurement range is expanded to six times (±1 OFDM Symbol) the previous range for more accurate measurement of delay time.

Functions

- Field Strength Measurements in SFN Environments
- Level, Delay and DU Ratio of Each Incoming Signal
- Time Delay between Signals (Time length: ±1 OFDM Symbol length)

Ordering Information

Please specify the model/order number, name and quantity when ordering.

Options

MS2721B-064	DVB-T/H Analysis Option (requires Option 9)
MS2721B-078	DVB-T/H SFN Option (requires Option 9)
MS2721B-057	BER Measurement (requires Option 64)
MT8222A-064	DVB-T/H Analysis Option*
MT8222A-078	DVB-T/H SFN Option*

*The BER measurement option is not available for the MT8222A

Option 64 DVB-T/H Analyzer Specifications*

The following table lists the standard specifications when Option 64 is installed on Anritsu's MS2721B or MT8222A.

Common	Channel Map	UHF(Australia), UHF(Europe), None
	Channel	When channel map is UHF (Australia), the numerical value 28 to 69 (setting resolution: 1 channel) can be set to channel. This time, the central frequency is set to 529.5 + (channel –28) x 7 MHz Channel When channel map is UHF (Europe), the numerical value 21 to 69 (setting resolution: 1 channel) can be set to channel. This time, the central frequency is set to 474 + (channel –21) x 8 MHz
	Frequency	When channel map is None, frequency range is 30 to 990 MHz (setting resolution: 1 Hz).
	Bandwidth	7 MHz, 8 MHz
	Pre Amp	On, Off
	Reference Level	–25 to +20 dBm/5 dB step (Pre Amp = Off) –50 to –10 dBm/10 dB step (Pre Amp = On)
Signal Power	Meas Mode	Single, Continuous, Average, Moving average, Max. hold
	Average Count	1 to 100
	Correction table for Field Strength	Level correction data table for measuring the Field Strength can be stored within the measurement instrument.
	Impedance	50, 75 Ohm (External impedance converter corresponds with the case of 75 Ohm)
Modulation Analysis	Meas Mode	Single, Continuous, Average, Moving average
	Average Count	1 to 100
	Screen Select	Constellation, Impulse response
	Mode	2K, 4K, 8K
	GI	1/4, 1/8, 1/16, 1/32
	Modulation	QPSK, 16QAM, 64QAM
	Hierarchy	None, α =1, α =2, α =4
	FFT Start Position	0/8, 1/8, 2/8, 3/8, 4/8, 5/8, 6/8, 7/8, 8/8, 0/8 Fixed, 1/8 Fixed, 2/8 Fixed, 3/8 Fixed, 4/8 Fixed, 5/8 Fixed, 6/8 Fixed, 7/8 Fixed, 8/8 Fixed
	Spectrum Reverse	On, Off
	Detect Parameters	Automatic detection for Mode, GI, Modulation, and Hierarchy parameter
Spectrum Monitor	Meas Mode	Single, Continuous
	Span	1, 3, 5, 11, 31, 51 Channel
Carrier MER <Tx>	Meas Mode	Single, Continuous, Average, Moving average
	Average Count	1 to 100
	Mode	2K, 4K, 8K
	GI	1/4, 1/8, 1/16, 1/32
	Modulation	QPSK, 16QAM, 64QAM
	Hierarchy	None, α =1, α =2, α =4
	FFT Start Position	0/8, 1/8, 2/8, 3/8, 4/8, 5/8, 6/8, 7/8, 8/8, 0/8 Fixed, 1/8 Fixed, 2/8 Fixed, 3/8 Fixed, 4/8 Fixed, 5/8 Fixed, 6/8 Fixed, 7/8 Fixed, 8/8 Fixed
	Spectrum Reverse	On, Off
	Detect Parameters	Automatic detection for Mode, GI, Modulation, and Hierarchy parameter
Option 57 BER Unit Available on the MS2721B only	Meas Mode	Single: The set number of bits is measured at once. Repeat: Measurement of the set number of bits is repeated
	Bit Count Setting	xE+yy x: 1 to 9, setting resolution 1 yy: 6 to 12, setting resolution 1 and 1E+6 to 1E+12
	Service	In Service: BER measurement is possible to arbitrary contents. It is possible to measure the measurement point of Before Viterbi and Before RS, simultaneously. Out of Service: BER measurement is possible to PRBS (PRBS 23). It is possible to measure the measurement point of Before Viterbi, Before RS and After RS.
	Stream	HP, LP
	BER Meas Point	Before Viterbi, Before RS and After RS can be choosen, when Service is selected "Out of Service".
	Result Disp	Current: Measured value is always updated. Last: Measured value is updated after measurement of the set number of bits is completed.
	TS Packet	The following can be chosen, when "BER Meas Point" is selected Before RS or After RS. 1 + [187] + 16, 4 + [184] + 16 (Only Out of Service)
	Spectrum Reverse	On, Off

* For performance specifications, each value is assumed to be obtained from measurement after 10-minute preheating under constant ambient temperature conditions.

