

ERAVANT

NEXT GENERATION MILLIMETERWAVE COMPONENTS

W BAND UPDATES

October 2020

TABLE OF CONTENTS

3	<u>Introduction</u>
5	<u>Antennas: OMT, Omni-Directional Antenna, Rectangular Horns, and Conical Horns</u>
10	<u>Amplifiers: Power and Low Noise</u>
19	<u>Frequency Multipliers: Active and Passive</u>
25	<u>Frequency Converters: Balanced Mixers, I/Q Mixers and Harmonic Mixers</u>
30	<u>Detectors</u>
32	<u>Control Devices: Electrical Attenuators, SPST, SPDT and SP4T</u>
37	<u>Passive Components: Diplexer, Waveguide to Coax Adapters, Power Dividers, Couplers and Filters</u>
45	<u>Waveguides: Straight, Bend and Twist</u>
46	<u>Ferrites: Waveguide Junction Isolators and Circulators, Faraday Isolator</u>
50	<u>Subassemblies: TX/RX, FMCW Modules</u>
54	<u>Full Band Test Equipment: Extenders and High ENR Noise Source</u>
63	<u>Website</u>

INTRODUCTION

ERAVANT designs and manufactures total solutions for microwave and millimeterwave applications covering 10 MHz to 220 GHz.

- **This presentation introduces Eravant's selective standard product offerings in the W-Band (75-110 GHz).**
- Our full product offering, including Limited Run models, are listed on our website at www.eravant.com.

Additional products and presentations are available upon customer request:

- Custom models for components and subassemblies can be configured to customers' specifications.
- Presentations about Ka, Q, U, V, E, F and D-Bands are available.
- Presentations for specific applications like 5G/IoT, Space, Test Instrumentation, Communications, and Radar are also available.

ERAVANT PRODUCT COVERAGE

- ERAVANT offers Total Product Solutions to configure any system applications in the Frequency Range of DC to 220 GHz.
- W Band products are mainly used in
 - Last mile communication systems
 - Automotive Radar systems
 - 5G systems
 - Scientific and industrial systems
 - Test equipment and set ups
- The intent of this presentation is to present the ERAVANT product offerings in **W** Band to help the customers having a quick overview of available product families for their project and system planning. The model selected is for illustration purpose. Many models with various performance in the same product family are available on the website.

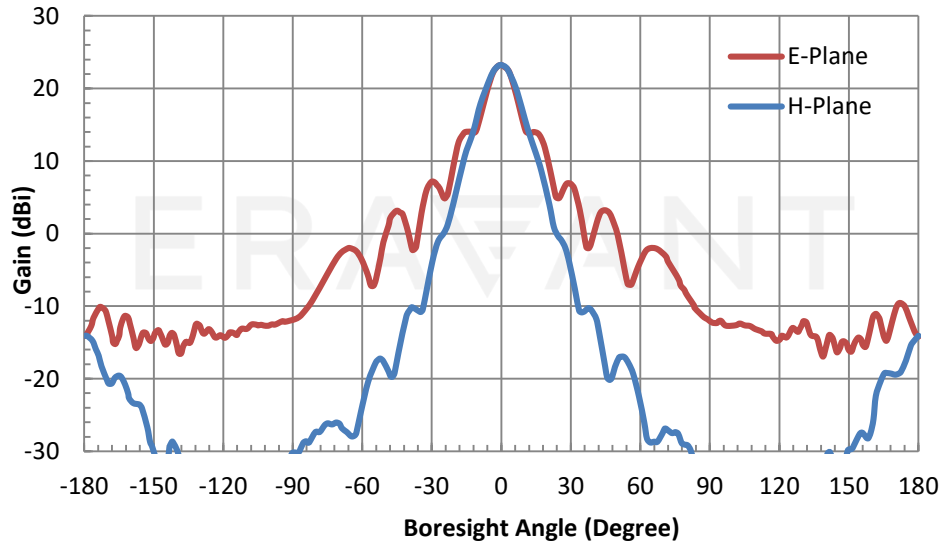
Rectangular Horn Antenna

Model SAR-2309-10-S2

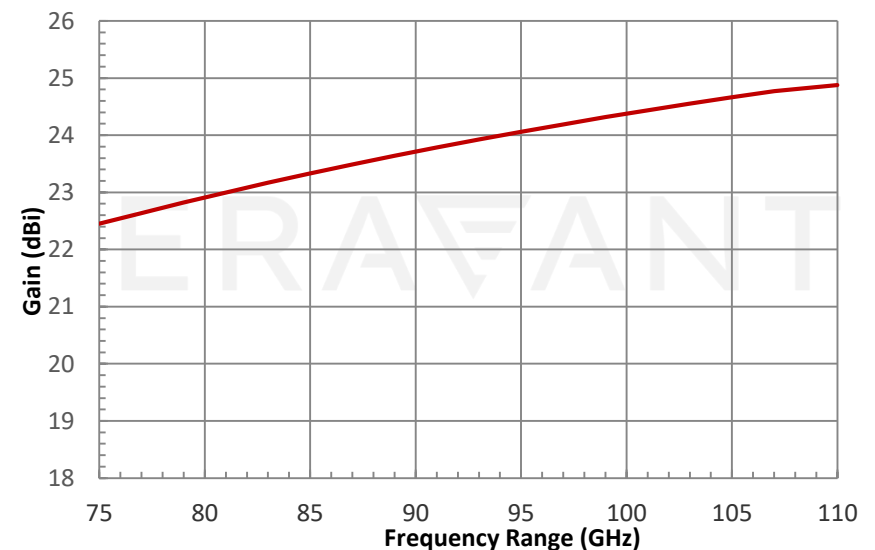
Parameter	Minimum	Typical	Maximum
Frequency	75 GHz		110 GHz
Gain	22 dBi	23 dBi	25 dBi
Polarization		Linear	
3 dB Beamwidth, E-Plane		11°	
3 dB Beamwidth, H-Plane		12°	
Sidelobes, E-Plane		-14 dB	
Sidelobes, H-Plane		-30 dB	
VSWR		1.15:1	



Typical Antenna Pattern @ 92.5 GHz



Typical Gain vs. Frequency



Conical Horn Antenna

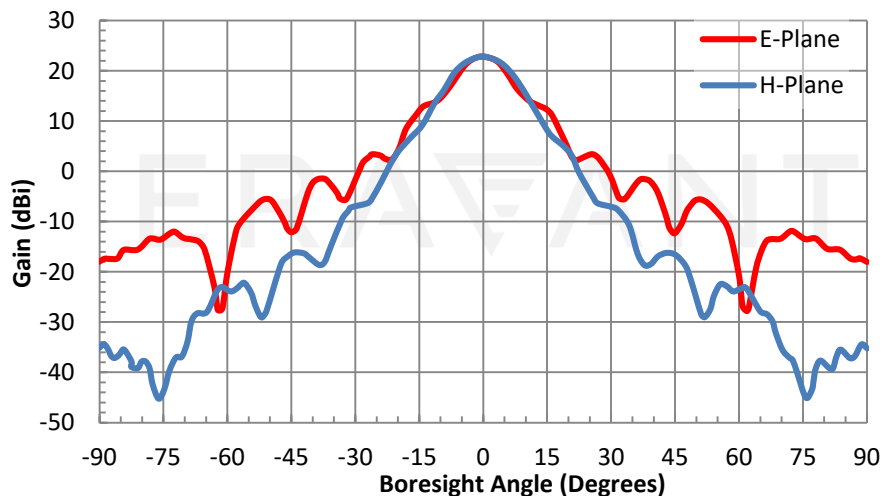
Model SAC-2309-094-S2

Parameter	Minimum	Typical	Maximum
Frequency*	87 GHz		100 GHz
Gain		23 dBi	
3 dB Beamwidth, E-plane		11°	
3 dB Beamwidth, H-plane		13°	
Sidelobes, E-plane		-20 dB	
Sidelobes, H-plane		-28 dB	
VSWR		1.15:1	

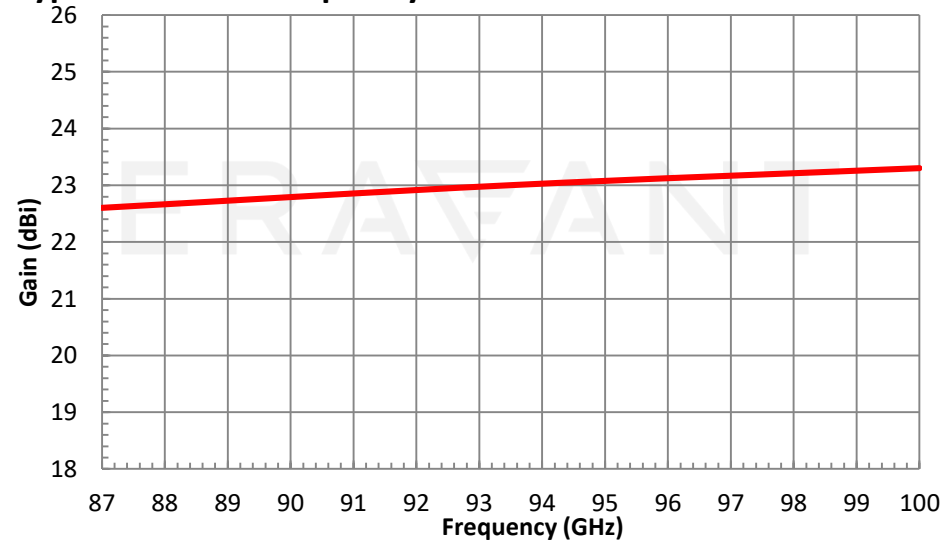


*Note: Can operate from 80 to 110 GHz if the dominant mode is maintained.

Typical Antenna Pattern @ 93.5 GHz



Typical Gain vs. Frequency



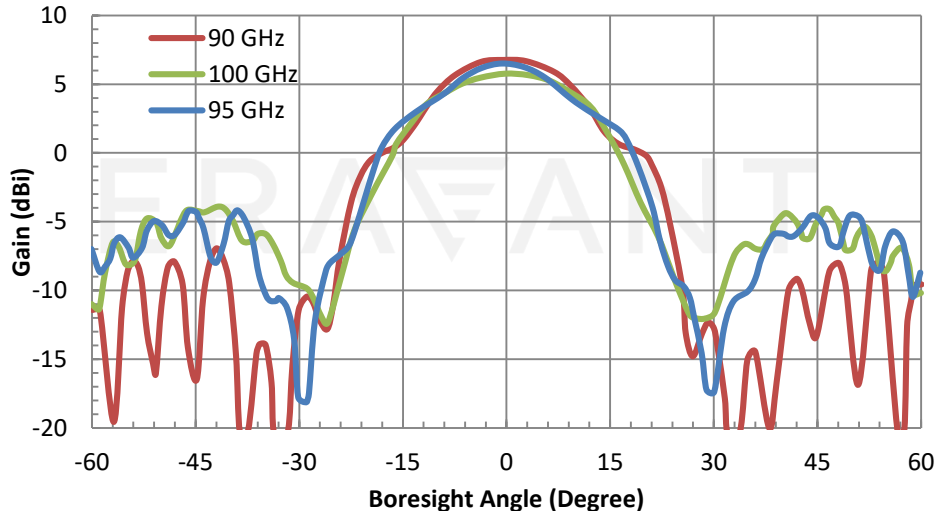
Omni-directional Antenna, 90 to 100 GHz

Model: SAO-9031040230-10-S1

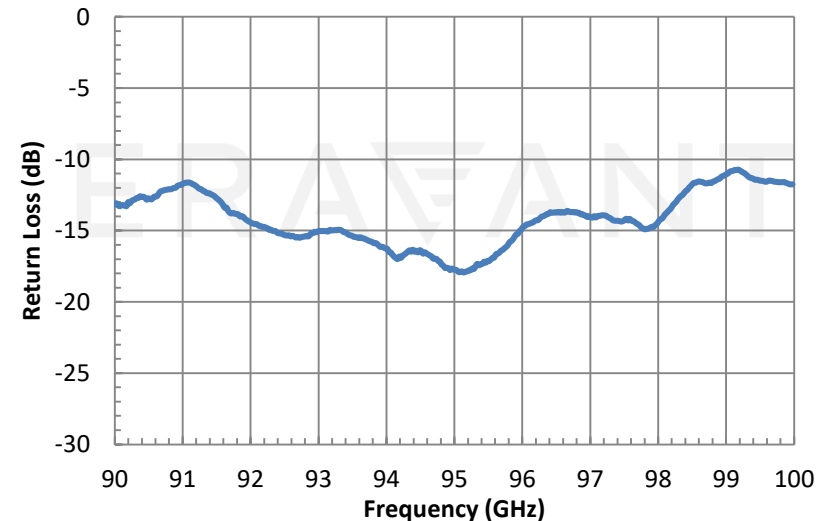
Parameter	Minimum	Typical	Maximum
Frequency Range	90 GHz		100 GHz
Gain		2 dBi	
Gain Variation		± 3 dB	
Azimuth		360°	
3 dB Beamwidth, Vertical		30°	
VSWR		2.1:1	
RF Connector	WR-10 with UG-387/U-M Flange		
Weight		0.2 Oz	



Simulated E-Plane Patterns



Typical Return Loss vs. Frequency



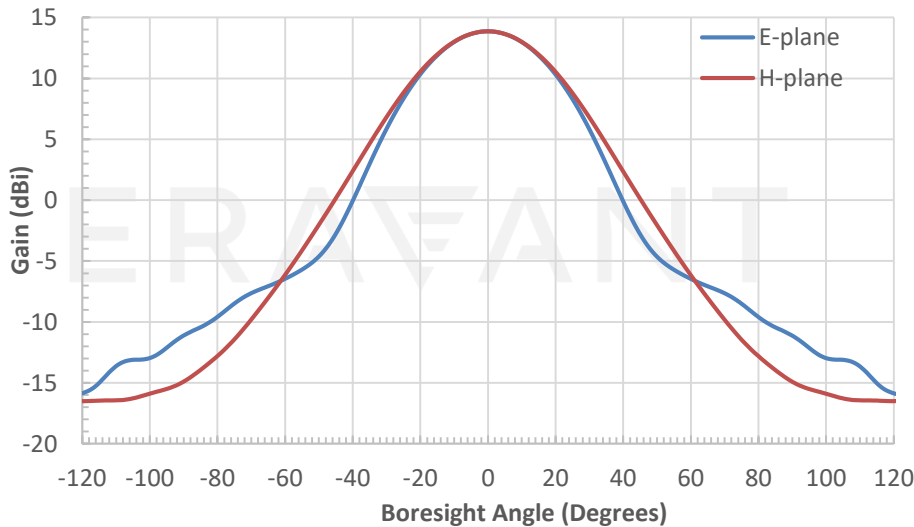
Dual Polarized Antenna, 75 to 110 GHz

Model SAF-7531141340-110-S1-100-DP

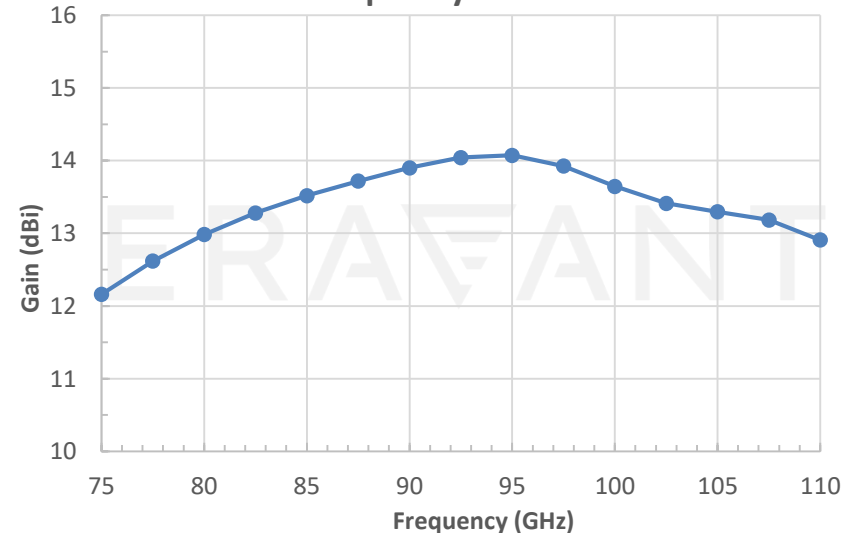
Parameter	Minimum	Typical	Maximum
Frequency	75 GHz	92.5 GHz	110 GHz
Gain		13 dBi	
3 dB Beamwidth, E-plane		40°	
3 dB Beamwidth, H-plane		40°	
Sidelobe Levels		-25 dB	
V and H Port Isolation		30 dB	
RF Connector	WR-10 with UG-387/U-M Flange		
Weight		0.1 lbs	



