Broadband Light Emission with Hyperbolic Material

Tech ID: 33807 / UC Case 2022-543-0

ABSTRACT

Researchers at the University of California, Davis have developed a solid-state device that uses Cherenkov Radiation to emit light at a tunable wavelength in the THz to IR range.

FULL DESCRIPTION

Cherenkov radiation (CR) results when a charged particle, such as an electron, travels through a medium faster than the phase velocity of that medium. CR has unique properties that make it useful for medical imaging, biomolecule identification, and particle detection, however, its applications are largely limited due to the extreme particle speeds required to emit CR. To generate such particle speeds, it is typically necessary to use particle accelerators or nuclear reactors as energy sources. Other limitations of this technology include large, bulky, designs with complicated optical setups and the requirement of cryogenic temperatures during operation. A new method of generating CR more efficiently is needed to make it more accessible for a majority of applications.

Researchers at the University of California Davis have developed a solid-state device that utilizes CR to emit photons in the THz and IR range with a low-energy electron beam energy input. The input energy, provided by a simple DC voltage, generates electron carriers in the device. The device's hyperbolic nanostructures then couple electron carriers into photon emission, thus allowing the device to generate light at a tunable frequency. Aside from low energy requirements, this device is also compact and fully operational at room temperature. The use of CR to generate tunable, broadband light emission with minimal energy requirements makes this device suitable for a variety of applications within wireless communications, medical imaging, particle detection, and other fields.

APPLICATIONS

- Wireless communications and processing systems with up to terabit-per-second data rates
- High-resolution medical imaging systems
- Particle sensing and spectroscopy

FEATURES/BENEFITS

- First implementation of Cherenkov Radiation using a simple DC voltage source
- Tunable light emission in the THz and IR frequency bands
- Operable at room temperature
- Small, compact design

PATENT STATUS

Patent Pending

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OTHER INFORMATION

KEYWORDS

hyperbolic material, light emission, broadband, nano structures, graphene, imaging, wireless communication, Cherenkov radiation

CATEGORIZED AS

- **Optics and Photonics**
  - All Optics and Photonics
- **Imaging**
  - Medical
  - Molecular
- **Materials & Chemicals**
  - Nanomaterials
- **Medical**
  - Imaging
- **Nanotechnology**
  - Electronics
- **Sensors & Instrumentation**
  - Biosensors

- Environmental Sensors
- Medical

RELATED CASES

2022-543-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Nonreciprocal Reflectarray Antennas based on time-modulation
- On-Chip Platform for Single-Molecule Electrical Conductance Measurements
- A Combined Raman/Single-Molecule Junction System For Chemical/Biological Analysis
- DNA-based, Read-Only Memory (ROM) for Data Storage Applications
- Hybrid Electromechanical Metamaterials for Optical and Electrical Devices
- Nonreciprocal And Reconfigurable Phased-Array Antennas

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