



Contribution ID: 2

Type: Oral presentation using Zoom

## Physics with far detectors at future lepton colliders

*Thursday, 28 October 2021 15:30 (30 minutes)*

At the Large Hadron Collider (LHC), several far detectors such as FASER and MATHUSLA have been proposed to target the long-lived particles (LLPs) featured with displaced vertices. Naturally one question arises as to the feasibility of installing similar far detectors at future lepton colliders like the CEPC and FCC-ee. Because of the different kinematics of final state particles and the freedom to locate both the experiment hall and the detectors, the future lepton collider with an additional far detector may play a unique role in searching for LLPs. In this study, we consider various locations and designs of far detectors at future  $e^-e^+$  colliders and investigate their potentials for discovering LLPs in the physics scenarios including exotic Higgs decays, heavy neutral leptons, and the lightest neutralinos. Our analyses show that the kinematical distinctions between the lepton and hadron colliders render the optimal positions of far detectors lying at the direction perpendicular to the collider beams at future  $e^-e^+$  colliders, in contrast to the LHC where a boost in the forward direction can be exploited. We also find that when searching for LLPs, such new experiments with far detectors at future lepton colliders may extend and complement the sensitivity reaches of the experiments at the future lepton colliders with usual near detectors, and the present and future experiments at the LHC. In particular, we find that, for the theory models considered in this study, a MATHUSLA-sized far detector would give a modest improvement compared to the case with a near detector only at future lepton colliders.

### 1st preferred time slot for your oral presentation

### 2nd preferred time slot for your oral presentation

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**Session Classification:** H&O: BSM particle production & Fixed target / Dark sectors / Applications outside particle physics

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