INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Exploring BSM Physics through doublet extensions of the Higgs Sector

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SHORT ABSTRACT

In the year 2012, two collaborations of LHC, ATLAS and CMS independently observed a new particle known as Standard Model (SM)-like Higgs boson. This discovery confirms Higgs mechanism as the way of Electroweak Symmetry Breaking. The Higgs boson was predicted by Peter Higgs and Francois Englert in 1964 to break the electroweak symmetry spontaneously, for which they received nobel prize in 2013. Although the discovery completes the particle spectrum of the SM, it opens the door for the beyond the SM Higgs sector as the observed particle can be accommodated in a natural way in many attractive multi-Higgs scenarios. But the confirmation of these models depends on observing other scalars of the models. Our main aim in this thesis is to explore the implications of some of the multi-Higgs models.

In our first work, we perform a model independent analysis focusing on the cascade decay of a heavy Higgs. In our second work, we consider an inert version of 2HDM, popularly known as inert higgs doublet model (IHDM). Explaining DM and non-zero neutrino mass in a single framework is a pressing task among modern particle physicists. In our final work, we make an attempt in this direction.

Summarizing, we focus on the multi-Higgs sector aiming to probe the additional scalars of the models at the LHC, and investigate the DM phenomenology from collider perspective in one of the models. We also make the connection of DM with neutrino mass in a single framework.