discover...

ML2490A Series

Peak Power Meters

Anritsu

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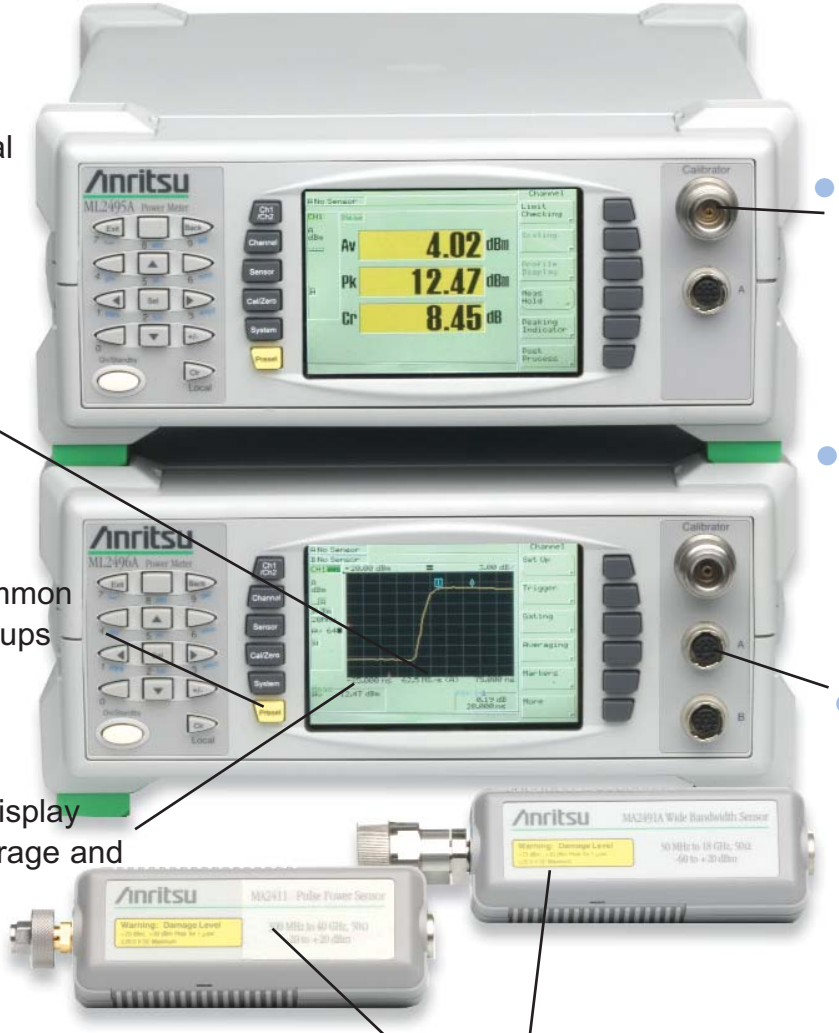
ML2490A Series Peak Power Meter

Higher Resolution Rise Time Measurements

- **Suitable for Radar Rising Edge signals**
- **65 MHz Bandwidth Mainframe**
- **1ns Settable display resolution**

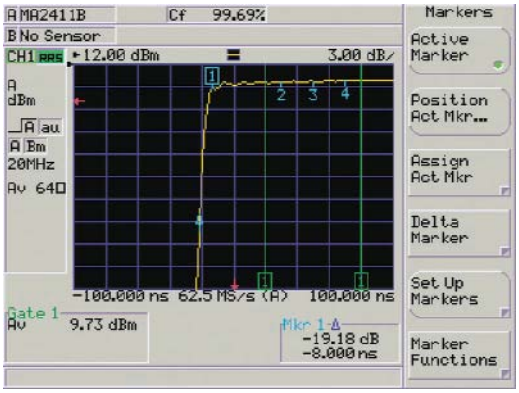


- Internal or External trigger facilities
- 50ns to 7s display range
- Preset key for common measurement set ups
- Colour Graphical Display
  Displays Peak, average and crest of any signal
- 50MHz/1GHz calibrator calibrates all Anritsu sensors
- CW Meter Mode
  High Dynamic Range accurate CW measurements
- Sensor Inputs
  Compatible with all Anritsu MA2400A sensors
- Fast Rise Time Sensors
  Optimised for Fast Rise Time High Video bandwidth measurements
  MA2411B 40 GHz 8ns Rise Time
  MA2490A/91A 8GHz/18GHz 18ns Rise Time Sensors
- Sensor EEPROM
  All MA2400 Series sensors have built-in EEPROMS with factory calibration data.
  Up to 9 User Calibration Factor Tables allow on-site calibration, extra frequency points or compensation for attenuators and couplers

- RS232 for control & firmware updates
- GPIB Comprehensive Command set for full functionality over GPIB
- V/GHz input for Cal factor correction or PAE(Power Added Efficiency) current Probe
- TTL Trigger Control PRF (Pulse Repetition Frequency) to 10MHz
- TTL outputs for Pass Fail Limits

- Rear panel options for Sensor Inputs and 0dBm Reference

- High resolution rising Edge measurements



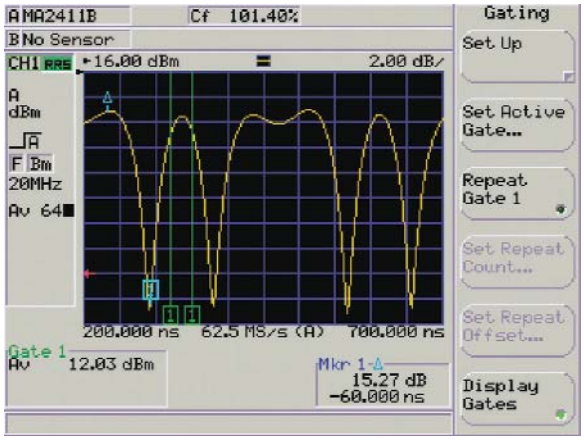
- External Video Provides 1/4VGA signal to CRT Monitor

The ML2490A is the ideal companion for other Anritsu Test equipment such as the MG3690B series and the MG3700A series

Features

1ns Settable Display Resolution

The ML2490A has 1ns settable resolution on time based measurements from 50ns to 3.2 µs.



