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Search for Higgs Boson decaying to long-lived scalar particles in pp collisions at $\sqrt{s} = 13$TeV with the ATLAS Detector AMBER ROEPE, Univ of Oklahoma — Many theories beyond the SM predict the existence of new particles with a macroscopic decay length, referred to as Long-Lived Particles (LLPs). These LLPs can help us understand the difference in scale of our fundamental forces, known as the hierarchy problem. We performed a search for decays of the Higgs boson to two long-lived neutral scalar particles a, in which each a decays to a pair of b quarks. As a result of the a lifetime, the b quarks are displaced. Therefore, our analysis requires the use of a special reconstruction algorithm, referred to as "Large Radius Tracking" (LRT). LRT was optimized to have a very high efficiency at the expense of high fake rate and CPU consumption. It is only feasible to use this algorithm on a specially selected ∼10% of the data collected. I developed an algorithm to select potential signal events for reconstruction with LRT, based on the results of the standard reconstruction. From the collection of LRT tracks, it is possible to reconstruct high-mass displaced vertices, for which there is no SM background. This is a novel search within the ATLAS experiment which provides unique sensitivity to this important signal between that of prompt searches and long-lived searches targeting decays in the calorimeter or muon spectrometer.

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