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Lepton flavor violating decay of true muonium:

$$(\mu^+ \mu^-) \rightarrow \mu^\pm e^\mp$$

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We propose a new charged lepton flavor violating (CLFV) process: the decay of true muonium ($\mu^+ \mu^-$) into a lepton pair of different flavors, $\mu^\pm e^\mp$. This purely leptonic, hadron-free process provides a clean signature and enables the probing of both photonic dipole and four-fermion CLFV interactions. Since CLFV mediators indirectly appear in most CLFV processes, it is important to search for various types of processes to identify the new particles responsible. We calculate the branching ratio using scalar, vector, and dipole operators, and by comparing with existing experimental constraints, we show it can reach $\mathcal{O}(10^{-20})$.

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