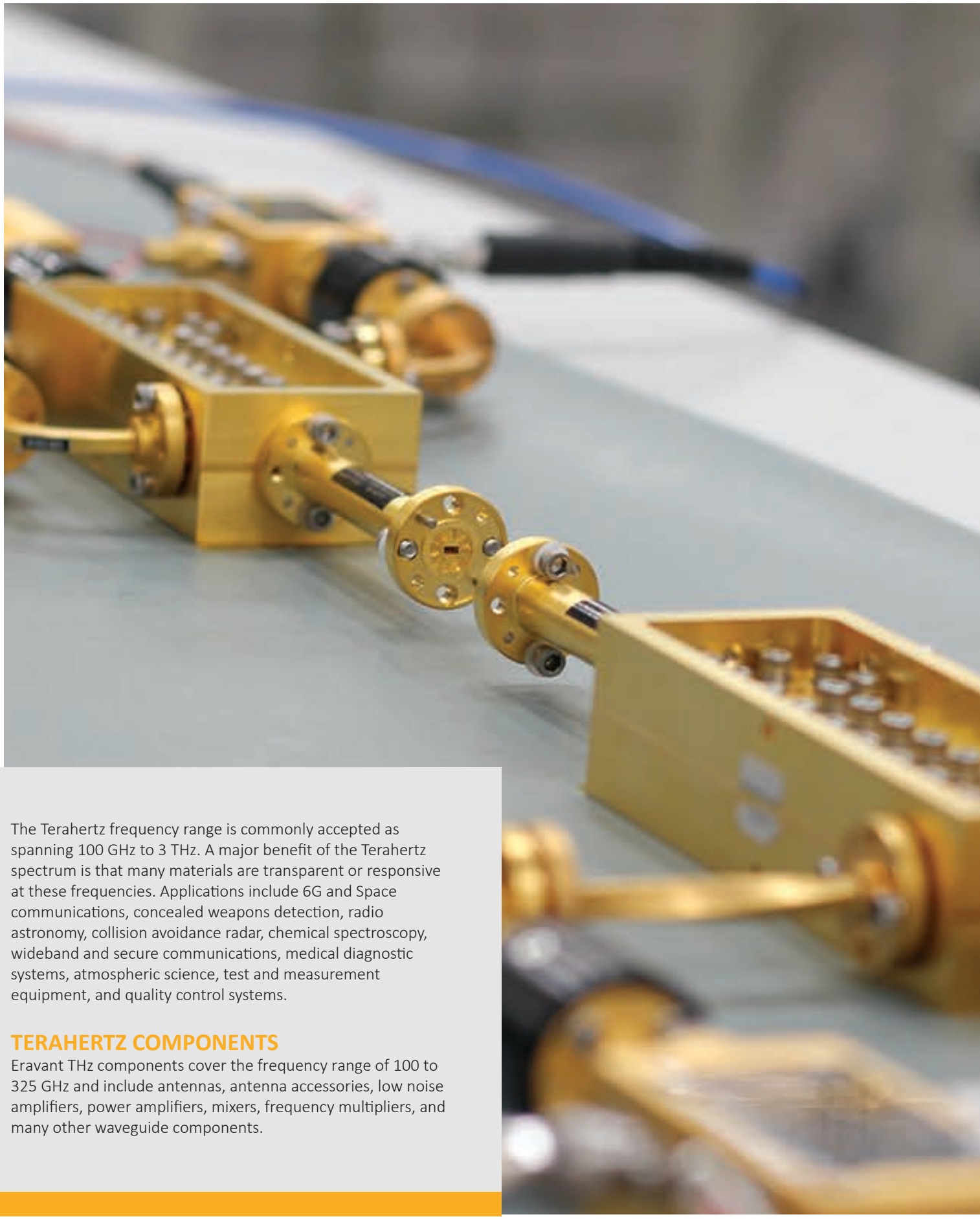
ERAVANT
MAKING MILLIMETERWAVE ACCESSIBLE

TERAHERTZ PRODUCTS

Making millimeter wave accessible
Solutions up to 325 GHz



The Terahertz frequency range is commonly accepted as spanning 100 GHz to 3 THz. A major benefit of the Terahertz spectrum is that many materials are transparent or responsive at these frequencies. Applications include 6G and Space communications, concealed weapons detection, radio astronomy, collision avoidance radar, chemical spectroscopy, wideband and secure communications, medical diagnostic systems, atmospheric science, test and measurement equipment, and quality control systems.

