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Development of a beam profile monitor based on the YAG:Ce scintillator for a multipurpose beam diagnostic system

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In this paper, a multipurpose beam diagnostic system based on a YAG:Ce scintillator is presented. This system was developed in order to measure beam profile, transverse parameters, momentum spectrum, and current of the electrostatic accelerator. The concerning issues in the beam profile monitor design such as image resolution and scintillator temperature distribution have been discussed. In order to estimate the resolution of the scintillator screen, the collision of ideal proton and electron beam with YAG:Ce scintillating screen was simulated using the Geant4 Monte Carlo code. Increasing scintillation temperature will decrease the scintillation optical yield and result in a change in beam profile, so COMSOL software was used to simulate the scintillation temperature distribution under different beam powers. The design procedure, including the handling of heat transfer and charging accumulation issues, as well as estimation and improvement of image resolution, has been investigated. After designing the beam profile monitor based on YAG:Ce,The equipment was provided and manufactured and the beam profile was measured using this diagnostic tool.

Footnotes

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