50ns minimum time display

See and measure the detail on narrow pulse width signals.

8ns typical Rise time with MA2411B sensor

The ML2490A rise time is typically 8ns with the MA2411B pulse sensor providing a fast measurement on the most demanding of radar signals.

65MHz Bandwidth

The power meter mainframe has 65MHz bandwidth.
Wide enough for accurate rise time measurements on radar signals or for measuring the peak signal of the latest 4G OFDM signals.

Two Sample modes

For time durations up to 3.2 µs, the ML2490A series samples continuously. This can be set either automatically or the sample rate can be adjusted directly by the user.
For time durations of 50ns to 3.2µ s the power meter uses repetitive sampling to build up the trace to 1ns settable display resolution. Changeover between the two modes is automatic.

External Video Connector

The ML2490A has a video connector on the rear panel as standard. The power meter can be connected to a standard CRT VGA monitor. The power meter can be located remotely in a test rack and the video screen located close to where the adjustments are taking place.

50MHz and 1GHz Calibration signals

The ML2490A has 50MHz and 1GHz calibrators as standard. Frequency is automatically selected for the sensor in use.

Dual Display Channel

The ML2490A supports dual display channels. Each display channel is a measurement set up and can use any selection or combination of the sensor inputs. The instrument can be configured to view one display channel or two. It can be switched between display channels quickly and simply via the Ch1/Ch2 Hard 'hot' key on the front panel. The user can also choose to view the measurement results as a graph profile or numerical readout.

Measurement Gates

At the heart of the power meter's signal processing lies the measurement gate facility. The new power meter supports up to 4 independently set gates or 8 gates repeated in a pattern. The gate allows the user to capture the relevant information from the signal under test. The wide bandwidth and high speed A/D allows the positioning of the gate very accurately within the signal profile. The user can choose between several measurements performed within the gate, average, peak, crest, max and min.
The max and min data are time stamped so that the position of these signals is recorded within the gate and can be used to record the overshoot and undershoot of a pulsed signal.

Markers

4 independent markers are available for denoting points of interest on the signal profile. The active marker can be scrolled directly from the front panel. A delta marker can be set independently from the active marker to read the difference or the average power result. The delta marker function can be linked to provide continuous scrolling through the signal.

Special Marker features

A set of specialised automatic marker functions has been provided to ease the measurement of pulsed systems. These functions are automatic pulse rise time, pulse fall time, off time and pulse repetition interval.

Trigger facilities

High speed measurements require precise triggering therefore the trigger level can be set manually or automatically.

The ML2490A series offer the following trigger modes:

Continuous, internal trigger on the rising or falling edge of either input A or input B and external TTL trigger.

The external trigger allows the power meter to be synchronised to external equipment. Data collection can be delayed for a pre-determined time after the trigger point. The internal trigger facility incorporates a settable frame arming facility which enables the power meter to synchronise to multi-pulse signals. A pre-trigger facility allows the capture and display of information on the signal before the trigger.
The single shot trigger facility can be used to capture specific one off events with a bandwidth of 20MHz.
Long duration pulses can also be measured in CW mode and the trigger sensitivity extends to <-30dBm.

Test Limits

The ML2490 series has two different types of automatic test limits. For many applications a simple power limit can be set up to test the upper and /or lower boundaries of the signal. For pulsed systems such as RADAR a time varying limit line can be set to test all aspects of the pulse profile. The power meter can be set up to indicate pass or fail and to hold the measurement display on failure which is important when trying to track down intermittent faults.
An internal limit editor enables the user to create and select his or her own limit profiles.

Presets

The ML2490 offers a number of radio system presets. Each preset configures the power meter settings to measure a radio system. GSM, GPRS, WCDMA, WLAN, *Bluetooth* and radar are some of the examples of radio systems supported by this facility.

Settings stores

The power meter has 20 settings stores. These provide a convenient way of having application specific measurement set ups for easy recall by the user.

Remote Interfaces

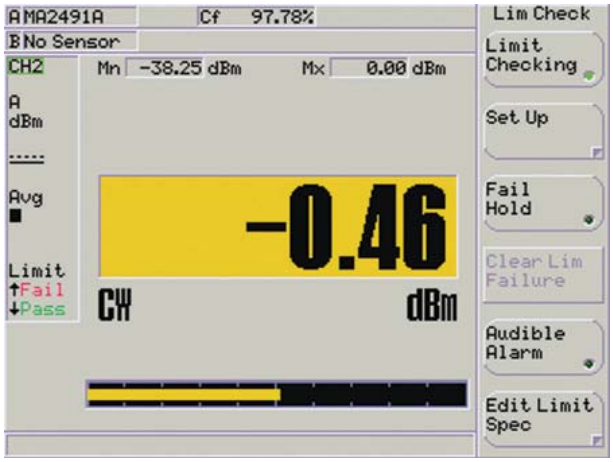
The ML2490A series supports GPIB and RS 232 as standard.

