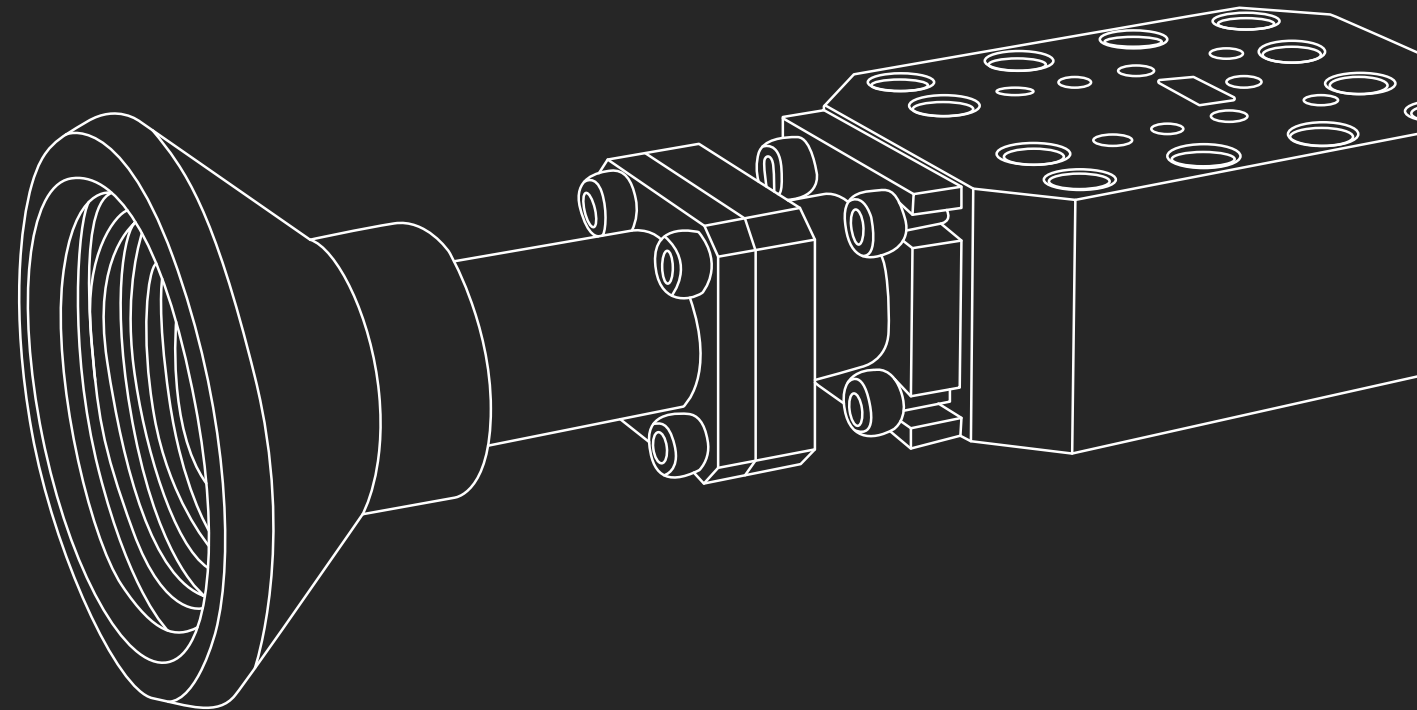


DUAL POLARIZED ANTENNAS

APPLICATIONS & CONFIGURATIONS FOR 5G



CONTENTS

INTRODUCTION

ERAVANT DUAL POLARIZED ANTENNA APPLICATIONS

ERAVANT QUAD-RIDGE BASED ANTENNA

ERAVANT OMT BASED ANTENNA

CONCLUSION

WEBSITE

ERAVANT PRODUCT COVERAGE

ERAVANT, formerly SAGE Millimeter, offers Total Product Solutions to configure any system applications in the Frequency Range of DC to 220 GHz.

Although the standard models are specified for full waveguide band operations, they can cover many Extended Millimeter Wave 5G Bands.

