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## Study of TOF PET using Cherenkov Light

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This work investigates the possibilities of improving the measurements of arrival time difference of the two 511 keV photons arising from annihilation of a positron in positron emission tomography (PET). The new technique of detecting the prompt Cherenkov light, produced by absorption of the annihilation photon in a suitable crystal, could considerably improve the image quality. A simple apparatus with PbF<sub>2</sub> crystals and microchannel plate photomultipliers (MCP PMTs) has been constructed and coincidence resolutions of 71 ps FWHM and 95 ps FWHM have been achieved with 5 mm and 15 mm thick crystals respectively. Simulation calculations are in agreement with the experimental findings.

In the contribution, we will first describe the principles of the detection method and present the experimental apparatus. We will then discuss the results of measurements of time resolution for two coincident 511 keV gamma photons absorbed in PbF<sub>2</sub> crystals. Finally, we will compare our measurements with simulation calculations, which also included a study with PbWO<sub>4</sub> crystals in order to investigate possible improvements of the design.

**Primary author:** Prof. KORPAR, Samo (J. Stefan Institute, Ljubljana, and University of Maribor)

**Presenter:** Prof. KORPAR, Samo (J. Stefan Institute, Ljubljana, and University of Maribor)

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