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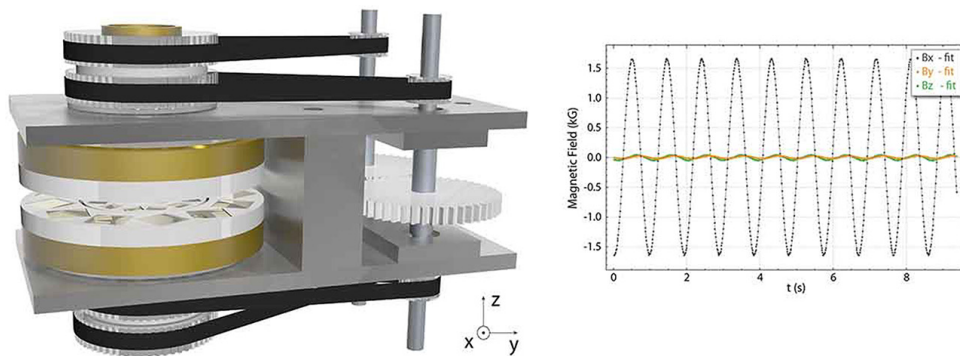
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A new and energy efficient table-top magnetic field generator

Savannah Mandel

Scientists design a low-cost, fully scalable, adjustable, single axis alternating magnetic field generator using permanent magnets.



Alternating current magnetic fields have broad scientific and commercial applications. However, the usage of electromagnets for generating magnetic fields is limited by power supply related problems, such as noise generation and power availability, in addition to operation limitations such as the lack of 3D mechanical and optical access within the area of strong fields.

To surpass these limitations, Tretiak et al. used nested Halbach arrays in two spinning wheels, to produce a powerful single-axis adjustable and alternating magnetic field. A Halbach array is a special arrangement of permanent magnets that generates magnetic fields with the strongest possible per mass of permanent magnet material.

“Our device is a permanent-magnet-based device that creates strong, homogeneous, magnetic fields in an area of 3D mechanical and optical access,” said Lykourgos Bougas.

The device generates a single-axis field of up to several kilogauss at frequencies of ~ 1 Hz. The authors describe their design as “green” because of its low-cost and low-power consumption. It is compatible with systems operating under a vacuum and is fully scalable and adjustable because it employs permanent magnets in a special geometrical arrangement.

“Our device is fully scalable and adjustable, in terms of its spatial dimensions, its accessibility, and its magnetic properties, but also in terms of the magnetic field topologies it can generate,” said Bougas. These advantages make the prototype adaptable for a wide range of applications, such as table-top scientific experiments.

The authors have been using the device for highly sensitive experiments in their laboratories. They are continuing to investigate novel potential applications for it and intend on optimizing the design to generate stronger magnetic fields.

Source: “Variable single-axis magnetic-field generator using permanent magnets,” by Oleg Tretiak, Peter Blümler, and Lykourgos Bougas, *AIP Advances* (2019). The article can be accessed at <https://doi.org/10.1063/1.5130896>.

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