



MILLIMETER WAVE SOURCE MODULE BROCHURE



“Innovation in Millimeter Wave Measurements”

General Information

OML millimeter wave source modules connect to the RF output of your existing signal generator to extend microwave outputs to millimeter and sub-millimeter wave frequencies between 50 and 325 GHz. A modern system configuration with the Keysight PSG is shown below, which consists of signal generator and source module. Simply connect the input of your device to the waveguide interface of the source module to conduct mm-wave measurements using your existing microwave instrumentation.



The SxxMS Series of source modules satisfies the EU Directives on Restriction of Hazardous Substances (Lead Free & RoHS).



Direct Connect Solutions

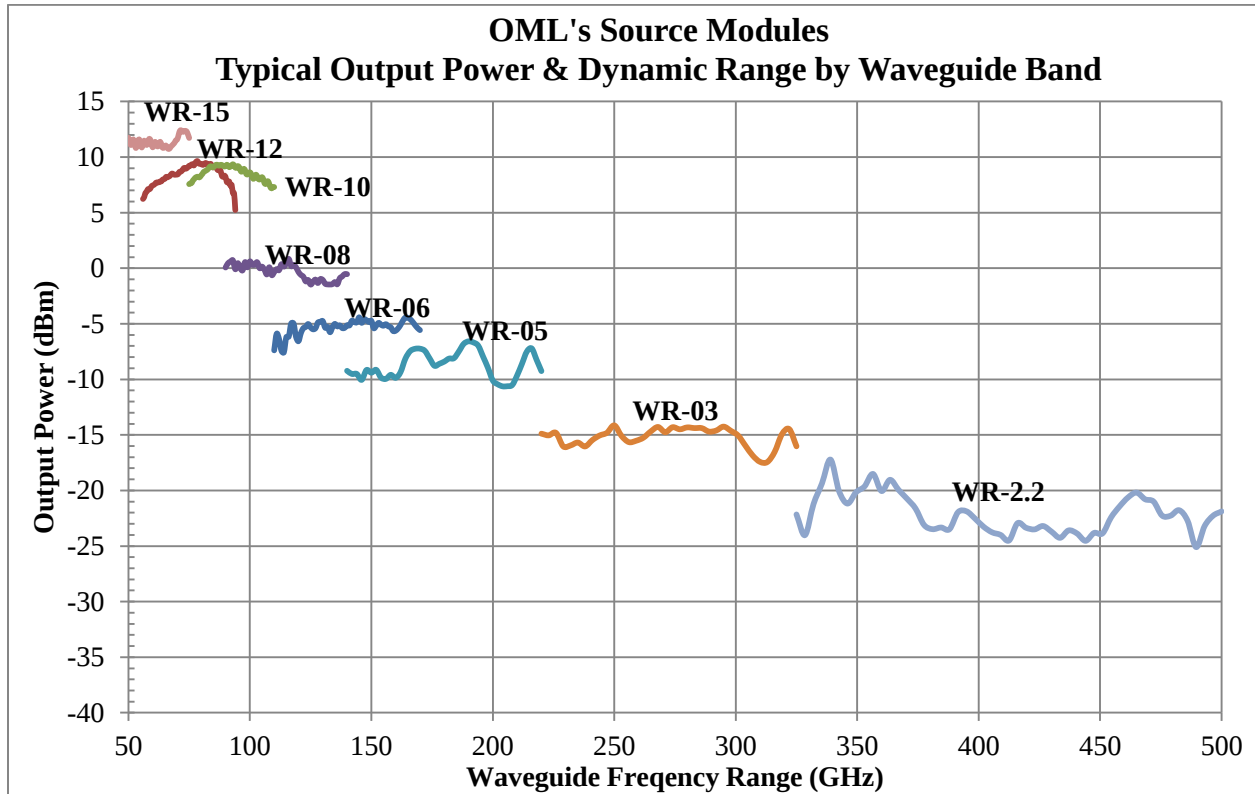
The OML modules are compatible with microwave signal generators from Anritsu, Keysight, Rohde & Schwarz, and Giga-tronics. Please contact your sales representative for help in configuring your system.

An optional configuration exists for the Keysight PSG to utilize the internal power supply of the microwave signal generator. Utilizing this optional DC power configuration can simplify your test setup by eliminating the need for an external power supply.

For compression testing, OML offers optional attenuator with 25 dB range to vary the output power. The micrometer adjustment offers a convenient mechanism for setting attenuation. In addition, you can repeat attenuation settings by simply repositioning the micrometer to the appropriate position.

