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# On the measurement of transition radiation characteristics in the prewave zone with the use of restricted parabolic mirror

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The present work deals with the problem of transition radiation characteristics measurement in the prewave zone. We consider backward millimeter wavelength transition radiation generated by ultrarelativistic electron during its traversal of thin metallic plate in vacuum. In [1] it was shown that the use of large (much larger than effective transverse size L of electron's coulomb field at considered wavelength) collecting parabolic mirror with the detector situated in its focal point enables complete elimination of the prewave zone effect for radiation characteristics (broadening of radiation angular distribution and frequency dependence of radiation spectral intensity) and allows obtaining the results which coincide with the ones obtained in the wave zone (which is very convenient since the wave zone may begin far beyond the boundaries of the laboratory).
The increase of the electron energy, as well as the choice of larger radiation wavelengths, increases L, which can reach and even exceed the size of the mirror. In this case the conditions considered in [1] (infinitely large mirror) are violated. In the present work we investigate the applicability region of the results obtained in [1] and derive radiation distributions obtained with the use of mirror of arbitrary transverse size. It is shown that even in the case when the mirror size is several times as large as L the position of radiation angular distribution maximum can still be significantly shifted from its 'wave zone'position.
As a special case a measurement with the use of a 'point-like'mirror, which allows defining radiation energy distribution over wave vector directions in a single point of space, is considered.

1) B.N. Kalinin, G.A. Naumenko, A.P. Potylitsyn et al., JETP Letters 84 (2006) 136.

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