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Search for Higgs to 4 leptons through new gauge bosons

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Abstract content
   (Max 300 words)

The H->ZZ-> 4l channel has long been known to be the dominant discovery channel for the Higgs with the ATLAS detector, due to its clean signature of 4 isolated leptons.

However, there are also scenarios where the Higgs could decay into a pair of new gauge bosons of very low mass which are not of the SM(Standard Model) but rather through a hidden sector.

Theoretical models , which predict hidden sector Higgs and gauge bosons, would be observable through mixing with SM Higgs, are well known and are applied in this investigation.

In this study, prospects for a Higgs discovery in the decay channel H -> Z'Z‘ -> 4l (where l can either be an electron or a muon) is being investigated.

The decay channel, H -> Z'Z‘ -> 4l , has both clean signature and a potentially large branching ratio for a low mass Higgs boson(mH<200 GeV/c2).

The decay of the mass eigenstate of the SM Higgs into two Z' bosons of which mass can be as low as 5 GeV', is possible. Because of its low mass and the low coupling to fermions, the Z' must decay into SM fermions (leptons or light quarks) with a very narrow width. Our interest is on the four-lepton state.

The decay of the Z' bosons to lepton pairs with a large branching ratio can be explored in the same way as the standard H ->ZZ(*) -> 4l channel, by relaxing the constraints on the di-lepton invariant mass.

Here, I shall talk about the fixed mass cuts as well as the backrounds we investigate in this search.

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