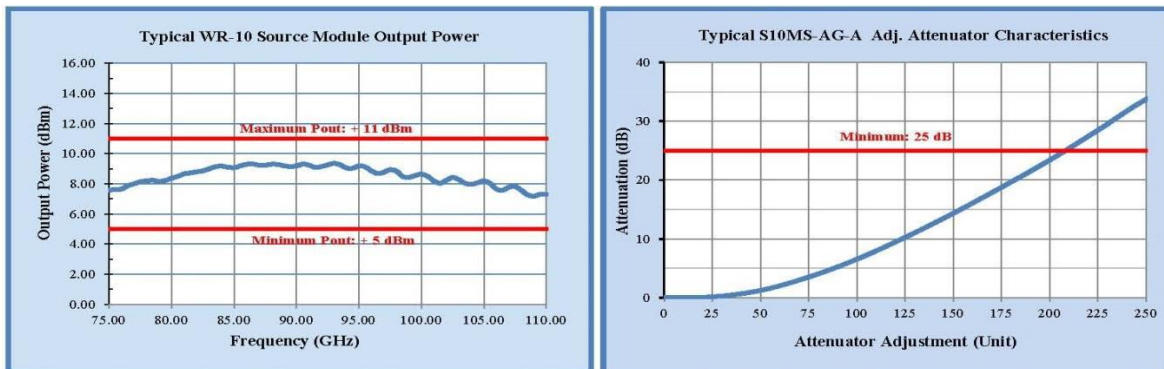
Typical Performance at a Glance

The following chart overviews the typical output power of our frequency extension source modules. On the horizontal axis is the waveguide frequency range between 50 and 500 GHz. The vertical axis is output power in dBm. These typical performance values are for the standard source module (i.e., no optional attenuator).



Output Power Characteristics

The output power characteristics are supplied with each source module. With optional attenuator, the modules are labeled with actual output power and attenuator characteristics versus positioning. Using this information (examples shown in following two charts) enables the direct setting of power levels.



Standard (SxxMS) Source Modules

SPECIFICATIONS ¹		MODEL						
	S15MS	S12MS	S10MS	S08MS	S06MS	S05MS	S03MS	S02.2MS
Frequency In (GHz)	12.5 to 18.8	10.0 to 15.0	12.5 to 18.4	11.2 to 17.5	9.1 to 14.2	11.6 to 18.4	12.2 to 18.1	10.8 to 16.7
Frequency Out (GHz)	50.0 to 75.0	60.0 to 90.0	75.0 to 110.0	90.0 to 140.0	110.0 to 170.0	140.0 to 220.0	220.0 to 325.0	325.0 to 500.0
Multiplier (xN)	x4	x6	x6	x8	x12	x12	x18	x30
RF in, damage level (dBm)	+20							
RF in (dBm) nom.	+10							
RF out (dBm) typ. ²	+11	+8	+8	-1	-5	-9	-15	-22
Higher order output harmonics (dBc) typ. ³	<-20							N/A
In-Band Spurious (dBc) typ. ⁴	<-20							N/A
RF in VSWR	≤ 2.0							
RF out VSWR	≤ 1.7	≤ 1.7	≤ 1.7	≤ 1.7	≤ 1.7	≤ 1.7	≤ 3.0	≤ 3.0
Manually Adjustable Attenuator ⁵	25 dB min							
RF in interface	SMA female							
RF out interface ⁶	WR-15	WR-12	WR-10	WR-08	WR-06	WR-05	WR-03	WR-02.2
Power	+12 VDC @ 1.5 A typ.							
Temperature	+20 to +30°C							
Weight	< 2 lbs							
Size ⁷ (L x W x H)	5.330” x 4.25” x 2.70”							
Environmental	Satisfies the EU Directives on Restriction of Hazardous Substances (RoHS)							

¹ Specifications are typical and subject to change without notice.

² As there are no internationally recognized power standards above 110 GHz, any power data supplied above 110 GHz is traceable only to OML's calorimeter.

³ As relates to the desired output frequencies. Applicable only with Keysight PSG & 8360 series synthesizers and Anritsu MG36xx, 68xxx/69xxx & 67xx series synthesizers.

⁴ In-band mixing products. Typically ≤-15 dBc in the lower 10% of the WR-15, WR-12 or WR10 waveguide band. Applicable only with Keysight PSG & 8360 series synthesizers and Anritsu MG36xx, 68xxx/69xxx & 67xx series synthesizers.

⁵ Available as an option (Option A). Currently not available in S02.2MS.

⁶ RF output port flange configuration per MIL-DTL-3922/67E (UG387/U-M).

⁷ Height excludes the adjustable rubber feet length and depth dimension excludes the output waveguide length.

