

EFFECTS OF ROLL ANGLES ON HALBACH ARRAY EFFICIENCY

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Abstract

The Halbach Array was first described by Mallinson in 1973 (IEEE Transactions on Magnetics, 9, 678-682, 1973). Named after Klaus Halbach, the Berkeley physicist who first applied Halbach arrays in the construction of wigglers, Halbach Arrays have seen increased use in applications that require high weight to magnetic field efficiency. Since magnet geometry is often dictated by the application, weight, and/or cost requirements, the progression of the angular orientation (roll angle) of the array is a frequent target for optimizing array performance. The effect of different roll angles of a magnet system is studied here on a canonical linear array modeled with two different magnet alloys – one high-energy, low-coercivity alloy, and one high-coercivity alloy. All models studied are comprised of square cross-sections. The integrated flux on each side of the array is compared for efficiency, while the half-maximum distances are compared for projection strength. To validate the model results, the candidate arrays are physically constructed, measured and compared to the modeled outcomes.

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