Simulated Antenna Patterns @ 90 GHz



Simulated Gain vs. Frequency



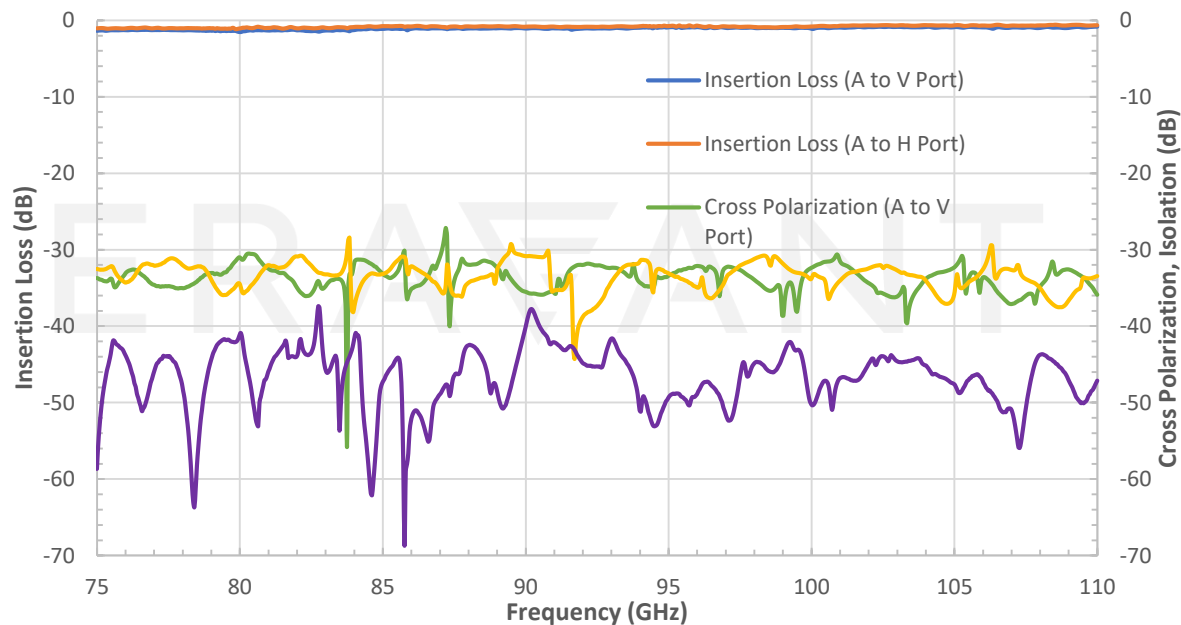
Full Band Orthomode Transducer

Model SAT-FW-10010-S1

Parameter	Minimum	Typical	Maximum
Frequency	75 GHz		110 GHz
Insertion Loss, Vertical		1.4 dB	
Insertion Loss, Horizontal		1.4 dB	
Isolation		35 dB	
Cross Polarization		35 dB	



Typical Performance vs Frequency



Features

- High Isolation
- Low Insertion Loss
- Full Band Coverage
- High Crosspol Rejection

Power Amplifier, 85 to 100 GHz, +24 dBm P-1dB

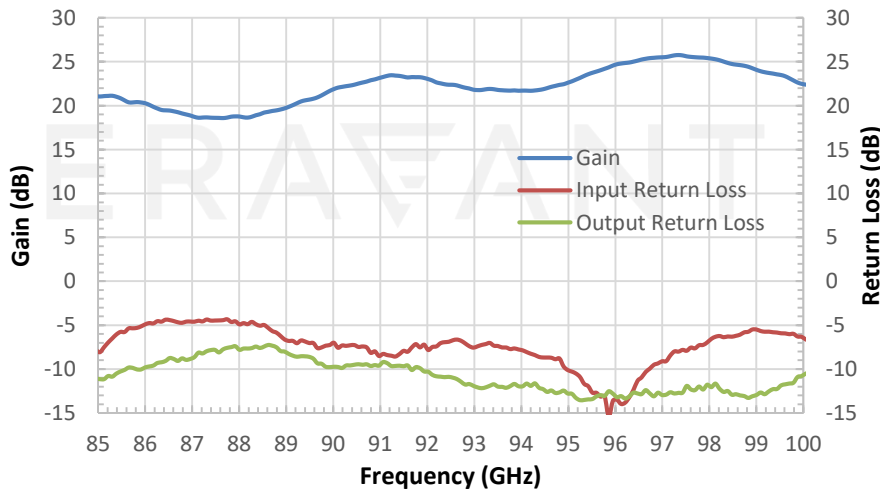
Model SBP-8531042324-1010-E1

Parameter	Minimum	Typical	Maximum
Frequency	85 GHz		100 GHz
Gain		23 dB	
P_{1dB}		+24 dBm	
P_{sat}		+26 dBm	
P_{in}			+15 dBm
Input VSWR		3:1	
Output VSWR		1.9:1	
DC Voltage		+8 V_{DC}	
DC Supply Current		1.8 A	



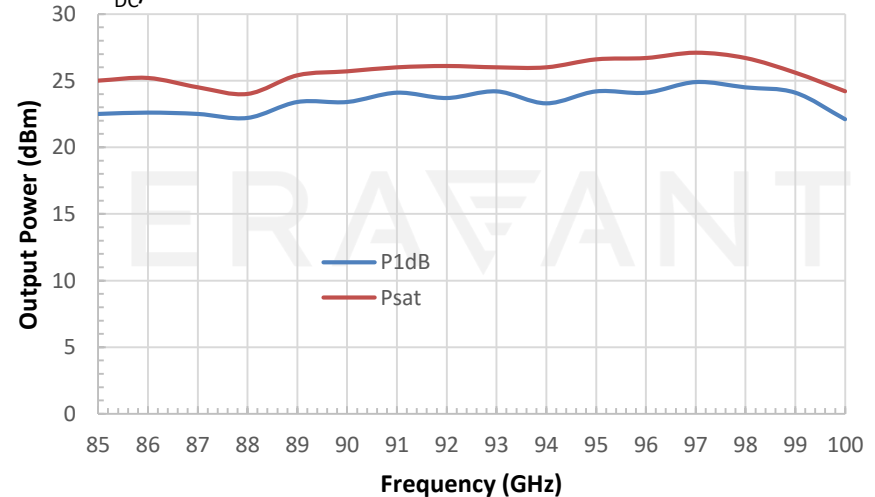
Gain and Return Loss vs. Frequency

Bias: +8 V_{DC} /1.925mA



Output Power vs. Frequency

Bias: +8 V_{DC} /1925 mA



Power Amplifier, 75 to 110 GHz, Full Band

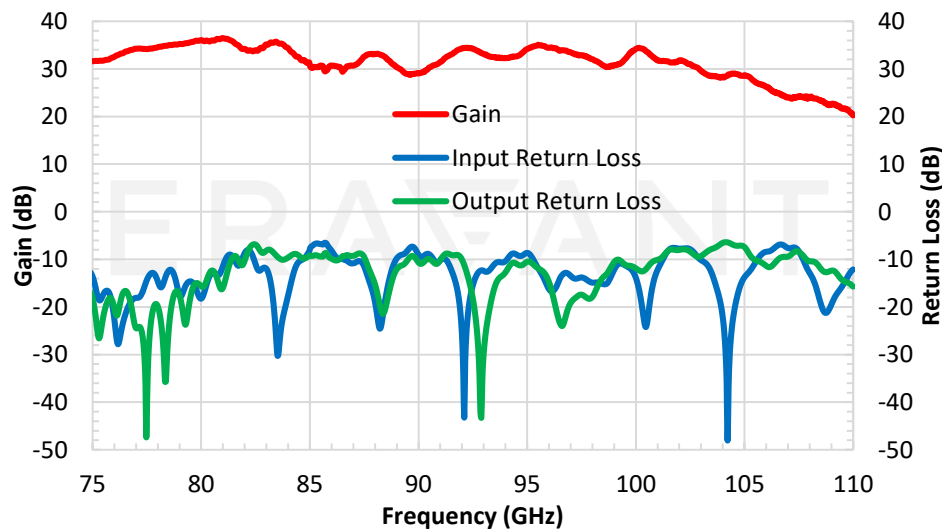
Model SBP-7531142515-1F10-E1-WC

Parameter	Minimum	Typical	Maximum
Frequency	75 GHz		110 GHz
Gain		25 dB	
P_{1dB}		+15 dBm	
P_{sat}		+20 dBm	
P_{in}			0 dBm
Input VSWR		1.9:1	
Output VSWR		1.9:1	
DC Voltage	+13 V _{DC}	+15 V _{DC}	+16 V _{DC}
DC Supply Current		190 mA	



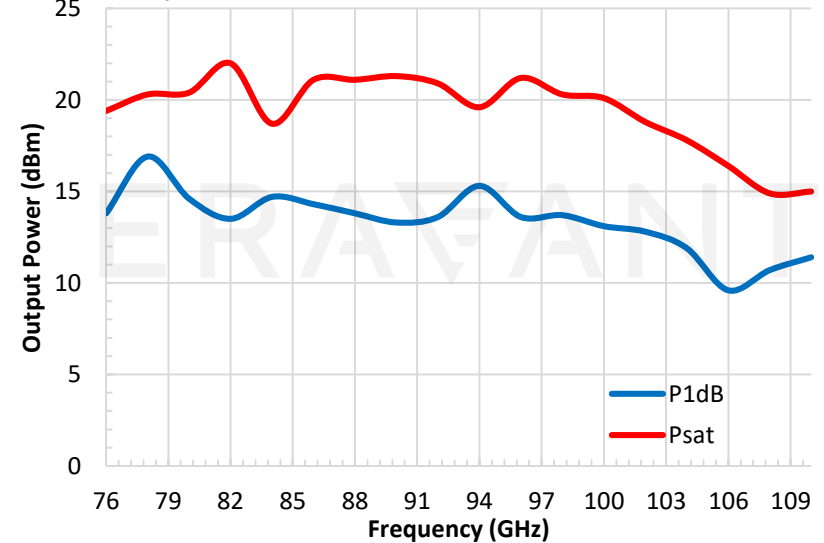
Typical Gain and Return Loss vs. Frequency

Bias: +15 V_{DC}/190 mA



Typical Output Power vs. Frequency

Bias: +15 V_{DC}/100 mA



Power Amplifier, 90 to 98 GHz, +26 dBm P-1dB

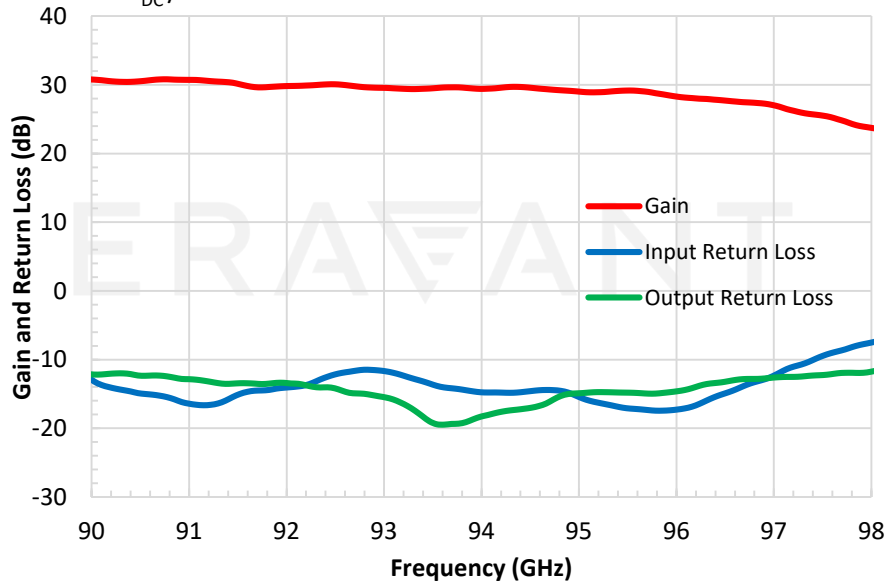
Model SBP-9039832526-1010-E1

Parameter	Minimum	Typical	Maximum
Frequency	90 GHz		98 GHz
Gain		25 dB	
P_{1dB}		+26 dBm	
P_{sat}		+29 dBm	
P_{in}			+5 dBm
Input VSWR		3:1	
Output VSWR		3:1	
DC Voltage		+15 V _{DC}	
DC Supply Current		650 mA	



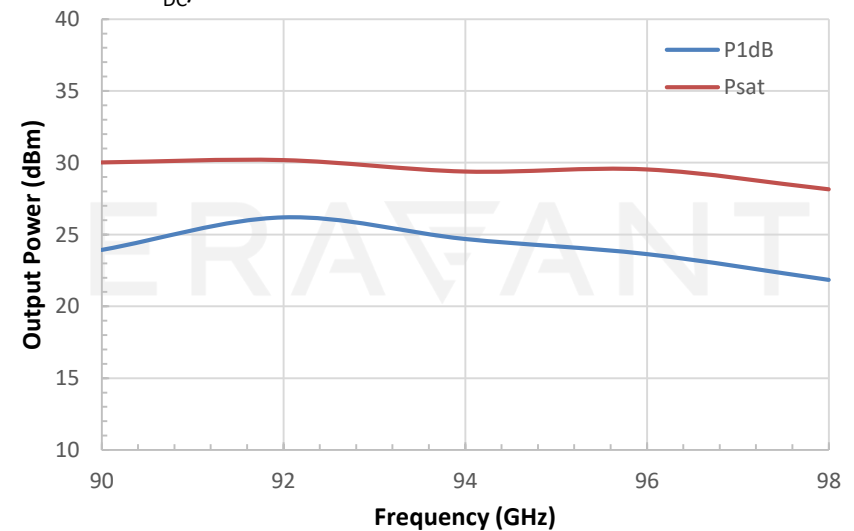
Typical Gain and Return Loss vs. Frequency

Bias: +13 V_{DC} / 620 mA



Output Power vs. Frequency

Bias: +13 V_{DC} / 620 mA



Power Amplifier, 75 to 110 GHz, +13 dBm P-1dB

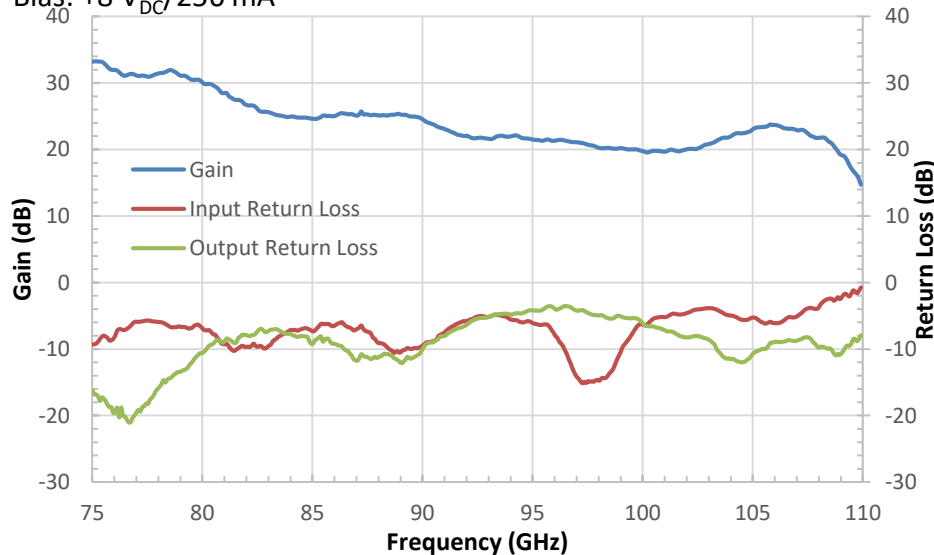
Model SBP-7531142213-1010-E1

Parameter	Minimum	Typical	Maximum
Frequency	75 GHz		110 GHz
Gain		22 dB	
P_{1dB}		+13 dBm	
P_{sat}		+14 dBm	
P_{in}			0 dBm
Input VSWR		2.3:1	
Output VSWR		2.3:1	
DC Voltage		+8 V _{DC}	
DC Supply Current		225 mA	



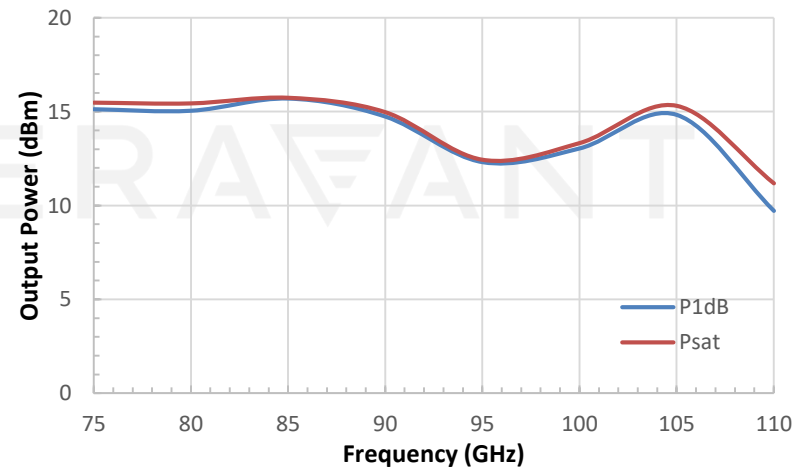
Gain and Return Loss vs. Frequency

Bias: +8 V_{DC}/256 mA



Output Power vs. Frequency

Bias: +8 V_{DC}/256 mA



Power Amplifier, 75 to 110 GHz, +15 dBm P-1dB

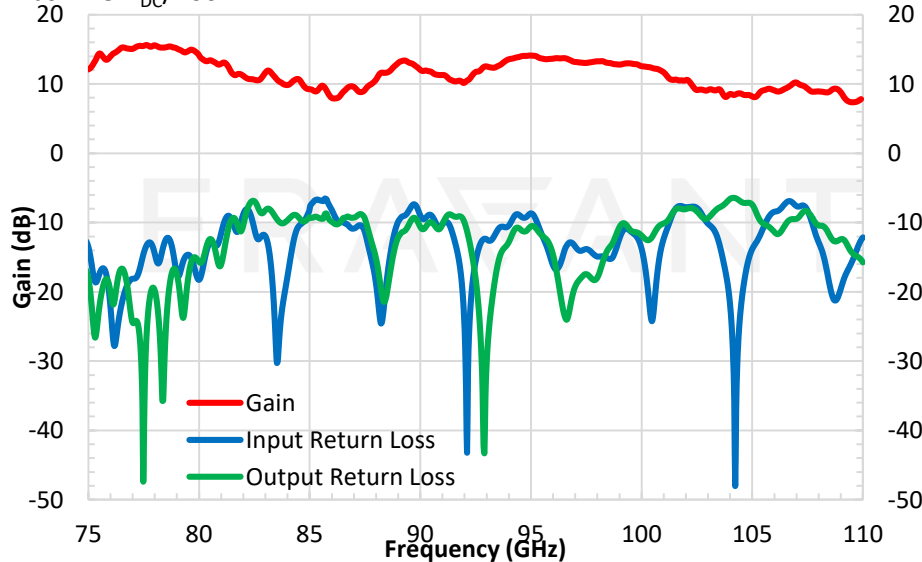
Model SBP-7531141015-1010-E1

Parameter	Minimum	Typical	Maximum
Frequency	75 GHz		110 GHz
Gain		10 dB	
P_{1dB}		+15 dBm	
P_{Sat}		+20 dBm	
P_{in}			+15 dBm
Input VSWR		2.0:1	
Output VSWR		2.0:1	
DC Voltage	+13 V _{DC}	+15 V _{DC}	+16 V _{DC}
DC Supply Current		100 mA	



