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Experimental signals for a heavy scalar resonance in the ATLAS 4-lepton data

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We have analyzed the ATLAS sample of 4-lepton events, in the region of invariant mass $620 \div 740$ GeV. We argue that, from these data, one can obtain a clear signal for the existence of a new scalar resonance. Looking for its possible interpretation, we have compared with the hypothetical second resonance of the Higgs field that has been recently proposed and which would couple to longitudinal W's with the same typical strength of the low-mass state at 125 GeV. In fact, on the one hand, the observed mass $(M_H)^{\text{exp}} = 660 \div 680$ GeV would fit well with the theoretical range $(M_H)^{\text{theor}} = 690 \pm 10$ (stat) ± 20 (sys) GeV. On the other hand, the ATLAS data reproduce to high accuracy the expected correlation between resonating peak cross section $\sigma_R(pp \rightarrow H \rightarrow 4l)$ and the ratio $\gamma_H = \Gamma_H/M_H$ which should mainly be determined by the lower mass $m_h = 125$ GeV. This supports the idea that m_h and the new $(M_H)^{\text{exp}}$ could really represent two different excitations of the same Higgs field. The analogous, CMS available results will also be discussed.

In-person participation

Yes

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