

ERAVANT

NEXT GENERATION MILLIMETERWAVE COMPONENTS

Ka BAND UPDATES

September 2020

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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 Ka-Band (26.5 to 40 GHz).**
- The product offering, including Limited Run models, are listed on the website at www.eravant.com.

Additional products and presentations are available upon request.

- Custom models for components and subassemblies can be configured to customers' specifications.
- Presentations about Q, U, V, E, W, F, D and G-Bands are available.
- Presentations for specific applications like 5G/IoT, Space, Test Instrumentation, Communications, and Radar are available online [here](#).

ERAVANT PRODUCT COVERAGE

- ERAVANT offers Total Product Solutions to configure any system applications in the Frequency Range of DC to 220 GHz.
- Ka Band products are mainly used in
 - Commercial and military communication systems
 - Commercial and military Radar systems
 - 5G mmW systems
 - Scientific and industrial systems
 - Test equipment and lab set ups
- The intent of this presentation is to present the ERAVANT product offerings in **Ka 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.

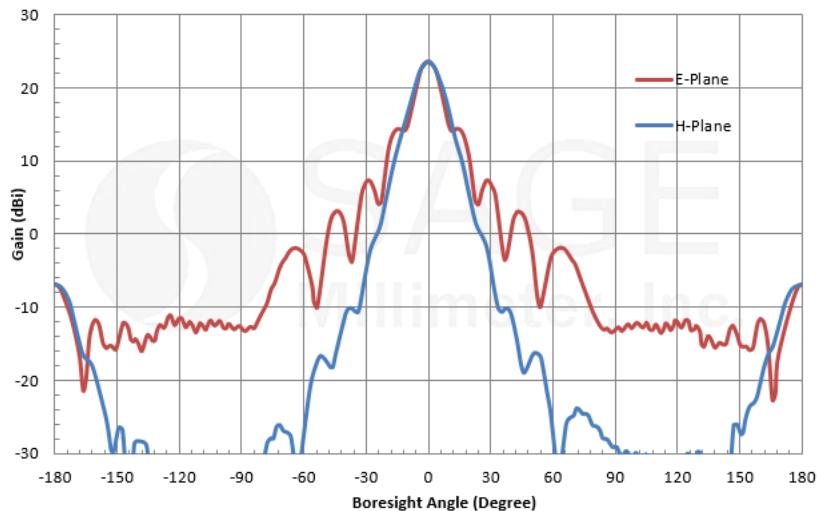
Rectangular Horn Antenna

Model SAR-2309-28-S2

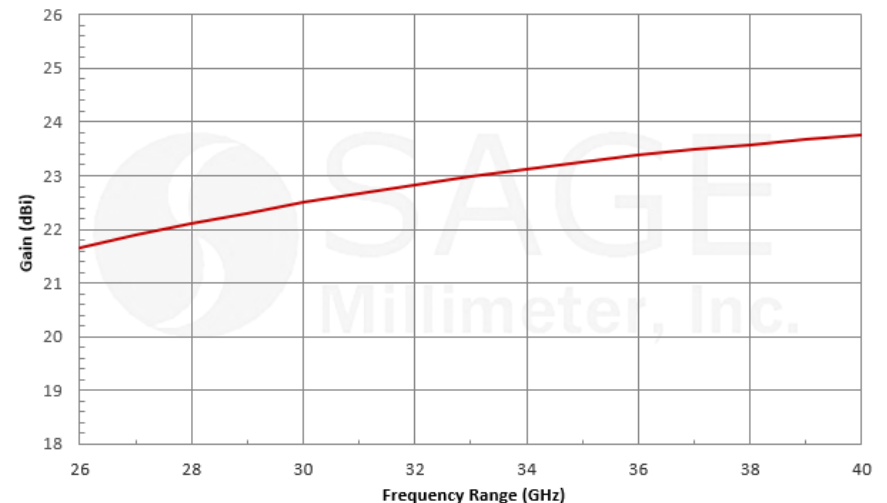
Parameter	Minimum	Typical	Maximum
Frequency	26.5 GHz		40 GHz
Gain	21.5 dBi	23 dBi	24 dBi
Polarization	Linear		
3 dB Beamwidth, E-Plane		10°	
3 dB Beamwidth, H-Plane		11°	
Side Lobes, E -Plane		14 dB	
Side Lobes, H Plane		30 dB	
VSWR		1.15:1	



Typical Antenna Pattern @ 33.25 GHz



Typical Gain vs. Frequency



Conical Horn Antenna

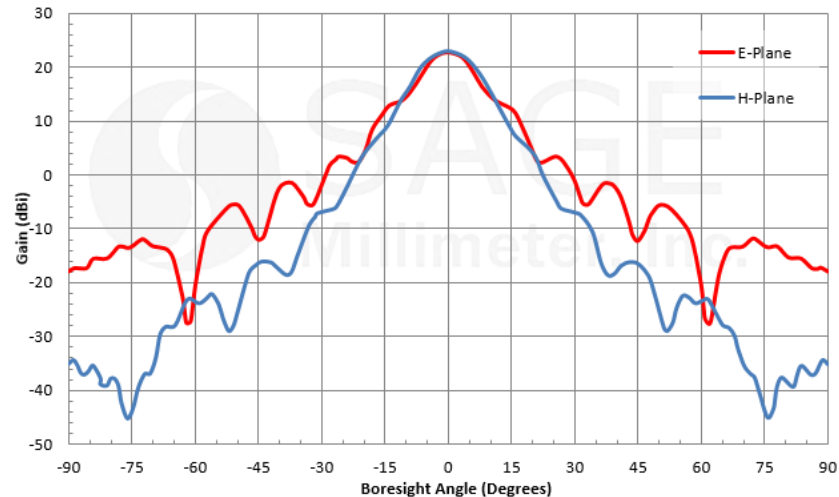
Model SAC-2309-250-S2

Parameter	Minimum	Typical	Maximum
Frequency*	33 GHz		38.5 GHz
Gain		23 dB	
3 dB Beamwidth, E-plane		11°	
3 dB Beamwidth, H-plane		13°	
Side lobes, E-plane		-20 dB	
Side lobes, H-plane		-28 dB	
VSWR		1.15:1	

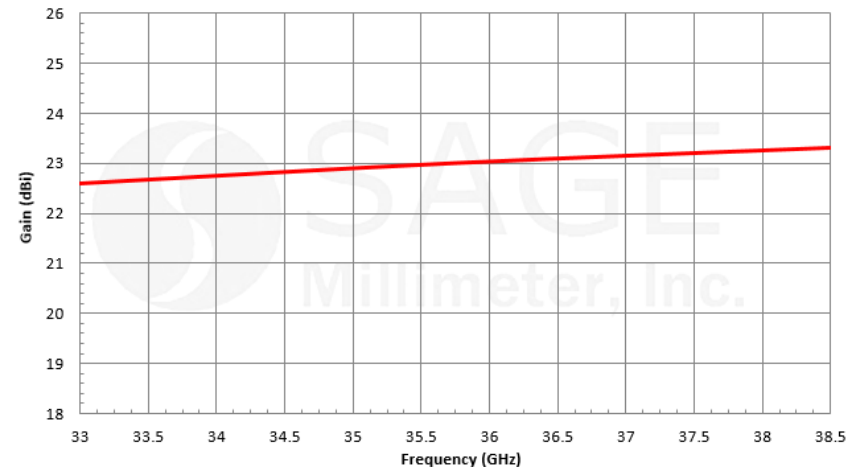


*Note: Can operate from 33 to 40 GHz if the dominant mode is maintained.

Typical Antenna Pattern @ 35.75 GHz



Typical Gain vs. Frequency



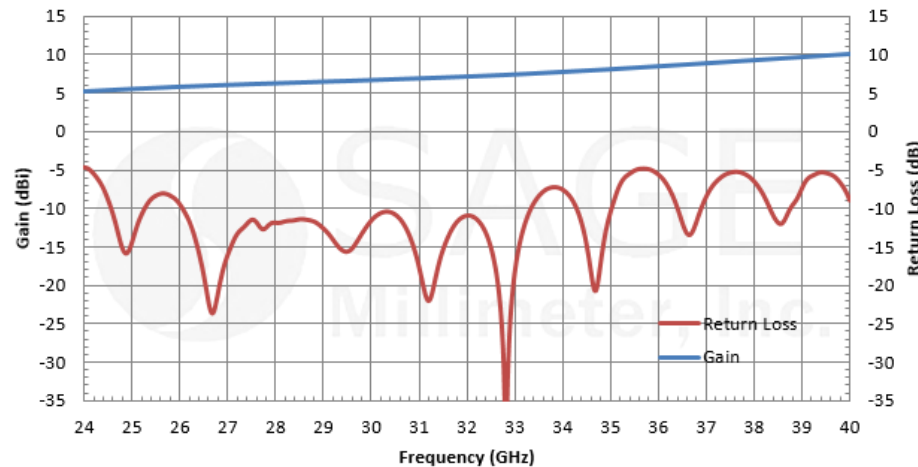
Omni-directional Antenna

Model: SAO-2734030810-28-S1

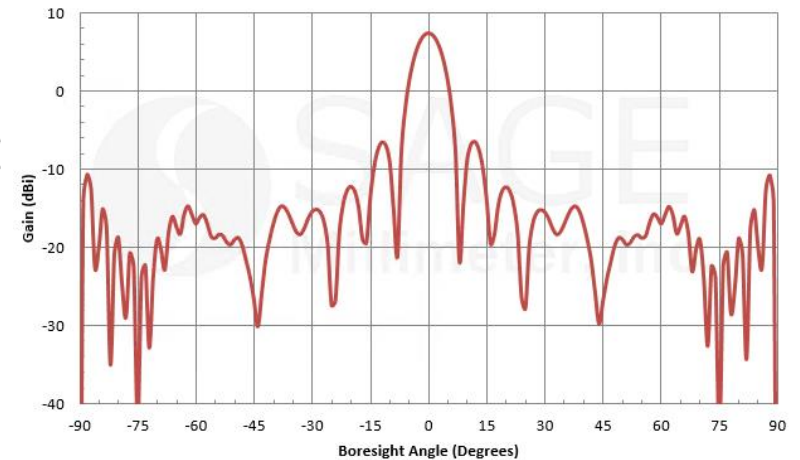
Parameter	Minimum	Typical	Maximum
Frequency*	24 GHz		40 GHz
Gain		7.5 dBi	
Gain Flatness		± 1 dB	
3 dB Beam Width, Vertical		10°	
Azimuth Beam Width		360°	
VSWR		2:1	
RF Connector	WR-28 with UG-599/U Flange		
Weight		2.2 Lbs	



Typical Gain and Return Loss vs. Frequency



Typical E-Plane Antenna Pattern @ 33.25 GHz



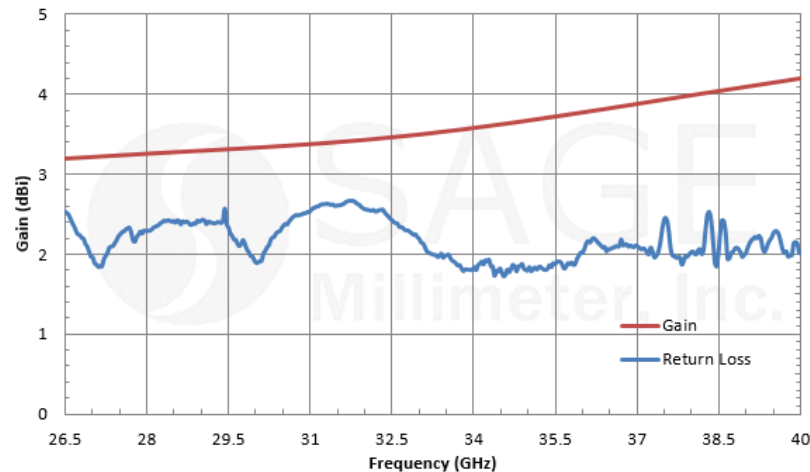
Omni-directional Antenna

Model: SAO-2734030345-28-S1

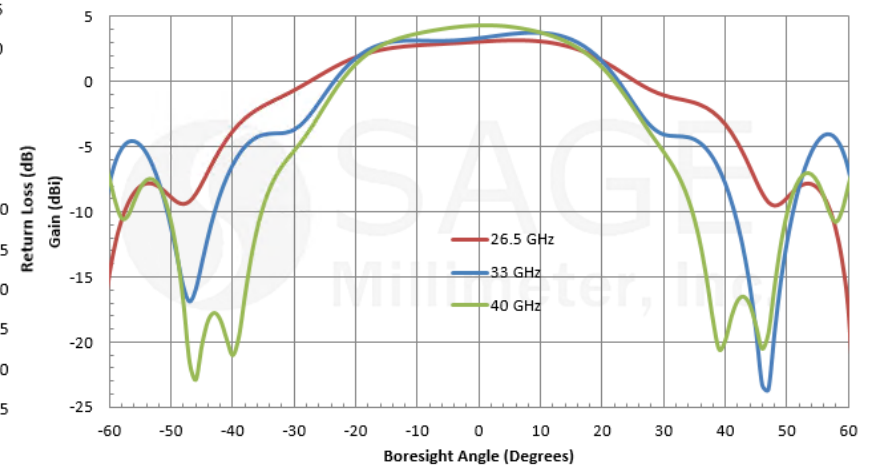
Parameter	Minimum	Typical	Maximum
Frequency*	26.5 GHz		40 GHz
Gain		3 dBi	
Gain Flatness		±1 dB	
3 dB Beam Width, Vertical		45°	
Azimuth Beam Width		360°	
VSWR		2:1	
RF Connector	WR-28 with UG-599/U Flange		
Weight		1.7 Oz	



Typical Gain and Return Loss vs. Frequency



Simulated E-Plane Antenna Patterns



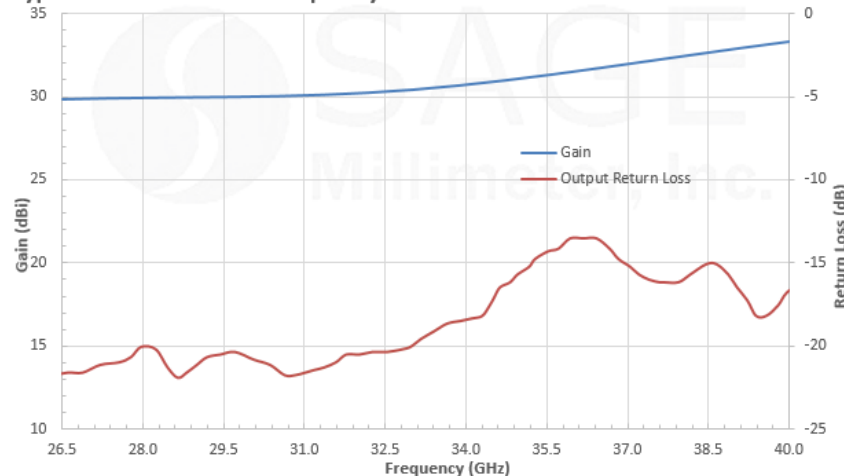
Omni-directional Antenna, Active

Model: SAO-2734033045-KF-C1-BL

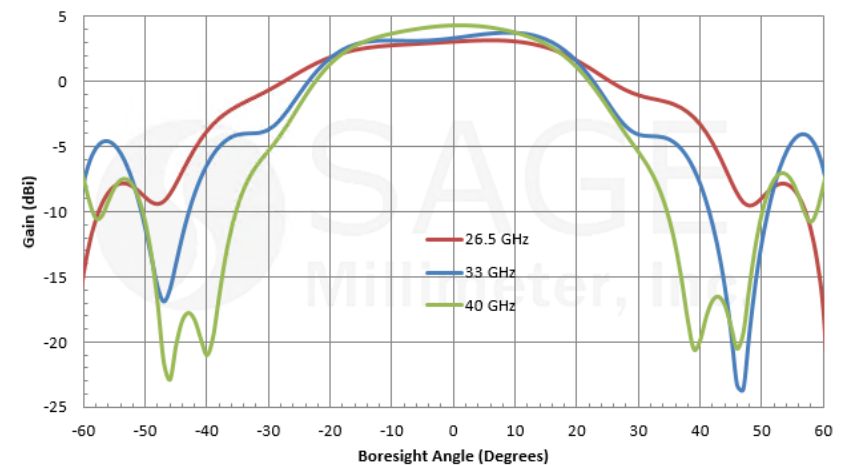
Parameter	Minimum	Typical	Maximum
Frequency*	26.5 GHz		40 GHz
Gain		30 dBi	
Noise Figure		5 dB	
P-1 dB		+10 dBm	
3 dB Beam Width, Vertical		45°	
Azimuth Beam Width		360°	
VSWR		2:1	
Bias		+5 Vdc/240 mA	
RF Connector		K Connector	
Weight		5 Oz	



Typical Performance vs. Frequency



Simulated E-Plane Antenna Patterns



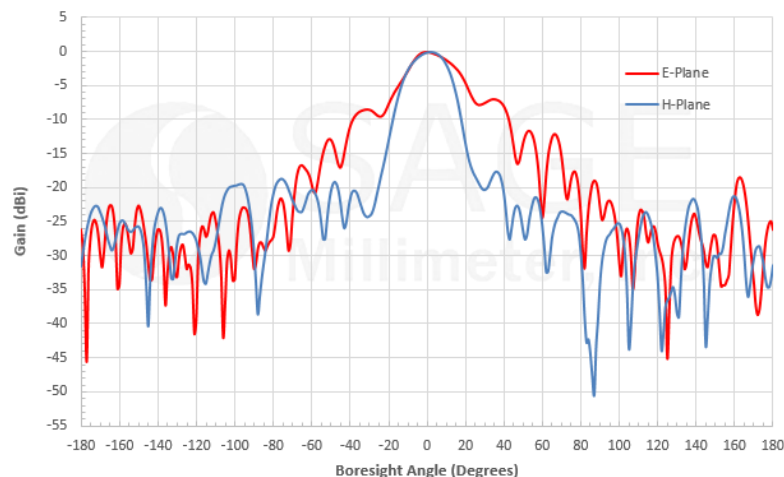
Qaud Ridged, Dual Polarized Antenna, 4 to 40 GHz

Model: SAV-0434031428-KF-U5-QR

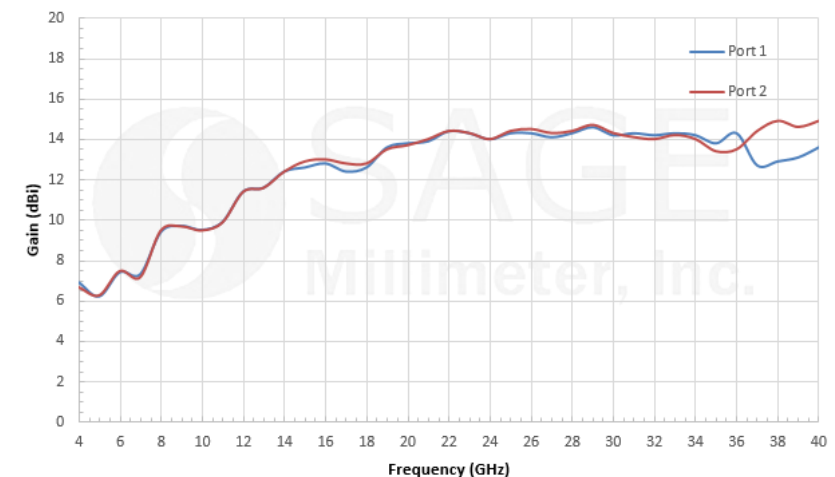
Parameter	Minimum	Typical	Maximum
Frequency*	4 GHz		40 GHz
Gain		14 dBi	
Polarization	Linear and Circular		
Side Lobes		-10 dB	
3 dB Beam Width, Vertical		28°	
3 dB Beam Width, Horizontal		28°	
VSWR		2:1	
Cross-pol		28 dB	
RF Connectors	K Connectors		
Weight		2.4 Oz	



