R1-O-028301

CHERENKOV LIGHT PRODUCED BY THE 5.7-MEV ELECTRON BEAM IN DIAMOND AND SAPPHIRE CRYSTALS *

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Cherenkov effect is well-known phenomenon and finds a broad application in physics including beam diagnostics. The ability to separate Cherenkov and luminescence light in detector based on crystal is critical to develop the new generation of optical techniques in low energy beam diagnostics [1, 2]. In this report we demonstrate the first experimental results on detection of Cherenkov light from the 5.7 MeV electron beam passing through synthetic diamond and sapphire crystal. The measurements have been carried out at TPU microtron [2]. The oblique incidence allows extracting Cherenkov light at a right angle with respect to the electron beam [3]. Thus, we have measured the dependence of Cherenkov radiation intensity on the crystal rotation angle employing the silicon photomultiplier (MicroSC/FC model) for fixed observation angle. Measured amplitude-time characteristics of radiation indicate that Cherenkov and luminescent light possess different glow times for sapphire crystal, while for synthetic diamond these times are comparable. The special optical scheme consisting of filter and polarizer allows us to separate Cherenkov and luminescence light. The experimentally obtained dependences have good agreement with theoretical curves computed by the polarization currents approach [4]. The proposed scheme for detection of Cherenkov light will be used to develop a new method for measurement of the ion beam energy at NICA facility (JINR, Dubna, Russia) [5].

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* The work was supported by the Russian Science Foundation under grant No. Приоритет-2030-НИП/ИЗ-005-0000-2030.