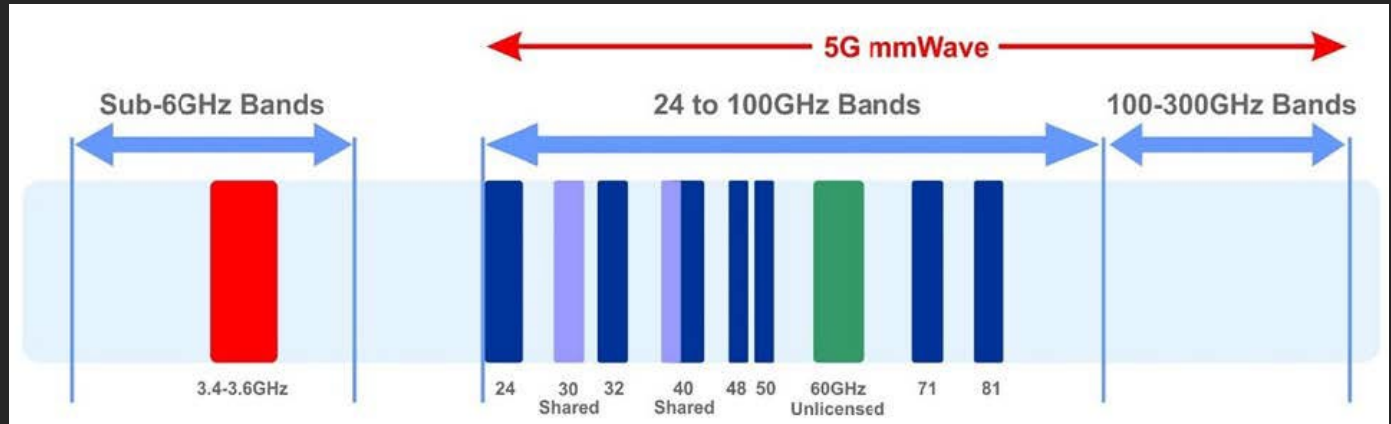
While thousands of offered modules cover the Full Spectrum of the Millimeter Wave 5G Band. The examples are,

- Beamforming, Omni Directional, Dual Polarized Antennas
- Broadband, Low Noise and Power Amplifiers
- Frequency Converters and Multipliers
- Control Devices
- Ferrite Devices
- Oscillators
- Passive Components and Ferrite Devices

5G FREQUENCY SPECTRUM

Millimeter 5G Frequency Bands:

- Ka Band: 24 to 34 GHz
- Q Band: 37 to 53 GHz
- V Band: 55 to 76 GHz
- E Band 81 to 86 GHz



ERAVANT ANTENNAS

There are several hundred standard **ERAVANT** models available to satisfy all 5G system applications. The antenna family includes the following types:

- Rectangular Horn Antenna
- Circular Horn Antenna
- Scalar Feed Horn Antenna
- Choke Flange Feed Horn Antenna
- Lens Correct Horn Antenna
- Gaussian Optics Antenna
- Microstrip Patch Array Antenna
- Omni Directional Antenna
- Probe Antenna
- Polarizer
- Orthomode Transducer
- Slotted Waveguide Array Antenna
- Cassegrain Antenna

This presentation introduces Eravant's dual-pol antennas offering in broadband for 5G System Applications.

DUAL-POLARIZED ANTENNA APPLICATIONS

Applications: 5G, UWB System, PCS (personal communication system), PCS (personal communication system), EMC (electromagnetic compatibility), OTA (Over the Air) Testing, Automotive

Scenarios:

- Vertical port only receives/transmits linearly polarized vertical waveform
- Horizontal port only receives/transmits linearly polarized horizontal waveform
- With 90-degree hybrid coupler, the left-hand polarization (LHP) or right-hand polarization (RHP) can be transmitted/received.
- When the antenna is in transceiving mode, it is known as a diplexer.
- No need to rotate antenna physically in the measurement system



Quad-Ridge Based Dual Pol Antenna



OMT Based Dual Pol Antenna

DUAL POLARIZED ANTENNA MODELS

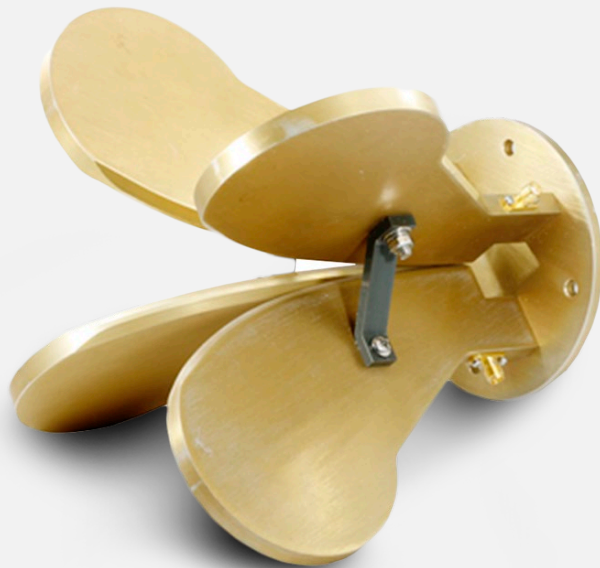
QUAD RIDGED DUAL POLARIZED ANTENNA

1 to 4 GHz

SAV-0130430883-SF-U4-QR

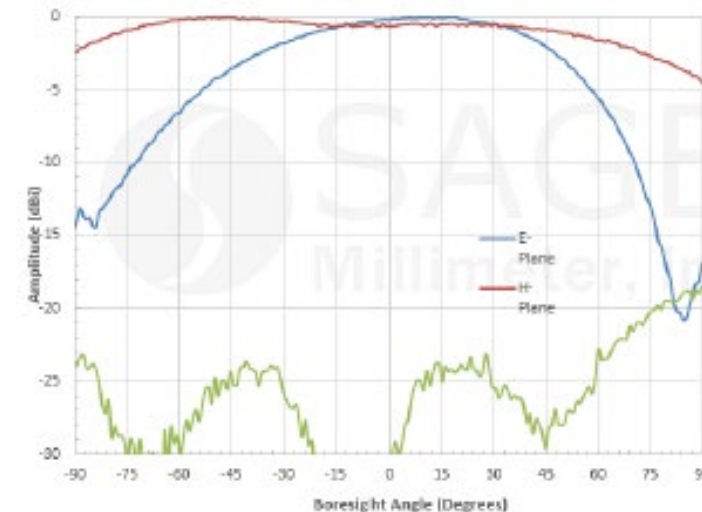
FEATURES:

