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Prospects for constrained supersymmetry at $\sqrt{s} = 33$ TeV and $\sqrt{s} = 100$ TeV proton-proton super-colliders

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Discussions are underway for a high-energy proton-proton collider. Two preliminary ideas are the $\sqrt{s} = 33$ TeV HE-LHC and the $\sqrt{s} = 100$ TeV VLHC. With Bayesian statistics, we calculate the probabilities that the LHC, HE-LHC and VLHC discover SUSY in the future, assuming that nature is described by the CMSSM and given the experimental data from the LHC, LUX and Planck. We find that the LHC with 300/fb at $\sqrt{s} = 14$ TeV has a 15-75% probability of discovering SUSY. Should that run fail to discover SUSY, the probability of discovering SUSY with 3000/fb is merely 1-10%. Were SUSY to remain undetected at the LHC, the HE-LHC would have a 35-85% probability of discovering SUSY with 3000/fb. The VLHC, on the other hand, ought to be definitive; the probability of it discovering SUSY, assuming that the CMSSM is the correct model, is 100%.

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