Physics

A Search for Heavy Neutrinos via Electroweak Vector Boson Fusion Processes in Proton-Proton Collisions at The Large Hadron Collider

Brandon Joseph Soubasis

Dissertation under the direction of Professor Will Johns

The focus of this thesis is a search for a heavy fourth neutrino by targeting heavy neutrino production via vector boson fusion (VBF) processes. This type of process includes two vector bosons (radiated from quarks involved in pp collisions) that "fuse" to produce a lepton and a heavy Neutrino. The distinguishing feature of VBF is a pair of highly energetic forward jets. A search for heavy neutrinos using the VBF topology has not been performed before at a collider, but may present an important avenue for discovery. The focus of the analysis is the VBF production of the second-generation heavy neutrino in the same-sign di-muon plus four jets final state, since it provides the best discovery potential.

Approved_____ Date 3/14/2023

Will Johns, Ph.D.