Typical Antenna Pattern @ 40 GHz



Typical Gain vs. Frequency



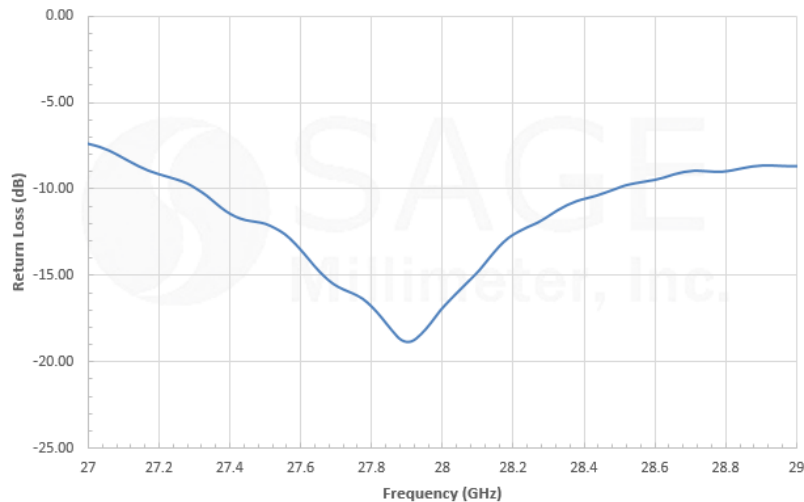
Beam-Forming Array Antenna, 4 x 16 Elements

Model: SAM-2832830695-DM-L1-64C

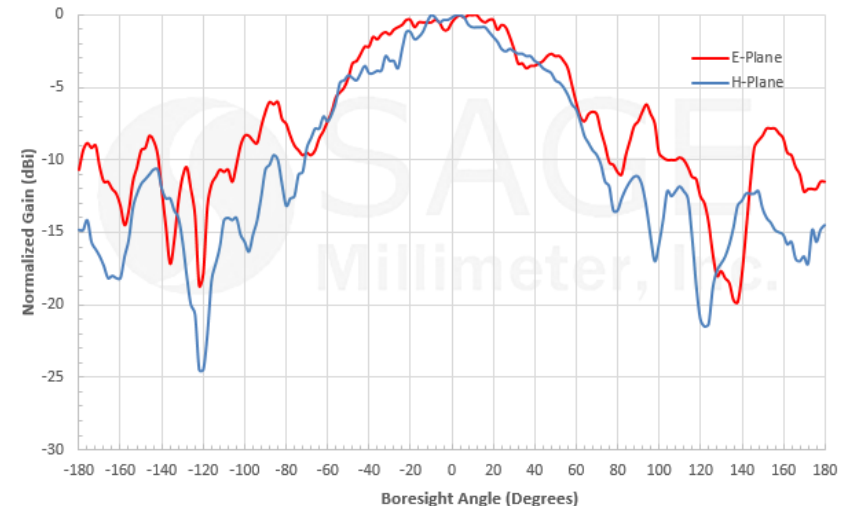
Parameter	Minimum	Typical	Maximum
Frequency*		28 GHz	
Gain		24 dBi	
3 dB Beam Width, Vertical		17°	
Azimuth Beam Width		4°	
Side Lobes		-12 dB	
Polarization		Linear	
VSWR		3:1	
RF Connector	64 x SMPM (M) Coaxial Connectors		
Weight		3.5 Oz	



Typical Single Antenna Element Return Loss vs Frequency



Typical Single Antenna Element Pattern @ 28 GHz



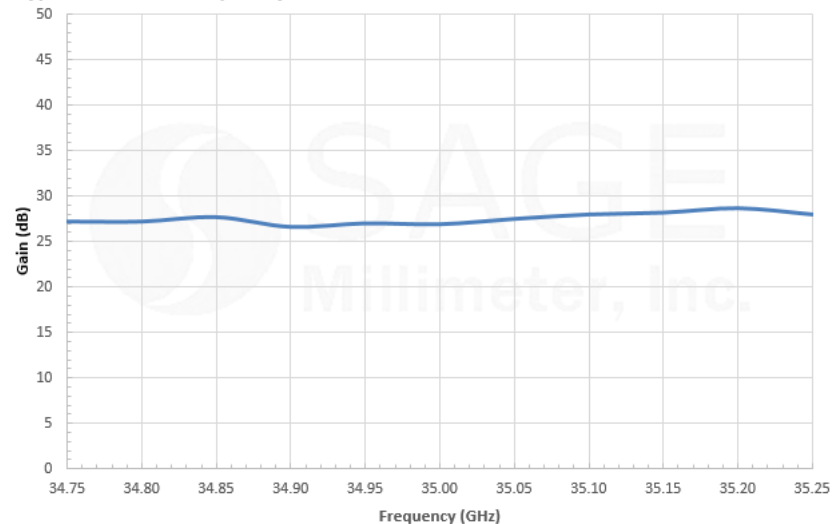
Slotted WG Array Antenna, 2°x16°

Model: SAW-3533532716-28-L2-WR

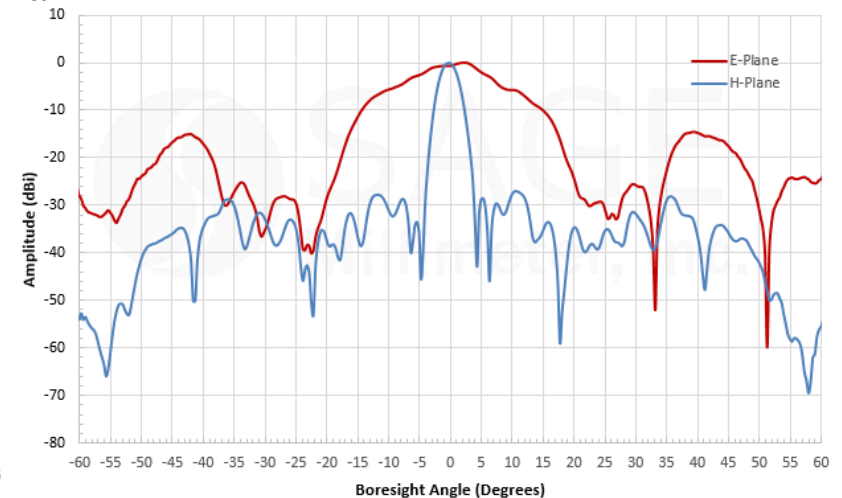
Parameter	Minimum	Typical	Maximum
Frequency*		35 GHz	
Gain		27 dBi	
3 dB Beam Width, Vertical		16°	
Azimuth Beam Width		2°	
Side Lobes		-15 dB	
Polarization		Linear	
VSWR		1.8:1	
RF Connector	WR-28 Waveguide with UG-599/U Flange		
Weight		10 Oz	



Typical Gain vs. Frequency



Typical Measured Antenna Patterns @ 35.0 GHz



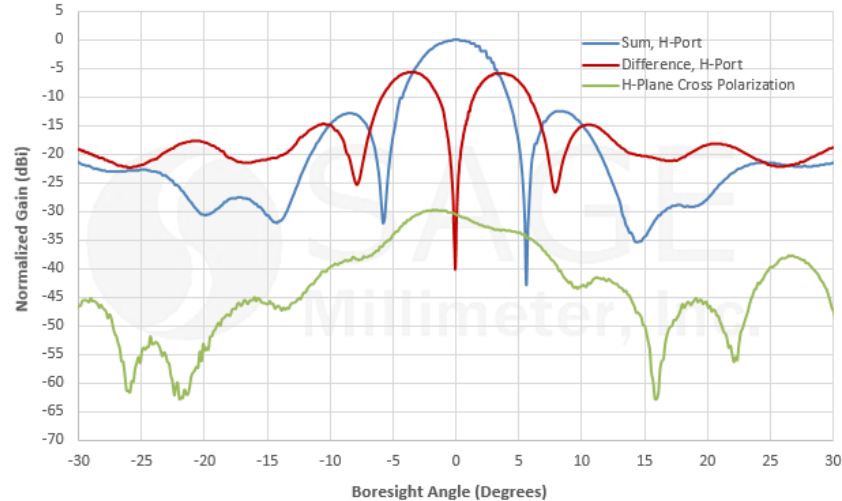
Monopulse Cassegrain Antenna, 4" Dish

Model: SAY-3433632750-28-U5-MP

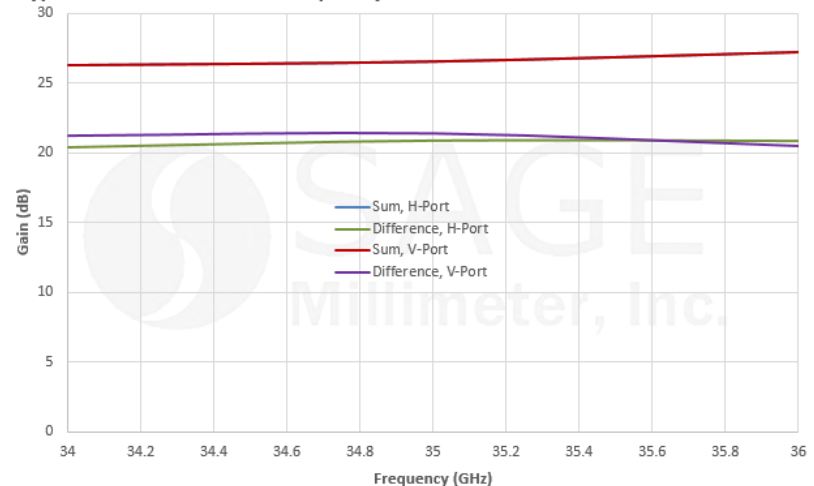
Parameter	Minimum	Typical	Maximum
Frequency	34 GHz	35 GHz	36 GHz
Sum Gain		27 dBi	
Sum 3 dB Beamwidth		5°	
Difference V-port and H-port Gain		21 dBi	
Side Lobes		-10 dB	
Null Depth		30 dB	
Polarization		Linear	
VSWR		2.0:1	
RF Connector	WR-28 Waveguide with UG-599/U Flange		
Weight		10 Oz	



Typical Measured H-Plane @ 35 GHz



Typical Measured Gain vs Frequency



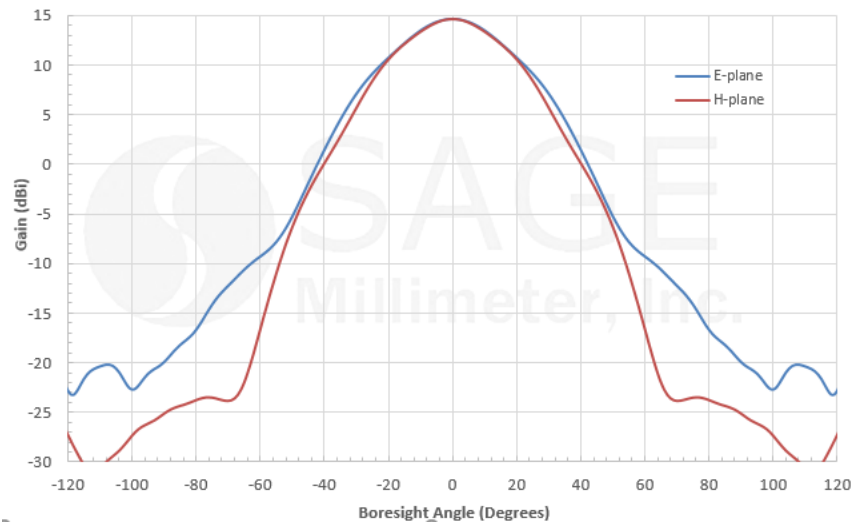
Dual Polarized Antenna, 24 to 42 GHz

Model SAF-2434231535-328-S1-280-DP

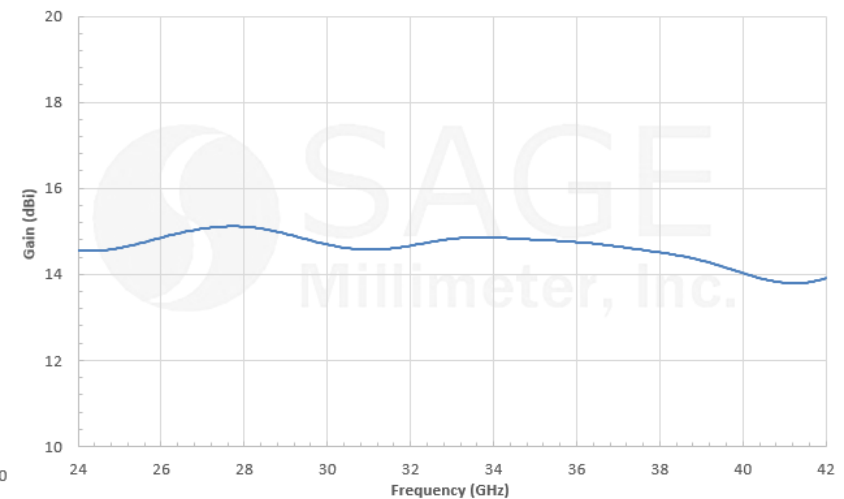
Parameter	Minimum	Typical	Maximum
Frequency	24 GHz		44GHz
Gain		15 dBi	
Gain Flatness		± 2.5 dB	
3 dB Beam Width, Vertical		35°	
3 dB Beam Width, Horizontal		35°	
Return Loss		15 dB	
V and H Isolation		35 dB	
Cross-pol Rejection		35 dB	
RF Connectors	WR-28 with UG-599/U Flange		
Weight		10 Oz	



Simulated Antenna Patterns @ 36 GHz



Simulated Gain vs. Frequency



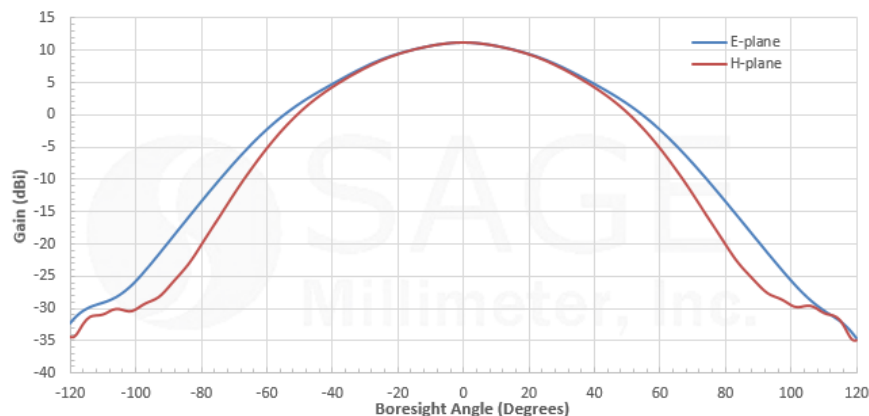
Dual Polarized Choke Flange Antenna, 24 to 42 GHz

Model: SAH-2434231060-328-S1-280-DP

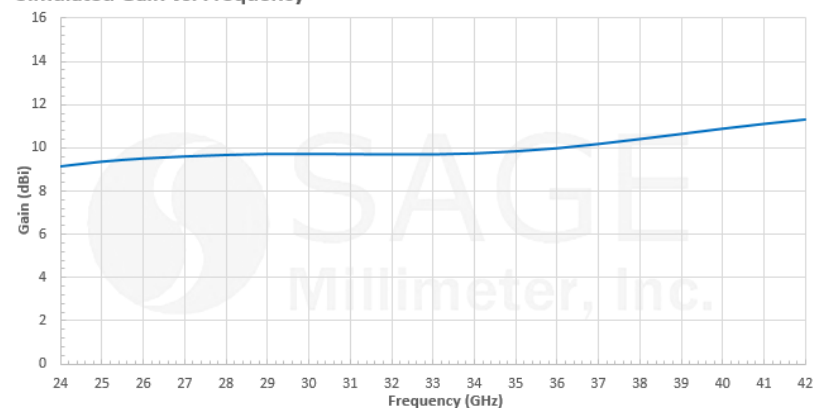
Parameter	Minimum	Typical	Maximum
Frequency	24 GHz		44GHz
Gain		10 dBi	
Gain Flatness		±2.0 dB	
3 dB Beam Width, Vertical		60°	
3 dB Beam Width, Horizontal		60°	
Return Loss		15 dB	
V and H Isolation		35 dB	
Cross-pol Rejection		35 dB	
RF Connectors		WR-28 with UG-599/U Flange	
Weight		10 Oz	



Simulated Antenna Patterns @ 42 GHz



Simulated Gain vs. Frequency



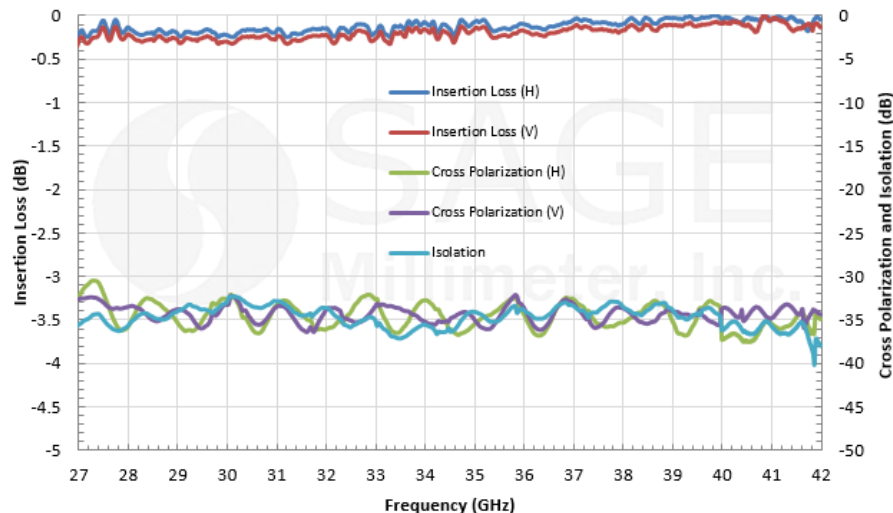
Full Band Orthomode Transducer, 24 to 42 GHz

Model: SAT-333-32828-C1

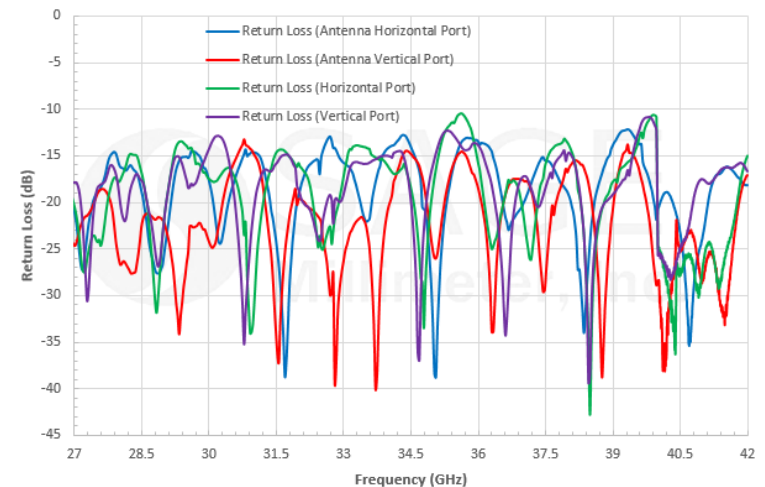
Parameter	Minimum	Typical	Maximum
Frequency	24 GHz		42GHz
Insertion Loss, Vertical		0.5 dB	
Insertion Loss, Horizontal		1.2 dB	
Isolation V to H Port		40 dB	
Cross Polarization (V and H to Ant Port)		35 dB	
Port Return Losses		15 dB	
V and H Waveguide Ports	WR-28 with UG-599/U Flange		
Antenna Port	0.328" Diameter Circular Waveguide		