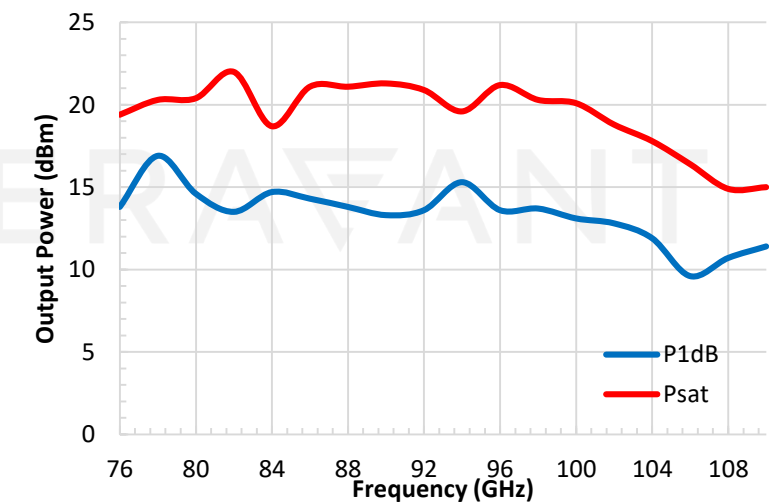
Typical Gain and Return Loss vs. Frequency

Bias: +15 V_{DC}/100 mA



Typical Output Power vs. Frequency

Bias: +15 V_{DC}/100 mA



Low Noise Amplifier, 75 to 110 GHz

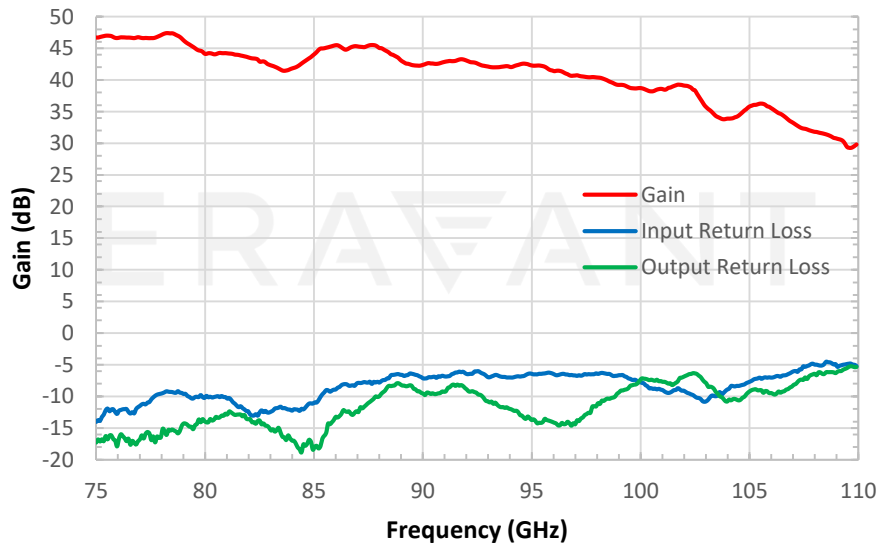
Model SBL-7531143550-1010-E1

Parameter	Minimum	Typical	Maximum
Frequency	75 GHz		110 GHz
Gain		35 dB	
Noise Figure		5 dB	
P_{in}			+15 dBm
Input VSWR		3:1	
Output VSWR		2.3:1	
DC Voltage	+6 V _{DC}	+8 V _{DC}	+15 V _{DC}
DC Supply Current		100 mA	



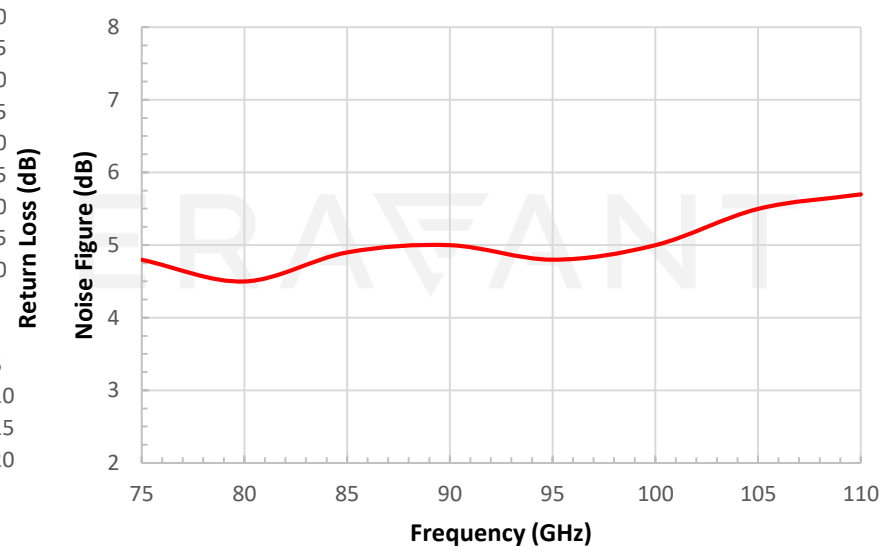
Typical Gain and Return Loss vs. Frequency

Bias: +8 V_{DC}/69 mA



Typical Noise Figure vs. Frequency

Bias: +8V_{DC}/69 mA



Low Noise Amplifier, 75 to 110 GHz

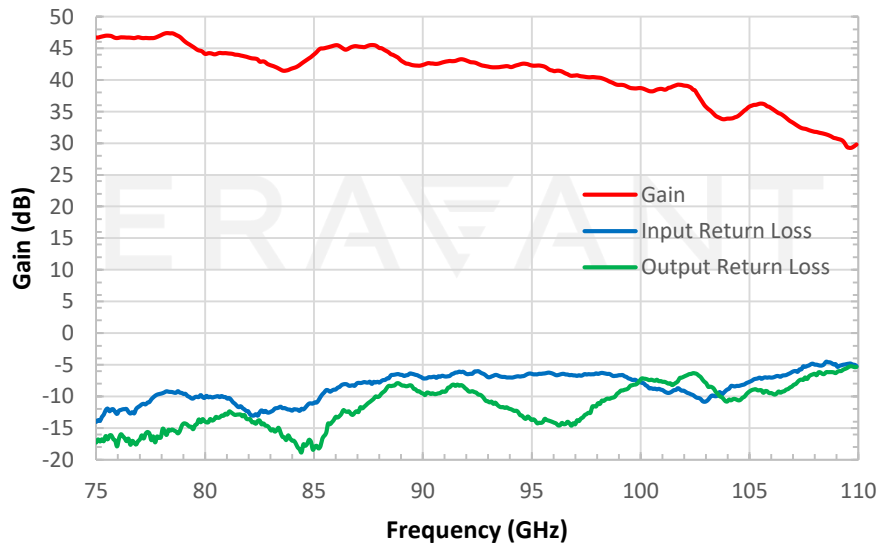
Model SBL-7531143550-1010-S1

Parameter	Minimum	Typical	Maximum
Frequency	75 GHz		110 GHz
Gain		35 dB	
Noise Figure		5 dB	
P_{in}			+15 dBm
Input VSWR		3:1	
Output VSWR		2.3:1	
DC Voltage	+6 V _{DC}	+8 V _{DC}	+15 V _{DC}
DC Current		100 mA	



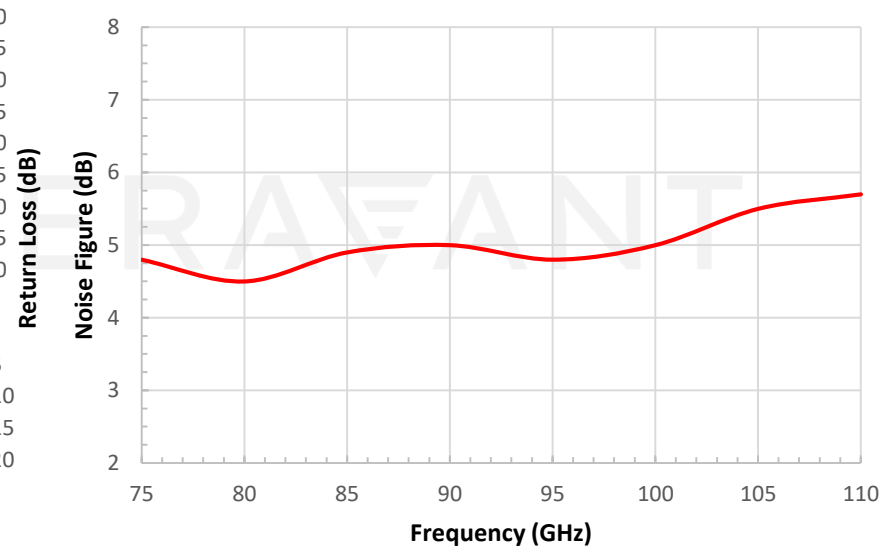
Typical Gain and Return Loss vs. Frequency

Bias: +8 V_{DC}/69 mA



Typical Noise Figure vs. Frequency

Bias: +8V_{DC}/69 mA



X6 Active Multiplier, +16 dBm Pout

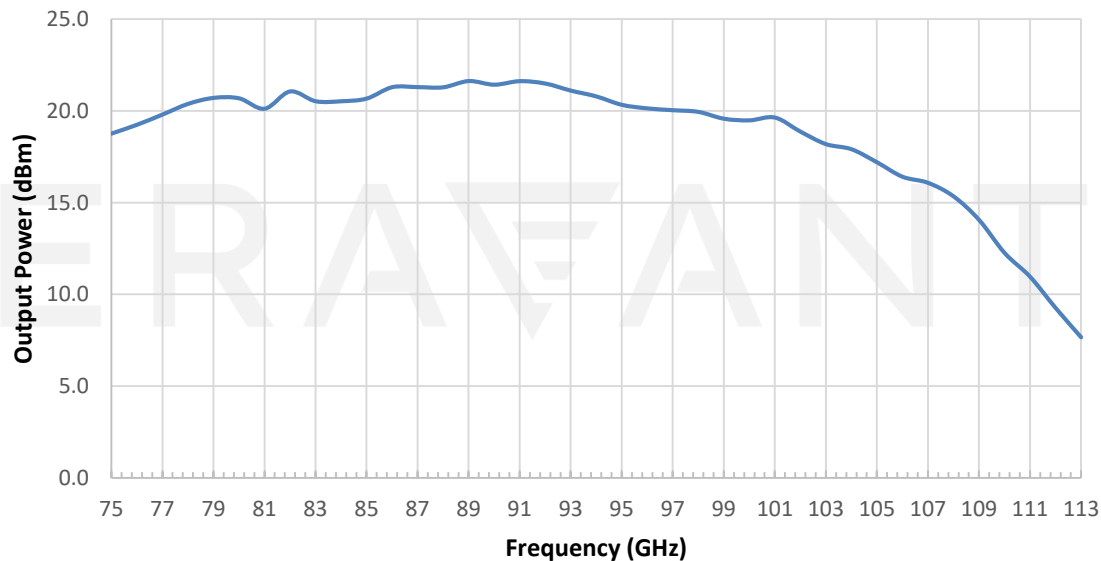
Model SFA-753114616-10SF-E1-1

Parameter	Minimum	Typical	Maximum
Input Frequency	12.5 GHz		18.83 GHz
Input Power		+3 dBm	+20 dBm
Output Frequency	75 GHz		113 GHz
Output Power	+7 dBm	+16 dBm	
Harmonic Suppression		-15 dBc	
Spurious		-60 dBc	
DC Voltage	+14 V _{DC}	+15 V _{DC}	+16 V _{DC}
DC Supply Current		550 mA	



Typical Output Power vs. Frequency

Bias: +15V_{DC} / 550 mA ; Input Power = +3 dBm



Features

- 75 to 113 GHz Coverage
- High Power Output
- Low Harmonic Emission

X8 Active Multiplier, +26 dBm Pout

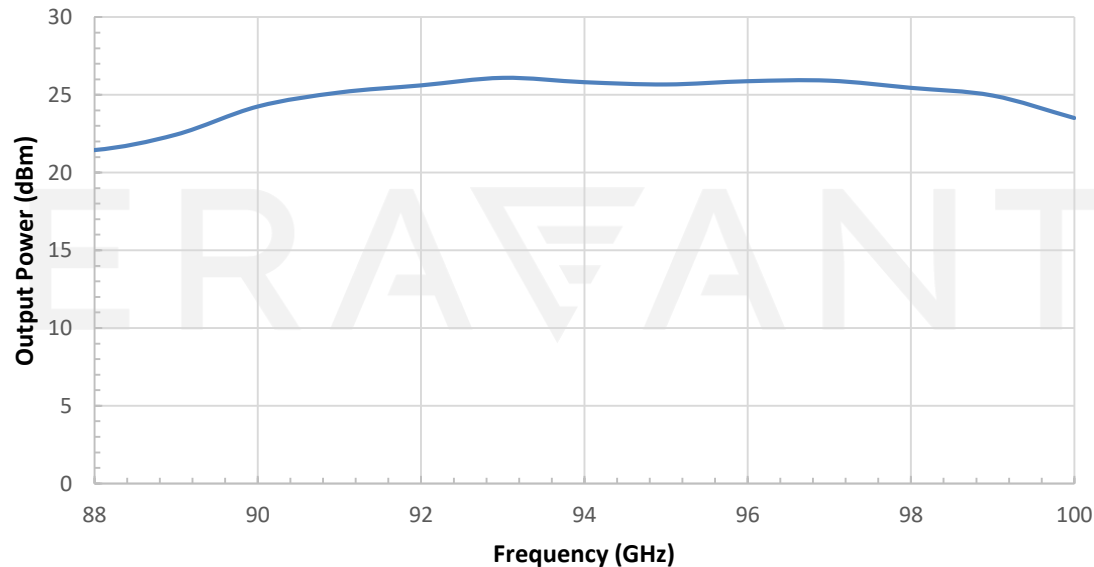
Model SFA-883104826-10SF-E1

Parameter	Minimum	Typical	Maximum
Input Frequency	11 GHz		12.5 GHz
Input Power		+5 dBm	+15 dBm
Output Frequency	88 GHz		100 GHz
Output Power		+26 dBm	
Harmonic Suppression		-15 dBc	
Port VSWR		1.9:1 dB	
DC Voltage		+8 V _{DC}	
DC Supply Current		1800 mA	



Output Power vs. Frequency

Bias: +8 V_{DC}/2 A



Features

- High Power Output
- Low Harmonic Emission

X12 Active Multiplier, +16 dBm Pout

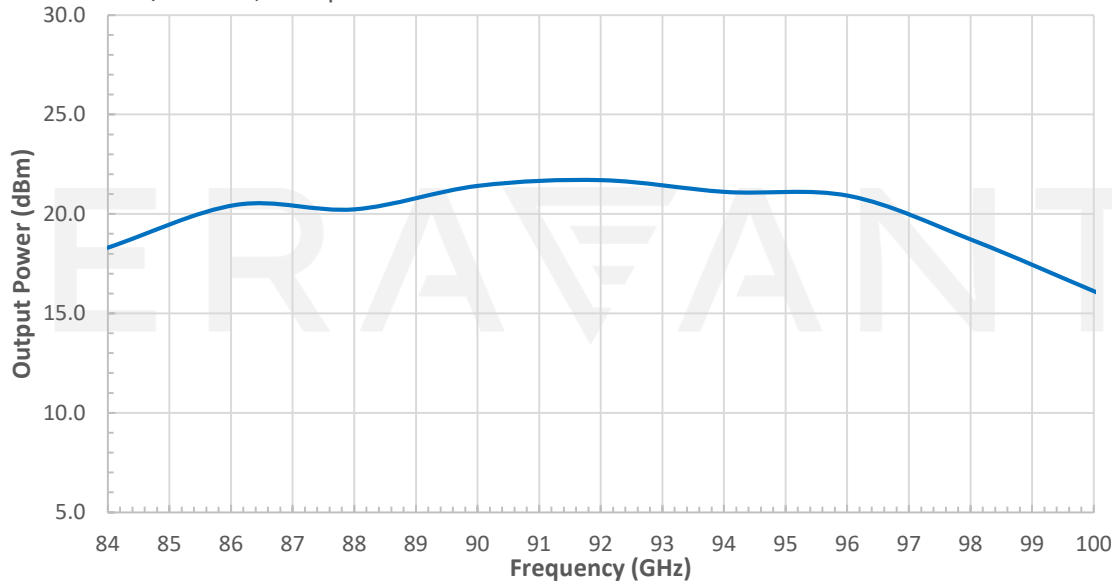
Model SFA-8431041216-10SF-E1

Parameter	Minimum	Typical	Maximum
Input Frequency	7.000 GHz		8.333 GHz
Input Power		+5 dBm	+10 dBm
Output Frequency	84 GHz		100 GHz
Output Power		+16 dBm	
Harmonic Suppression		-20 dBc	
Spurious		-60 dBc	
DC Voltage	+6 V _{DC}	+8 V _{DC}	+15 V _{DC}
DC Supply Current		400 mA	



