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## How to increase the field gradient produced by a superconducting Halbach array by modifying its geometric parameters?

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Halbach arrays made of bulk melt-textured  $\text{YBa}_2\text{Cu}_3\text{O}_{7-\delta}$  superconductors are very promising systems to generate magnetic flux density gradients exceeding those given by classic Halbach arrays using permanent magnets. When assembling an array made of bulk superconductors, the challenge is to prevent a reorganization of induced currents in the superconductors and their subsequent demagnetization. In this work, we investigate various configurations to achieve this goal: the peripheral samples are replaced by bulk superconductors in the shape of triangular prisms or they are vertically shifted with respect to the central sample. Using 3D finite element modelling and semi-analytical modelling based on Biot-Savart law, we show that very little demagnetization occurs in these structures. Their properties can therefore be predicted reasonably with semi-analytical modelling.

### Topic

Applications in large instruments such as high-field magnets, medical magnets and accelerator magnets

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