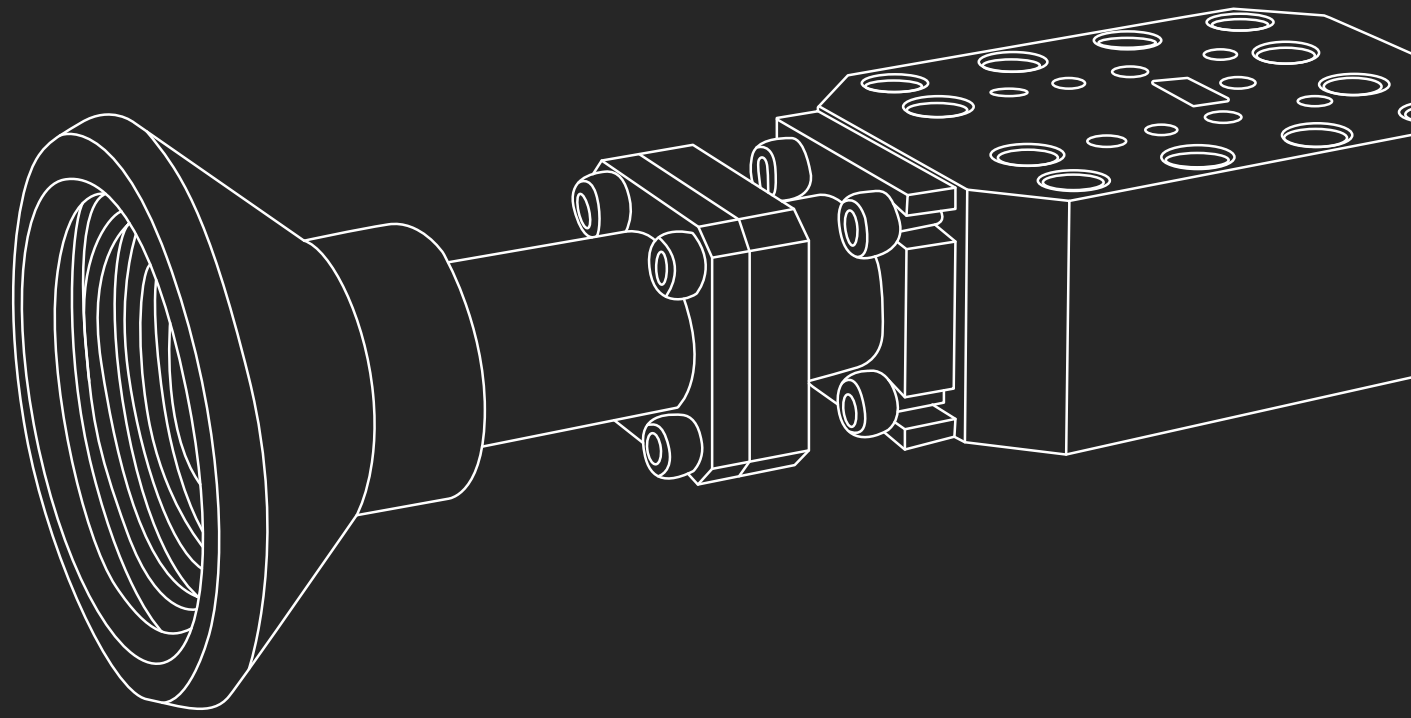
ERAVANT
NEXT GENERATION MILLIMETERWAVE SOLUTIONS

DUAL POLARIZED ANTENNAS

APPLICATIONS & CONFIGURATIONS FOR 5G



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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.

