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Monte Carlo reweighting: Signal interpolation for ATLAS Dark Matter searches

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Current Dark Matter (DM) searches at the ATLAS experiment require detailed signal hypotheses for various DM models. In order for a DM analysis to cover a large DM model parameter space, many Monte Carlo (MC) samples might be needed to accurately represent possible signatures/kinematics of the DM model. For complex experiments, such as ATLAS, detector level MC samples are computationally expensive and cannot be done for an arbitrary number of signal parameter points. Signal interpolation methods allow one to work around this by employing knowledge about the model to interpolate from existing detector level signal samples to new parameter points. The ATLAS search for DM in mono-Higgs decays, where the Higgs boson decays to two photons, employs a method of signal interpolation called MC reweighting, which is based on truth information from generator level MC samples.

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