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**Study of systematic uncertainties for Higgs Boson Searches in  $H \rightarrow \gamma\gamma$  and  $H \rightarrow W^+W^- \rightarrow l^+\nu l^-\nu$  Final States in ATLAS<sup>1</sup>** HEE YEUN KIM, University of Texas at Arlington, JAEHOON YU COLLABORATION<sup>2</sup> — This study focuses on the theoretical systematic uncertainties for Higgs particle searches in  $H \rightarrow \gamma\gamma$  and  $H \rightarrow W^+W^- \rightarrow l^+\nu l^-\nu$  channels at ATLAS and for background processes. The precision of Monte Carlo event generator predictions benefit dramatically from the inclusion of higher-order corrections in various ways in total and differential cross sections. In this study, two different combinations of Monte-Carlo tools, PowhegBox-Pythia and PowhegBox-Herwig, are used with various Parton Distribution Function sets in CTEQ6.6 and MSTW2008NLO for systematic uncertainties resulting from parton showering and PDF uncertainties. Large scale Monte-Carlo event simulations have been performed to estimate the background. Cut based analyses have been done and theoretical predictions have been compared to the 2011 ATLAS data. This enables us to understand the underlying parton dynamics in the processes, and to quantify the theoretical systematic uncertainties in background estimates and Higgs signal cross sections.

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