## THESIS INFORMATION

Thesis title: **One-loop corrections to decays of Higgs boson and charged lepton in a flipped 3-3-1 model and 3-3-1 model with arbitrary $\beta$**

1. PhD student information.

   Full name: Hoang Hanh Phuong.
   Education Schedule: 2016 - 2020.
   Speciality: Theoretical Physics and Mathematical Physics.
   Code: 9 44 01 03

2. Supervisor Information.

   - Full name: Nguyen Thi Ha Loan.
   - Institution: Ha Noi Pedagogical University 2.
   - Academic Title: Assoc Prof: 2010, PhD: 1997.
   - Major: Theoretical Physics.

   - Full name: Ha Thanh Hung.
   - Institution: Ha Noi Pedagogical University 2.
   - Academic Title: Assoc Prof: 2017, PhD: 2014.
   - Major: Theoretical and Mathematical Physics.

3. Training institution: Ha Noi Pedagogical University 2.

4. Summary of the new results of the thesis.

   In the flipped 3-3-1 model:

   + We have established the analytic formulas expressing one-loop contributions to the branching ratio of the decays $h \to \mu\tau, \mu \to e\gamma$.

   + Determining allowed regions of the parameter space that satisfy the experimental bound on cLFV. At the same time, the LFVHD branching ratio is large enough for experiments to be measured. Investigating the dependencies of $\mathrm{Br}(h \to \mu\tau, \mu \to e\gamma)$ on the parameters $(M_E)$, $(s_{ij})$, $(k_1)$, new results are:

   - The main LFV sources originate from the heavy charged leptons. One loop contributions to the LFV decay amplitudes $h \to \mu\tau$ and $\tau \to \mu\gamma$ are larger than those of $h \to \tau e, \mu e$ and $\tau, \mu \to e\gamma$, respectively.

- $\mathrm{Br}(h \to \tau\mu, \tau e)$ and $\mathrm{Br}(h \to \mu e)$ can reach the order $\mathcal{O}(10^{-3}-10^{-4})$ and $\mathcal{O}(10^{-6})$ respectively, very close to the recent experimental lower bounds. They should be used for constraining the parameter space for future improved lower bounds.

- $\mathrm{BR}(\tau \to \mu\gamma, e\gamma) \leq \mathcal{O}(10^{-14})$, much smaller than the planed sensitivities of upcoming experiments. $\mathrm{BR}(\mu \to e\gamma)$ can reach the order of $\mathcal{O}(10^{-15})$ which is more promising for searching by experiments.

In the 3-3-1$\beta$ model:

+ One-loop contribution on $\mathrm{BR}(h \to Z\gamma, \gamma\gamma)$. They depend weakly on $\beta$. $F^{331}_{21,sv}$ and $F^{331}_{21,v}$ can have the same order. Hence, $F^{331}_{21,sv}$ should not be ignored. For $\beta = \sqrt{3}$, gauge and Higgs contributions may be large and have the same order.

+ There may exist recent gauge extensions of the BSM that allow large $|\delta\mu_{Z\gamma}|$, while still satisfy the future experimental constraint $|\delta\mu_{\gamma\gamma}| \leq 0.04$.

+ Our numerical investigation obtains: (i) The large deviations $\delta\mu_{Z\gamma}$ originate from the one-loop contribution of $H^{\pm}$ and large $|s_\delta|$, and $|\delta\mu_{Z\gamma}| \leq |\delta\mu_{\gamma\gamma}| < 0.23$ for large $v_\chi \geq 14$ TeV. In the 3-3-1 with $\beta = \sqrt{3}$ and $v_3 \simeq 3$ TeV, $\delta\mu_{Z\gamma}$ may be large in the allowed region $\mu_{\gamma\gamma} = 0.99 \pm 0.14$. For the near future sensitivity $|\delta\mu_{\gamma\gamma}| = 0.04$, this model still allows $|\delta\mu_{Z\gamma}| \leq 0.1$, but it canot reach the near future sensitivity $|\delta\mu_{Z\gamma}| = 0.23$.

- The total decay width of the $h^0_3$ and $BR(h^0_3 \to \gamma\gamma, Z\gamma)$ are an important signal to distinguish different 3-3-1 models.

Supervisor PhD student

Assoc. Prof. Nguyen Thi Ha Loan Hoang Hanh Phuong

Assoc. Prof . Ha Thanh Hung