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Searching for the Invisible using cross-section ratios

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With an abundance of cosmological evidence motivating the existence of dark matter, one of the topmost priorities of the High Energy Physics community is understanding its nature and integrating it into our extremely successful (yet incomplete) theory of the Standard Model. Presented here is a collider search for invisible new-physics phenomena using cross-section ratios for pp collisions at a centre of mass energy of 13 TeV at the ATLAS detector.

The production of particles invisible to the experimental apparatus can be inferred via a momentum imbalance in the detector, if produced in association with visible objects (e.g. hadronic jets). Ratios of fiducial cross-sections are then measured between the production of jets in association with missing transverse energy and the production of jets in association with either a single lepton or an opposite-sign same-flavour lepton pair, which are very similar to each other in the Standard Model, effectively leading to the cancellation of most theoretical and experimental uncertainties in the ratio.

The particle-level ratios are measured differentially with respect to a number of kinematic properties of the jet system and are readily available to be used in constraining beyond the Standard Model theories without the need of any simulation for the detector apparatus or background processes.

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