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Charged Particles Production by High-Energy Electron Beam in a Tungsten Target

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Positrons are usually produced in tungsten (further W) single-crystalline and amorphous targets (see, e.g. [1]). However, in tungsten single-crystals dechanneling length of incident electrons is rather short, which restricts their applicability. The possibility of application of textured polycrystalline targets (in which the channeling of electrons was recently observed [2]) for increasing of positron production was proposed in [3]. This aim is supposed to be achieved due to channeling in the crystallites of the downstream textured W target of the electrons scattered in the upstream W single-crystal.
In the present work, we report about the beginning of experimental research in this direction with the use of W targets acting as amorphous ones [4]. Presently charged particles production by 7 GeV electron beam in a W target was studied with the use of thin silicon surface-barrier detectors. The beam was supplied at accelerator U70 in Protvino. In the first experiments there was observed the production of charged particles in upstream W targets of different thicknesses (1.5–12 mm) placed on different distances (11–110 mm) from the downstream silicon detector. Determination of the number of created particles and their nature was performed by the analysis of ionization loss spectra (Landau peaks) formed by the particles in the detector. Comparison with corresponding theoretical estimations is presented.

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Summary

It is a report about experimental investigation of charged particles (electrons and positrons) production in a tungsten target by a high-energy electron beam. Particle registration is made with the use of thin silicon detectors. Comparison with corresponding theoretical estimations is presented.

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