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Search for Di-Higgs Resonance at the ATLAS Experiment[1]
PEACE KOTAMNIVES, ERIC TORRENCE, University of Oregon, ATLAS COLLABORATION — With the question remaining whether there is only one Higgs boson or several, our research studies how a heavier Higgs boson could be found in the ATLAS data at the LHC. By the pure Standard Model phenomenon, we expect to find production of two SM Higgs bosons from the tri-linear Higgs coupling. However, the rate at which this will happen is far below what we will be able to see for many years at the LHC. As the discovered Higgs boson can decay to different pairs of particles, and the rate is expected to be proportional to the mass of the decay particle involved, the most likely decay channel is H→bb at 33%, and the second most likely channel is H→WW at 25%. Therefore, HH→bbbb channel has the highest rate of production, but HH→WWbb channel is chosen due to higher backgrounds in the four-b channel. In addition, two W bosons could decay into two quarks, one lepton and its neutrino. The performance of identifying HH→WWbb events for large heavy Higgs mass has studied specifically by using boosted object tagging. From the detector, we expect collimated jets from b quarks merging into a fat jet. By applying the relativistic kinematics theory and reducing some major backgrounds, we compare our alternative algorithms with the current algorithm in reconstructing the W→qq candidate. With the improved sensitivity, our expectation is to see a bump on top of the mass distribution indicating the new physics particle that we are searching for.

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