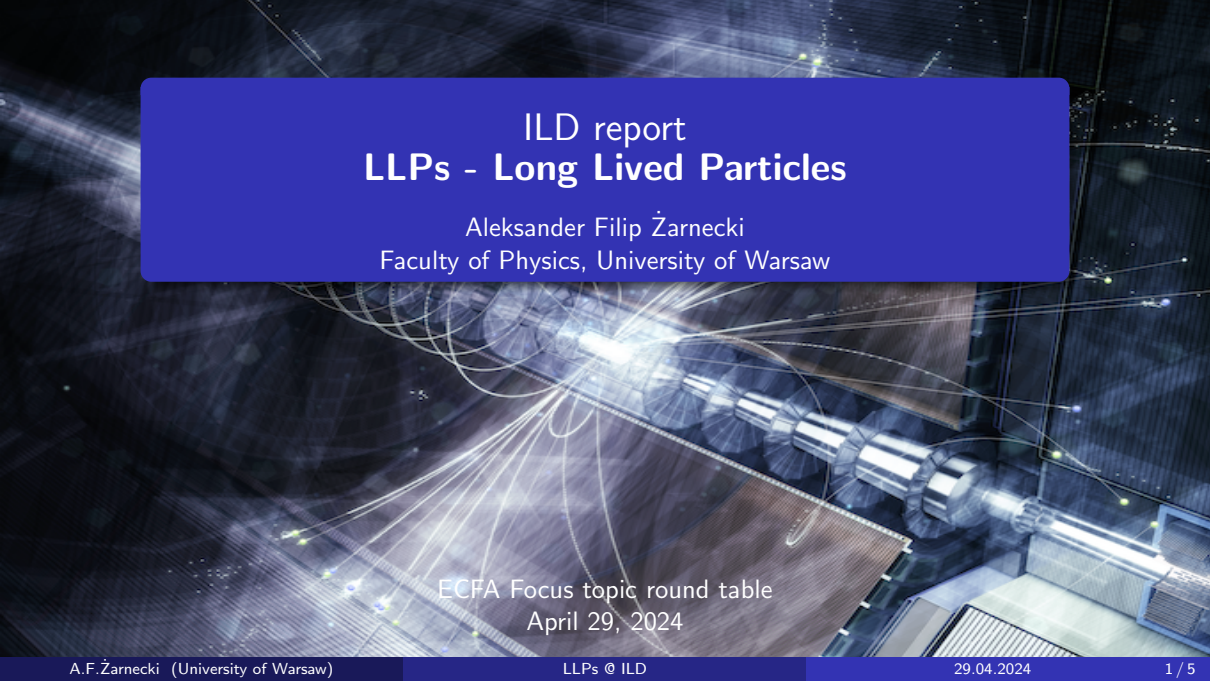
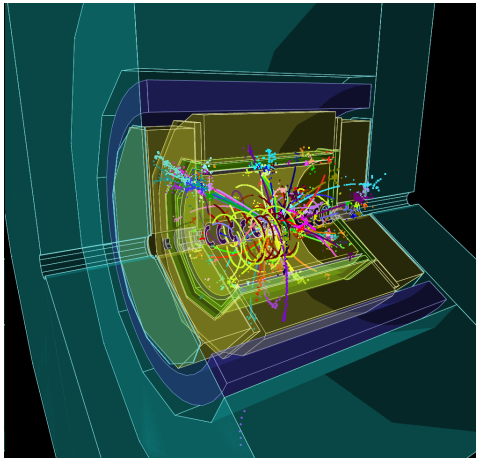


ILD report
LLPs - Long Lived Particles

Aleksander Filip Żarnecki
Faculty of Physics, University of Warsaw

ECFA Focus topic round table
April 29, 2024

ILD



The International Large Detector (ILD) is a detector concept for both Linear and Circular e+e- Colliders. Dedicated CC design version implemented, full simulation studies ongoing...

It is based on particle flow for overall event reconstruction, with central tracking based on the large volume Time Projecting Chamber (TPC).

Large volume, with isotropic sensitivity, for displaced track reconstruction...