- 1 to 4 GHz
- Dual Polarized
- 6.57" (L) X 8.08" (W) X 8.08" (H)
- 5 Models to Cover up to 50 GHz



Parameter	Minimum	Typical	Maximum
Frequency	1.0 GHz		4.0 GHz
Gain		8.0 dBi	
Polarization	Linear and Circular		
3 dB Beamwidth, E-Plane		68°	
3 dB Beamwidth, H-Plane		98°	
Side Lobes		-10 dB	
Port Isolation		20 dB	
Return Loss		9 dB	
Specification Temperature		+25 °C	
Operation Temperature	-45 °C		+85 °C

Typical Antenna Patterns @ 1 GHz



QUAD RIDGED DUAL POLARIZED ANTENNA

6 to 25 GHz

SAV-0632531431-SF-U3-QR

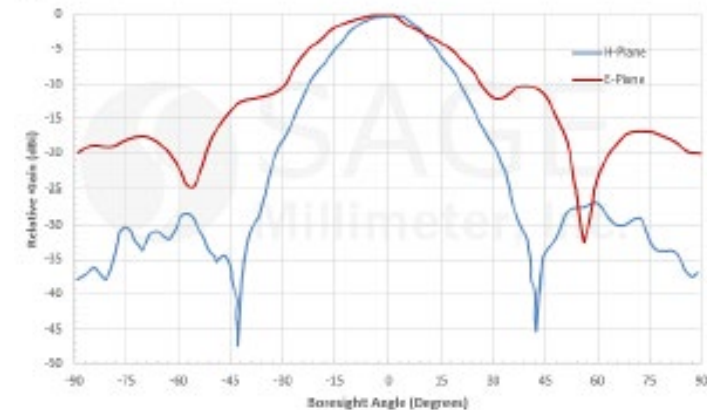
FEATURES:

- 6 to 24.5 GHz
- Dual Polarized
- 3.13" (L) X 1.69" (W) X 1.69" (H)
- 5 Models to Cover up to 50 GHz



Parameter	Minimum	Typical	Maximum
Frequency	6.0 GHz		24.5 GHz
Gain		14 dBi	
Polarization	Circular and Linear		
E-Plane 3 dB Beamwidth		26°	
H-Plane 3 dB Beamwidth		36°	
Port to Port Isolation		35 dB	
E-Plane Sidelobe Levels		-17 dB	
H-Plane Sidelobe Levels		-20 dB	
Return Loss		8 dB	
Cross Polarization		-30 dB	
Power Handling			25 W (CW)
Specification Temperature		+25°C	
Operating Temperature	-40°C		+85°C

Typical Antenna Pattern @ 24.5 GHz



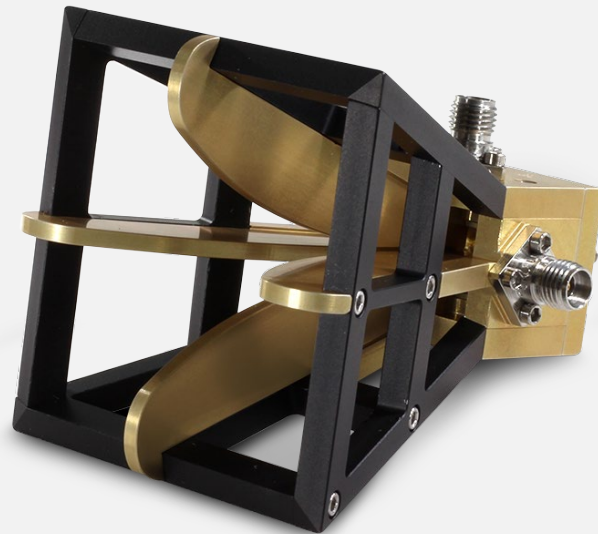
QUAD RIDGED DUAL POLARIZED ANTENNA

4 to 40 GHz

SAV-0434031428-KF-U5-QR

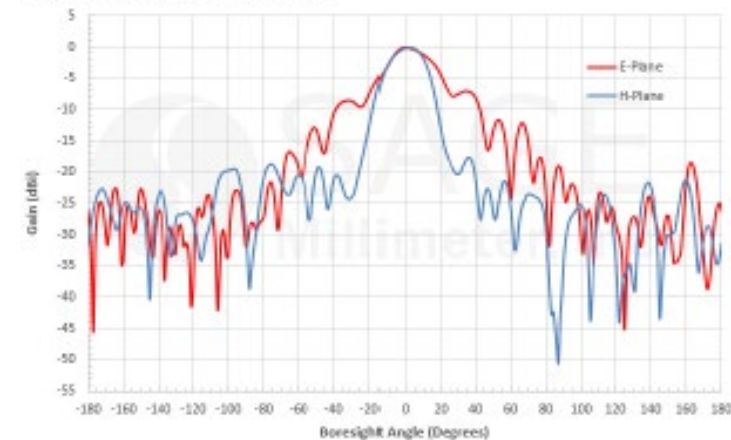
FEATURES:

