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Simulating hard photon production with WHIZARD

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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 search approach 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. Analysis of the energy spectrum and angular distributions of those photons can shed light on the nature of dark matter and its interactions. Therefore, it is crucial to be able to simulate the signal and background samples in a uniform framework, to avoid possible systematic biases. The WHIZARD program is a flexible tool, which is widely used by e^+e^- collaborations for simulation of many different "new physics" scenarios.
We propose the procedure of merging the matrix element calculations with the lepton ISR structure function implemented in WHIZARD. It allows us to reliably simulate the mono-photon events, including the two main Standard Model background processes: radiative neutrino pair production and radiative Bhabha scattering.
We demonstrate that cross sections and kinematic distributions of mono-photon in neutrino pair-production events agree with corresponding predictions of the $calKK$MC, a Monte Carlo generator providing perturbative predictions for SM and QED processes, which has been widely used in the analysis of LEP data.

Time Zone

Europe/Africa/Middle East

Primary authors: Dr KOTLARSKI, Wojciech (TU - Dresden); ZARNECKI, Aleksander Filip (University of Warsaw); KALINOWSKI, Jan Henryk (University of Warsaw (PL))

Presenter: Dr KOTLARSKI, Wojciech (TU - Dresden)

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