

Abstract Submitted  
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**Search for Higgs boson pair production in the  $bb$  tau tau final state for the ATLAS Experiment at LHC of CERN** DAN BROWN, California State University, Fresno — Results of the optimization for vector boson fusion to maximize signal efficiency and minimize background are presented. The study surrounds the production of Higgs boson pairs (HH) where one decays to a pair of b quarks and the other to a tau lepton pair in the ATLAS detector in proton proton collisions at  $s = 13$  TeV. Optimized selection cuts are needed to separate not only the background, but gluon gluon fusion as well. The mass of the 2 bjets (b quarks) and the eta separation between the bjets were a main focus, finding the optimal cuts for these variables, which was around  $M_{jj} > 900$  GeV and  $|\Delta\eta_{jj}| > 4$ . Combining other cuts from other variables, such as the transverse momentum of the 2 bjets and 2 taus, proved to improve significance. Some cuts may have given this better significance, but ended up cutting too much of our signal. Finally a boosted decision tree (BDT) was used to optimize the separation between signal and background to achieve our optimal significance for the signal. The results of this study have been presented to the US ATLAS workshop at SLAC.

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