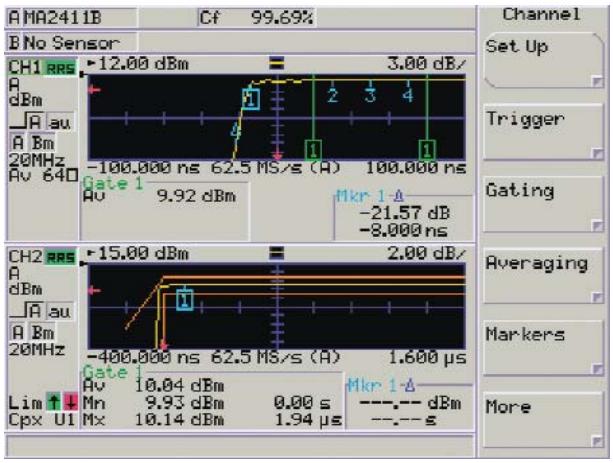
Secure mode

The ML2490A series has a secure mode for operations in security sensitive areas. Once activated the secure mode wipes all information stored in the non-volatile RAM on power up.

CW Meter Mode

Functions as a dual purpose high accuracy, high dynamic range CW power meter





Designed for your application

Radar Systems

The high bandwidth and sample rate of the ML2490A provide accurate peak measurements on a variety of RADAR, Radio-navigation and Radio-location systems.
The ML2490A series has a number of features tailored for peak power measurement on pulsed systems.
With a typical 8ns rise time, and a 1ns resolution on the measurement, the ML2490A and MA2411B have the performance to look at the rising edge of radar signals.

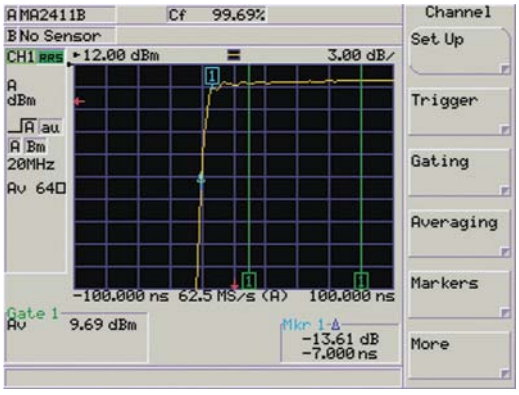
The power meter can be easily set up to trigger on a pulse or sequence of pulses. Up to 4 independent gates can be set to measure the average, max and min powers on a sequence of pulses. The data for the max and min includes the timestamp and gives the user automatic display of the position and value of the maximum overshoot and minimum undershoot in each pulse.

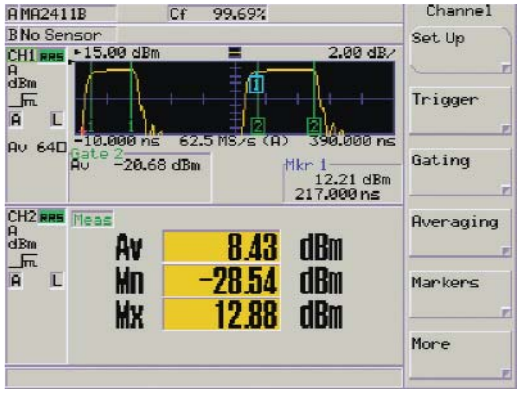
A set of automatic marker functions gives pulse rise time, fall time, off time and Pulse Repetition Interval.
The Delta marker can be set up to measure the droop of the pulse top.

The Trigger event display is available as either arrows on the border of the screen or as an adjustable trigger event waveform on the display.

All timings for the gates and markers are taken from the trigger event.

The offset table function corrects the power meter reading to read the true output power when the power meter is being used with a coupler or high power attenuator in the radar test system.



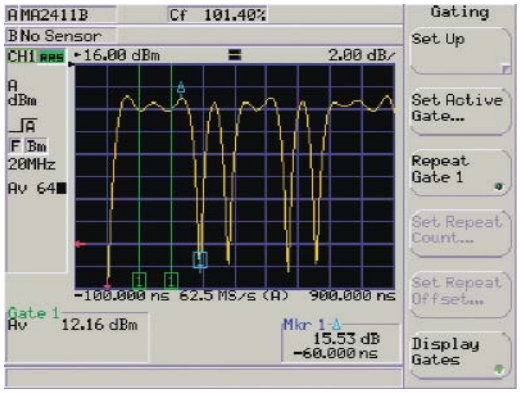


Wideband OFDM Signals

The ML2490A has been designed to measure the peak power of wideband OFDM systems currently under development . The display can be configured to measure Average, Peak and Crest Factor.
Dithered sampling ensures accurate measurements on wideband high data rate carriers under continuous transmission.

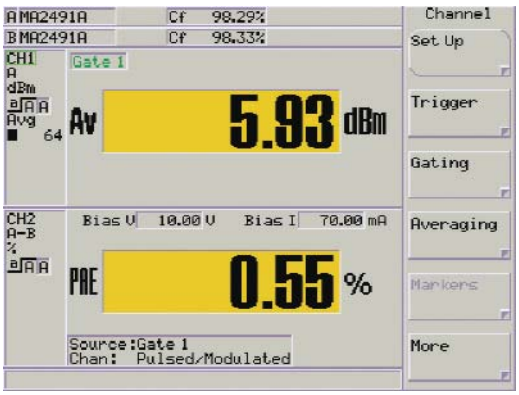
The 65MHz mainframe bandwidth enables high accuracy peak measurements on the most demanding power envelope conditions.

