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PACE Discussion

Clear Mind

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Ph.D.
24/10/2022

Outline

- Ph.D. work
- Post-doc proposal

ClearMind Project | CEA-Saclay/IRFU/DPhP

Objectives:

- Fast detector for TOF-PET:
  - Coincidence time resolution: **<100 ps** (FWHM)
  - 511-keV γ-ray interaction 3D resolution: **a few mm**

Detect efficiently Cherenkov and scintillation lights

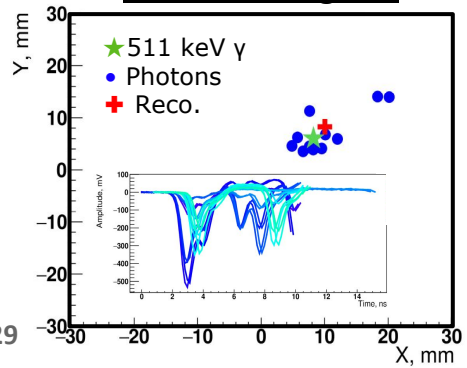
→ Detector with **monolithic**, **large surface, $PbWO_4$** crystal as the optical window of the **MCP-PMT**

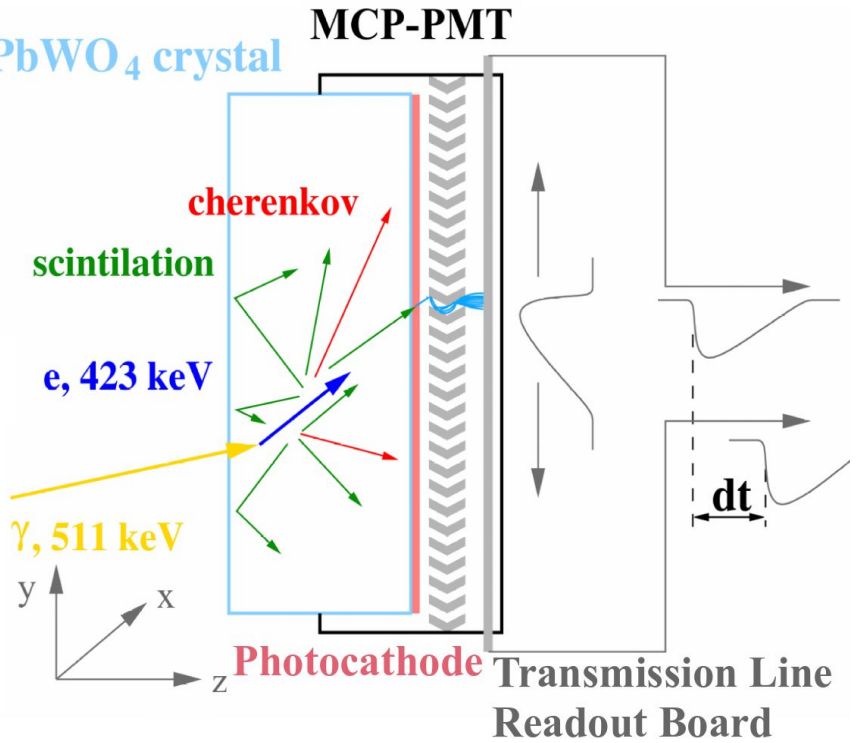
→ **Direct deposition** of the photocathode