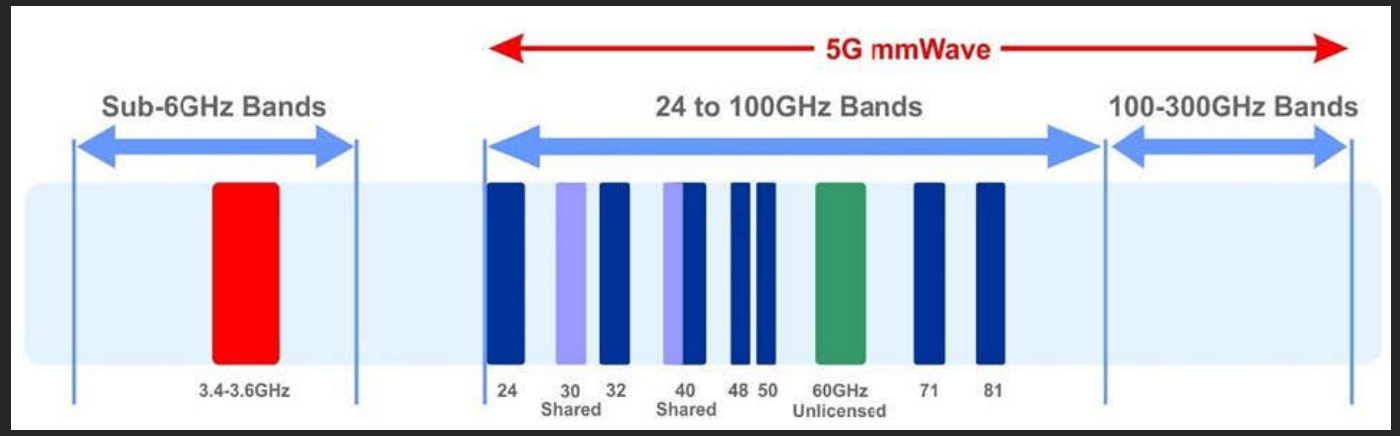
While thousands of offered modules cover the Full Spectrum of the Millimeter Wave 5G Band. The examples are,

- 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.