Output Power vs. Frequency

Bias: +8 Vdc/450 mA, RF Input Power: +5 dBm



Features

- High Power Output
- Low Harmonic Emission

X2 Passive Multiplier

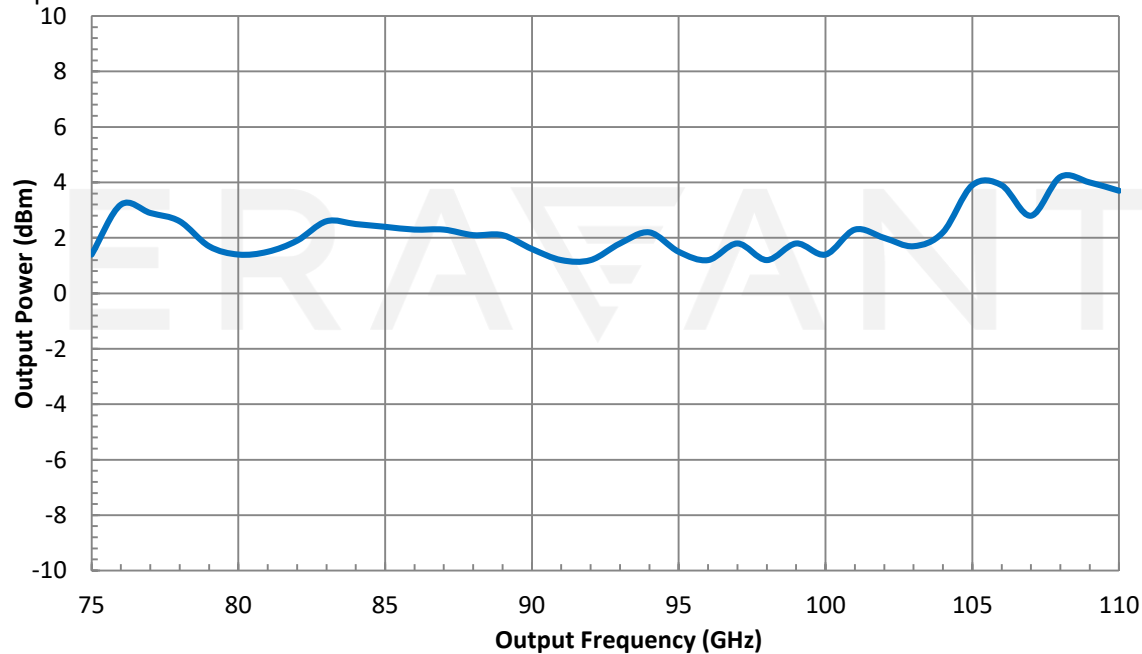
Model SFP-1022F-S2

Parameter	Minimum	Typical	Maximum
Input Frequency	37.5 GHz		55.0 GHz
Output Frequency	75.0 GHz		110.0 GHz
Input Power		+17 dBm	+19 dBm
Output Power		+0 dBm	
Harmonic Suppression		20 dB	



Output Power vs Frequency

Input Power: +16 dBm



Features

- Minimal Conversion Loss
- No External Bias
- Compact Package

X3 Passive Multiplier

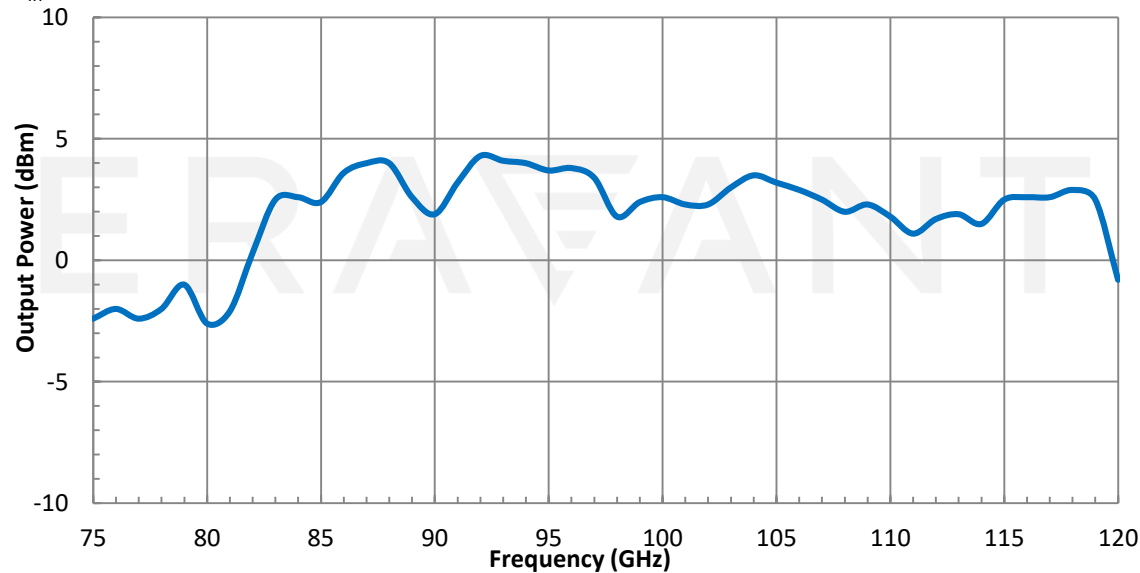
Model SFP-753124300-1028-S1

Parameter	Minimum	Typical	Maximum
Input Frequency	25 GHz		40 GHz
Output Frequency	75 GHz		120 GHz
Input Power		+20 dBm	+22 dBm
Output Power		+0 dBm	
Harmonic Suppression		20 dB	



Output Power vs. Frequency

P_{in} : +19 dBm



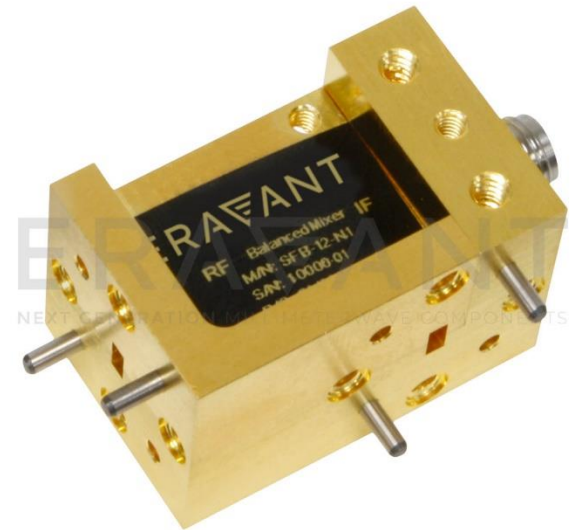
Features

- Broadband Operation
- Minimal Conversion Loss
- No External Bias
- Balanced Configuration for Low Harmonic Emissions

Balanced Mixer

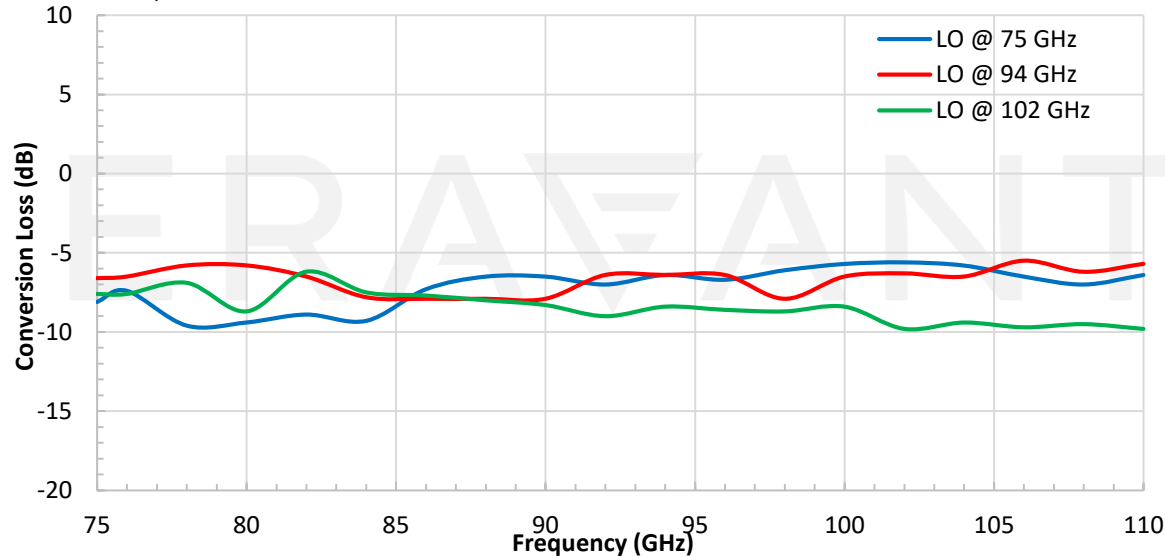
Model SFB-10-N1

Parameter	Minimum	Typical	Maximum
RF Frequency	75 GHz		110 GHz
LO Frequency	75 GHz		110 GHz
IF Frequency	DC		35 GHz
LO Pumping Power	+12 dBm	+13 dBm	+15 dBm
Conversion Loss		9 dB	12 dB
Input P _{1dB}		-3 dBm	
RF to LO Isolation		30 dB	
Combined RF and LO Power			+18 dBm



Conversion Loss vs. Frequency

RF: -20 dBm; LO: +12 dBm



Features

- Full Waveguide Band Coverage
- Low Conversion Loss
- High IF Frequency up to 35 GHz
- Compact Package

Externally Biased Balanced Mixer

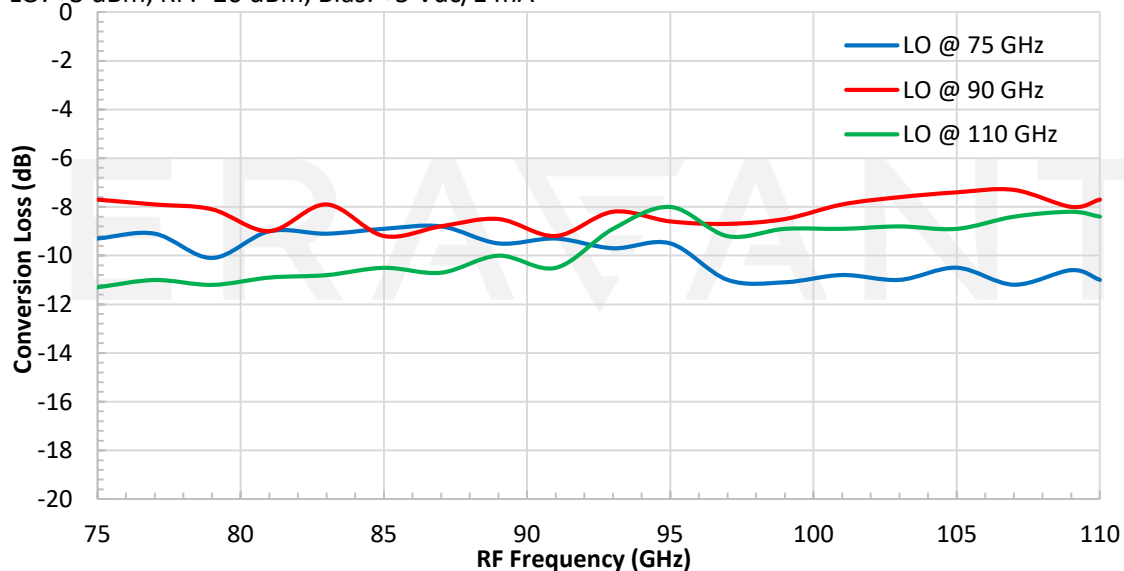
Model SFB-10-E2

Parameter	Minimum	Typical	Maximum
RF Frequency Range	75 GHz		110 GHz
LO Frequency Range	75 GHz		110 GHz
IF Frequency Range	DC		35 GHz
Required LO Pumping Power	+0 dBm	+3 dBm	+10 dBm
Conversion Loss		10 dB	
Input P-1 dB		-10 dBm	
Combined RF and LO Power			+13 dBm
External Bias Voltage		+5 V _{DC} /2mA	+5 V _{DC} /5mA



Conversion Loss vs. Frequency

LO: +3 dBm, RF: -20 dBm, Bias: +5 Vdc/1 mA



Features

- Full Waveguide Band Coverage
- Low LO Power Requirement
- Low Conversion Loss
- High IF Frequency up to 35 GHz
- Compact Package

I/Q Mixer, Full Band

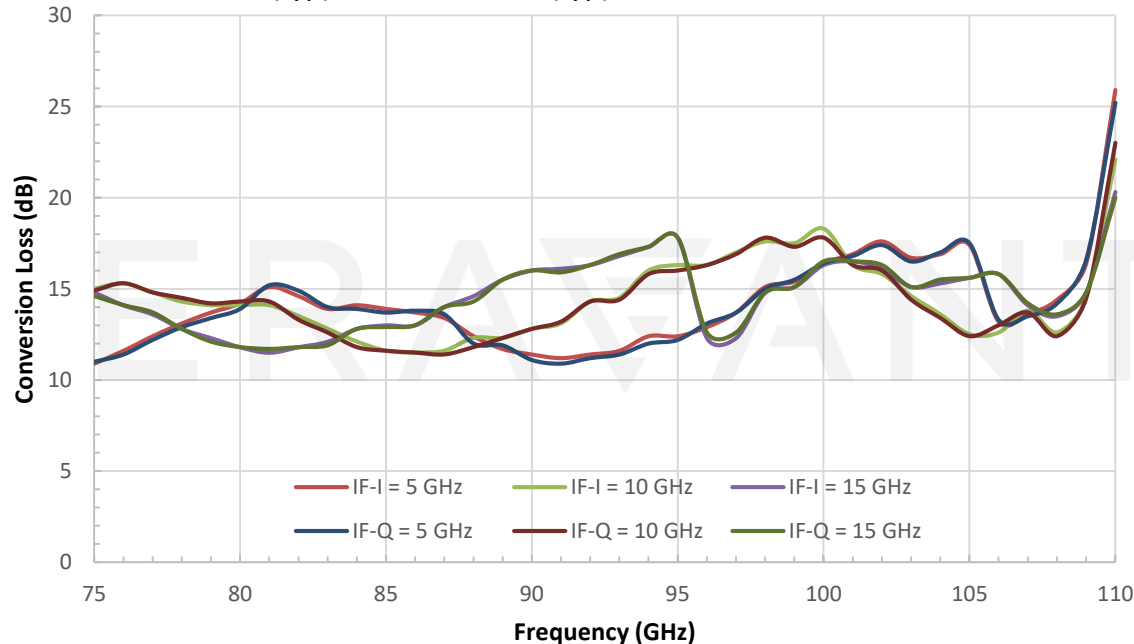
Model SFQ-75311415-1010SF-N1-M

Parameter	Minimum	Typical	Maximum
RF Frequency	75 GHz		108 GHz
LO Frequency	75 GHz		108 GHz
LO Pumping Power		+15 dBm	+20 dBm
IF Frequency	DC		20 GHz
Conversion Loss		15 dB	
I/Q Phase Unbalance		$\pm 15^\circ$	
Combined RF & LO Power			+20 dBm



Conversion Loss vs. Frequency

LO Power = 15 dBm (typ); RF Power = -20 (typ)



Features

- Full Waveguide Band Coverage
- Low Conversion Loss
- Compact Package
- IF Port DC Coupled for Phase Detection

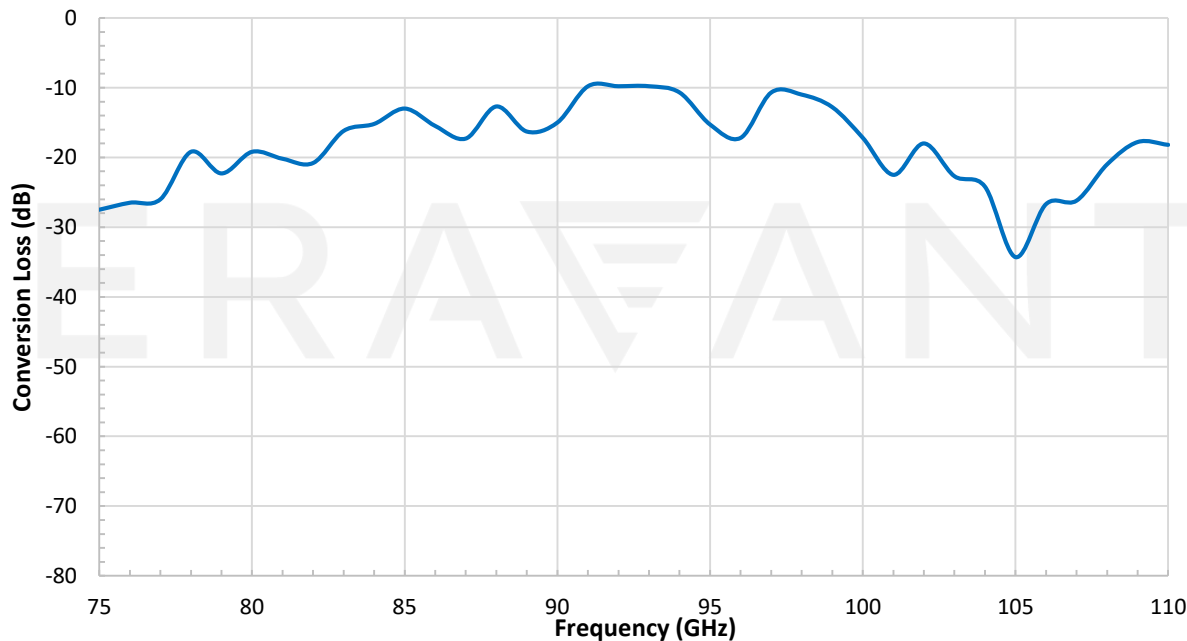
Third Harmonic Mixer

Model SFH-7531140320-10KFSF-N3

Parameter	Minimum	Typical	Maximum
RF Frequency	75 GHz		110 GHz
LO Frequency	25 GHz		36.67 GHz
IF Frequency	DC		1.5 GHz
LO Pumping Power	+8 dBm	+13 dBm	+16 dBm
Conversion Loss		20 dB	
LO to IF Isolation		30 dB	
Combined RF and LO Power			+16 dBm



