



Contribution ID: 52

Type: **not specified**

Higgs physics programme at the High-Luminosity LHC with ATLAS

Wednesday 5 April 2017 09:00 (20 minutes)

From the mid-2020s, the Large Hadron Collider will run as High Luminosity LHC (HL-LHC) with a centre of mass energy of 14 TeV and an instantaneous luminosity of $5\text{--}7 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$. It aims to collect a total integrated luminosity of 3000 fb⁻¹ by about 2037.

The unprecedented amount of data collected by the upgraded ATLAS detector at the HL-LHC will be used to make precision measurements of the 125 GeV Higgs boson. In addition final states including Higgs bosons can be used to probe for beyond-the-Standard-Model physics and for search for rare processes.

Observation of di-Higgs production, $pp \rightarrow HH$, can be used to constrain the parameter λ in the Higgs potential and is one of the key physics drivers for the HL-LHC programme. However due to the small predicted cross section for HH production many final states must be considered to gain sensitivity to di-Higgs production at the HL-LHC.

In this talk we present the studies on the prospects for precision measurements of the Higgs boson and searches for rare Higgs boson processes at the upgraded ATLAS detector at the HL-LHC. Also, prospects to observe di-Higgs production at the upgraded ATLAS detector at the HL-LHC are reported and discussed.

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Session Classification: WG7 Future of DIS

Track Classification: WG7) Future of DIS