A preset is available to instantly set the power meter up to measure continuous OFDM.



CCDF, CDF and PDF statistical functions are supported on the OFDM measurements and enable the designers of power amplifiers to correctly estimate the margins on the peak power handling capabilities of the amplifiers.

PAE, Power Added Efficiency can be measured on the dual input ML2496A. Amplifier Bias Voltage can be entered manually or over the GPIB. Bias current can also be measured using a current probe connected directly to the power meter.



A Power Sensor for every application

Anritsu manufactures 7 different families of power sensors, where each design has been optimised for a specific application.

Power sensors are based on either thermal converters or diode detectors.

Diode power sensors are based on half or full wave diode rectifiers constructed from zero bias Schottky diodes. The rectifier output is low-pass filtered forming an envelope detector. This post detection bandwidth is sometimes referred to as the video bandwidth and is a measure of how quickly the power sensor can respond to a changing input signal such as a Radar pulse or a multi-carrier OFDM signal.

The power meter has two modes, pulsed modulated and CW. Most sensors can work in either mode. The trade off between the modes is dynamic range; increases of bandwidth are traded off for reduction in overall sensitivity.

The choice of sensor is dictated by several considerations, frequency range, dynamic range and the modulation. The rise time of the sensor should be chosen to match the rise time of the modulation

Pulse and Wideband Sensors:- MA2490/1A and MA2411B

The MA2490A and MA2491A sensors have been designed as dual purpose Wideband and CW sensors.
These sensors have a 18ns rise time in the pulse modulated mode setting on the power meter and can be used to make average, peak and crest measurements on signals with rapid amplitude change such as WCDMA, WLAN, WiMax and Radar. These sensors have a video bandwidth of 20MHz. These sensors have a built in CW mode, there is a FET switch which chops the signal from the sensor at low power levels when CW mode is selected on the power meter.

The pulse sensor MA2411B has been specifically designed for the widest possible bandwidth. This sensor has the fastest rise time and does not contain a FET switch for low level CW applications. Use this sensor for the most demanding rising edge measurements and wideband measurements on OFDM multi-carrier signals.

Standard Diode Sensors:- MA2470D

The MA2470D series Standard Diode Sensors have been designed for high dynamic range, high accuracy CW and TDMA measurements. The sensors have 90dB dynamic range and linearity better than 1.8% making them the choice for precision measurements. The rise time of these sensors is fast enough for power measurements on GSM and similar TDMA systems that use GMSK modulation.

High Accuracy Diode Sensors:- MA2440D

The MA2440D series high accuracy diode sensors have a built in 3dB attenuator to minimise input VSWR. They are used where the best measurement accuracy is required over a large dynamic range, for example when measuring amplifiers. High accuracy diode sensors have a dynamic range of 87dB compared to the 90dB of standard diode sensors. In all other respects the performance of the sensors is identical to the standard diode sensor.

Universal Power Sensors:- MA2480D

The MA2480A series universal sensors are true RMS sensors that have a dynamic range of 80dB. These sensors can be used for average power measurements on multi-tone or WCDMA signals. The sensor architecture consists of three pairs of diodes, each one configured to be working in its square law region over the dynamic range of the sensor. Anritsu's three stage approach leads to a faster measurement as the signal to noise ratio is better than earlier two diode pair architectures.
Option 01 provides TDMA measurement capability. This calibrates one of the diode pairs for linearity over a wide dynamic range.

Fast Thermal Sensors:- MA2420D

Anristu's thermal sensors provide excellent power measurement accuracy over 50dB dynamic range with more speed than any other thermal sensor available. Thermal sensors measure the true RMS power regardless of the input waveform, so are suitable for measuring the power of a variety of continuous waveforms such as WCDMA, multi-tone signals and CW. The MA2420D series have excellent linearity and low VSWR, making them good choices for laboratory applications. The thermal power sensor includes a version without a DC block which can measure down to 100KHz.

