VectorStar®

High Performance, Broadband Network Analysis Solutions

ME7838D Series Vector Network Analyzers

The VectorStar ME7838D 145 GHz Broadband system is the world's first VNA combining RF, microwave, and two mm-wave bands in a single coaxial output. Through the use of the Anritsu-developed 0.8 mm coaxial connector, frequencies up to 145 GHz can be propagated within a coaxial transmission line without waveguide flange connections. A broadband frequency sweep from 70 kHz to 145 GHz is now available without the need to concatenate multiple systems. The result is more accurate device characterization from near-DC through the W band and F band frequencies. W band devices can now be characterized beyond the operating frequency of the application for more accurate modeling and higher success rate from the first design turn. The ME7838D fully supports the 3744A-Rx 30 GHz to 125 GHz receiver for noise figure measurements up to 125 GHz. Integrating Anritsu's unique strength in nonlinear transmission line technology (NLTL), the ME7838D system offers many advances in broadband performance over traditional systems including:

- Industry-best broadband frequency coverage, starts at 70 kHz instead of 10 MHz and is operational from 40 kHz to 145 GHz through a single coaxial connector
- Industry-best dynamic range, 120 dB at 10 MHz, 108 dB at 65 GHz, 108 dB at 110 GHz, and 94 dB at 145 GHz
- Industry-best measurement speed, 55 ms for 201 points at 10 kHz IFBW
- Compact, lightweight mm-Wave modules for easy, precise, and economical positioning on the wafer probe station, 0.7 lb and 1/50 the volume of traditional mm-wave modules
- The first millimeter-wave system with real time leveling of power without the need for calibration software correction tables
- Industry-best calibration and measurement stability, 0.1 dB over 24 hrs
- Fully supports tri-axial Kelvin bias tee connections for on-wafer device biasing up to 145 GHz
- Millimeter-wave waveguide coverage to 1.1 THz
- The ME7838A 110/125 GHz Broadband system can be easily upgraded to 145 GHz by incorporating the new Anritsu MA25300A mm-wave module

Broadband VNA System 70 kHz to 145 GHz

The ME7838D broadband VNA system provides single sweep coverage from 70 kHz to 145 GHz and is operational from 40 kHz to 145 GHz. It consists of the following items:

- MS4647B VectorStar VNA, 70 kHz to 70 GHz with Option 007, Option 070, and Option 080/081
- 3739C Broadband Millimeter-Wave Test Set and Interface Cables
- MA25300A Millimeter-Wave Module, 2 each

Millimeter Waveguide VNA System 50 GHz to 1.1 THz

The ME7838D Millimeter-wave configuration provides waveguide output from 50 GHz to 1.1 THz in waveguide bands. The system can extend the broadband system or be configured to operate only as a waveguide system. It consists of the following items:

- MS4647B VectorStar VNA, 70 kHz to 70 GHz with Option 007, and Option 82/083
- 3739C Broadband Millimeter-Wave Test Set and Interface Cables
- Millimeter-Wave Module, 2 each

VectorStar ME7838D Broadband System

Description Page

1. Definitions

All specifications and characteristics apply under the following conditions, unless otherwise stated:

Warm-Up Time	After 90 minutes of warm-up time, where the instrument is left in the ON state.
Temperature Range	Over the 25 °C ± 5 °C temperature range.
Error-Corrected Specifications	For error-corrected specifications, over 23 °C ± 3 °C, with < 1 °C variation from calibration temperature. For error-corrected specifications are warranted and include guard bands, unless otherwise stated.
Typical Performance	"Typical" specifications describe expected, but not warranted, performance based on sample testing. Typical performance indicates the measured performance of an average unit and do not guarantee the performance of any individual product. "Typical" specifications do not account for measurement uncertainty and are shown in parenthesis, such as (-102 dB), or noted as Typical.
User Cables	Specifications do not include effects of any user cables attached to the instrument.
Discrete Spurious Responses	Specifications may exclude discrete spurious responses.
Internal Reference Signal	All specifications apply with internal 10 MHz Crystal Oscillator Reference Signal.
Characteristic Performance	Characteristic performance indicates a performance designed-in and verified during the design phase. It does include guard-bands and is not covered by the product warranty.
Below 300 kHz	All uncertainties below 300 kHz are typical.
Recommended Calibration Cycle	12 months
Interpolation Mode	All specifications are with Interpolation Mode Off.
Specifications Subject to Change	All specifications subject to change without notice. For the most current data sheet, please visit the Anritsu web site at www.anritsu.com.

2. Specifications for Broadband Configuration

2.1 ME7838D Broadband System Configuration

ME7838D Broadband Hardware Configuration

The ME7838D broadband VNA system provides single sweep coverage from 70 kHz to 145 GHz and is operational from 40 kHz to 145 GHz. It consists of the following items:

VNA	MS4647B* VectorStar VNA, 70 kHz to 70 GHz with Option 007, Option 070, and Option 080/081
Test Set	3739C Broadband Test Set and interface cables
mm-Wave Modules	MA25300A Millimeter-Wave Module, 2 each

*Support for the MS464xA VectorStar is available.

ME7838D Broadband System Major Options

The major ME7838D broadband VNA system options are:

Option 002	MS4640B-002, Time Domain Measurement
Option 041	MS4640B-041, Noise Figure Measurement
Option 051	MS4647B-051, External VNA Direct Access Loops
Option 061	MS4647B-061, Active Measurement Suite, with 2 Attenuators
Option 062	MS4647B-062, Active Measurement Suite, with 4 Attenuators
Bias Tees	SC8215 and SC7287 Kelvin Bias Tees
3659	0.8 mm Calibration and Verification Kit

2.2 System and Receiver Dynamic Range, Noise Floor (Excludes localized spurious responses and crosstalk)

System Dynamic Range	System dynamic range is measured as the difference between maximum port power and the RMS noise floor in a 10 Hz bandwidth and no averaging (ports terminated).
Noise Floor	Noise floor is calculated as the difference between maximum rated port power and system dynamic range.
Receiver Dynamic Range	Receiver Dynamic Range is calculated as the difference between the receiver compression level and the noise floor at Ports 1 or 2.
Normalizing Measurement	Normalizing measurement made with a through line connection, with its effects compensated for. The cables between the VNA and the MA25300A modules are assumed to be the 806-206 1.85 mm cable (61 cm, 24 in long) or the 806-209 1.85 mm cable (91 cm, 36 in long). All figures are typical.

	System Dynamic Range (dB)[a]		Receiver Dynamic Range (dB)[a]		Noise Floor (dBm)[a]	
Frequency Range	**ME7838D**	**ME7838D Option 062**	**ME7838D**	**ME7838D Option 062**	**ME7838D**	**ME7838D Option 062**
70 kHz to 300 kHz	93	90	89	86	–83	–80
> 0.3 to 2 MHz	103	100	103	102	–93	–90
> 2 to 10 MHz	115	112	115	114	–105	–102
> 0.01 to 2.5 GHz	120	116	121	122	–110	–109
> 2.5 to 24 GHz	110	105	121	121	–110	–108
> 24 to 54 GHz	110	107	125	125	–115	–115
> 54 to 60 GHz	110	110	124	124	–114	–114
> 60 to 67 GHz	110	110	123	123	–113	–113
> 67 to 80 GHz	108	108	121	121	–111	–111
> 80 to 85 GHz	106	106	123	123	–113	–113
> 85 to 90 GHz	106	106	122	122	–112	–112
> 90 to 95 GHz	106	106	121	121	–111	–111
> 95 to 105 GHz	106	106	121	121	–111	–111
> 105 to 110 GHz	109	109	125	125	–115	–115
> 110 to 120 GHz	108	108	118	118	–111	–111
> 120 to 125 GHz	104	104	116	116	–109	–109
> 125 to 140 GHz	92	92	109	109	–102	–102
> 140 to 145 GHz	94	94	107	107	–100	–100

a. Excludes localized spurious responses and crosstalk.

2.3 Test Port Power, Receiver Compression

Port power control is provided by the base VNA for frequencies below 54 GHz, and by the MA25300A mm-Wave module for frequencies greater than 54 GHz. Receiver compression point is defined as the port power level beyond which the response may be compressed more than 0.2 dB relative to normalization level. 10 Hz IF bandwidth used to remove high level noise effects. All typical.

	Port Power (dBm)		Receiver Compression [a]	
Frequency Range	Max Power ME7838D	Max Power ME7838D Option 062	Compression ME7838D	Compression ME7838D Option 062
70 kHz to 300 kHz	10	10	6	6
> 0.3 to 2 MHz	10	10	10	12
> 2 to 10 MHz	10	10	10	12
> 0.01 to 2.5 GHz	10	7	11	13
> 2.5 to 24 GHz	0	–3	11	13
> 24 to 54 GHz	–5	–8	10	10
> 54 to 60 GHz	–4	–4	10	10
> 60 to 67 GHz	–3	–3	10	10
> 67 to 80 GHz	–3	–3	10	10
> 80 to 85 GHz	–7	–7	10	10
> 85 to 90 GHz	–6	–6	10	10
> 90 to 95 GHz	–5	–5	10	10
> 95 to 105 GHz	–5	–5	10	10
> 105 to 110 GHz	–6	–6	10	10
> 110 to 120 GHz	–3	–3	7	7
> 120 to 125 GHz	–5	–5	7	7
> 125 to 140 GHz	–10	–10	7	7
> 140 to 145 GHz	–6	–6	7	7

a. Using the 806-206 1.85 mm (61 cm, 24 in long) test port cables or the 806-209 1.85 mm (91 cm, 36 in long) test port cables between the VNA and the MA25300A mm-Wave modules.

Power Range, Accuracy, Linearity, and Resolution

Accuracy is defined at –10 dBm or max rated power, whichever is lower. Linearity is defined as the port power linearity error between the accuracy test power level and 5 dB below. Typical.

	Range (dBm)		Accuracy (dB)	Linearity (dB)	Resolution (dB)
Frequency Range	ME7838D	ME7838D Option 062			
70 kHz to 300 kHz	–25 to +10	–85 to +10	±1.5	±1.5	0.01
> 0.3 to 2 MHz	–25 to +10	–85 to +10	±1.5	±1.5	0.01
> 2 to 10 MHz	–25 to +10	–85 to +10	±1.5	±1.5	0.01
> 0.01 to 2.5 GHz	–25 to +10	–85 to +8	±1.0	±1.0	0.01
> 2.5 to 24 GHz	–25 to 0	–85 to –3	±1.0	±1.0	0.01
> 24 to 54 GHz	–30 to –5	–90 to –8	±1.5	±1.0	0.01
> 54 to 60 GHz	–55 to –4	–55 to –4	±2.0	±1.5	0.01
> 60 to 67 GHz	–55 to –3	–55 to –3	±2.0	±1.5	0.01
> 67 to 80 GHz	–55 to –3	–55 to –3	±2.0	±1.5	0.01
> 80 to 85 GHz	–55 to –7	–55 to –7	±2.0	±1.5	0.01
> 85 to 90 GHz	–55 to –6	–55 to –6	±2.0	±1.5	0.01
> 90 to 95 GHz	–55 to –5	–55 to –5	±2.0	±1.5	0.01
> 95 to 105 GHz	–55 to –5	–55 to –5	±3.0	±2.0	0.01
> 105 to 110 GHz	–55 to –6	–55 to –6	±3.0	±2.0	0.01
> 110 to 120 GHz	–55 to –3	–55 to –3	±4.0	±3.0	0.01
> 120 to 125 GHz	–55 to –5	–55 to –5	±4.0	±3.0	0.01
> 125 to 140 GHz	–50 to –10	–50 to –10	±5.0	±4.0	0.01
> 140 to 145 GHz	–50 to –6	–50 to –6	±5.0	±4.0	0.01

2.4 High Level Noise

Noise measured at 1 kHz IF bandwidth, at maximum power or compression limit (whichever is less), with through transmission. RMS. Typical.

Frequency Range	Magnitude (dB)	Phase (deg.)
70 kHz to 500 kHz	< 0.04	< 0.4
> 0.5 to 2 MHz	< 0.005	< 0.05
> 2 to 10 MHz	< 0.005	< 0.05
> 0.01 to 2.5 GHz	< 0.005	< 0.05
> 2.5 to 24 GHz	< 0.006	< 0.06
> 24 to 54 GHz	< 0.005	< 0.06
> 54 to 80 GHz	< 0.005	< 0.06
> 80 to 110 GHz	< 0.008	< 0.09
> 110 to 120 GHz	< 0.008	< 0.09
> 120 to 125 GHz	< 0.011	< 0.11
> 125 to 140 GHz	< 0.016	< 0.16
> 140 to 145 GHz	< 0.016	< 0.16

2.5 Stability

Measurement ratio at maximum leveled power and with nominally a full reflect or a stable thru over the normal specified temperature range. (23 °C ±3°C Typical)

Frequency Range	Magnitude (dB/°C)	Phase (deg./°C)
70 kHz to 300 kHz	< 0.04	< 0.4
> 0.3 to 2 MHz	< 0.04	< 0.4
> 2 to 10 MHz	< 0.04	< 0.4
> 0.01 to 2.5 GHz	< 0.03	< 0.3
> 2.5 to 24 GHz	< 0.03	< 0.3
> 24 to 54 GHz	< 0.03	< 0.4
> 54 to 80 GHz	< 0.03	< 0.4
> 80 to 110 GHz	< 0.03	< 0.5
> 110 to 120 GHz	< 0.03	< 0.6
> 120 to 125 GHz	< 0.03	< 0.6
> 125 to 140 GHz	< 0.04	< 0.7
> 140 to 145 GHz	< 0.05	< 0.7

2.6 Frequency Resolution, Accuracy, and Stability

Resolution	Accuracy	Stability
1 Hz	± 5 x 10^{-7} Hz/Hz (at time of calibration)	< 5 x 10^{-9}/°C over 0 °C to 50 °C temperature < 1 x 10^{-9}/day aging, instrument on

2.7 Uncorrected (Raw) Port Characteristics

Typical performance with either ME7838D or ME7838D with Option 062.

