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Dirac Neutralinos and Electroweak Scalar Bosons of N=1/N=2 Hybrid Supersymmetry at Colliders

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In the N=1 supersymmetric extension of the Standard Model, neutralinos associated in supermultiplets with the neutral electroweak gauge and Higgs bosons are, as well as gluinos, Majorana fermions. They can be paired with the Majorana fermions of novel gaugino/scalar supermultiplets, as suggested by extended N=2 supersymmetry, to Dirac particles. Matter fields are not extended beyond the standard N=1 supermultiplets in N=1/N=2 hybrid supersymmetry to preserve the chiral character of the theory.

Complementing earlier analyses in the color sector, central elements of such an electroweak scenario are analyzed in the present study. The decay properties of the Dirac fermions and of the scalar bosons are worked out, and the single and pair production channels of the new particles are described for proton collisions at the LHC, and electron/positron and photon-photon collisions at linear colliders. Special attention is paid to modifications of the Higgs sector, identified with an N=2 hypermultiplet, by the mixing with the novel electroweak scalar sector.

Primary author: KALINOWSKI, Jan (Inst. Theor. Physics, University of Warsaw)

Presenter: KALINOWSKI, Jan (Inst. Theor. Physics, University of Warsaw)

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