

# The 16th International Workshop on Tau Lepton Physics (TAU2021) (Virtual Edition)

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## $\tau \rightarrow \ell\ell\ell$ at a rate of one out of $10^{14}$ tau decays?

*Monday, September 27, 2021 1:40 PM (20 minutes)*

We present in full analytic form the partial widths for the lepton flavor violating decays  $L^\pm \rightarrow \ell^\pm \ell'^+ \ell'^-$ , with  $L = \tau, \mu$  and  $\ell^{(\prime)} = \mu, e$ , mediated by neutrino oscillations in the one-loop diagrams. Compared to the first result by Petcov:1976ff, which was obtained in the nonphysical zero momentum limit  $\mathcal{P} \ll m_\nu \ll M_W$ , we retain full dependence on external scales  $\mathcal{P}$  and determine the branching ratios in the physical limit  $m_\nu \ll \mathcal{P} \ll M_W$ . We show that in this limit the conclusion by Pham:1998fq that  $\tau \rightarrow \ell\ell\ell'$  could be as large as  $10^{-14}$  is flawed. In this talk we will describe the details of our calculation, present our results, and motivate some of the peculiarities of this calculation from the viewpoint of effective field theory.

### What is your topic?

Lepton universality and flavour violation

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