



Contribution ID: 430

Type: Oral Presentation

## Higgs boson mass measurement using $H \rightarrow ZZ \rightarrow 4\ell$ decays at CMS

Wednesday 31 July 2019 17:12 (24 minutes)

The Higgs boson is an integral piece of the Standard Model and knowing its properties helps to establish limits on and to lower the uncertainties of other parameters in a wide variety of analyses. This presentation will summarize the methods used to make the world's most accurate Higgs mass measurement which currently stands at:  $m_H = 125.26 \pm 0.21$  GeV. This analysis studies the  $H \rightarrow ZZ \rightarrow 4\ell$  channel (where  $\ell = e, \mu$ ) using 2016 data collected by the CMS experiment ( $35.9 \text{ fb}^{-1}$ ) at  $\sqrt{s} = 13$  TeV. A 3-dimensional likelihood fit is performed, which uses: (1) the four-lepton invariant mass, (2) event-by-event four-lepton mass uncertainty, and (3) a matrix element-based kinematic discriminant. In addition, a kinematic constraint on an invariant mass of two leptons coming from the mostly on-shell Z boson is used to improve measurements of their momenta and, hence, a measurement of the Higgs boson mass on an event-by-event basis.

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**Session Classification:** Higgs & Electroweak Physics

**Track Classification:** Higgs & Electroweak Physics