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## The Design of the Electron and Positron Source for CERN External Beam Lines

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The “standard” way of a high energy positron beam in proton accelerator-driven systems includes two stages. Firstly, the proton beam is directed on a target material. The protons produce neutral pions that after a short decay they decay to 2 gamma rays. At the second stage, these gammas are producing electron-positron pairs on a high-Z (typically Pb) converter. Magnets between the target and the converter considerably reduces though does not totally eliminate the hadron contamination. We propose to use a tungsten oriented crystal as the gamma converter. Since an electromagnetic shower in such a crystal is accelerated, *one can drastically reduce the thickness of the converter preserving nearly the same positron yield compared with the amorphous Pb converter. This will considerably reduce the level of hadron background at the converter exit. Moreover, by adjusting the crystal thickness, one can increase the positron yield in a certain energy range. We demonstrate the simulation results of the new scheme using as an example the production of positrons in the H4 beam line of CERN SPS North Area external beam line carried out with Geant4 simulation toolkit\*.*

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### Footnotes

- L. Bandiera et al. Phys. Rev. Lett. 121, 021603 (2018). \*\* J.Allison et al., NIM A 835, 186-225 (2016).

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Yes

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