Frequency Range	Directivity (dB)	Port Match (dB)
70 kHz to 10 MHz	10[a]	8
> 0.01 to 2.5 GHz	9[a]	10
> 2.5 to 30 GHz	5[a]	11
> 30 to 40 GHz	9[a]	11
> 40 to 54 GHz	9[a]	11
> 54 to 80 GHz	9	10
> 80 to 110 GHz	5	7
> 110 to 120 GHz	5	7
> 120 to 125 GHz	5	7
> 125 to 140 GHz	5	7
> 140 to 145 GHz	5	6

a. Raw directivity is degraded below 300 kHz, 2.2 to 2.5 GHz and in narrow bands within 10 to 34 GHz.

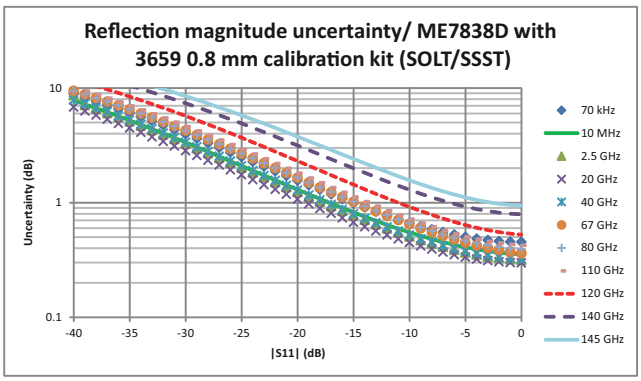
2.8 Corrected System Performance and Uncertainties – SOLT/SSST

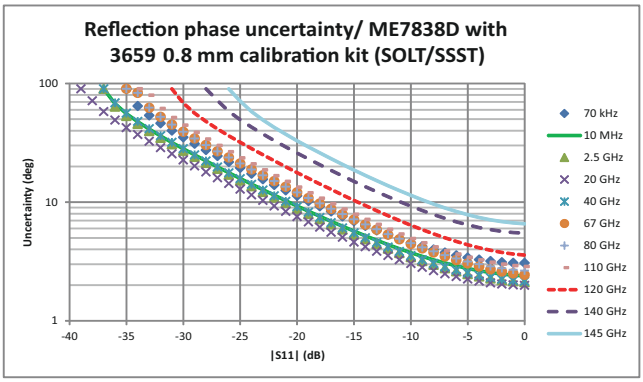
With 12-term concatenated SOLT and Triple Offset Short Calibration (SSST), using the 3659 0.8 mm Calibration Kit. Typical.

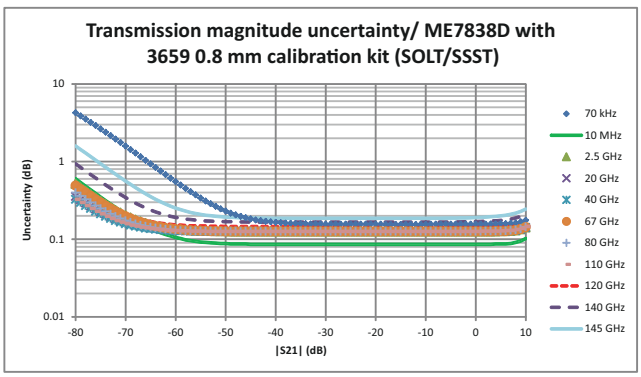
Frequency Range	Directivity (dB)	Source Match (dB)	Load Match (dB)	Reflection Tracking (dB)	Transmission Tracking (dB)
70 kHz to 10 MHz	36	36	36	± 0.1	± 0.1
> 0.01 to 2.5 GHz	38	41	38	± 0.05	± 0.03
> 2.5 to 20 GHz	40	41	40	± 0.05	± 0.05
> 20 to 67 GHz	35	41	35	± 0.05	± 0.07
> 67 to 80 GHz	35	38	35	± 0.05	± 0.07
> 80 to 95 GHz	35	40	35	± 0.05	± 0.07
> 95 to 110 GHz	34	37	34	± 0.05	± 0.07
> 110 to 125 GHz	30	34	30	± 0.07	± 0.09
> 125 to 140 GHz	28	28	28	± 0.09	± 0.11
> 140 to 145 GHz	26	28	26	± 0.11	± 0.13

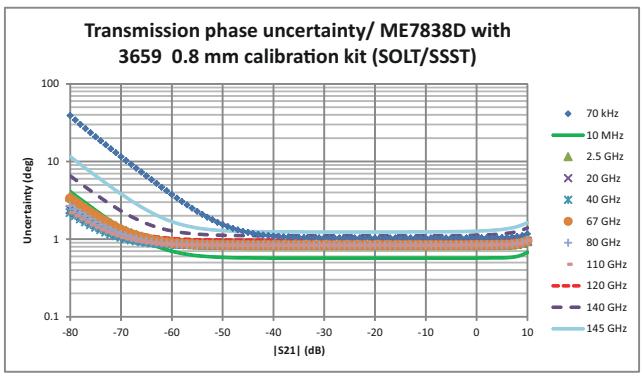
Measurement Uncertainties – SOLT/SSST

The graphs give measurement uncertainties after the above calibration. The component uncertainties are combined based on their characteristics: residual directivity, load and source match, tracking, network analyzer dynamic accuracy and connector repeatability are assumed to be fully correlated while noise effects (high level noise and noise floor effects) are assumed to be internally uncorrelated and uncorrelated with the first group of terms. 10 Hz IF Bandwidth is used. For transmission uncertainties, it is assumed that s11 = s22 = 0. For reflection uncertainties, it is assumed that s21 = s12 = 0. For other conditions, please use our free Exact Uncertainty calculator software, downloadable from the Anritsu web site at www.anritsu.com.



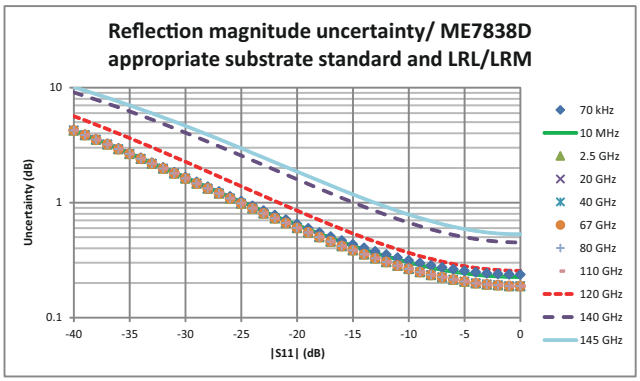


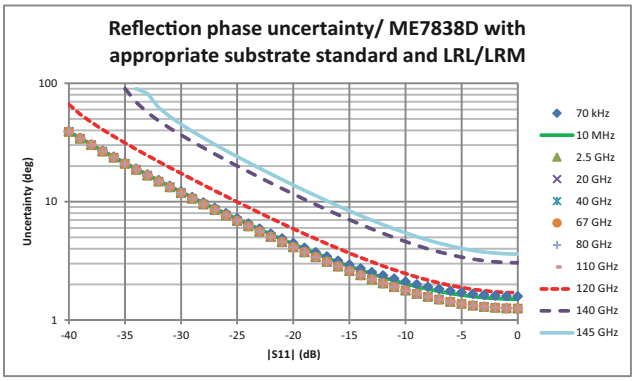


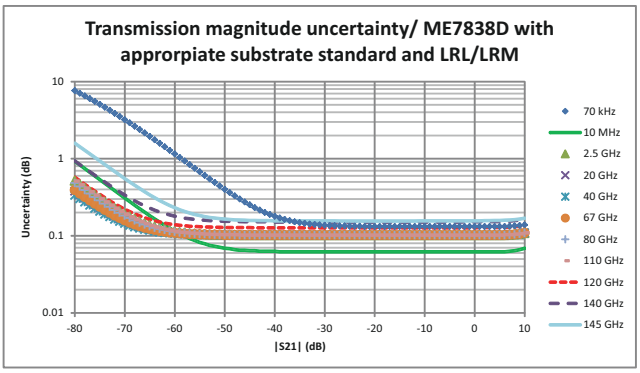


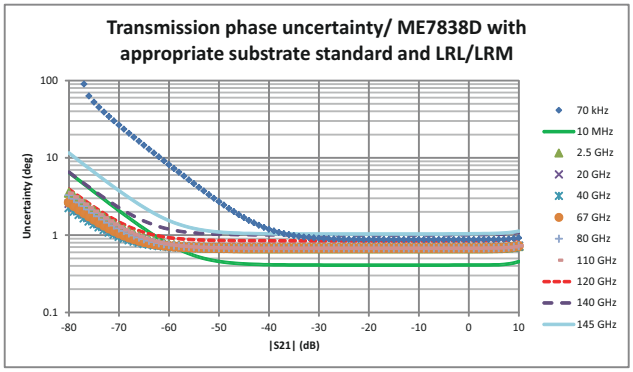
2.9 Corrected System Performance and Uncertainties – LRL/LRM

With 12 term LRL/LRM calibration using on-wafer substrate standards. Typical. Based on a typical vendor supplied impedance standard substrate









2.10 Measurement Time

Measurement times include sweep time, retrace time, and band-switching time. Typical.

Measurement Time (ms)

Full Band, 70 kHz to 145 GHz, Display ON, and ALC ON.

Calibration	IFBW	Measurement Time (ms)[a]			
		401 Points	1,601 Points	10,001 Points	25,000 Points
1-port calibration	1 MHz	80	100	350	700
	30 kHz	90	160	600	1500
	10 kHz	110	240	1100	2600
	1 kHz	470	1600	10,000	25,000
	10 Hz	47,000	160,000	1,000,000	2,500,000
2-port calibration	1 MHz	160	200	700	1400
	30 kHz	180	320	1200	3000
	10 kHz	220	480	2200	5200
	1 kHz	940	3200	20,000	50,000
	10 Hz	94,000	320,000	2,000,000	5,000,000

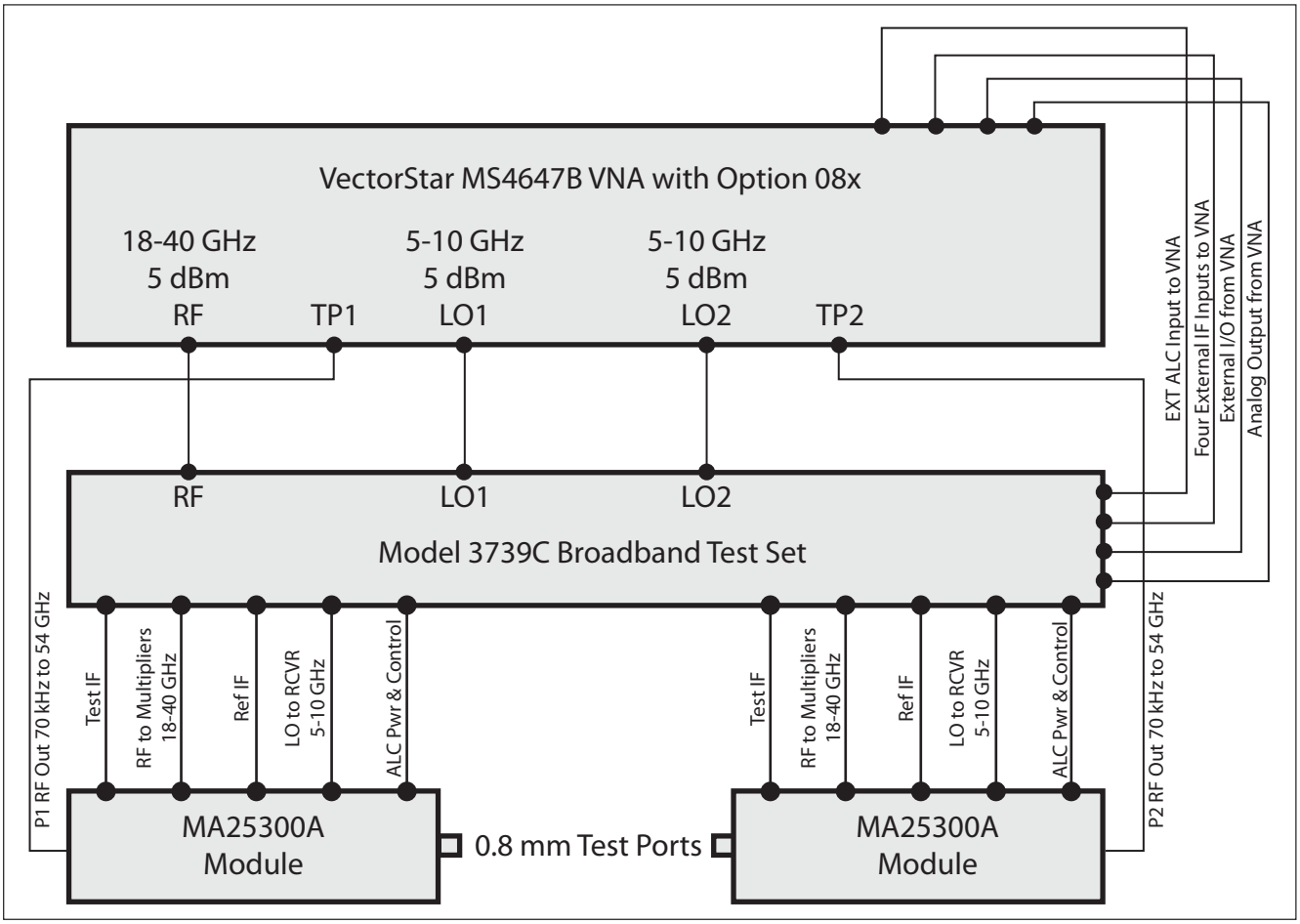
a. Measurement times are for ME7838D Broadband and ME7838D Millimeter-Wave Systems.

