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The e+BOOST Project

The **e$^+$BOOST** (intense positron source Based On Oriented crySTals) project aims to demonstrate the effectiveness of a novel fixed-target positron source scheme enhanced by coherent phenomena in crystals. Future lepton colliders such as **FCC-ee, CLIC, and CepC** require unprecedented positron beam intensities to achieve their respective luminosity goals.

Conventional positron production schemes, based on a high-energy electron beam impinging on a solid target, are limited by the **peak energy density deposition (PEDD)** threshold, beyond which the target structure is compromised. A promising alternative is to exploit the intense coherent radiation emitted in oriented crystals, enabling a higher rate of e^+e^- pair production compared to non-oriented targets, while significantly reducing the PEDD in the converter.

The proposed crystal-based positron source adopts a hybrid target configuration, consisting of a thin oriented crystal radiator followed downstream by a thicker amorphous converter, which transforms the generated photons into e^+e^- pairs. This scheme, initially proposed in [1], has been successfully validated at CERN and KEK [2], and is currently under investigation within the FCC-ee injector design framework [3].

Recent experimental results have shown a clear enhancement in radiation yield when the crystal radiator is properly aligned with the incoming beam, as reported in [4] and [5], providing strong validation of the concept. These findings have also confirmed the reliability of the simulation framework [6], which is now being used to guide the **optimization of a crystalline positron source for FCC-ee**, as detailed in [7].

In this contribution, I will present the latest results of the e$^+$BOOST project, including both experimental outcomes and simulation studies supporting the development of future high-intensity positron sources.

[1] R. Chehab *et al.*, DOI :10.5170/CERN-1989-005.105
[2] R. Chehab *et al.*, DOI :10.1016/S0370-2693(01)01395-8
[3] I. Chaikovska *et al.*, DOI: 10.18429/JACoW-IPAC2019-MOPMP003
[4] N.Canale *et al.*, DOI : 10.1016/j.nima.2025.170342
[5] L.Bandiera *et al.*, DOI : 10.1140/epjc/s10052-022-10666-6
[6] A. Sytov *et al.*, DOI: 10.1007/s40042-023-00834-6
[7] F. Alharthi *et al.*, DOI : 10.1016/j.nima.2025.170412

Secondary track

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