

Precision Measurements with Di-Bosons at the LHC

Tuesday, May 29, 2018 5:45 PM (25 minutes)

Precision measurements at the LHC can provide probes of new physics, and they are complementary to direct searches. The high energy distribution of di-boson processes (WW , WZ , Vh) is a promising place, with the possibility of significant improvement in sensitivity as the data accumulates. We focus on the semi-leptonic final states, and make projections of the reach for future runs of the LHC with integrated luminosities of 300 fb^{-1} and 3 ab^{-1} . We emphasize the importance of tagging the polarization of the vector bosons, in particular for the WW and WZ channels. We employ a combination of kinematical distributions of both the W and Z , and their decay products to select the longitudinally polarized W and Z . We have also included our projections for the reach using the associated production of vector bosons and the Higgs. We demonstrate that di-boson measurements in the semi-leptonic channel can surpass the sensitivity of the precision measurement at LEP, and they can be significantly more sensitive than the HL-LHC $h \rightarrow Z\gamma$ measurements. We have also considered the reaches on the new physics mass scale in different new physics scenarios, including the Strongly Interacting-Light Higgs (SILH), the Strongly Coupled Multi-pole Interaction (Remedios), and the class of models with partially composite fermions.

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Session Classification: Physics at High Energies

Track Classification: PHE