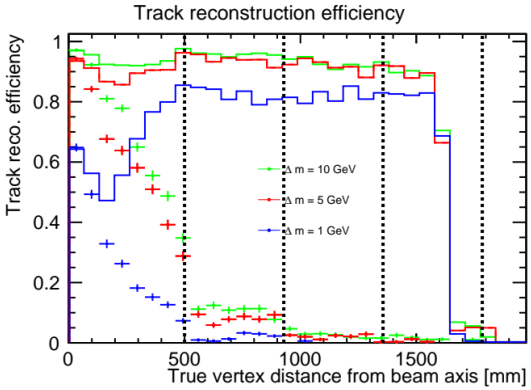
Ongoing full simulation study

see presentation by Jan Klamka

- Track reconstruction settings modified for better LLP acceptance
- Dedicated displaced vertex finding procedure implemented
- Background from overlay events included
- General limits on LLP production extracted
- Performance compared for TPC with pad readout and all-silicon tracking design ⇒

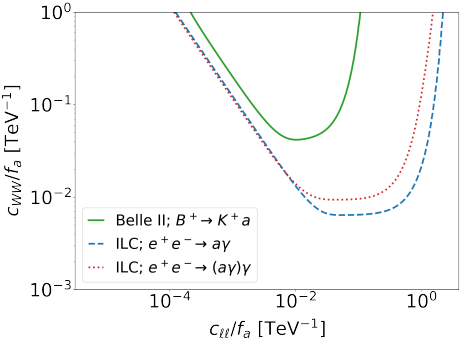
Still to be studied:

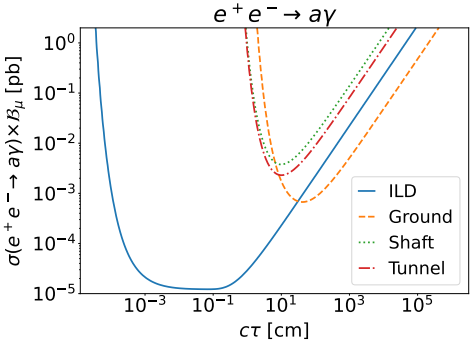
- Limits for specific BSM models
- Performance of TPC with pixel readout

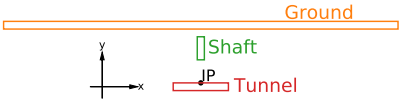


Far Detectors at ILC?

Earlier studies LLPs discovery potential for sub-GeV ALPs arXiv:2202.11714

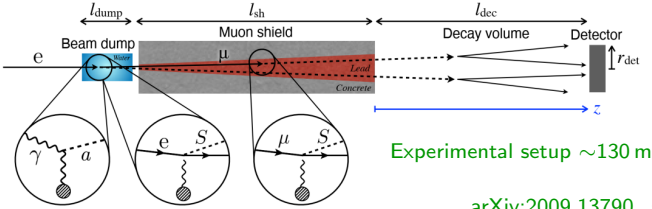






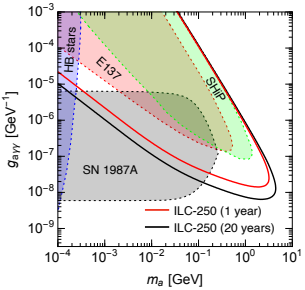
ILC main beam dump experiments

Concept of main beam dump experiments searching for axion-like particles or new scalars:



Experimental setup $\sim$130 m

arXiv:2009.13790, see also arXiv:2105.13768



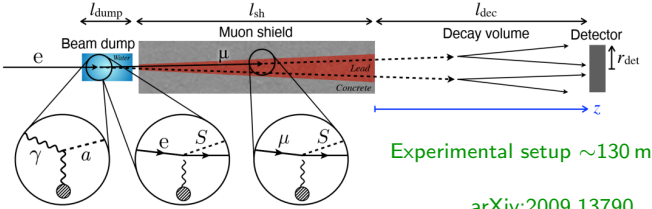
Axion-like particle model looking for $a \to \gamma\gamma$

$$\mathcal{L} \ni -\frac{1}{4} g_{a\gamma\gamma} a F_{\mu\nu} \tilde{F}^{\mu\nu} + \frac{1}{2}(\partial_\mu a)^2 - \frac{1}{2} m_a^2 a^2$$

An order of magnitude better sensitivity than other experiments

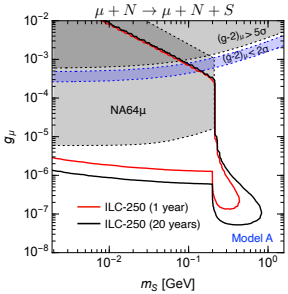
ILC main beam dump experiments

Concept of main beam dump experiments searching for axion-like particles or new scalars:



Experimental setup ∼130 m

arXiv:2009.13790, see also arXiv:2105.13768



Light scalar coupled to charged leptons

$$\mathcal{L} \ni \frac{1}{2}(\partial_\mu S)^2 - \frac{1}{2}m_S^2 S^2 - \sum_{l=e,\mu,\tau} g_l S \bar{l} l$$

Sensitivity down to very small couplings Model A: $g_l \propto m_l$