Sensor Specifications

Model	Frequency Range	Dynamic Range dBm (CW)	SWR	Rise Time	Sensor Linearity	RF Conn
Pulse Sensor						
MA2411B	300MHz to 40GHz	-20dBm to +20dBm See meter specifications for pulsed dynamic range	<1.15; 0.3 to 2.5GHz <1.35; 2.5 to 26 GHz <1.50; 26 to 40GHz	<8ns typical at +10dBm <18ns when used with ML2487/8A	<4.5% 0.3 to 18GHz <7% 18 to 40GHz	K (m)
Max Power Input	+23dBm Continuous, +30dBm, 1µs, ±20V dc					
Temperature Accuracy	<2.0%, 10 to 45°C					
Notes:	Requires option 15 when used with ML2487/8A Power Meters		Not compatible with ML2430A Power Meters			
Wideband Sensors						
MA2490A	50MHz to 8GHz	-60dBm to +20dBm See meter specifications for pulsed dynamic range	<1.17; 50 to 150MHz <1.12; 0.15 to 2.5GHz <1.22; 2.5 to 8GHz	<18ns	<7% 50 to 300MHz <3.5% 0.3 to 8 GHz	N (m)
MA2491A	50MHz to 18GHz		<1.17; 50 to 150MHz <1.12; 0.15 to 2.5GHz <1.22; 2.5 to 12.4GHz <1.25; 12.4 GHz to 18GHz		<7% 50 to 300MHz <3.5% 0.3 to 18 GHz	
Max Power Input	+23dBm Continuous, +30dBm, 1 µs ±20V dc					
Temperature Accuracy	<1.0%, 10 to 45°C					
Notes	MA2490/1A sensors not compatible with ML2430A power meters					
Standard Diode Sensors						
MA2472D	10MHz to 18GHz	-70 to +20 dBm See meter specifications for pulsed dynamic range	< 1.17; 10 - 150 MHz MA2472D only < 1.90; 10 - 50 MHz < 1.17; 50 - 150 MHz < 1.12; 0.15 - 2 GHz < 1.22; 2 - 124 GHz < 1.25; 12.4 - 18 GHz < 1.35; 18 - 32 GHz < 1.50; 32 - 40 GHz < 1.63; 40 - 50 GHz	<4µs	1.8%, < 18 GHz 2.5%, < 40 GHz 3.5%, < 50 GHz For MA2475D see notes	N (m)
MA2473D	10MHz to 32GHz					K (m)
MA2474D	10MHz to 40GHz					K (m)
MA2475D	10MHz to 50GHz					V (m)
Max Input Power	+23dBm Continuous, +30dBm, 1µs, ±20V dc					
Temperature Accuracy	<1.0%<40GHz, <1.5% <50GHz 5 to 50°C					
Notes	For linearity on MA2475D only applicable -70dBm + 15dBm					
Fast Thermal Sensors						
MA2421D	0.1 MHz - 18 GHz	-30 to + 20dBm	< 1.10; 0.1 MHz - 2 GHz < 1.15; 2 - 12.4 GHz < 1.20; 12.4 - 18 GHz	<4ms	1.8%, < 18 GHz	N (m)
MA2422D	10 MHz - 18 GHz	-30 to + 20dBm	< 1.90; 10 - 50 MHz < 1.17; 50 - 150 MHz < 1.10; 0.15 - 2 GHz < 1.15; 2 - 12.4 GHz < 1.20; 12.4 - 18 GHz < 1.25; 18 - 32 GHz < 1.30; 32 - 40 GHz < 1.40; 40 - 50 GHz	<4ms	1.8%, < 18 GHz 2.5%, < 40 GHz 3.5%, < 50 GHz	N (m)
MA2423D	10 MHz - 32 GHz					K (m)
MA2424D	10 MHz - 40 GHz					K (m)
MA2425D	10 MHz - 50 GHz					V (m)
Max Input Power	+24dBm Continuous, +30dBm, 1µs, ±2.2V dc					
Temperature Accuracy	<1.0%, 5 to 50°C					
Notes	MA2421D No DC block, response to DC. All other sensors have dc blocks					
High Accuracy Diode Sensors						
MA2442D	10 MHz - 18 GHz	- 67 to + 20dBm	< 1.90; 10 - 50MHz < 1.17; 50 - 150MHz ** < 1.08; 0.15 - 2GHz < 1.16; 2 - 12.4GHz < 1.21; 12.4 - 18GHz < 1.29; 18 - 32GHz < 1.44; 32 - 40GHz < 1.50; 40 - 50GHz	<4µs	1.8%, < 18 GHz 2.5%, < 40 GHz 3.5%, < 50 GHz For MA2445D see notes	N (m)
MA2444D	10 MHz - 40 GHz					K (m)
MA2445D	10 MHz - 50 GHz					V (m)
Max Input Power	+23dBm Continuous, +30dBm, 1µs, ±20V dc					
Temperature Accuracy	<1.0%<40GHz, <1.5% <50GHz 5 to 50°C					
Notes	For Linearity on MA2445D only applicable -67 dBm to +15dBm					
Fast Diode Sensors						
MA2468D	10 MHz - 6 GHz	-60 to + 20dBm	<1.90;10-50MHz <1.17;50-150MHz <1.12;0.15-2GHz <1.22;2-12.4GHz <1.25;12.4-18GHz	<0.6 µs	1.8%	N (m)
MA2469D	10 MHz - 18 GHz					
Max Input Power	+23dBm Continuous, +30dBm, 1µs, ±20V dc					
Temperature Accuracy	<1.0%, 5 to 50°C					
Notes	Not for use on ML2430A series power meters					
Universal Power sensors						
MA2481D	10 MHz - 6 GHz	-60 to + 20dBm	<1.17;10-150MHz <1.12;0.15-2GHz <1.22;2-12.4GHz <1.25;12.4-18GHz	<4µs (with option 01 only)	10 MHz to 6GHz 3% -60dBm to +20dBm 6 to 18GHz 3% -60dBm to 0dBm 3.5% 0 to +20dBm (1.8% CW with option 01)	N (m)
MA2482D	10MHz - 18 GHz					
MA2480/01	Adds Fast CW mode to Universal Power sensors for high speed measurements of CW signal plus TDMA and pulse measurement					
Max Input Power	+26dBm Continuous, +35dBm, 1µs, ±20V dc					
Temperature Accuracy	<1.0%, 15 to 35°C					

