All-Optical Epsilon-Near-Zero Enabled Streak Camera

An ultrafast all-optical camera (attosecond resolution) for sub-femtosecond measurements in optics, semiconductors, and chemistry.

Researchers at Purdue University have developed an ultrafast camera for the measure of sub-femtosecond phenomena in a single exposure. By using an all-optical ultrafast modulator based on epsilon-near-zero materials, this technology results in faster sampling rate as well as lower cost when compared with existing ultrafast cameras. The technology has sub-femtosecond resolution, compared to industrial systems with picosecond/sub-picosecond resolution. This technology has a range of applications across optics, chemistry, biology, and the semiconductor industry where the imaging of ultrafast phenomena can give insights into the folding of proteins, biochemical processes, and the dynamics and transfers of electric charges.

Advantages:

- All-optical design

- Significant improvements in temporal resolution

- Simpler and more cost effective than existing technologies

Applications:

- Characterization of sub-femtosecond phenomena

- Lasers

- Electron transitions

- Semiconductor Design

Technology Validation: This technology has been validated through the fabrication and testing of the components independently. Results showed a temporal resolution of 5 attoseconds, a 100,000x improvement over

Technology ID
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Category
Computing/Photonic & Optical Computing Technologies
Materials Science & Nanotechnology/Nanomaterial Characterization & Imaging Tools
Chemicals & Advanced Materials/Materials Processing & Manufacturing Technologies

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conventional methods.

Related Publications:

https://www.purdue.edu/newsroom/releases/2023/Q3/purdue-streak-camera-innovation-could-capture-actions-that-last-femtoseconds-or-less.html

TRL: 4

Intellectual Property:

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