Measurement Time (ms) vs. System Dynamic Range (dB)

Full Band, Display ON, and ALC ON.

Calibration	401 Points Measurement Time	Achieved System Dynamic Range (Opt 062 at 54 GHz)	IFBW and Averaging Used
Uncorrected or 1-port calibration	110 470	77 87	10 kHz/no avg 1 kHz/no avg
2-port calibration	220 940	77 87	10 kHz/no avg 1 kHz/no avg

2.11 Block Diagram – ME7838D Broadband VNA System



Broadband Configuration Block Diagram

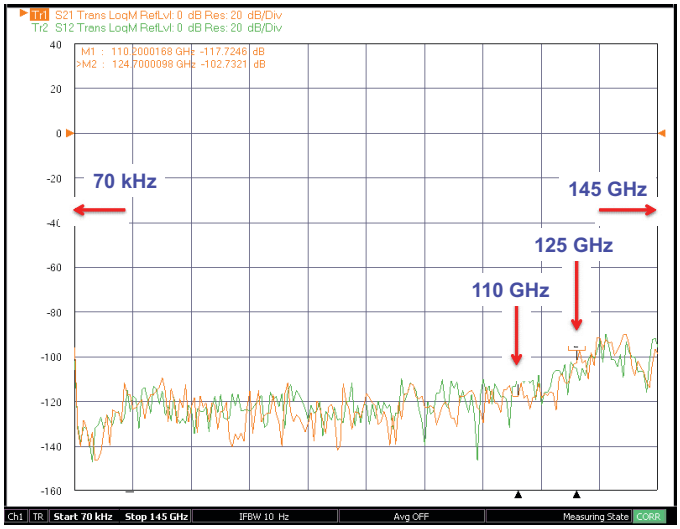
2.12 SC8215 and SC7287 Kelvin Bias Tees

When connected to the Source input of the MA25300A module, provides Sense and Force SMC connections 1.5 in from the test port to minimize the IR drops associated with the impedances between the bias tee and the DUT.

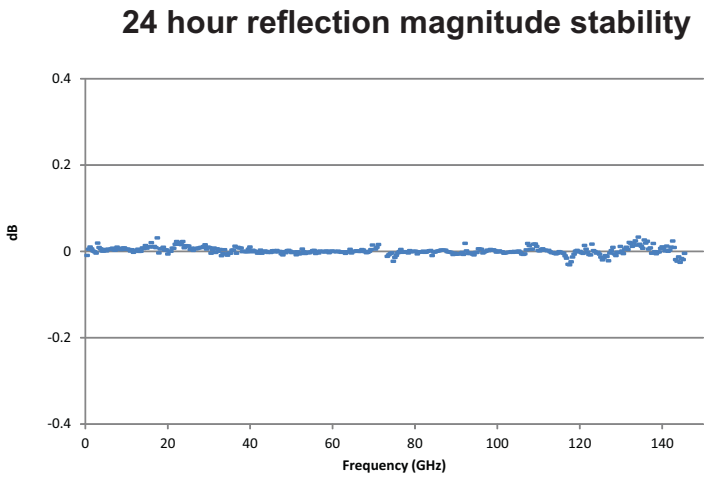
Part Number	Description	Voltage	Current
SC8215	The SC8215 is a bias tee operating for system frequencies of 70 kHz to 110/145 GHz	Max Voltage: 16 VDC	Max Current: 100 mA
SC7287	The SC7287 is a bias tee operating for system frequencies of 100 MHz to 110/145 GHz.	Max Voltage: 50 VDC	Max Current: 500 mA
Tri-Axial Output SMUs	For applications requiring Source Measure Units (SMU) with tri-axial outputs, a tri-axial (male) to SMC (male) cable is available, with the inner-shield isolated from ground at the bias tee SMC end, to float at the SMU guard potential. Check the accessories list for ordering information on page 29.		

2.13 Measurement Examples

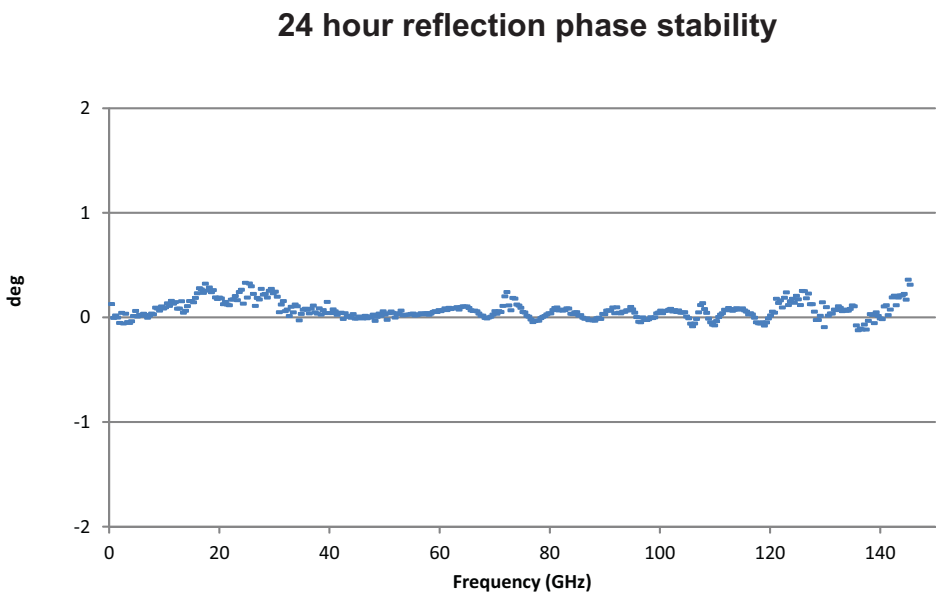
The following figures are measurement examples of the ME7838D Broadband system performance.



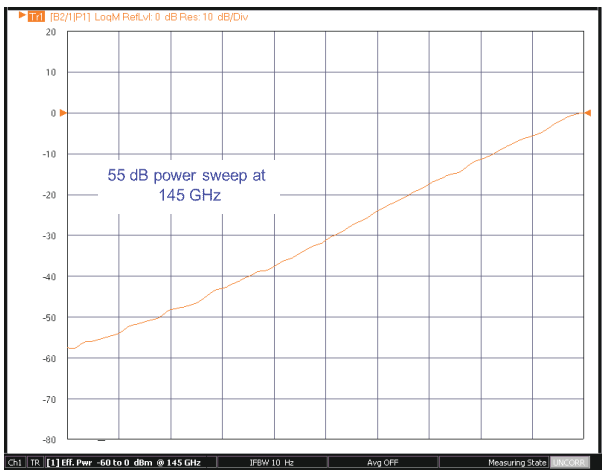
Dynamic range of ME7838D system at the 0.8 mm coaxial test port from 70 kHz to 145 GHz.



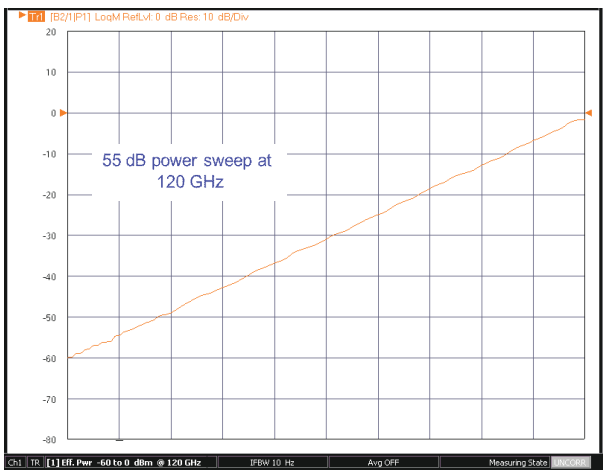
24 hour reflection magnitude stability from 70 kHz to 145 GHz in a typical lab environment when measured at 23 °C ±3°C.



24 hour reflection phase stability from 70 kHz to 145 GHz in a typical Lab environment when measured at 23 °C ±3°C



Power sweep range at 145 GHz. By using detection and power control inside the MA25300A millimeter-wave module; improved accuracy, linearity and range can be achieved.



Power sweep range at 120 GHz demonstrating greater than 55 dB of control.

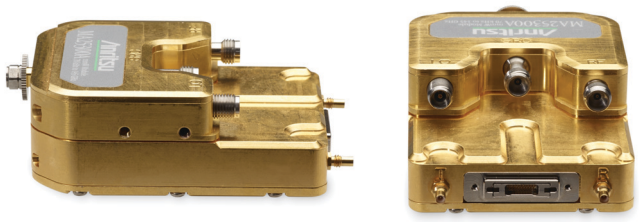
3. Specifications for Waveguide Band Configuration

3.1 ME7838D Millimeter-Wave VNA, Waveguide Bands

Three configurations are available for waveguide band operation above 145 GHz when using the ME7838D system.

- First, the Anritsu MA25300A Broadband Millimeter-Wave module can be adapted to waveguide measurements using waveguide adapters. Waveguide adapters from Flann are available with 0.8 mm connectors and cover the WR08 and WR06 bands.
- Second, the Anritsu 3744A-EE or 3744A-EW millimeter-wave module can be used. These version modules operate in the extended E and W waveguide bands and are operational using the MS4644B, MS4645B, or MS4647B VectorStar (with options 08x and 007) and the 3739C broadband/millimeter-wave test set.
- The third configuration option is to use external millimeter-wave modules with any model VectorStar (with options 08x and 007) and the 3739C test set. For millimeter bands either the OML or VDI modules may be used.

3.2 E and W Band Operation Using the MA25300A, 3744A-EE, or 3744A-EW mm-Wave Module



MA25300A Millimeter-Wave Modules

3744A-EE/3744A-EW Millimeter-Wave Module with Waveguide Adapter

The MA25300A Broadband mm-Wave module can be adapted to a waveguide band output by adding an available waveguide band adapter. Using the MA25300A modules provides the opportunity to sweep frequencies for broadband applications and quickly convert to waveguide configurations for banded measurements. The advantages of small compact modules with excellent RF performance and power range control can therefore be realized in both broadband and waveguide configurations when using the MA25300A mm-Wave module. For systems where only waveguide band operation is required, for E band or W band modules can be used.

The 3744A-EE or 3744A-EW mm-Wave module operates from 54 GHz to 110 GHz. The band supported is determined by the waveguide adapter connected to the 1.0 mm test port output of the 3744A-EE/EW module:

- 3744A-EE configures the module for Extended E Band
- 3744A-EW configures for Extended W Band

The RF input port of the 3744A-EE or 3744A-EW module is restricted below 54 GHz, however, the RF input port retains a DC connection to the 1 mm test port. Thus, the waveguide adapter can be removed for on-wafer applications from 54 GHz to 110 GHz operation and the on-wafer DUT can be biased through the RF input port.

Band	Frequency Range (GHz)	Waveguide Flange	Transmission/Reflection Module
Ext-E	56 to 94[a]	WR-12	3744A-EE
Ext-W	65 to 110	WR-10	3744A-EW

a. Operational to 95 GHz.

3.3 Port Power, Noise Floor, Dynamic Range – 3744A-EE/3744A-EW mm-Wave Modules

System dynamic range is defined as the ratio of the source power to the noise floor. Maximum Receiver Power is defined as the 0.2 dB compression point of the receiver at the waveguide port. Receiver dynamic range is defined as the ratio of maximum receive power to the noise floor. Noise Floor measurements are RMS, are made with no average in a 10 Hz IF bandwidth, and include an isolation calibration. All figures are typical.

3744A-EE Extended-E Band (WR-12) Waveguide

Frequency Range (GHz)	Source Power (dBm)	Max. Receive Power (0.2 dB comp. pt.) (dBm)	Noise Floor (dBm)	System Dynamic Range (dB)	Receiver Dynamic Range (dB)
56 to 60	–5	11	–111	106	122
> 60 to 67	0	11	–106	106	117
> 67 to 80	–3	11	–109	106	120
> 80 to 85	–7	11	–112	115	123
> 85 to 90	–5	11	–110	105	120
> 90 to 94[a]	–2	12	–105	103	117

a. Operational to 95 GHz.

