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Dark photons and axion-like particles at the Electron-Ion Collider

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The Electron-Ion Collider, a proposed high-luminosity facility with advanced charged particle and photon detection capabilities, provides unique opportunities to uncover new physics beyond the Standard Model.
We analyze its sensitivity to dark photons produced through electron bremsstrahlung in coherent scattering. Thanks to its beam energy settings, it has the potential to comprehensively probe the previously unexplored parameter space between the constraints from meson decays and beam dumps below $\mathcal{O}(1)$ GeV with displaced-vertex search.
Additionally, the EicC has the potential to probe axion-like particles (ALPs) in the mass range \(0.1 \, \text{GeV} \lesssim m_a \lesssim 5 \, \text{GeV} \), with a coupling reach of \(\Lambda \lesssim 10^6 \, \text{GeV} \) , by combining the prompt-decay and displaced-vertex searches. The projected sensitivities to ALPs exceed the current bounds.

Collaboration you are representing

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Session Classification: Dark Matter and Its Detection

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