SRI 2024

SRI2 24

Contribution ID: 273

Type: Contributed talk

Undulator Light Source with a Compact, Slender and Lightweight Frame Based on a Magnet Technology Developed for the Very-Short-Period Undulators

Wednesday 28 August 2024 12:30 (15 minutes)

We have been exploring a novel method to fabricate undulator magnets having a very short period length of a few mm. Plate monolithic magnets (PMM) made of Nd-Fe-B, 100mm long with 4-mm period length have been successfully fabricated[1-4]. The 4-mm period length allows us to obtain 12-keV radiation with the first harmonic of this undulator in the 2.5-GeV light source accelerator. A connection method of these magnet plates has also been successfully developed to fabricate longer undulator magnets[5-6].

As a next step of the development, we are developing a magnetic cancellation method of an attractive force produced by the undulator main magnets by using repulsion magnets. The attractive force is effectively cancelled out by them placed outward in the magnet gap. We found that the repulsion magnets made of PMM were easily optimized in the present system where the main magnets were also made of PMM in contrast to the previous work[7].

We are also developing a compact undulator frame, in which magnetic attractive force between the main undulator magnets is effectively cancelled out by the above cancellation method using repulsion magnets. This undulator is designed as a light source for an XUV-FEL development which has been undertaken in the experimental plat-form at SP-8 for the JST-MIRAI project[8]. Target parameters of the undulator for this experiment are: period length, \boxtimes u=25mm, field strength K=1.4 at the gap=5mm or larger, and number of period=80. The magnet array is divided into two segments 1m long each, gap of which can be controlled independently. The weight of the undulator system is as light as 500kg/m.

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I plan to submit also conference proceedings

Yes

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Session Classification: Mikrosymposium 10/1: New Lattices and IDs

Track Classification: 10. New lattices and novel insertion devices