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**Séminaire
DPhP**

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Search for the Higgs boson decay to charm quarks at the ATLAS experiment

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Since the discovery of the Higgs boson by the ATLAS and CMS experiments, almost a decade ago, its couplings to massive vector bosons and third-generation fermions have been firmly established. There is also first evidence for the Higgs boson coupling to muons. However, the coupling to second-generation quarks is still very much unconstrained.

In this seminar, I will present the most recent search for the Higgs boson decay to charm quarks by the ATLAS collaboration, using the full LHC Run-2 dataset. The search targets Higgs boson production in association with a massive vector boson and relies on dedicated flavour tagging algorithms to identify jets originating from charm quarks. Events are categorised according to the number of leptons, jets, charm-tagged jets, and the transverse momentum of the vector boson, and a combined fit to the dijet invariant mass is performed in 44 signal and control regions. As a validation of the analysis methods, the diboson production with heavy vector bosons decaying to one or two charm quarks is measured simultaneously.

The search for Higgs boson decays to charm quarks yields an observed upper limit on the production cross-section times branching fraction of 26 times the value predicted in the Standard Model. This allows, for the first time, to place a direct constraint on the Higgs-charm coupling of at most 8.5 times the coupling strength in the Standard Model.

I'll end with a brief overview of complementary approaches to probe the Higgs-charm coupling pursued in ATLAS and discussing the prospects for the search for Higgs boson decays to charm quarks at the HL-LHC.
