

**SEMINARIO**  
**Departamentos de Física Teórica I y II**  
**Universidad Complutense de Madrid**

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**TITULO:** The Stability Bound on the Higgs Mass and the Early Universe

**LUGAR:** FACULTAD DE CIENCIAS FÍSICAS UCM

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**ABSTRACT:**

The LHC has fixed the last Standard Model (SM) parameter, the Higgs mass. Now, we can study the predictions of the SM (appropriately extended to account for neutrino oscillations and dark matter) in a vast energy range, up to the Planck scale. Although the SM does not provide a dynamical explanation of electroweak symmetry breaking (EWSB), this analysis is important for at least two reasons. It gives us information about very high energies, which we cannot even dream to reach at particle colliders, and, even more importantly, it can also tell us whether the SM has other problems, besides those that are universally accepted as SM problems. We will discuss the currently most precise determination of the bound on the Higgs mass that ensures our vacuum is stable up to Planck energies. We will find that we are very close to the border between stability and metastability, with a pronounced preference for the metastable scenario. This fact puts stringent bounds on Higgs inflation and so points towards a beyond the SM explanation of inflation. Such an explanation as well as a dynamical origin of EWSB can be achieved, remarkably, in theories of all interactions (including gravity) where fundamental scales are absent: agravity.