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Search for Higgs boson to 4 leptons through new gauge bosons

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The $H \rightarrow ZZ^{(*)} \rightarrow 4\text{leptons}$ channel is one of the most promising channels for a low-mass Higgs boson, as it has both a clean signature and a large branching fraction for Higgs mass below a few hundred GeV. The ATLAS experiment has explored this channel using the LHC collisions data at a center-of-mass energy of 7 TeV, using data-driven background estimation techniques. Some Abelian Hidden Sector models predict the existence of new Higgs and gauge (Z') bosons, weakly coupled to the Standard Model (SM) sector. The decay of the SM Higgs to a pair of Z' bosons is allowed, possibly with a large branching fraction, by the mixing of the Higgs sectors. The decay of the Z' bosons to lepton pairs with a large branching fraction can then be explored in the same way as the standard $H \rightarrow ZZ^{(*)} \rightarrow 4l$ channel, by relaxing the constraints on the di-lepton invariant mass. Perspectives on this new approach with the ATLAS experiment are presented.

**Level (Hons, MSc,
 PhD, other)?**

PhD

**Consider for a student
 award (Yes / No)?**

No

**Would you like to
 submit a short paper
 for the Conference
 Proceedings (Yes / No)?**

Yes

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