3744A-EW Extended-W Band (WR-10) Waveguide

Frequency Range (GHz)	Source Power (dBm)	Max. Receive Power (0.2 dB comp. pt.) (dBm)	Noise Floor (dBm)	System Dynamic Range (dB)	Receiver Dynamic Range (dB)
65 to 67	0	11	–106	106	117
> 67 to 80	–3	11	–109	106	120
> 80 to 85	–7	11	–112	115	123
> 85 to 90	–5	11	–110	105	120
> 90 to 105	–2	12	–105	103	117
> 105 to 110	–7	12	–110	103	122

Power Range, Accuracy, Linearity, and Resolution

Accuracy is defined at –10 dBm or max rated power, whichever is lower. Linearity is defined as the incremental error between the accuracy test power level and 5 dB below. Typical.

Frequency (GHz)	Range (dBm)		Accuracy (dB)	Linearity (dB)	Resolution (dB)
	ME7838D	ME7838D Option 062			
54 to 60	–55 to –4	–55 to –4	± 2.0	± 1.5	0.01
> 60 to 67	–55 to 1	–55 to 1	± 2.0	± 1.5	0.01
> 67 to 80	–55 to –2	–55 to –2	± 2.0	± 1.5	0.01
> 80 to 85	–55 to –6	–55 to –6	± 2.0	± 1.5	0.01
> 85 to 90	–55 to –4	–55 to –4	± 2.0	± 1.5	0.01
> 90 to 105	–55 to 0	–55 to 0	± 3.0	± 2.0	0.01
> 105 to 110	–50 to –5	–50 to –5	± 3.0	± 2.0	0.01
> 110 to 120[a]	–40 to –12	–40 to –12	± 4.0	± 3.0	0.01
> 120 to 125[a]	–40 to –15	–40 to –15	± 4.0	± 3.0	0.01

a. 110 to 125 GHz frequency range is available as operational.

Alternatively, the V, E, and W bands can be supported using external millimeter-wave modules such as the 3740/41A series modules available from Anritsu. For further description and specifications please refer to the VectorStar ME7828A Technical Data Sheet – 11410-00452 available at www.anritsu.com.

3.4 Corrected System Performance/Uncertainties – 3744A-EE/3744A-EW mm-Wave Modules

With 12-term Offset Short Sliding Load or LRL calibrations, using high precision waveguide sections and standards from the appropriate calibration kit.

3744A-EE Extended-E Band (WR-12) Waveguide – 56 GHz to 94 GHz

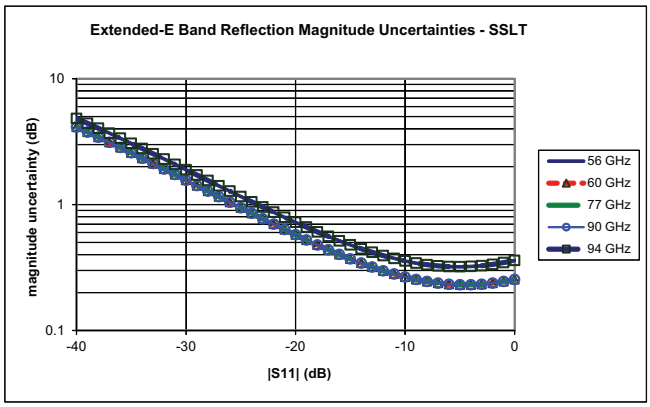
Calibration Type	Directivity (dB)	Source Match (dB)	Load Match (dB)	Reflection Tracking (dB)	Transmission Tracking (dB)
Offset Short	> 44	> 33	> 44	± 0.080	± 0.100
LRL	> 44	> 43	> 44	± 0.006	± 0.006

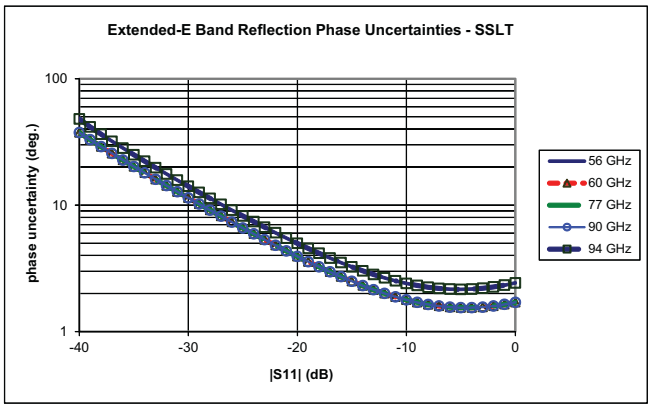
3744A-EW Extended-W Band (WR-10) Waveguide – 65 GHz to 110 GHz

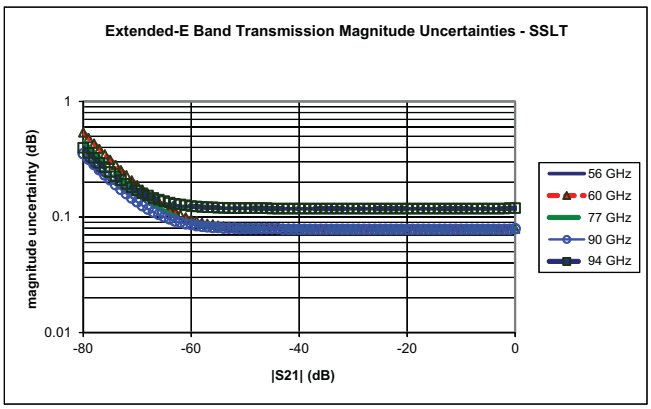
Calibration Type	Directivity (dB)	Source Match (dB)	Load Match (dB)	Reflection Tracking (dB)	Transmission Tracking (dB)
Offset Short	> 40	> 30	> 46	± 0.080	± 0.100
LRL	> 40	> 40	> 46	± 0.006	± 0.006

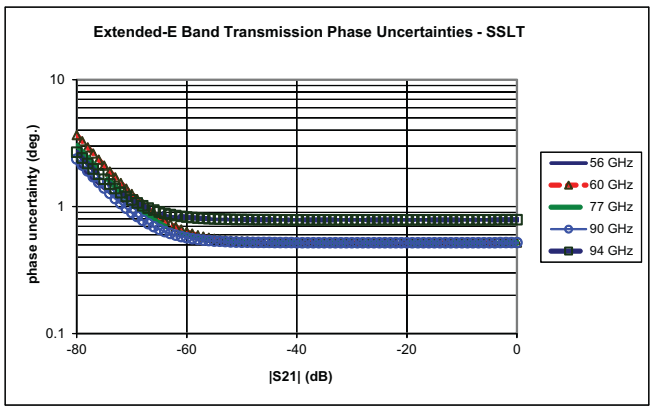
Measurement Uncertainties – Extended-E Band – SSLT

The graphs give measurement uncertainties after the above calibration. The errors are worse case contribution of residual directivity, load and source match, frequency response and isolation, network analyzer dynamic accuracy, and connector repeatability. 10 Hz IF Bandwidth is used. For transmission uncertainties, it is assumed that s_{11}= s_{22}= 0. For reflection uncertainties, it is assumed that s_{21}= s_{12}= 0. All calibrations and measurements were performed at default port power. For other conditions, please use our free Exact Uncertainty Calculator software, available for download from the Anritsu web site at www.anritsu.com. Typical.



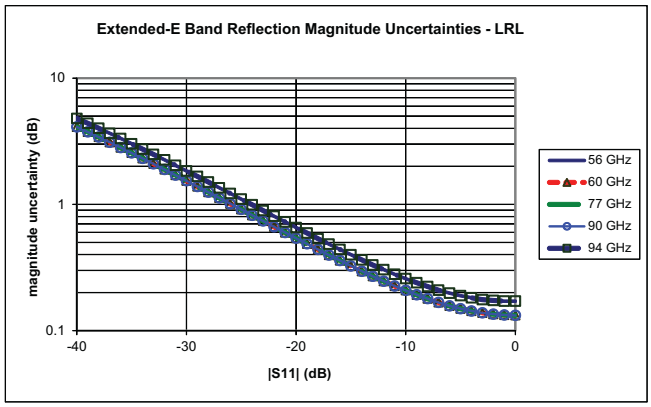


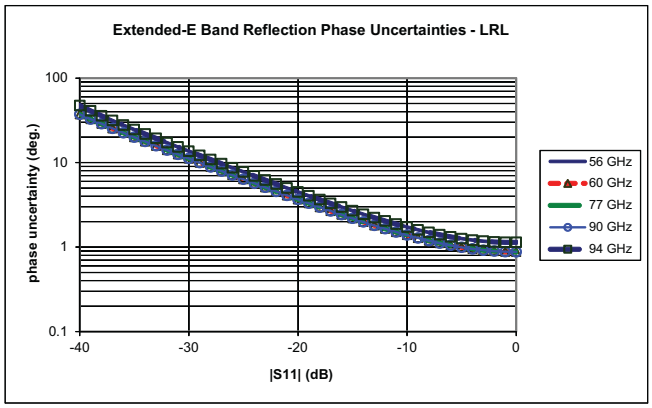


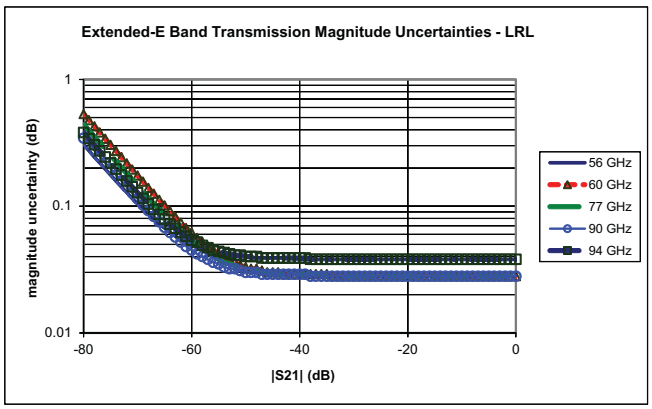


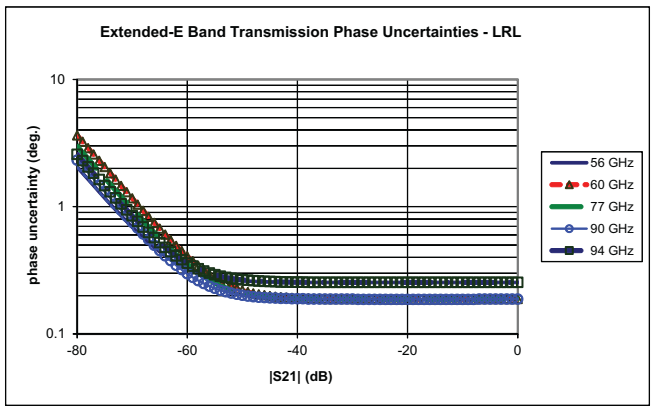
Measurement Uncertainties – Extended-E Band – LRL

The graphs give measurement uncertainties after the above calibration. The errors are worse case contribution of residual directivity, load and source match, frequency response and isolation, network analyzer dynamic accuracy, and connector repeatability. 10 Hz IF Bandwidth is used. For transmission uncertainties, it is assumed that $s_{11}= s_{22}= 0$. For reflection uncertainties, it is assumed that $s_{21}= s_{12}= 0$. All calibrations and measurements were performed at default port power. For other conditions, please use our free Exact Uncertainty Calculator software, available for download from the Anritsu web site at www.anritsu.com. Typical.



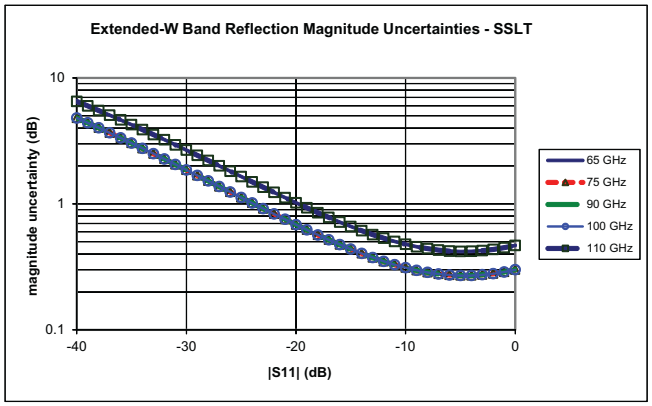


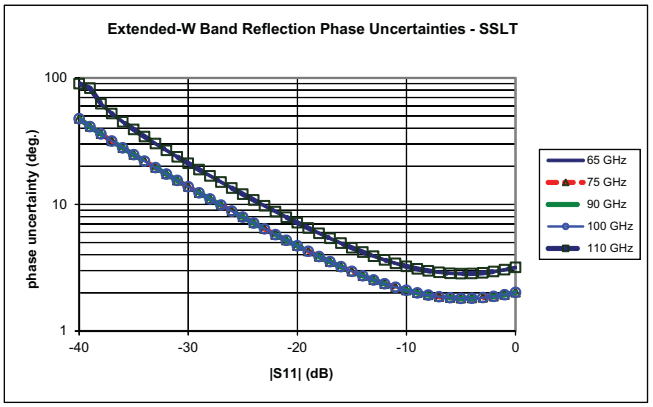


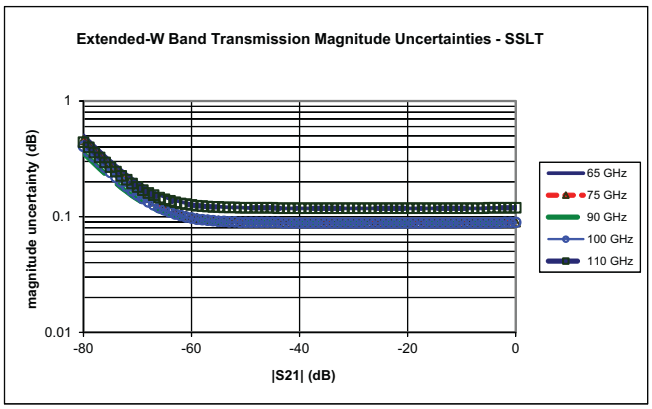


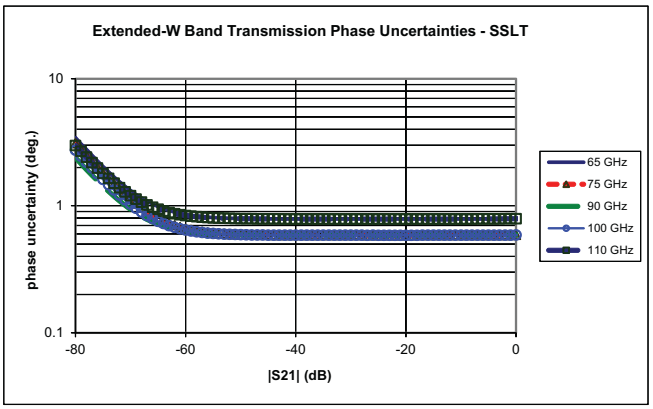
Measurement Uncertainties – Extended-W Band – SSLT

