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Spectral Decomposition of Missing Transverse Energy at Hadron Colliders

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We propose a spectral decomposition to systematically extract information of dark matter at hadron colliders. The differential cross section of events with missing transverse energy (MET) can be expressed by a linear combination of basis functions. In the case of s-channel mediator models for dark matter particle production, basis functions are identified with the differential cross sections of subprocesses of virtual mediator and visible particle production while the coefficients of basis functions correspond to dark matter invariant mass distribution in the manner of the Källén-Lehmann spectral decomposition. For a given MET dataset and mediator model, we show that one can differentiate a certain dark matter–mediator interaction from another through spectral decomposition.

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