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Axion-Like Particles at Future $e^{-}p$ Colliders

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In Beyond Standard Model (BSM) theories, Axion-Like Particles (ALPs) are hypothesized to be Pseudo-Nambu-Goldstone bosons that have spontaneously broken the global Peccei-Quinn (PQ) symmetries at very high energies. Due to the approximated symmetry shifts, the ALPs are naturally lighter compared to the electroweak or QCD particles. Future high-precision experiments may be able to find ALPs that have masses that are well below the GeV scale, but future high-energy lepton and hadron colliders may also be able to search for the heavier
ALPs. This particles are known to have very rich physical phenomenology at the targeted high- and low-energy collider experiments. Therefore, this establishes them as the prime targets for the future experiments that are aimed at the discovery of new physics that goes beyond the known and widely accepted Standard Model (SM) of particle interactions. In this work, We are investigating the possibility of detecting this new kind of particles via the charged and neutral current processes: $e^{-}\ p \to \nu_e\ j\ a_x$, $e^{-}\ p \to e^{-}\ j\ a_x$ for channels WW and $\gamma\gamma$, ZZ and γZ respectively and with further decay $a_x \to \gamma\gamma$ at future $e^{-}\ p$ colliders. Furthermore, we are also providing possible constraints on the available couplings $g_{a\gamma\gamma}$, g_{aWW}, $g_{a\gamma Z}$ and g_{aZZ}.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

MSc

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