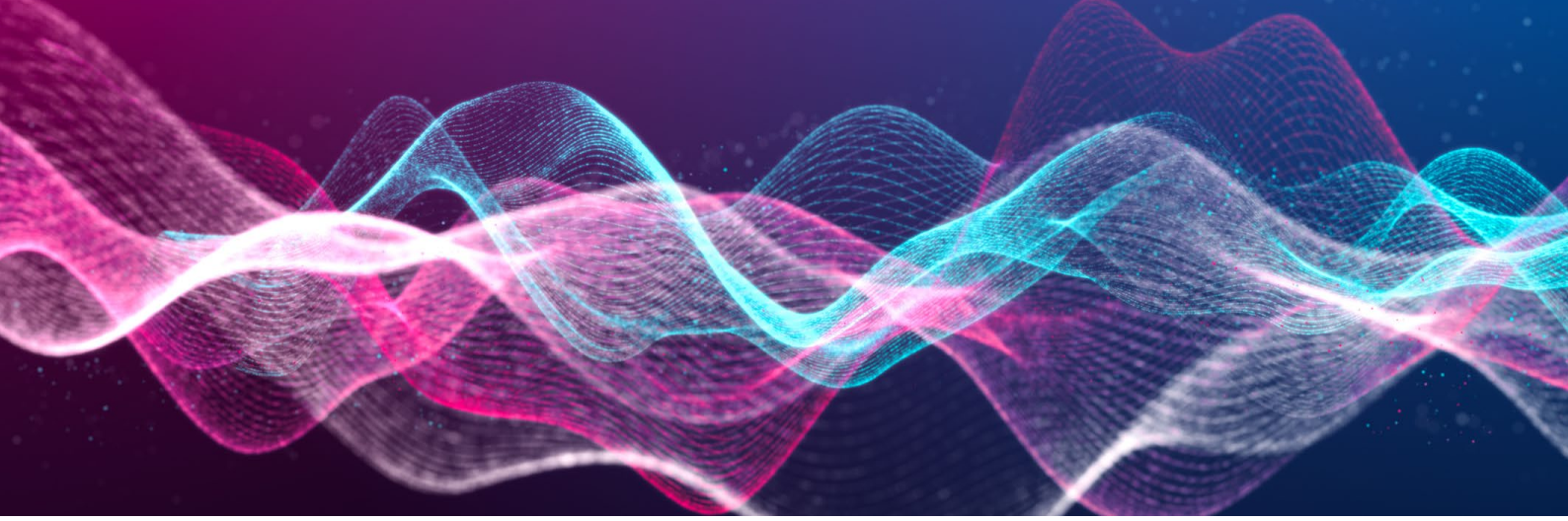

Low power nanomagnet storage and computing

A new method to change the state of individual magnetic nanoparticles within a dense array using a low cost, low-power laser for data storage technology and potential application in neuromorphic 'in-memory' computing.

Proposed use

The technological benefits of optically-switched magnetism are enormous and achieving it has long been a goal of both industry and academia.

This technology allows low power, high density magnetic data storage in bit patterned media. A key future application could be in next-generation neuromorphic computation hardware as this technology is very suited to new technologies where multiple storage and/or logic functions are co-located e.g. 'universal memory', 'memcomputing', 'hardware neural networks'.

Problem addressed

Computation is forecasted to reach 30% of global energy production by 2030. However, systems using nanomagnetics could be 100,000 times more energy efficient than standard electronics as information is transferred as a wave, reducing global energy need.

Established nanomagnetic technologies require ultrafast and intense pulses of light from expensive high-power lasers or otherwise are dependent on circular optical polarisation or a magnetic field. This technology uses extremely low power continuous wave lasers with linear polarization in the absence of a magnetic field.

This technique only uses aluminium, nickel and iron compared to rare and expensive elements used in existing techniques.

Technology overview

This invention is a new method to change the state of a magnetic particle within a dense nanomagnet array using continuous wave light from an extremely cheap low powered laser.

Hybrid magnetoplasmonic structures were developed combining a switchable magnetic bit with a light-focusing plasmonic antenna. Deterministic switching was demonstrated in high-density, strongly-interacting arrays including writing exotic high-energy states.

Benefits

- All optical magnetic switching with **extremely cheap low power lasers** in the absence of a magnetic field.
- **Low power, high density data storage** well suited to **hardware neural networks**.
- Potential application in **next-generation neuromorphic computation hardware**
- Magnetic computing is theoretically **100,000 times more energy efficient** data storage compared to standard electronics.
- **Low cost materials** such as aluminium, nickel and iron compared to existing techniques
- Continuous wave laser uses linear polarization and so **is not dependent on circular optical polarization.**

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Intellectual property information

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