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Azimuthal Asymmetry of Coherent Cherenkov Radiation From a Tilted Bunch

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Femtosecond and sub-femtosecond electron pulses are used in different scientific fields (pump-probe experiments, laser-driven acceleration, ultrafast electron diffraction, etc.). Diagnostics tools for such ultrashort electron bunches have to be developed parallel to the progress of accelerator technologies.

In the paper [1] the coherent transition radiation process is proposed to measure not only bunch duration but tilting angle of the ultrashort pancake-like bunch. In the present report, we have considered a coherent Cherenkov radiation (CChR) from a tilted bunch in a thin inclined dielectric plate and showed a possibility to use this process for bunch diagnostics. Simulation was performed using the polarization current model [2]. We have demonstrated that in this case the CChR azimuthal distribution is strongly distorted. Changing an inclination angle of the plate and measuring an azimuthal asymmetry of the resulting CChR one can reconstruct a bunch length and bunch tilting angle.

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References

- [1] G. Kube, A.P. Potylitsyn, JINST 13, C02055 (2018).
- [2] D. V. Karlovets, JETP 113(1), 27-45 (2011).

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