Typical Performance vs. Frequency



Typical Return Loss vs. Frequency



Power Amplifier, GaN, 32 to 38 GHz, +40 dBm

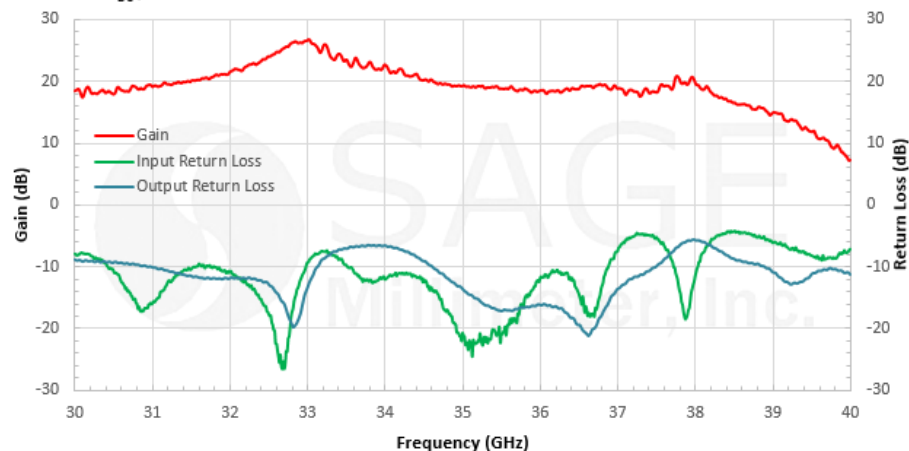
Model: SBP-3233831838-KFKF-E1-HR

Parameter	Minimum	Typical	Maximum
Frequency	32 GHz		38GHz
Gain		18 dB	
P_{1dB}		+38 dBm	
P_{sat}		+40 dBm	
P_{in}			+30 dBm
Input VSWR		1.5:1	
Output VSWR		2:1	
DC Voltage		+30 V _{DC}	+48 V _{DC}
DC Supply Current		2 A	



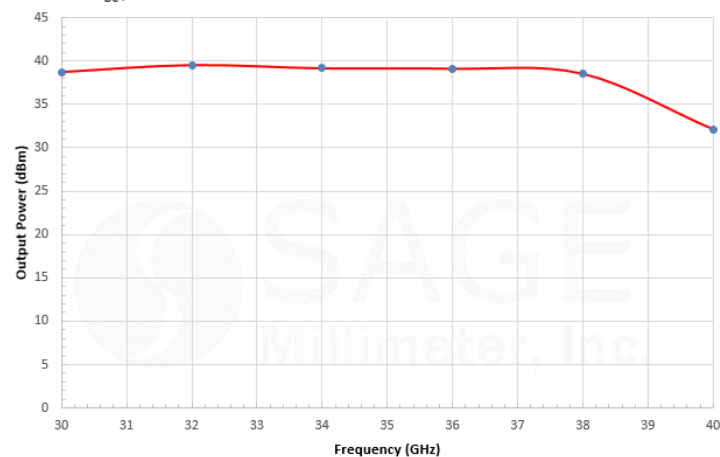
Typical Gain and Return Loss vs. Frequency

Bias = +30 V_{DC} / 560 mA



Typical Output Power Psat Vs. Frequency

Bias = +48 V_{DC} / 2 A



Power Amplifier, GaAs, 31 to 38 GHz, +35 dBm

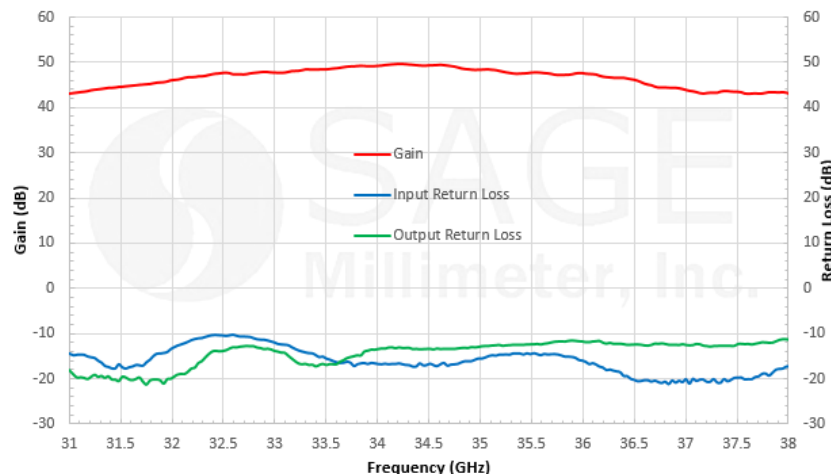
Model: SBP-3133834034-KFKF-C1-2

Parameter	Minimum	Typical	Maximum
Frequency	31 GHz		38GHz
Gain		40 dB	
P_{1dB}		+34 dBm	
P_{sat}		+35 dBm	
P_{in}			+20 dBm
Input VSWR		2:1	
Output VSWR		2:1	
DC Voltage		+8 V _{DC}	
DC Supply Current		4 A	



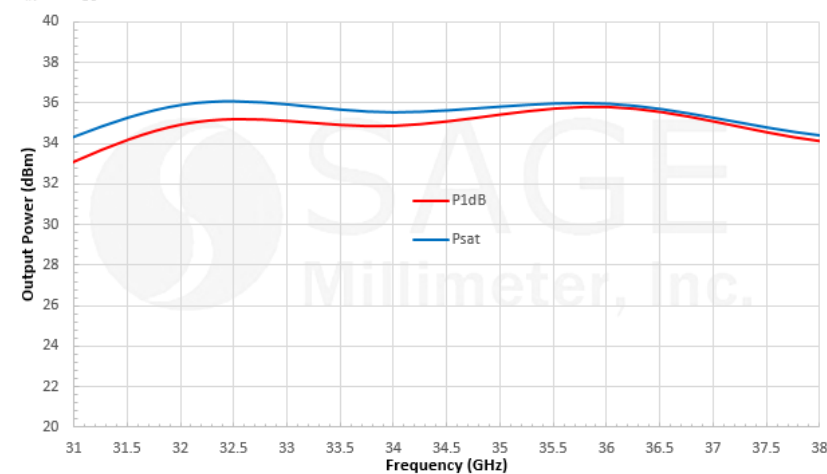
Typical Gain and Return Loss vs. Frequency

V_{IN} : +8 V_{DC}/2.4 A



Typical P_{1dB} and P_{sat} vs. Frequency

V_{IN} : +8 V_{DC}/4 A



Broadband Amplifier, 18 to 42 GHz Band

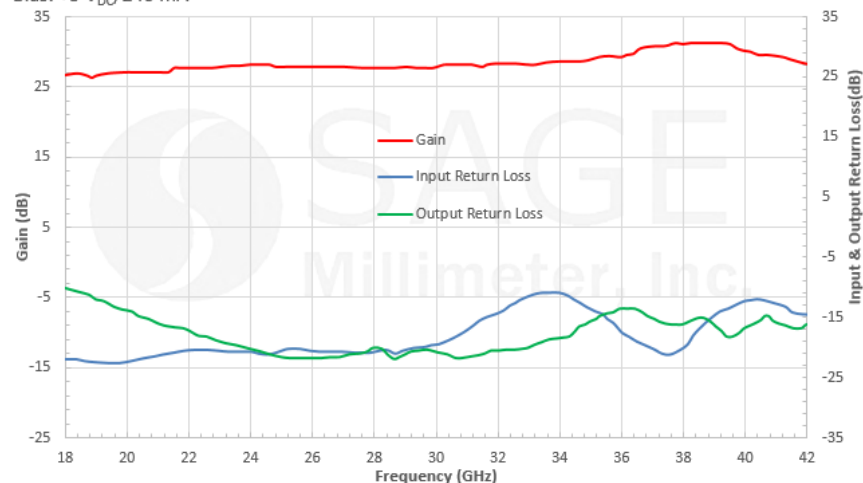
Model: **SBB-1834232815-KFKF-E3**

Parameter	Minimum	Typical	Maximum
Frequency	18 GHz		42 GHz
Gain	22 dB		28 dB
P_{1dB}	+10 dBm	+15 dBm	
P_{sat}		+16 dBm	
NF		4.0 dB	
Input VSWR		2:1	
Output VSWR		2:1	
DC Voltage		+5 V _{DC}	+5.5 V _{DC}
DC Supply Current		240 mA	



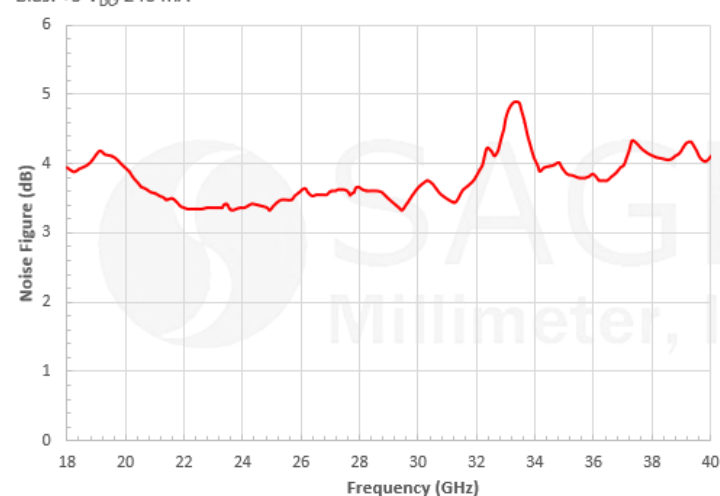
Typical Performance vs. Frequency

Bias: +5 V_{DC}/240 mA



Typical Noise Figure vs. Frequency

Bias: +5 V_{DC}/240 mA



Low Noise Amplifier, 26 to 40 GHz

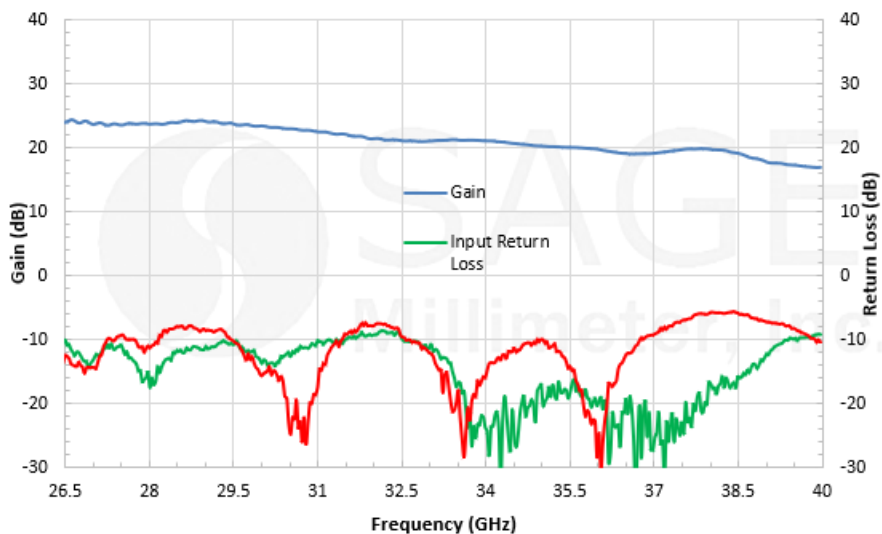
Model: SBL-2634032030-2828-E1

Parameter	Minimum	Typical	Maximum
Frequency	26 GHz		40 GHz
Gain		20 dB	
Noise Figure		3 dB	
P_{in}			-1 dBm
Input VSWR		2:1	
Output VSWR		2:1	
DC Voltage	+6 V _{DC}	+8 V _{DC}	+12 V _{DC}
DC Supply Current		66 mA	



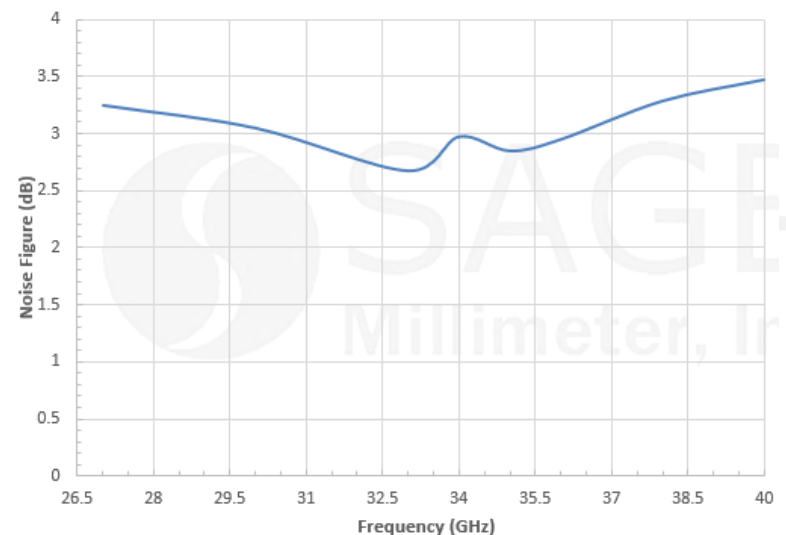
Typical Gain and Return Loss vs. Frequency

Bias: +8 V_{DC}/66 mA



Typical Noise Figure vs. Frequency

Bias: +8 V_{DC}/66 mA



Low Noise Amplifier, 26.5 to 40 GHz

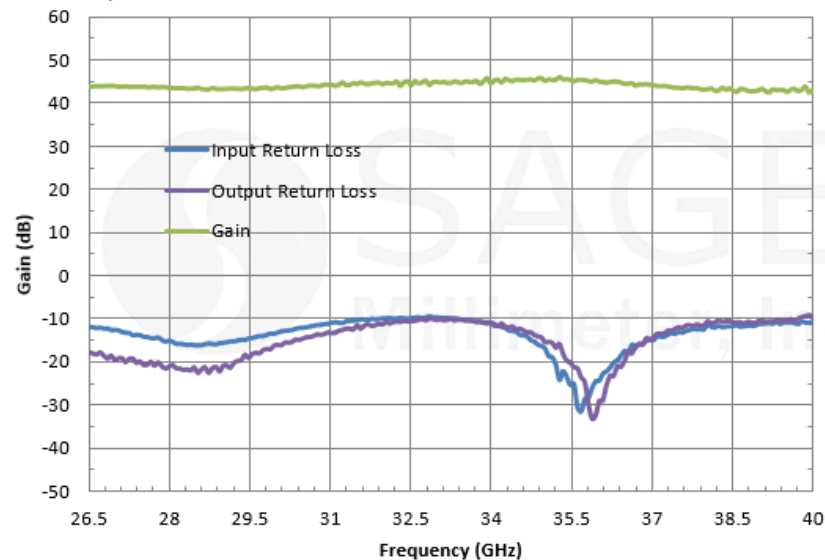
Model: SBL-2734034025-KFKF-E3

Parameter	Minimum	Typical	Maximum
Frequency	26.5 GHz		40 GHz
Gain		40 dB	
Noise Figure		2.5 dB	
P_{in}			-10 dBm
Input VSWR		2:1	
Output VSWR		2:1	
DC Voltage		+12 V _{DC}	+12 V _{DC}
DC Supply Current		200 mA	



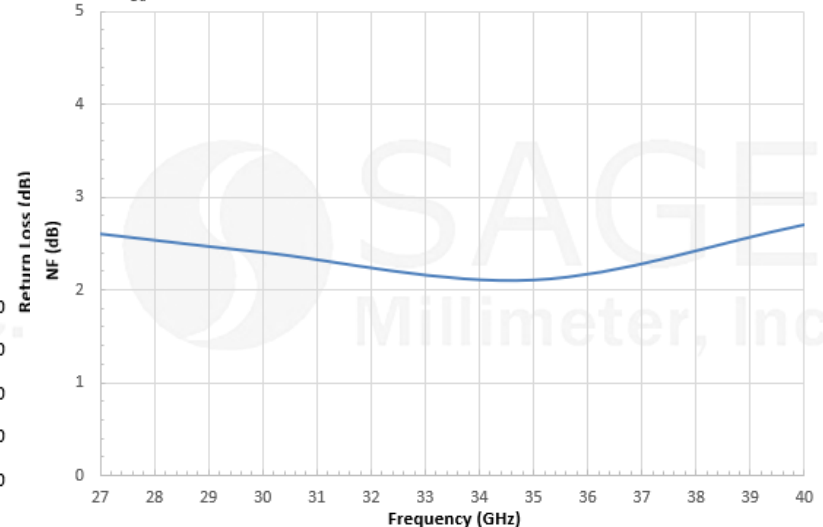
Typical Gain and Return Loss vs Frequency

Bias: +12V/200 mA



Typical Noise Figure vs. Frequency

Bias: +12 V_{DC}/200 mA



X2 Active Multiplier, +20 dBm Pout

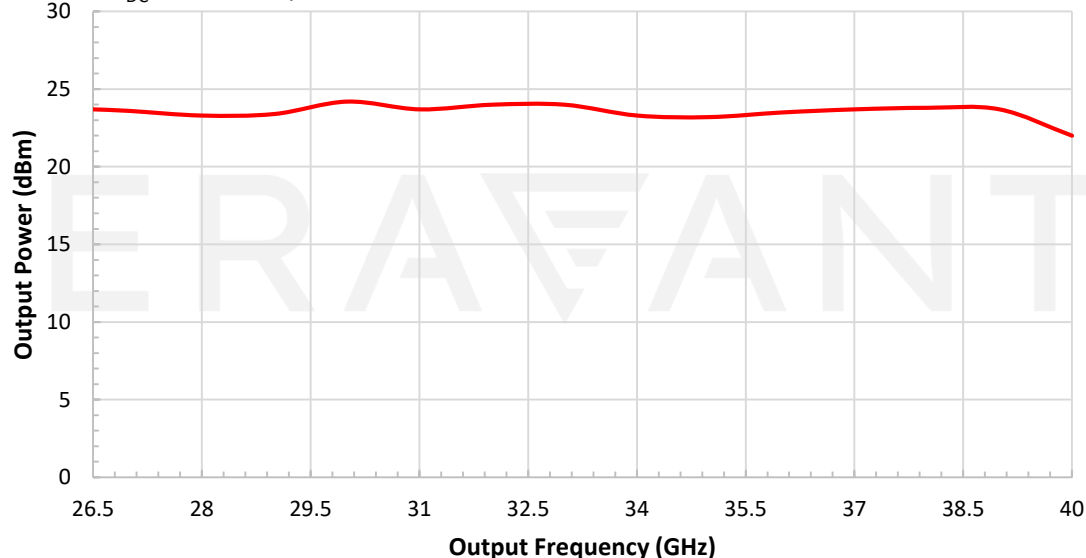
Model: SFA-282SF-E1

Parameter	Minimum	Typical	Maximum
Input Frequency	13.25 GHz		20.00 GHz
Input Power		+ 5 dBm	+20 dBm
Output Frequency	26.5 GHz		40 GHz
Output Power		+20 dBm	
Harmonic Suppression		-20 dBc	
Spurious		-60 dBc	
DC Voltage		+8 V _{DC}	
DC Supply Current		420 mA	



Typical Output Power vs. Output Frequency

Bias: +8 V_{DC}/420 mA; Input Power: +5 dBm



Features

- Full Band Coverage
- High Power Output
- Low Harmonic Emission

X2 Active Multiplier, +29 dBm Pout

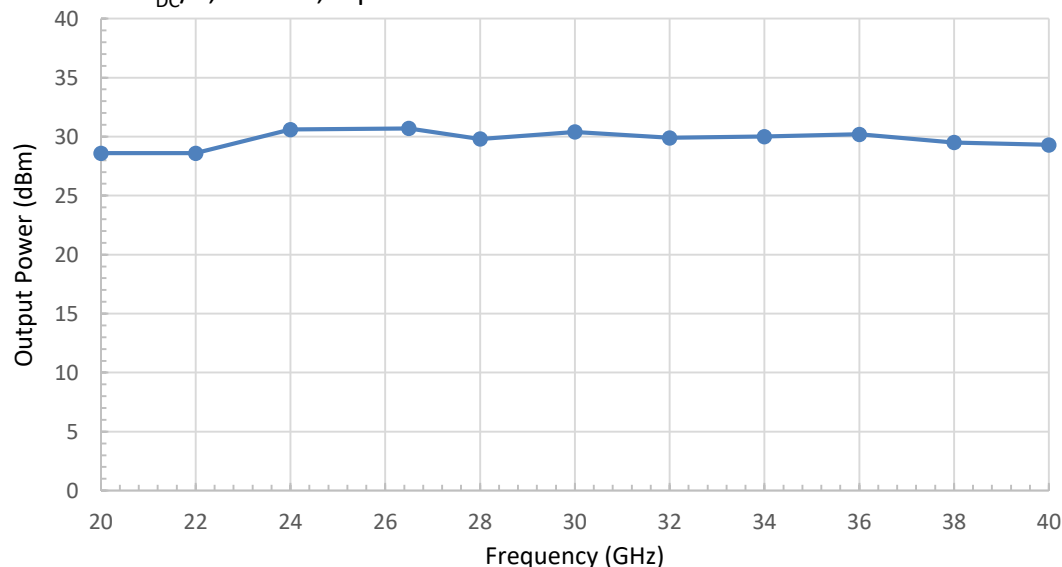
Model: SFA-203403229-KFSF-S1

Parameter	Minimum	Typical	Maximum
Input Frequency	12 GHz		21 GHz
Input Power		+ 5 dBm	+10 dBm
Output Frequency	26.5 GHz		40 GHz
Output Power		+29 dBm	
Harmonic Suppression		-15 dBc	
Spurious		-60 dBc	
DC Voltage		+8 V _{DC}	
DC Supply Current		1,800 mA	