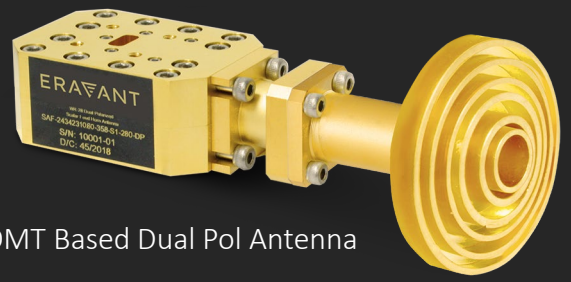
DUAL-POLARIZED ANTENNA APPLICATIONS

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

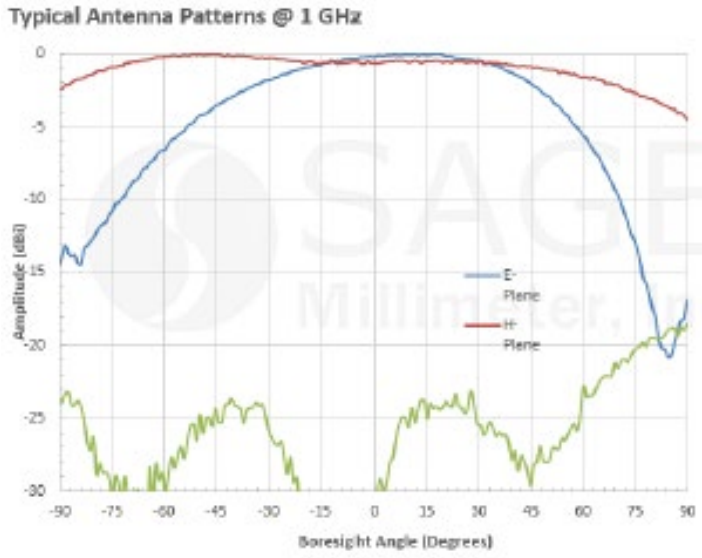
1 to 4 GHz

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



QUAD RIDGED
DUAL POLARIZED ANTENNA

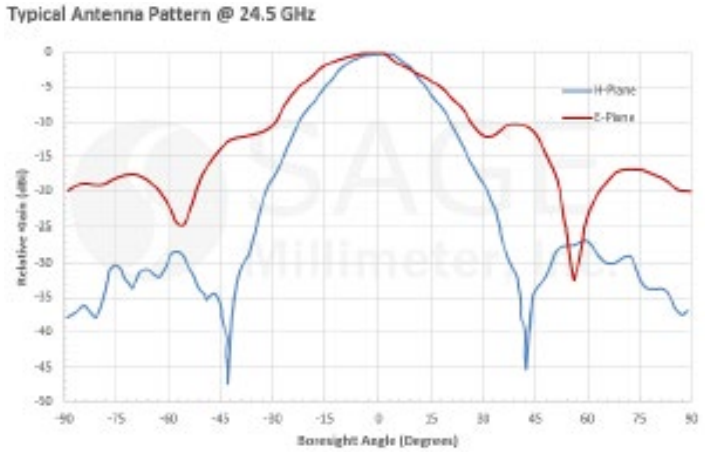
6 to 25 GHz

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



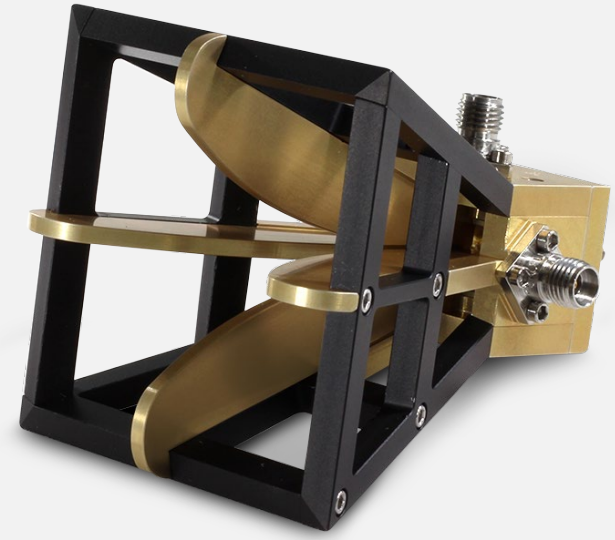
QUAD RIDGED
DUAL POLARIZED ANTENNA

4 to 40 GHz

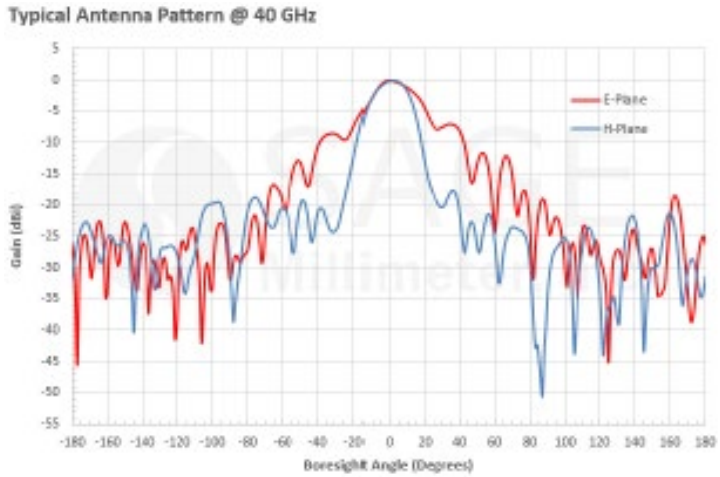