Option 64 DVB-T/H Analyzer Specifications (continued)

Common	Reference Frequency		Internal, External (10 MHz)	
Signal Power	DVB-T/H Signal, 1 Channel Input			
	Channel Power	Measures channel power		
		Display Resolution	0.1 dB	
		Accuracy	Channel Map: UHF(Europe), Channel: 21 to 69, Bandwidth: 8 MHz Averaging Count: 10, Target VSWR <1.5, 50 Ohm termination Preamplifier: Off ±2.0 dB (–10 to 20 dBm, typical) ±2.0 dB (–60 to –10 dBm) Preamplifier: On ±2.0 dB (–84 to –20 dBm)	
		DANL (Display Average Noise Level)	Channel Map: UHF(Europe), Channel: 21 to 69, Bandwidth: 8 MHz Averaging Count: 50, RF input 50 Ohm termination, 20 to 30 °C Preamplifier: Off, Reference Level: –25 dBm ≤–69 dBm Preamplifier: On, Reference Level: –50 dBm ≤–93 dBm	
		1 dB Compression Level	Channel Map: UHF(Europe), Channel: 21 to 69, CW, 20 to 30 °C Preamplifier: Off, Reference Level: –25 dBm ≥–15 dBm Preamplifier: On, Reference Level: –50 dBm ≥–43 dBm	
		Unit	dBm	
	Termination Voltage, Open Terminal Voltage, Field Strength	Display Item	Termination Voltage [dBµV], Open Terminal Voltage [dBµV (emf)], Field Strength [dBµV/m]	
		Graph	Termination Voltage [dBµV] is displayed as bar chart	
Modulation Analysis	DVB-T/H Signal, 1 Channel Input			
	Common	Frequency Lock Range	±90 kHz	
		Frequency Offset	Measures central frequency offset of modulation signal	
			Unit	Hz
			Display Resolution	0.1 Hz
			Accuracy	–20 dBm, MER >40 dB, Preamplifier: off, Average Count 10, Channel Map: UHF (Europe), Channel: 21 to 69, Bandwidth: 8 MHz, Mode: 8K GI: 1/8, Modulation: 64QAM, Hierarchy: None ± (Measurement frequency x Reference frequency accuracy) ±0.3 Hz
		Channel Power	Measures channel power (@RF In)	
			Display Resolution	0.1 dB
		MER	Measures MER (Modulation Error Ratio)	
			Display Item	Total, Data, TPS
			Display Resolution	0.1 dB
			Residual MER	MER: Total, Channel Map :UHF (Europe), Channel: 21 to 69 Bandwidth: 8 MHz, Mode: 8K, GI:1/8, Modulation: 64 QAM, Hierarchy: None, Average count: 10, Typical Preamplifier: Off, Reference Level: –20 dBm input ≥42 dB Preamplifier: On, Reference Level: –50 dBm input ≥37 dB
			Interference	MER: Total, Channel Map: UHF(Europe), Channel: 21 to 69, Bandwidth: 8 MHz, Mode: 8K, GI:1/8, Modulation: 64 QAM, Hierarchy: None, Average Count: ten, Reference Level: –25 dBm, ±2ch interfering wave, 0 dBm typical for required wave ≥30 dB (Preamplifier: Off, –35 dBm)

Option 64 DVB-T/H Analyzer Specifications (continued)