Typical Output Pout vs. Frequency

Bias = +8 V_{DC}/1,800 mA; Input Power: +5 dBm



Features

- 5G mmW Band
- High Power Output
- Low Harmonic Emission

X3 Active Multiplier, +18 dBm Pout

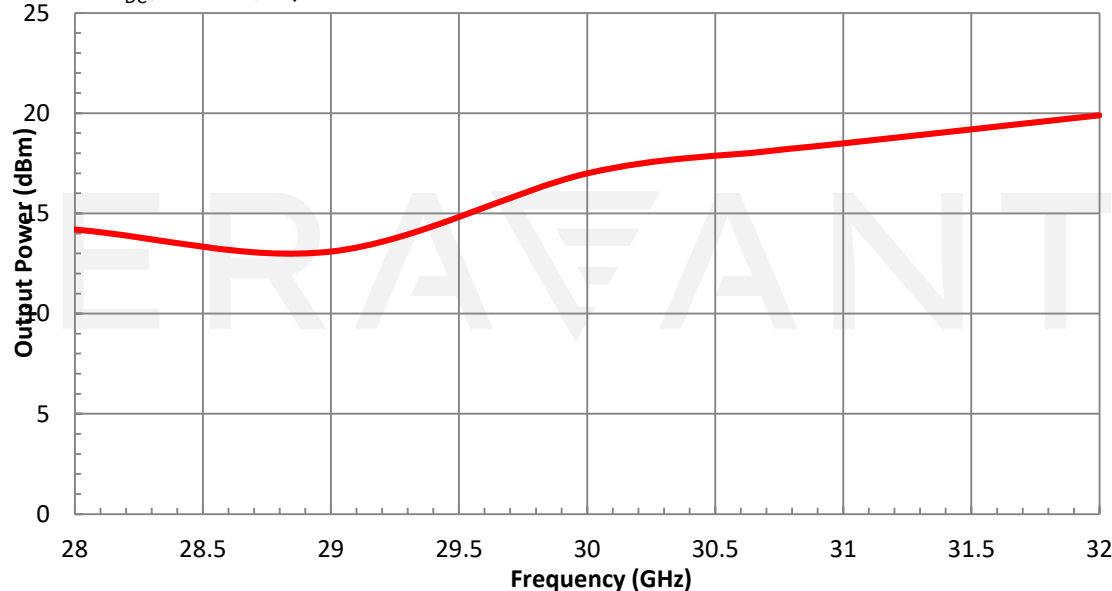
Model: SFA-283323318-28SF-E1

Parameter	Minimum	Typical	Maximum
Input Frequency	9.33 GHz		10.66 GHz
Input Power		+ 10 dBm	+20 dBm
Output Frequency	28 GHz		32 GHz
Output Power		+18 dBm	
Harmonic Suppression		-20 dBc	
Spurious		-60 dBc	
DC Voltage		+8 V _{DC}	
DC Supply Current		350 mA	



Typical Output Power vs. Output Frequency

Bias: +8 V_{DC}/350 mA; Input Power: +10 dBm



Features

- X3 Multiplication
- Low Harmonic Emission

X2 Passive Multiplier

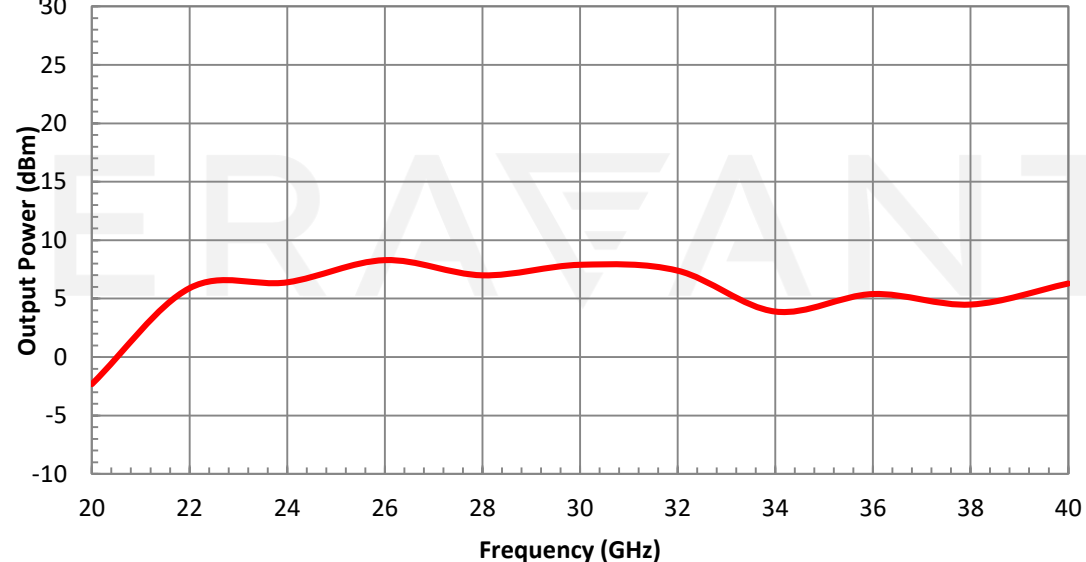
Model: SFP-223403205-28SF-S1

Parameter	Minimum	Typical	Maximum
Input Frequency	11 GHz		20 GHz
Output Frequency	22 GHz		40 GHz
Input Power		+18 dBm	+20 dBm
Output Power		+5 dBm	
Harmonic Suppression		20 dB	



Typical Output Power vs. Output Frequency

Input Power: +18 dBm



Features

- 5G mmW Band
- Minimal Conversion Loss
- No External Bias
- Compact Package

X3 Passive Multiplier

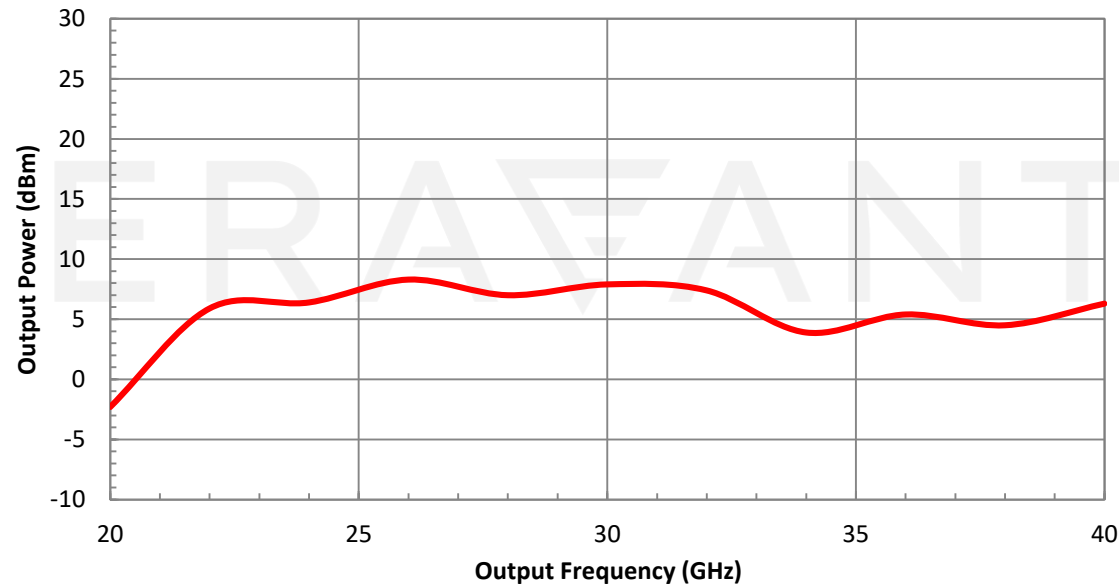
Model: SFP-243423303-28SF-S1

Parameter	Minimum	Typical	Maximum
Input Frequency	8 GHz		14 GHz
Output Frequency	24 GHz		42 GHz
Input Power		+20 dBm	+23 dBm
Output Power		+3 dBm	
Harmonic Suppression		20 dB	



Typical Output Power vs. Output Frequency

Input Power: +18 dBm



Features

- 5G mmW Band
- Minimal Conversion Loss
- No External Bias
- Compact Package

Harmonic Mixer for Spectrum Analyzer

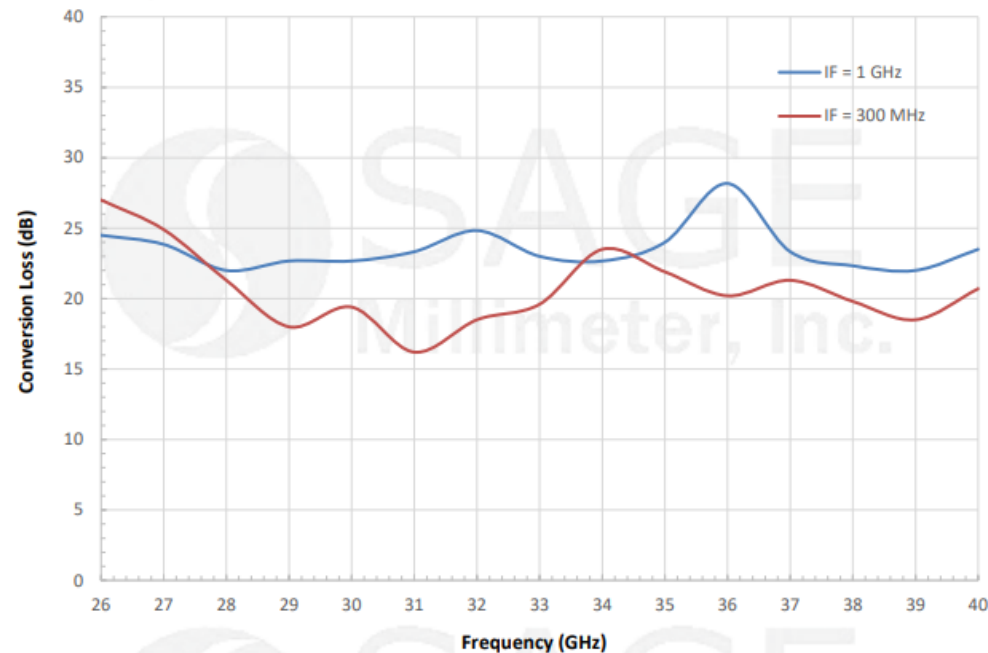
Models: SFH-28SF5F-A3 and SFH-28SF5F-A3-2

Parameter	Minimum	Typical	Maximum
RF Range	60 GHz		90 GHz
LO Frequency	3 GHz		6.1 GHz
IF Range	DC		1.3 GHz
Input Power		+16 dBm	+19 dBm
Harmonic Number		8	
Conversion Loss		45 dB	



Typical Conversion Loss vs. Frequency

RF = -20 dBm, LO = +16 dBm



Features

- Full Waveguide Band Operation
- No External Bias Required
- 8th Harmonic Detection
- 4th Harmonic Detection

Balanced Mixer

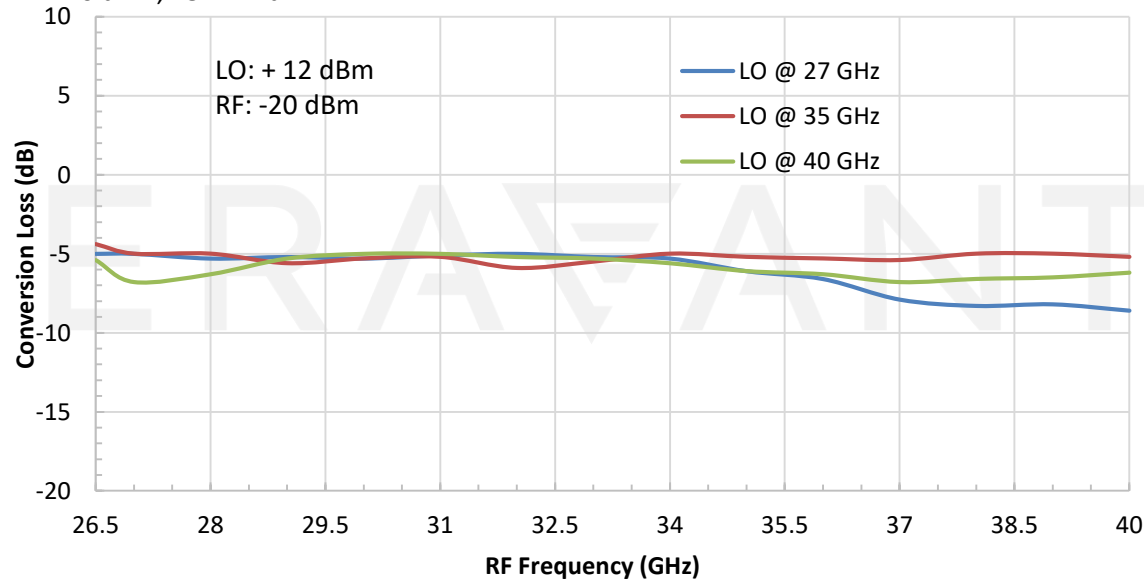
Model: SFB-28-N1

Parameter	Minimum	Typical	Maximum
RF Frequency	26.5 GHz		40 GHz
LO Frequency	26.5 GHz		40 GHz
IF Frequency	DC		13.5 GHz
LO Pumping Power	+10 dBm	+13 dBm	+15 dBm
Conversion Loss		7.5 dB	10 dB
RF to LO Isolation		30 dB	
Combined RF and LO Power			+20 dBm



Typical Conversion Loss vs. Frequency

RF: -20 dBm; LO: +12 dBm



Features

- Full Waveguide Band Coverage
- Low Conversion Loss
- High IF Frequency up to 13.5 GHz
- Compact Package

Balanced Mixer

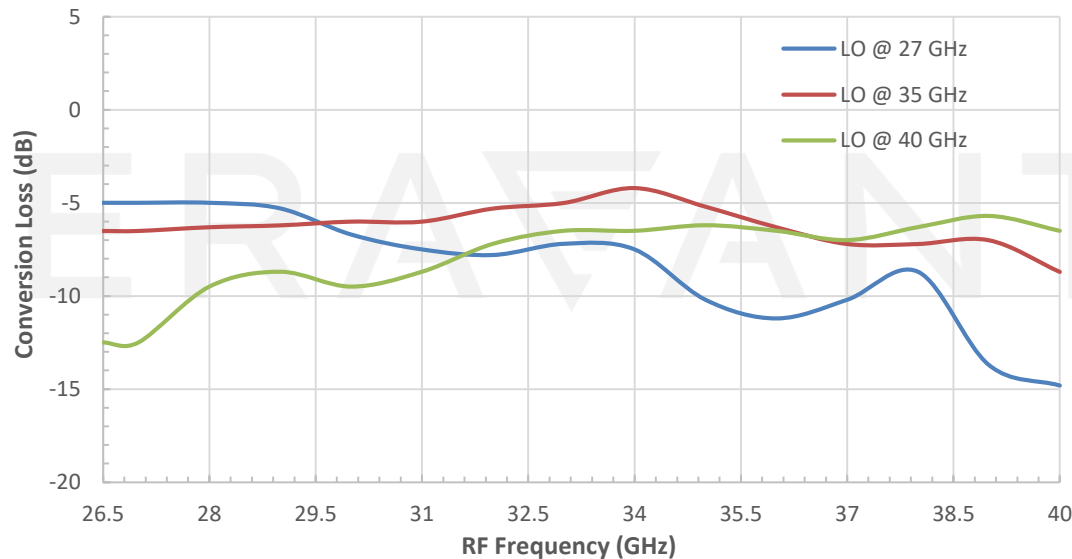
Model: SFB-28-N1-M

Parameter	Minimum	Typical	Maximum
RF Frequency	26.5 GHz		40 GHz
LO Frequency	26.5 GHz		40 GHz
IF Frequency	DC		13.5 GHz
Input P-1 dB		+10 dBm	
LO Pumping Power	+13 dBm	+15 dBm	+15 dBm
Conversion Loss		12 dB	
RF to LO Isolation		30 dB	
Combined RF and LO Power			+22 dBm



Typical Conversion Loss vs. Frequency

RF: -20 dBm, LO: +13 dBm



Features

- Full Waveguide Band Coverage
- High Input P-1 dB
- High IF Frequency up to 13.5 GHz
- Superior Port Isolations
- Compact Package

Amplitude Detector

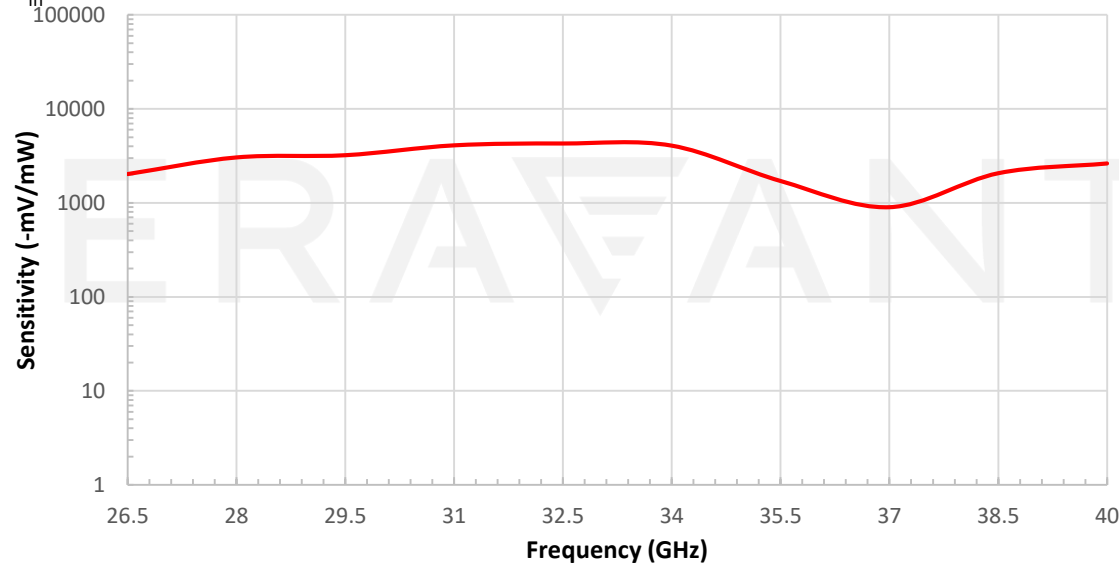
Models: SFD-273403-28SF-N1 and SFD-273403-28SF-P1

Parameter	Minimum	Typical	Maximum
Frequency Range	26.5 GHz		40 GHz
Sensitivity (SFD-603903-12SF-N1)		-1,300 mV/mV	
Sensitivity (SFD-603903-12SF-P1)		+1,300 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

- Broad or Narrow Band Operation
- High Sensitivity Without Tuning
- High Sensitivity Stability Over Broad Temperature Range

