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INVESTIGATIONS OF ELECTROWEAK SYMMETRY BREAKING MECHANISM FOR HIGGS BOSON DECAYS INTO FOUR FERMIONS

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Models with extended Higgs boson sectors are of prime importance for
investigating the mechanism of electroweak symmetry breaking for Higgs decays
into four fermions and for Higgs-production in association with a vector bosons [1]. In the framework of
the Two-Higgs-Doublet Model [2] using two scenarios obtained from the experimental measurements we presented next-to-leading-order results on the four-fermion decays of light CP-even Higgs boson, $h \to 4f$ [3].
With the help of Monte Carlo program Prophecy 4f 3.0 [4], we calculated the values $\Gamma = \Gamma_{EW} / (\Gamma_{EW} + \Gamma_{SM})$
and $\Gamma = \Gamma_{EW+QCD} / (\Gamma_{EW+QCD} + \Gamma_{SM})$ for Higgs boson decay channels $H \to \nu_\mu \overline{\mu} e \overline{\nu_e}, \mu \overline{\mu} e \overline{e}, e \overline{e} e \overline{e}$. We
didn't find significant difference when accounting QCD corrections to EW processes in the decay modes of
Higgs boson.
Using computer programs Pythia 8.2 [5] and FeynHiggs [6] we calculated the following values: $\sigma(VBH)BR(H \to ZZ)$ and $\sigma(VBF)BR(H \to WW)$ for VBF production processes, $\sigma(ggH)BR(H \to WW)$ and $\sigma(ggH)BR(H \to ZZ)$ for gluon fusion production process at 13
and 14 TeV and found good agreement with experimental data [7].

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