Modulation Analysis	Constellation	TPS	TPS information (68 bits) displayed in hexadecimal		
			Inner Interleave	Native, In-depth	
			Cell ID	Cell ID (16 bits) displayed in hexadecimal and decimal	
			Code Rate	1/2, 2/3, 3/4, 5/6, 7/8 HP and LP displayed in hierarchical mode	
			Time Slicing	On, Off HP and LP displayed in hierarchical mode	
			MPE-FEC	On, Off HP and LP displayed in hierarchical mode	
		Constellation	Display Item	Data, TPS	
		Carrier MER Graph	For field measurement		
			Horizontal Axis	Frequency Displays central frequency as 0 MHz.	
				Display Range	When Bandwidth is 7 MHz: –3.328 to 3.328 MHz When Bandwidth is 8 MHz: –3.804 to 3.804 MHz
				Valid Range	Bandwidth: 7 MHz When Mode is 2K: –3.234 to 3.234 MHz When Mode is 4K: –3.281 to 3.281 MHz When Mode is 8K: –3.305 to 3.305 MHz Bandwidth: 8 MHz When Mode is 2K: –3.696 to 3.696 MHz When Mode is 4K: –3.750 to 3.750 MHz When Mode is 8K: –3.777 to 3.777
				Display Resolution	Bandwidth: 7 MHz When Mode is 2K: 3.906 kHz When Mode is 4K: 1.953 kHz When Mode is 8K: 0.977 kHz Bandwidth: 8 MHz When Mode is 2K: 4.464 kHz When Mode is 4K: 2.232 kHz When Mode is 8K: 1.116 kHz
			Vertical Axis	MER	
				Display Range	0 to 30 dB
				Display Resolution	0.1 dB
			Marker	Carrier number, Offset frequency and MER displayed	
	Impulse Response	Impulse Response Graph	Horizontal Axis	Delayed time Displays the maximal level signal as 0 ms	
				Display Range	All graph: –1/24 of the valid symbol length to 7/24 of the valid symbol length Zoom graph: 50.00 µs (Band Width: 7 MHz) or 43.75 µs (Band Width: 8 MHz) width at the optional position within the all graph
				Valid Range	0 µs to guard interval
				Display Resolution	0.13 µs (Bandwidth: 7 MHz) 0.11 µs (Bandwidth: 8 MHz
				0 µs positon	Shifting the 0 ms position changes the 0 ms position on All graph. Displayed range when the 0 ms position is selected: Left: –(1/24 of the valid symbol length) to 7/24 of the valid symbol length Center: –(4/24 of the valid symbol length) to 4/24 of the valid symbol length Right: –(7/24 of the valid symbol length) to 1/24 of the valid symbol length
			Vertical Axis	Level	
				Display Range	5, 10, 25, 50 dB
			Marker	On, Off When marker is on, Delay, Distance and relative Level are displayed Delta marker On, Off When delta marker is on, the current marker position becomes a reference position. Delay time, presumed distance and relative level are displayed.	

Option 64 DVB-T/H Analyzer Specifications (continued)

Modulation Analysis	Impulse Response	Marker	On, Off When marker is on, Delay, Distance and relative Level are displayed Delta marker On, Off When delta marker is on, the current marker position becomes a reference position. Delay time, presumed distance and relative level are displayed.		
		Frequency Response Graph	Horizontal Axis	Displays the central frequency as 0 MHz	
				Display Range	When Bandwidth is 7 MHz: –3.328 to 3.328 MHz When Bandwidth is 8 MHz: –3.804 to 3.804 MHz
				Valid Range	Bandwidth: 7 MHz When Mode is 2K: –3.234 to 3.234 MHz When Mode is 4K: –3.281 to 3.281 MHz When Mode is 8K: –3.305 to 3.305 MHz Bandwidth: 8 MHz When Mode is 2K: –3.696 to 3.696 MHz When Mode is 4K: –3.750 to 3.750 MHz When Mode is 8K: –3.777 to 3.777 MHz
				Display Resolution	Bandwidth: 7 MHz When Mode is 2K: 3.906 kHz When Mode is 4K: 1.953 kHz When Mode is 8K: 0.977 kHz Bandwidth: 8 MHz When Mode is 2K: 4.464 kHz When Mode is 4K: 2.232 kHz When Mode is 8K: 1.116 kHz
			Vertical Axis	Display Range	5, 10, 25, 50 dB
				Marker	On, Off When marker is on, the offset frequency and the relative level are displayed
Spectrum Monitor	Spectrum Graph		Horizontal axis	Channel or Frequency	
				Display width	1, 3, 5, 11, 31, 51 Channel
			Vertical Axis	Display Range	100 dB of the range between –150 to 20 dB (Preamplifier: On, Reference level: Over –50 dBm, Preamplifier: Off, Reference level: 20 dBm)
	Channel Power		Measures the channel power (@RF In)		
			Display Resolution	0.1 dB	
Carrier MER<Tx>	DVB-T/H Signal, 1 Channel Input for Stable Signal Like Transmitter				
	Common	Frequency Offset	Measures the central frequency offset of the modulation signal		
			Unit	Hz	
			Display Resolution	0.1 Hz	
		Channel Power	Measures the channel power (@RF In)		
			Display Resolution	0.1 dB	
		MER	Measures MER (Modulation Error Ratio)		
			Display Item	Total, Data, TPS	
			Display Resolution	0.1 dB	
		TPS	TPS information (68 bits) is displayed in hexadecimal		
			Inner Interleave	Native, In-depth	
			Cell ID	Cell ID (16 bits) is displayed in hexadecimal and decimal	
			Code Rate	1/2, 2/3, 3/4, 5/6, 7/8 HP and LP are displayed in hierarchical mode	
			Time Slicing	On, Off HP and LP are displayed in hierarchical mode	
			MPE-FEC	On, Off HP and LP are displayed in hierarchical mode	
		Carrier MER Graph	For Transmitter measurement		
			Horizontal Axis	Frequency Displays the central frequency as 0 MHz	
				Display Range	When Bandwidth is 7 MHz: –3.328 to 3.328 MHz When Bandwidth is 8 MHz: –3.804 to 3.804 MHz
				Valid Range	When Bandwidth is 7 MHz: –3.328 to 3.328 MHz When Bandwidth is 8 MHz: –3.804 to 3.804 MHz
				Display Resolution	Bandwidth: 7 MHz When Mode is 2K: 3.906 kHz When Mode is 4K: 1.953 kHz When Mode is 8K: 0.977 kHz Bandwidth: 8 MHz When Mode is 2K: 4.464 kHz When Mode is 4K: 2.232 kHz When Mode is 8K: 1.116 kHz
			Vertical Axis	MER	
				Display Range	0 to 50 dB
				Display Resolution	0.1 dB
			Marker	Carrier number, Offset frequency and MER are displayed	

