ERAFANT

NEXT GENERATION MILLIMETERWAVE COMPONENTS

Sub-THz Waveguide Switches

11 to 16 June 2023, IMS 2023 MicroApps

CONTENTS

INTRODUCTION

Sub-THz Frequency Range

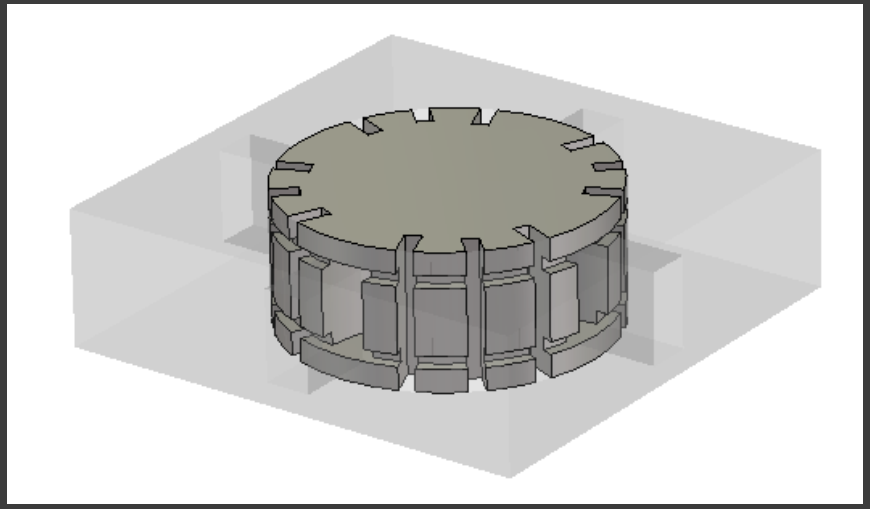
- 100-300 GHz

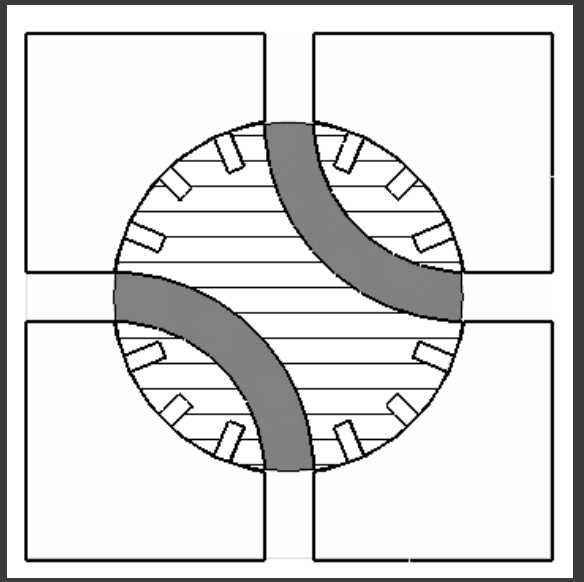
Waveguide Switch

- Passive waveguide device used to route RF signals along one or more paths while providing high isolation between ports
- Signal paths are isolated from one another via RF choke structure in rotor
- Can be manual operated or motorized
- Higher power handling, higher isolation between ports, lower insertion loss, more reliable compared to PIN diode switches or other active devices.

DESIGN

- Waveguide switch paths are machined and assembled into a cylindrical piece called the rotor
- Choke grooves are machined into the rotor after assembly.
- Rotor outer diameter and housing inner diameter are precisely machined and controlled to tight tolerances to ensure the clearance gap between the rotor and housing remains within electrical design parameters while also allowing mechanical rotation to occur.
- For lower frequencies, the clearance gap can be as large as 0.003” all around.
- For higher frequencies, the clearance gap can be as small as 0.001” to 0.002” all around.
- 0.001” clearance gap is a limitation for higher frequencies, any smaller than that and there will not be enough clearance for mechanical rotation