The graphs give measurement uncertainties after the above calibration. The errors are worse case contribution of residual directivity, load and source match, frequency response and isolation, network analyzer dynamic accuracy, and connector repeatability. 10 Hz IF Bandwidth is used. For transmission uncertainties, it is assumed that $s_{11}= s_{22}= 0$. For reflection uncertainties, it is assumed that $s_{21}= s_{12}= 0$. All calibrations and measurements were performed at default port power. For other conditions, please use our free Exact Uncertainty Calculator software, available for download from the Anritsu website at www.anritsu.com. Typical.



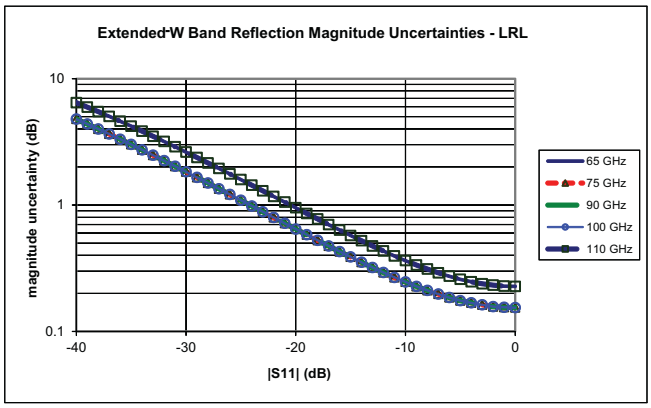


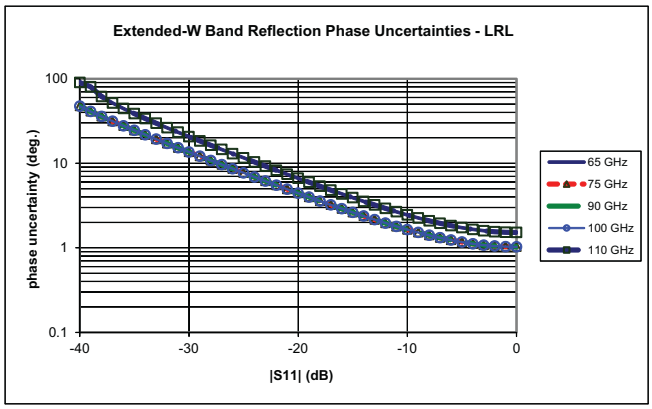


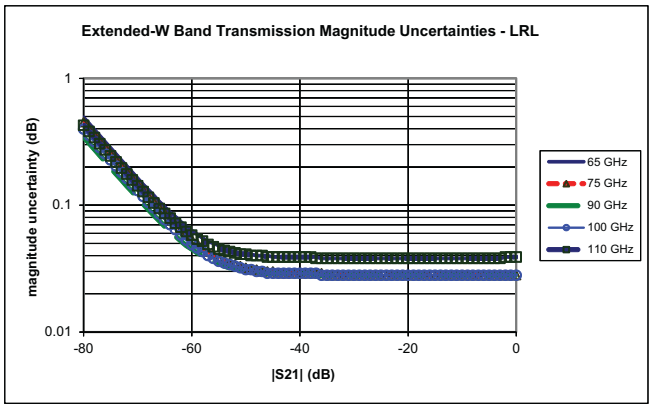


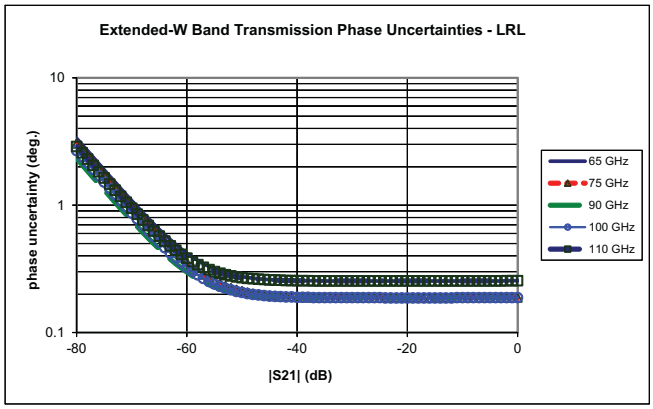
Measurement Uncertainties – Extended-W Band – LRL

The graphs give measurement uncertainties after the above calibration. The errors are worse case contribution of residual directivity, load and source match, frequency response and isolation, network analyzer dynamic accuracy, and connector repeatability. 10 Hz IF Bandwidth is used. For transmission uncertainties, it is assumed that $s_{11}= s_{22}= 0$. For reflection uncertainties, it is assumed that $s_{21}= s_{12}= 0$. All calibrations and measurements were performed at default port power. For other conditions, please use our free Exact Uncertainty Calculator software, available for download from the Anritsu website at www.anritsu.com. Typical.

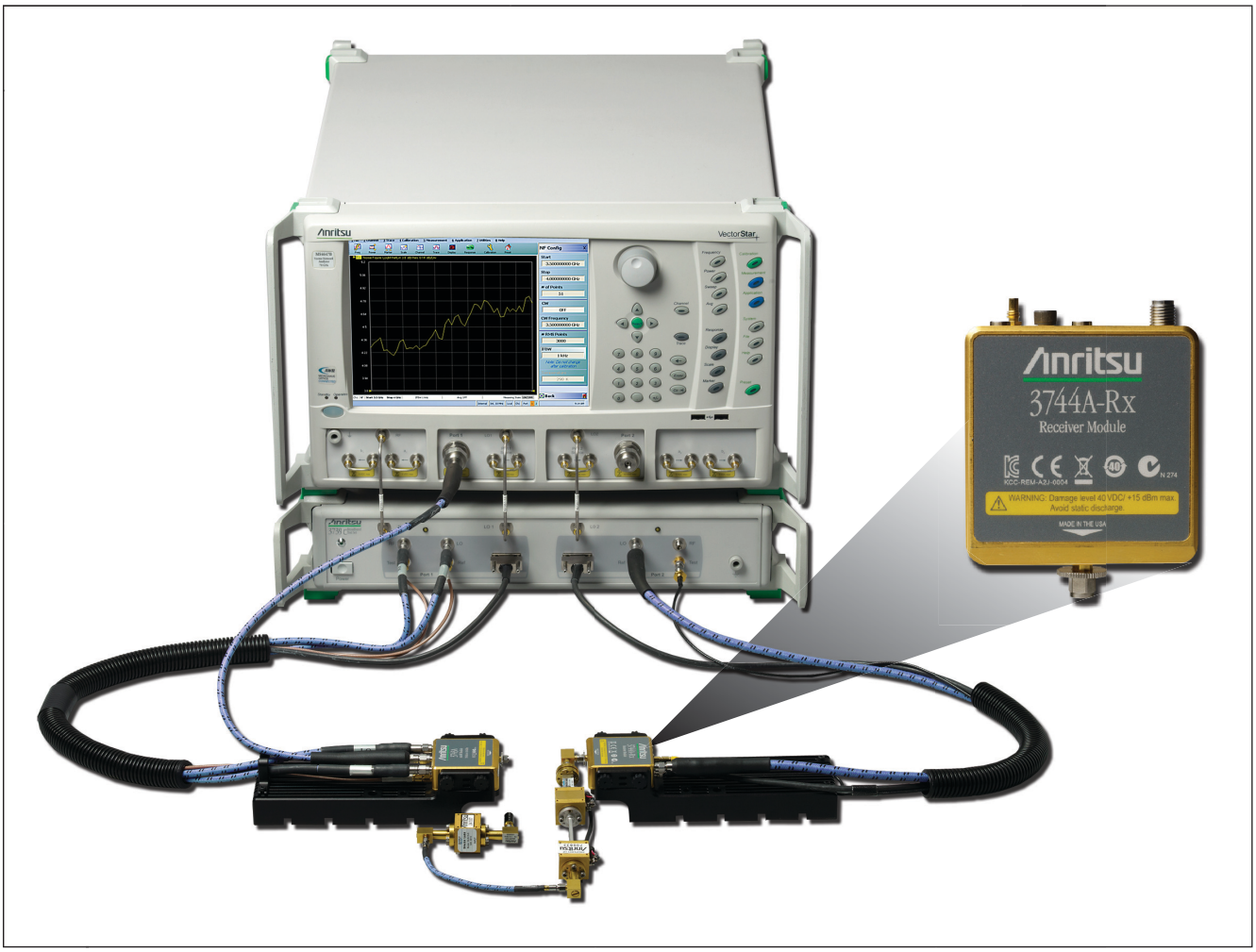








3.5 ME7838D with Option 041 and 3744A-Rx mm-Wave Noise Figure Measurements



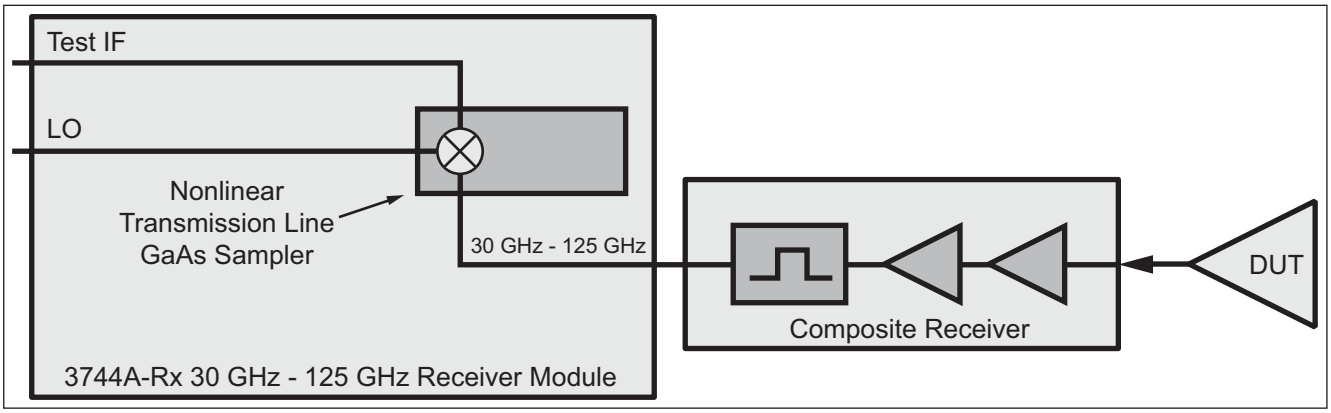
ME7838D with 3744A-Rx Receiver Module

The 3744A-Rx receiver module can be used with Option 041, Noise Figure, and the ME7838D mm-Wave or broadband system to perform mm-Wave noise figure measurements from 30 GHz to 125 GHz. The receiver bypasses the internal couplers (see block diagram), maximizing the noise figure of the receiver for optimum noise figure measurement accuracy. The receiver is derived from the 3743A mm-Wave module and utilizes the same nonlinear transmission line technology for optimum mm-Wave performance. Using the advantages of the 3743A mm-Wave module system architecture provides a unique solution to mm-Wave noise figure measurements previously unavailable.

3.6 Block Diagram – 3744A Receiver Module

The 3744A-Rx receiver module is optimized as a receiver-only mm-Wave module for applications such as mm-Wave antenna measurements and mm-Wave noise figure measurements. Elimination of the input coupler produces a mm-Wave receiver with excellent noise floor sensitivity and dynamic range. When coupled with a composite receiver, the receiver module provides a solution for mm-Wave noise figure measurements.

As with all cold source method noise figure measurements, the output of the DUT is first sent to an external composite receiver for pre-amplification. This ensures that the system noise figure is minimized for optimum measurement accuracy. The Anritsu Noise Figure Uncertainty Calculator (available on the website at www.anritsu.com) can be used to determine optimum preamplifier gain needed for the desired measurement uncertainty.



