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Search for Beyond Standard Model Physics with FASER at the LHC

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FASER (the Forward Search Experiment) is a compact detector located about 480 m downstream of the ATLAS interaction point at CERN's Large Hadron Collider (LHC). It is designed to explore new Beyond the Standard Model (BSM) physics by searching for light, weakly interacting, and long-lived particles (LLPs) produced in the far-forward region. This unique setup—shielded by approximately 100 m of rock and concrete—enables FASER to perform highly sensitive searches for exotic states such as dark photons (A') and axion-like particles (ALPs), potentially mediating interactions between the visible and dark sectors. During Run 3 (2022–2024), FASER has recorded 190 fb^{-1} of data with over 97% efficiency, and A dark photon and ALP searches are performed. We will present these physics results, probing previously unexplored mass and coupling ranges. FASER is now planning an upgrade of its preshower sub-detector to improve diphoton resolution and background discrimination, aiming for enhanced sensitivity in upcoming ALP and other new physics searches. With continued data collection through Run 3 and a substantially increased data set during the High-Luminosity LHC era (Run 4), FASER will further extend its discovery potential for long-lived particles and other novel BSM signatures. In this talk, we will present the status of the experiment, including detector design, detector performance, and physics results of new particle searches from Run 3 data.

Collaboration(s)

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