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Axion-like particle reconstruction and experimental design with simulation-based inference

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Axion-like particles (ALPs) arise in BSM theories with global symmetry breaking. Beam-dump experiments have been constructed and proposed to look for them at the sub-GeV scale. Given a successful signal observation, would we be able to reconstruct the ALP properties even from inaccurate detectors? We use a simulation-based inference approach to reconstruct the posterior probability of the ALP parameters. The derived posterior is both narrow and reliable. Moreover, the neural network can be quickly trained for different detector properties, making it an ideal framework for optimizing experimental design

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