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Magnetic field measurement of the center bend magnet for Korea-4GSR

The Multipurpose Synchrotron Radiation Accelerator (4GSR), supported by the Pohang Accelerator Laboratory (PAL), has brightness 100 times higher and extremely low beam emittance ($<100 \text{ pm}\cdot\text{rad}$) compared to third-generation synchrotron radiation accelerator. To achieve these specifications, 4GSR storage ring is designed with 28 cells based on the Hybrid 7-Bend Achromat lattice concept, utilizing longitudinal gradient bends (LGBMs) and reverse bends (RBs) in each cell to suppress emittance. The circumference of the storage ring is 800 meters, and each cell features a 2T center bend magnet (CB) located at its center for harder X-ray source. This paper describes the design, specifications and magnetic field measurement system of the CB prototype used in the storage ring. The field mapping system is designed using a 3-axis Hall probe sensor (I3C-03C10L-B02T0K5J) from SENIS, which minimizes planar effects. The driving system for the X, Y, and Z axes consists of linear motors and stepper motors, achieving an accuracy of less than $5 \mu\text{m}$. This system is capable of measuring a three-dimensional space of $400 \text{ mm} \times 200 \text{ mm} \times 3200 \text{ mm}$.

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