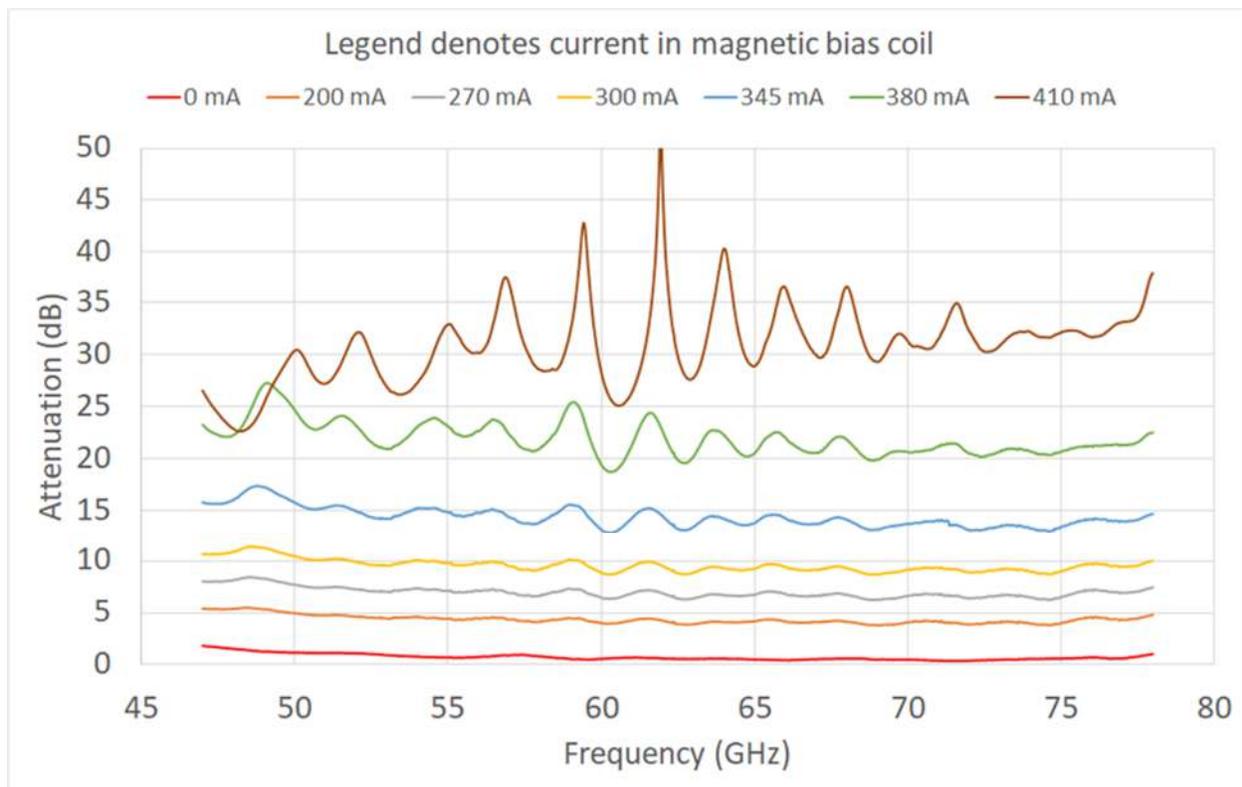


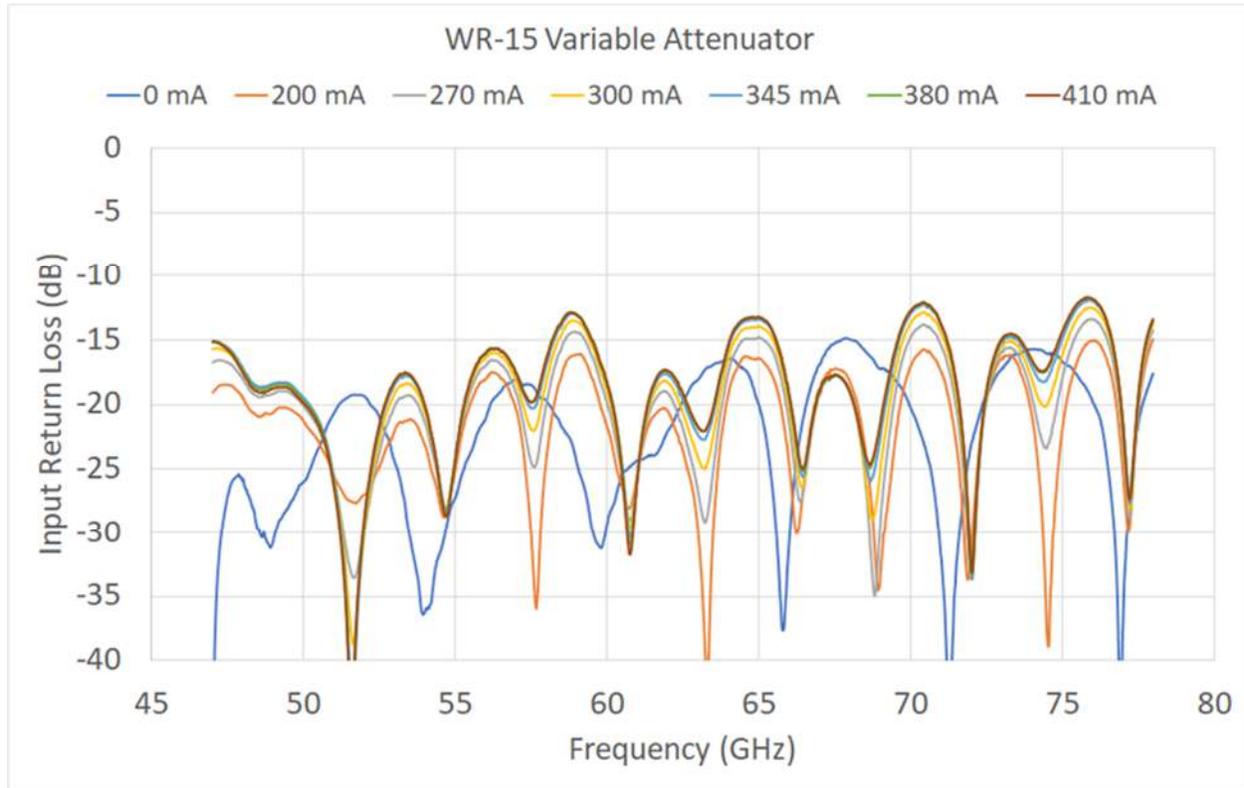
Voltage Variable Attenuators

Voltage variable attenuators (VVA) find wide application in many microwave and millimeter-wave systems. At frequencies above 50 GHz, most VVA's are either based on pin diodes or resistive vanes with motor driven mechanical actuators. Many pin diode VVA's offer only partial waveguide band coverage (10 GHz at WR-10) with maximum power near 100 mW. Transistor chip attenuators are available with good performance to 100 GHz, but the maximum power rating is only 30 mW. The chip must be mounted to a circuit and integrated into waveguide.

At Micro Harmonics we have developed a line of voltage variable attenuators based on the physics of Faraday rotation. Our VVA design uses a magnetic coil to produce a variable magnetic bias field in a ferrite rod. The VVA is similar in many respects to our Faraday rotation isolators. Using this approach, we have produced VVA's in WR-15, WR-12, and WR-10 with full waveguide band operation and relatively high power handling as compared to other technologies. These VVAs are compact, lightweight, and are insensitive to damage from electrostatic discharge. The measured performance of our WR-15 VVA is shown in the graph below. The attenuation is relatively flat up to about 20 dB.



The measured port reflections are shown in the graph below. The VSWR is less than 1.7:1 at the highest attenuation levels.



WR-15 attenuator

The photograph to the left shows our WR-15 attenuator. The attenuator is compact with the main body measuring only 0.75 x 0.75 x 1 inch (19 x 19 x 25 mm). The small size makes the attenuator very easy to fit into millimeter-wave systems. A DC control voltage is applied through an SMP connector. The switching speed is estimated to be a few kilohertz due to the relatively large inductance of the magnetic coil.

Micro Harmonics designs and manufactures all products in the United States. We do reliability testing (Belcore) and cryogenic cycling tests. Nylon thread lockers are used to ensure that our components stay assembled in the field. Every component is thoroughly RF tested and the data is shared with the customer. Our components are fully warranted.

When you purchase a Micro Harmonics component, rest assured that you are receiving the highest quality and best performance available on the global commercial market.

Micro Harmonics Corporation
20 S Roanoke St, Ste 202
Fincastle, VA 24090

Ph: 540.473.9983
Fax: 844.449.1561
MicroHarmonics.com