



$\tau \rightarrow \ell \gamma$  at Belle II



THE UNIVERSITY OF  

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MELBOURNE

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See ya, folks.

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# Chapter 1

## Lepton Flavour Violation and the Standard Model

### 1.1 Introduction

Lepton flavour violation (LFV) is an exciting field of research at the frontier of particle physics. Searches for LFV can probe a wide variety of new physics (NP) scenarios. We will not be looking at all LFV; in this literature review we specifically cover charged LFV of the form  $\tau \rightarrow \ell\gamma$ . Of the tau processes, these modes are predicted to be the most sensitive to NP. We choose to investigate tau LFV rather than, say, muon LFV, for two main reasons. Firstly, the tau processes have predicted branching fractions of  $\sim 5 - 6$  orders of magnitude greater than the analogous muon processes, due to the differences in mass [?]. The decay  $\tau \rightarrow \mu\gamma$  has a predicted branching fraction  $\sim 6$  orders of magnitude greater than the analogous  $\mu \rightarrow e\gamma$ ! Secondly, if this NP introduces Higgs-like particles, we would observe the NP more strongly in the tau sector, since taus couple more strongly to Higgs than do muons.