Typical Conversion Loss vs. Frequency



Features

- Low LO Power Requirement
- Third Harmonic Mixing
- Compact Package

Amplitude Detector

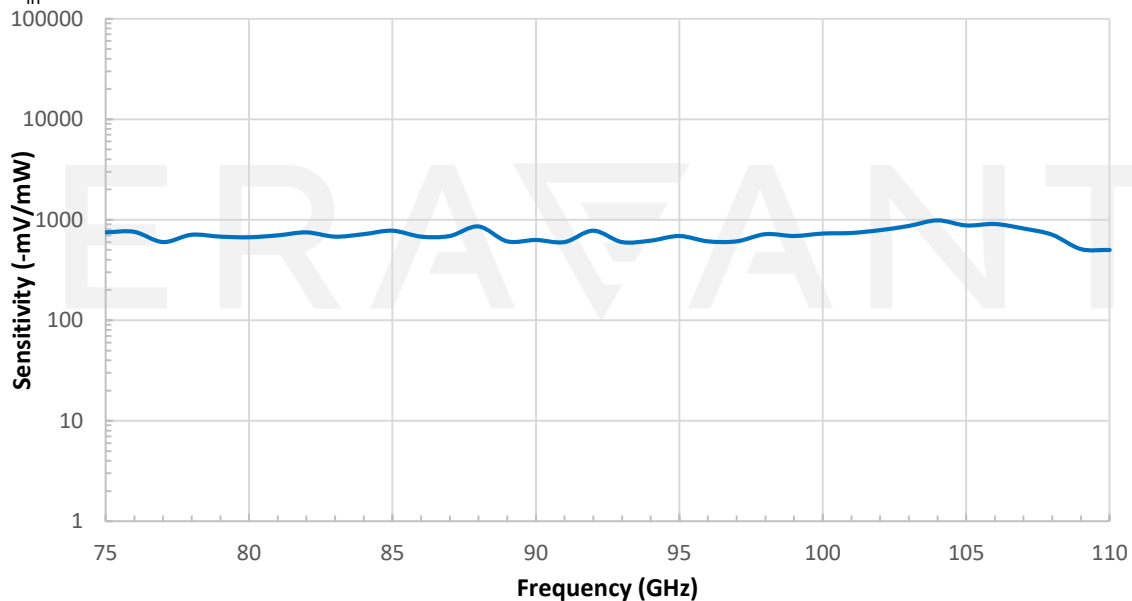
Models SFD-753114-10SF-N1 and SFD-753114-10SF-P1

Parameter	Minimum	Typical	Maximum
Frequency Range	75 GHz		110 GHz
Sensitivity (SFD-753114-10SF-N1)		-800 mV/mV	
Sensitivity (SFD-753114-10SF-P1)		+800 mV/mV	
Sensitivity Flatness		± 2.0 dB	
Linear Detection Range	-45 dBm	-10 dBm	0 dBm
RF Input Power		-20 dBm	+17 dBm
Video Bandwidth		10 MHz	



Typical Performance vs. Frequency

$P_{in} = -20$ dBm



Features

- Full Waveguide Band Operation
- High Sensitivity Without Tuning
- High Sensitivity Stability Over Broad Temperature Range

Amplitude Detector with Isolator

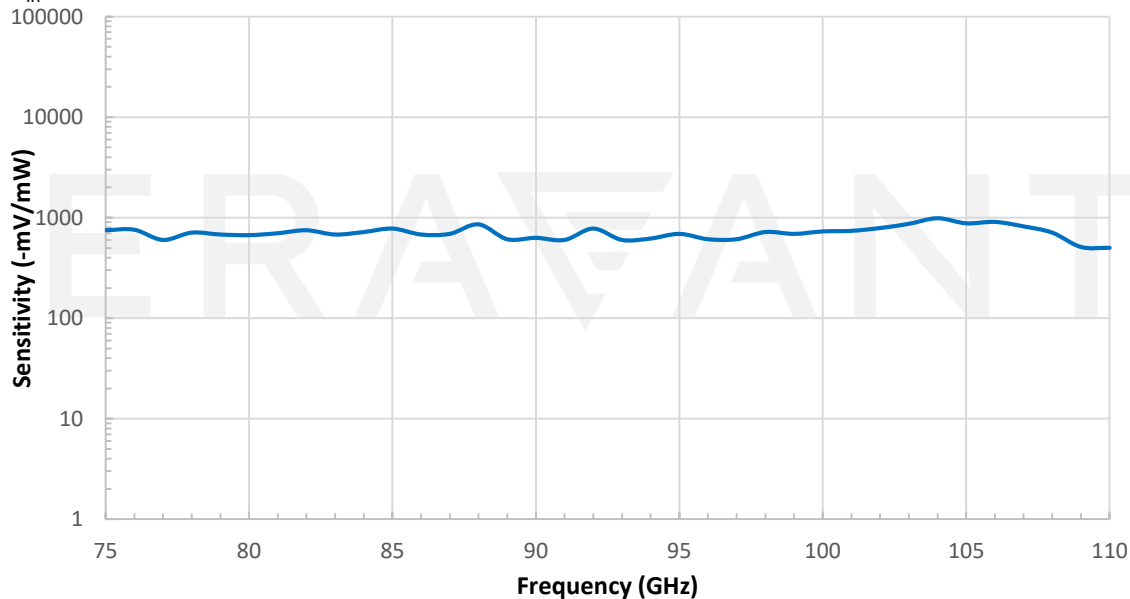
Models STD-10SF-NI and STD-10SF-PI

Parameter	Minimum	Typical	Maximum
Frequency Range	75 GHz		110 GHz
Sensitivity (STD-10SF-NI)		-800 mV/mV	
Sensitivity (STD-10SF-PI)		+800 mV/mV	
Sensitivity Flatness		± 2.0 dB	
Linear Detection Range	-45 dBm	-10 dBm	0 dBm
RF Input Power		-20 dBm	+17 dBm
Video Bandwidth		10 MHz	



Typical Performance vs. Frequency

$P_{in} = -20$ dBm



Features

- Full Waveguide Band Operation
- High Sensitivity Without Tuning
- Faraday Isolator Integrated

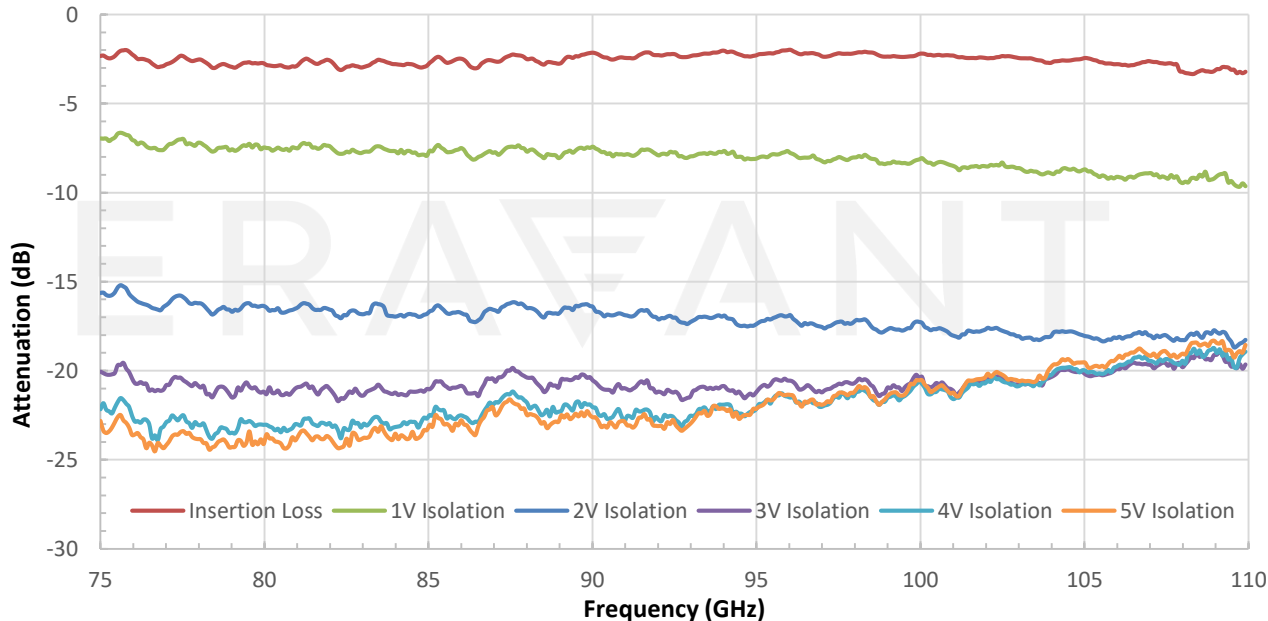
Electrical Attenuator

Model SKA-7531142520-1010-A1

Parameter	Minimum	Typical	Maximum
Frequency	75 GHz		110 GHz
Insertion Loss		2.5 dB	3.0 dB
Attenuation	3.0 dB	20 dB	30 dB
Power Handling		+20 dBm	
Control Voltage		0 to -5 V _{DC} / 5 mA	0 to -6 V _{DC} / 8 mA
Controlling Speed		100 ns	



Typical Attenuation vs. Frequency at Various Control Voltage Value



Features

- Low Insertion Loss
- High Dynamic Range
- Fast Control Speed

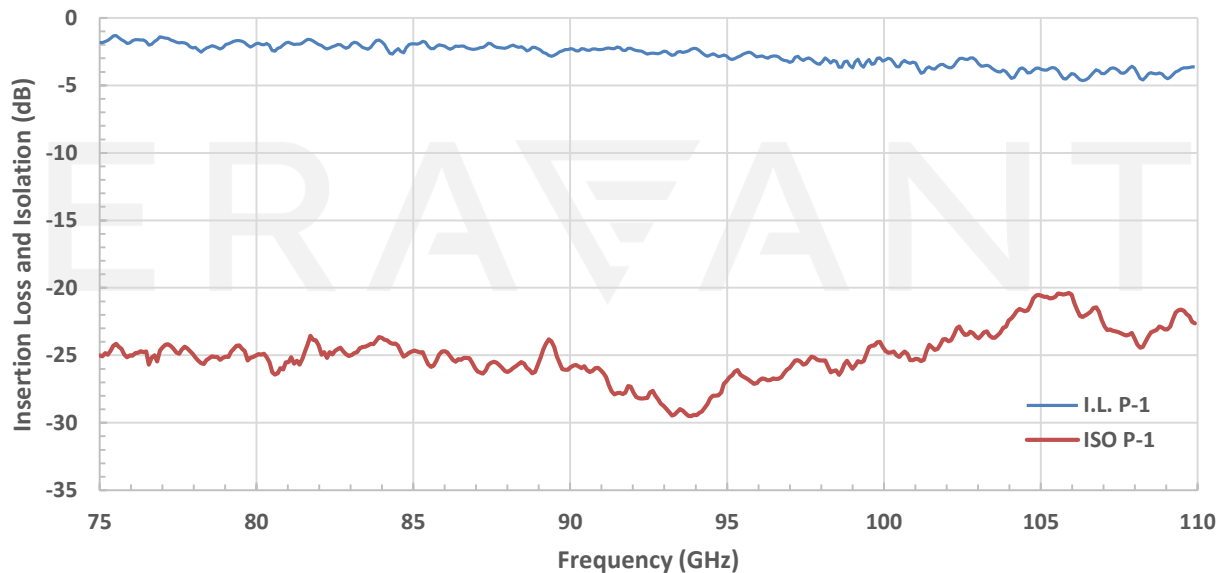
SPST PIN Diode Switch

Model SKS-7531142520-1010-R1

Parameter	Minimum	Typical	Maximum
RF Frequency	75 GHz		110 GHz
Insertion Loss		2.5 dB	
Isolation		15 dB	
Power Handling		+20 dBm	+23 dBm
Bias Voltage		$\pm 5 V_{DC}$	
Bias Current		10 mA	
Control Signal		TTL	
Switching Speed		100 ns	



Typical Insertion Loss and Isolation vs. Frequency



Features

- Low Insertion Loss
- High Isolation
- Fast Control Speed

SPDT PIN Diode Switch

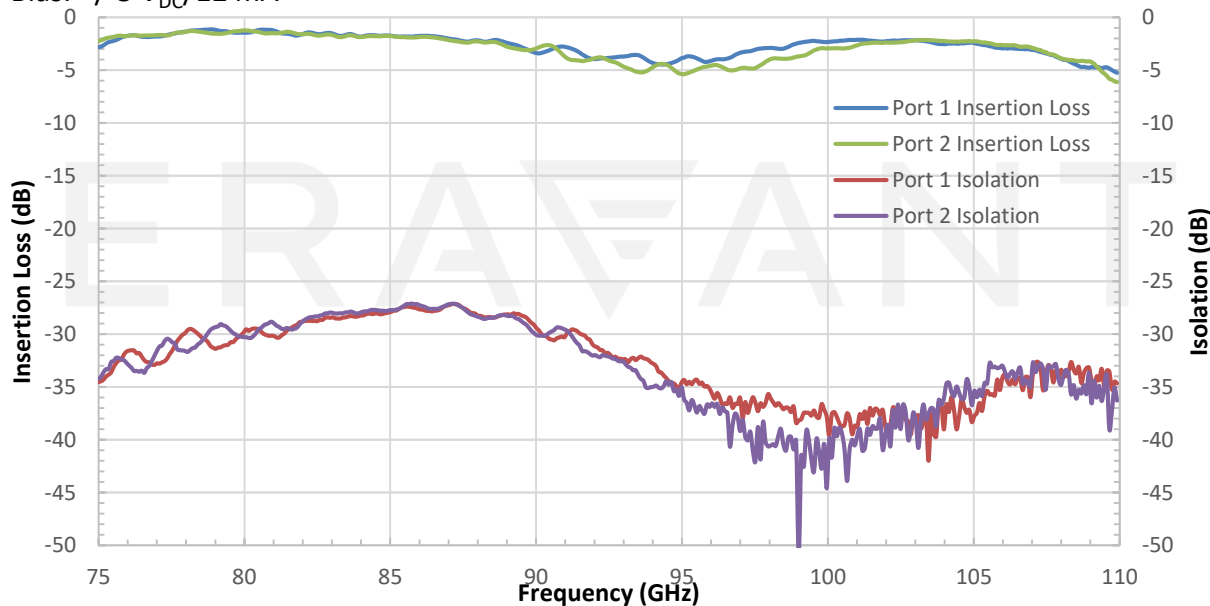
Model SKD-7531143530-1010-R1-M

Parameter	Minimum	Typical	Maximum
Frequency	75 GHz		110 GHz
Insertion Loss		3.5 dB	
Isolation	25 dB	30 dB	
Maximum Input Power			+30 dBm
Control Signal		TTL	
Switching Speed		100 ns	
Bias Voltage		$\pm 5 V_{DC}$	
Bias Current		10 mA	



Typical Performance vs. Frequency

Bias: $\pm 5 V_{DC}/12 \text{ mA}$



Features

- Low Insertion Loss
- High Isolation
- Fast Control Speed

SP4T PIN Diode Switch

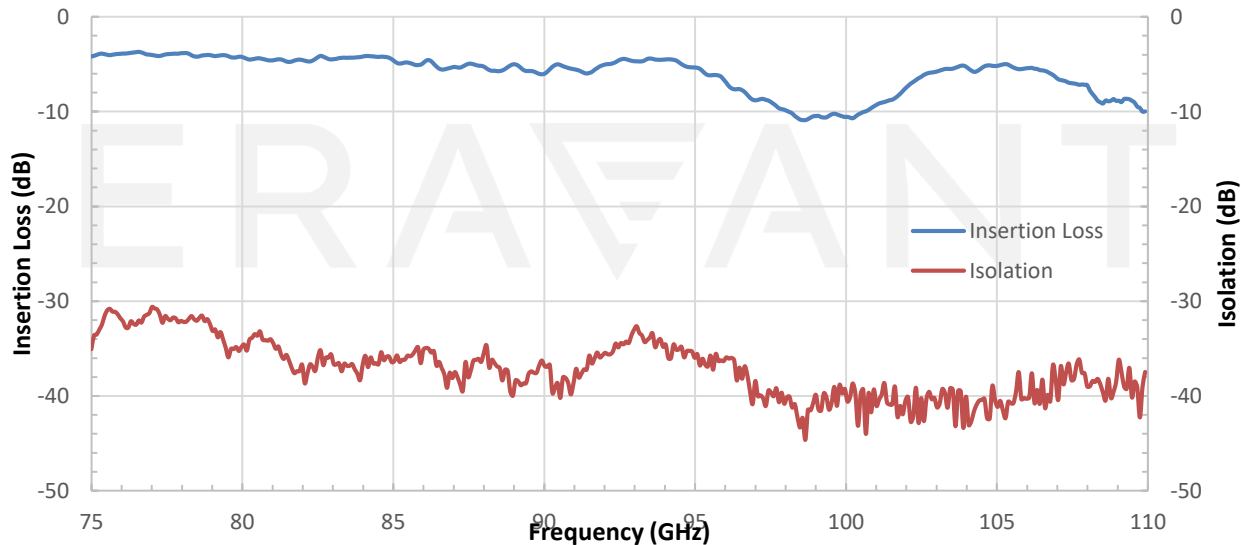
Model SK4-7531148030-1010-R1-M

Parameter	Minimum	Typical	Maximum
Frequency	75 GHz		110 GHz
Insertion Loss		8.0 dB	
Isolation		30 dB	
VSWR		2.0:1 @ "On" State	
Control Voltage		$\pm 5 V_{DC}$	
Control Current		30 mA	
Power Handling			+30 dBm
Switching Speed		100 ns	