- 4 to 40 GHz
- Dual Polarized
- 2.69" (L) X 2.10" (W) X 2.10" (H)
- 5 Models to Cover up to 50 GHz



Parameter	Minimum	Typical	Maximum
Frequency	4 GHz		40 GHz
Gain		14 dBi	
Polarization	Linear and Circular		
E-Plane 3 dB Beamwidth		28°	
H-Plane 3 dB Beamwidth		28°	
Port to Port Isolation	28 dB	30 dB	
E-Plane Sidelobe Levels		-10 dB	
H-Plane Sidelobe Levels		-15 dB	
Return Loss		10 dB	
Cross Polarization	23 dB	28 dB	
Power Handling			10 W (CW)
Specification Temperature		+25°C	
Operating Temperature	-40°C		+85°C

Typical Antenna Pattern @ 40 GHz



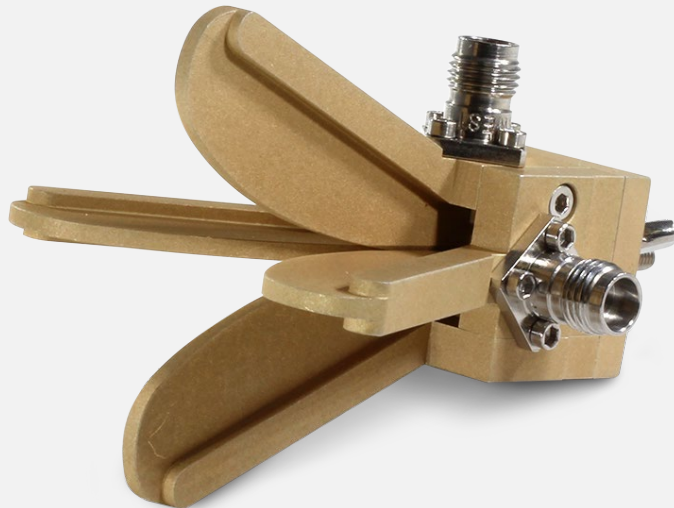
QUAD RIDGED DUAL POLARIZED ANTENNA

5 to 50 GHz

SAV-0535031140-2F-U5-QR

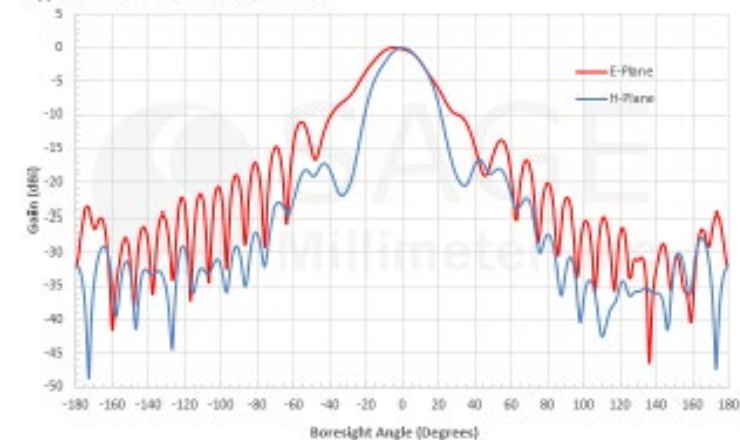
FEATURES:

- 5 to 50 GHz
- Dual Polarized
- 2.18" (L) X 1.76" (W) X 1.76" (H)
- 5 Models to Cover up to 50 GHz



Parameter	Minimum	Typical	Maximum
Frequency	5 GHz		50 GHz
Gain		11 dBi	
Polarization	Linear and Circular		
E-Plane 3 dB Beamwidth		40°	
H-Plane 3 dB Beamwidth		40°	
Port to Port Isolation	28 dB	30 dB	
E-Plane Sidelobe Levels		-10 dB	
H-Plane Sidelobe Levels		-15 dB	
Return Loss		10 dB	
Cross Polarization	18 dB	25 dB	
Power Handling			5 W (CW)
Specification Temperature		+25°C	
Operating Temperature	-40°C		+85°C

