Distributed Nanowire Sensor for Single Photon Imaging
Technology #18503

Applications

- Biological imaging
- Quantum computing
- Deep space communications

Problem Addressed

The development of a camera with single-photon sensitivity and sub-micrometer spatial resolution has applications in many scientific fields. Although superconducting nanowire single-photon detectors (SNSPDs) have superior performance to other discrete detectors, integrating multiple SNSPDs into an array for single-photon imaging is difficult, because of the complexity of signal processing and the cooling requirements of cryogenic designs.

Technology

The invention is a new architecture for a single superconducting nanowire, which uses hundreds of pixels to spatially resolve single photons. Using a simple readout method with only two radio frequency output lines and conventional room-temperature electronics, the design is a detector that is sensitive enough to detect a single photo with high quantum efficiency, low dark counts and low timing jitter. The resulting nanowire is easily shapeable for either a large active area for astronomical observation or sub-micrometer spatial resolution for near-field imaging. The number of distinguishable pixels is only limited by the total length of the nanowire and the timing accuracy for reading out the electrical pulses.

Advantages

- High quantum efficiency, low dark counts, and low timing jitter single photon detector
- Simple readout method requires only two radio frequency output lines and conventional room-temperature electronics
- Nanowire easily shapeable for either a large active area for astronomical observation or sub-micrometer spatial resolution for near-field imaging

Categories For This Invention:

- Electronics & Circuits
- Electronic Components
- Nanowires (Electronics & Circuits)
- Superconductors
- Photonics
- Sensors (Photonics)
- Detectors
Imagers

**Intellectual Property:**

Distributed nanowire sensor for single photon imaging
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Distributed nanowire sensor for single photon imaging
Issued US Patent

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**Publications:**

Superconducting-nanowire Single-photon-detector Linear Array
Applied Physics Letters
September 30, 2013

Explained: Nanowires and Nanotubes
MIT News
April 11, 2013

Single Photon Detectors Based on Superconducting Nanowires over Large Active Areas
Applied Physics B: Lasers and Optics
September 1, 2009

**External Links:**

Quantum Nanostructures and Nanofabrication Group
http://www.rle.mit.edu/qnn/