Insertion Loss and Isolation vs. Frequency

Bias: $\pm 5V_{DC}/37 \text{ mA}$



Features

- Broad Band Coverage
- High Isolation
- Compact Size

Waveguide Motorized Switch

Model SWJ-10-TS

Features

- Low Insertion Loss
- High Isolation
- TTL Control

Applications:

- Test Set
- Communication Systems
- Radar Systems



Parameter	Minimum	Typical	Maximum
Frequency	75 GHz		110 GHz
Insertion Loss		0.8 dB	
Isolation		50 dB	
Bias Voltage		$\pm 28 V_{DC}$	$\pm 30 V_{DC}$
Bias Current		250 mA	
VSWR			1.2:1
Control Signal		TTL	
Switching Speed		150 ms	300 ms
Power Handling			100 W (CW)

Waveguide to Coax Adapter

Models SWC-101F-R1 and SWC-101M-R1

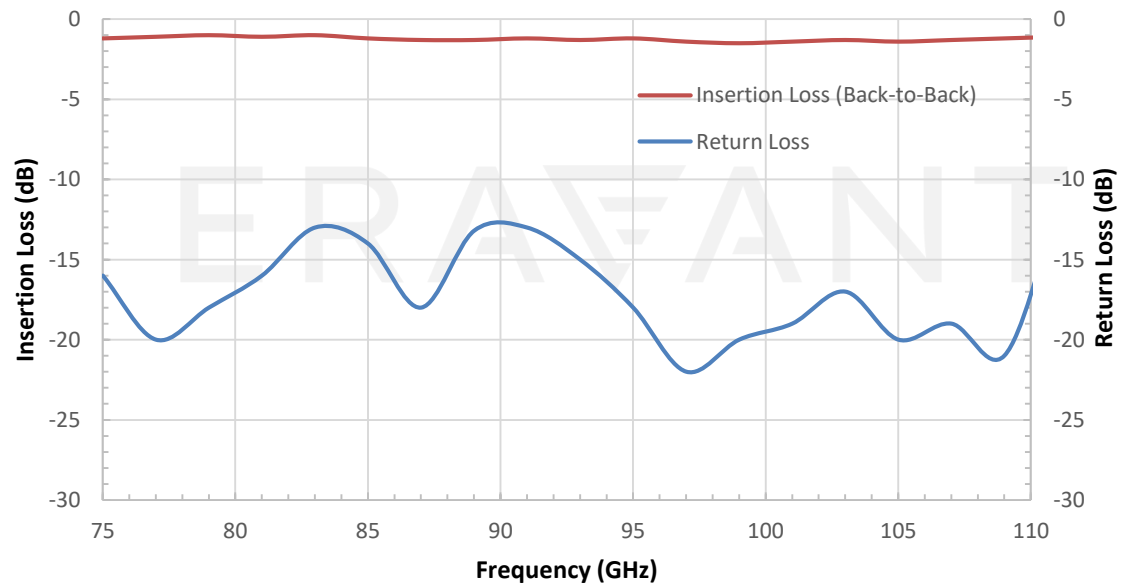
Parameter	Minimum	Typical	Maximum
Frequency Range	75 GHz		110 GHz
Insertion Loss		1.2 dB	1.6 dB
Return Loss	12 dB	15 dB	
Power Handling			10 W (CW)



Features

- Full Waveguide Band Coverage
- Lower Insertion Loss and VSWR
- Instrumentation Grade
- DC Open Circuit

Return Loss and Back-to-Back Insertion Loss vs. Frequency



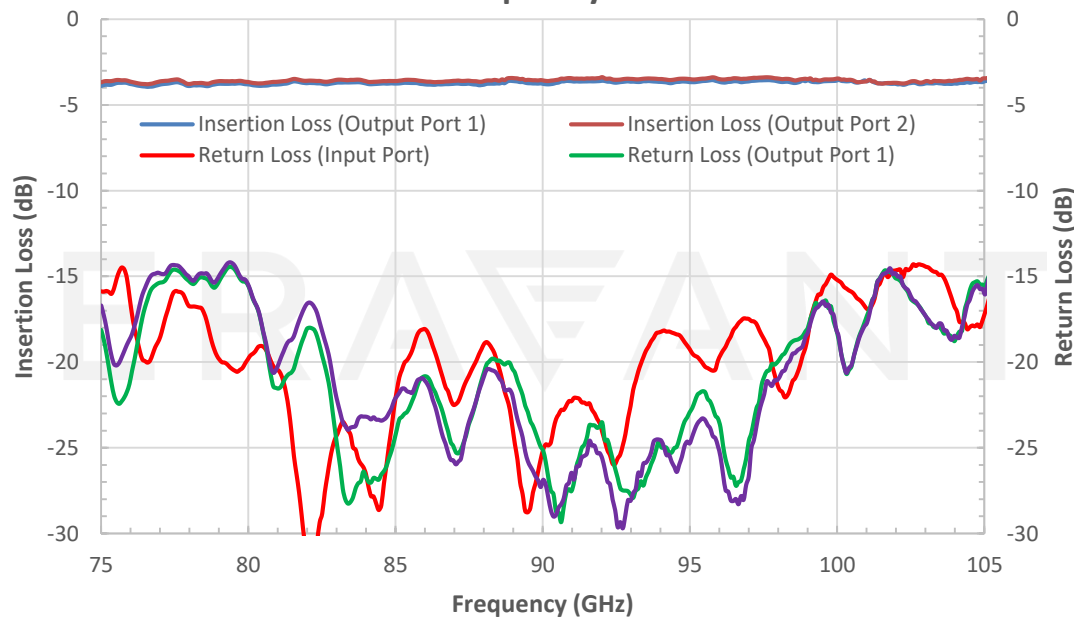
Waveguide 2-Way Power Divider

Model SWP-75311402-12-S1

Parameter	Minimum	Typical	Maximum
Frequency	75 GHz		105 GHz
Power Unbalance		± 0.3 dB	
Insertion Loss		0.8 dB	
Isolation		20 dB	
Input / Output VSWR			1.5:1



Insertion and Return Loss vs Frequency



Features

- 2, 4, 8, 16, 32 Ways
- Right Angle and Inline Configuration
- Low Insertion Loss
- High Isolation
- Compact Package

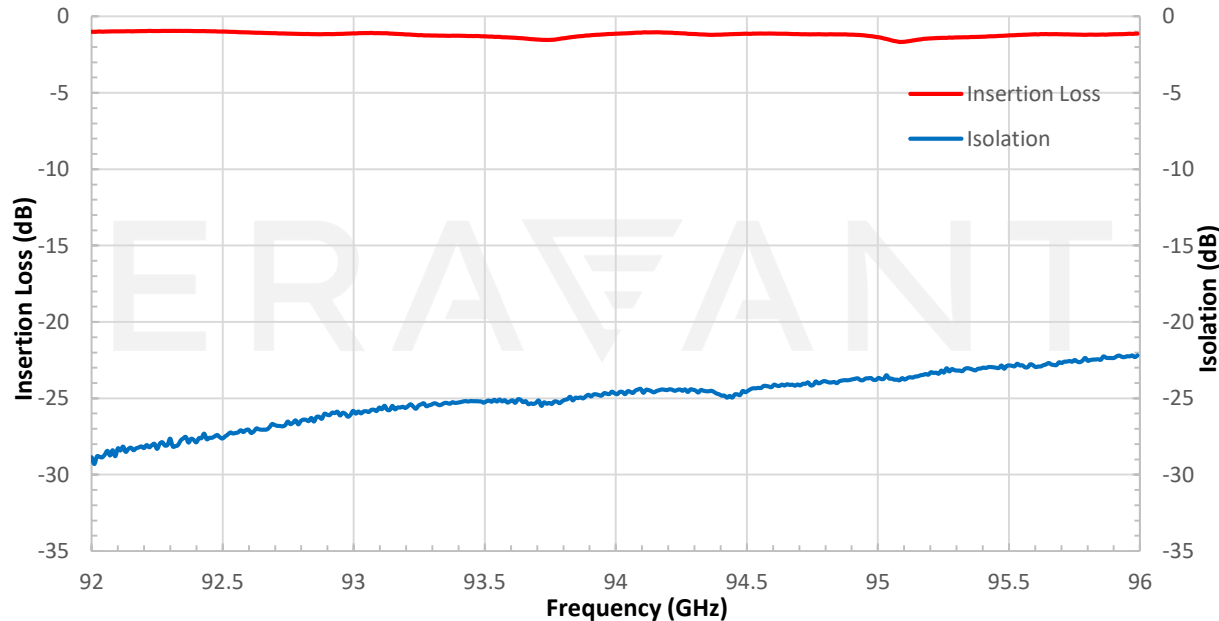
Waveguide 4-Way Power Divider

Model SWP-92396304-10-S1

Parameter	Minimum	Typical	Maximum
Frequency	92 GHz		96 GHz
Insertion Loss		1.0 dB	
Power Imbalance		± 0.4 dB	
Port Isolation		20 dB	
Input / Output VSWR		1.5:1	



Typical Isolation and Insertion Loss vs. Frequency



Features

- 2, 4, 8, 16, 32 Ways
- Right Angle and Inline Configuration
- Low Insertion Loss
- High Isolation
- Inline Configuration

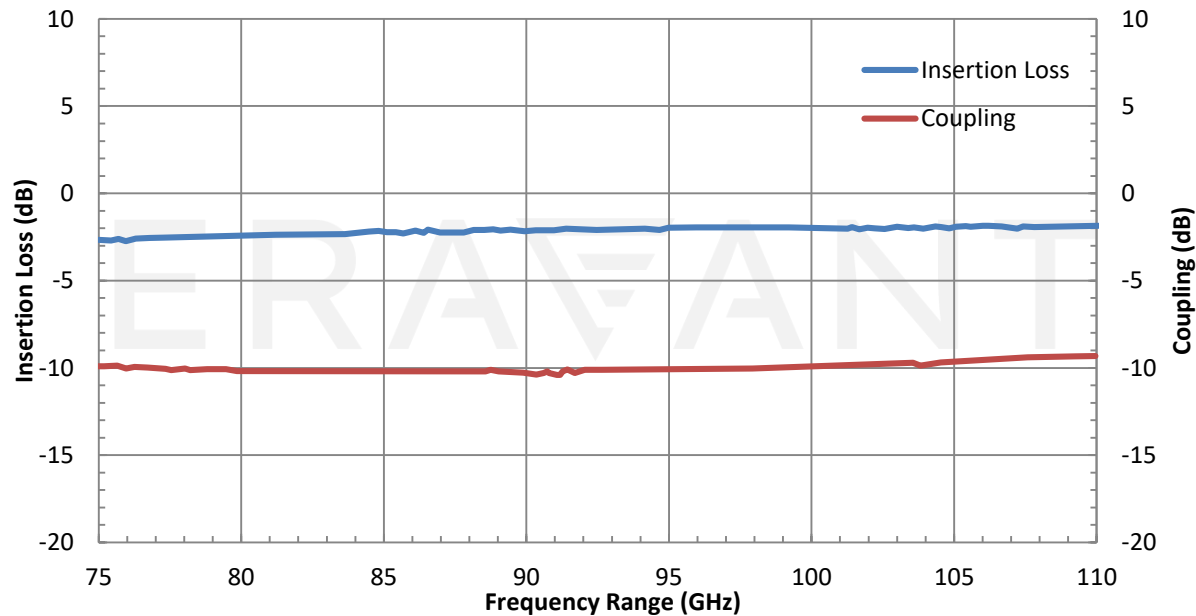
Waveguide Directional Coupler

Model SWD-1040H-10-SB

Parameter	Minimum	Typical	Maximum
Frequency	75 GHz		110 GHz
Insertion Loss*		1.0 dB	
Coupling*		10 dB	
Directivity*	30 dB	40 dB	
Main Line VSWR			1.1:1



Typical Insertion Loss and Coupling vs. Frequency



Features

- Full Band Operation
- 3, 6, 10, 20, 30, 40 dB
- Dual Directional
- Bi-Directional
- Waveguide Version
- Low Insertion Loss
- High Directivity

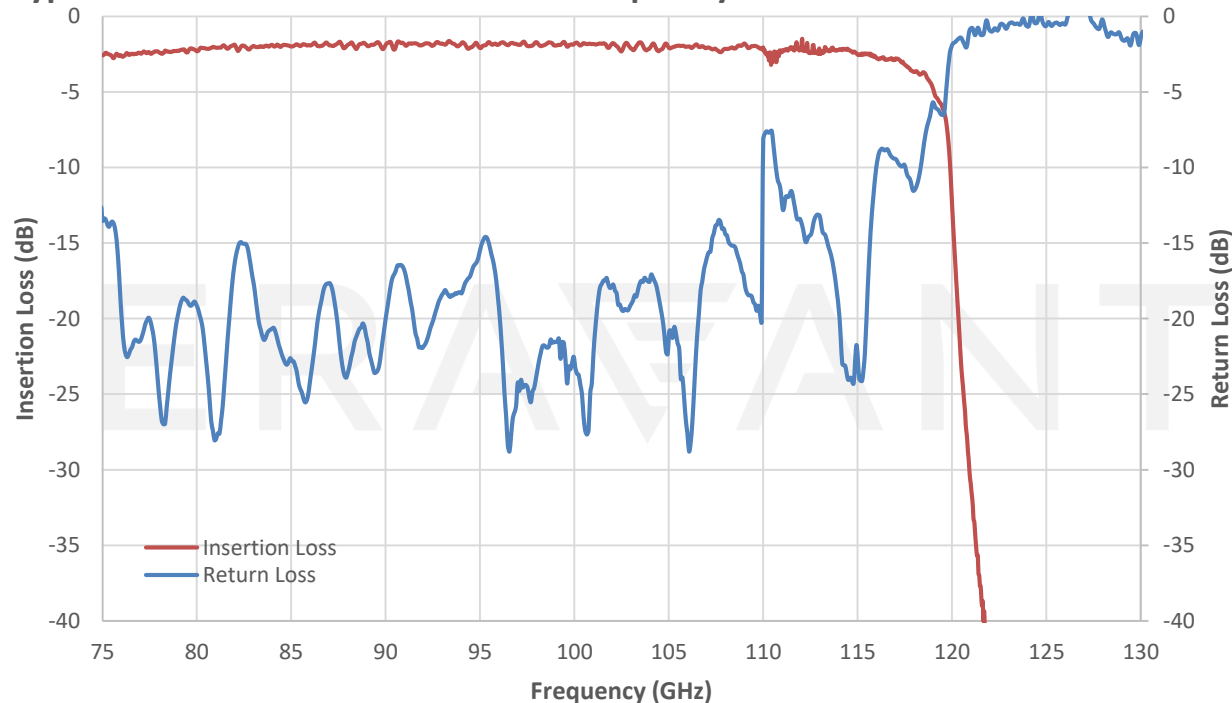
Waveguide Lowpass Filter 70 to 118 GHz

Model SWF-12412460-10-L1

Parameter	Minimum	Typical	Maximum
Passband Frequency	70 GHz		118 GHz
Passband Insertion Loss		2.5 dB	
Rejection Frequency, Low Side	DC		59 GHz
Rejection Frequency, High Side	123 GHz		200 GHz
Rejection		60 dB	
Passband VSWR		1.5:1	



Typical Insertion and Return Loss vs Frequency



Features

- Lowpass, Highpass and Bandpass
- Narrow and Broadband
- Low Cost
- Low Insertion Loss
- High Rejection

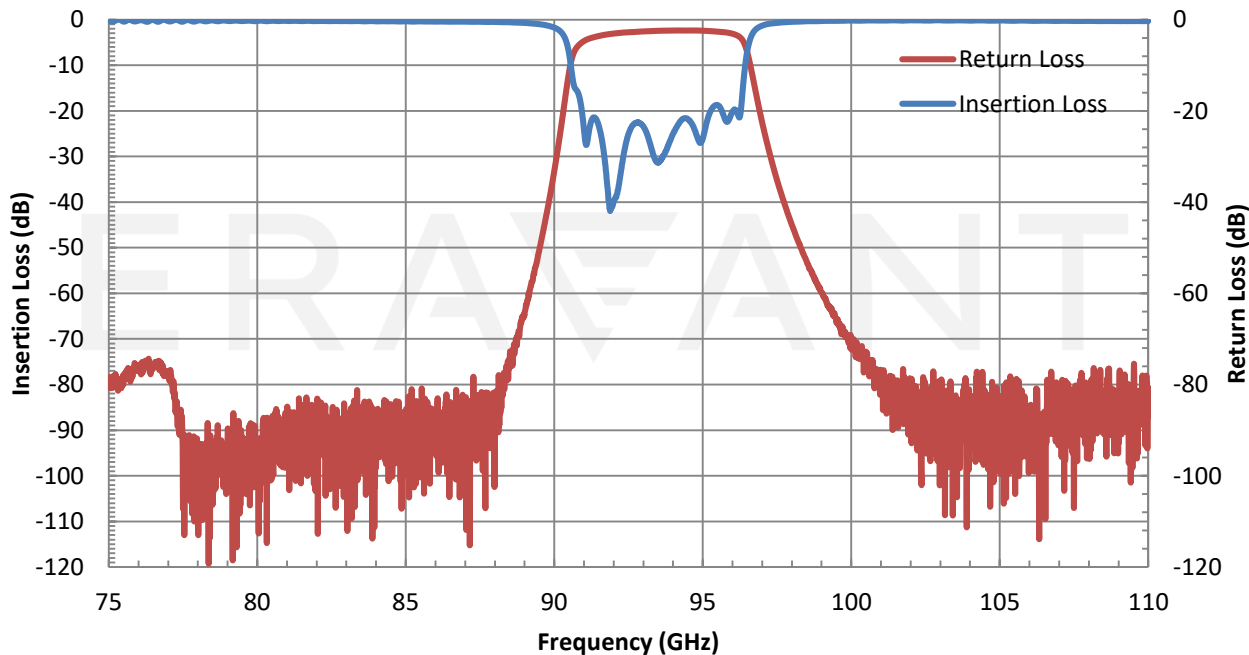
Waveguide Bandpass Filter

Model SWF-94304340-10-B1

Parameter	Minimum	Typical	Maximum
Passband Frequency	92 GHz		96 GHz
Passband Insertion Loss		2.5 dB	3.5 dB
Passband Ripple		± 0.3 dB	
Rejection Frequency, Low Side	DC		90 GHz
Rejection Frequency, High Side	98 GHz		130 GHz
Rejection	35 dB	40 dB	
Passband VSWR		1.5:1	