Typical Antenna Pattern @ 50 GHz



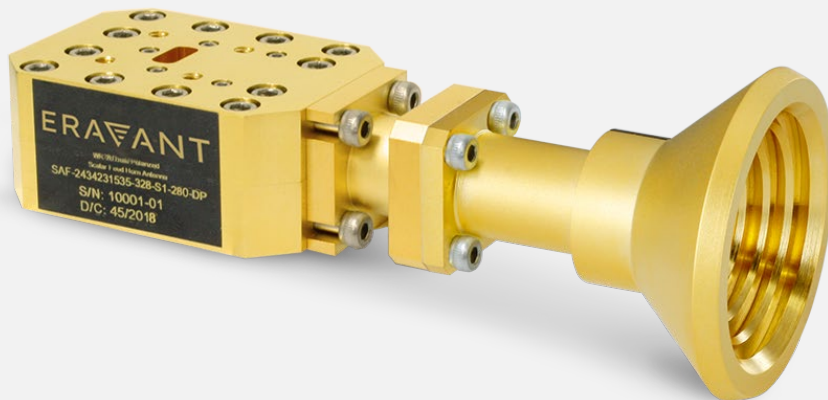
SCALAR HORN DUAL POLARIZED ANTENNA

24 to 42 GHz

SAF-2434231535-328-S1-280-DP

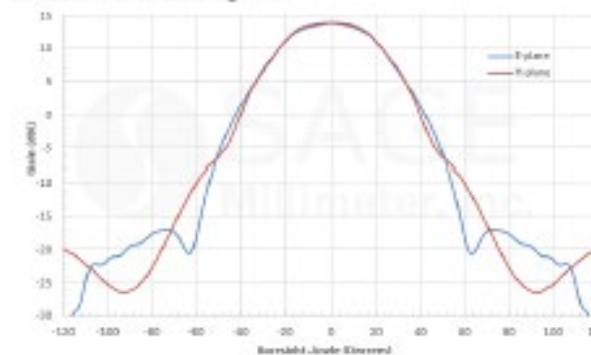
FEATURES:

- 24 to 42 GHz, wide bandwidth
- Gain 15 dBi
- 3 dB Beamwidth 35°
- Dual Polarized
- 4.10" (L) x 1.60" (W) x 0.75" (H)
- 4 Models to Cover up to 110 GHz

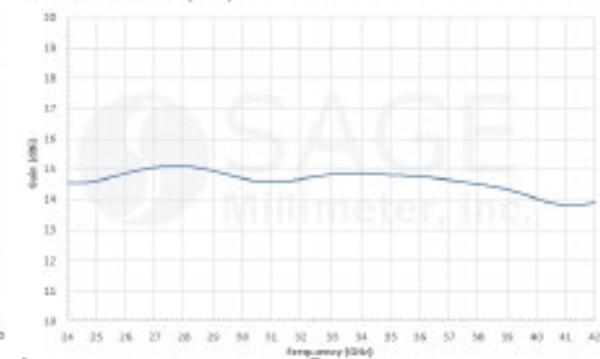


Parameter	Minimum	Typical	Maximum
Frequency	24 GHz		42 GHz
Gain		15 dBi	
3 dB Beamwidth, E-plane @ 33 GHz		35°	
3 dB Beamwidth, H-plane @ 33 GHz		35°	
Sidelobe Levels		-25 dB	
V and H Port Isolation		35 dB	
Cross Polarization Rejection		35 dB	
Port Return Loss		15 dB	
Specification Temperature		+25 °C	
Operating Temperature	-40 °C		+85 °C

Simulated Antenna Patterns @ 42 GHz



Simulated Gain vs. Frequency



SCALAR HORN DUAL POLARIZED ANTENNA

75 to 110 GHz

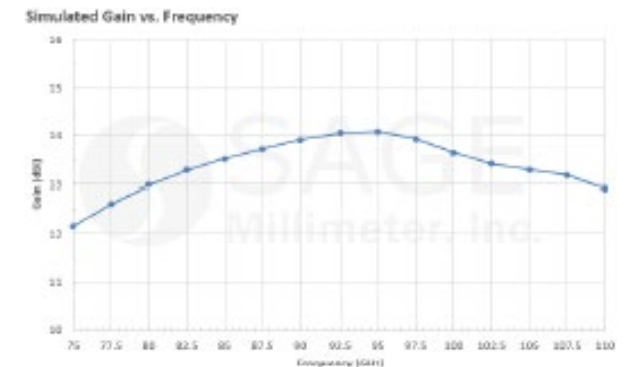
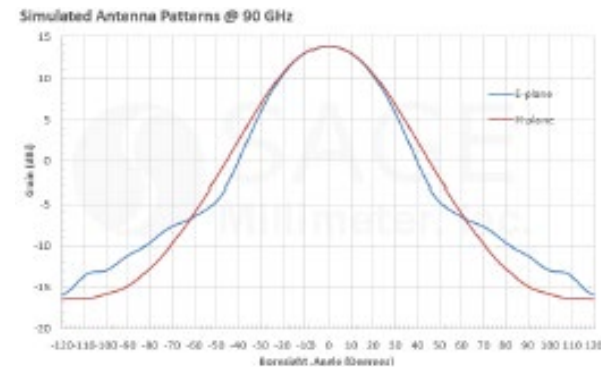
SAF-7531141340-110-S1-100-DP

FEATURES:

