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Study to Characterize Axion-like Particle Properties in Higgs Boson Decays ARIANA GONZALEZ, DARIN ACOSTA, University of Florida — This research attempts to review and optimize the steps required to conduct a search for new axion-like particles (ALP) in a Higgs Boson $\rightarrow$ Z Boson + ALP $\rightarrow$ 2 leptons + 2 photon decay, and to assess the sensitivity of such a search. This includes becoming involved in the data selection process where selection requirements are applied to the data, validating data in comparison to Monte Carlo simulations in control regions to ensure the backgrounds are understood, and studying possible systematic uncertainties that can affect the search. Additionally, how the search results are interpreted as limits on cross sections and theory parameters will be investigated. This research will cover finding invariant mass plots of the decay products, plotting the angles between the diphotons and dileptons, transforming the momentum in the lab frame of the ALP and Z boson into to the center of mass frame, finding the polar angle of the photons in the rest frame of the ALP, and finding a background (jets) to use for comparison to the signal. This analysis uses proton-proton collision data from the CMS detectors of CERN's Large Hadron Collider to search for the decays. This presentation will be explaining my proposed research and what it entails as it is still in progress.

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