Insertion Loss and Return Loss vs. Frequency



Features

- Lowpass, Highpass and Bandpass
- Narrow and Broadband
- Low Cost
- Low Insertion Loss
- High Rejection

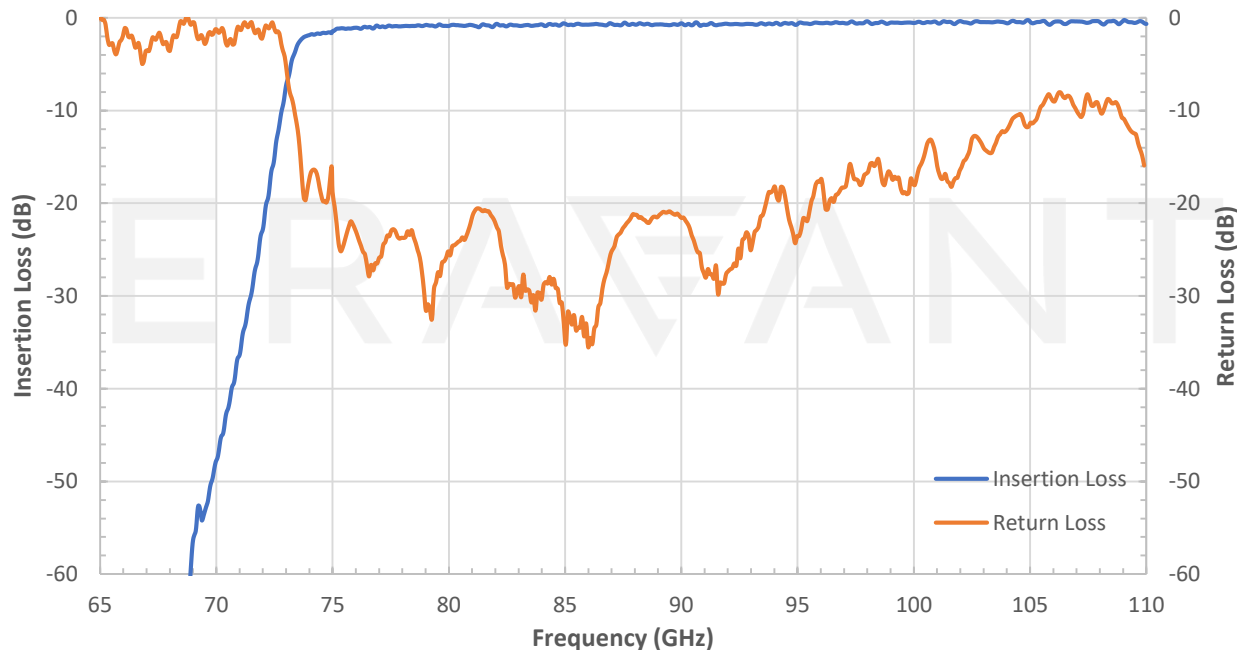
Waveguide Highpass Filter, 75 GHz and Higher

Model SWF-75370340-10-H1

Parameter	Minimum	Typical	Maximum
Passband Frequency	75 GHz		
Passband Insertion Loss		1.0 dB	
Passband Ripple		± 0.4 dB	
Passband VSWR		1.4:1	
Rejection Frequency	DC		70 GHz
Rejection		40 dB	
Waveguide	WR-10 with UG-387/U-M Anti-Cocking Flange		



Typical Insertion and Return Loss vs Frequency



Features

- Lowpass, Highpass and Bandpass
- Narrow and Broadband
- Low Cost
- Low Insertion Loss
- High Rejection

Waveguides

- Straights: 1", 2" etc. and Custom Length
- Bends, 45°, 90° and Custom Angle
- Twists, 45°, 90° and Custom Angle
- Flexible Waveguides, 1", 2", 3" and 4"



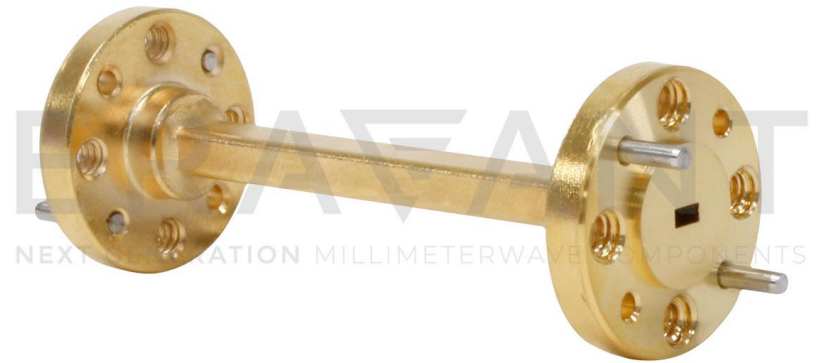
Waveguide E-Bend: 90°



Waveguide H-Bend: 90°



Flexible Waveguide: 2"



Waveguide Straight: 2"



Waveguide Twist: 90°

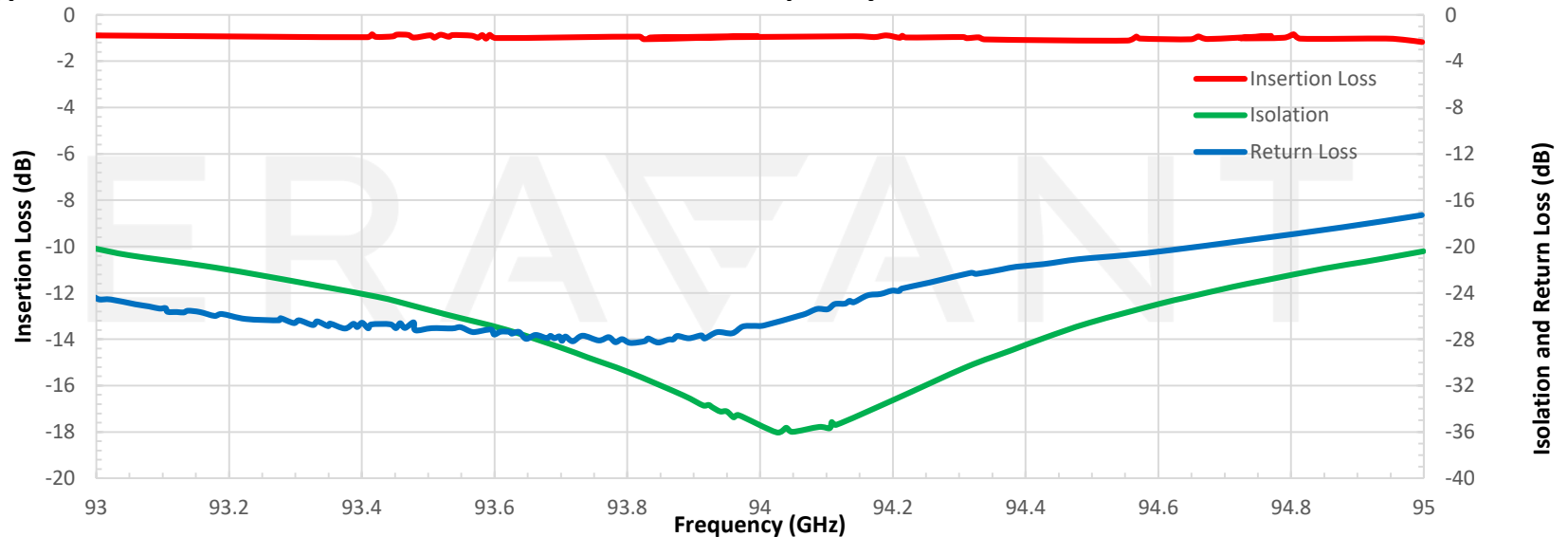
Junction Isolators and Circulators, 93 to 95 GHz

Model **SNW-9339531018-10-I1** and **SNW-9339531018-10-C1**

Parameter	Minimum	Typical	Maximum
Frequency	93 GHz		95 GHz
Insertion Loss		1.0 dB	
Isolation	14 dB	18 dB	
VSWR		1.4:1	
Forward Power Handling		2 W (CW)	3 W (CW)
Reverse Power Handling		0.5 W (CW)	1 W (CW)



Typical Insertion Loss, Isolation and Return Loss vs. Frequency



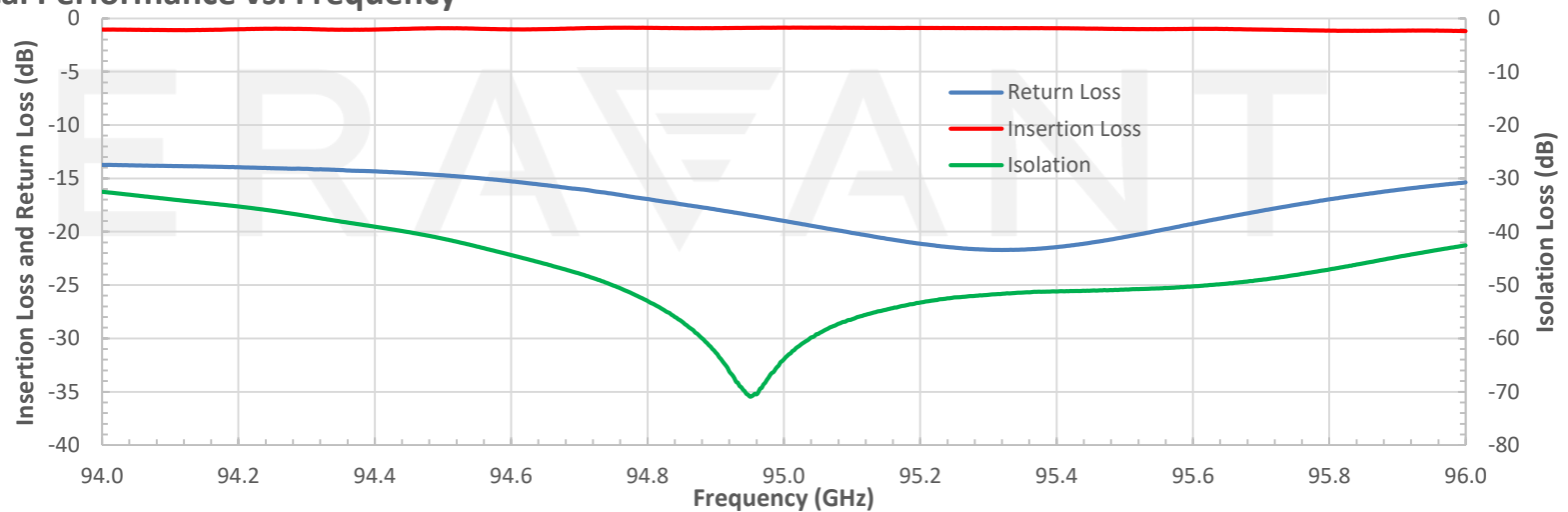
Three Junction Circulator, to 81 GHz

Model SNW-9439631535-10-CM

Parameter	Minimum	Typical	Maximum
Frequency	94 GHz		96 GHz
Insertion Loss* (Port 1 to Port 2 & Port 2 to Port 3)		1.5 dB	
Isolation* (Port 2 to Port 1 & Port 3 to Port 2)		35 dB	
Insertion Loss (Port 3 to Port 1)*		45 dB	
Isolation (Port 1 to Port 3)*		25 dB	
VSWR		1.3:1	



Typical Performance vs. Frequency



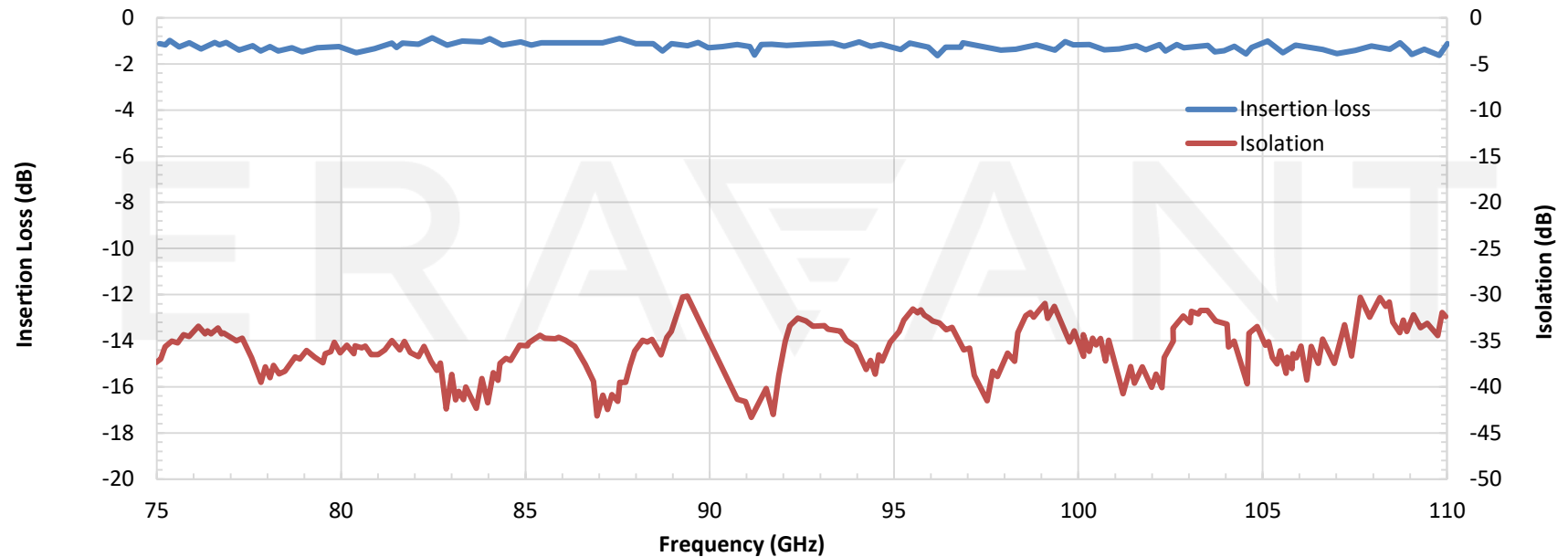
Faraday Isolator, Full Band

Model STF-10-S1

Parameter	Minimum	Typical	Maximum
RF Frequency	75 GHz		110 GHz
Insertion Loss		1.5 dB	2.2 dB
Isolation		28 dB	
VSWR		1.4:1	
Power Handling		1.0 W (CW)	1.2 W (CW)



Typical Performance vs. Frequency



Transmitter Module, 92 to 96

Model SST-9430432030-10-M1

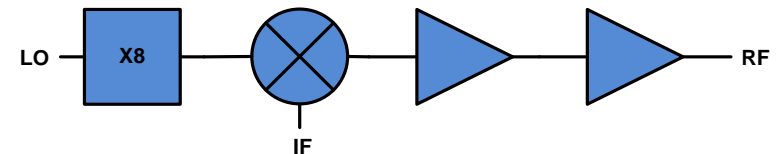
Features

- Compact size
- Built-in X8 Active Multiplier
- Fully Integrated Module



Parameter	Minimum	Typical	Maximum
RF Output Frequency	92 GHz		96 GHz
IF Input Frequency	4 GHz	6 GHz	8 GHz
IF Input Power		-20 dBm	+7 dBm
RF to IF Conversion Gain		30 dB	
RF Output P-1 dB/Psat		+20/+24 dBm	
LO Frequency		11.00 GHz	
LO Input Power		0 dBm	+10 dBm
LO DC Voltage Supply	+6 V _{DC}	+8 V _{DC}	+16 V _{DC}
LO Current Supply		750 mA	

Functional Block Diagram:



Receiver Module, 90 to 96 GHz

Model SSR-9330634030-10-M1-I

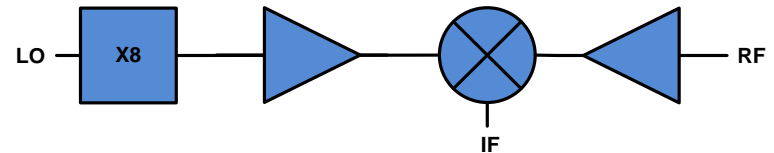
Features

- Compact size
- Built-in X8 Active Multiplier
- Fully Integrated Module

Parameter	Minimum	Typical	Maximum
RF Input Frequency	90 GHz		96 GHz
RF Input Power		-60 dBm	-24 dBm
Noise Figure		4 dB	
IF Output Frequency	3 GHz		9 GHz
RF to IF Conversion Gain		30 dB	
Image Rejection		20 dB	
LO Frequency		10.875 GHz	
LO Input Power	0 dBm	+5 dBm	+10 dBm
LO DC Voltage Supply	+5 V _{DC}	+8 V _{DC}	+12 V _{DC}
LO Current Supply		400 mA	