→ **Transmission line** readout board

→ **SAMPIC** digitization module

Reco. with signals



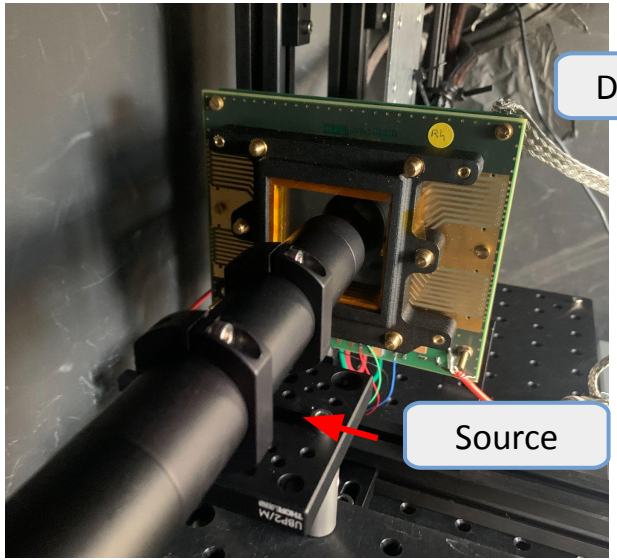


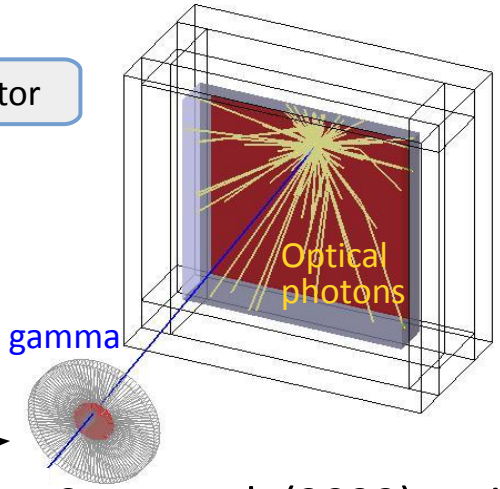
– D. Yvon *et al.*, 2020, JINST 15 P07029

– M. Follin *et al.*, 2021, NIM A, 1027, p. 166092

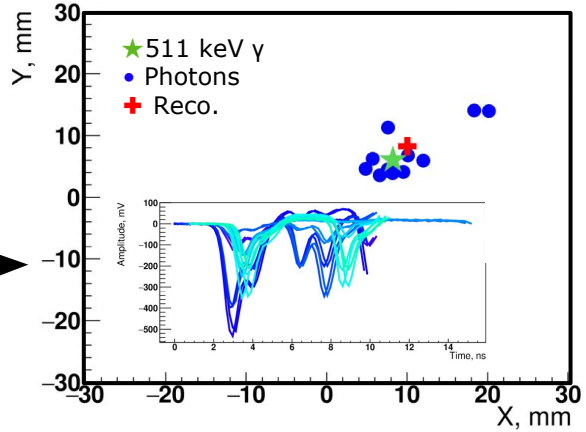
Simulation and Artificial Intelligence for A Gamma-Detector for High Resolution PET Imaging

Measurement ⟵ **Simulation** ⟵ **AI Event Reconstruction**





Signal formation



Sung et al. (2022) arxiv:2209.11587 [physics.ins-det]

Publications/Conferences

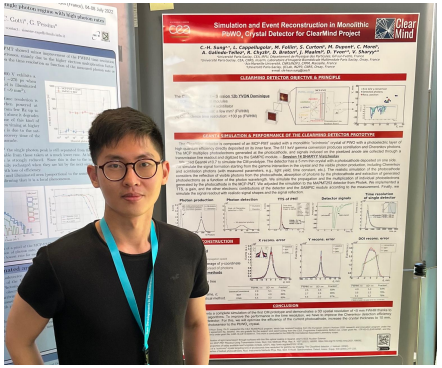
Publication

- "Detailed simulation for the ClearMind prototype detection module and event reconstruction using artificial intelligence", (Submitted to Nuclear Instruments and Methods in Physics Research, Section A), 2022, https://doi.org/10.48550/arXiv.2209.11587.

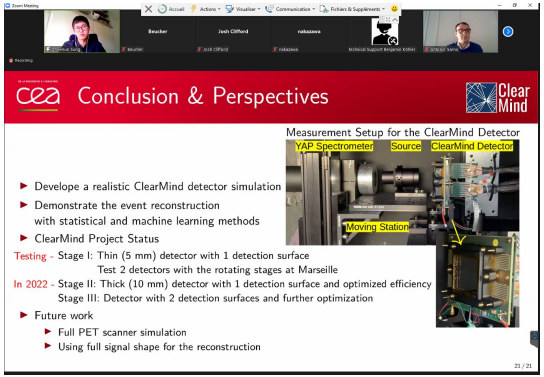
Conferences

- "Machine Learning Algorithms for the Gamma Conversion Reconstruction in the ClearMind Project", IN2P3/IRFU Machine Learning Workshop 2022, Paris, September, 2022.
- "Geant4 Simulation for the ClearMind Project and Reconstruction of the Gamma Conversion", NDIP, Troyes, July, 2022.
- "Geant4 Simulation for the ClearMind Project and Reconstruction of the Gamma Conversion", The 9th French-Ukrainian workshop on the instrumentation developments for HEP, Orsay, October, 2021.
- "Geant4 Simulation for the ClearMind Project and Reconstruction of the Gamma Conversion", 2021 VIRTUAL IEEE NUCLEAR SCIENCE SYMPOSIUM AND MEDICAL IMAGING CONFERENCE 28th International Symposium on Room-Temperature Semiconductor Detectors, October 2021

NDIP2020



IEEE2021



Post-Doc Proposal

Lab visit to EPFL (Switzerland)

Professor: Edoardo Charbon

Host researcher: Emanuele Ripiccini

Topic: Innovative SiPM/SPAD development for high resolustion medical imaging.

Aim: 10 ps time resolution photon detector development.