Specifications			
Frequency Range	100 kHz to 65 GHz, sensor dependant		
Power Sensors	Meter compatible with all MA2400A/B/C/D Sensors		
Display Measurement Range	-70 to +200dBm dependant upon sensor range, external coupler or attenuator		
Display Resolution	Selectable from 0.1 to 0.001 dB in Readout Mode 0.01dB in profile mode Time Axis 1ns settable resolution Pulse/Modulated Mode <200ns capture time (200 points) 15µs CW Mode		
Display Units	Linear: nW to GW,%,Volts Log: dBm,dBW,dB, dBµV,dBmV		
Measurements	Power:-Average, Peak, Crest, Maximum, Minimum Statistics:- PDF, CDF and CCDF PAE:- Power Added Efficiency		
Measurement Modes	Pulse/Modulated for wideband measurements CW for CW measurements Peaking Meter ±5dB range Readout/CW mode only		
Measurement Display	Profile (Graph) for Pulse/Modulated Mode Readout (Numerical) for Pulse/Modulated and CW Display Average, Max, Min, Max and Min Measurement Hold, Max, Min Hold		
Power Measurement Dynamic Range			
Overall Dynamic Range			
Standard Diode Sensors	-70 dBm to +20 dBm CW mode -34dBm to +20dBm Pulse Modulated Mode		
Wideband Sensors	-60 dBm to +20 dBm CW mode -30 dBm to +20 dBm Pulse Modulated Mode		
Power Meter Amplifier Range	Pulse modulated mode dynamic range covered by 3 overlapping amplifier ranges, R7,R8 & R9 CW mode dynamic range covered by 5 overlapping amplifier ranges, R1,R2,R3, R4 & R5 Universal Sensor MA2481/82D ranges 1 to 6		
Pulse Modulated Amplifier Dynamic Range Performance			
Range 7 Dynamic Range Maximum normal nominal operational value to Bottom nominal limit	-2dBm to +20dBm MA2491A -6dBm to +20dBm MA2472D		
Range 8 Dynamic Range Maximum normal nominal operational value to Bottom limit	-20dBm to +10dBm MA2491A -24dBm to +6dBm MA2472D		
Range 9 Dynamic Range Maximum normal nominal operational value to Bottom limit	-30dBm to -4dBm MA2491A -34dBm to -9dBm MA2472D		
Range Control	Automatic or manual. When in manual clear indication given to user (display and GPIB) of fault conditions (under or over-range)		
Power Measurement Accuracy	As defined by uncertainty calculations with relevant sensor and source match conditions		
Instrumentation Accuracy CW Mode	<0.5% ±0.02 dB absolute accuracy ±0.04 dB relative accuracy		
Zero set CW mode (each range)	Equivalent Noise Power 256 Moving Average	MA2472D	MA2491A
	Range 1	0.5 µW	2 µW
	Range 2	50nW	100nW
	Range 3	0.5nW	2nW
	Range 4	0.2nW	1nW
	Range 5	50pW	0.5nW
Instrumentation Accuracy Pulse/Modulated Mode	<0.8% Nominal range 7,8		

Zero Set Pulse/Modulated Mode (each range)	Equivalent Noise Power	MA2472D	MA2491A
	Range 7	5µW	15µW
	Range 8	1µW	5µW
	Range 9	0.5µW	2µW
Bandwidth			
Nominal Bandwidth **Pulse/Modulated mode** Mainframe 3dB point			
Repetitive Sampling	>65 MHz range 7 >38 MHz range 8 >16 MHz range 9		
One shot	20 MHz		
Nominal Bandwidth **CW mode** Mainframe 3dB point	17 kHz range 1,2,3,4 36 Hz range 5		
Nominal Bandwidth with MA2411B Sensor MA2411B Sensor nominal Bandwidth 50MHz	Combined B/W >39 MHz range 7 >29 MHz range 8 >12 MHz range 9		
Rise Time with MA2411B sensor **10% to 90% at +10dBm** System Rise Time	Typical 8ns Maximum 12ns		
Rise Time Measurement Dynamic Range	The ML249XA will be able to functionally measure 10% to 90% rise times over the following dynamic range with the MA2491A. Peak power -20dB m to +20dBm		
Overshoot Pulsed Modulated Mode	<= 3% in linear power at +10dBm		
Sampling			
Sampling Modes	Random Repetitive Sample Mode (display set to 200 points) 50ns-3.2µs Trigger Capture (Display) time Continuous Sampling Mode (display set to 200 points) 3.2µs-7s Trigger Capture (Display) time Automatic selection, with current mode indicated on display. Conflicts between setting selected and other instrument setting are indicated through user warnings (displayed and GPIB)		
Sampling Rate	62.5 MS/s pulse/modulated mode 75 kS/s in CW mode Manual Setting (Pulse Modulated mode only) 62.5 MS/s to 30.5 kS/s		
Sample Rate Clock Accuracy	± 100ppm		
Time Display Trigger Capture Time			
Trigger / Display Capture Range	50 ns to 7s		
Settable Time Measurement Resolution Trigger capture time 50ns to 3.2µs	1ns		
Trigger Time Resolution Uncertainty Trigger Capture time 50ns to 3.2µs	± 2ns or display resolution, whichever is the larger		
Trigger Time Resolution Uncertainty Trigger Capture time 3.2µs to 7s	±16ns or display resolution whichever is the larger		
Trigger Capture Time settable Resolution	**Display points = 200** 1ns or 0.5% of trigger capture time, which ever is the larger. **Display Points = 400** 1ns or 0.25% of trigger capture time (400points), which ever is the larger.		