SAV-0434031428-KF-U5-QR

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



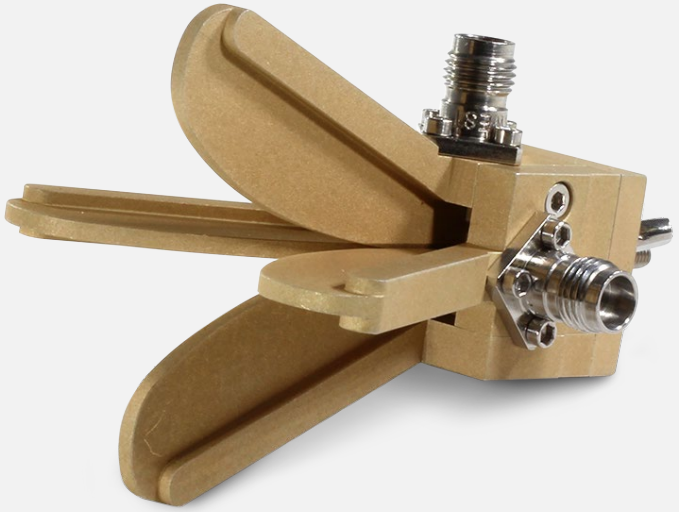
QUAD RIDGED
DUAL POLARIZED ANTENNA

5 to 50 GHz

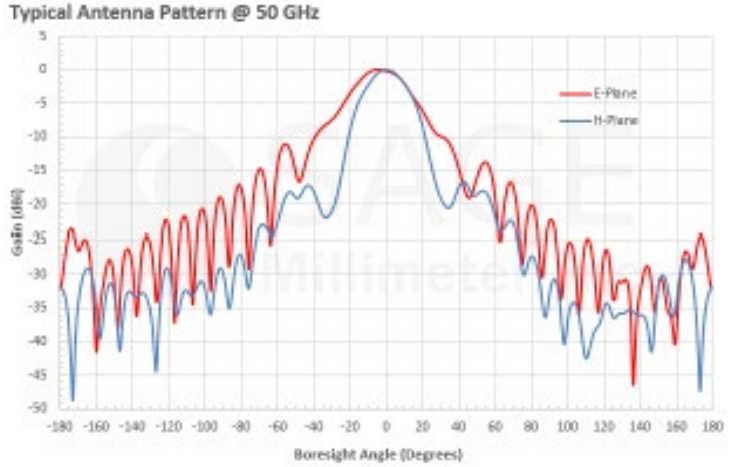
SAV-0535031140-2F-U5-QR

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



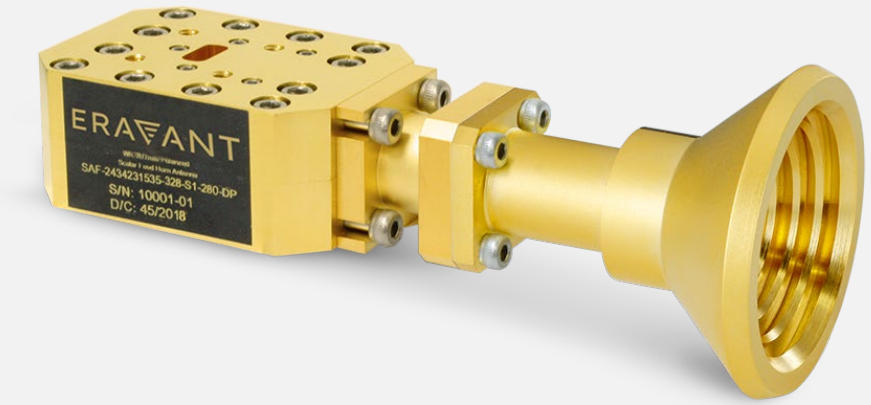
SCALAR HORN
DUAL POLARIZED ANTENNA

24 to 42 GHz

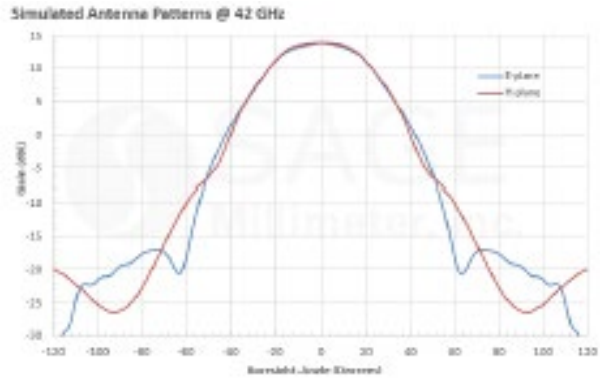
SAF-2434231535-328-S1-280-DP

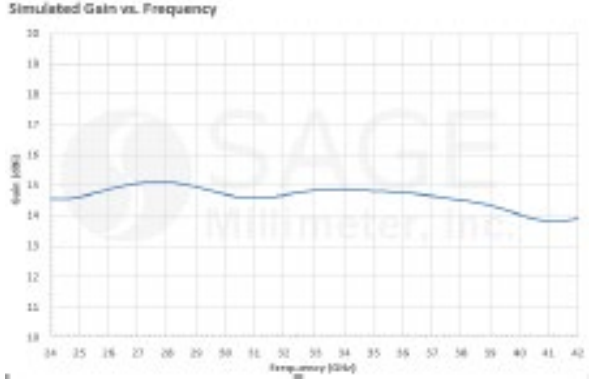
FEATURES:

