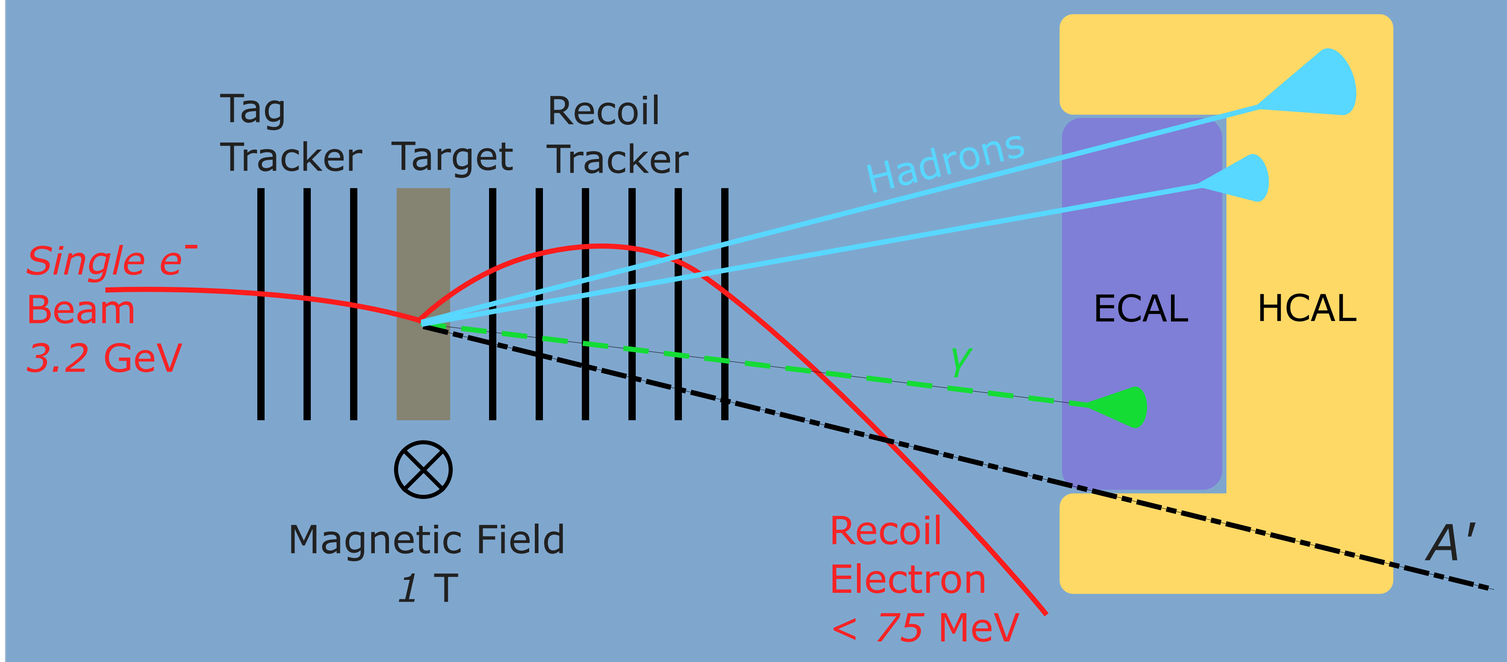
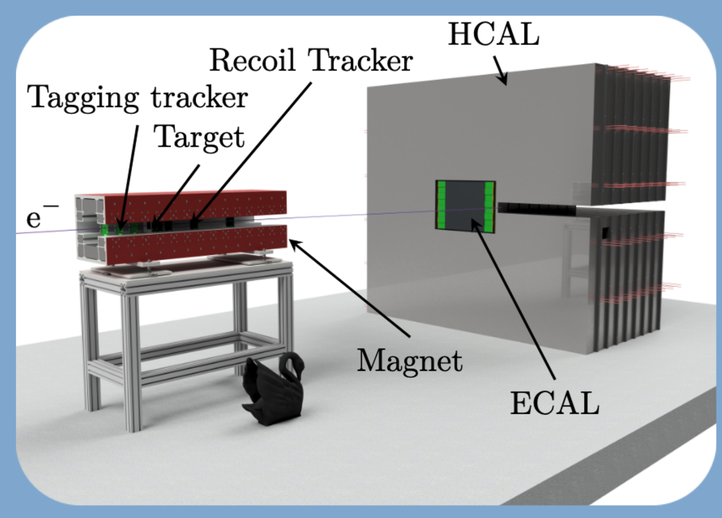
Lohengrin

