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Studying Neutralinos Bottom-Up at the LHC

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We describe work-in-progress that attempts to extract model-independent information about neutralino properties from LHC data, assuming only the particle content of the MSSM, that all two-body neutralino decays are kinematically forbidden and that neutralino inclusive production has a sufficient cross section. We show that the Lorentz invariant dilepton mass distribution, which will be well-determined at the LHC if squarks and/or gluinos are light enough, encodes clear information about the relative sign of the mass eigenvalues of the parent and daughter neutralinos. Somewhat surprisingly, we find that in the limit that the neutralino mass gap is significantly smaller than the mass of the Z boson and slepton that mediate neutralino decays, it will be impossible to tell Z -mediated decays from slepton-mediated decays. Finally, we study a complicated case where two different neutralinos $\tilde{Z}_{2,3}$ both contribute to this mass distribution, and show that in the ideal situation it may be possible to extract information about $M_{1,2}$, μ and even the slepton mass, although with quasi-realistic cuts on lepton momenta, the precision with which this is possible is considerably degraded, at least in our preliminary study.

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