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Some Results on Lepton Flavour Universality Violation

Based on **J. Alda**, J. Guasch, S. Peñaranda
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Outline

Why flavour physics? Why not?

- Theoretical interest: why do fermions have a large range of masses ($m_t/m_e \approx 350000$)?
- Flavour physics is (one of) the best places to look for New Physics.
  - Flavour Changing Neutral processes are heavily suppressed in the SM (loop and mass suppressed).
  - But New Physics might be not so suppressed: sizable contributions.
- Experiments are capable of good sensitivities: LHCb, BaBar, Belle.

Some B physics anomalies

- Rare B decays: $b \to s\mu^+\mu^-$ and $b \to se^+e^-$:
  - $R_{K^{(*)}} = \frac{\mathcal{B}(B \to K^{(*)}\mu^+\mu^-)}{\mathcal{B}(B \to K^{(*)}e^+e^-)}$.
  - $R_K^{\rm SM} = 1.00 \pm 0.01, \qquad R_K^{\rm exp} = 0.745^{+0.090}_{-0.074} \pm 0.036,$ (2.6σ). [1]
  - $R_{K^*}^{\rm SM} = 1.00 \pm 0.01, \qquad R_{K^*}^{\rm exp} = 0.685^{+0.113}_{-0.069} \pm 0.047,$ (2.5σ). [2]
  - Angular observables P_4', P_5'.
  - Violation of Lepton Flavour Universality?
- B_s mixing:
  - $\Delta M_S^{\rm SM} = 20.01 \pm 1.25\,{\rm ps}^{-1}$, $\Delta M_S^{\rm exp} = 17.757 \pm 0.021\,{\rm ps}^{-1}, \quad (1.8\sigma)$. [3]

[1] R. Aaij *et al* (LHCb Collaboration) arXiv:1406.6482

[2] S. Bifani. CERN Seminar, 18 April 2017 & arXiv:1705.05802

[3] L. Di Luzio, M. Kirk, A. Lenz. arXiv:1712.06572