TERAHERTZ COMPONENTS

Eravant THz components cover the frequency range of 100 to 325 GHz and include antennas, antenna accessories, low noise amplifiers, power amplifiers, mixers, frequency multipliers, and many other waveguide components.

Isolators

Eravant offers three types of waveguide isolators based on the Faraday rotation principle: Standard, Compact, and Miniature. Standard isolators offer excellent broadband performance in a sturdy waveguide configuration. Compact isolators offer similar performance but in a smaller package. Miniature isolators offer the smallest package size available and are highly resistant to stray magnetic fields. Measuring 0.75 x 0.75 x 0.52 inches, model STF-05-S1-M is a miniature Faraday isolator that operates from 140 to 220 GHz. The novel magnetic design, combined with a precision machined housing, achieves 23 dB typical isolation with 4.5 dB insertion loss. The ports are WR-05 waveguide with UG-387/U-M anti-cocking flanges.

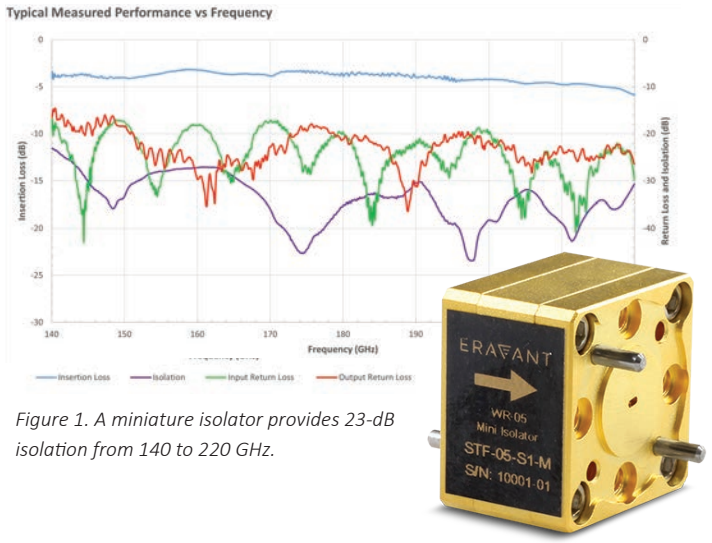


Figure 1. A miniature isolator provides 23-dB isolation from 140 to 220 GHz.

Directional Couplers

With frequency coverage up to 325 GHz, directional couplers with either one or two coupled ports provide coupling levels from 3 to 40 dB with directivity spanning 20 to 40 dB. Model SWD-2025H-05-SB is a G-band, three-port waveguide directional coupler that delivers 20 dB nominal coupling with 25 dB typical directivity across the full waveguide band from 140 to 220 GHz. Typical insertion loss is 2.1 dB. The coupler employs a traditional multi-hole, split block design that achieves flat coupling and low insertion loss. The interfaces are WR-05 waveguide with UG-387/U-M anti-cocking flanges.