SxxMS-AG Source Modules for Keysight PSG (E82xx with High Power Option)

SPECIFICATIONS ¹		MODEL						
	S15MS -AG	S12MS -AG	S10MS -AG	S08MS -AG	S06MS -AG	S05MS -AG	S03MS -AG	S02.2MS -AG
Frequency In (GHz)	12.5 to 18.8	10.0 to 15.0	12.5 to 18.4	11.2 to 17.5	9.1 to 14.2	11.6 to 18.4	12.2 to 18.1	10.8 to 16.7
Frequency Out (GHz)	50.0 to 75.0	60.0 to 90.0	75.0 to 110.0	90.0 to 140.0	110.0 to 170.0	140.0 to 220.0	220.0 to 325.0	325.0 to 500.0
Multiplier (xN)	x4	x6	x6	x8	x12	x12	x18	x30
RF in, damage level (dBm)	+36							
RF in (dBm) nom.	+10							
RF out (dBm) typ. ²	+11	+8	+8	-1	-5	-9	-15	-22
Higher order output harmonics (dBc) typ. ³	<-20							
In-Band Spurious (dBc) typ. ⁴	<-20							
RF in VSWR	≤ 2.0							
RF out VSWR	≤ 1.7	≤ 1.7	≤ 1.7	≤ 1.7	≤ 1.7	≤ 1.7	≤ 3.0	≤ 3.0
Manually Adjustable Attenuator ⁵	25 dB min							
RF in interface	SMA female							
RF out interface ⁶	WR-15	WR-12	WR-10	WR-08	WR-06	WR-05	WR-03	WR-02.2
Power	Supplied by E82xx series PSG							
Temperature	+20 to +30°C							
Weight	< 2 lbs							
Size ⁷ (L x W x H)	5.33” x 4.25” x 2.70”							
Environmental	Satisfies the EU Directives on Restriction of Hazardous Substances (RoHS)							

¹ Specifications are typical and subject to change without notice.

² As there are no internationally recognized power standards above 110 GHz, any power data supplied above 110 GHz is traceable only to OML's calorimeter.

³ As relates to the desired output frequencies. Applicable only with Keysight PSG & 8360 series synthesizers.

⁴ In-band mixing products. Typically ≤-15 dBc in the lower 10% of the WR-15, WR-12 or WR10 waveguide band. Applicable only with Keysight PSG & 8360 series synthesizers.

⁵ Available as an option (Option A). Currently not available in S02.2MS-AG.

⁶ RF output port flange configuration per MIL-DTL-3922/67E (UG387/U-M).

⁷ Height excludes the adjustable rubber feet length and depth dimension excludes the output waveguide length.

Ordering Information

Standard Model Number	Source Module Description	Frequency, GHz
S19MS-L	WR-19 Source Module	40-60
S15MS	WR-15 Source Module	50-75
S12MS	WR-12 Source Module	60-90
S10MS	WR-10 Source Module	75-110
S08MS	WR-08 Source Module	90-140
S06MS	WR-06 Source Module	110-170
S05MS	WR-05 Source Module	140-220
S04MS	WR-04 Source Module	170-260
S03MS	WR-03 Source Module	220-325
S02.2MS	WR-02.2 Source Module	325-500
Standard Accessory	Accessory Description	
V00DCBC1	DC power cable (3 ft)	

Keysight Model Number	Description	Frequency, GHz
S15MS-AG	WR-15 Source Module, Keysight	50-75
S12MS-AG	WR-12 Source Module, Keysight	60-90
S10MS-AG	WR-10 Source Module, Keysight	75-110
S08MS-AG	WR-08 Source Module, Keysight	90-140
S06MS-AG	WR-06 Source Module, Keysight	110-170
S05MS-AG	WR-05 Source Module, Keysight	140-220
S04MS-AG	WR-04 Source Module, Keysight	170-260
S03MS-AG	WR-03 Source Module, Keysight	220-325
S02.2MS-AG	WR-02.2 Source Module, Keysight	325-500
Standard Accessories	Accessories Description	
V00DCDC2	DC power cable (6 ft)	
V00LOIF	RF cable, SMA(m) to SMA(m), 3 ft	

Options	Description
-A	Adds 0 to 25 dB Manually Adjustable Attenuator to RF Path (Currently not available in S04MS, S04MS0AG, S02.2MS & S02.2MS-AG)

Standard Accessories	Description
V00DCBC1¹	Dual Banana Plug to 7 Pin Circular Bayonet Plug DC power cable, 3 ft
VDCPW12-5¹	DC Power Supply (7-Pin Output Circular Jack & US AC Power Cord), 12VDC 5A Output.
V00DCDC2²	D connector plug to 7 pin Circular Bayonet Plug DC power cable, 6 ft (Keysight PSG series with “Source module interface” output)
VDCPW09-4³	DC Power Supply (7-Pin Output Circular Jack & US AC Power Cord), 9VDC 4.5A Output.
V00LOIF	Test Port Ext. Cable, DC to 18 GHz, 3 ft, SMA(m) - SMA(m), 50 Ohm

