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Parametric X-ray radiation from powder targets

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Parametric X-ray radiation (PXR) is a consequence of the interaction of charged particles with a substance in which there is a periodic structure. This type of radiation is generated as a result of coherent emission of electrons of the medium due to polarization caused by the Coulomb field of incident charged particles. The characteristics of such radiation depend on the incident charged particles, the angle of observation, as well as on the characteristics of the sample under study [1]. Previously, a lot of work was carried out on the generation of PXR from crystals and polycrystals, and our group was able to register PXR from powder targets for the first time. The advantage of powder targets lies in the absence of preferential orientation of crystallites, which distinguishes them from polycrystals. In the first work on the study of PXR from powders, tungsten powder with a grain size from 0.8 to 1.7 microns was used as a target [2]. The experimental results showed a good agreement with the kinematic theory of PXR. In this regard, it was decided to continue research with powders.

This paper shows the results of continuing studies of PXR generation from powders. Nickel powder with a grain size of 1.56 microns was selected as the test sample. The experimental part was carried out in the Department of High Energy Physics of the FIAN. The source of relativistic electrons was a microtron with an energy of 7 MeV, the observation angles were 150 degrees and 180 degrees relative to the velocity of the electrons. The results obtained showed a good agreement with the kinematic theory of PXR in form, position and relative intensity for the selected observation angles.

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