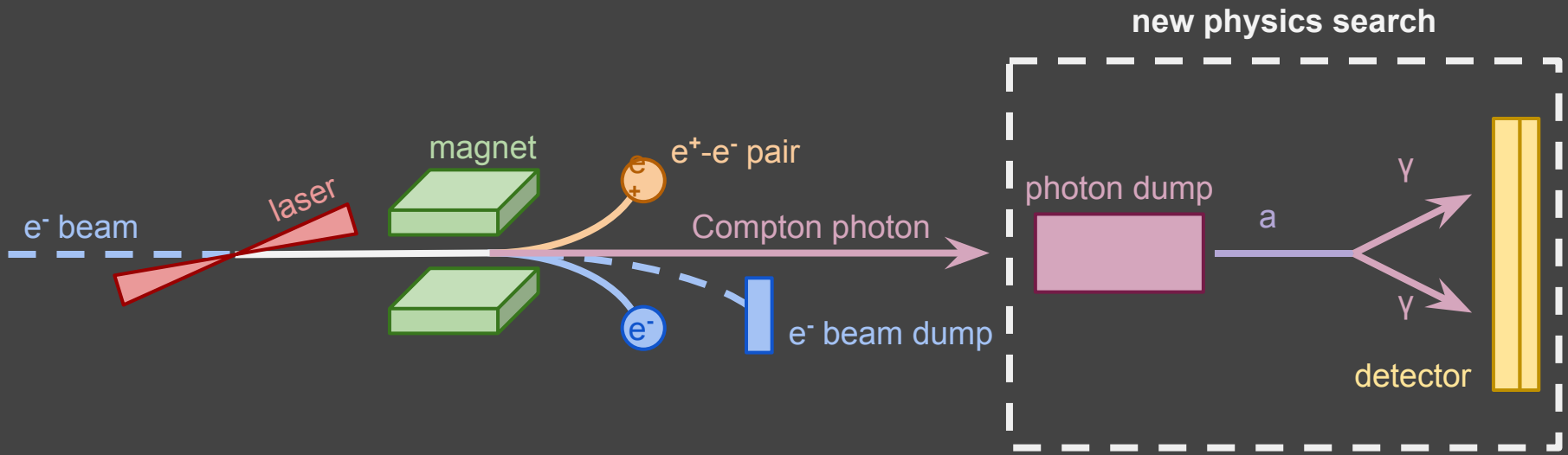
LUXE-NPOD

ECAL-E as NPOD Detector

LUXE SAS Meeting, 13.11.2023

ECAL-E as NPOD Detector

LUXE-NPOD Reminder



- can we **identify** a signal (two photons form ALP decay)
- can we **reconstruct** the ALP properties
- can we **reject** background

ECAL-E as NPOD Detector

ECAL-E Overview

availability:

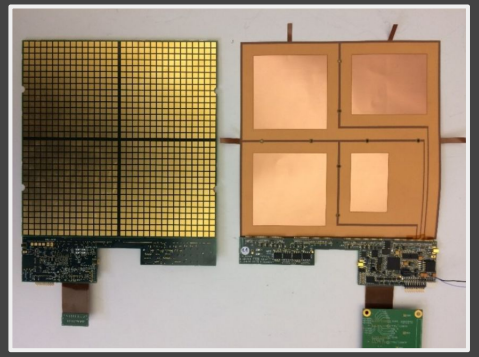
- ECAL-E is only used for the NBW electrons in the gamma mode
  ➔ can be used as NPOD detector in electron mode

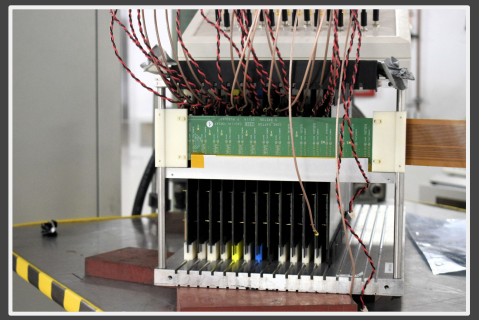
technology:

- high-granularity SiW calorimeter

configuration:

- three modules, each 18 x 18 cm^2
- 15 sandwich layers
- silicon tiles of size 5.5 x 5.5 mm^2 with a thickness of 0.5 mm
- tungsten absorbers of 7 x 2.8 mm and 8 x 4.2 mm thickness



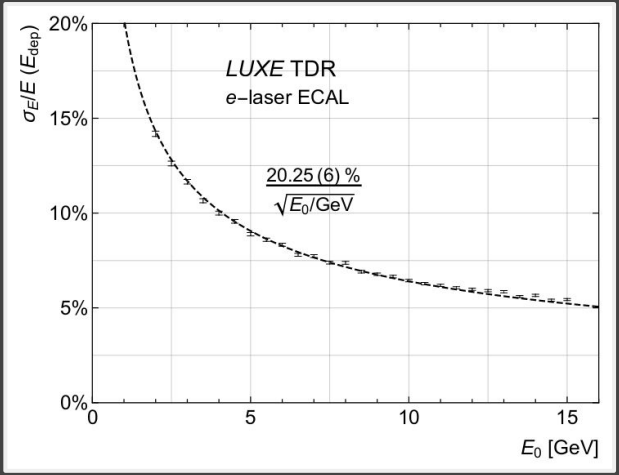


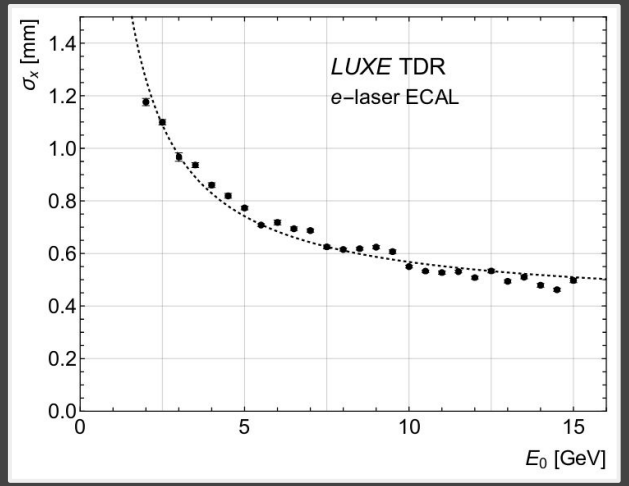
10.48550/arXiv.2004.12792
10.1016/j.nima.2019.162969

ECAL-E as NPOD Detector

Performance

energy[1]: $\sigma_E / E = (20.2 \pm 0.1)\% / (E_0 / \text{GeV})^{1/2}$
position[1]: $\sigma_p \approx 0.5$ mm at 10 GeV
angle[2]: $\sigma_\vartheta \approx 80$ mrad at 1 GeV
time[3]: $\sigma_t \approx 1$ ns





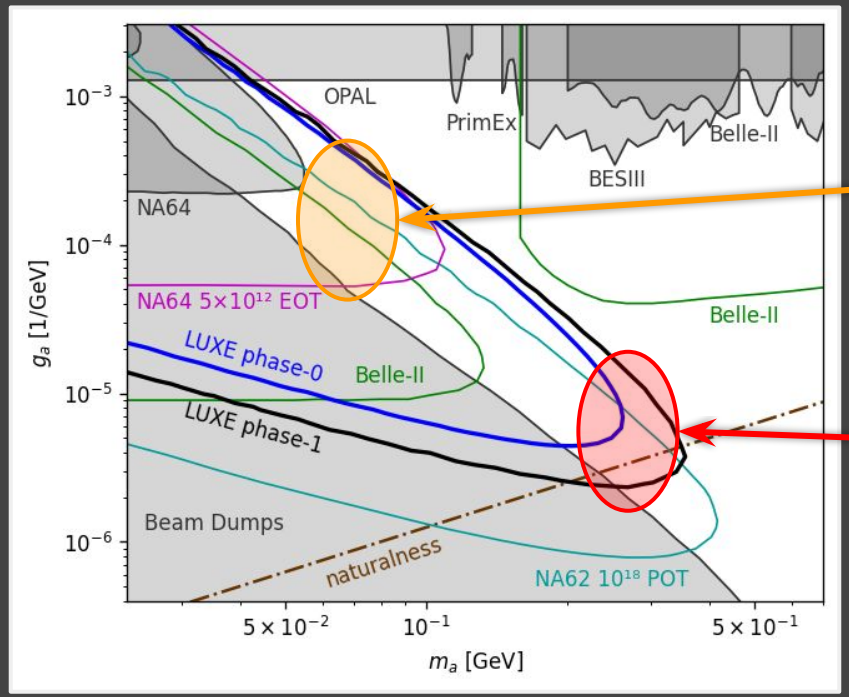
[1]: 10.48550/arXiv.2308.00515
[2]: 10.1088/1742-6596/1162/1/012033
[3]: A. Irles, private communication

