





Cluster of excellence and the DMLAB@DESY



LOHENGRIN@ELSA IN FOUR SLIDES

There is also INSIGHT@ELSA with sensitivity for baryon spectroscopy

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WHAT IS LOHENGRIN?

Experiment is a proposed search for dark sector particles, specifically dark photons utilising a fixed-target missing momentum technique, where a high-intensity electron beam is directed at a thin target to produce standard model particles and, potentially, dark sector particles



- Inspired by the proposal for the LDMX experiment:
 - electron beam-dump experiment with 4-16 GeV electrons and up to ~tens of electrons on target per spill (see <u>arXiv:1808.05219</u>)
 - Phase I: m_e = 1 @ 50 MHz
 - Phase II+: m_e = 2-10 @ 50 MHz -200 MHz
- Possibility to setup a similar experiment at the ELSA accelerator in Bonn (see this paper)
 - benefit from electron energy resolution of ELSA
 - use clean, single electron events at high rate
 - started with guiding principle: build the experiment fast using existing technology



More details see talk from <u>Martin Schürmann</u> from the Lohengrin Study group

ELSA - ELECTRON STRETCHER ACCELERATOR

- Located in the basement of the Physikalisches Institut in Bonn
- 3.2 GeV beam of (on average) single electrons through resonant extraction
- Small energy spread of 0.8‰
- Effective extraction rate of 100 MHz
 - => ~ 10^{15} EOT within a year





Extensive consolidation and maintenance phase during a two-year shutdown in 2025-2027

Lohengrin

Experiments with similar approach: LDMX, DarkSHINE, NA64.

Search for Lohengrin dark bremsstrahlung process



Dominant process(es):

$$e^- \mathcal{H} \to e^- \mathcal{H} \gamma$$

and subsequent photo- and electro-nuclear reactions.

Occasionally:

 $e^- \mathcal{H} \to e^- \mathcal{H} A'$

controlled by ε , $m_{A'}$.

=> Search for **recoiling**, **low energy solitary electrons** by vetoing backgrounds with ECAL and HCAL!

Covers a region of dark photon masses between roughly 1 MeV and 50 MeV



Lohengrin

Detector layout as used for current simulations Timescale: start "shortly" after ELSA refurbishment (~2030)

HCAL:

Essential to veto neutral hadrons Sandwich of iron absorber layers (2cm) and silicon layers (0.05 cm)

collaborators welcome!



based on CALICE

prototype