3744A-Rx Block Diagram configured for mm-Wave noise figure measurements

3.7 3744A-Rx Receiver Compression, Noise Floor

Receiver Compression Point is defined as the port power level beyond which the response may be compressed more than 0.2 dB relative to the normalization level. 10 Hz IF bandwidth is used to remove trace noise effects. All typical.

Noise Floor is relative to the receiver power calibration performed at –10 dBm. Typical.

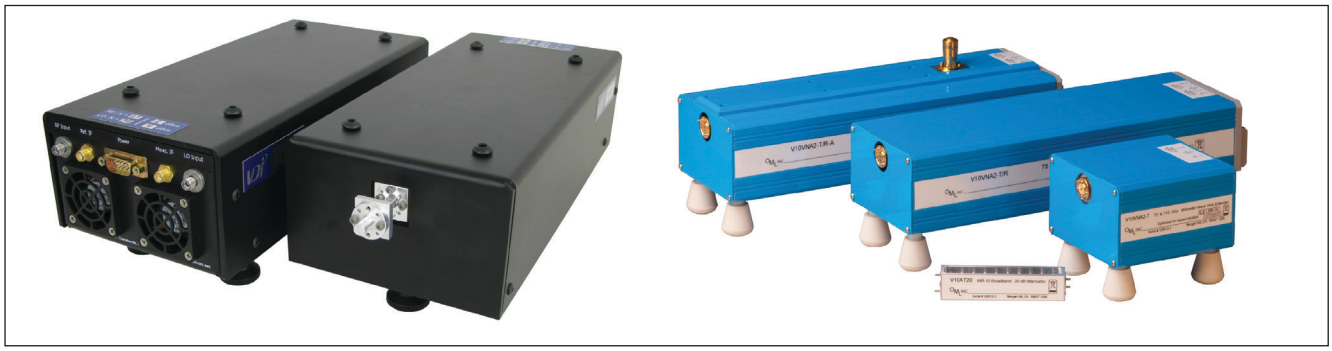
Frequency (GHz)	Receiver Compression (dBm)[a]	Noise Floor (dBm)[b]
30 to 54	0	–124
> 54 to 60	0	–122
> 60 to 67	0	–117
> 67 to 80	0	–120
> 80 to 85	0	–123
> 85 to 90	0	–121
> 90 to 95	0	–121
> 95 to 105	0	–117
> 105 to 110	0	–122
> 110 to 120	–5	–120
> 120 to 125	–5	–117

a. At the 3744A-Rx test port.

b. Excludes localized spurious responses and crosstalk.

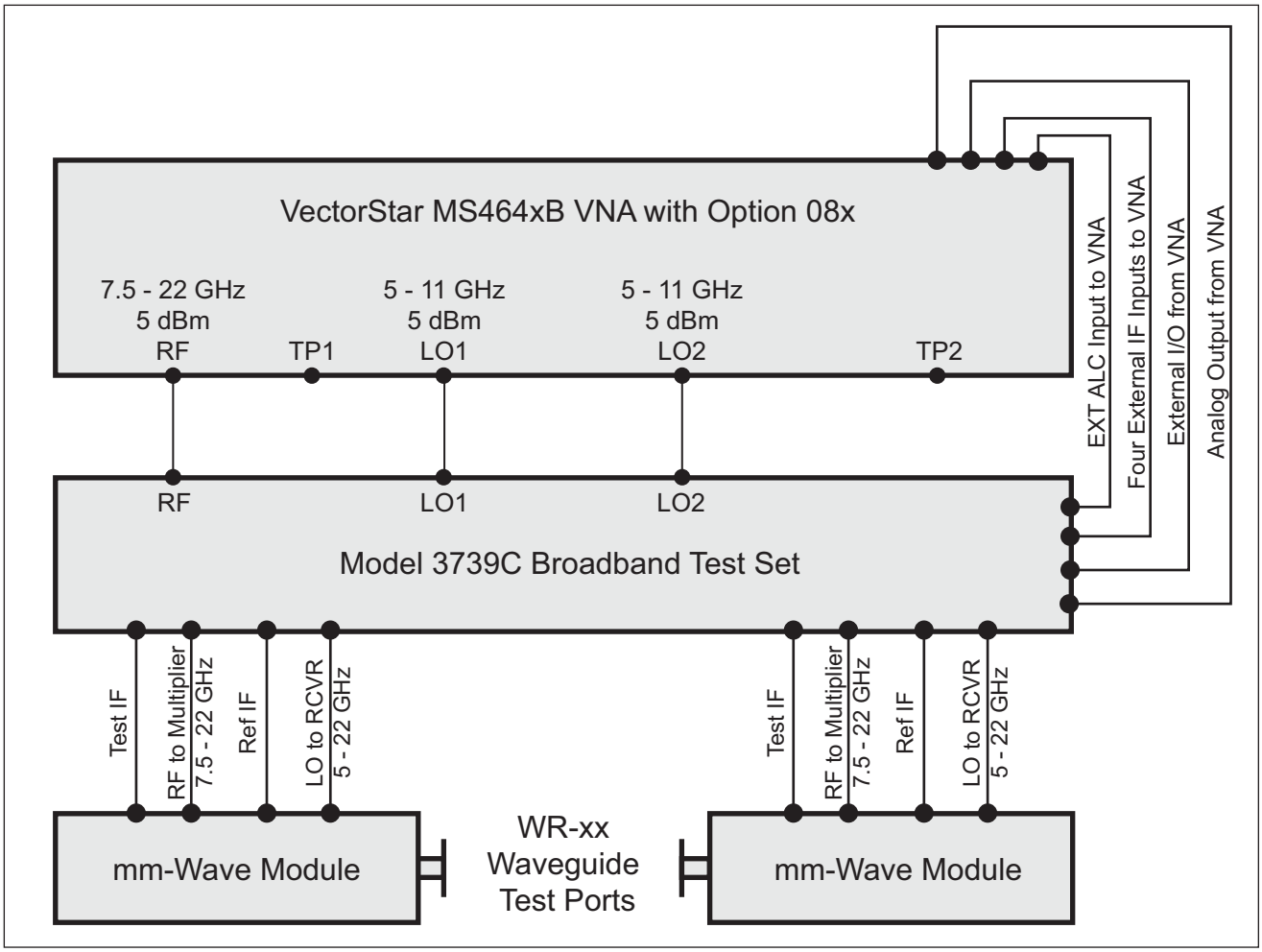
4. VectorStar ME7838D Waveguide Bands from 50 GHz to 1.1 THz

The VectorStar Millimeter-Wave system supports OML or VDI modules starting at 50 GHz. System performance is based on the specific mm-Wave module installed and appropriate cal kit. Contact the vendor web site for additional information.



VDI and OML Millimeter-Wave Modules

4.1 Block Diagram – Millimeter-Wave VNA System



Millimeter-Wave Configuration Block Diagram

4.2 VectorStar ME7838D Millimeter-Wave System with VDI Modules

This section provides the specifications for the VectorStar MS4640B series microwave Vector Network Analyzers (VNAs) when configured with the Virginia Diodes, Inc. millimeter-wave (mm-Wave) frequency extension modules. The following frequency bands are supported:

Waveguide Band	WR15	WR10	WR8.0	WR6.5	WR5.1	WR4.3	WR3.4	WR2.8	WR2.2	WR1.5	WR1.0[a]
Frequency (GHz)	50 to 75	75 to 110	90 to 140	110 to 170	140 to 220	170 to 260	220 to 330	260 to 400	325 to 500	500 to 750	750 to 1100

a. Contact Anritsu

4.3 System Configuration with VDI Modules

The VectorStar Millimeter-Wave system provides control of VDI modules for frequency extension coverage up to 1.1 THz. MS4640B series VectorStar VNA may be configured for mm-Wave operation by adding the appropriate control option and test set. System requirements include:

- MS4642B, MS4644B, MS4645B, or MS4647B Model VectorStar VNA*
- MS4640B Option 007, Receiver Offset
- MS4640B Option 080, 081, 082, or 083
- SM6537 Interface Cable
- 3739C Test Set

Each VDI module is equipped with a dedicated external power supply and DC cable. Connection between VectorStar and the VDI mm-Wave module is provided with the supplied interface cable.

*Support for the MS464xA VectorStar is available.

4.4 VDI Module Specifications

Dynamic range and stability specifications are valid for any MS4640B VectorStar VNA with appropriate options. Directivity specifications are valid when using appropriate VDI calibration kits.

VDI Millimeter-Wave Extenders Summary Specifications[a] Band / Frequency Range (GHz)							
Waveguide Band (GHz)	Dynamic Range[b] (± dB)	Minimum Dynamic Range[c] (± dB)	Magnitude Stability (± dB)	Phase Stability (± deg)	Test Port Power (dBm)	Directivity (dB)	Maximum Dimensions[d] (in)
WR15 50 to 75	120	100	0.15	2	6	30	11x5x3
WR10 75 to 110	120	100	0.15	2	6	30	11x5x3
WR8.0 90 to 140	120	100	0.15	2	0	30	11x5x3
WR6.5 110 to 170	120	100	0.25	4	0	30	11x5x3
WR5.1 140 to 260	120	100	0.25	4	–6	30	11x5x3
WR4.3 170 to 260	115	100	0.3	6	–6	30	11x5x3
WR3.4 220 to 325	115	100	0.3	6	–9	30	11x5x3
WR2.8 260 to 400	100	80	0.5	8	–16	30	11x5x3
WR2.2 325 to 500	100	80	0.5	8	–17	30	11x5x3
WR1.5 500 to 750	100	80	0.8	10	–25	30	11x5x3
WR1.0 750 to 1100	60	40	1	15	–35	30	8x5x3

a. Specifications. These results assume a through measurement with two TxRx Heads. The specifications quoted here are "expected" and subject to change. Stability is for 1 hour after a 1 hour warm-up, in a stable environment with ideal cables. The dynamic range (RBW 10 Hz) is measured by first connecting two TxRx heads together and normalizing the un-calibrated S_{21}. The heads are then disconnected and terminated with a waveguide load. The RMS of the measured S_{21} parameter is the system dynamic range.

b. Typical. BW = 10 Hz, dB, typical.

c. Typical. BW = 10 Hz, dB, minimum.

d. Dimensions: L x W x H dimensions in inches.

4.5 VDI Module Options

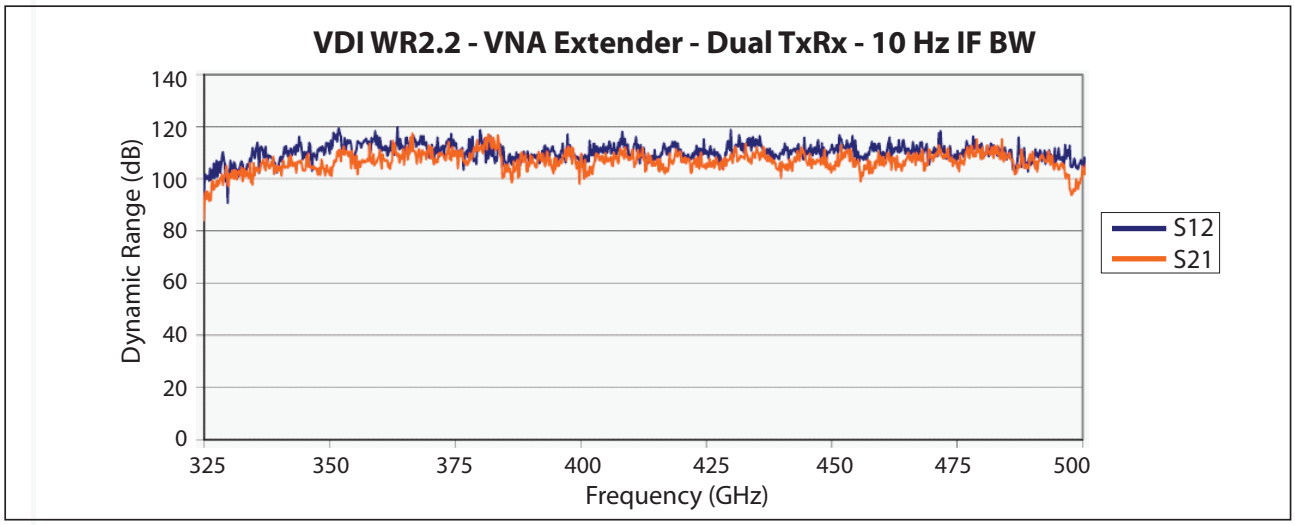
Options available for millimeter-wave extenders are listed below:

Micrometer-Drive Variable Attenuator	A 0 dB to 30 dB micrometer-drive variable attenuator option is available on TxRx and Tx modules up through WR2.2. If ordered, "–Attn" is added as an option suffix to the module model number.
Increased Test Port Power	Options exist for increasing test port power in some full bands or in partial bands. Consult factory for more information.
Non-Standard Frequency Bands	Non-standard frequency bands are possible. Consult factory for more information.
Custom Configuration	Anritsu/VDI will work with customers to reconfigure any extender to meet specific needs.

