



Contribution ID: 95

Type: **not specified**

## The lifetime of the electroweak vacuum

*Wednesday, August 5, 2015 5:00 PM (30 minutes)*

If the Standard Model (SM) is valid up to extremely high energy scales, then the Higgs potential becomes unstable at approximately  $10^{11}$  GeV. Calculations of the lifetime showed that it vastly exceeds the age of the Universe. However, these calculations are extremely sensitive to effects from Planck scale higher-dimensional operators and, without knowledge of these operators, firm conclusions about the lifetime of the SM vacuum cannot be drawn. It is surprising that the Planck scale operators can have such a large effect when the instability is at  $10^{11}$  GeV. There are two reasons for the size of this effect. In typical tunneling calculations, the value of the field at the center of the critical bubble is much larger than the point of the instability; in the SM case, this turns out to be numerically within an order of magnitude of the Planck scale. In addition, tunneling is an inherently non-perturbative phenomenon, and may not be as strongly suppressed by inverse powers of the Planck scale. We include effective higher dimensional Planck-scale operators and show that they can have an enormous effect on the tunneling rate.

### Oral or Poster Presentation

Oral

**Primary author:** SHER, Marc (William and Mary College)

**Presenter:** SHER, Marc (William and Mary College)

**Session Classification:** EWK and Higgs Sector

**Track Classification:** Electroweak and Higgs Theory