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Two ultimate tests of constrained supersymmetry

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The discovery of the Higgs boson at 126 GeV seems to imply masses in the multi-TeV regime for the simplest constrained SUSY models. Thus, with the exception of limited regions of the parameter space where stop mixing is large, in these scenarios the new physics might be out of reach even for the 14 TeV run. We discuss the prospects of using two alternative and complementary ways to explore the high-mass regions of the parameter space of the CMSSM and the NUHM: 1) We quantify the impact of reducing the experimental error in the measurement of $BR(B_s \to \mu^+\mu^-)$ to about 5% around the Standard Model value. We show that, in the CMSSM, $BR(B_s \to \mu^+\mu^-)$ has power to disfavor the A-funnel region that, otherwise, could neither be probed by direct SUSY searches at the LHC nor by direct dark matter searches. We also discuss the case of the NUHM, where the constraining power of $BR(B_s \to \mu^+\mu^-)$ is not as significant. 2) We show that the multi-TeV region of the parameter space of both models will be, for the most part, sensitive to direct dark matter searches in future one-tonne detectors. A nearly complete experimental testing of the CMSSM over multi-TeV ranges of superpartner masses, far beyond the reach of direct SUSY searches at the LHC, can therefore be achievable. For the NUHM, it will be more difficult to derive detailed information, but light can be shed on the model in a few cases.

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