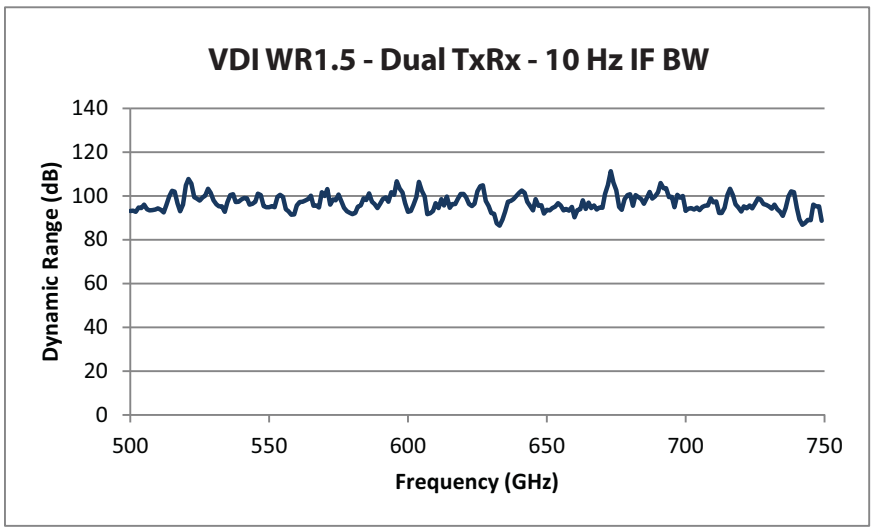
4.6 VDI Module Head Configurations

TxRx	Transmitter with two Receivers (Reference and Measurement), and two couplers. Two TxRx heads are required for full two-port measurements.
TxRef	Transmitter with Reference Receiver and one coupler.
Rx	Measurement Receiver.

4.7 ME7838D Measurement Examples Using VDI Millimeter-Wave Modules

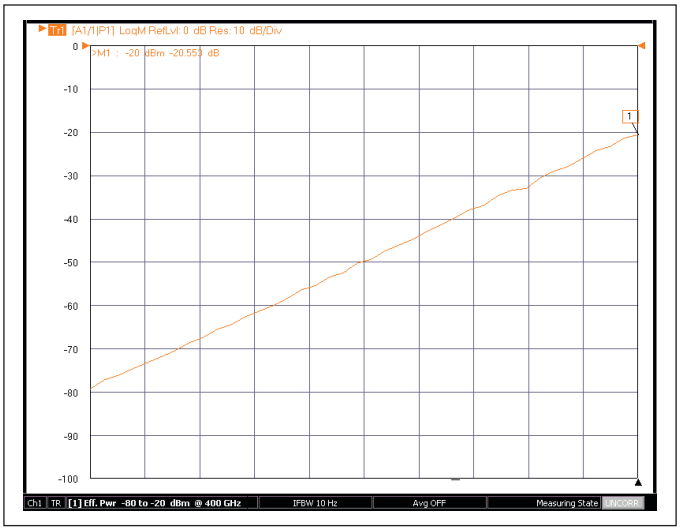


Dynamic Range Plot of VDI WR2.2 Module – 10 Hz IFBW



Dynamic Range Plot of VDI WR1.5 Dual TxRx – 10 Hz IFBW

ME7838D 400 GHz Power Sweep with VDI WR2.2 TxRx Module



Real time power sweep of VDI WR2.2 module using system power level control and no mechanical attenuators.

4.8 VectorStar ME7838D Millimeter-Wave System with OML Modules This section provides specifications for the VectorStar MS4640B series microwave Vector Network Analyzers (VNAs) when configured with the OML millimeter-wave frequency extension modules.

Description	Each OML module must be equipped with a dedicated external power supply and DC cable. Connection between the VectorStar and the OML mm-Wave module is provided with the supplied interface cable.
System Configuration	The VectorStar Millimeter-Wave system provides control of OML modules for frequency extension coverage up to 325 GHz. The MS4640B series VectorStar VNA may be configured for mm-Wave operation by adding the appropriate control option and test set.
System requirements	MS4642B, MS4644B, MS4645B, or MS4647B Model VectorStar VNA* MS4640B Option 007, Receiver Offset MS4640B Option 080, 081, 082, or 083 SM6537 Interface Cable 3739C Test Set
Specifications	Dynamic range specifications are valid for any MS4640B VectorStar VNA with appropriate options. Directivity specifications are valid when using appropriate OML calibration kits.

*Support for the MS464xA VectorStar is available.

4.9 OML Millimeter-Wave Extenders Summary Specifications Specifications are typical and subject to change without notice.

OML "T/R" Models		V15VNA2-T/R	V12VNA2-T/R	V10VNA2-T/R	V08VNA2-T/R	V06VNA2-T/R	V05VNA2-T/R	V03VNA2-T/R
System Operating Frequency[a]	**(GHz)**	WR-15 50 to 75	WR-12 60 to 90	WR-10 75 to 110	WR-08 90 to 140	WR-06 110 to 170	WR-05 140 to 220	WR-03 220 to 325
Test Port Output Power[b]	**Minimum Typical (dBm)**	5 8	2 5	3 5	–8 –4	–15 –10	–18 –13	–23 -
Test Port Input Power @ 0.1 dB Compression[c]	**Typical (dBm)**	8	8	6	4	–5	–5	–5
Test Port Match[c]	**Typical (dB)**	> 17	> 17	> 17	> 17	> 15	> 15	> 9
Residual Source & Load Match	**Typical (dB)**	> 35	> 35	> 35	> 35	> 35	> 35	> 33
Test Dynamic Range[d]	**Minimum Typical (dB)**	92 > 105	92 > 105	95 > 110	90 > 105	80 > 95	80 > 95	60 > 75
Reflection & Transmission Tracking[e]	**Magnitude (dB) Phase (deg.)**	± 0.2 ± 2	± 0.2 ± 2	± 0.2 ± 2	± 0.3 ± 3	± 0.4 ± 5	± 0.4 ± 6	± 0.4 ± 8
Coupler Directivity[c]	**Typical (dB)**	> 35	> 35	> 35	> 33	> 30	> 30	> 30
Size[f]	**(L x W x H)**	13.0" x 4.3" x 2.7"						

a. Test Port Flange Configuration is compatible with MIL-DTL-3922/67D (UG 387/U-M).

b. 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.

c. Not Tested

d. Measured at 10 Hz IF bandwidth.

e. At +25 °C. Measured for 1 hr after 1 hr warm-up. Based on "perfect" RF and LO test cables not moved after warm-up and calibration. Not tested.

f. Height excludes the adjustable rubber feet; length and depth dimensions exclude the output waveguide length.

5. Standard Capabilities for All Configurations

For standard capabilities of the VectorStar VNAs, please see the **VectorStar MS4640B Series VNA Technical Data Sheet and Configuration Guide – 11410-00611**, available at www.anritsu.com.

6. Mechanical and Environmental

MS4640B Vector Network Analyzer Dimensions without rack mount option.

Height	267 mm body (6u) 286 mm between feet outer edges
Width	426 mm body 457 mm between feet outer edges 487 mm between front panel handles outer edges
Depth	502 mm body 591 mm between handle and foot outer edges
Weight	< 28 kg (< 62 lbs) lbs), Typical weight for a fully-loaded MS4647B VNA

3739C Broadband/Millimeter-Wave Test Set Dimensions without rack mount option.

Height	89 mm body (2u) 108 mm between feet outer edges
Width	426 mm body 457 mm between feet outer edges 487 mm between front panel handles outer edges
Depth	502 mm body 591 mm between handle and foot outer edges
Weight	5.75 kg (12.7 lbs)

MA25300A Millimeter-Wave Module

Height	21.5 mm
Width	54 mm
Depth	55.3 mm
Weight	0.27 kg (0.6 lbs)

Environmental – Operating	Conforms to MIL-PRF-28800F (Class 3)
Temperature Range	0 ºC to +50 ºC without error codes* * Except for 'unleveled' error messages that may occur at the extreme edges of the temperature range above.
Relative Humidity	5 % to 95 % at +40 ºC, Non-condensing
Altitude	4,600 m (15,000 ft)

Environmental – Non-Operating

Temperature Range	–40 ºC to +75 ºC
Relative Humidity	0 % to 90 % at +65 ºC, Non-condensing
Altitude	15,200 m (49,000 ft)

EMI

Meets the emissions and immunity requirements of:
EN55011/2007 Class A, Group 1
EN61000-4-2: 1998 (± 4 kV CD, 8k AD)
EN61000-4-3: 2008 (80 MHz to 2700 MHz @ 3 V/m)
EN61000-4-4: 2004 (500V SL, 1000V PL)
EN61000-4-5: 2006 (2 kV L-E, 1 kV L-L)
EN61000-4-6:2007 (0.15 MHz to 80 MHz, 3 V)
EN61000-4-11:2004 (1 cycle, 100 %)

7. Calibration and Correction Capabilities

Calibration Methods	Short-Open-Load-Through (SOLT) with Fixed or Sliding Load Offset-Short (SSLT) Triple-Offset-Short Short-Open-Load-Reciprocal (SOLR) Reciprocal or Unknown Through Method Line-Reflect-Line (LRL) / Line-Reflect-Match (LRM) Advanced-LRM (A-LRM™) for improved on-wafer calibrations AutoCal With Thru Update available
Correction Models	Full 12-term 1 Path / 2 Port Frequency Response (Transmission or Reflection, one or both directions) Reflection Only (1 Port or 2 Ports)
Merged Calibration	Merge multiple calibration methods over bands of frequency points.
Coefficients for Calibration Standards	
Load from USB Device	Load coefficients from USB Memory Device from your Anritsu calibration kit.
User-Defined	Enter manual coefficients into User-Defined locations.
Reference Impedance	Modify the reference impedance from 50 Ω to any impedance, excluding 0 Ω.
Interpolation	Allows interpolation between calibration frequency points, if selected
Adapter Removal Calibration	Characterizes and "removes" an adapter used during calibration that will not be used for subsequent device measurements, for accurate measurement of non-insertable devices.
Dispersion Compensation	Selectable as Coaxial, other non-dispersive (for example a coplanar waveguide), Waveguide, or Microstrip.
Power Calibrations	
Types	Flat Power Calibrations and Linear Power Calibrations (Power Meter Correction)
Enhanced Power Accuracy	Different power meter calibrations are available to enhance power accuracy at the desired reference plane (to usually ≈ 0.1 dB for short periods of time).
Flat Power Calibrations	Flat power calibrations (using the appropriate 1.0 mm adapter depending on the sensor) are available. Different power meters/sensors are required depending on the frequency range (above or below 70 GHz). Power level is user-selectable when within the power adjustment range of the internal source. Other power levels are then arrived at by offset transfers.
Linear Power Calibration	A linear power calibration is performed over a range of power levels for use in power sweep mode and is performed at a specified frequency or frequency range.
External Power Meter	Both calibrations are performed using an external power meter over the dedicated GPIB port.
Embedding/De-embedding	The MS4640B is equipped with an Embedding/De-embedding system.
De-embedding	De-embedding is generally used for removal of test fixture contributions, modeled networks and other networks described by S-parameters (s2p files) from measurements. An extraction utility is part of this package that allows the easier computation of de-embedding files based on some additional calibration steps and measurements.
Embedding	Similarly, the Embedding function can be used to simulate matching circuits for optimizing amplifier designs or simply adding effects of a known structure to a measurement.
Multiple Networks	Multiple networks can be embedded/de-embedded and changing the port and network orientations is handled easily.
Impedance Conversion	Allows entry of different impedances (complex values) for different ports.

8. Mechanical Calibration/Verification Kits

0.8 mm Calibration/Verification Kit, 3659

Provides 12-term SOLT or Triple Offset Short calibrations, for 0.8 mm devices, and two verification standards.

3659 0.8 mm Calibration/Verification Kit providing 12-Term SOLT or SSST calibrations and two verification standards.

3659 Cal Kit Contains:	Additional Information (Typical)	Quantity	Part Number
0.8 mm Calibration / Verification Kit			3659
Offset Short 0.8 mm (male)	Offset: 2.020 mm	1	23.850-1
Offset Short 0.8 mm (male)	Offset: 2.650 mm	1	23.850-2
Offset Short 0.8 mm (male)	Offset: 3.180 mm	1	23.850-3
Offset Short 0.8 mm (female)	Offset: 2.020 mm	1	23.8F50-1
Offset Short 0.8 mm (female)	Offset: 2.650 mm	1	23.8F50-2
Offset Short 0.8 mm (female)	Offset: 3.180 mm	1	23.8F50-3
Open 0.8 mm (male)	Offset: 1.510 mm	1	24.850
Open 0.8 mm (female)	Offset: 1.930 mm	1	24.8F50
Fixed Termination 0.8 mm (male)		1	28.850
Fixed Termination 0.8 mm (female)		1	28.8F50
Adapter, 1.0 mm (male) to 0.8 mm (male) Connector		1	33W.850
Adapter, 1.0 mm (male) to 0.8 mm (female) Connector		1	33W.8F50
Adapter, 1.0 mm (female) to 0.8 mm (male) Connector		1	33WF.850
Adapter, 1.0 mm (female) to 0.8 mm (female) Connector		1	33WF.8F50
Adapter, 0.8 mm (male) to 0.8 mm (female)		1	33.8.8F50
Adapter, 0.8 mm (male) to 0.8 mm (male)		1	33.8.850
Adapter, 0.8 mm (female) to 0.8 mm (female)		1	33.8F.8F50
Stepped Impedance Thruline, 0.8 mm (male - female)	Verification Device	1	18.8.8F50-1B
50 Ohm matched Thruline, 0.8 mm (male - female)	Verification Device	1	18.8.8F50-1
Torque Wrench	6 mm, 5.4 N·cm (4 lbf·in)	1	01-524
Open-ended Wrench	6 mm / 7 mm	1	01-525
Coefficients for standards	On USB Memory Device	1	–

9. Test Port Cables

Test Port Cables, Flexible, High Performance

Description	Frequency Range	Impedance	Length (cm)	Insertion Loss (dB)	Return Loss (dB)	Part Number
1.0 mm (male) 1.0 mm (female)	DC to 110 GHz (125 GHz)	50 Ω	10	1.74	≥ 14	3671W1-50-1
			13	2.23	≥ 14	3671W1-50-2
			16	2.74	≥ 14	3671W1-50-3
0.8 mm (male) 0.8 mm (female)	DC to 145 GHz	50 Ω	10	2	≥ 12	3670.850-1
0.8 mm (male) 0.8 mm (female)	DC to 145 GHz	50 Ω	16	3.5	≥ 12	3670.850-2

3670.850-1, 3670.850-2, 0.8 mm Test Port Cables

10. Precision Adapters, Attenuators, and Other Components

Anritsu offers a complete line of precision adapters and attenuators. For more information, please visit our web site at www.anritsu.com.