Contact Information

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MILLIMETER WAVE RECTANGULAR TE₁₀ WAVEGUIDE INFORMATION

WG Band	Waveguide Frequency Range (GHz)	Wavelength Range λ_0 (mil)	Wavelength Range λ_0 (mm)	Guide Wavelength Range λ_g/λ_0	Waveguide Impedance Range (Ω)	TE ₁₀ Cutoff Freq (λ_c (GHz)	TE ₁₀ Cutoff λ_c (mil)	TE ₁₀ Cutoff λ_c (mm)	Internal Dimensions (mils)	Internal Dimensions (mm)
WR-28	26.5 - 40.0	445.4 - 295.1	11.313 - 7.495	1.650 - 1.177	621.9 - 443.6	21.1	560.0	14.22	280.0 x 140.0	7.112 x 3.556
WR-22	33.0 - 50.0	357.7 - 236.1	9.085 - 5.996	1.661 - 1.177	626.0 - 443.6	26.3	448.0	11.38	224.0 x 112.0	5.690 x 2.845
WR-19	40.0 - 60.0	295.1 - 196.7	7.495 - 4.997	1.613 - 1.173	608.3 - 442.4	31.4	376.0	9.55	188.0 x 94.0	4.775 x 2.388
WR-15	50.0 - 75.0	236.1 - 157.4	5.996 - 3.997	1.657 - 1.181	624.8 - 445.1	39.9	296.0	7.52	148.0 x 74.0	3.759 x 1.880
WR-12	60.0 - 90.0	196.7 - 131.1	4.997 - 3.331	1.690 - 1.186	637.2 - 447.1	48.4	244.0	6.20	122.0 x 61.0	3.099 x 1.549
WR-10	75.0 - 110.0	157.4 - 107.3	3.997 - 2.725	1.620 - 1.185	610.9 - 446.7	59.0	200.0	5.08	100.0 x 50.0	2.50 x 1.270
WR-08	90.0 - 140.0	131.1 - 84.3	3.331 - 2.141	1.746 - 1.177	658.1 - 443.6	73.8	160.0	4.06	80.0 x 40.0	2.032 x 1.016
WR-06	110.0 - 170.0	107.3 - 69.4	2.725 - 1.763	1.771 - 1.183	667.7 - 445.9	90.8	130.0	3.30	65.0 x 32.5	1.651 x 0.826
WR-05	140.0 - 220.0	84.3 - 53.6	2.141 - 1.363	1.777 - 1.176	669.7 - 443.3	115.7	102.0	2.59	51.0 x 25.5	1.295 x 0.648
WR-04	170.0 - 260.0	69.4 - 45.4	1.763 - 1.153	1.695 - 1.177	638.8 - 443.9	137.2	86.0	2.18	43.0 x 21.5	1.092 x 0.546
WR-03	220.0 - 325.0	53.6 - 36.3	1.363 - 0.922	1.627 - 1.183	613.5 - 445.9	173.6	68.0	1.73	34.0 x 17.0	0.864 x 0.432
WR-02.8	260.0 - 400.0	45.4 - 29.5	1.153 - 0.749	1.708 - 1.177	643.8 - 443.6	210.8	56.0	1.42	28.0 x 14.0	0.711 x 0.356
WR-02.2	325.0 - 500.0	36.3 - 23.6	0.922 - 0.600	1.771 - 1.185	667.7 - 446.7	268.2	44.0	1.12	22.0 x 11.0	0.559 x 0.279
WR-01.9	400.0 - 600.0	29.5 - 19.7	0.749 - 0.500	1.587 - 1.169	598.3 - 440.6	310.6	38.0	0.97	19.0 x 9.5	0.483 x 0.241
WR-01.5	500.0 - 750.0	23.6 - 15.7	0.600 - 0.400	1.620 - 1.175	610.9 - 442.8	393.4	30.0	0.76	15.0 x 7.5	0.381 x 0.191
WR-01.2	600.0 - 900.0	19.7 - 13.1	0.500 - 0.333	1.746 - 1.194	658.1 - 450.1	491.8	24.0	0.61	12.0 x 6.0	0.305 x 0.152
WR-01.0	750.0 - 1100.0	15.7 - 10.7	0.400 - 0.273	1.620 - 1.185	610.9 - 446.7	590.1	20.0	0.51	10.0 x 5.0	0.254 x 0.127