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PS1-13: X-Ray Cherenkov Radiation: Theory Limitations and Inconsistency of Experimental Results

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The Cherenkov radiation (ChR) is generated in the soft X-ray region in the vicinity of the absorption edges, where the well-known Cherenkov condition is fulfilled [1]. This X-ray ChR peculiarity can be useful for different applications such as development of the compact, narrow-band, and intense soft X-ray sources [2, 3]. Authors of the experiments [3, 4] have measured the X-ray yield in the vicinity of Cherenkov angles $\cos(\theta) = 1/(n\beta)$ (n is the refractive index, β is the particle relative velocity) and showed the reasonable agreement with a model based on classical theory of transition radiation [5]. From our viewpoint such an approach is insufficient and the model used is inconsistent. We show that the process of the X-ray ChR should be described using more universal theory [6], where the origin of the radiation field is a polarization current induced in a bulk of the medium by Coulomb field of the initial particle. We compare the results obtained by our approach with previous ones and show that there are contributions from ChR and transition radiation for the experimental conditions [2-4].

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References

1. A.V. Bazylev, V.I. Glebov, E.I. Denisov, N.K. Zhevago and A.S. Khlebnikov, JETP Lett. 24 (1976) 371.
2. W. Knulst, O.J. Luiten, M.J. van der Wiel, and J. Verhoeven, Appl. Phys. Lett. 79 (2001) 2999.
3. W. Knulst, M.J. van der Wiel, O.J. Luiten and J. Verhoeven, Appl. Phys. Lett 83 (2003) 4050.
4. W. Knulst, M.J. van der Wiel, O.J. Luiten and J. Verhoeven, Proc. of SPIE 5196 (2004) 393.
5. V.L. Ginzburg and I.M. Frank, Zh. Eksp. Teor. Fiz. 16 (1946) 15.
6. D.V. Karlovets and A.P. Potylitsyn, JETP Lett. 90 (2009) 368.

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