LUXE-NPOD

ECAL-E as NPOD Detector

LUXE Technical Meeting, 09.11.2023

ECAL-E as NPOD Detector

Leading Questions

- 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

Overview

availability:

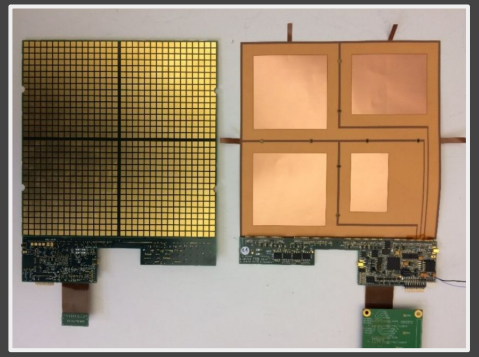
- ECAL-E is only used for the NBW electrons in the gamma mode
  ➔ can be used as NPOD detector in electron mode

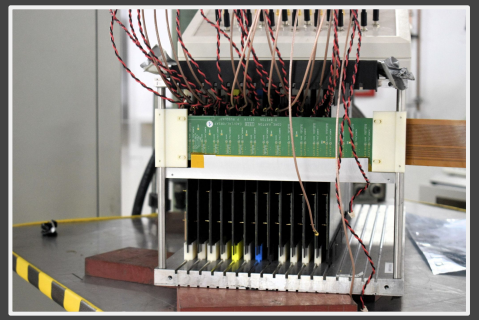
technology:

- high-granularity SiW calorimeter with SiPM on tiles technology

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

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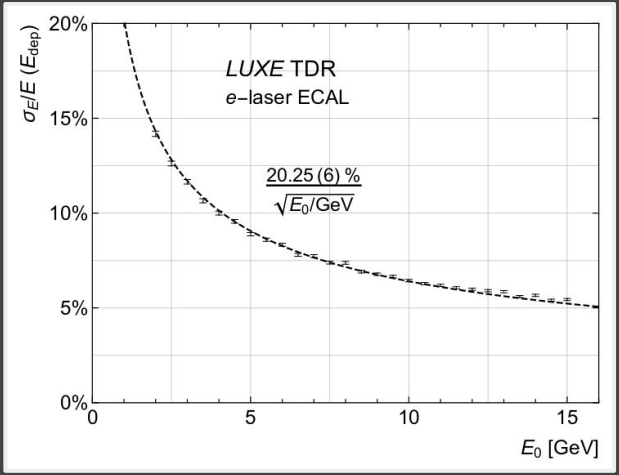
Performance

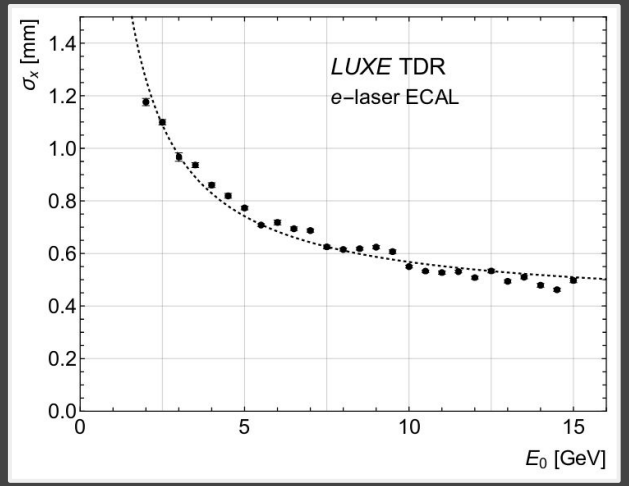
energy[1]: $\sigma_E / E = (20.2 \pm 0.1)\% / (E_0 / \mathrm{GeV})^{1/2}$

