

# EFFECTIVE FIELD THEORY AS A PROBE FOR CHARGED LEPTON FLAVOR VIOLATION

SEMINAR

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**ABSTRACT**

Our current understanding of fundamental constituent of matter consists of quarks and leptons within the framework of Standard Model (SM). Among these, quarks and electrically neutral-charged leptons (neutrinos) can mix among themselves. Such phenomena known as quark and lepton flavor violation (LFV) respectively. But similar mixing is absent among electrically charged leptons. Therefore, any experimental observation of charged Lepton Flavor Violation (cLFV) would definitely prove the existence of new physics beyond the SM. With such strong motivation cLFV processes have been studied for a long time with great details, though nothing has been observed yet. A model independent approach to study such cLFV processes is the Standard Model Effective Field Theory (SMEFT) framework where the SM is extended with higher-dimensional gauge-invariant operators involving SM fields only. In this talk I would discuss two such model independent analyses, lepton-flavour-violating (LFV)  $Z$  boson decays (LFVZD),  $Z \rightarrow \ell_i \ell_j$  and leptonic as well as semi-leptonic LFV  $B$ -meson decays (LFVBD) such as  $B_s \rightarrow \mu^+ e^-$ ,  $B^+ \rightarrow K^+ \mu^+ e^-$ ,  $B^0 \rightarrow K^{*0} \mu^+ e^-$ , and  $B_s \rightarrow \phi \mu^- e^+$ .

For LFVZDs, in order to discuss the discovery potential at the proposed circular  $e^+e^-$  colliders CEPC and FCC-ee, I'll present the indirect constraints obtained from LFV  $\mu$  and  $\tau$  decays on the operators that can induce  $Z \rightarrow \ell_i \ell_j$ . On the other hand, for LFVBDs I'll show the results of analyses from the interplay among the Wilson coefficients of most relevant operators responsible for these processes and other cLFV processes to find the maximal possible LFV effects in  $B$ -meson decays. For the processes where  $B$ -meson is decaying to  $\mu^\pm$  and  $e^\mp$ , we show that new physics can be constrained by an enhancement of 2-4 orders of magnitude on the current sensitivities of the BRs of  $B^+ \rightarrow K^+ \mu^+ e^-$ ,  $B^0 \rightarrow K^{*0} \mu^+ e^-$  and  $B_s \rightarrow \phi \mu^\pm e^\mp$ .

**WEDNESDAY, MAY 22, 2024****03:00 PM****PAMU SEMINAR ROOM***Everyone is invited to attend*