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Interference effects in dilepton resonance searches for Z' bosons and dark matter mediators (8'+2')

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New Z' gauge bosons arise in many extensions of the Standard Model and predict resonances in the dilepton invariant mass spectrum. We present ZPEED (Z' Exclusions from Experimental Data), an open-source code providing fast likelihoods and exclusion bounds for general Z' models based on the most recently published 139 fb^{-1} ATLAS dilepton data. PDF and detector effects as well as higher-order corrections are effectively implemented by tabulated functions enabling a fast computation of various test statistics. Moreover, interference effects with the Standard Model Drell-Yan background can be added to the signal cross section in the analysis, which can strengthen constraints on model parameters substantially. For generic Z' models, upper bounds on the couplings can improve by up to a factor of 1.5. In simplified dark matter models, in which the dark matter contributes to the decay width of the Z', the sensitivity of dilepton resonance searches on the mediator mass can be increased by 40%.

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