- 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





SCALAR HORN
DUAL POLARIZED ANTENNA

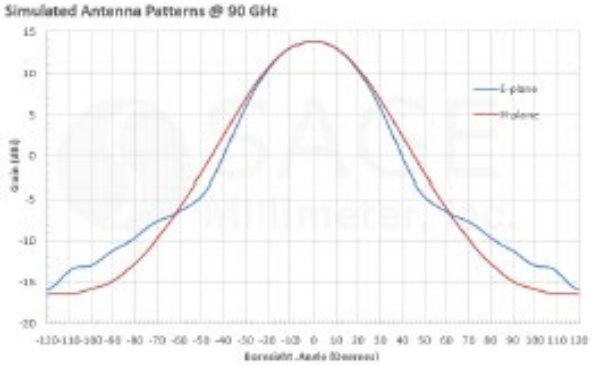
75 to 110 GHz

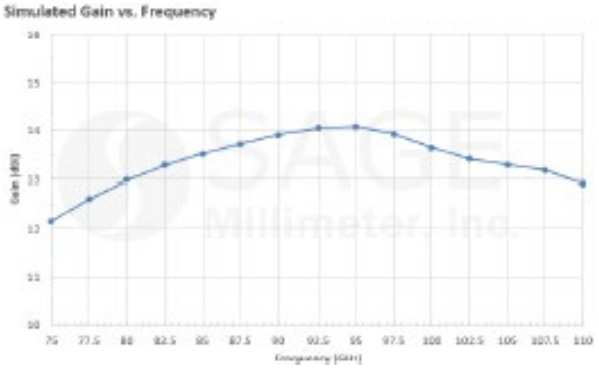
SAF-7531141340-110-S1-100-DP

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





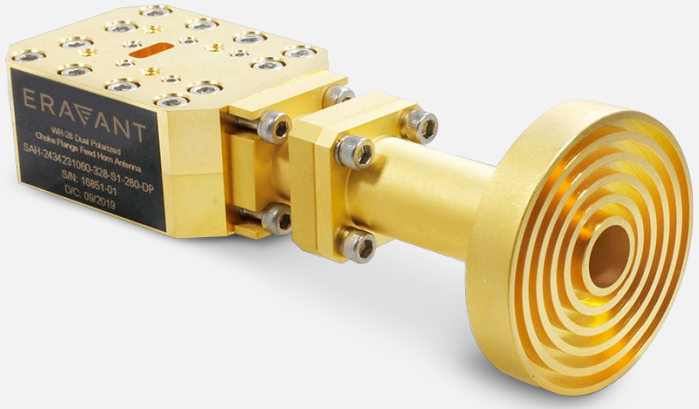
CHOKE FLANGE
DUAL POLARIZED HORN ANTENNA

24 to 42 GHz

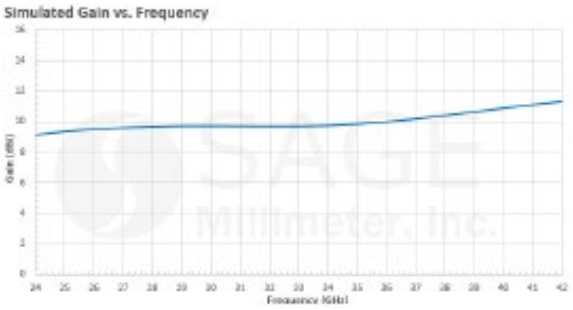
SAH-2434231060-328-S1-280-DP

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



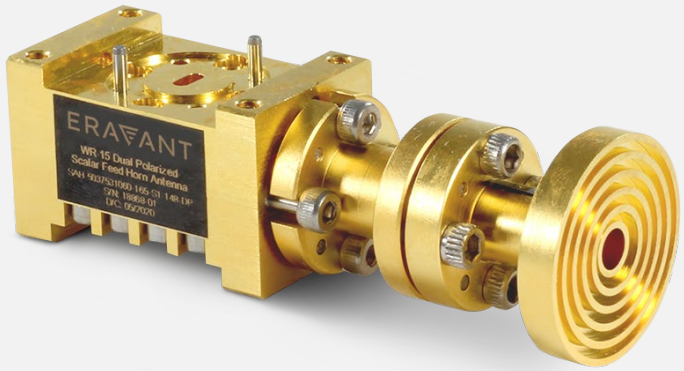
CHOKE FLANGE
DUAL POLARIZED HORN ANTENNA

50 to 75 GHz

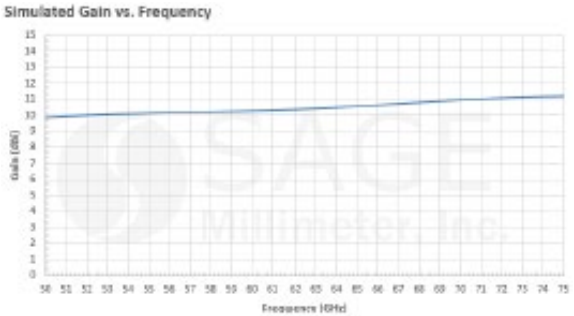
SAH-5037531060-165-S1-148-DP

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” (Ø)
- 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



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 atwww.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.

