Docket #: S21-111

Quantum Enhanced Electro-Optic Modulator

Researchers at Stanford are developing a device that uses quantum engineered states and interactions to detect electromagnetic waves with a sensitivity and bandwidth beyond that possible with existing technology. Such an advance could lead to improved performance across a wide array of systems in terms of size, weight, and power. Currently, electro-optic modulators are widely used in communications, sensing, and computing, among other fields. However, the sensitivity and power requirement of these detectors fall short of what is predicted possible. The new approach envisions an electro-optic modulator that uses 'squeezed' states of light to boost sensitivity. Squeezed states of light have been used to significantly improve measurements in the gravitational wave laser interferometer LIGO, but have yet to find wider use. Integrating a scaled down squeezed state generator and electro-optic sensor on the same chip enables a vastly more robust realization of a quantum sensor that **could achieve a significant 10-100x enhancement in sensitivity over current classical technology**. This work could lead to new types of sensors out of reach of classical technologies.

Stage of Development
Proof of concept

Applications

- Receiving antennas (esp. phased arrays) widely used in communications, radar and passive imaging
- Quantum transducers

Advantages

- Increased sensitivity and low noise
- Size/weight/power improvements
- Enables sensors that may be worn or mounted on lightweight platforms (space or autonomous)
- Could eliminate need for electronic amplifiers

Patents

- Published Application: 20220373735
- Issued: 12,007,602 (USA)

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