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The contribution of multiple reflections to transition radiation

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A uniformly moving electron passing through a slab induces electromagnetic
emission known as transition radiation. The generated rays propagate inside
the slab and undergo multiple reflections off the slab boundary. We employ the polarization current method in order to derive the reflectionless
solution for an observed radiation intensity and compare it with that of Pafomov
which accounts for multiple reflections exactly. We identify the parameters of the set up that reduce the Pafomov solution to a reflectionless scenario. Provided the ultrarelativistic electron, the proper choice of the slab thickness allows the consideration of the reflectionless solution even in the optical range. Furthermore, it is shown that in the x-ray regime the reflections only become substantial when the radiation is incident on the slab boundary at a high angle at which the intensity of the radiation is vastly reduced. Therefore for a slab shaped screen the reflections may be ignored. Nevertheless the identification of the scenarios where reflectionless solution deviates from the Pafomov, could be used to qualitatively describe transition radiation from targets of complex shape.

Footnotes

Paper preparation format

Region represented

Europe

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