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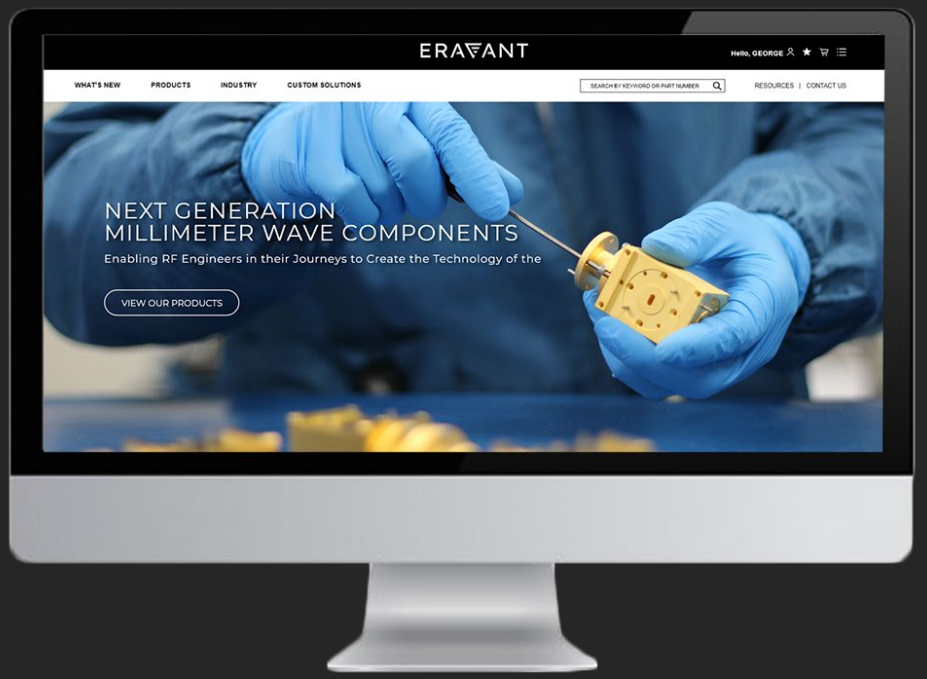

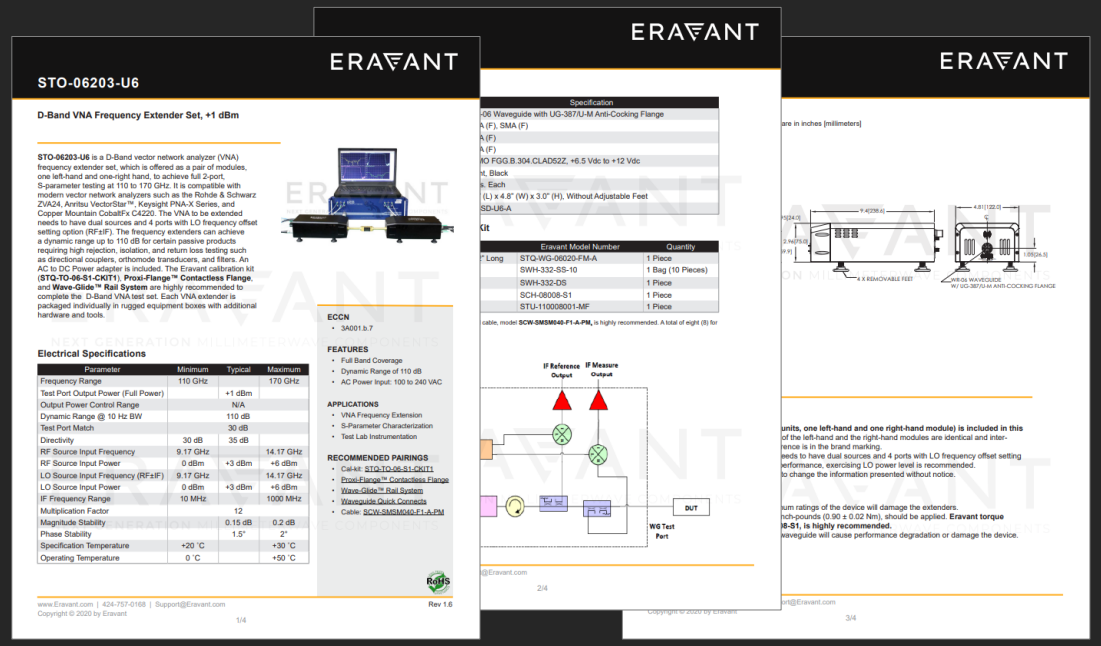

PASSIVE FREQUENCY MULTIPLIERS

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-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	+16 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-2734033N05-28SF-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	2.92 mm (F)	Datasheet STEP File	View
SFP-363573303-19SF-N1	57 GHz	86 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