$B \to D^{(*)}\tau\nu$ HFLAV AVERAGE

The ratio

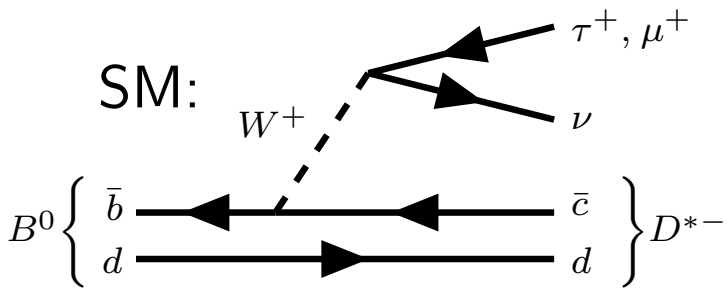
$$R(D^{(*)}) = \frac{\mathcal{B}(B \to D^{(*)}\tau^+\nu_\tau)}{\mathcal{B}(B \to D^{(*)}\mu^+\nu_\mu)}$$

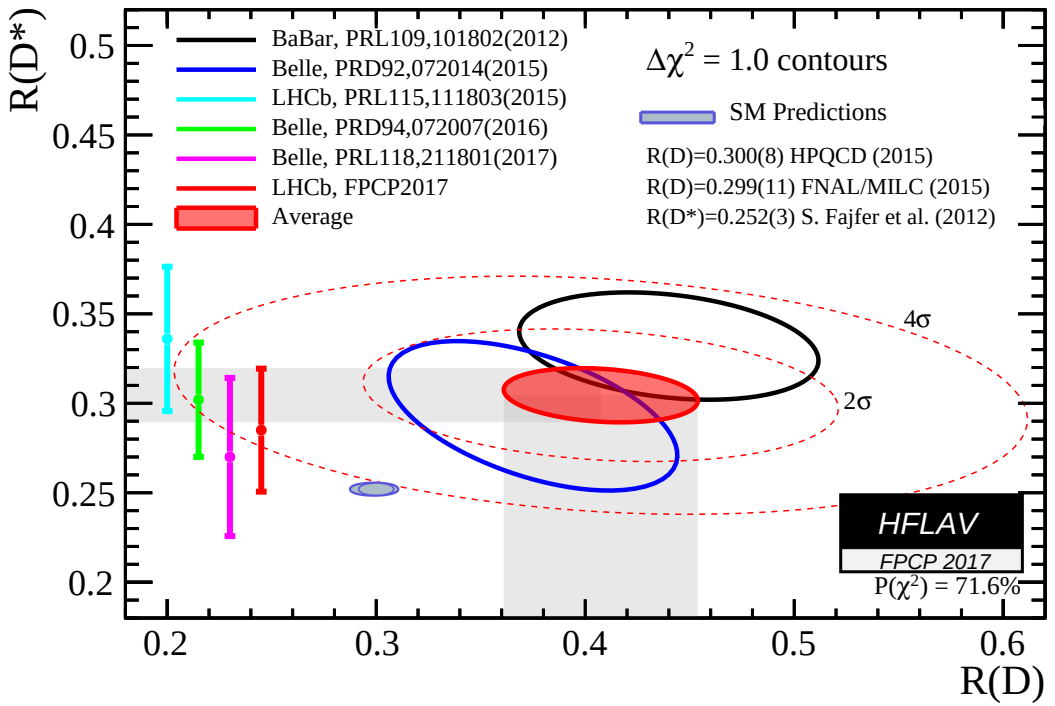
tests lepton universality.

In the SM it differs from unity due to phase-space (and phase space affecting form factors).

Experimental average is 4σ from SM prediction.

New vector bosons? Leptoquarks?





BABAR [PRL 109 101802 (2012)], [PRD 88 072012 (2013), arXiv:1303.0571] Belle [PRD 92 072014 (2015)] [Moriond EW, arXiv:1603.06711], LHCb [PRL 115 (2015) 111803] [arXiv:1708.08856].
Theory [Na et al., PRD 92 054410 (2015)], [Faijfer et al., PRD 85 094025 (2012)]

Study of $B_c^+ \to J/\psi \tau^+ \nu_\tau$

LHCb measured $R(D^{*+})$ with $\tau^+ \to \mu^+ \nu \overline{\nu}$ [PRL 115 (2015) 111803](Greg Ciezarek Nikhef) and $\tau^+ \to \pi^+ \pi^- \pi^+$ [arXiv:1708.08856]

What about $B_c^+ \to J/\psi \tau^+ (\mu^+ \nu \overline{\nu}) \nu$?

- Three-dimensional template fit in missing mass (m_{miss}),decay time (τ) and coarse E^*, q^2 bins (Z)
- ✔ Surprising signal excess (3σ)
- Measure $R(J/\psi) = 0.71 \pm 0.17 \pm 0.18$, which is 2σ above the SM

➜ Veldhoven Focus session on this anomaly and that in $b \to s\ell^+\ell^-$.
See [Ciezarek] and [Archilli] in Nature.

SM: