

TECHNOLOGY READINESS LEVEL: 5

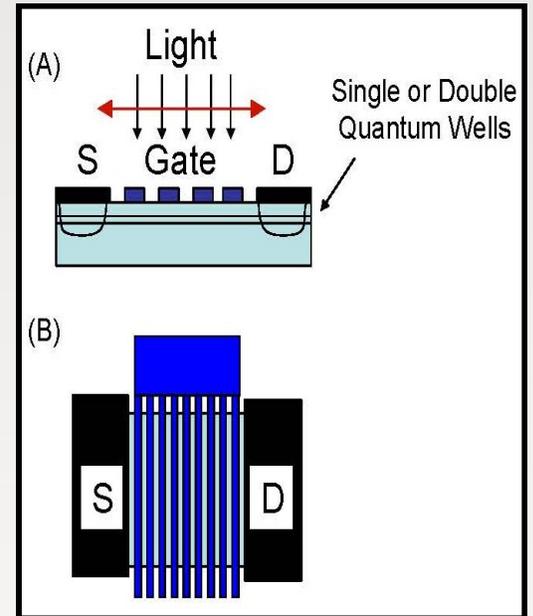
US PATENT # 7,420,225

KEY ELEMENTS HAVE BEEN DEMONSTRATED IN RELEVANT ENVIRONMENTS.

TECHNOLOGY SUMMARY

There has been much interest expressed in terahertz technology due to the diverse range of applications that it applies to. However, the terahertz components have been known to perform poorly due to it lying between traditional electronic and photonic fields. Sandia National Laboratories has created a direct detector for terahertz radiation that seeks to close the “technological gap”.

The present invention is a direct detector that is a depletion mode field-effect transistor built from heterostructures and consisting of electrical contacts and a grating-gate. The grating gate tunes the electron density of the detector and adjusts the Plasmon frequency to match the THz radiation illuminating the device. The detector shows a photoresponse when the Plasmon frequency under the grating gate was turned to the frequency of the incident illumination, a capability not found in other terahertz devices.



A) The detector operating at normal incidence with electric field polarized across the grating

B) Top-Down view of the detector

POTENTIAL APPLICATIONS

- National defense & security
- Molecular spectroscopy
- Imaging array
- Medical imaging
- Remote sensing
- electronics

TECHNOLOGICAL BENEFITS

- Plasmons are not tied to the bandgap energy and can be excited by small THz photon energies
- Detector is easier to produce and control
- Easier to integrate with additional electronics
- Requires lower voltage

TECHNOLOGY INQUIRY?

Contact us for more information or licensing opportunities at

ip@sandia.gov

Refer to SD # 10181

or visit

<https://ip.sandia.gov>