

Manifestation of the Formation Length Effect for X-ray Transition Radiation by 1-6 GeV Electrons in Periodic Multifoil Radiators

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Formation region effects in X-ray transition radiation are experimentally investigated. The study was performed on the test beam facility TB21 at DESY [1]. The radiation was generated by 1-6 GeV electrons in two multilayer targets of different period, which consisted of thin aluminum foils separated by air gaps. The period of the first target was smaller than the typical size of the radiation formation distance in the gap between the foils, while the period of the second one exceeded this distance. Both the effects of suppression and enhancement of X-ray transition radiation were observed at variation of the incident electron beam energy. The latter effect of radiation enhancement in the small-period radiator compared to the large-period one is a new feature of the discussed emission which was not reported in previous investigations of this kind (see, e. g., [2]). Application of this effect for a noticeable enhancement of the radiation yield is discussed and the conditions required for this are presented. The expression for the spectral density of transition radiation from a multilayer target is derived for the case of an arbitrary transversal particle distribution in the electron beam and the finite size of the detector active area. The experimental results are analyzed and compared to the theoretical estimations.

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References

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