Amplitude Detector

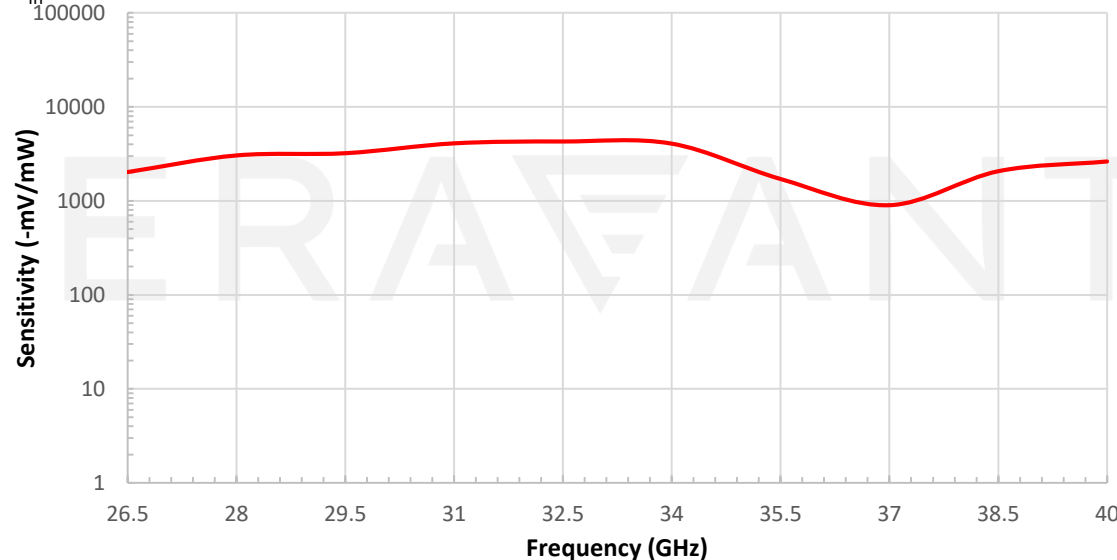
Models: STD-28SF-NI and STD-28SF-P1

Parameter	Minimum	Typical	Maximum
Frequency Range	26.5 GHz		40 GHz
Sensitivity (SFD-603903-12SF-N1)		-1,300 mV/mV	
Sensitivity (SFD-603903-12SF-P1)		+1,300 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

- Broad or Narrow Band Operation
- High Sensitivity Without Tuning
- High Sensitivity Stability Over Broad Temperature Range

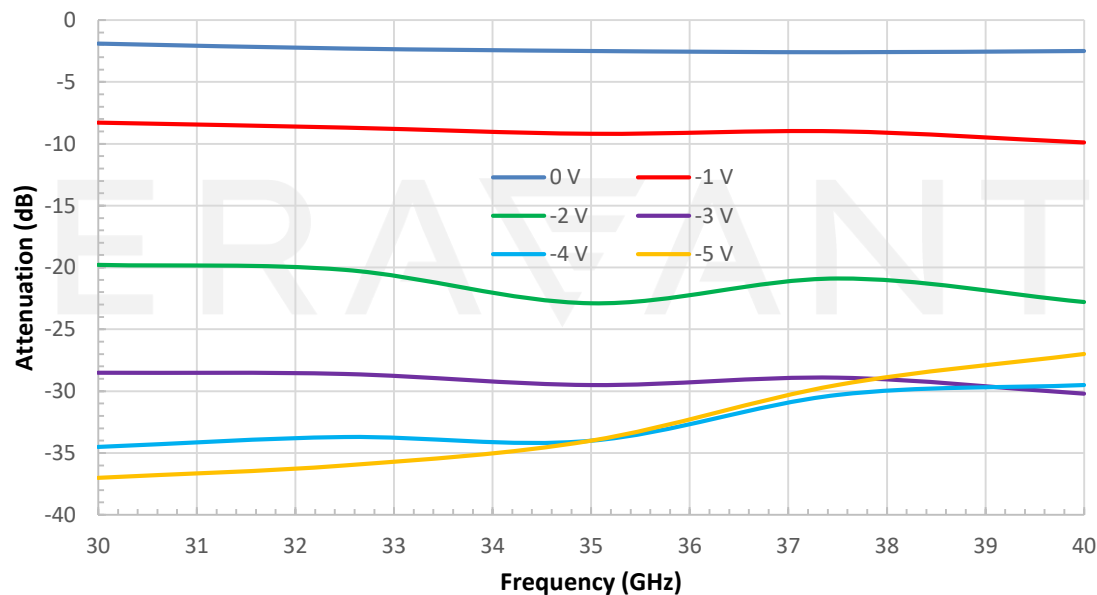
Electrical Attenuator

Model: SKA-2734032530-2828-A1

Parameter	Minimum	Typical	Maximum
RF Frequency	26.5 GHz		40 GHz
Insertion Loss		2.5 dB	3.0 dB
Attenuation		30 dB	
Power Handling		+20 dBm	+23 dBm
Control Voltage		0 to -5 V _{DC} /10 mA	0 to -6 V _{DC} /10 mA
Control Speed		100 ns	



Typical Attenuation vs. Frequency



Features

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

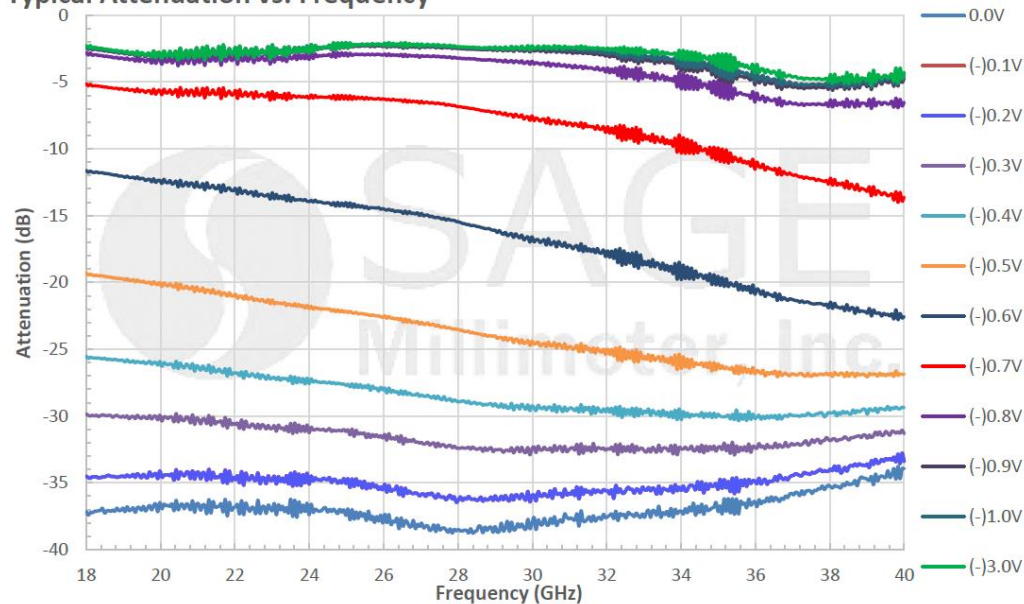
Electrical Attenuator

Model: SKA-1834033537-KFKF-A1-M

Parameter	Minimum	Typical	Maximum
RF Frequency	18 GHz		40 GHz
Insertion Loss		2.5 dB	3.0 dB
Attenuation		30 dB	
Power Handling		+20 dBm	+23 dBm
Control Voltage		0 to -5 V _{DC} /10 mA	0 to -6 V _{DC} /10 mA
Control Speed		100 ns	



Typical Attenuation vs. Frequency



Features

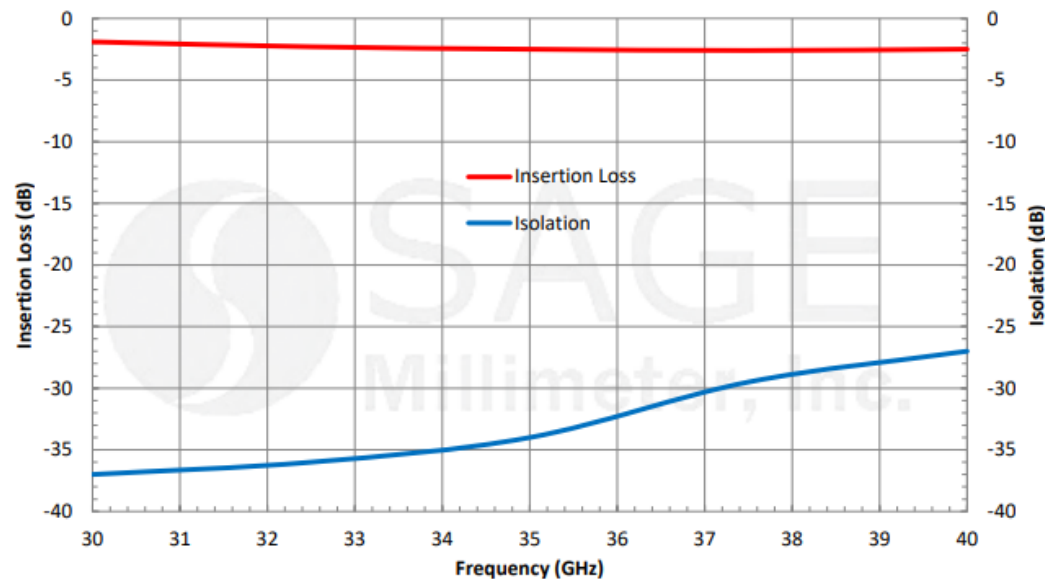
- 18 to 40 GHz Bandwidth
- Low Insertion Loss
- High Dynamic Range
- Fast Control Speed

SPST PIN Diode Switch

Model: SKS-2734032030-2828-R1

Parameter	Minimum	Typical	Maximum
RF Frequency	26.5 GHz		40 GHz
Insertion Loss		2.0 dB	
Isolation		30 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

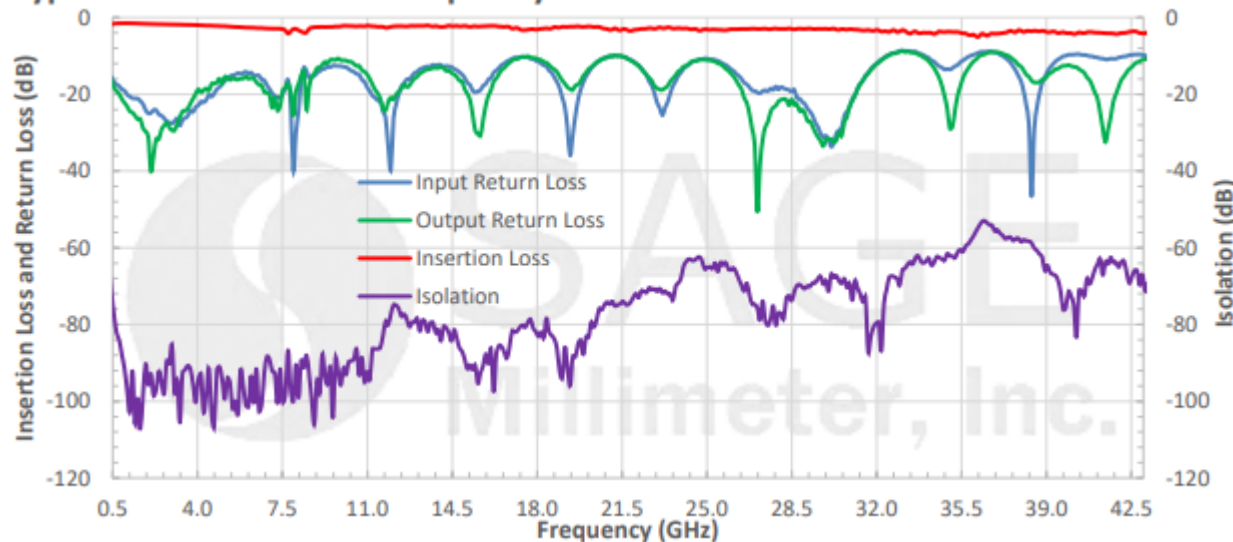
SPDT PIN Diode Switch

Model SKD-0524334560-KFKF-A3

Parameter	Minimum	Typical	Maximum
RF Frequency	0.5 GHz		43 GHz
Insertion Loss		4.5 dB	
Isolation		60 dB	
Power Handling		+20 dBm	+27 dBm
Bias Voltage		$\pm 5 V_{DC}$	
Bias Current		100/50 mA	
Control Signal		TTL	
Switching Speed		100 ns	



Typical Performance vs. Frequency



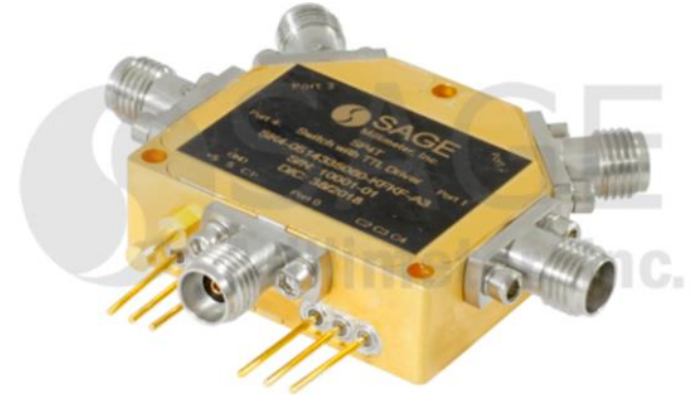
Features

- 0.5 to 43 GHz
- 5G mmW Band
- Many Models
- High Isolation
- Fast Control Speed

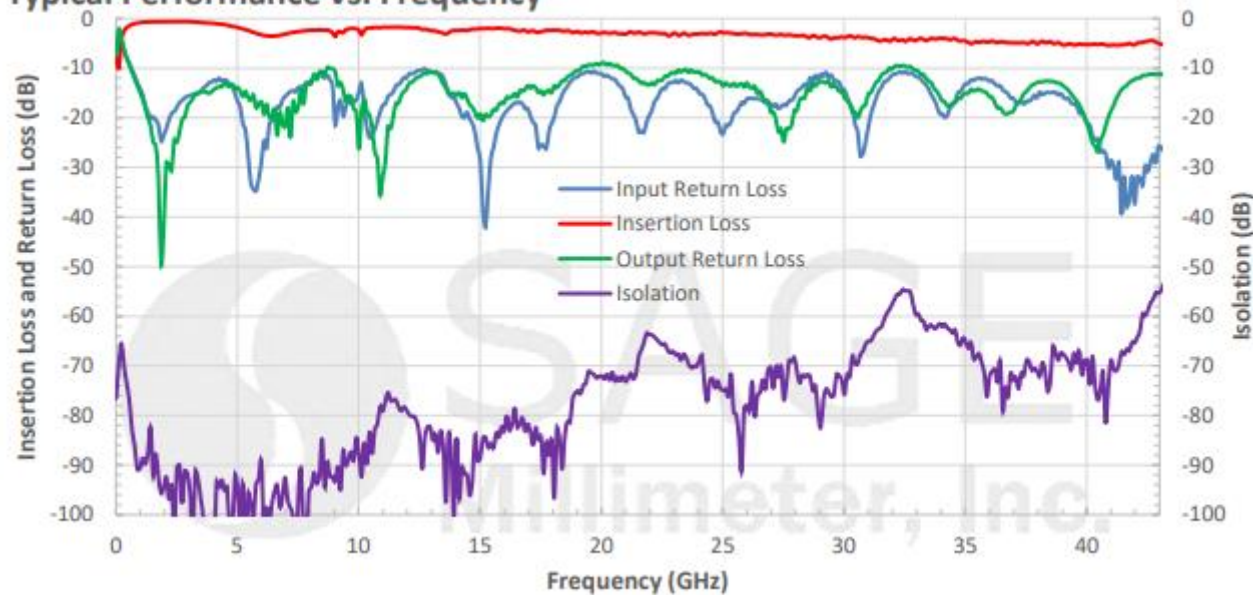
SP4T PIN Diode Switch

Model: SK4-0524335060-KFKF-A3

Parameter	Minimum	Typical	Maximum
Frequency	0.5 GHz		43 GHz
Insertion Loss		5.0 dB	
Isolation		60 dB	
VSWR		2.0:1 @ "On" State	
Control Voltage		$\pm 5 V_{DC}$	
Control Current		100/50 mA	
Power Handling			+23 dBm
Switching Speed		100 nS	



Typical Performance vs. Frequency



Features

- 0.5 to 43 GHz
- Many Models
- 5G mmW Band
- High Isolation
- Fast Control Speed

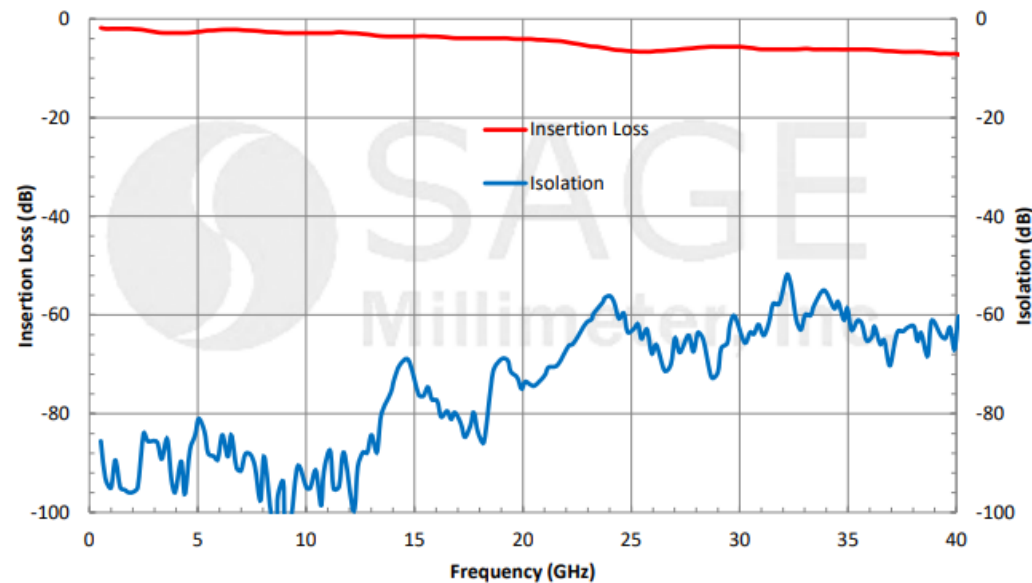
SP8T PIN Diode Switch

Model: SK4-0524335060-KFKF-A3

Parameter	Minimum	Typical	Maximum
Frequency	0.5 GHz	40 GHz	43 GHz
Insertion Loss		6.5 dB	
Isolation		60 dB	
VSWR		2.0:1 @ "On" State	
Control Voltage		$\pm 5 V_{DC}$	
Control Current		100/50 mA	
Power Handling			+23 dBm
Switching Speed		100 nS	



Typical Insertion Loss and Isolation vs. Frequency



Features

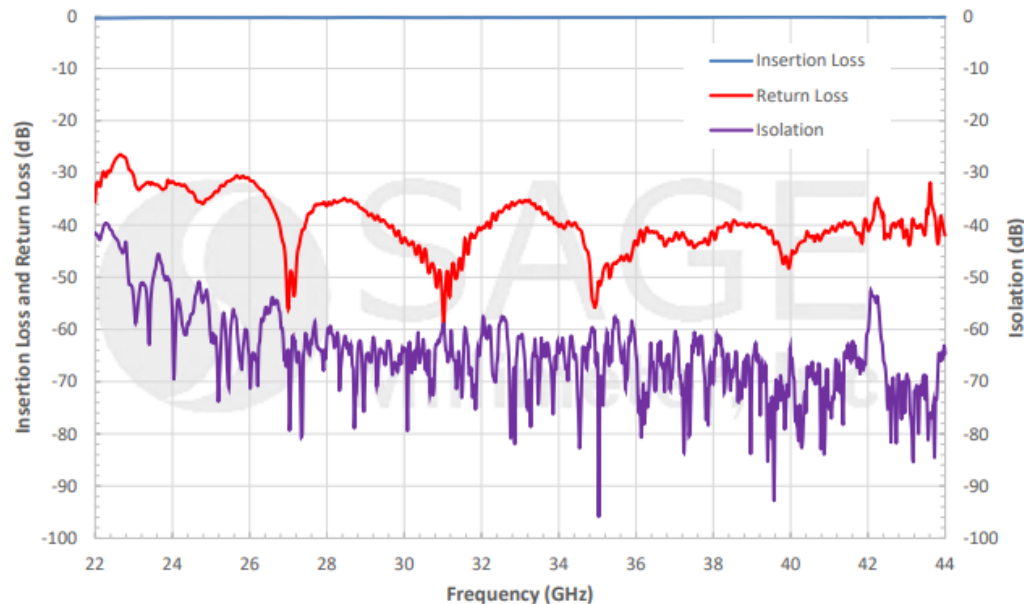
- 0.5 to 43 GHz
- 5G mmW Band
- High Isolation
- Fast Control Speed

