

BSM/EW – Roadmap

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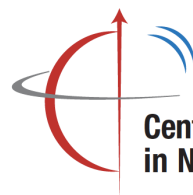
April 14, 2026



University
of Manitoba



Stony Brook
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Center for Frontiers
in Nuclear Science

BSM / EW at EIC

Bardh Quni [University of Manitoba]

Leptoquark / CLFV

Charged Lepton Flavor Violation (CLFV) via $e \rightarrow \tau$ transition in DIS at 18×275 GeV.

Status: Bardh completed a cut-based analysis for the 3-prong hadronic τ decay. First sensitivity projection produced: coupling/mass² exclusion limit $\sim 1.84 \text{ TeV}^{-2}$ for one vector leptoquark type.

Next steps: Extend to all 13 leptoquark types.

Ming Xiong Liu, Yasser Corrales, Xuan Li et al. [LANL]

HNLs/CLFV

HNLs motivated by neutrino mass generation; CLFV via $e \rightarrow \tau$ in DIS using SMEFT operators.

Status: Theory-driven Monte Carlo events (SMEFT framework) generated. Tracking association validated on small-scale test sample (10k events). Minor beam-energy mismatch (250 vs 275 GeV) identified and corrected.

Next steps: Validate τ hadronic (3π) and leptonic ($\tau \rightarrow \mu$) reconstruction; request large-scale official production at 275 GeV; produce tagging-performance studies and first sensitivity projections by mid-summer.

Alessandro Tricoli, Jae Nam, Alyssa Wheeler et al. [BNL]

Axion-Like Particles

ALP production in $e+\text{Pb}$ collisions; mass range $\sim 0.1\text{--}20$ GeV

Status: Generator-level kinematics validated through afterburner (IP6) and EICrecon full sim. Electron ID efficiency $\sim 80\%$ above $p_T=0.5$ GeV. Issue with model below 1 GeV under investigation.

Next steps: Requested background-embedded sim in April campaign. Target initial sensitivity projections by early summer.

- Wide collision energy range and diverse ion species make EIC uniquely suited for ALP searches.
- Targets intermediate-mass electrophilic ALPs: 0.1 GeV - 20 GeV
 - Complements high-mass (> 20 GeV) LHC searches and low-mass (sub-MeV) non-collider experiments.
- ePIC PID systems resolve ALP decay final states, unique sensitivity to production mechanisms

Completed steps so far,

- Feasibility study initiated (early 2026)
- Event kinematics of non-decaying ALP production and associated detector smearing effects characterised using MadGraph5 v3.5.14 event generator and official EICrecon framework.
- Official ePIC sim production requested for April campaign

ALPs - Roadmap

Alessandro Tricoli, Jae Nam, Alyssa Wheeler et al. [BNL]

