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Improvement of Field Simulation Concept of Staggered Undulator with HTS YBCO Bulk

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An undulator with a strong magnetic field in a short period will become an important light source device in an accelerator storage ring or a free-electron laser. The bulk YBCO can be used to construct a high-temperature-superconducting undulator with staggered array structure. The bulk YBCO of diameter 32 mm and thickness 2.5 mm was constructed and assembled as a staggered magnet array. The period length was 5 mm; the magnet gap is 4 mm. To estimate the strength of a sinusoidal field and to optimize the end-pole design to minimize the first field integral (i.e. electron angle) and second field integral (electron position), an energy-minimization method (EM-method) based on Bean's model to simulate the field trapped in the HTS-Bulk is introduced. In this paper we focus on promoting the practical value of the EM-method simulation. Aggregating the experience of measurement of the bulk YBCO undulator at 77 K and 7 K and the experience of simulation work based on the EM-method, we tackle some issues to enhance the integrality of this undulator design work.

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