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Lepton flavour violation in RS models with a brane- or nearly brane-localized Higgs

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We perform a comprehensive study of charged lepton flavour violation in Randall-Sundrum (RS) models in a fully 5D quantum-field-theoretical framework. We consider the RS model with minimal field content and a “custodially protected” extension as well as three implementations of the IR-brane localized Higgs field, including the non-decoupling effect of the KK excitations of a narrow bulk Higgs. Our calculation provides the first complete result for the flavour-violating electromagnetic dipole operator in Randall-Sundrum models.
It contains three contributions with different dependence on the magnitude of the anarchic 5D Yukawa matrix, which can all be important in certain parameter regions. We study the typical range for the branching fractions of $\mu \to e\gamma$, $\mu \to 3e$, $\mu N \to eN$ as well as $\tau \to \mu\gamma$, $\tau \to 3\mu$ and the electron electric dipole moment by a numerical scan in both the minimal and the custodial RS model. The combination of $\mu \to e\gamma$ and $\mu N \to eN$ currently provides the most stringent constraint on the parameter space of the model. A typical lower limit on the KK scale T is around $2\,\mathrm{TeV}$ in the minimal model (up to 4˜TeV in the bulk Higgs case with large Yukawa couplings), and around $4\,\mathrm{TeV}$ in the custodially protected model, which corresponds to a mass of about 10˜TeV for the first KK excitations, far beyond the lower limit from the non-observation of direct production at the LHC.

Primary authors: Dr ROHRWILD, Jürgen (Rudolf Peierls Centre for Theoretical Physics, University of Oxford); Prof. BENEKE, Martin (Physik-Department T31 Technische Universität München); Dr MOCH, Paul (Universität Siegen)

Presenter: Dr MOCH, Paul (Universität Siegen)

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