THESIS INFORMATION

Thesis title**: One loop corrections to the decays of Higgs and charged leptons in the flipped 3-3-1 model and the 3-3-1 model with abitrary β**

1. PhD student information.

Full name: HOÀNG HẠNH PHƯƠNG

Education schedule: 2016-2020

Specialty: Theoretical Physics and Mathematical Physics.

Code: 9 44 01 03

2. Training institution: Ha Noi Pedagogical University 2.

3. Research objects and scope of the study: Constructing formulas of branching ratios (Br), signal strengths of some rare decays with leading contributions from one-loop levels in the 3-3-1 models, then using them into numerical investigations in order to compare the results with experiments. The decays mentioned in this thesis are the standard model-like (SM-like) Higgs and charged leptons decays $h \to \mu\tau, \mu \to e\gamma$ in the flipped 3-3-1 model, and $h \to Z\gamma, \gamma\gamma$ in the 3-3-1 with arbitrary β (331 β).

4. Supervisor information.

Full name**: Nguyễn Thị Hà Loan.**

Institution: Ha Noi Pedagogical University 2.

Academic Title: Assoc Prof.: 2010 , PhD 1997

Specialty: Theoretical Physics and Mathematical Physics.

Full name: **Hà Thanh Hùng.**

Institution: Ha Noi Pedagogical University 2.

Academic Title: Assoc Prof.: 2018, PhD: 2014

Specialty: Theoretical Physics and Mathematical Physics.

5. New results of the thesis.

Studying in details the two decays of the SM-like Higgs in the two versions of the 3-3-1 models, we obtain the following new results:

In the flipped 3-3-1 model, we have constructed all analytic formulas for one-loop contributions to the branching ratios of the decays $h \to \mu\tau, \mu \to e\gamma$. Using these results for numerical investigations, we have found out the allowed regions of the parameter space satisfying the experimental cLFV constraints as well as resulting in the large Br of LFVHD enough to be detected by the upcoming experiments. In particularly, the Br of LFVHD $h \to \tau\mu, \tau e$ and $h \to \mu e$ can reach orders of $O(10^{-3}\text{-}10^{4})$ and $O(10^{-6})$, which are very close to the recent experimental sensitivities. These results will be used to constrain the parameter space of the model when the experimental sensitivities are improved in the near future.

In the model 331 β, we have calculated all analytic formulas for all one-loop contributions to the Br($h \to Z\gamma, \gamma\gamma$), including those ignored previously, for example $F^{331}_{21,svv}$. All of the contributions depend weakly on β, and they may have the same order with $F^{331}_{21,svv}$. For $\beta = \sqrt{3}$, contributions from gauge bosons and Higgs may be large and have the same orders, hence $F^{331}_{21,svv}$ should not be ignored. The numerical investigation showed that there exist large contributions from new Higgs and gauge boson that result in large deviation of the signal strength $\delta\mu_{Z\gamma}$, and still satisfy the upcoming experimental constraint from that of the SM-like Higgs decay to two photons, $\delta\mu_{\gamma\gamma} \le 0.04$. These large $\delta\mu_{Z\gamma}$, is originated from charged Higgs contributions and large s_δ, but has an upper bound $\mu_{Z\gamma} \le \mu_{\gamma\gamma} = 0.23$. In the model with $\beta = \sqrt{3}$ and $v_3 \sim 3TeV$, $\mu_{Z\gamma}$ may be large in the regions satisfying $\mu_{\gamma\gamma} = 0.99 \pm 0.14$. Corresponding to the planned sensitivity $\delta\mu_{\gamma\gamma} = 0.04$, this model still allows $\delta\mu_{Z\gamma} = 0.1$, but can not reach the planned sensitivity $\delta\mu_{Z\gamma} = 0.23$ for the decay SM-like Higgs to Z and photon.

Supervisor | PhD student

Assoc. Prof. Dr. Nguyễn Thị Hà Loan | Hoàng Hạnh Phương

Assoc. Prof. Dr Hà Thanh Hùng