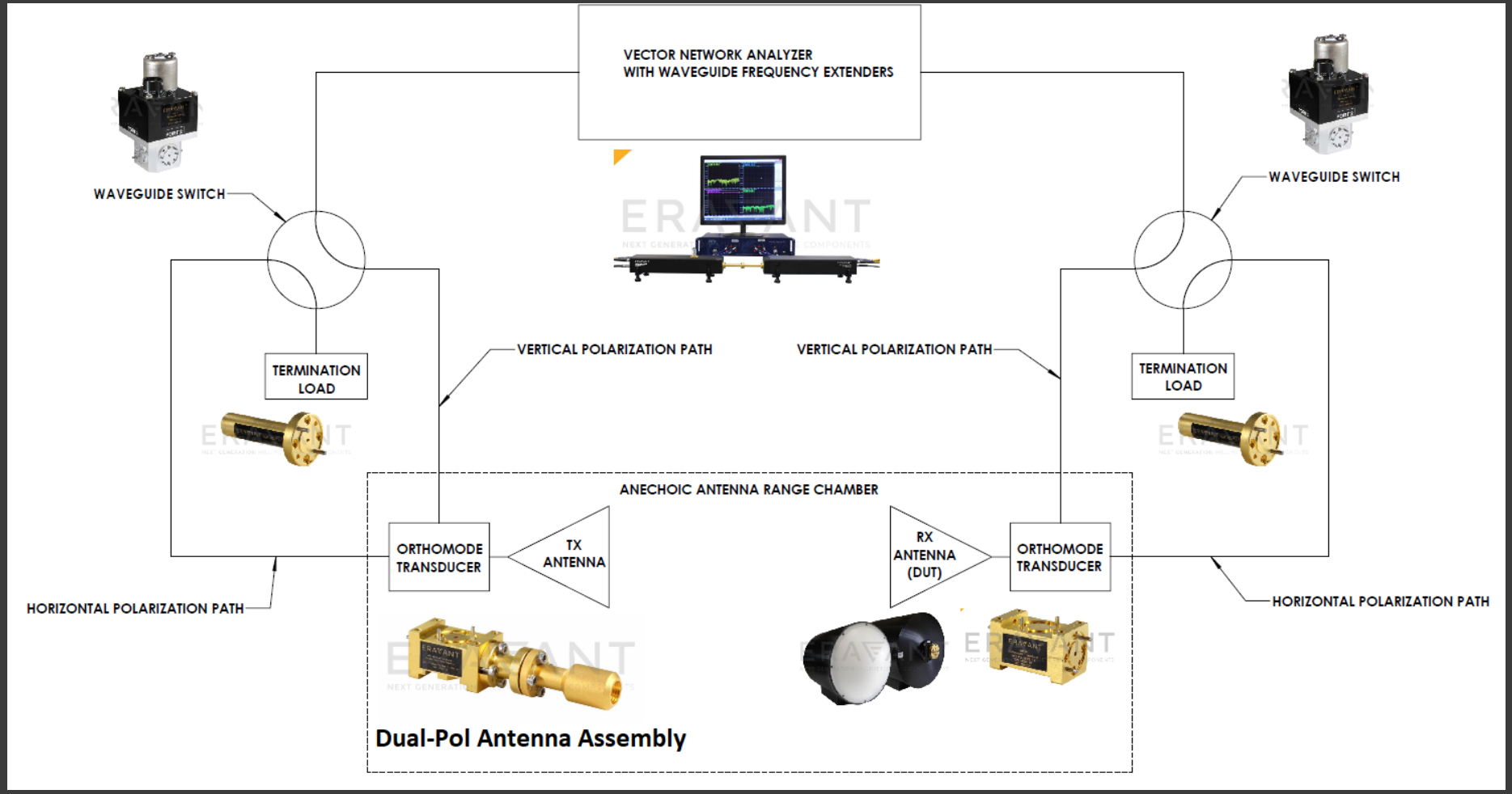


APPLICATIONS

- Companies are rapidly investing in sub-THz waveguide components to build testing infrastructure to support 6G product research and development.
- D-band (110-170 GHz) is the frequency band that gaining the most attention for 6G development at the moment. The waveguide size for this band is WR-06.
- In addition to waveguide switches, Eravant also offers D-band antennas and other components that can help companies realize their 6G D-band test setups.
- An example configuration of a D-band 6G antenna test system that uses all Eravant components is shown in the next slide.
- In the example configuration, the waveguide switch is used to conveniently switch between vertical and horizontal polarization paths for the receiving and transmitting antenna in order to take co-pol (gain) and cross-pol measurements.
- Eravant components used in the example configuration are listed below.

