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Helical undulators assembled from magnetized ring sectors

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Undulators assembled from quasi-helices consisting of readily available magnetized ring rare-earth sectors are proposed. "Radially" magnetized sectors create a stronger field on the axis than longitudinally magnetized ones. The field value weakly depends on the number of sectors per undulator period. An experimentally studied prototype Halbach-type helical undulator of "radially" and longitudinally magnetized quasi-helices consisting of ring NdFeB sectors with a period of 2 cm and a comparatively large inner diameter of 8 mm provides a field of about 0.6 T on the axis. By reducing the inner diameter to 5 mm, it is possible to obtain a field twice as large. When assembling such an undulator, it is convenient, while maintaining the positions of all ring sectors, to use a division of the undulator not into quasi-helices, but into cylindrical sectors shifted along the axis and rotated relative to each other. Permanent undulators from ring sectors can provide a higher velocity of transverse electron oscillations than planar ones, and therefore seem promising for increasing the efficiency of FELs in various frequency ranges.

Footnotes

Paper preparation format

Region represented

Asia

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