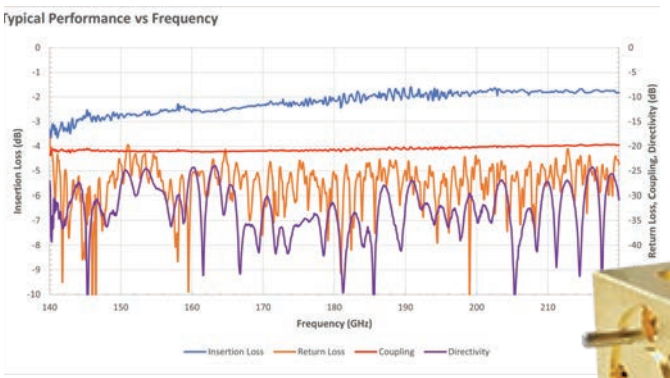
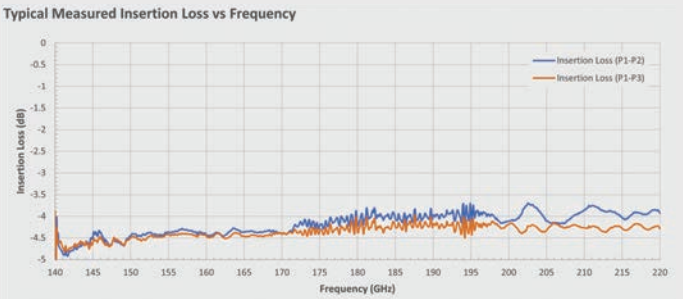


Figure 2. A directional coupler yields 20-dB coupling from 140 to 220 GHz.

Power Dividers / Combiners

A wide range of power divider configurations are available with the number of output ports ranging from 2 to 16. Both right-angle and in-line port arrangements are offered. Frequency coverage reaches up 330 GHz. Model SWP-14422402-05-S1 is a G-band, 2-way right-angle power divider that operates from 140 to 220 GHz. The divider offers typical insertion loss of 1.7 dB with 20 dB isolation between output ports. Amplitude balance is within +/- 0.6 dB. All ports are WR-05 waveguide with UG-387/U-M anti-cocking flanges.



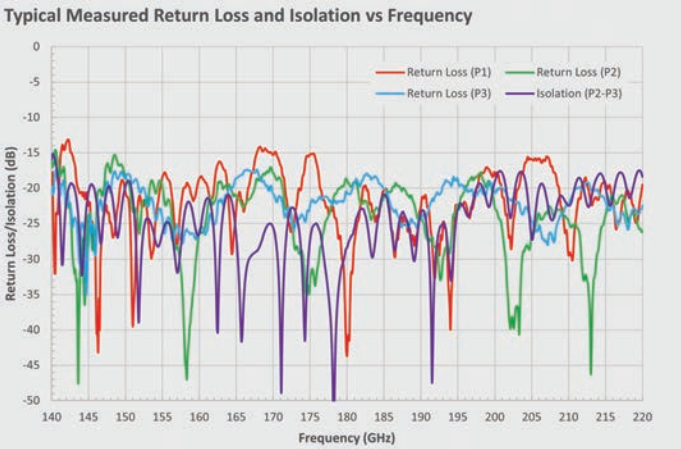


Figure 3. A two-way right-angle power divider provides more than 20 dB isolation from 140 to 220 GHz.

Low Noise Amplifiers

Eravant's low noise amplifiers cover frequencies from several GHz up to 270 GHz. In a WR-03 waveguide package, model SBL-2242741585-0303-E1 provides 15-dB gain with 8.5-dB noise figure from 220 to 270 GHz (Figure 4). A full-band amplifier, model SBL-1141743065-0606-E1 in a WR-06 waveguide package, provides 30-dB gain from 110 to 170 GHz with 6.5-dB noise figure.