Component	Eravant P/N
VNA with Frequency Extenders (VNA not included)	STO-0620300-CMC-S1
Waveguide Switch	SWJ-06-T1
Termination Load	SWL-0627-S1
Orthomode Transducer + TX Antenna (Dual Pol Antenna Assembly)	SAF-1141741335-082-S1-065-DP
Orthomode Transducer	SAT-FD-06506-S1
RX Antenna (RX)	SAG-1442244501-059-S1

APPLICATIONS



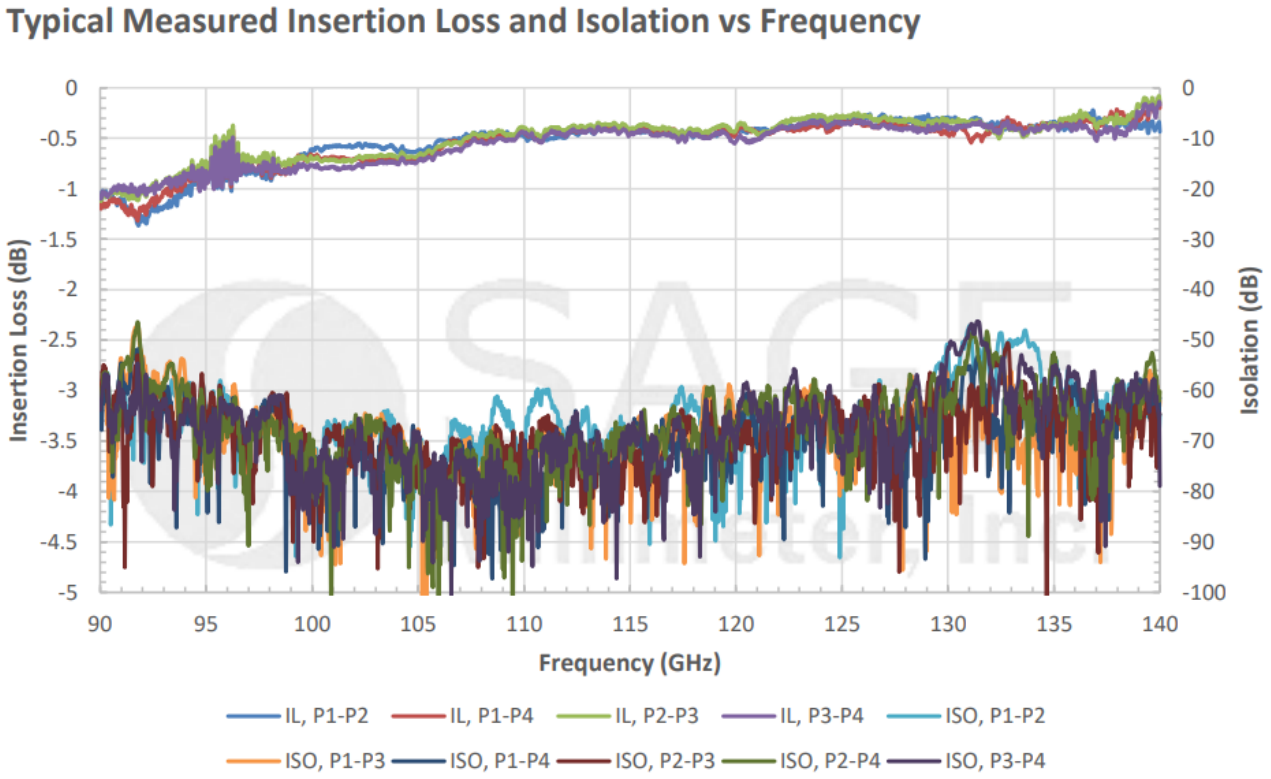
PRODUCTS

The following products will be presented with typical specifications and measured test data:

- WR-08 waveguide switch (Eravant model SWJ-08-T1)
- WR-06 waveguide switch (Eravant model SWJ-06-T1)
- WR-05 waveguide switch (Eravant model SWJ-05-T1)

WR-08 WAVEGUIDE SWITCH (SWJ-08-T1)

