EXTENSIONS OF THE SM

Prof. Steven Lowette

CN1 BEYOND THE STANDARD MODEL

- Experimental evidence for BSM physics:
  - → Gravity
  - → Matter-antimatter asymmetry
  - → Neutrino oscillation
  - → Dark matter
- Theoritical indications for BSM physics:
  - → (hierarchy problem)
  - → # families, # parameters, gauge grap structure
  - → strong CP problem
  - → stability of the E-W vacuum
- Experimental anomalies:
  - → Anomalies in B-physics
  - → " at CMS/ATLAS
  - → " magnetic moment muon $(g-2)_\mu$
  - → (Beryllium anomaly)
  - ⋮

CN2 Experimental anomalies

- Flavour anomalies: $R_K = \frac{Br[B \to K\mu\mu]}{Br[B \to Kee]}$
  - → Part of B-physics (hadrons with bottom quarks)
    - ↳ Ratio should be $= 1$, but measured at $R_K = 0,846^{+0.044}_{-0.041}$
      - → Tension with SM $\sim 2,6\sigma$
  - → Combining with other decay (like $b \to s\mu\mu$, $B_s \to \phi\mu\mu$, ...), tension to up to 4σ in global fit.
  - → Other example: $R_{K^*} = \frac{Br[B \to K^*\mu\mu]}{Br[B \to K^*ee]} \sim 0,7^{+0,2}_{-0.18}$
  - → Other analysis with angles, energy, ...