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Extending the Discovery Potential for Inelastic-Dipole Dark Matter with FASER

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Neutral particles are notoriously difficult to observe through electromagnetic
interactions. As a result, they naturally elude detection in most collider detectors. In this talk, I will point out that neutral particles that interact through a
dipole interaction can nevertheless be detected in far-forward detectors
designed to search for long-lived particles (LLPs). In contrast to previous analyses that focused on neutral particles with elastic interactions, we consider inelastic interactions. This naturally leads to LLPs, and we demonstrate that FASER (and future experiments at the Forward Physics Facility) will be able to probe substantial regions of the associated parameter space. In particular, we find that FASER is capable of probing the region of parameter space wherein thermal freeze-out gives rise to an O(GeV)dark-matter candidate with the appropriate relic abundance, as well as regions of parameter space that are difficult to probe at fixed-target experiments. FASER and its successor experiments may therefore play a critical role in the discovery of such a dark-matter candidate.

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