Frequency	90 to 140 GHz
Insertion Loss	1.2 dB
Return Loss	20 dB
Isolation	50 dB



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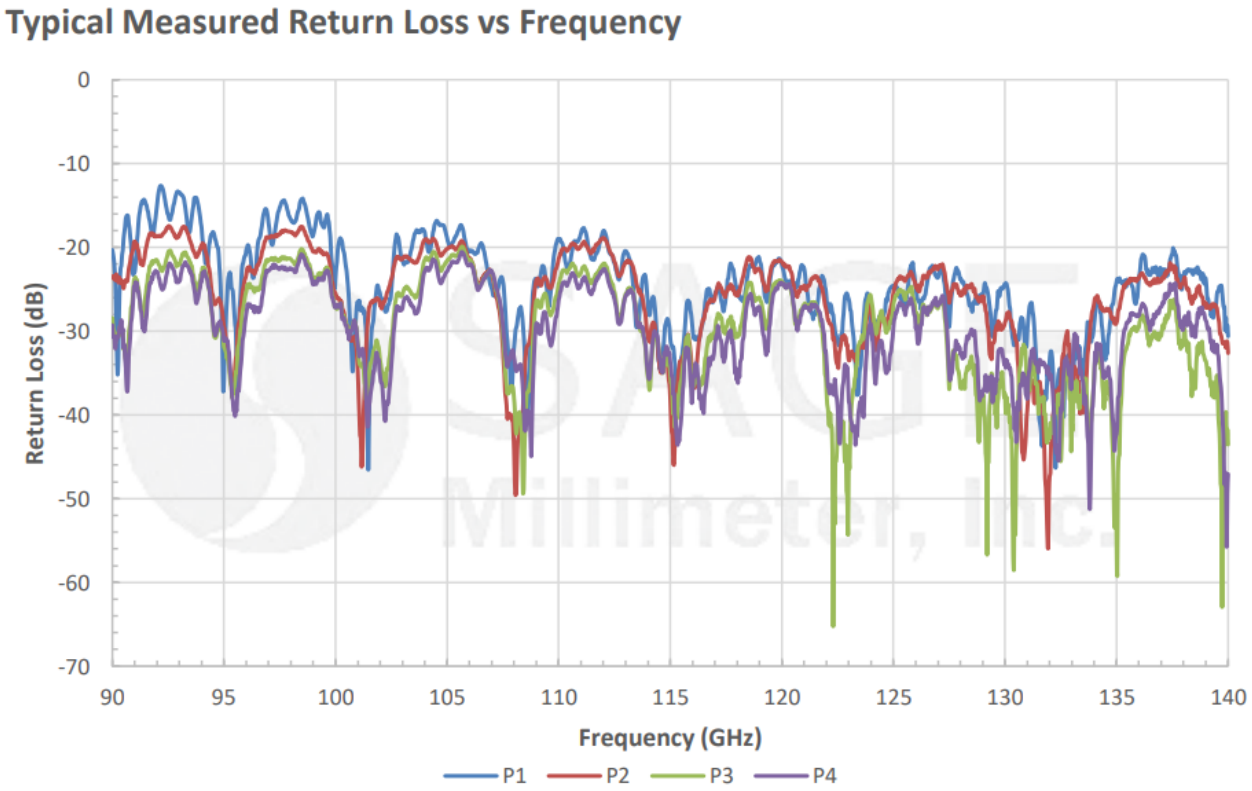
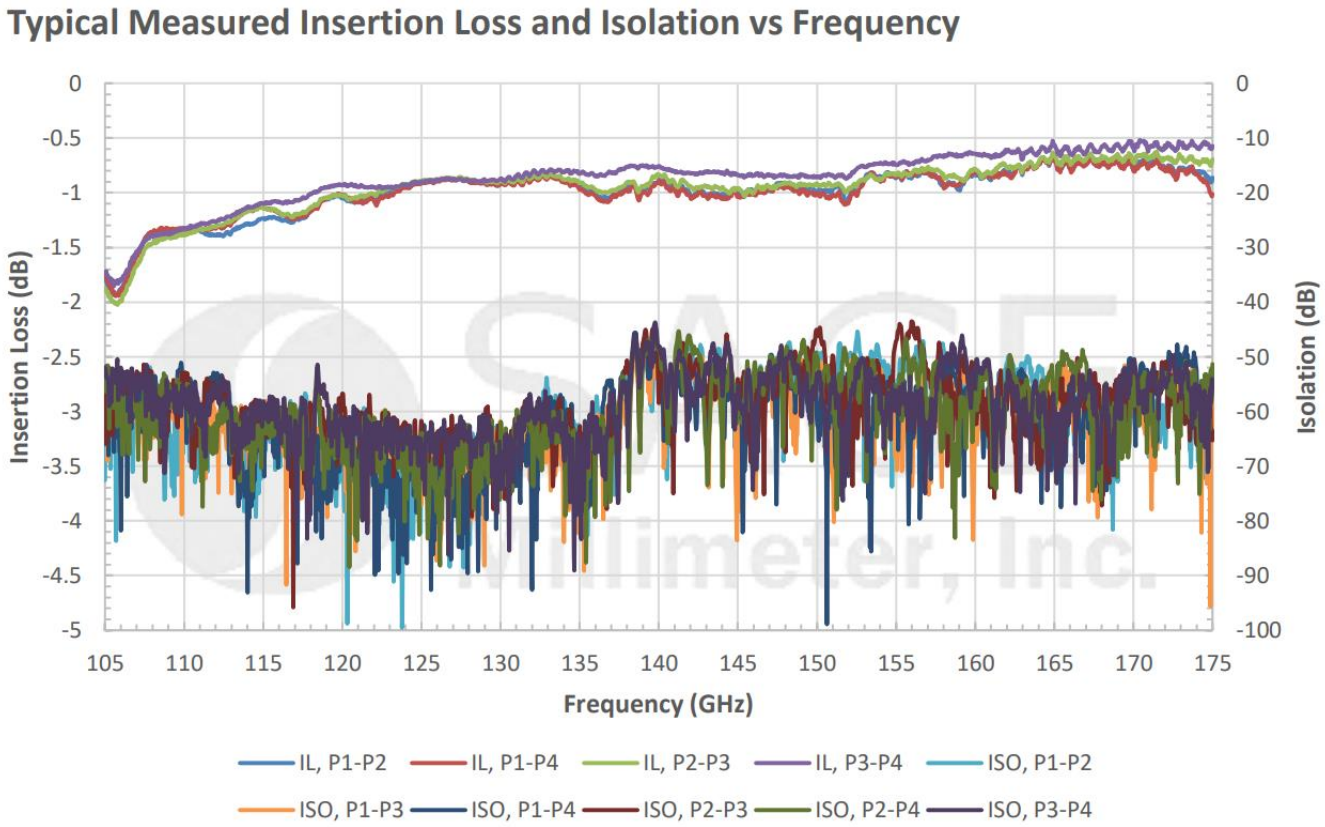