11. Warranty

The ME7838D Series VNAs and related accessories offer a 3 year warranty from the date of shipment. Please contact your local service center for additional warranty coverage. Note that the key component of the system, the MS4640B VNA, is covered by a 3-year standard warranty.

12. Ordering Information

The ME7838D Broadband/Millimeter-Wave VNA System provides single sweep coverage from 70 kHz to 145 GHz and consists of the following standard components and optional accessories, which are described in the sections below:

12.1 ME7838D Broadband System, 70 kHz to 145 GHz

Action	Part Number and Description	Additional Information
Order the base VectorStar model with the listed options:	• MS4647B, 70 kHz to 70 GHz VNA • MS4640B-007, receiver offset • MS4640B-070, 70 kHz frequency coverage • 3739C, broadband test set with 36 inch interface cables • M25300A, Millimeter-Wave, 2 each • ME7838D-SS020, On-site system assembly and verification	
Include one of the following:	• MS4647B-080, MS4647B with ME7838D system option OR • MS4647B-081, MS4647B with ME7838D system option and • Option 051 or 061 or 062	
Include one of the following:	• 806-206, 1.85 mm phase stable VNA RF cables, 24”, M-F, 2 each OR • 806-209, 1.85 mm phase stable VNA RF cables, 36”, M-F, 2 each	
Additional Options:	• MS4640B-001, MS4640B rack mount • 3739C-001, 3739C rack mount • MS4640B-002, Time domain	
	• MS4647B-051, External VNA loops • MS4647B-061, Active measurement suite, 2 attenuators • MS4647B-062, Active measurement suite, 4 attenuators	Must be ordered with option MS4647B-081
	• MS4647B-031, Dual Source	Must be ordered with option MS4647B-084 Must be ordered with option MS4647B-085 if option MS4647B-051, or MS4647B-061, or MS4647B-062 are ordered.

12.2 ME7838D Waveguide-Band System to 110 GHz – 3744A-EE or 3744A-EW mm-Wave Modules

Configurator for ME7838D Millimeter-Wave System using 3744A-EE or 3744A-EW mm-Wave Modules:

Action	Part Number and Description	Additional Information
Choose and order one of the three base VectorStar models with options listed:	• MS4644B VNA, 10 MHz to 40 GHz • MS4640B-007 • MS4644B-082 or MS4644B-083	MS4644B-083 is ordered when options 051, 061, or 062 are included.
	• MS4645B VNA, 10 MHz to 50 GHz • MS4640B-007 • MS4645B-082 or MS4645B-083	MS4645B-083 is ordered when options 051, 061, or 062 are included.
	• MS4647B VNA, 10 MHz to 70 GHz • MS4647B-007 • MS4647B-080 or MS4647B-081	MS4647B-081 is ordered when options 051, 061, or 062 are included.
Add options if desired:	• Include Options 051, 061, or 062	Options 061 and 062 include the Active Measurement Suite
	• MS4640B-070 for 70 kHz operation in base VNA	
	• MS4640B-002 for Time Domain	
	• MS4640B-041 for Noise Figure	
Order:	• 3739C mm-Wave Test Set	
Choose Extended-E or Extended-W Band Modules:	• 3744A-EE, 56 GHz to 94 GHz Extended E Band module, 2 each	
	• 3744A-EW, 65 GHz to 110 GHz Extended W Band module, 2 each	

Accessories

35WR12WF-EE	Precision Waveguide to Coax Adapter Kit, 56 GHz to 94 GHz, WR-12 to 1.0 mm (f)
35WR10WF-EW	Precision Waveguide to Coax Adapter Kit, 65 GHz to 110 GHz, WR-10 to 1.0 mm (f)

12.3 ME7838D Waveguide-Band System – Anritsu 3740/41A; OML; VDI mm-Wave Modules

ME7838D Waveguide-band System using Anritsu 3740/41A, OML, or VDI Millimeter-Wave modules:

Action	Part Number and Description	Additional Information
Choose and order one of the three base VectorStar models with options listed:	• MS4642B VNA, 10 MHz to 20 GHz • MS4640B-007 Receiver Offset • MS4642B-082 or MS4642B-083	MS4642B-083 is ordered when options 051, 061, or 062 are included.
	• MS4644B VNA, 10 MHz to 40 GHz • MS4640B-007 Receiver Offset • MS4644B-082 or MS4644B-083	MS4644B-083 is ordered when options 051, 061, or 062 are included.
	• MS4645B VNA, 10 MHz to 50 GHz • MS4640B-007 Receiver Offset • MS4645B-082 or MS4645B-083	MS4645B-083 is ordered when options 051, 061, or 062 are included.
	• MS4647B VNA, 10 MHz to 70 GHz • MS4647B-007 Receiver Offset • MS4647B-080 or MS4647B-081	MS4647B-081 is ordered when options 051, 061, or 062 are included.
Add options if desired:	• Include Options 051, 061, or 062	Options 061 and 062 include the Active Measurement Suite
	• MS4640B-070 for 70 kHz operation in base VNA	
	• MS4640B-002 for Time Domain	
Order:	• 3739C mm-Wave test set	
	• SM6600 Interface Cables for Anritsu 3740/41A mm-Wave Modules • SM6537 Interface Cables for OML/VDI mm-Wave Modules	Does not include DC cable. DC supply is provided by mm-Wave module power supply.
Choose one of the two appropriate millimeter-wave module combinations:	• 2 each TxRx transmission and reflection millimeter-wave modules	Choose appropriate OML or VDI modules. Contact Anritsu Company for ordering information.
	• 1 each TxRx transmission and reflection module, and • 1 each Tx transmission only module	

Accessories

SC8215	Kelvin Bias Tee 70 kHz to 145 GHz, Max Voltage: 16 VDC, Max Current: 100 mA
SC7287	Kelvin Bias Tee 100 MHz to 145 GHz, Max Voltage: 50 VDC, Max Current: 500 mA
SC8218	Triax (male) to SMC (male) Cable, (Inner-shield floating at SMC end), 1.5 m (60 in) long two (2) needed per Kelvin Bias Tee
ML2437A	Power Meter, Single Channel, for flat test port power calibration
SC7770	Thermal Sensor, with special characterization, 70 kHz to 70 GHz, V (female)
SM6494	System floor console (includes larger size writing table)
2100-1	GPIB cable, 1 m (39 in) long
2100-2	GPIB cable, 2 m (79 in) long
2100-4	GPIB cable, 4 m (157 in) long
806-206	1.85 mm cable, 61 cm (24 in) long, for connecting the VNA and the MA25300A Modules
806-209	1.85 mm cable, 91 cm (36 in) long, for connecting the VNA and the MA25300A Modules
01-201	Torque Wrench (for tightening male devices), 8 mm (5/16 in), 0.9 N·m (8 lbf·in) for SMA, 3.5 mm, 2.4 mm, K, and V connectors
01-202	Universal Test Port Connector Wrench
01-203	Torque Wrench (for tightening the VNA test ports to female devices) 20.6 mm (13/16 in), 0.9 N·m (8 lbf·in)
01-204	Anritsu Stainless Steel Connector Wrench, circular, open-ended for SMA, 3.5 mm, 2.4 mm, K and V connectors
01-504	Torque wrench (for tightening male devices) 6 mm, 0.45 N-m (4 lbf-in) for 1.0 mm and 0.8 mm connectors
01-524	Low profile Torque Wrench (for tightening male devices), 6 mm, 0.45 N-m (4 lbf-in), 126 mm long for 1.0 mm and 0.8 mm connectors

Calibration/Verification Kits

3659	0.8 mm Calibration/Verification Kit
3656B	1.0 mm Calibration/Verification Kit
3655V	WR-15 Waveguide Calibration Kit, Without Sliding Loads
3655V-1	WR-15 Waveguide Calibration Kit, With Sliding Loads
3655E	WR-12 Waveguide Calibration Kit, Without Sliding Loads
3655E-1	WR-12 Waveguide Calibration Kit, With Sliding Loads
3655W	WR-10 Waveguide Calibration Kit, Without Sliding Loads
3655W-1	WR-10 Waveguide Calibration Kit, With Sliding Loads
3650A	SMA/3.5 mm Calibration Kit, Without Sliding Loads
3650A-1	SMA/3.5 mm Calibration Kit, With Sliding Loads
3652A	K Calibration Kit, Without Sliding Loads
3652A-1	K Calibration Kit, With Sliding Loads
3654D	V Calibration Kit, Without Sliding Loads
3654D-1	V Calibration Kit, With Sliding Loads
3657	V Multi-Line Calibration Kit, Without Shorts
3657-1	V Multi-Line Calibration Kit, With Shorts

Test Port Cables, Flexible, High Performance

3671W1-50-1	1.0 mm (male) to 1.0 mm (female), 1 each, 10.0 cm (3.9 in)
3671W1-50-2	1.0 mm (male) to 1.0 mm (female), 1 each, 13.0 cm (5.1 in)
3671W1-50-3	1.0 mm (male) to 1.0 mm (female), 1 each, 16.0 cm (6.3 in)
3671KFS50-60	K (female) to 3.5 mm (male) cable, 60 cm (one cable)
3671KFK50-60	K (female) to K (male) cable, 60 cm (one cable)
3671KFK50-100	K (female) to K (male) cable, 1 each, 100 cm (one cable)
3671KFKF50-60	K (female) to K (female) cable, 1 each, 60 cm (once cable)
3671VFV50-60	V (female) to V (male) cable, 1 each, 60 cm (one cable)
3671VFV50-100	V (female) to V (male) cable, 1 each, 100 cm (one cable
3671KFSF50-60	K (female) to 3.5 mm (female) cable, 1 each, 60 cm (one cable)
3671VFVF50-60	V (female) to V (female) cable, 1 each, 60 cm (one cable)
3671VFV50-100	V (female) to V (male) cable, 1 each, 60 cm (one cable)
3670.850-1	0.8 mm (male) to 0.8 mm (female), 1 each, 10.0 cm (3.9 in)
3670.850-2	0.8 mm (male) to 0.8 mm (female), 1 each, 16.0 cm (6.3 in)

Adapters and More

0.8-105F	0.8 mm (female) Sparkplug Launcher Connector, DC to 145 GHz
0.8-105M	0.8 mm (male) Sparkplug Launcher Connector, DC to 145 GHz
34WV50	1.0 mm (male) to V (male) Adapter, 1.0 mm to V, Coaxial
34WVF50	1.0 mm (male) to V (female) Adapter, 1.0 mm to V, Coaxial
34WFV50	1.0 mm (female) to V (male) Adapter, 1.0 mm to V, Coaxial
34WFVF50	1.0 mm (female) to V (female) Adapter, 1.0 mm to V, Coaxial
33WW50	1.0 mm (male) to 1.0 mm (male) Adapter, 1.0 mm in-series, Coaxial
33WWF50	1.0 mm (male) to 1.0 mm (female) Adapter, 1.0 mm in-series, Coaxial
33WFWF50	1.0 mm (female) to 1.0 mm (female) Adapter, 1.0 mm in-series, Coaxial
35WR10W	WR10 to 1.0 mm (male) Adapter, 1.0 mm to WR10 Waveguide
35WR10WF	WR10 to 1.0 mm (female) Adapter, 1.0 mm to WR10 Waveguide
SC7260	WR12 to 1.0 mm (male) Adapter, 1.0 mm to WR12 Waveguide
SC7442	WR12 to 1.0 mm (female) Adapter, 1.0 mm to WR12 Waveguide
35WR15V	WR15 to V (male) Adapter, V (1.85 mm) to WR15 Waveguide
35WR15VF	WR15 to V (female) Adapter, V (1.85 mm) to WR15 Waveguide
For More Information	Refer to our **Precision RF & Microwave Components Catalog** for descriptions of adapters and other components.

Additional Accessories

0.8 mm to Waveguide adapters available from Flann Microwave Ltd

0.8 mm Infinity probes available from Cascade Microtech

VectorStar®

Find Drivers, Utilities, Software Updates, and other Helpful Tools at the VectorStar Users Site. Visit:
www.anritsu.com/en-us/Products-Solutions/Solution/Welcome-to-the-VectorStar-Users-Site-.aspx

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List Revision Date: 20130905

ME7838D BB/mm-Wave VNA VectorStar TDS

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