Triggering	
Trigger Sources	**Signal Triggers** Continuous (not in Random Repetitive Sampling mode) Internal, External TTL Rising or falling Edge **Remote Bus Triggers** (TR1,TR2,TR3) GPIB or external Bus
Arming Sources	**Repetitive Sampling Modes** Automatic Frame for QAM and multi-pulse **Continuous Sampling Mode** Single Automatic Frame for QAM and multi-pulse
Frame Arming Time Range	0 to 64 x trigger capture time range or 120 µs whichever is the greater.
Trigger Modes	**Manual** Single power value set to cover entire measurement dynamic range of sensor **Auto** Automatically sets trigger level for signal over measurement dynamic range
Internal Trigger Dynamic Range	-18 dBm to +14 dBm with MA2491A in Pulse/Modulated mode -30 dBm to +10 dBm with MA2472D in Pulse/Modulated mode -28 dBm to +10 dBm with MA2472D in CW mode
Internal Trigger Settable Resolution	0.1dB
Nominal Internal Trigger Bandwidth	Variable-auto set and manual 20MHz, 2MHz, 200KHz, 20KHz
External Trigger Maximum Trigger Rate	10 MHz minimum
Trigger / Display Capture Range	50 ns to 7s
Trigger Capture settable Resolution	**Display points = 200** 1ns or 0.5% of trigger capture time, which ever is the larger. **Display Points = 400** 1ns or 0.25% of trigger capture time (400points), which ever is the larger.
Trigger Delay Range	**Pulse Modulated Mode** Pretrigger (-ve): 95% of the Trigger Capture range Post Trigger: Set by 256K buffer and sample rate **CW mode** Post Trigger Only: 0-999ms depending on Trigger Capture period setting
Trigger Delay Settable Resolution	**Display points = 200** 1ns or 0.5% of trigger capture time, which ever is the larger. **Display Points = 400** 1ns or 0.25% of trigger capture time (400points), which ever is the larger
Trigger Delay Uncertainty	+/-2ns for pre and post trigger Trigger capture time set to 50ns.
Trigger latency (20MHz trigger BW)	+/-15ns
Trigger point waveform displayed on screen	Trigger point depicted by trigger edge waveform. Edge represents trigger point of signal. Display position of trigger edge waveform adjustable.
Power Reference ML2480A-15 specification Standard in ML2495/6A	
Output Power	1.00 mW Traceable to National standards
50MHz Frequency Accuracy	<1%
50MHz VSWR	1.12
50MHz Output Power Accuracy	±1.2% per year, 0.9% RSS Traceable to National Standards
1GHz Frequency Accuracy	<2%
1GHz VSWR	1.2
1GHz Output Power Accuracy	±1.2% per year, 0.9% RSS Traceable to National Standards
Connector	Type N female

Sensor/Channel Control	
Limit Lines	Simple pass fail for CW Complex limits for pulsed and TDMA systems Limits can be stored in the instrument
Markers	4 Markers and 1 Delta Marker Marker to Max/Min Pulse Rise Time Pulse Fall Time Pulse Width Off Period Pulse Repetition Interval
Gates	4 Independently set Gates or 8 repeated Gates 1 Fence per Measurement Gate Gate Measurement supports Average, Peak, Crest, Max and Min
System Configuration	
Display	LCD, Colour ¼ VGA
Save /Recall	20 settings stores Preset accessible on Front Panel Offset tables
Secure Mode	Wipes non-volatile memory on power up when active
Interfaces	
GPIB Speed **CW Mode**	>400 Readings/second TR3 mode
GPIB speed Pulse Modulated Mode **Continuous Sampling**	>350 Readings/second 1µs pulse, readout mode, Display turned off TR3 Mode
GPIB speed Pulse Modulated Mode **Profile data**	200 points per sweep:-Binary Float Output 5µs Trigger Capture Time >10 profile transfers/sec
GPIB speed Pulse Modulated Mode **Repetitive sampling**	>20 Readings/sec 50ns pulse, readout mode, Display turned off TR3 Mode
GPIB Compatibility	Back Compatible with ML2480A products. All equivalent functionality supported, and uses identical GPIB commands. Additional functionality added.
RS232	1200,2400,4800,9600,19200,38400,57600 Baud rates supported
External Video Display	CRT VGA Compatible timing output, display size is ¼ of VGA screen size
BNC I/O Rear Panel	
V/GHz	Can be configured for Cal factor correction from synthesiser Ext Voltage Voltmeter Connection: current probe for PAE applications
External Trigger	External TTL trigger Input. Maximum Trigger frequency 10MHz
Output 1	Can be configured for Analog Output Pass/Fail TTL o/p Limits Levelling:- Sensor Input A
Output 2	Can be configured for Analog Output Pass/Fail TTL o/p Limits Levelling:- Sensor Input B Trigger Output
General Specifications	
General	MIL-T28800F, Class 3
Operating Temperature Range	0 to 50 °C, Mainframe only. See sensor specification for performance of sensors.
Storage Temperature Range	-40 to 70 °C
Power Requirements	AC 90V to 250V 47 to 440Hz
EMC and Safety	Complies with requirements for CE marking EN 61326 EN61010-1
Non Volatile RAM Battery Type	Lithium
Non Volatile RAM Battery Life	5 years
Warranty	1 year standard 3 year optional
Dimensions	Width 213mm (8.39 inches) Height 88mm (3.46 inches) Depth 390mm (9.84 inches)
Weight	3kg

ML2430A Series

Power Meters Ideal for CW applications

The ML2430A Series Power Meters combine the advantages of thermal meter accuracy, diode meter speed and peak power meter display graphics.

The result is a single instrument that samples at more than 35k per second and achieves 90 dB dynamic range with a single sensor.

The ML2430A Series includes graphics display capability as a standard feature. The ruggedised housing and optional high-capacity NiMH battery bring laboratory quality accuracy to field service applications.

Accessories

ML2419A Range Calibrator

Reduce annual calibration expense with Anritsu's precision range calibrators.

The ML2419A Range Calibrator verifies the ML2400A Series Power Meter's measurement channels.

The meter's 50 MHz Oscillator level is verified by comparison method. When the calibrator is connected, user operation prompts appear on the meter's screen.

Soft Carry Case

The soft carry case protects the power meter and has pockets for all common accessories making it the ideal carry bag for field use.