WR-06 WAVEGUIDE SWITCH (SWJ-06-T1)

Frequency	110 to 170 GHz
Insertion Loss	1.5 dB
Return Loss	20 dB
Isolation	45 dB



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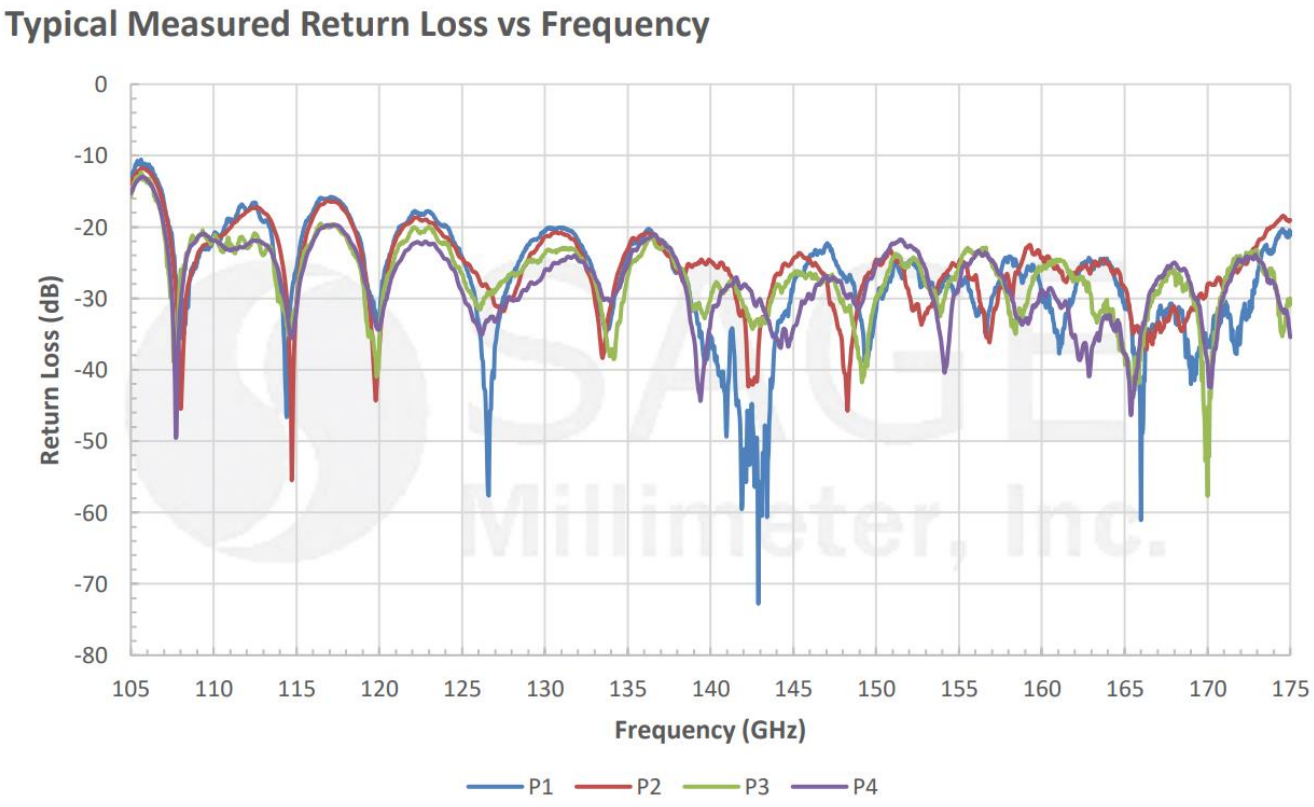
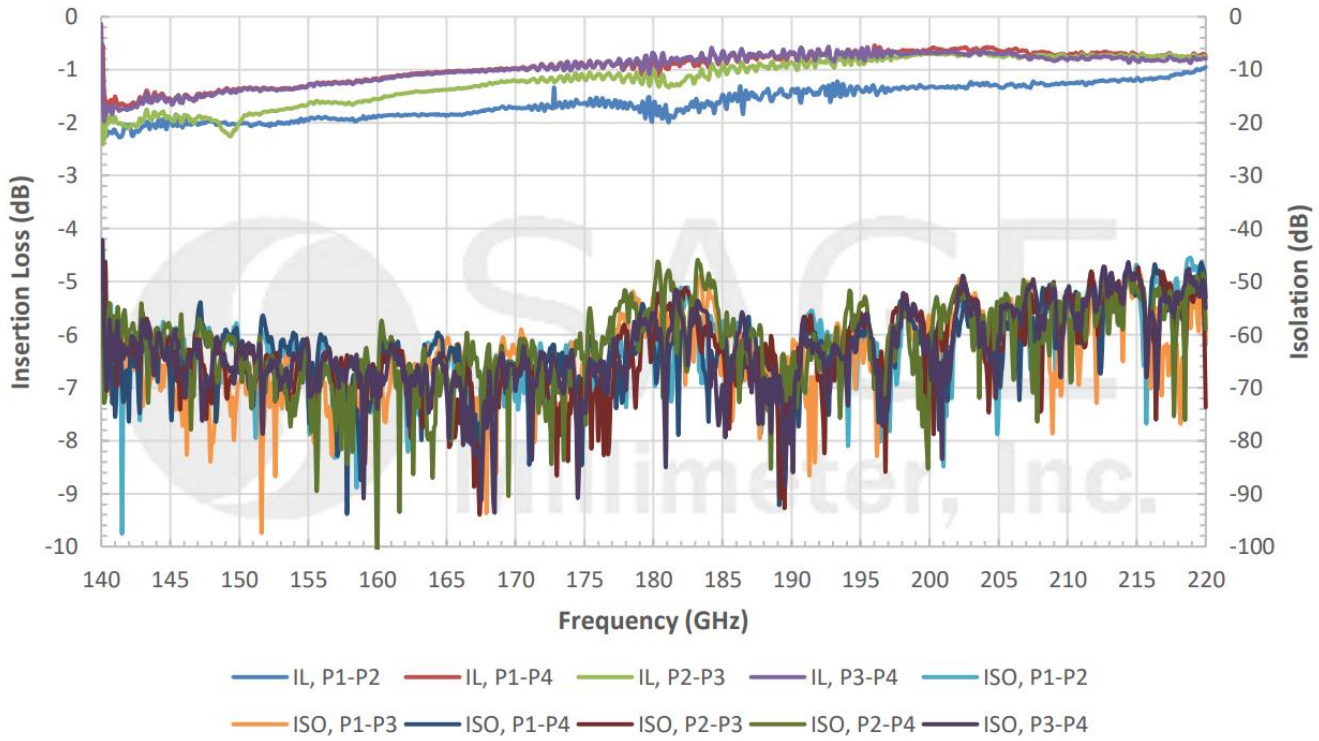