Dark Photon Searches at ELSA

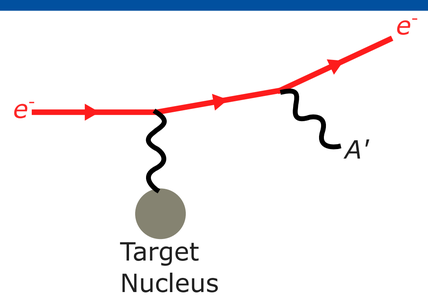
UNIVERSITÄT BONN

Fixed-Target Missing Momentum Technique



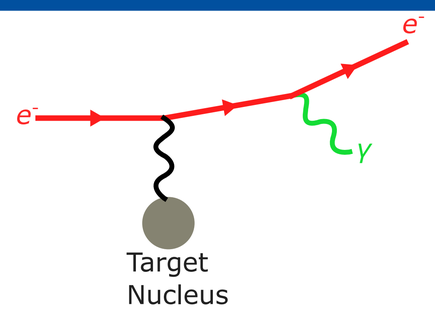


Dark Bremsstrahlung Signal



Potential, new interaction in the dark sector coupling feebly to the electron. Dark Photon A' as gauge boson

SM Bremsstrahlung



Main process, vetoed by energy cut on electron or detection of high energetic γ in ECAL

Other Processes and Backgrounds

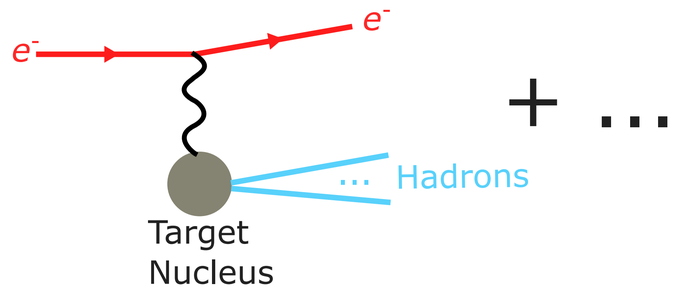


Photo-/Electronuclear Processes, Virtual Compton Scattering (VCS), Neutrinos

Experimental Challenges

Tracking Detector

- Ultrafast, ultrathin MAPS
- AI engine based two-level trigger
- Suitable frontend electronics
- Reconstruction of low energetic final state electrons

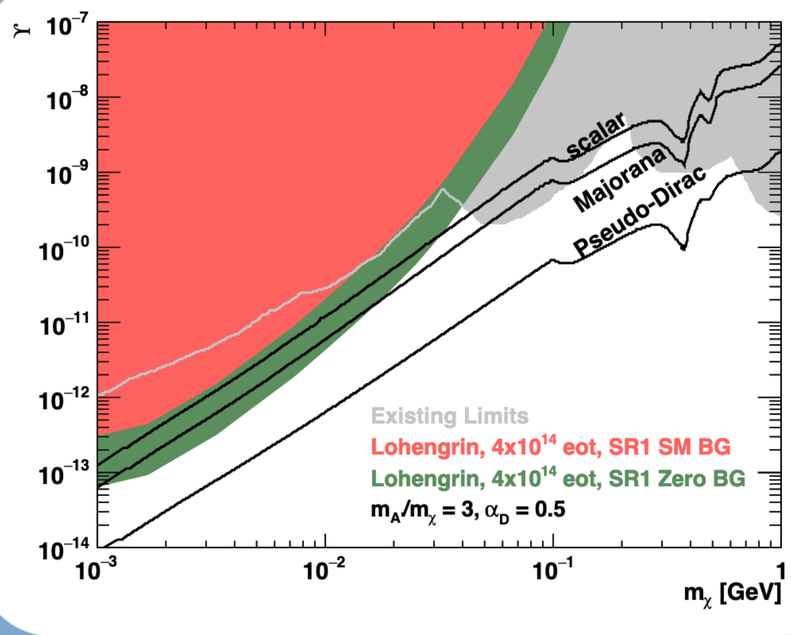
Calorimeter

- Ultrafast, highly granular ECAL
- Veto of SM Bremsstrahlung on top of low energetic photon background
- Veto of hadronic backgrounds

Analysis

- Accurate simulations
- Accurate background estimation
- Optimisation of signal region
- Different signal scenarios
- Different run scenarios and their sensitivity

Estimated Sensitivity



Proposed Roadmap

Phase 1

- No HCAL
- Bremsstrahlung
- VCS estimation

Phase 2

- Install HCAL
- Neutral Hadrons

Phase 3

- Physics run
- 4×10^{14} EOT in one year

Research Group Desch

arXiv:2410.10956