Option 64 DVB-T/H Analyzer Specifications (continued)

Option 57 BER Unit Available on the MS2721B only	These specifications become effective when the Option 64 is installed in the MS2721B. At the time of this unit mounting, a temperature of the function of this unit of operation is restricted to 0 °C to 40 °C		
	Indication	Real Time Monitor	Signal Sync: Locked, Unlocked TPS Parity: OK, NG PRBS Sync (PRBS23): Locked, Unlocked (only Out of Service)
		TPS Info	Length indicator: 23,31,33 Mode: 2K, 4K, 8K GI: 1/4, 1/8, 1/16, 1/32 Modulation: QPSK, 16QAM, 64QAM 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 of a detailed information for TPS warning.
		Estimate Time	hh: mm: ss hh: hour, mm: minute, ss: second
	BER measurement	Display format	Rate: x.xx E-yy x.xx: Mantissa, display resolution 0.01 yy: Exponent, display resolution 1 Error Count: It displays in the following cases. In Service: Before RS Out of Service: Before RS, After RS
	PER measurement	It is performed when In service, and After RS in the case of Out of Service are set.	
		Display format	Rate: x.xx E-yy x.xx: Mantissa, display resolution 0.01 yy: Exponent, display resolution 1 Error Count: It displays number of error packets.
	MER (Quick)	Display Items	Instant, Maximum, Moving average, Minimum
		Unit	dB
		Display Resolution	0.1 dB
		Display Range	< 27 dB
	CH Power (@RF In)	Display Items	Instant, Maximum, Moving average, Minimum
		Unit	dB
		Display Resolution	0.1 dB
	Connector	BNC-J, 75 Ω	
	Output level	800 mVp-p (typical)	
Reference Frequency		Frequency	10 MHz
		Level	–10 to +10 dBm
Save the Measurement Results			JPEG file on the measurement screen and the CSV file of the numerical data (Except for graph data) can be stored within the internal memory. The file of the measurement results within the memory can be copied to the external memory.
Save Recall of the Setting Information			Saves the panel setting information into the internal memory. Recalls the panel set information which is saved, to reflect to the panel setting.
Display Language			English or Japanese is selectable.

Option 78 DVB-T/H Single Frequency Network (SFN) Measurement Specifications

The following table lists the standard specifications when Option 78 is installed on Anritsu's MS2721B or MT8222A.

