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Charm is better than beauty: searching for the Higgs coupling to charm quarks

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Eight years ago, the discovery of a new fundamental particle, the Higgs boson (H), was announced by the ATLAS and CMS collaborations at CERN. While elementary particles acquire their mass through their interaction with the Higgs field, the large differences in their masses as well as the origin of the three generations of fermions remain unexplained to this day and constitute the Standard Model flavour puzzle.

Measuring the coupling of each fermion to the Higgs boson is one of the most important tasks in modern particle physics. The next most promising candidate in the quark sector is the decay to a pair of charm quark and antiquark (cc).

This poster will focus on the analysis of the associated production of the Higgs boson with a W or Z boson performed by the ATLAS Collaboration using data collected between 2015 and 2018, and will describe the analysis strategy employed to search for the $H \rightarrow cc$ signal. More precisely, recent achievements in the charm tagging technology that enables the identification of jets containing charm hadrons will be presented. Our current understanding of the $H \rightarrow cc$ process will be outlined, and the various results of the ATLAS, CMS and LHCb collaborations will be compared. Finally, the interpretation of this new result as a probe to the Standard Model flavour puzzle and its large constraining power on new physics scenarios will be discussed.

Primary author: STAMENKOVIC, Marko (Nikhef National institute for subatomic physics (NL))

Presenter: STAMENKOVIC, Marko (Nikhef National institute for subatomic physics (NL))

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