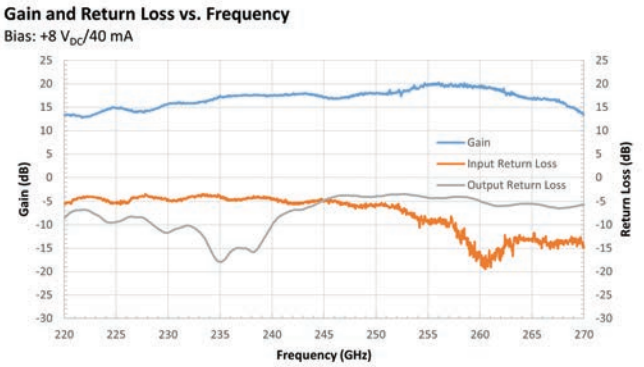
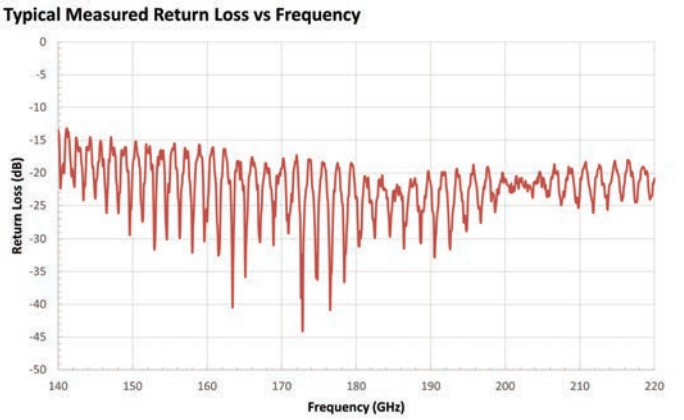


Figure 4. The Measured Performance of 220 to 270 GHz Low Noise Amplifier

Gaussian Optics Antennas

Making the most of THz power often means selecting antennas with the highest available gain. Eravant's Gaussian Optics Antennas operate up to 220 GHz with 1-degree typical beam width and gains ranging from 40 to 46 dBi. Model SAG-1442244501-059-S1 is a 6-inch diameter G-band Gaussian antenna that covers 140 to 220 GHz with 45 dBi nominal gain and 1 degree half power beam width. The antenna supports linear and circular polarizations and utilizes a corrugated feed horn for excellent aperture efficiency, high cross-polarization rejection, and low side lobe levels.



Contactless Waveguide Straight Sections

Straight waveguide sections with Proxi-Flange™ contactless waveguide flanges support rapid and flexible testing of components and systems by eliminating the need to tighten waveguide screws when making temporary connections between waveguide components. The novel contactless flange design includes a choke ring populated with an array of pins to form a gap structure that suppresses signal leakage and minimizes reflections when placed in close proximity to a conventional waveguide flange. Model STQ-WG-05025-FB-CF is a straight waveguide section with a Proxi-Flange™ interface that operates from 140 to 220 GHz. The insertion length is 2.5 inches. Nominal insertion loss is 4.5 dB with typical return loss of 25 dB. Other Proxi-Flange™ models operate from 18 to 330 GHz.

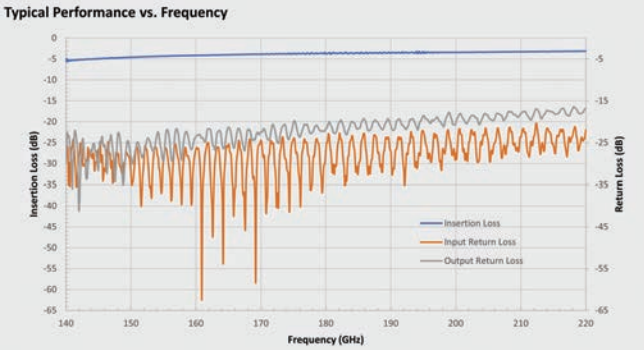


Figure 5. A straight WR-05 waveguide section with a Proxi-Flange™ conactactless waveguide flange has typical insertion loss of 4.5 dB and return loss of 20 dB from 140 to 220 GHz.

Frequency Multipliers

Frequency multipliers are often used with signal sources to achieve higher output frequencies. Multiplication preserves the frequency accuracy and stability of the signal source with minor increases in sideband noise, and possibly higher harmonic content that can be filtered out if necessary. Both passive and active frequency multipliers are available.

