



Contribution ID: 208

Type: Oral Presentation

Search for a heavier Higgs like boson and a dark force boson using ATLAS experiment results

Thursday, 29 July 2021 15:15 (15 minutes)

This paper presents the search for the Higgs boson, with mass 125GeV , decaying to two new intermediate states and then into four lepton final states, $H \rightarrow Z_d Z_d \rightarrow 4l$ together with the search for a double Z_d hypothesis. The analysis is conducted using the Run II data set from pp collisions collected with the ATLAS detector corresponding to a total integrated luminosity of 140fb^{-1} at a centre of mass energy of $\sqrt{s} = 13\text{TeV}$. A study on modifying the signal region has also been conducted, assuming a broader width on the Z_d . Based on the signal and background models, the total number of expected events is 14, while 19 events were observed in the modified signal region. The results are compatible with Standard Model predictions. The search for the double hypothesized Z_d 1 and Z_d 2 is performed in the medium signal region. For this study, clustering algorithms and azimuthal integration are used to find the hypothesized Z_d 1 and Z_d 2 vector boson masses. Particular emphasis is also given to the limit setting procedure used in this analysis. In addition, the procedure used to port the limit setting code from CPU to GPU is reviewed together with the performance of the modified machinery.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

MSc

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Session Classification: Nuclear, Particle and Radiation Physics

Track Classification: Track B - Nuclear, Particle and Radiation Physics