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Hybrid Positron Source for FCC-ee

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We study a hybrid positron source based on the radiation of high energy (GeV) photons by coherent bremsstrahlung in the oriented single crystal, and a subsequent amorphous target for the photons. The primary electron beam could be accelerated to 4.46 GeV energy for the current setup of FCC-ee. It is possible to set photon radiation peak on 3.08 GeV with the proper orientation of the crystal. Second target will be used to convert photons into e+e- pairs. Then positrons with energy around 1.54 GeV will be captured and send to the dumping ring. One of the advantages of the method is the direct high-energy positron beam production. This method is simple since it does not require further acceleration of low energy positrons. Second advantage is the small radiation and pair production angles (˜$1/\gamma$) due to the high energy of particles. Another advantage is the possibility of producing longitudinally polarized positrons starting with longitudinally polarized electrons. The dependence of the efficiency of positron production on the target material, thickness, orientation as well as parameters of the positron beam at various energies are presented.

Authors: APYAN, Armen (A.I. Alikhanyan National Science Laboratory (ANSL)); ZIMMERMANN, Frank (CERN)

Presenter: APYAN, Armen (A.I. Alikhanyan National Science Laboratory (ANSL))

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