

Naturalness of the Non-Universal MSSM in the light of the recent Higgs results

Thursday 27 September 2012 16:10 (20 minutes)

We analyse the naturalness of the Minimal Supersymmetric Standard Model (MSSM) in the light of recent LHC results from the ATLAS and CMS experiments. We study non-universal boundary conditions for the scalar and the gaugino sector, with fixed relations between some of the soft breaking parameters, and find a significant reduction of fine-tuning for non-universal gaugino masses. For a Higgs mass of about 125 GeV, as observed recently, we find parameter regions with a fine-tuning of $O(10)$, taking into account experimental and theoretical uncertainties. These regions also survive after comparison with simplified model searches in ATLAS and CMS. For a fine-tuning less than 20 the lightest neutralino is expected to be lighter than about 400 GeV and the lighter stop can be as heavy as 3.5 TeV. On the other hand, the gluino mass is required to be above 1.5 TeV. For non-universal gaugino masses, we discuss which fixed GUT scale ratios can lead to a reduced fine-tuning and find that the recent Higgs results have a strong impact on which ratio is favoured. We also discuss the naturalness of GUT scale Yukawa relations, comparing the non-universal MSSM with the CMSSM.

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Session Classification: Parallel Session 1: Particle Phenomenology