Waveguide Manual Switch

Model: SWJ-28-M1 and SWJ-28-M1-H

Parameter	Minimum	Typical	Maximum
Frequency	22 GHz		44 GHz
Insertion Loss		0.2 dB	
Isolation		45 dB	
Power Handling		100 W (CW)	
Cycle Time		250 mA	
VSWR		500,000	
Control Signal		TTL	

Typical Performance vs Frequency



Features

- 5G mmW Band
- Low Insertion Loss
- High Isolation
- Durable and Repeatable

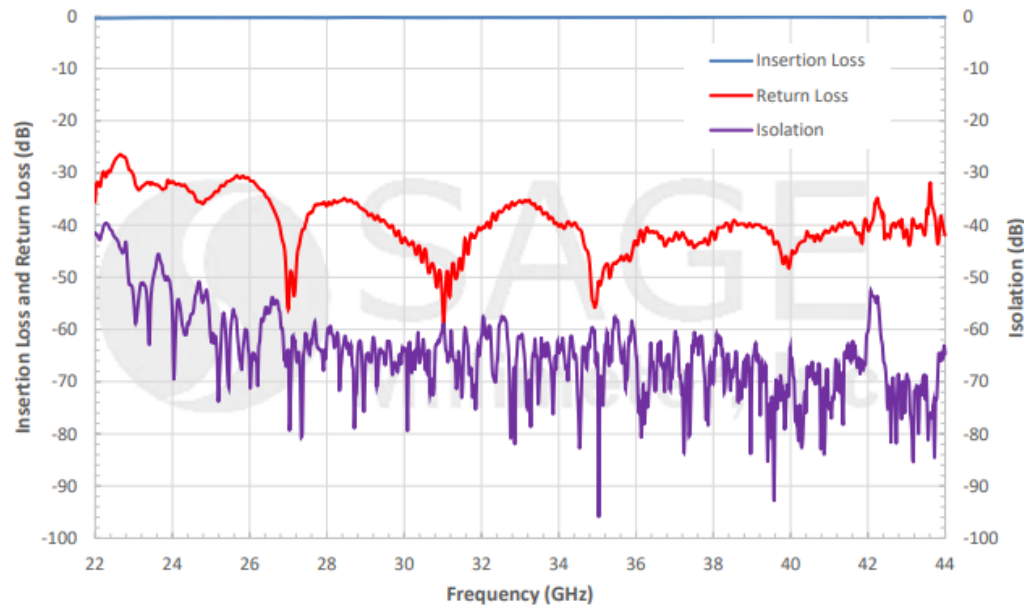
Waveguide Motorized Switch

Model: SWJ-28-TS

Parameter	Minimum	Typical	Maximum
Frequency	26.6 GHz		40 GHz
Insertion Loss		0.15 dB	0.5 dB
Isolation	55 dB	60 dB	
Bias Voltage		$\pm 28\text{ V}_{\text{DC}}$	
Bias Current		250 mA	
VSWR			1.2:1
Control Signal		TTL	
Switching Speed		125 mS	
Power Handling		100 W (CW)	



Typical Performance vs Frequency



Features

- Full Ka Band Operation
- Low Insertion Loss
- High Isolation
- Durable and Repeatable

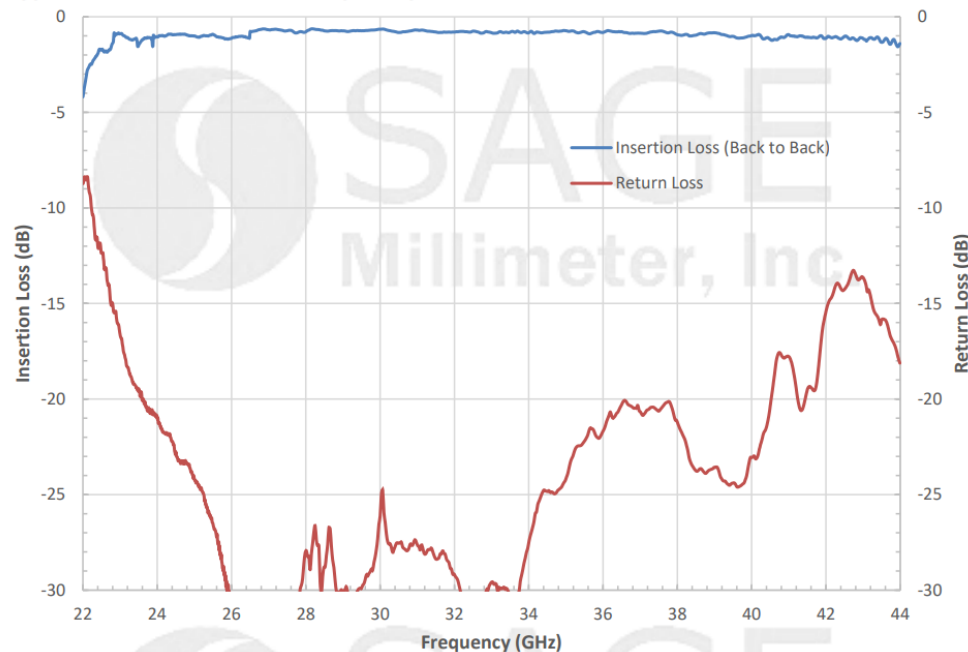
Waveguide to Coax Adapter, End Launch

Models: SWC-28KF-E1 and SWC-28KM-E1

Parameter	Minimum	Typical	Maximum
Frequency Range	26.5 GHz		40 GHz
Insertion Loss		0.35 dB	
Return Loss		20 dB	
Power Handling			20 W (CW)



Typical Performance vs. Frequency



Features

- 5G mmW Band
- Various Configurations
- Various Coax Connectors
- Lower Insertion Loss
- High Return Loss
- Instrumentation Grade
- DC Short Circuit

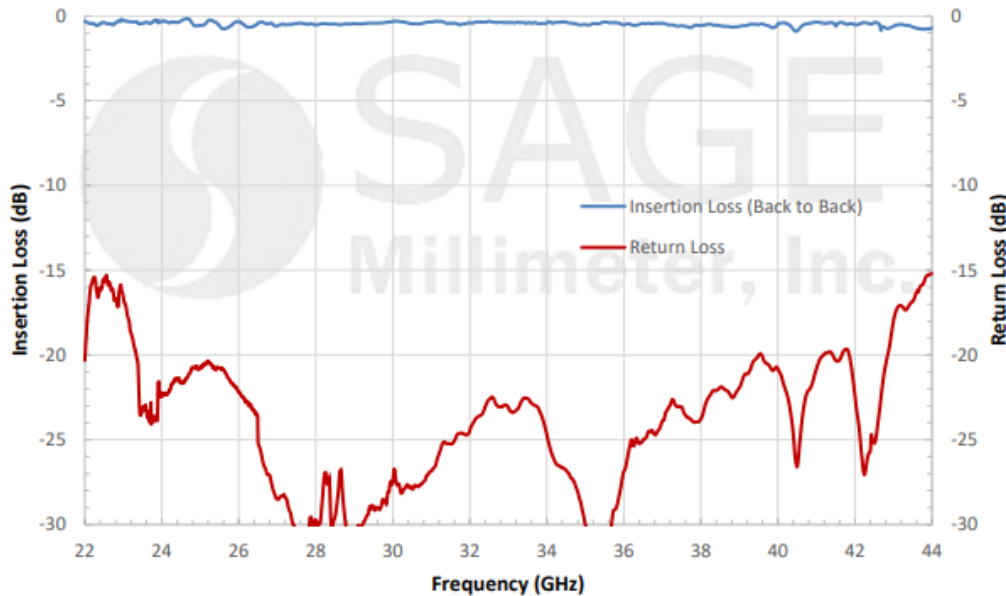
Waveguide to Coax Adapter, Right Angle

Models: SWC-28KF-R1 and SWC-28KM-R1

Parameter	Minimum	Typical	Maximum
Frequency Range	26.5 GHz		40 GHz
Insertion Loss		0.35 dB	
Return Loss		20 dB	
Power Handling			20 W (CW)



Typical Performance vs. Frequency



Features

- 5G mmW Band
- Various Configurations
- Various Coax Connectors
- Lower Insertion Loss
- High Return Loss
- Instrumentation Grade
- DC Short Circuit

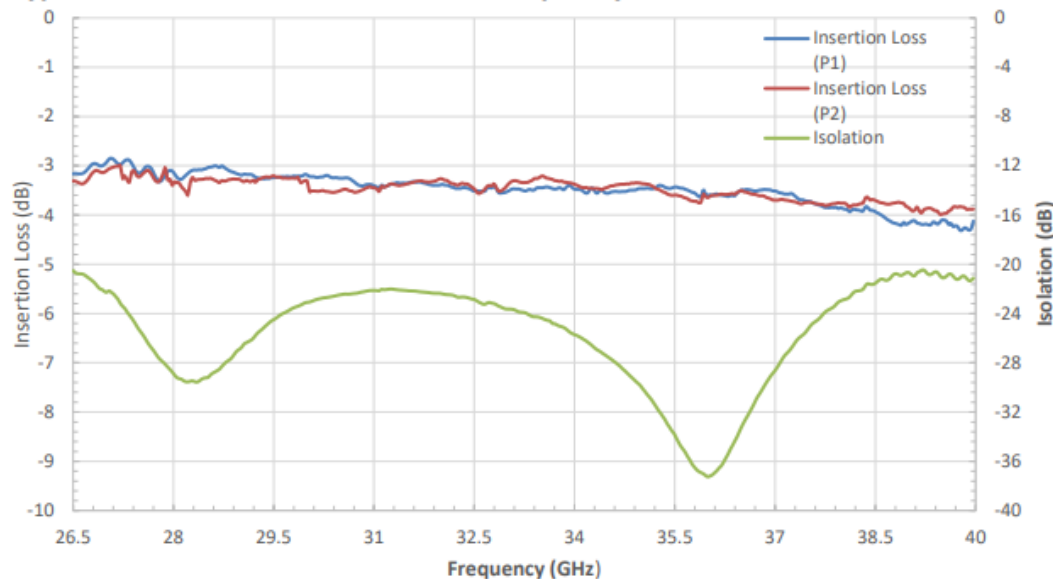
Waveguide 2-Way Power Divider

Model: SWP-27340302-28-S1

Parameter	Minimum	Typical	Maximum
Frequency	26.5 GHz		40 GHz
Power Imbalance		± 0.2 dB	
Insertion Loss		0.4 dB	
Isolation		20 dB	
Input / Output VSWR			1.5:1



Typical Insertion Loss & Isolation 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

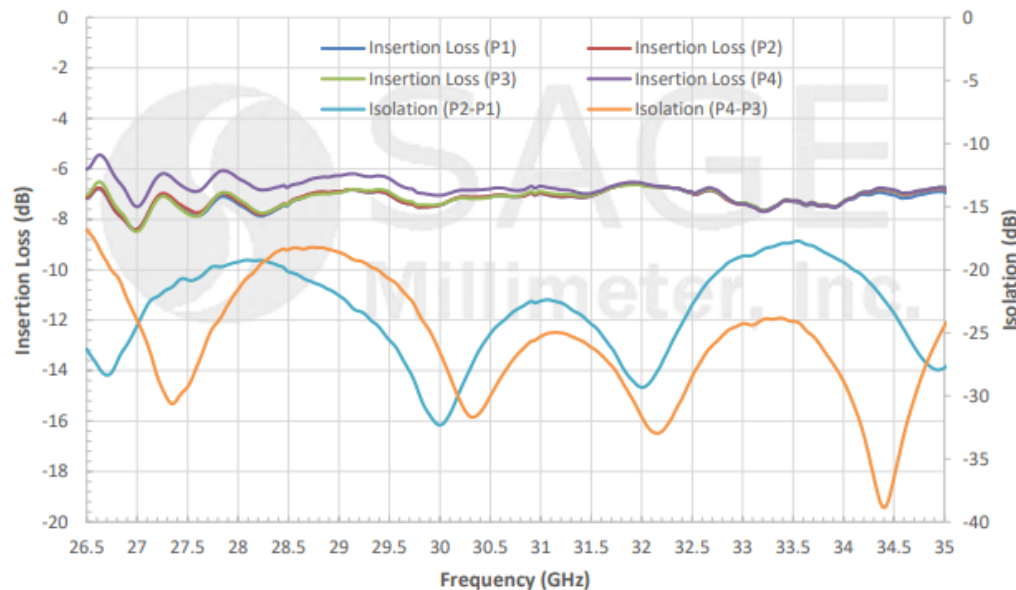
Model: SWP-27335304-28-E1

Parameter	Minimum	Typical	Maximum
Frequency	26.5 GHz		35 GHz
Power Imbalance		± 0.4 dB	
Insertion Loss		0.5 dB	
Isolation		20 dB	
Input / Output VSWR			1.5:1



Typical Insertion Loss & Isolation vs. Frequency

Isolation was tested between adjacent ports (i.e. 1-2, 3-4)



Features

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

Waveguide 8-Way Power Divider

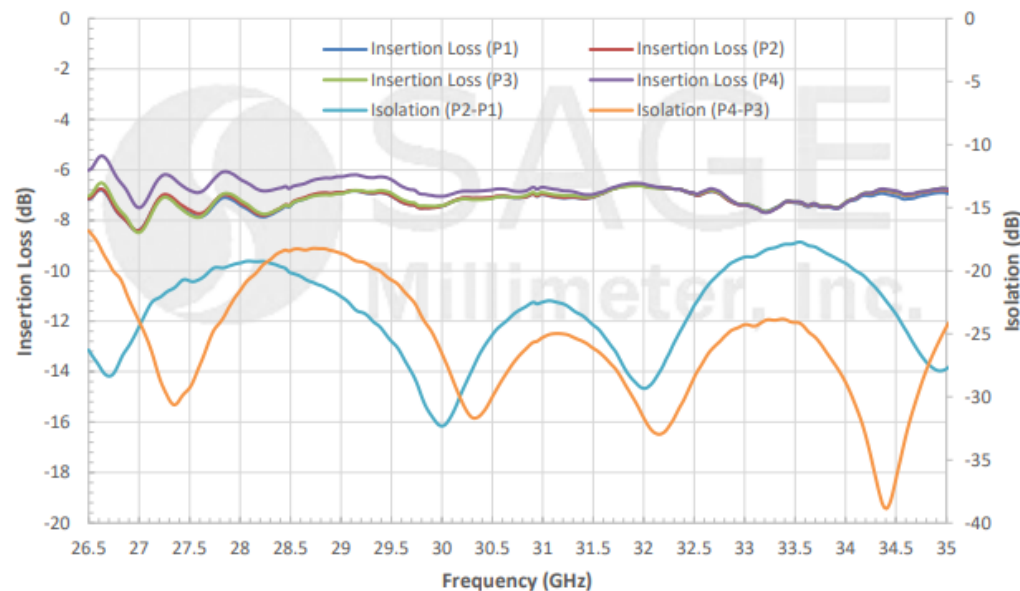
Model: SWP-29331308-28-E1

Parameter	Minimum	Typical	Maximum
Frequency	28.5 GHz		30.5 GHz
Power Imbalance		± 0.2 dB	
Insertion Loss		0.9 dB	
Isolation		25 dB	
Input / Output VSWR			1.5:1



Typical Insertion Loss & Isolation vs. Frequency

Isolation was tested between adjacent ports (i.e. 1-2, 3-4)



Features

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

Waveguide 16-Way Power Divider

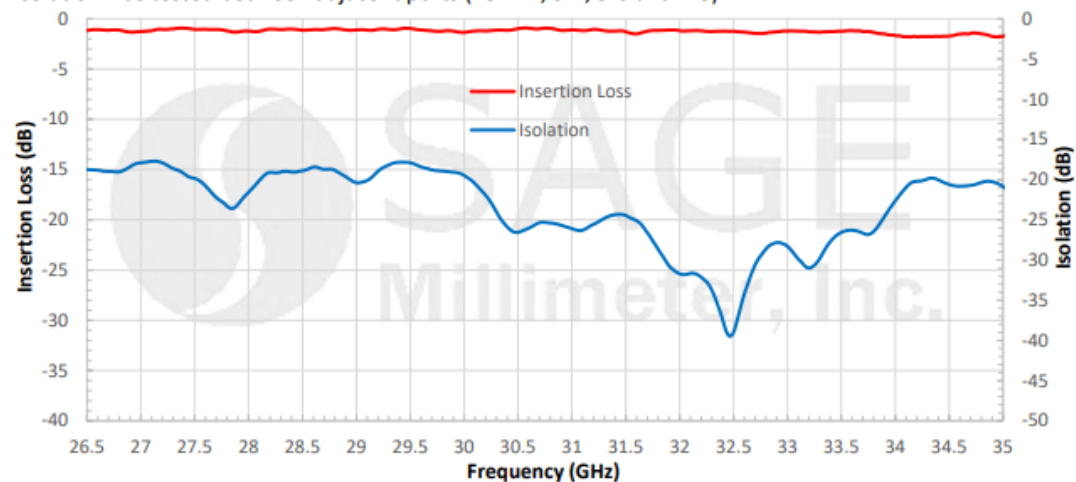
Model: SWP-27335316-28-C1

Parameter	Minimum	Typical	Maximum
Frequency	26.5 GHz		35.0 GHz
Power Imbalance		± 0.2 dB	
Insertion Loss		1.2 dB	
Isolation		20 dB	
Input / Output VSWR			1.5:1



Typical Isolation and Insertion Loss vs. Frequency

Isolation was tested between adjacent ports (i.e. 1-2, 3-4, 5-6 and 7-8)



Features

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

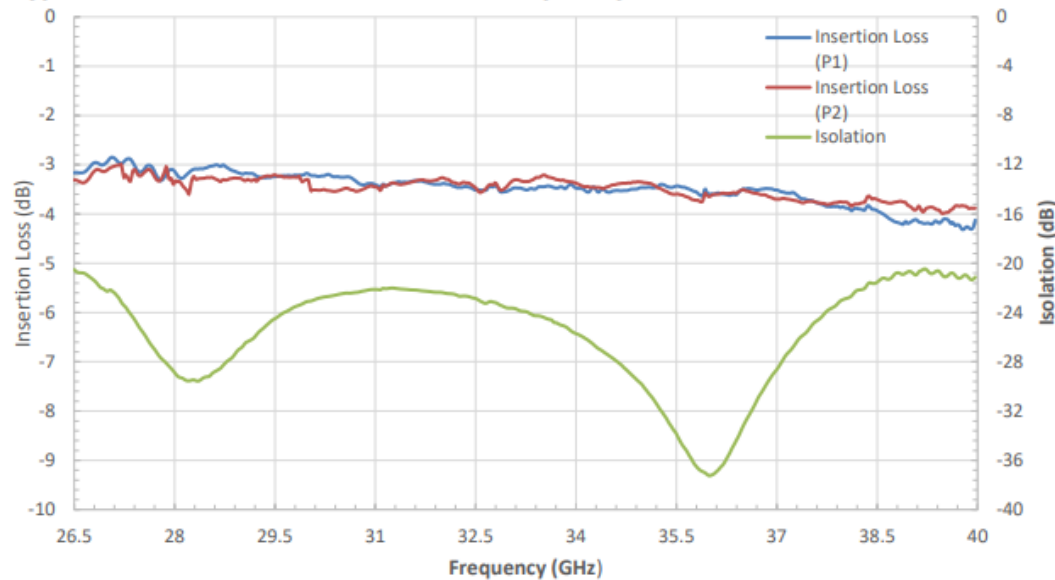
Waveguide Magic Tee

Model: SWM-27340320-28-SB

Parameter	Minimum	Typical	Maximum
Frequency	26.5 GHz		40 GHz
Insertion Loss		0.25 dB	
Isolation (Sum and Difference Ports)		30 dB	
Isolation (Collinear Ports)		20 dB	
Input / Output VSWR			1.5:1



