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New approach to DM searches with mono-photon signature

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One of the important goals of the proposed future e^+e^- collider experiments is the search for dark matter particles using different experimental approaches. The most general one is based on the mono-photon signature, which is expected when production of the invisible final state is accompanied by a hard photon from initial state radiation. We propose the procedure of merging the matrix element calculations with the lepton ISR structure function implemented in WHIZARD, which allows for consistent, reliably simulation of mono-photon events for both signal and SM background processes. We demonstrate that cross sections and kinematic distributions of mono-photon in neutrino pair-production events agree very well with corresponding predictions of the KKMC, a Monte Carlo generator providing perturbative predictions for SM and QED processes, which has been widely used in the analysis of LEP data. We plan to exploit the proposed procedure in estimating the sensitivity of future e^+e^- colliders to different DM scenarios. Here we would also like to propose a novel approach, where the experimental sensitivity is defined in terms of both the mediator mass and mediator width. This approach is more model independent than the approaches presented so far, assuming given mediator coupling values to SM and DM particles.

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