Prospects for a new $\mu^+ \rightarrow e^+e^+e^-$ Experiment

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In the minimal Standard Model (SM) of strong and electoweak interactions with vanishing neutrino masses lepton flavour is conserved. Hence processes such as $\mu^+ \rightarrow e^+e^+e^-$, $\mu^+ \rightarrow e^+\gamma$ and $\mu^-A \rightarrow e^+A$ would indicate Lepton Flavour Violation (LFV). Currently favoured extensions beyond the SM such as Super Symmetry (SUSY) or SUSY-GUTs predict LFV rates at levels accessible for experiments at high intensity muon beams such as those at PSI. The current upper limit for the decay $\mu^+ \rightarrow e^+e^+e^-$ of 1.0×10^{-12} could be improved by more than one order of magnitude with a new experiment based on the technology of the MEG experiment.