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

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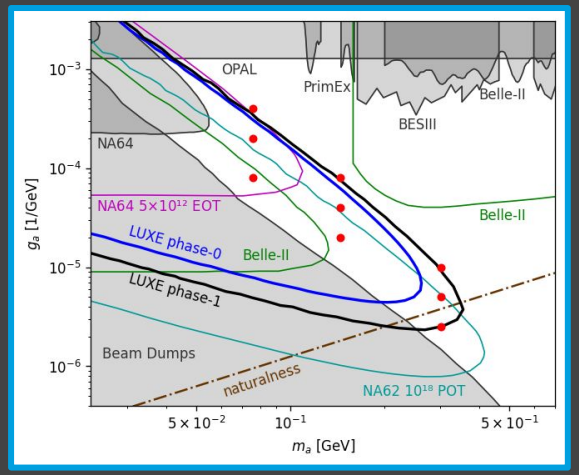
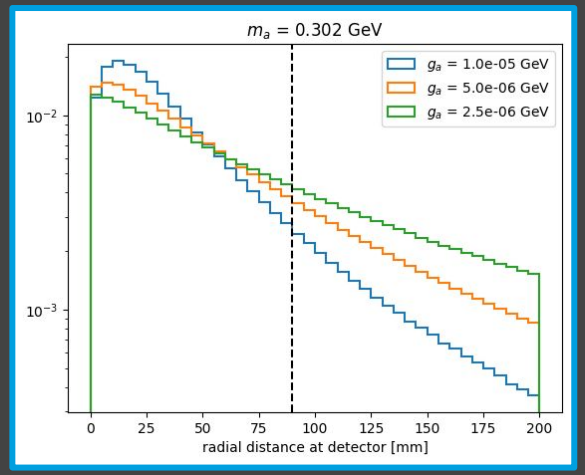
Size





Compton spectrum: $\mu \equiv a_0 \equiv \xi = 3$

signal events R≤ 90 mm:

g_a = 10 keV: 85%

g_a = 5 keV: 72%

g_a = 2.5 keV: 57%

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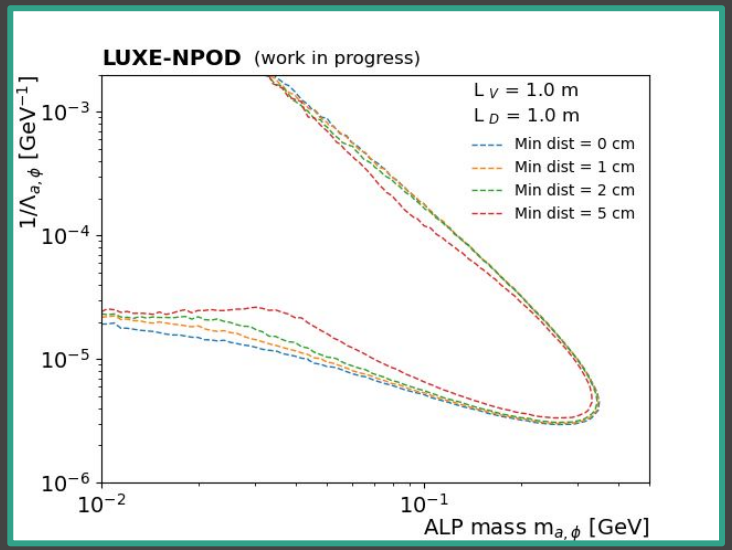
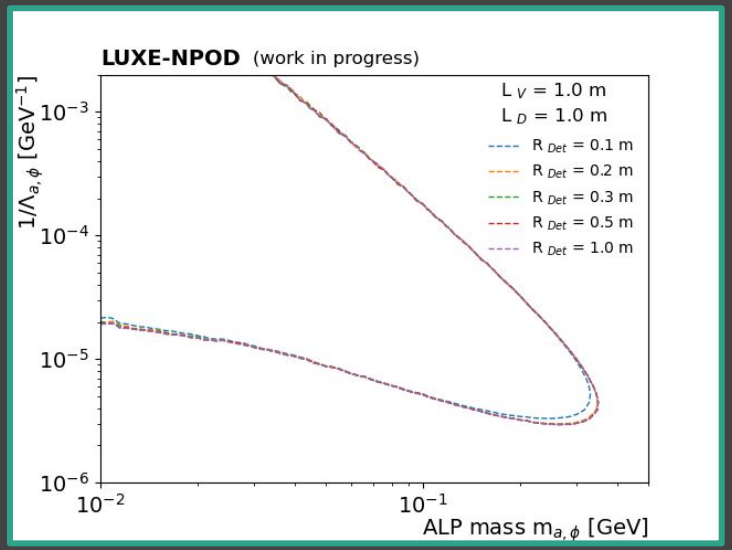
Spatial Resolution and Size



Resolution



Size

ECAL-E as NPOD Detector

Conclusion (Use with Caution)

- we should be able to get to background free scenario
- we should be able to identify signal

- to be done:
  - neutron rejection
  - mass reconstruction
  - coupling reconstruction for 5 signal events