50MHz Reference Oscillator

When power sensors must be located a long distance from the power meter, the MA2418A Reference Oscillator provides a remote, traceable 0dBm power reference.

MA2418A is DC powered from a 16 to 24 volt jack plug.

Bail Arm & Protective Front Cover

A bail arm is available as a convenient carry handle and is suitable for angling the meter on a workbench.

Accessories

Power Attenuators

Model	Frequency Range	Rating	Connectors
42N50-20	DC - 18 GHz	20 dB, 5W, 50 ohm	N male to N female
42N50-30	DC - 18 GHz	30 dB, 50W, 50 ohm	N male to N female
42KC-20	DC - 40 GHz	20 dB, 5W, 50 ohm	K male to K female

Precision Attenuators

Model	Frequency Range	Rating	Connectors
41KC-3	DC - 40 GHz	3 dB, 2W, 50 ohm	K male to K female
41KC-6	DC - 40 GHz	6 dB, 2W, 50 ohm	K male to K female
41KC-10	DC - 40 GHz	10 dB, 2W, 50 ohm	K male to K female
41KC-20	DC - 40 GHz	20 dB, 2W, 50 ohm	K male to K female
41V-3	DC - 60 GHz	3 dB, 2W, 50 ohm	V male to V female
41V-6	DC - 60 GHz	6 dB, 2W, 50 ohm	V male to V female
41V-10	DC - 60 GHz	10 dB, 2W, 50 ohm	V male to V female
41V-20	DC - 60 GHz	20 dB, 2W, 50 ohm	V male to V female

Precision Coaxial Adapters

Model	Frequency Range	Connectors
510-90	DC - 3.3 GHz	N male to 7/16 DIN female
510-91	DC - 3.3 GHz	N female to 7/16 DIN female
510-92	DC - 3.3 GHz	N male to 7/16 DIN male
510-93	DC - 3.3 GHz	N female to 7/16 DIN male
K220B	DC - 40 GHz	K male to K male
K222B	DC - 40 GHz	K female to K female
K224B	DC - 40 GHz	K male to K female

Precision Waveguide to Coaxial Adapters

Contact your local Anritsu sales office for details of our range of precision waveguide to coaxial adapters.

Please see back page for your local Anritsu representative, or email:
info@eu.anritsu.com

Coaxial Adapters

Model	Frequency Range	Connectors
1091-26	DC to 18 GHz	N male to SMA male
1091-27	DC to 18 GHz	N male to SMA female
1091-80	DC to 18 GHz	N female to SMA male
1091-81	DC to 18 GHz	N female to SMA female

Power Splitters

Model	Frequency Range	Connectors
1091-28	DC - 18 GHz	N female - N female/N female
K241B	DC - 26.5 GHz	K male - K female/K female
K241C	DC - 40 GHz	K male - K female/K female
V241C	DC - 60 GHz	V male - V female/V female

Power Dividers

Model	Frequency Range	Connectors
1091-29	DC - 18 GHz	N male - N female/N female
K240B	DC - 26.5 GHz	K female - K female/K female
K240C	DC - 40 GHz	K female - K female/K female
V240C	DC - 60 GHz	V female - V female/V female

Precision Loads

Model	Frequency Range	Connectors
28N50-2	DC - 18 GHz	N male
28NF50-2	DC - 18 GHz	N female
28A50-1	DC - 18 GHz	GPC-7
28K50	DC - 40 GHz	K male
28KF50	DC - 40 GHz	K female
28V50B	DC - 67 GHz	V male
28VF50B	DC - 67 GHz	V female

RF Bridges and Open/Shorts

Model	Description	Frequency Range	Connectors
60N50-1	RF Bridge, 46 dB	0.005 - 2.0 GHz	N male
60NF50-1	RF Bridge, 46 dB	0.005 - 2.0 GHz	N female
87A50-1	RF Bridge, 38 dB	2.0 - 18 GHz	GPC-7
22A50	Open/Short	DC - 18 GHz	GPC-7
22N50	Open/Short	DC - 18 GHz	N male
22NF50	Open/Short	DC - 18 GHz	N female

Calibrated Torque Wrenches

Model	Description
01-201	Calibrated torque wrench for K and V connectors
01-204	Calibrated torque wrench for N connector

Ordering Information

Models

ML2495A Power Meter, Single Input
ML2496A Power Meter, Dual Input

Included Accessories

Power Cord for Destination
One 1.5m sensor cord per meter input
Operation Manual
GPIB Manual
Certificate of calibration, also included with sensors

Options and Accessories

ML2400A-01 Rack Mount, single unit
ML2400A-03 Rack Mount, side by side
ML2400A-05 Front Bail Handle
ML2490A-06 Rear Mount input A
ML2490A-07 Rear Input A and Reference
ML2490A-08 Rear Mount inputs A,B and Reference
ML2490A-09 Rear Mount Inputs A and B
ML2400A-12 Front Panel Cover
ML2400A-20 Spare 1.5m Sensor Cable
ML2400A-21 0.3m Sensor Cable
ML2490A-33 Extra Operating Manual
ML2490A-34 Extra Programming Manual
ML2490A-37 Electronic Manuals-Deletes paper version from shipment
ML2490A-98 Premium Cal to Z540 ISO guide 25
ML2490A-99 Service Cal to Z540 ISO guide 25
760-209 Hardside Transit Case
D41310 Soft Carry Case with Shoulder Strap
MA2418A 50MHz Reference Oscillator with Power Supply
MA2497A Agilent 8480 series sensor adapter

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