



Enhanced Traveling Wave Tube

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WARF: P140188US01

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a traveling wave tube that uses a slow wave structure capable of increasing output power by 50 fold.

Overview

A traveling wave tube (TWT) is a vacuum electronic device that acts as a microwave amplifier capable of providing high gain and high output power. TWTs are used in many wireless devices like radar systems, satellite communications and wireless transponders.

TWTs use a slow wave structure that supports the propagation of an electron beam and an electromagnetic wave through the device. The interaction between the beam and the wave boosts the output power of the device. The dimensions of the slow wave structure dictate this interaction.

At millimeter wave frequencies, it would be desirable to increase the size of the slow wave structure without decreasing its frequency band of operation. This would enable higher gain and output power levels.

The Invention

UW–Madison researchers have designed a slow wave structure that can enhance the gain and output power of a TWT.

The modified slow wave structure has ports to receive and output amplified radiofrequency (RF) signals. It is made of two different materials that repeat at periodic intervals, e.g., the first material may be a vacuum and the second material may be a metal plate or wire mesh. The second material has a real part of permittivity that is negative and a real part of permeability that is positive at an operational frequency of the RF signal. An electron beam vacuum tube runs through the center of the slow wave structure.

Applications

- Use in satellites, radar and military contexts
- Communication systems, base stations and cell towers

Key Benefits

- Increases output RF power by about 50x
- Allows device to scale up
- Maintains desired gain and output power within the millimeter wave frequency range

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Modeling and simulations have been completed.

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Additional Information

Related Technologies

- [WARF reference number P100168US01 describes a compact antenna for wideband and low frequency applications.](#)

Tech Fields

- [Information Technology : Networking & telecommunications](#)

For current licensing status, please contact Michael Carey at mcarey@warf.org or 608-960-9867

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