Typical Insertion Loss & Isolation vs. Frequency



Features

- Full Waveguide Operation
- Low Insertion Loss
- High Isolation
- Compact Package

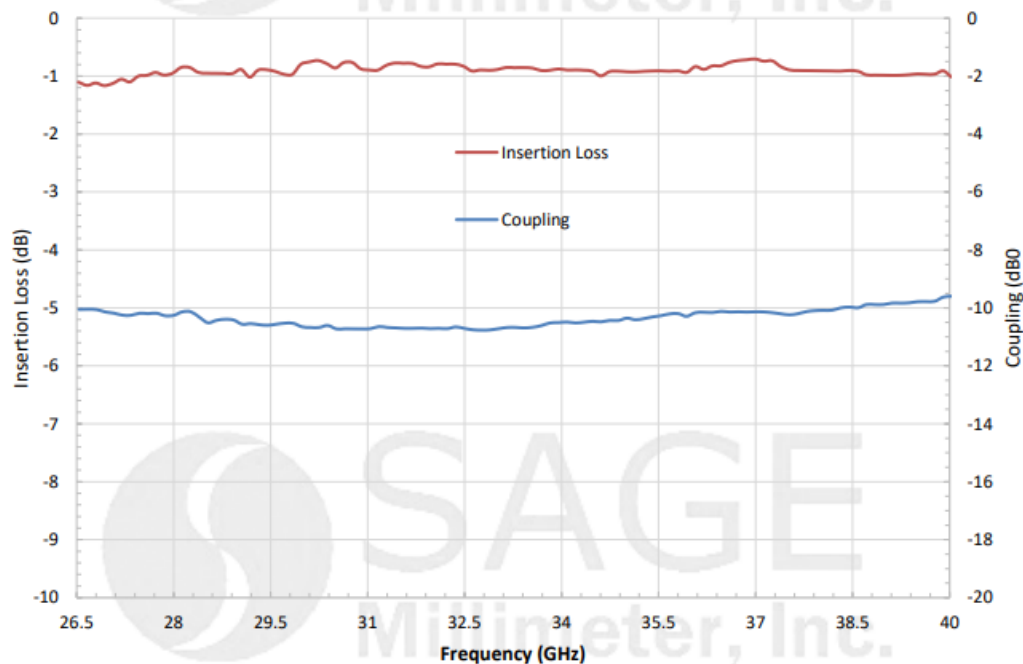
Waveguide Directional Coupler

Model: SWD-1040H-28-SB

Parameter	Minimum	Typical	Maximum
Frequency	26.5 GHz		40 GHz
Insertion Loss*		0.5 dB	
Coupling*		10.0 dB	
Directivity*	35 dB	40 dB	
Main Line VSWR			1.1 : 1



Typical Coupling and Insertion Loss vs. Frequency



Features

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

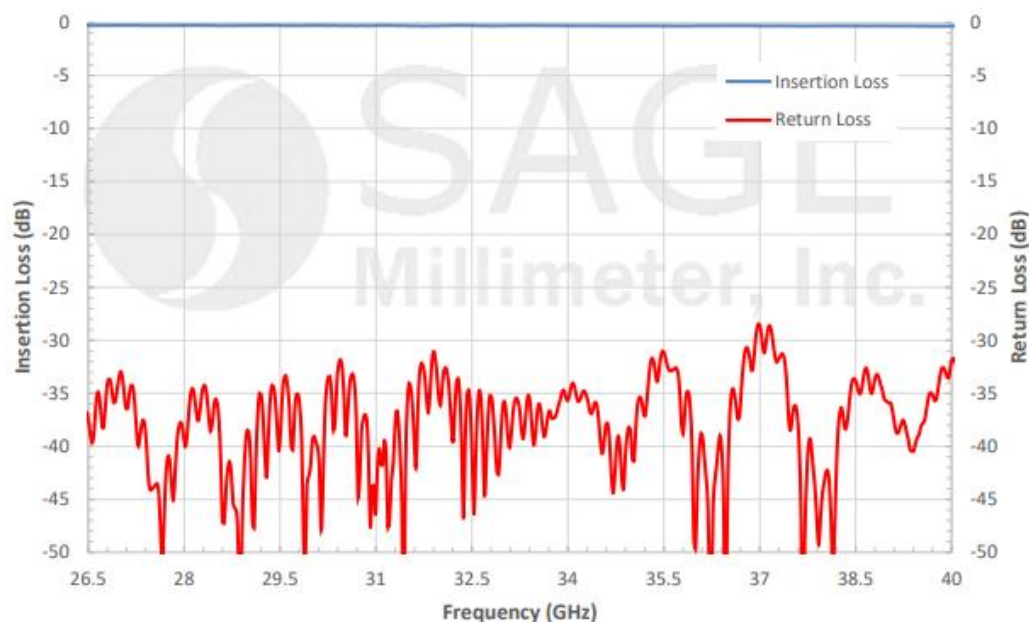
Waveguide Crossguide Coupler

Model: SWX-31339330-28-4B

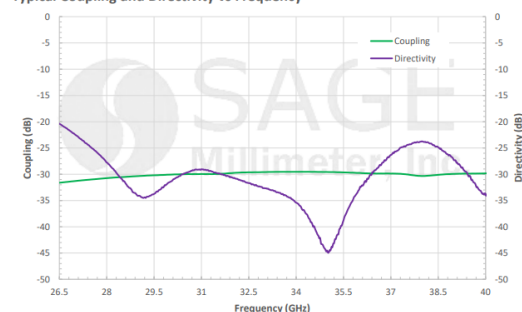
Parameter	Minimum	Typical	Maximum
Frequency	31 GHz		39 GHz
Insertion Loss*		0.3 dB	
Coupling*		30.0 dB	
Directivity*		15 dB	
Main Line VSWR		1.2 : 1	



Typical Insertion Loss and Return Loss vs Frequency



Typical Coupling and Directivity vs Frequency



Features

- Broad Band Operation
- 20, 30, 40 dB
- Waveguide Version
- Low Insertion Loss
- 3 Port and 4 Port

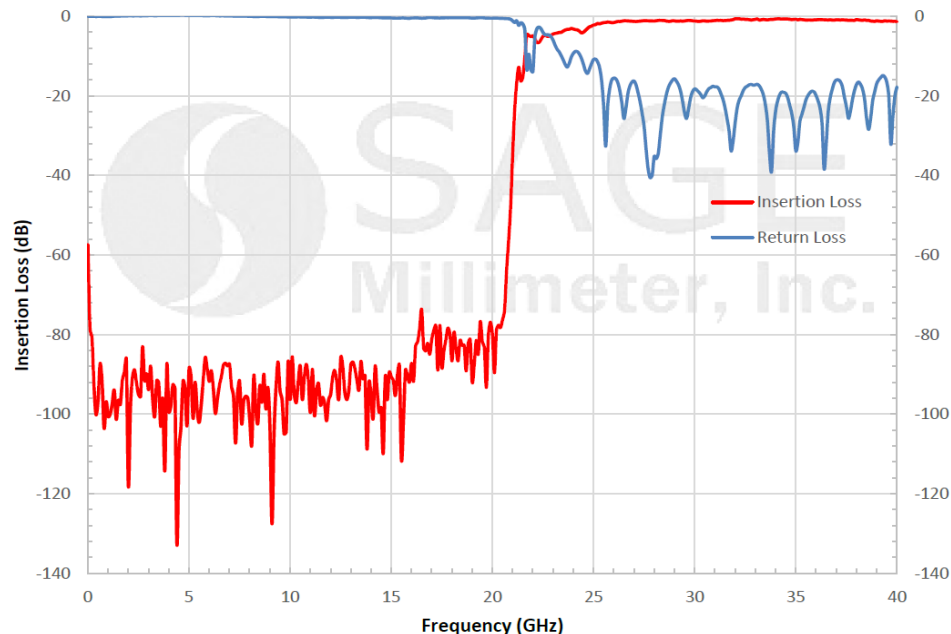
Waveguide Lowpass Filter 26.5 to 40 GHz

Model: SWF-40348360-28-L1

Parameter	Minimum	Typical	Maximum
Passband Frequency	26.5 GHz		40 GHz
Passband Insertion Loss		1.0 dB	
Passband Ripple		± 0.4 dB	
Rejection Frequency, Low Side	DC		21 GHz
Rejection Frequency, High Side	48 GHz		90 GHz
Rejection		60 dB	
Passband VSWR		1.2:1	



Typical Performance vs. Frequency



Features

- Waveguide and Coax
- Many Models
- Lowpass, Highpass and Bandpass
- Narrow and Broadband
- Low Cost
- Low Insertion Loss
- High Rejection

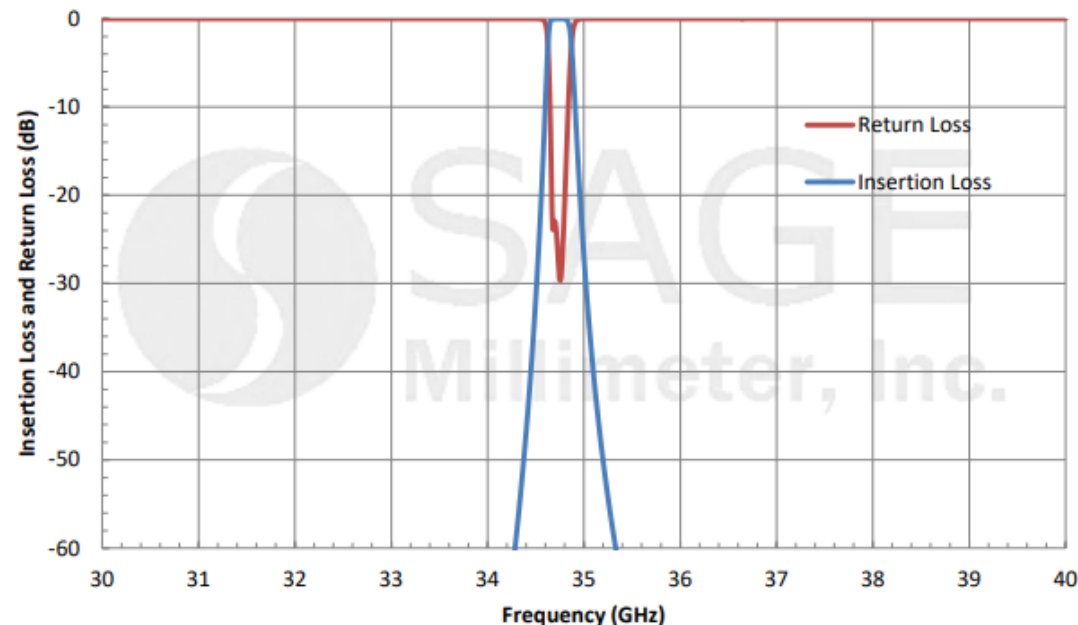
Waveguide Bandpass Filter, 34.65 to 34.85 GHz

Model: SWF-35302240-28-B1

Parameter	Minimum	Typical	Maximum
Passband Frequency	34.65 GHz		34.85 GHz
Passband Insertion Loss		3.0 dB	
Passband Ripple		± 0.4 dB	
Rejection Frequency, Low Side	DC		34.10 GHz
Rejection Frequency, High Side	35.40 GHz		40.00 GHz
Rejection		40 dB	
Passband VSWR		1.15:1	



Simulated Insertion Loss and Return Loss vs. Frequency



Features

- Waveguide and Coax
- Many Models
- Lowpass, Highpass and Bandpass
- Narrow and Broadband
- Low Cost
- Low Insertion Loss
- High Rejection

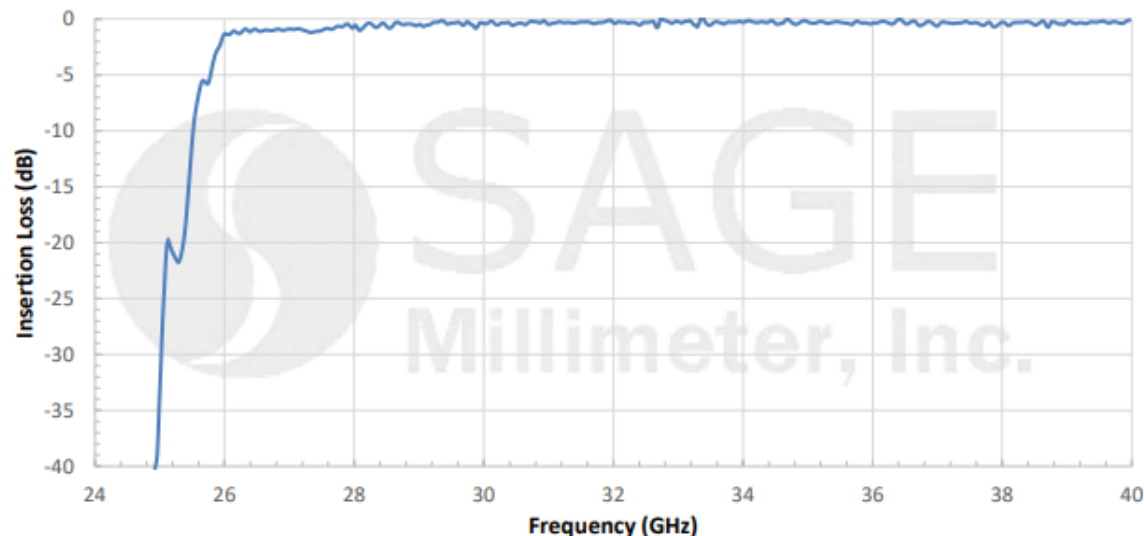
Waveguide Highpass Filter, 26.5 GHz and Higher

Model: SWF-27323340-28-H1

Parameter	Minimum	Typical	Maximum
Passband Frequency	26.5 GHz		
Passband Insertion Loss		0.5 dB	
Passband Ripple		± 0.2 dB	
Rejection Frequency, Low Side	DC		22.5 GHz
Rejection		40 dB	
Passband VSWR		1.2:1	
Waveguide	WR-28 with UG-599/U Flange		



Typical Frequency vs. Insertion Loss



Features

- Waveguide and Coax
- Many Models
- Lowpass, Highpass and Bandpass
- Narrow and Broadband
- Low Cost
- Low Insertion Loss
- High Rejection

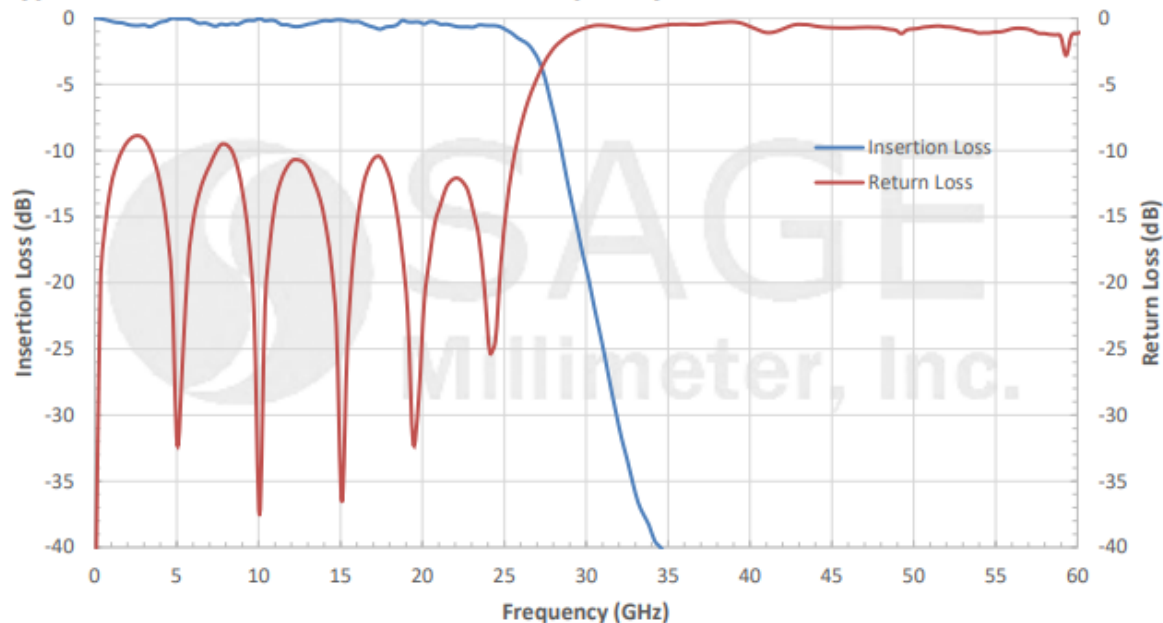
Coaxial Lowpass Filter DC to 25 GHz

Model: SCF-25340330-KFKM-L1

Parameter	Minimum	Typical	Maximum
Passband Frequency	DC GHz		25 GHz
Passband Insertion Loss		0.6 dB	
Passband Ripple		± 0.3 dB	
Rejection Frequency, Low Side	40		60 GHz
Rejection		30 dB	90 GHz
Impedance		50 Ω	
Passband VSWR		1.15:1	



Typical Insertion and Return Loss vs Frequency



Features

- Waveguide and Coax
- Many Models
- Lowpass, Highpass and Bandpass
- Narrow and Broadband
- Low Cost
- Low Insertion Loss
- High Rejection

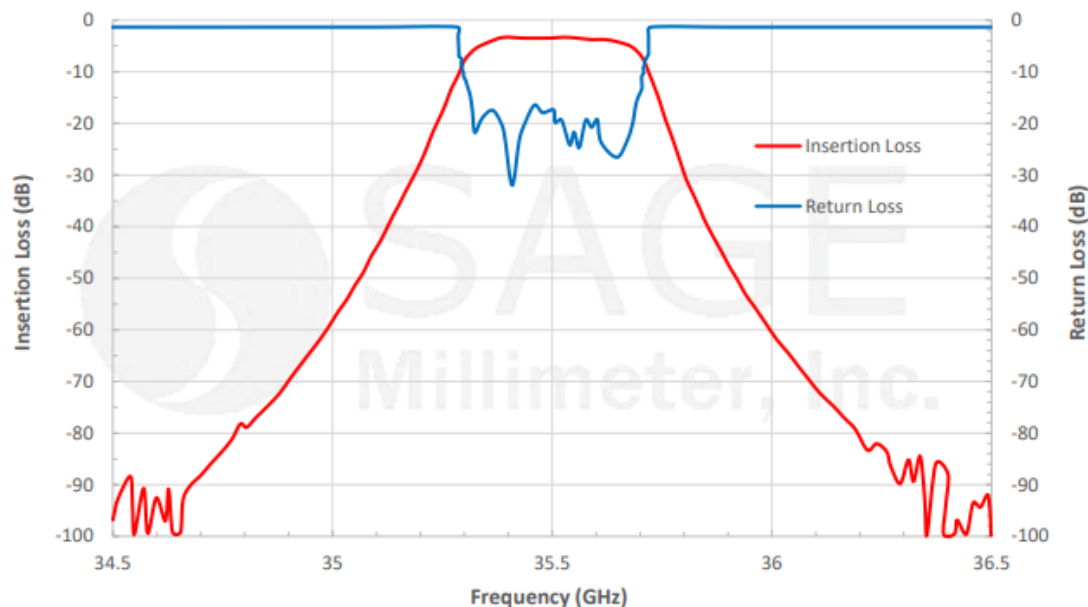
Coaxial Bandpass Filter, 35.4 to 35.6 GHz

Model: SCF-36302270-SFSF-B3

Parameter	Minimum	Typical	Maximum
Passband Frequency	35.4 GHz		35.6 GHz
Passband Insertion Loss		4.0 dB	
Passband Ripple		± 0.3 dB	
Rejection Frequency, Low Side	DC		34.8 GHz
Rejection Frequency, High Side	36.3 GHz		40.00 GHz
Rejection		70 dB	
Passband VSWR		1.15:1	



Typical Performance vs. Frequency



Features

- Waveguide and Coax
- Many Models
- Lowpass, Highpass and Bandpass
- Narrow and Broadband
- Low Cost
- Low Insertion Loss
- High Rejection

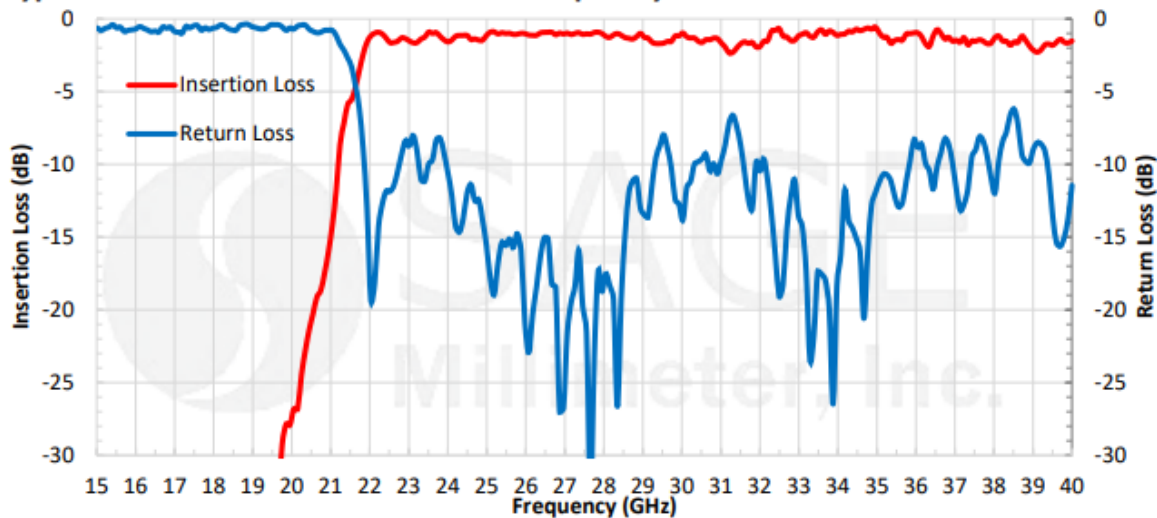
Coaxial Highpass Filter, 20 GHz and Higher

Model: SCF-22318340-28KFKF-H1

Parameter	Minimum	Typical	Maximum
Passband Frequency	22 GHz		42 GHz
Passband Insertion Loss		1.0 dB	
Passband Ripple		± 0.2 dB	
Rejection Frequency, Low Side	DC		18 GHz
Rejection		40 dB	
Passband VSWR		1.2:1	
Waveguide		K(F)	



Typical Insertion and Return Loss vs. Frequency



Features

- 5G mmW Band
- Waveguide and Coax
- Many Models
- 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, 6", 12", 24" and 36" etc.



