Contribution ID: **112** Type: **Contribution (25 + 5 min)**

Electroweak vacuum stability, Higgs and top masses, and new physics

Thursday 4 December 2014 18:10 (25 minutes)

According to the usual analysis, if the Standard Model (SM) is valid up to the Planck scale M_P, the stability condition of the electroweak (EW) vacuum (stable, metastable or unstable) mainly depends on the Higgs and top masses, M_H and M_t.
The analysis is performed by considering SM interactions only, as it is argued that new physics at M_P, although present, has no impact on it, and the results are presented with the help of a stability diagram in the (M_H, M_t) plane. For the current experimental values of M_H and M_t, in particular, the EW vacuum turns out to be metastable, with a lifetime much longer than the age of the universe.
I this talk I present some recent work showing that new physics can have a great impact on the stability phase diagram, a result that has quite interesting phenomenological consequences. Candidates for
beyond SM physics can be “tested” against this stability analysis.
Moreover, contrary to some recent claims, higher precision measurements of the top and Higgs masses cannot provide any definite indication on whether we live in a stable or metastable universe, the answer to this question strongly depends on new physics. Finally, these results cast serious doubts on the Higgs inflation scenario, the latter being highly based on a crucial fine tuning of the EW vacuum stability condition.

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Session Classification: Parallel 9: Higgs Physics @ LHC, discrete symmetries @LHC, new facilities

Track Classification: Higgs Physics at LHC and Beyond