- 75 to 110 GHz
- Gain 13 dBi
- 3 dB Beamwidth 40°
- Dual Polarized
- 2.70" (L) x 0.8" (W) x 0.8" (H)
- 4 Models to Cover up to 110 GHz



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	
Cross Polarization Rejection		30 dB	
Port Return Loss		15 dB	
Specification Temperature		+25 °C	
Operating Temperature	-40 °C		+85 °C



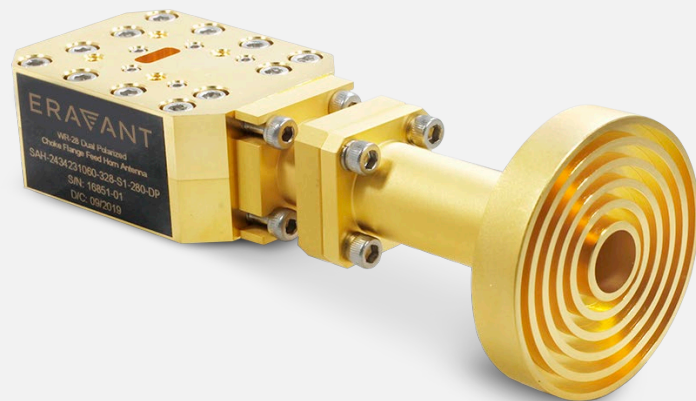
CHOKE FLANGE DUAL POLARIZED HORN ANTENNA

24 to 42 GHz

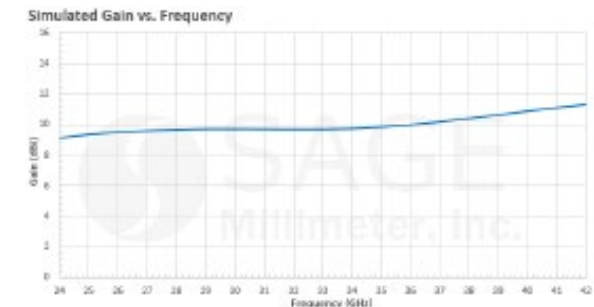
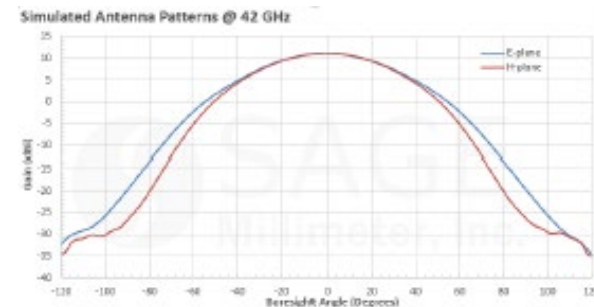
SAH-2434231060-328-S1-280-DP

FEATURES:

- 24 to 42 GHz, wide bandwidth
- Gain 10 dBi
- 3 dB Beamwidth 60°, board coverage
- Dual Polarized
- 4.10" (L) x 1.48" (W) x 0.75" (H)
- 4 Models to Cover up to 110 GHz



Parameter	Minimum	Typical	Maximum
Frequency	24 GHz	33 GHz	42 GHz
Gain		10 dBi	
3 dB Beamwidth, E-plane @ 33 GHz		60°	
3 dB Beamwidth, H-plane @ 33 GHz		60°	
Sidelobes, E-plane		-25 dB	
Sidelobes, H-plane		-35 dB	
V and H Port Isolation		35 dB	
Cross Polarization Rejection		35 dB	
Port Return Loss		15 dB	
Specification Temperature		+25 °C	
Operating Temperature	-40 °C		+85 °C



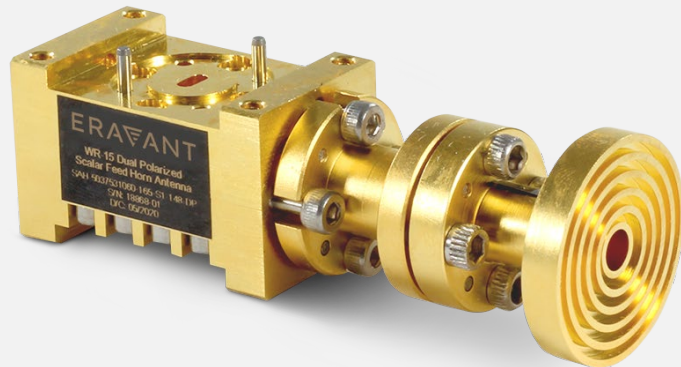
CHOKE FLANGE DUAL POLARIZED HORN ANTENNA

50 to 75 GHz

SAH-5037531060-165-S1-148-DP

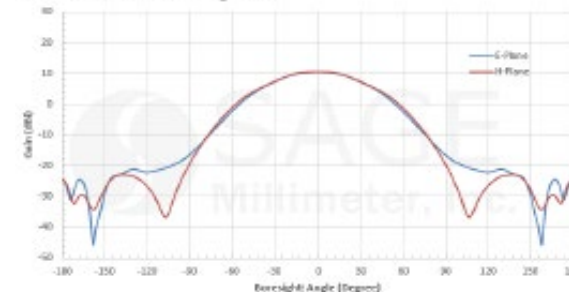
FEATURES:

