



Contribution ID: 11

Type: **Oral**

The Matrix Element Method within CMS

Monday 1 September 2014 14:00 (25 minutes)

The Matrix Element Method (MEM) is unique among the analysis methods used in experimental particle physics because of the direct link it establishes between theory and event reconstruction. This method was used to provide the most accurate measurement of the top mass at the Tevatron and since then it was used in the discovery of electroweak production of single top quarks. The method can in principle be used for any measurement, with a large gain compared to cut-based analysis techniques for processes involving intermediate resonances. Within CMS, this method is mainly known as a cross check to test the newly discovered boson spin (MELA), and as a way to compute the main background for the Higgs production in association with a top quark ($t\bar{t}H$). In this contribution, the MEM is presented using the example of two ways of using it through the two CMS analysis mentioned below. The advantages and limitations of this method will also be highlighted, and the latest approved results will be presented.

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Session Classification: Data Analysis - Algorithms and Tools

Track Classification: Data Analysis - Algorithms and Tools