



Terahertz Radiation Mixer

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BRIEF DESCRIPTION

A terahertz radiation mixer for detecting an electromagnetic input signal having a radio frequency.

BACKGROUND

Terahertz applications remain relatively undeveloped because the terahertz region lies between the traditional microwave and optical regions of the electromagnetic spectrum, where electronic or photonic technologies have been developed for these purposes. Terahertz applications have been hampered due to the historically poor performance of terahertz components lying in the "technological gap" between these traditional electronic and photonic domains. There has been a need for a selective and tunable narrowband detector for terahertz spectrum analysis and imaging. Most solid state devices have had difficulty in this regard, because the electron energy relaxation times in such devices are typically much longer than the period of terahertz oscillations and terahertz energies are smaller than typical thermal energies. Therefore, the terahertz electromagnetic wave is oscillating too fast for free carriers to respond. A fast solid-state terahertz radiation mixer is still needed to enable coherent detection for terahertz applications requiring high resolution.

DESCRIPTION

Researchers at the University of California, Santa Barbara have developed a terahertz radiation mixer for detecting an electromagnetic input signal having a radio frequency. The gate voltage can be tuned to modulate the electron density under the grating gate so that the local oscillator signal resonates with a spatial frequency of a standing plasmon resonance of the two-dimensional electron gas in the channel region. When operated on a plasmon resonance, the mixer provides a narrowband response with an intermediate frequency that can be up to 10 GHz or greater. Alternatively, the gate voltage can be greater than the pinch-off voltage of the field-effect transistor to provide a broadband pinch-off response having higher sensitivity.

ADVANTAGES

- Higher sensitivity
- Can withstand higher frequencies and higher current densities

APPLICATIONS

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OTHER INFORMATION

KEYWORDS

Terahertz, THz, Radiation

Mixer, indtelecom

CATEGORIZED AS

- **Biotechnology**
- Other
- **Environment**
- Other
- **Medical**
- **Devices**

RELATED CASES

2006-058-0

- ▶ Terahertz applications
- ▶ High-resolution spectroscopy
- ▶ Remote sensing for space applications

This technology is available for licensing.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	7,376,403	05/20/2008	2006-058

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