- 50 to 75 GHz
- Gain 10 dBi
- 3 dB Beamwidth 60°
- Dual Polarized
- 2.75" (L) x 0.80" (W) x 0.80" (H) x 0.93" (∅)
- 4 Models to Cover up to 110 GHz

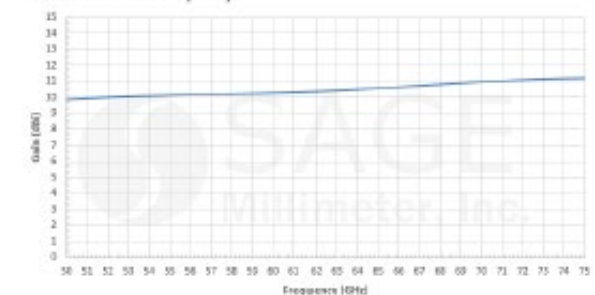


Parameter	Minimum	Typical	Maximum
Frequency	50 GHz		75 GHz
Gain		10 dBi	
3 dB Beamwidth, E-plane @ 62 GHz		60°	
3 dB Beamwidth, H-plane @ 62 GHz		60°	
Sidelobe Levels		-30 dB	
V and H Port Isolation		40 dB	
Cross Polarization Rejection		35 dB	
Port Return Loss		15 dB	
Specification Temperature		+25 °C	
Operating Temperature	-40 °C		+85 °C

Simulated Antenna Patterns @ 62 GHz



Simulated Gain vs. Frequency



COMPARISON

ITEM	QUAD-Ridge Based	OMT Based
Antenna Type	Circular or Rectangular Horn	All Types
Operating Bandwidth	Ultra-broad, such as 2 to 18 GHz	Waveguide bandwidth in general
Gain	Low in General, such as 10 to 20 dBi	Wide Range, 10 to 50 dBi
Side Lobe Levels	High, 10 to 20 dBi	Wide Range, antenna type dependent
Beamwidth	Limited Range	Wide Range, antenna type dependent
Crosspol	Low, 25 dB typical	High, 40 dB typical
Port Isolation	Low, 20 dB typical	High, 40 dB typical
Port Type	Coax	Waveguide or Coax

OMT-BASED ANTENNAS OVERVIEW

DUAL POLARIZED ANTENNA TYPES	FEATURES
OMT + Conical Horn (SAC Series)	Full waveguide band performance, gain is limited to 25 dBi, high side lobe level, lower cost
OMT + Pyramid Horn (SAR Series)	Full waveguide band performance, gain is limited to 25 dBi, high side lobe level, lower cost
OMT + Choke Flange Horn (SAH Series)	Full waveguide band performance, broader beamwidth and low gain, low side lobe level, lower cross-polarization, moderate cost
OMT + Scalar Feed Horn (SAF Series)	Full waveguide band performance, broader beamwidth and gain up to 17 dBi, low side lobe level, lower cross-polarization, moderate cost
OMT + Lens Corrected Horn (SAL Series)	Full waveguide band performance, narrow beamwidth and high gain depending on the dish size selection, low side lobes, moderate cost
OMT + Gaussian Antenna (SAG Series)	Full waveguide band performance, narrow beamwidth and high gain depending on the aperture size selection, low side lobes, lower cross-polarization, high cost
OMT + Cassegrain Antenna (SAY Series)	Full waveguide band performance, narrow beamwidth and high gain depending on the dish size selected, lower cross-polarization, high cost

CONCLUSION

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

- This presentation introduces Eravant's standard product offering in broadband for 5G System Applications.
- 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 for specific applications like Instrumentations, Space, Communications, and Radar are also available.
- Presentations about Ka, Q, U, V, E, W, F and D-Bands are available.