Electric Characteristic	For performance specifications, each value is assumed to be obtained from measurement after 10-minute preheating under constant ambient temperature conditions.		
Total	Frequency Range	30 to 990 MHz (setting resolution: 1Hz)	
	Channel Map	UHF (Australia), UHF (Europe) None (Optional frequency setup	
	Channel Range	When channel map is UHF (Australia), a numerical value from 28 to 69 (setting resolution: 1 channel) can be set to channel. This time, the central frequency is set to 529.5 + (channel –28) x 7 MHz When channel map is UHF (Europe), a numerical value from 21 to 69 (setting resolution: 1 channel) can be set to channel. This time, the central frequency is set to 474 + (channel –21) x 8 MHz	
	Band Width	7, 8 MHz	
	Mode	2K, 4K, 8K Manual setup or automatic detection setup	
	Guard Interval	1/4, 1/8, 1/16, 1/32 Manual setup or automatic detection setup	
	Modulation System	QPSK, 16QAM, 64QAM Manual setup or automatic detection setup	
	Hierarchy	None, α = 1, α = 2, α = 4	
	Spectrum Reverse	On, Off	
	FFT Start Position	Can specify the position to hew out data used for modulation analysis. Pick up the data for the valid symbol length, from where guard interval of n/8 x guard interval length is included, beginning at a valid symbol start. n: 0 to 8	
	Maximum Input Level	+20 dBm (Preamplifier: Off) –10 dBm (Preamplifier: On	
	Reference Level Setting Range	+20 to –25 dBm, 5 dB steps (Preamplifier: Off) –10 to –50 dBm, 10 dB steps (Preamplifier: On)	
	Impedance	50, 75 Ω (External impedance converter deals wh it 75 Ω)	
	Correction Table for Field Strength Measurement	Can store the level correction data table for field strength measurement	
	Measurement Mode	Single, Continuous	
Channel Power/Terminal Voltage	DVB-T/H Signal, 1 Channel Input		
	Level	Input Level Range	+20 dBm to noise floor (Preamplifier: Off) –20 dBm to noise floor (Preamplifier: On)
		Measurement Resolution	0.1 dB
		Measurement Resolution	Channel Map: UHF(Europe), Channel: 21 to 69, Bandwidth: 8 MHz, Target's VSWR: 1.5 or less, 50 Ω Preamplifier: Off ±2.0 dB (+20 to –10 dBm, typical) ±2.0 dB (–10 to –60 dBm) Preamplifier: On ±2.0 dB (–20 to –84 dBm)
		Display Average Noise Level	Channel Map: UHF (Europe), Channel: 21 to 69, Bandwidth: 8 MHz, RF input 50 W termination, 20 °C to 30 °C Preamplifier: Off, Reference level: –25 dBm ≤–69 dBm Preamplifier: On, Reference level: –50 dBm ≤–93 dBm
		1 dB Compression Level	Channel Map: UHF(Europe), Channel: 21 to 69, CW, 20 °C to 30 °C Preamplifier: Off, Reference level: –25 dBm ≥–15 dBm Preamplifier: On, Reference level: –50 dBm ≥–43 dBm
		Units	dBm, dBmV, dBmV/m

Option 78 DVB-T/H Single Frequency Network (SFN) Measurement Specifications (continued)