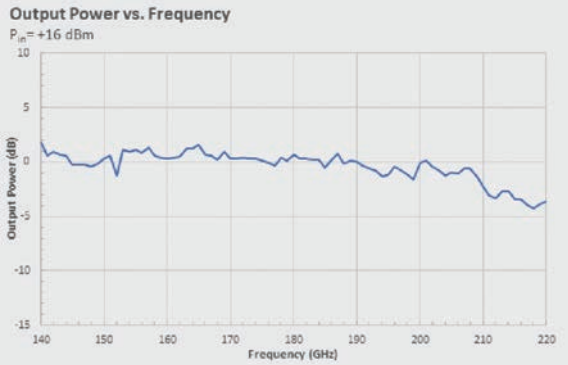


Figure 7. The Measured Performance of G Band Passive Doubler

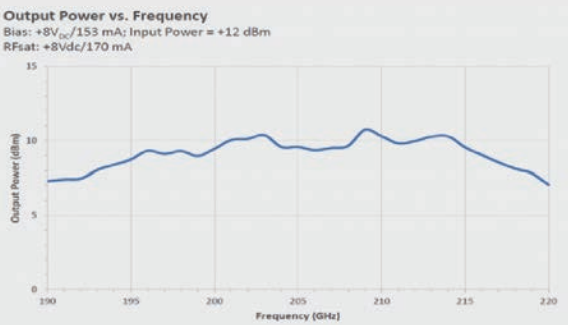


Figure 8. The Measured Performance of G Band Active Multiplier

Passive multipliers typically employ Schottky diodes and generally provide multiplication factors of 2, 3, or 4. Many models operate over full waveguide bands up to 220 GHz. Passive multipliers require no DC power and have relatively straightforward implementations but they exhibit significant conversion loss. In contrast, active multipliers combine passive multiplier circuits, filters and amplifiers to provide higher output power and higher multiplication factors. Most of Eravant's frequency multipliers cover full waveguide bandwidths. Alternatively, custom units with narrower frequency coverage can be designed to reach other performance goals such as lower conversion loss or lower harmonic content. Model SFP-05210-S2 is a passive frequency doubler that provides full G-Band coverage from 140 to 220 GHz with output power around 0 dBm when driven with +16 dBm input power (Figure 7). Model SFA-194224208-0510-E1 is an active doubler that yields output signals from 190 to 220 GHz at +8 dBm using an input signal of +12 dBm and a DC supply of +8 Volts at 170 mA (Figure 8).

Power Amplifiers

Power amplifiers typically incorporate GaAs, InP or GaN semiconductor technologies to achieve output levels that are relatively high for THz components. Power combining techniques in planar circuits and in waveguide configurations are used to achieve the best electrical and mechanical performance possible. Model SBP-2142351507-0404-E1 covers the frequency range of 210 to 230 GHz with 15 dB gain and +10 dBm output power in a WR-04 waveguide package (Figure 9).

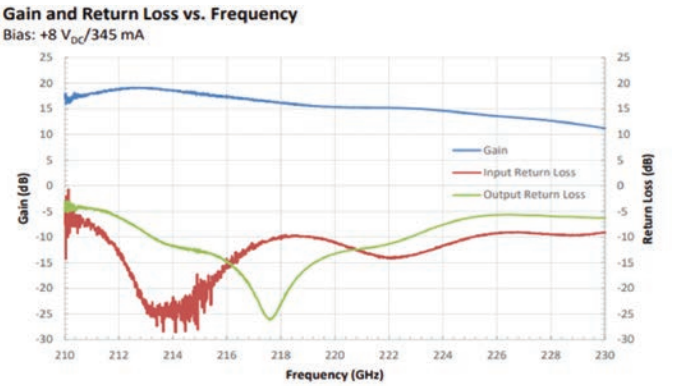


Figure 9. The Measured Performance of 210 to 230 GHz Power Amplifier

Mixers

Model SFB-05-E2 is an externally biased balanced mixer that covers the full G-Band from 140 to 220 GHz. Its conversion loss is about 13 dB using +3 dBm of LO power. The waveguide interfaces are WR-05.

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