ECAL-E as NPOD Detector

Changing ECAL-E Position

ECAL-E as NPOD Detector

Phase Space

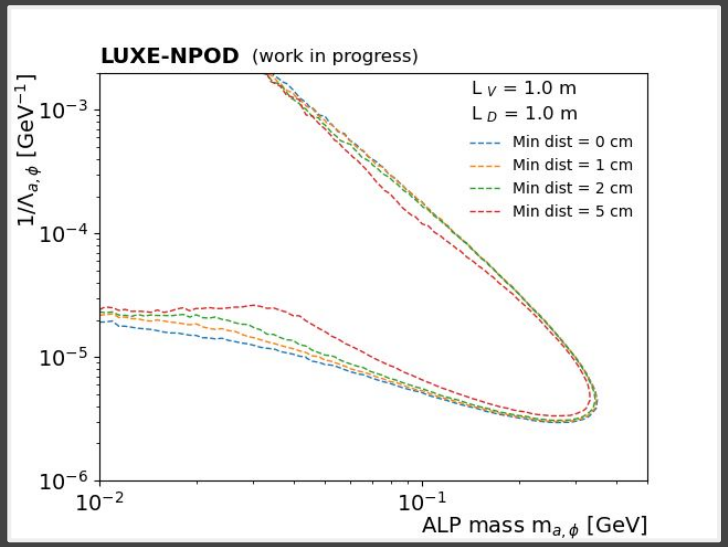


defines resolution

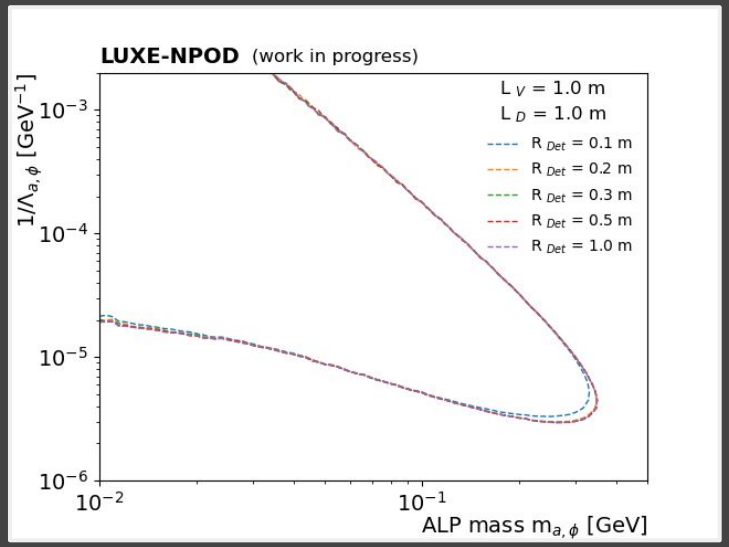
defines size

ECAL-E as NPOD Detector

Spatial Resolution and Size



Resolution



Size

ECAL-E as NPOD Detector

Conclusion - Next Steps

summary:

- high-granularity SiW calorimeter is a suitable technology
- easy and cheap accessible via ECAL-E

next steps:

- simulate detector with Geant4 (KIT) and dd4hep (DESY) to
  - check performance
  - check signal and background response
- reconstruction (KIT) with clustering algorithms developed by CMS