WR-05 WAVEGUIDE SWITCH (SWJ-05-T1)

Frequency	140 to 220 GHz
Insertion Loss	2.5 dB
Return Loss	15 dB
Isolation	40 dB

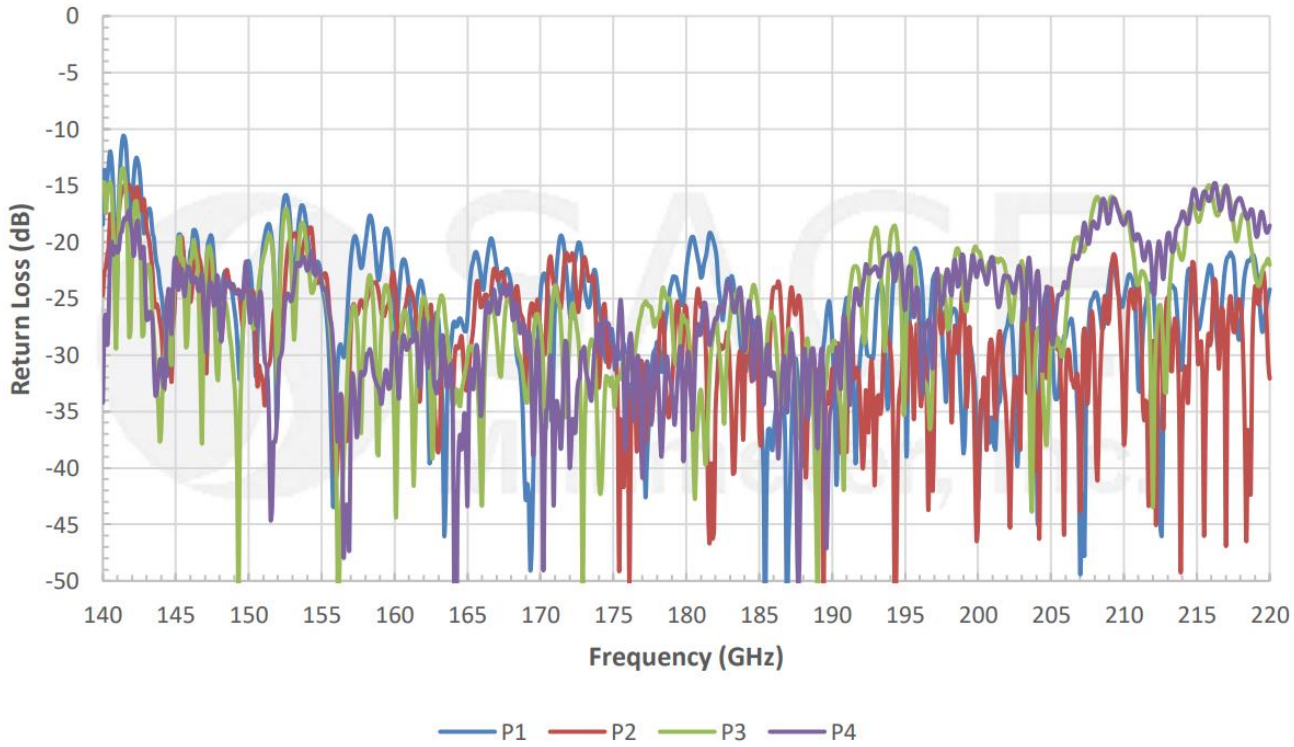
Typical Measured Insertion Loss and Isolation vs Frequency



WR-05 WAVEGUIDE SWITCH (SWJ-05-T1)

Frequency	140 to 220 GHz
Insertion Loss	2.5 dB
Return Loss	15 dB
Isolation	40 dB

Typical Measured Return Loss vs Frequency



CONCLUSION

- Waveguide switches for sub-THz frequencies have been developed and tested to cover 90 to 220 GHz.
- 6G wireless technology development is heating up and so is the demand for components operating in the 6G frequency spectrum, especially at D-band (110-170 GHz).
- Eravant offers a wide range of D-band components, including the waveguide switch, to help companies rapidly build and deploy 6G D-band test instrumentation setups.