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Design of high-field permanent dipole magnet with extremely low leakage field

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In fourth-generation light sources, the storage ring lattices are generally very compact, which may result in serious cross-talk effect. Reducing the leakage field of magnets will be an effective way to mitigate this issue. In this paper, a new type of permanent magnet structure is designed based on an analysis of magnetic flux leakage in normal permanent dipole magnet. A comparison of this new structure with the traditional magnetic shield illustrates that this new structure shows superior performance in reducing leakage field. Then a permanent dipole magnet is designed and simulated using 3D finite element method for Hefei Advanced Light Facility. The peak field of this magnet reaches 1.48 T and the leakage field is only a few Gauss.

Footnotes

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Author: WANG, Zihan (University of Science and Technology of China)

Co-authors: FENG, Guangyao (University of Science and Technology of China); BAI, Zhenghe (University of Science and Technology of China)

Presenter: WANG, Zihan (University of Science and Technology of China)

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