Functional Block Diagram:



Full Band VNA Frequency Extender

Model STO-10203-U6

Features

- Full Band Coverage
- Dynamic Range of 110 dB
- AC Power Input: 100 to 240 VAC

Applications

- Dual Source and 4 Port VNA Extension
- E band S-Parameter Measurement
- Test Lab Instrumentation



Parameter	Minimum	Typical	Maximum
RF Operating Frequency	75 GHz		110 GHz
Test Port Output Power		+5 dBm	
Output Power Control Range	0 to 20 dB		
Dynamic Range @ 10 Hz Bandwidth	100 dB	110 dB	
Test Port Match		30 dB	
Directivity	35 dB	40 dB	
RF Source Input Frequency	12.5 GHz		18.33 GHz
RF Source Input Power	0 dBm	+3 dBm	+6 dBm
LO Source Input Frequency (RF \pm IF)	12.5 GHz		18.33 GHz
LO Source Input Power	0 dBm	+3 dBm	+6 dBm

Full Band Frequency Extender

Model STE-SF610-15-S1

Features

- Full Waveguide Band Operation
- High Output Power
- Low Harmonics and Spurious Emission
- Cost Effective
- Instrumentation Grade
- Adjustable/Removable Legs

Applications

- Network Analyzer Systems
- Frequency Sources
- Test Instrumentations



Parameter	Minimum	Typical	Maximum
Output Frequency Range	75 GHz		110 GHz
Input Frequency Range	12.50 GHz		18.33 GHz
Output Power		+15 dBm	
Input Power	+1 dBm	+5 dBm	+20 dBm
Harmonic Suppression		20 dBc	
Spurious Suppression		60 dBc	
DC Voltage	+13 V	+15V	+16 V
DC Current		650 mA	

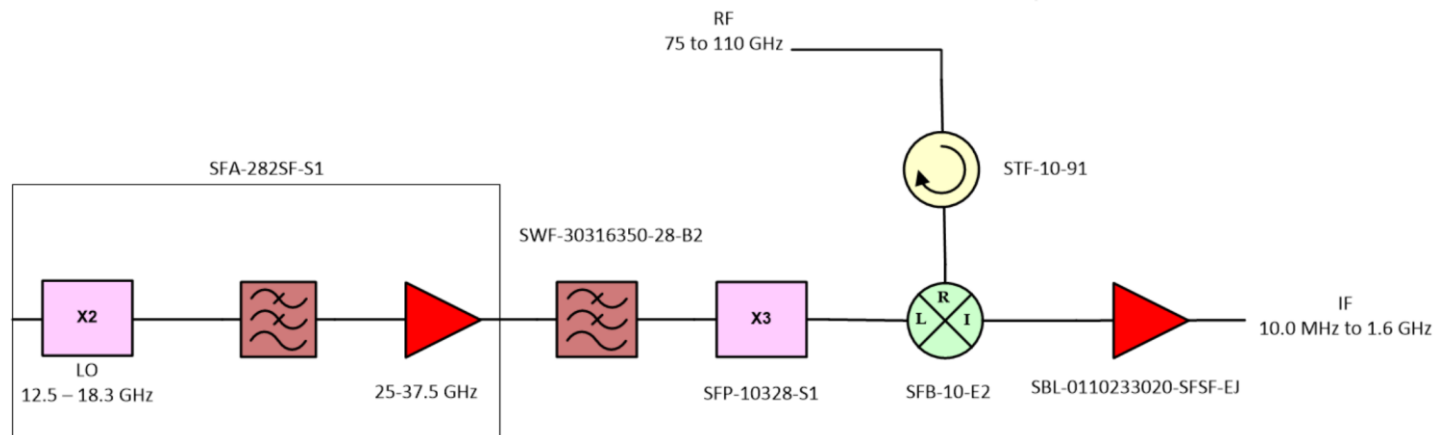
Full Band Noise Figure and Gain Test Extender

Model STG-10-S2

Parameter	Minimum	Typical	Maximum
RF Frequency Range	75 GHz		110 GHz
Noise Source: ENR	11.0 dB	12.0 dB	
Noise Source: Bias	+ 18 V _{DC} /50mA	+28 V _{DC} /60mA	+30 V _{DC} /75mA
IF Frequency Range	10 MHz		26.5 GHz
LO Frequency Range	12.5 GHz		18.3 GHz
LO Power	+3 dBm	+5 dBm	+20 dBm
N.F. Dynamic Range	0 dB		20 dB
Conversion Gain	15 dB	20 dB	
Down-Converter: Bias		+12 V _{DC} /450mA	+15 V _{DC} /550mA



Down-converter Block Diagram:



High ENR Noise Source with Isolator

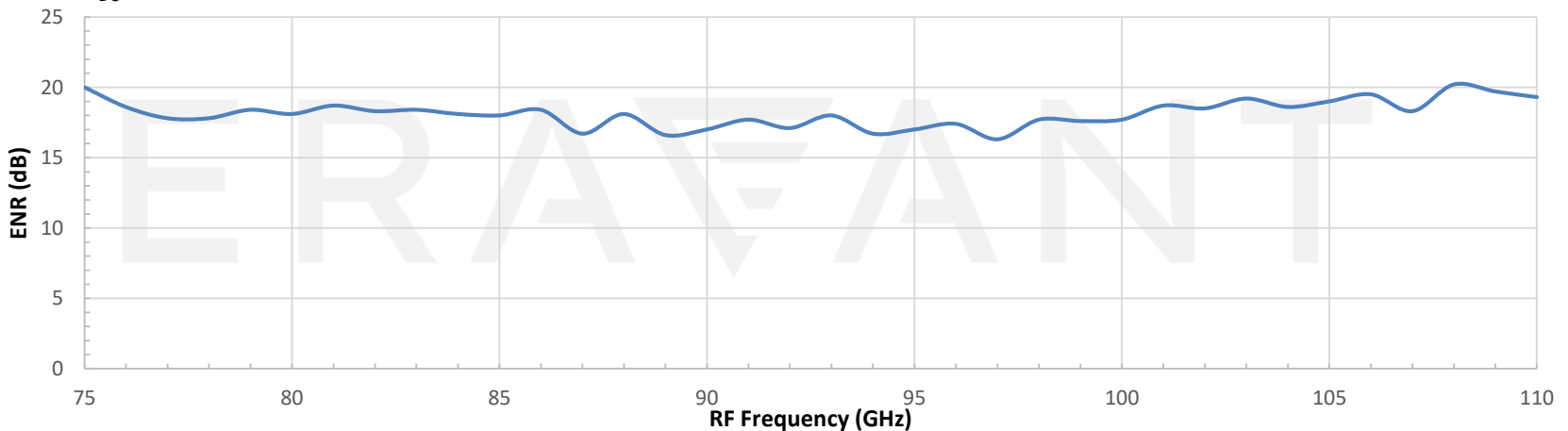
Model STZ-75311418-10-I1

Parameter	Minimum	Typical	Maximum
RF Frequency Range	75.0 GHz		110.0 GHz
ENR	15.0 dB	18.0 dB	
ENR Flatness		± 1.5 dB	
Temperature Stability		0.01 dB/°C	
Long Term Temperature Stability		0.05 dB/day	
AM Modulation Trigger		TTL	
AM Modulation Rate		1.0 KHz	
DC Bias	+18 V _{DC} /35 mA	+28 V _{DC} /60 mA	+30 V _{DC} /75 mA



Typical ENR vs. Frequency

V_{DC}: +28 V, I_{DC}: 60 mA



Direct Reading Attenuator

Model STA-60-10-D1

Features

- Full Band Coverage
- High Attenuation Accuracy
- Large Scaled Dial

Applications:

- Test Lab
- Instrumentations
- Manual Test Set



Parameter	Minimum	Typical	Maximum
RF Frequency Range	75 GHz		110 GHz
Insertion Loss		0.8 dB	
Attenuation Range	0 dB		60 dB
Attenuation Accuracy	0.1 dB or 3% of reading, whichever is larger, up to 40 dB		
VSWR			1.3:1
Power Handling (CW)		50 mW	100 mW

Digital Direct Reading Attenuator

Model STA-60-10-D5

Features

- Full Band Coverage
- High Attenuation Accuracy
- Digital Screen with Back Light

Applications:

- Test Lab
- Instrumentations
- Manual Test Set



Parameter	Minimum	Typical	Maximum
RF Frequency Range	75 GHz		110 GHz
Insertion Loss		1.2 dB	2.0 dB
Attenuation Range	0 dB		60 dB
Attenuation Accuracy	0.1 dB or 2% of Setting, whichever is larger, up to 40 dB		
VSWR		1.2:1	1.3:1
Power Handling (CW)		150 mW	300 mW

Programmable Attenuator

Model STA-60-10-P1

Features

- Full Band Coverage
- High Attenuation Accuracy
- IEEE-488 and USB Control Ports

Applications:

- Test Lab
- Instrumentations
- Auto Test Set



Parameter	Minimum	Typical	Maximum
RF Frequency Range	75 GHz		110 GHz
Insertion Loss		2.5 dB	
Attenuation Range	0 dB		70 dB
Attenuation Accuracy	0.1 dB or 3% of the reading, whichever is larger, up to 40 dB		
VSWR		1.2:1	1.3:1
Power Handling (CW)		300 mW	600 mW

Harmonic Mixer for Keysight Spectrum Analyzer

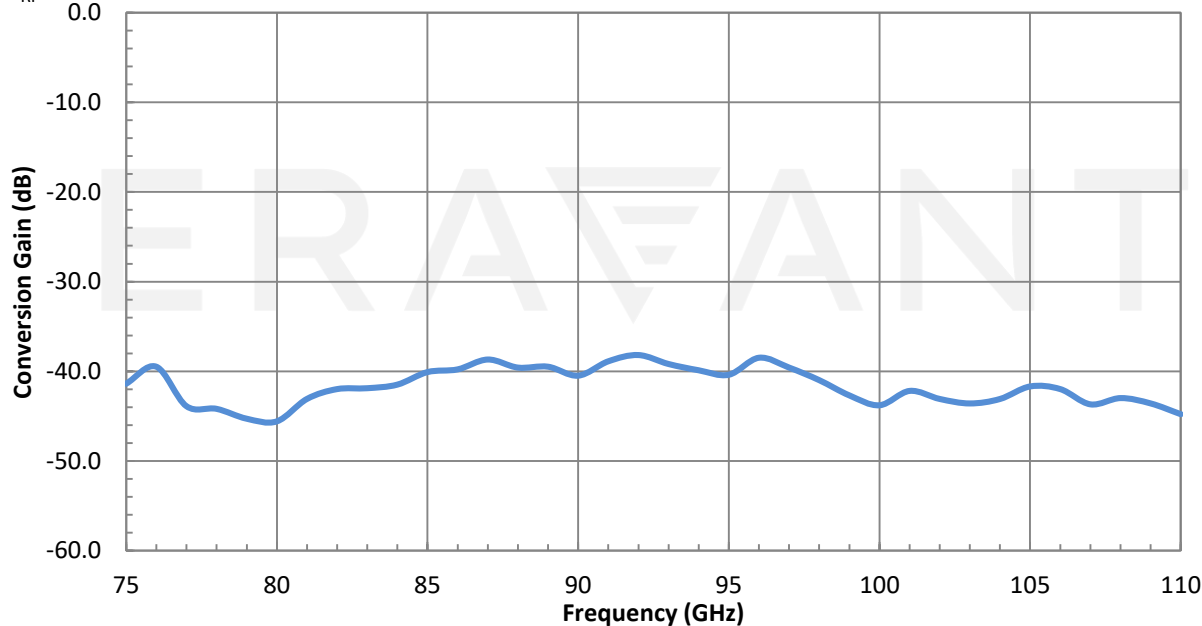
Model SFH-10SF5F-A3

Parameter	Minimum	Typical	Maximum
RF Range	75 GHz		110 GHz
LO Frequency	3.0 GHz		6.1 GHz
IF Range	DC		1.3 GHz
Input Power		+16 dBm	+19 dBm
Harmonic Number		18	
Conversion Loss		47 dB	



Typical Conversion Loss vs. Frequency

$P_{RF} = -20$ dBm



Features

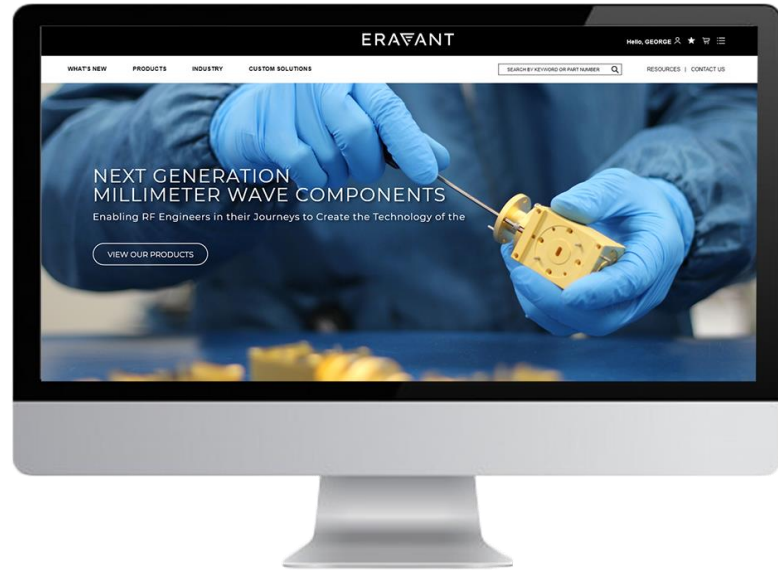
- Full Waveguide Band Operation
- No External Bias Required
- 18th Harmonic Detection

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SWM-60390320-12-SB Rev. 1.0

Full E-Band Magic Tee

Description:

Model SWM-60390320-12-SB is an E band magic tee that covers the entire band from 50 to 90 GHz. This magic tee is a four port hybrid coupler and/or power divider with two collinear arms, an E plane (difference) arm, and an H plane (sum) arm. The magic tee offers less than 1.0 dB insertion loss and high isolation between the two collinear arms and between the sum and difference arms. All waveguide ports have standard WR-12 waveguides with UG-387/U Flanges.

Features:

- Low Insertion Loss and High Isolation
- Compact Package

Applications:

- Test Labs
- Test Instrumentation
- Sub-assemblies

Electrical Specifications:

Parameter	Minimum	Typical	Maximum
Frequency	40 GHz		90 GHz
Insertion Loss		0.35 dB	
Isolation	Sum and Difference Ports	30 dB	
	Collinear Ports	20 dB	
VSWR		1.5:1	

Mechanical Specifications:

Item	Specification
Sum and Difference Ports	WR-12 Waveguide with UG-387/U Flange
Collinear Ports	WR-12 Waveguide with UG-387/U Flange
Weight	1.2 Oz
Finishing	Gold Plated
Material	Aluminum
Outline	WM BE

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Page 1 | Page 2 | Page 3

PASSIVE FREQUENCY MULTIPLIERS

GRID TABLE 28 RESULTS

MODEL	MINIMUM OUTPUT FREQUENCY	MAXIMUM OUTPUT FREQUENCY	OUTPUT POWER	MINIMUM INPUT FREQUENCY	MAXIMUM INPUT FREQUENCY	INPUT POWER	OUTPUT PORT	INPUT PORT	DOWNLOADS	VIEW
SFP-06212-S2	110 GHz	170 GHz	0 dBm	55 GHz	55 GHz	+18 dBm	WR-08 Waveguide	WR-12 Waveguide	Datasheet	View
SFP-06319-U9	110 GHz	170 GHz	-3 dBm	36.67 GHz	56.67 GHz	+20 dBm	WR-05 Waveguide	WR-16 Waveguide	Datasheet	View
SFP-06510-S2	140 GHz	220 GHz	-3 dBm	70 GHz	110 GHz	+17 dBm	WR-05 Waveguide	WR-10 Waveguide	Datasheet	View
SFP-223403205-28SF-S1	22 GHz	40 GHz	+5 dBm	11 GHz	20 GHz	+18 dBm	WR-28 Waveguide	SMA (F)	Datasheet STEP File	View
SFP-243423303-28SF-S1	24 GHz	42 GHz	+3 dBm	8 GHz	14 GHz	+20 dBm	WR-28 Waveguide	SMA (F)	Datasheet STEP File	View
SFP-2835F-U9	26.5 GHz	40.0 GHz	+5 dBm	8.37 GHz	13.33 GHz	+20 dBm	WR-28 Waveguide	SMA (F)	Datasheet	View
SFP-2734033105-28SF-S1	26.5 GHz	40 GHz	-5 dBm	8.37 GHz	13.33 GHz	+10 dBm	WR-28 Waveguide	SMA (F)	Datasheet STEP File	View
SFP-2235F-S1	33 GHz	50 GHz	+3 dBm	11 GHz	16.67 GHz	+20 dBm	WR-22 Waveguide	SMA (F)	Datasheet STEP File	View
SFP-222KF-S1	33 GHz	50 GHz	+7 dBm	16.5 GHz	25 GHz	+20 dBm	WR-22 Waveguide	2.82 mm (F)	Datasheet STEP File	View
SFP-363573303-19SF-N1	57 GHz	36 GHz	+3 dBm	12 GHz	19 GHz	+20 dBm	WR-19 Waveguide	SMA (F)	Datasheet STEP File	View
SFP-192KF-S1	40 GHz	60 GHz	+6 dBm	20 GHz	30 GHz	+20 dBm	WR-19 Waveguide	2.92 mm (F)	Datasheet STEP File	View