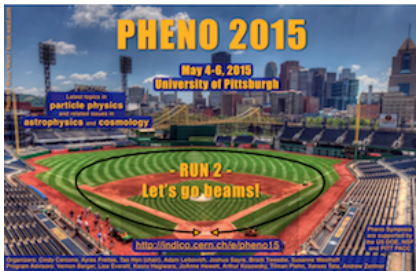

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Implications of naturalness for the heavy Higgs bosons of supersymmetry

Monday 4 May 2015 17:00 (15 minutes)

Recently, it has been argued that various measures of SUSY naturalness- electroweak, Higgs mass and EENZ/BG- when applied consistently concur with one another and make very specic predictions for natural supersymmetric spectra. Highly natural spectra are characterized by light higgsinos with mass not too far from m_h and well-mixed, but TeV-scale, third generation squarks. We apply the unied naturalness measure to the case of heavy Higgs bosons A, H, and H^\pm. We find that their masses are bounded from above by naturalness depending on tan\beta: e.g. for 10% fine-tuning and tan\beta ~ 10, we expect m_A \le 2.5 TeV whilst for 3% fine-tuning and tan\beta as high as 50, m_A \le 8 TeV. Furthermore, the presence of light higgsinos seriously alters the heavy Higgs boson branching ratios, thus diminishing prospects for usual searches into Standard Model (SM) natural states, while new discovery possibilities arise due to the supersymmetric decay modes. The heavy SUSY decay modes tend to be H; A; H^\pm \Rightarrow W; Z; or h+ missing E_T + soft tracks so that single heavy Higgs production is characterized by the presence of high p_T W, Z, or h bosons plus missing E_T. These new heavy Higgs boson signatures seem to be challenging to extract from SM backgrounds.

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