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Coherent X-ray radiation by relativistic electron in a structure "amorphous layer- vacuum-periodic layered medium"

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The dynamic theory of coherent X-ray radiation by relativistic electron crossing a three-layer structure consisting of an amorphous substance layer, a layer of vacuum and a layer with artificial periodic structure has been developed. The process of radiation and propagation of X-ray waves in an artificial periodic structure have been considered based on two-wave approximation of dynamic diffraction theory in Laue scattering geometry. The expressions describing the DTR and PXR spectral-angular densities and their interference in the considered structure have been obtained for general case of asymmetric reflection of the electron coulomb field from the layer with artificial periodic structure. At that, under constructive interference of TR waves from different boundaries of amorphous layer and constructive interference of TR waves from amorphous layer and entrance boundary of artificial periodic structure the spectral-angular density of DTR can be increased by orders of magnitude greater than the value of the spectral-angular density from artificial structure only. The possibility to increase the angular DTR density with increasing the substance density of amorphous layer has been shown.
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