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Development of the beam separation test device to evaluate the electric field of non-destructive electrostatic septum

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Slow beam the extraction in synchrotrons is utilized for various nuclear and particle physics experiments and radiology. A beam loss at a septum electrode induces equipment activation and damage. We have been developing a non-destructive electrostatic septum. This septum has multiple electrodes, and those are placed around the outside of the beam. Measuring the 2-D electric field distribution of this septum is important to evaluate the beam loss reduction due to this septum. We are developing the beam separation test device consists of a prototype septum, horizontal and vertical wire scanners and the electron gun installed on a movable stage fixed to a drive unit. This device measures the electric field by injecting an electron beam into the electric field and measuring the bending angle of the beam orbit. Since the width of the electron beam determines the resolution of the measurement data, we developed an additional lens system that can transport the beam 1.5 m with a width of 1 mm. We used a square chamber for the 2-D measurement system. A permalloy magnetic shield is installed inside the chamber and reduces the external magnetic field from 50 μT to less than 1.5 μT.

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