

## New physics signatures with final state containing a Z and a Higgs boson, and significant missing energy and the LHC

The discovery of the Scalar Higgs Boson,  $h$ , in July 2012 means that the particle spectrum of the Standard Model (SM) is complete. New questions arise, whether the electroweak symmetry breaking mechanism in the SM is really complete, and whether there are more particles with scalar like properties, like the Higgs Boson. The Wits HEP group has postulated the existence of a heavy scalar,  $H$ , with a mass around 270 GeV. If embedded into a two Higgs Doublet, heavier charged bosons and a pseudo-scalar can be predicted. In this research the main aim is to search for a heavy pseudo-scalar  $A$ , where the prime search channel would be,  $pp \rightarrow A \rightarrow ZH$ . Where the Z boson decays to two leptons,  $Z \rightarrow ll$  ( $l = e$  or  $\mu$ ). The large branching ratios of  $H \rightarrow h\chi\chi$  and  $h \rightarrow bb$  means that the  $ZH +$  Missing Energy (MET) channel opens up. MET is described as the transverse energy which is not detected in a particle detector but is expected due to laws of conservation of momentum. This search is feasible as long as  $m_A > m_H + m_Z$ .

### I intend to submit my contribution for the proceedings

Yes

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