Waveguide E-Bend: 90°



Waveguide Straight: 2"



Waveguide H-Bend: 90°



Flexible Waveguide: 6"



Waveguide Twist: 90°

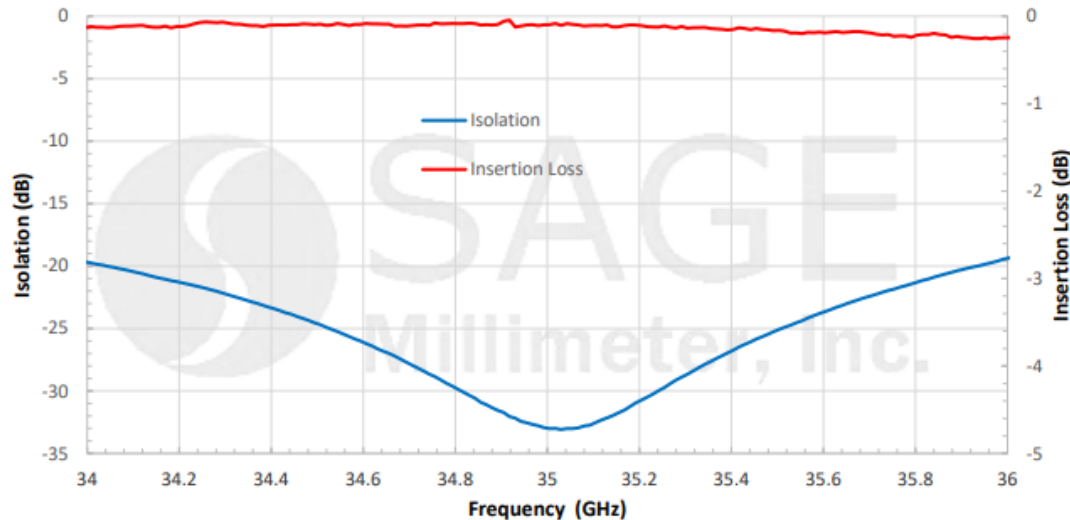
Junction Isolators and Circulators, 34 to 36 GHz

Models: SNW-3433630320-28-I1 and SNW-3433630320-28-C2

Parameter	Minimum	Typical	Maximum
RF Frequency Range	34 GHz		36 GHz
Insertion Loss			0.4 dB
Isolation	18 dB		
VSWR			1.4:1
Forward Power Handling			3 W (CW)
Reverse Power Handling			1 W (CW)



Typical Insertion Loss and Isolation vs. Frequency



Features

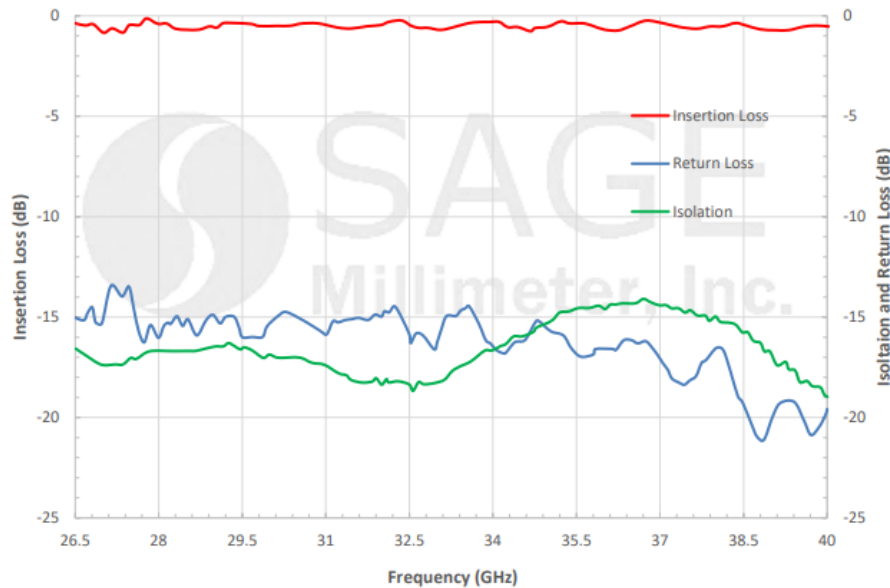
- 5G mmW Band
- Waveguide and Coax
- Many Models
- Narrow and Broadband
- Low Cost
- Low Insertion Loss
- High Isolation

Junction Isolators and Circulators, 26.5 to 40 GHz

Models: SNF-28-I5 and SNF-28-C5

Parameter	Minimum	Typical	Maximum
RF Frequency Range	26.5 GHz		40 GHz
Insertion Loss		0.4 dB	0.7 dB
Isolation		15 dB	
VSWR		1.5:1	
Forward Power Handling			20 W (CW)
Reverse Power Handling			10 W (CW)

Typical Performance vs. Frequency



Features

- 5G mmW Band
- Waveguide and Coax
- Many Models
- Narrow and Broadband
- Low Cost
- Low Insertion Loss
- High Isolation

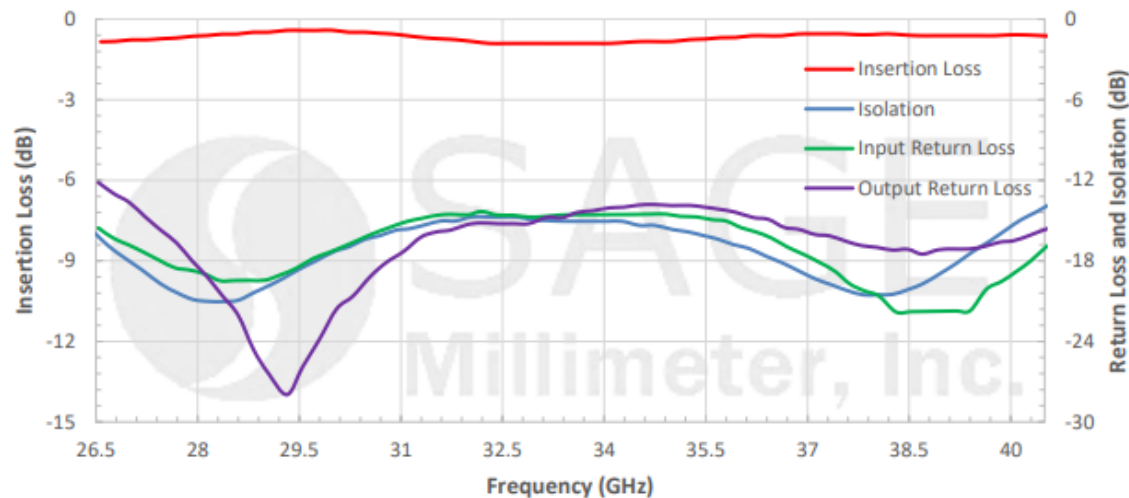
Coaxial Isolators and Circulators, 26.5 to 40 GHz

Models: SNC-2734031614-KFKF-I7 and SNC-2734031614-KFKFKF-C7

Parameter	Minimum	Typical	Maximum
RF Frequency Range	26.5 GHz		40 GHz
Insertion Loss		1.6dB	
Isolation		14 dB	
VSWR		1.8:1	
Forward Power Handling			10 W (CW)
Reverse Power Handling			1 W (CW)



Typical Performance vs. Frequency



Features

- 5G mmW Band
- Waveguide and Coax
- Many Models
- Narrow and Broadband
- Low Cost
- Low Insertion Loss
- High Isolation

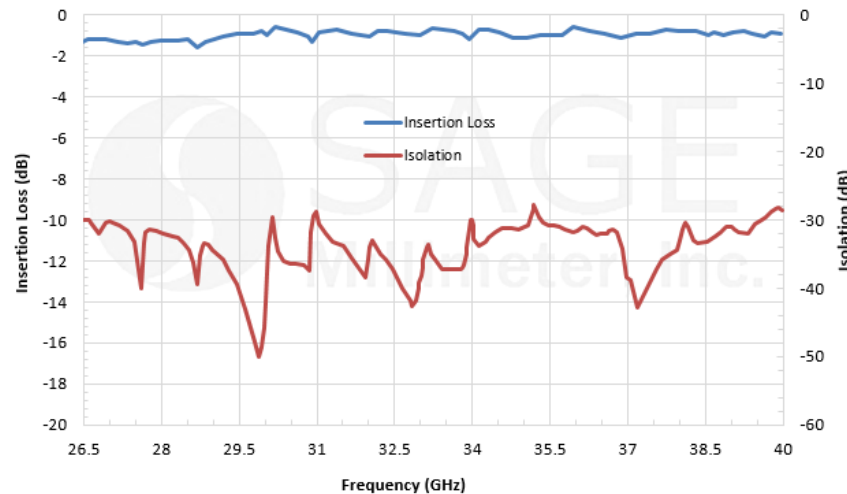
Faraday Isolator, Full Band

Model: STF-28-S1 and STF-28-91

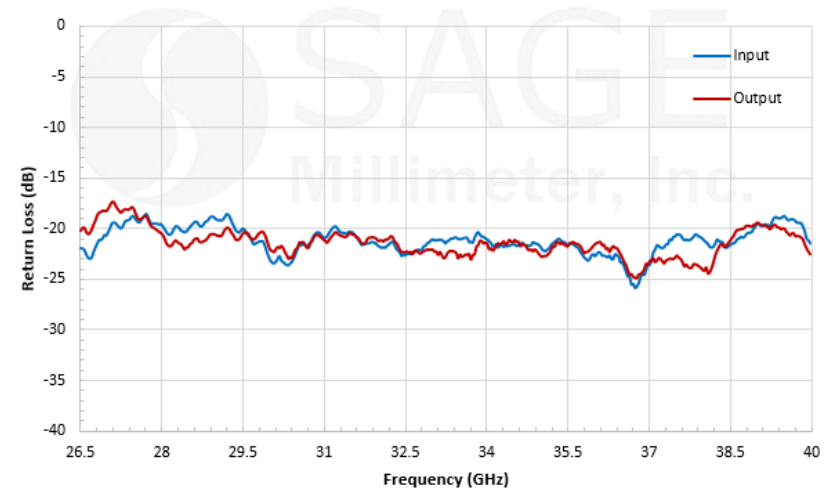
Parameter	Minimum	Typical	Maximum
RF Frequency Range	24 GHz		42 GHz
Insertion Loss		1.5 dB	2.0 dB
Isolation		28 dB	
VSWR			1.4:1
Forward Power Handling		1 W (CW)	1.2 W (CW)
Reverse Power Handling		1 W (CW)	1.2 W (CW)



Typical Performance vs. Frequency



Typical Return Loss vs. Frequency



Noise Source with Isolator

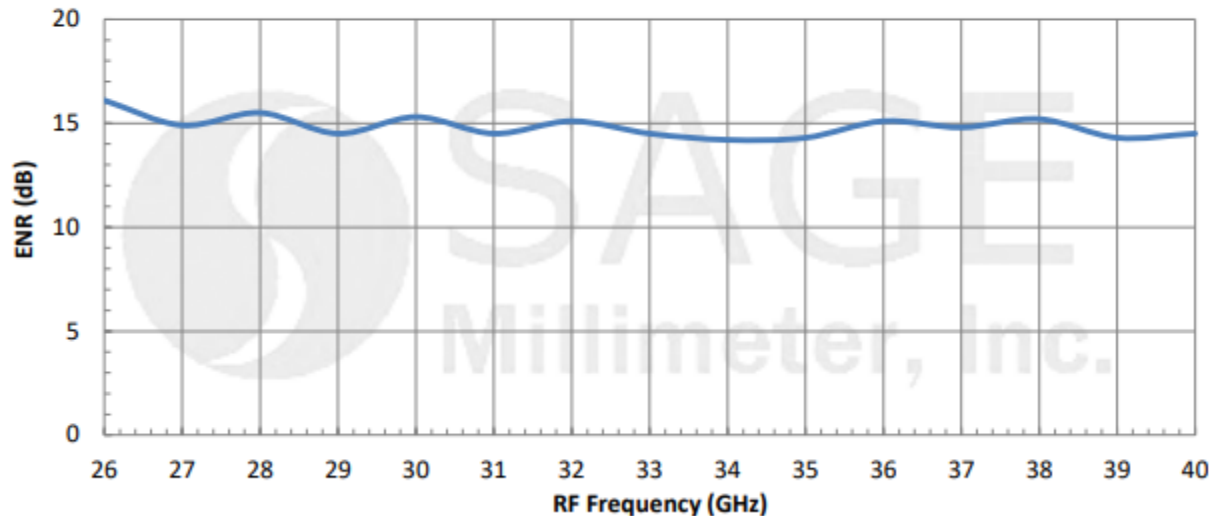
Model: STZ-28-I1

Parameter	Minimum	Typical	Maximum
RF Frequency Range	26.5 GHz		40.0 GHz
ENR		15.0 dB	
ENR Flatness		± 1.0 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} /45 mA	+28 V _{DC} /75 mA	+30 V _{DC} /100 mA



Typical ENR vs. Frequency

V_{DC} = +18 V, I_{DC} = 50 mA



Fixed Tuned Attenuator

Model: STA-20-28-F2

Features

- Full Band Coverage
- 3, 6, 10, 20, 30 dB etc. Attenuation Levels
- High Performance
- Rugged Mechanical Structure

Applications:

- Test Lab
- Instrumentations
- Subsystems



Parameter	Minimum	Typical	Maximum
RF Frequency Range	24 GHz		42 GHz
Insertion Loss		0.4 dB	
Attenuation Range	0 dB		30 dB
VSWR		1.2:1	
Power Handling			1.2 W
Waveguide	WR-28 with UG-599/U Flange		

Level Setting Attenuator

Model: STA-30-28-M1

Features

- Full Band Coverage
- Head Locking Screw
- Compact Length
- Convenient Level Setting

Applications:

- Test Lab
- Instrumentations
- Manual Test Set



Parameter	Minimum	Typical	Maximum
RF Frequency Range	24 GHz		42 GHz
Insertion Loss		0.4 dB	
Attenuation Range	0 dB		30 dB
VSWR		1.2:1	
Power Handling			1.2 W
Waveguide	WR-28 with UG-599/U Flange		

Direct Reading Attenuator

Model: STA-60-28-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	26.5 GHz		40 GHz
Insertion Loss		0.5 dB	
Attenuation Range	0 dB		60 dB
Attenuation Accuracy	0.1 dB or 3% of reading, whichever is larger, up to 40 dB		
VSWR		1.2:1	1.3:1
Power Handling		50 mW	100 mW

Digital Direct Reading Attenuator

Model: STA-60-28-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	26.5 GHz		40 GHz
Insertion Loss		0.5 dB	
Attenuation Range	0 dB		60 dB
Attenuation Accuracy	0.1 dB or 2% of reading, whichever is larger, up to 40 dB		
VSWR		1.2:1	1.3:1
Power Handling		250 mW	1,000 mW

Programmable Attenuator

Model: STA-60-28-P1

Features

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

Applications:

- Test Lab
- Instrumentations
- Auto Test Set



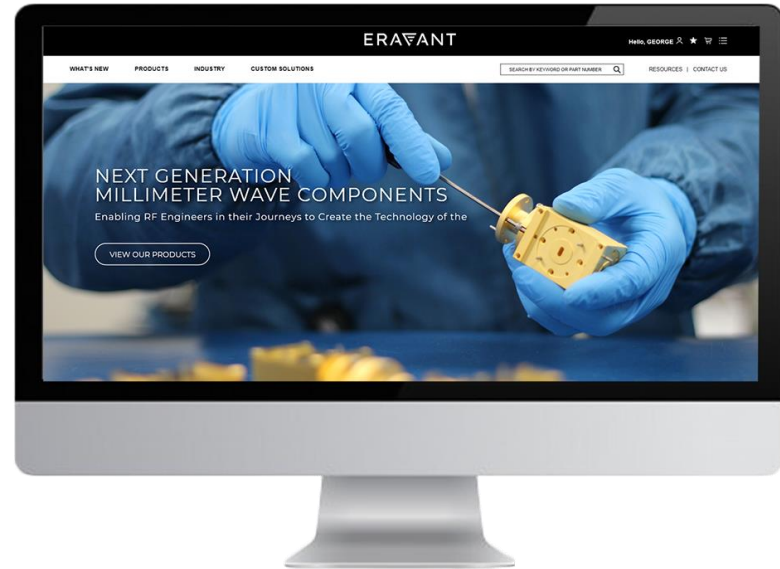
Parameter	Minimum	Typical	Maximum
RF Frequency Range	26.5 GHz		40 GHz
Insertion Loss		0.5 dB	
Attenuation Range	0 dB		70 dB
Attenuation Accuracy	0.1 dB or 3% of reading, whichever is larger, up to 40 dB		
VSWR		1.2:1	1.3:1
Power Handling		1 Watt	2.5 W

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SWM-60390320-12-SB

Full E-Band Magic Tee

Description:

Model SWM-60390320-12-SB is an E-band magic tee that covers the entire band from 80 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	80 GHz		90 GHz
Insertion Loss		0.10 dB	
Isolation		20 dB	
Collinear Ports		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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frequency

Return Loss

Insertion Loss

Isolation

Collinear Ports

Sum and Difference Ports

Weight

Finishing

Material

Outline

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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	85 GHz	+16 dBm	WR-08 Waveguide	WR-12 Waveguide	Datasheet	View
SFP-06319-U6	110 GHz	170 GHz	-3 dBm	36.67 GHz	56.67 GHz	+20 dBm	WR-06 Waveguide	WR-19 Waveguide	Datasheet	View
SFP-06210-S2	140 GHz	220 GHz	-3 dBm	70 GHz	110 GHz	+17 dBm	WR-05 Waveguide	WR-10 Waveguide	Datasheet	View
SFP-2234033-28SF-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-283SF-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-2734033-205-28SF-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-223SF-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-363673303-19SF-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	2.82 mm (F)	Datasheet STEP File	View