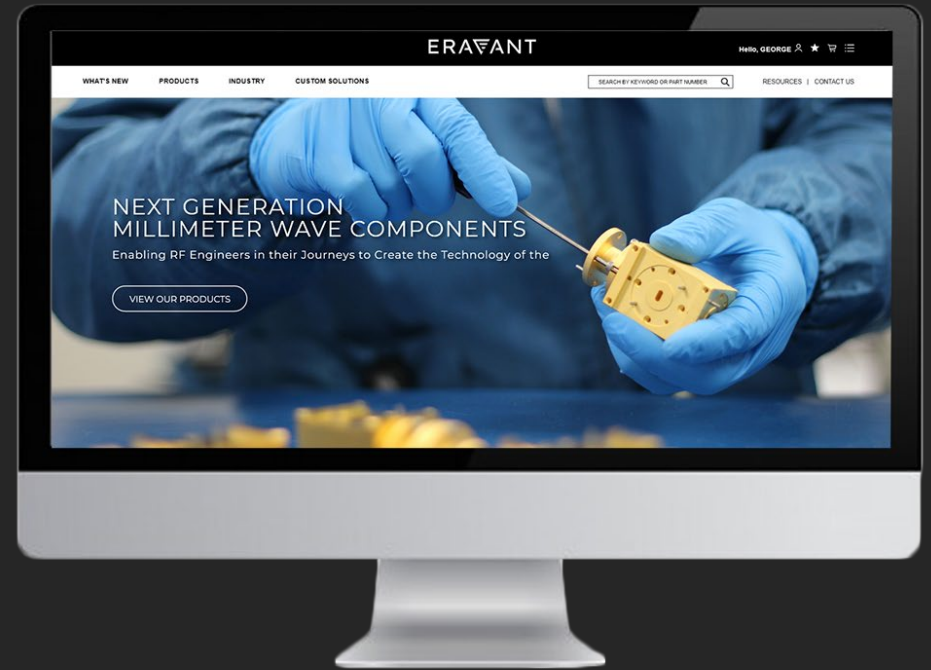
ERAANT

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STO-06203-U6

D-Band VNA Frequency Extender Sat, +1 dBm

STO-06203-U6 is a D-Band vector network analyzer (VNA) frequency extender set, which is offered as a pair of modules, one left-hand and one right-hand, to achieve full 2-port S-parameter testing at 110 to 170 GHz. It is compatible with modern vector network analyzers such as the Rohde & Schwarz ZVA24, Avtech VectorStar™, Keysight PNA-X Series, and Copper Mountain Cobalt™ C4220. The VNA to be extended needs to have dual sources and 4 ports with LO frequency offset setting option (RFHF). The frequency extenders can achieve a dynamic range up to 110 dB for certain passive products requiring high rejection, isolation, and return loss testing such as directional couplers, orthomode transducers, and filters. An AC to DC Power adapter is included. The Eravant calibration kit (STO-TO-06-S1-CKIT1), Proxi-Flange™, Contactless Flange, and Wave-Glide™ Rail System are highly recommended to complete the D-Band VNA test set. Each VNA extender is packaged individually in rugged equipment boxes with additional hardware and tools.

Electrical Specifications

Parameter	Minimum	Typical	Maximum
Frequency Range	110 GHz		170 GHz
Test Port Output Power (Full Power)		+1 dBm	
Output Power Control Range		N/A	
Dynamic Range @ 10 Hz BW		110 dB	
Test Port Match		30 dB	
Directivity	30 dB		35 dB
RF Source Input Frequency	9.17 GHz		14.17 GHz
RF Source Input Power	0 dBm	+3 dBm	+6 dBm
LO Source Input Frequency (RFHF)	9.17 GHz		14.17 GHz
LO Source Input Power	0 dBm	+3 dBm	+6 dBm
IF Frequency Range	10 MHz		1000 MHz
Multiplication Factor		12	
Magnitude Stability		0.15 dB	0.2 dB
Phase Stability		1.2°	2°
Specification Temperature	+20 °C		+30 °C
Operating Temperature	0 °C		+50 °C

ERAANT

Specification

06 Waveguide with UG-387UM Anti-Cooking Flange
A (F), SMA (F)
N (F)
N (F)
NO FGG.B.304 CLAD52Z, +6.5 Vdc to +12 Vdc
H, Black
H, Each
(L) x 4.8" (W) x 3.0" (H), Without Adjustable Feet
SD-LISA

Kit

Eravant Model Number	Quantity
Long STO-WG-0620-FMA	1 Piece
SWH-332-SS-10	1 Bag (10 Pieces)
SWH-332-SS	1 Piece
SCH-08006-S1	1 Piece
STU-110008001-MF	1 Piece

ECN: 34031.0.7

FEATURES

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

APPLICATIONS

- VNA Frequency Extension
- S-Parameter Characterization
- Test Lab Instrumentation

RECOMMENDED PARTINGS

- Cable: LIO-10-06-S1-CKIT1
- Proxi-Flange™ Contactless Flange
- Wave-Glide™ Rail System
- Waveguide-Check Contacts
- Cable: SCW-SMSMM02FLAEM

are in inches (millimeters)

units, one left-hand and one right-hand module) is included in this of the left-hand and the right-hand modules are identical and interchangeable is in the brand marking needs to have dual sources and 4 ports with LO frequency offset setting performance, exercising LO power level is recommended, to change the information presented without notice.

sum ratings of the device will damage the extenders. ich-pours (0.50 x 0.02 mm), should be applied. Eravant torque R-S1, is highly recommended. waveguide will cause performance degradation or damage the device.

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	+10 dBm	WR-06 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-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-U6	26.5 GHz	40.0 GHz	+5 dBm	8.37 GHz	13.33 GHz	+20 dBm	WR-28 Waveguide	SMA (F)	Datasheet	View
SFP-273403305-28SF-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-2226F-S1	33 GHz	50 GHz	+7 dBm	16.5 GHz	25 GHz	+20 dBm	WR-22 Waveguide	2.92 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-1026F-S1	40 GHz	60 GHz	+6 dBm	20 GHz	30 GHz	+20 dBm	WR-10 Waveguide	2.92 mm (F)	Datasheet STEP File	View