Impulse Response	DVB-T/H Signal, 1 Channel Input			
	Frequency Lock Range			±90 kHz
	Level	Input Level Range		+20 dBm to noise floor +10 dB (Preamplifier: Off) –20 dBm to noise floor +10 dB (Preamplifier: On)
	Impulse Response Graph	Display Range		All graph: –896 ms to +896 ms (Bandwidth: 8 MHz) –1024 ms to +1024 ms (Bandwidth: 7 MHz) Zoom graph: Optional 66 ms width of All graph (Bandwidth: 8 MHz) Optional 75 ms width of All graph (Bandwidth: 7 MHz)
		Resolution		0.11 ms (Bandwidth: 8 MHz) 0.13 ms (Bandwidth: 7 MHz)
		Vertical Axis (Level)	Display Range	5, 10, 20, 40 dB
			Display Resolution	0.1 dB
		Marker		Can read delay time, relative level (DU ratio), power and field strength (unit: dBmV/m) by using marker function
		Marker Mode		Normal: Reads 1-point marker Zone: Zoom graph: Reads the maximum value within the 1/10 width marker. (Bandwidth: 8 MHz) Zoom graph: Reads the maximum value within the 1/10 width marker. (Bandwidth: 7MHz)
Impulse Response: Path-level Estimation	Selects the object path with marker, 8K Mode, Guard Interval: 1/8, Channel Map: UHF (Europe), Channel: 21 to 69, Bandwidth: 8 MHz, Target's VSWR of 1.5 or less, 50 Ω			
	2 wave model	Main Wave Estimated Level Accuracy*1		Preamplifier: Off ±2.5 dB (Terminal power: –10 to –55 dBm, typical) Preamplifier: On ±2.5 dB (Terminal power: –20 to –79 dBm, typical)
		Delay Wave Estimated Level Accuracy*2		Preamplifier: Off ±2.5 dB (Terminal power: –10 to –55 dBm, typical) Preamplifier: On ±2.5 dB (Terminal power: –20 to –79 dBm, typical)
		DU Ratio Accuracy*2		Preamplifier: Off ±1.0 dB (Terminal power: –10 to –55 dBm, typical) Preamplifier: On ±1.0 dB (Terminal power: –20 to –79 dBm, typical)
	*1: Time difference between main wave and delay wave is 5 to 850 ms, DU ratio is 3 dB or more *2: Time difference between main wave and delay wave is 5 to 850 ms, DU ratio is 3 to 20 dB			
	3 wave model	Main Wave Estimated Level Accuracy*3, *5		Preamplifier: Off ±2.5 dB (Terminal power: –10 to –55 dBm, typical) Preamplifier: On ±2.5 dB (Terminal power: –20 to –79 dBm, typical)
		Delay Wave Estimated Level Accuracy*4, *5		Preamplifier: Off ±2.5 dB (Terminal power: –10 to –55 dBm, typical) Preamplifier: On ±2.5 dB (Terminal power: –20 to –79 dBm, typical)
		DU Ratio Accuracy*4, *5		Preamplifier: Off ±1.0 dB (Terminal power: –10 to –55 dBm, typical) Preamplifier: On ±1.0 dB (Terminal power: –20 to –79 dBm, typical)
	*3: When time difference between main wave and delay wave is 5 to 420 ms, and DU ratio is 6 dB or more *4: When time difference between main wave and delay wave is 5 to 420 ms, and DU ratio is 6 dB *5: When main wave is set to 0 ms * Delay time (absolute value) of one delay wave is different from that of the other by 2 ms or more * When difference of delay time among delay waves is different from delay time (absolute value) by 2 ms or more			

Option 78 DVB-T/H Single Frequency Network (SFN) Measurement Specifications (continued)

Impulse Response: Interference	UHF (Europe), Channel: 21 to 69, Bandwidth:8 MHz, 8K Mode, Guard Interval: 1/8, 21 to 69 channel, 64QAM, Reference Level: –25 dBm, ±2 channels for desired signal, CW interfering wave of 0 dBm			
	Main Wave Presumed Level Accuracy*6		Preamplifier: Off ±2.5 dB (Terminal power: –35 dBm, typical)	
	*6: When time difference between main wave and delay wave is 5 to 850 ms and DU ratio is 3 dB or more at 2-wave model			
Impulse Response: Sidelobe Compress Function of Main Wave	Automatically compresses the occurrence of the sidelobe centered on the main wave.			
In-band Spectrum	Displays the measurement signal spectrum, focusing on the setup frequency.			
	Level	Input Level Range		+20 dBm to noise floor (Preamplifier: Off) –20 dBm to noise floor (Preamplifier: On)
	In-band Spectrum Graph	Horizontal Axis Frequency)		Displays the central frequency as 0 MHz.
		Display Range		±3.804 MHz (Bandwidth: 8 MHz) ±3.328 MHz (Bandwidth: 7 MHz)
		Valid Range		±3.804 MHz (Bandwidth: 8 MHz) ±3.328 MHz (Bandwidth: 7 MHz)
		Display Resolution		Bandwidth: 8MHz: 1.116 kHz Bandwidth: 7MHz: 0.977 kHz
		Vertical Axis		Displays, with linear value root-mean-square of the spectrum within the display range as 0 dB standard.
		Vertical Axis (Level)	Display Range	5, 10, 25, 50 dB
			Display Resolution	0.1 dB
		Marker		Delta Marker Off: Reads 1-point marker frequency and relative level from vertical axis 0 dB. Delta Marker On: Reads relative level, presumed distance and frequency difference, based on the position just after turning the delta marker on.
Others	External Reference Signal	Frequency		10 MHz
		Level		–10 to +10 dBm
	Measurement Result Save			Saves the JPEG file on the measurements screen and the text file of the numerical value within the internal memory. Can copy the measurements file within the internal memory to the external memory.
	Save and Recall of the Panel Setup Information			Saves the panel setup information into the internal memory Recalls the saved panel setup information to reflect to the panel setup.
	Screen Display Language			English, Japanese