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Single Photon Detection using Magnetic Tunnel Junction Array

A highly efficient, low-cost Short-Wave Infrared single-photon camera offers fast, clear imaging and ranging for automotive, defense, and astrophysics applications by significantly lowering the dark count rate and filtering thermal noise.

Researchers at Purdue University have developed a new Short-Wave Infrared (SWIR) camera technology. This single-photon detector is highly efficient for recognizing weak light scattering from imaging and ranging in cars to locating objects in outer space. The device significantly lowers dark counting rate while also filtering thermal noise, unlike photomultiplier tubes and single-photon avalanche diodes. Purdue researchers have shown that their SWIR technology can detect one hundred infrared photons from satellites furthest from Earthâ€”thirteen billion miles away. This next generation instrument uses heat assisted detection and ranging methods (HADAR) by absorbing a photon, increasing the temperature of a single pixel, and finally inducing a magnetic phase transition to produce a readout in less than one nanosecond.

Advantages:

-High Detection Efficiency

-Fast Electrical Readout

-Portable

-Low Dark Count Rate

-CMOS Adaptable -Low-Cost

Potential Applications:

-Astrophysics

-Automotive

-Military/Defense

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Category

Aerospace & Defense/Defense Electronics & Surveillance Technologies

Semiconductors/Devices & Components

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Intellectual Property:

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Keywords: SWIR camera technology, single-photon detector, heat assisted detection and ranging, HADAR, high detection efficiency, low dark count rate, CMOS adaptable, astrophysics, automotive imaging, military defense, single-photon sensitive, thermal noise minimization, Camera, Circuits, Computer Program, Computer Programming, Computer Technology, Light Waves, Magnetics, Micro & Nanotechnologies, Nanophotonics, Nanoscale, Photons, Portable, Pulsed Laser, Signals, Single-Photon, Waveguide