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Electron beam profile determination by multi-angle scanning using scintillation optical fiber

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Nowadays, the development of an approach for quick and accurate diagnostics of ionizing radiation beams is important. This study proposes a method of multi-angle scanning using scintillation optical fibers as detection elements for determining the energy electron beam profile. Beam characterization measurements by this method involve several steps, including mathematical processing based on inverse Radon transform.

To investigate the proposed method and detector material, an experiment was conducted at Tomsk Polytechnic University to determine the transverse profile of the 5.7 MeV electron beam. The beam shape was measured for an open field and for a deformed one by an additional target. After collecting and processing the data, a beam profile was reconstructed in the transverse plane. To assess the quality of the obtained profiles, similar experiments were performed using Gafchromic EBT3 dosimetry films.

As a result, a comparative analysis of the electron beam profiles was carried out, demonstrating the effectiveness of the multi-angle scanning method and the proposed setup based on the scintillation detection element. The proposed method and device offer a promising solution for quick and accurate diagnostics of high-energy electron beams.

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