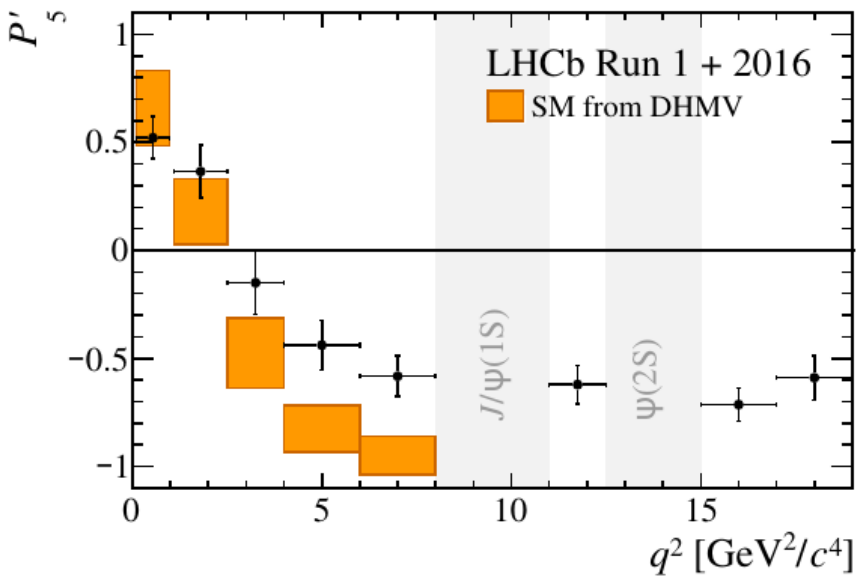
Rare Processes and Precision: Present

- Rare decays are well established probes of new physics
- Several anomalies in $b \to s\ell\ell$ decays:
  (1) hints for LFU violation (R_K, R_{K^*}),
  (2) total rates of several decays low compared to SM prediction,
  (3) anomalous angular distribution in $B_d \to K^* \mu\mu$ (P_5').

- Latest LHCb result on P_5' has exp. uncertainties that are comparable to the (agressive?) theory uncertainties.
- Will we learn anything from more precise measurements of the angluar distribution?

  Yes! With robust theory predictions can get e.g. robust bounds on right-handed currents or CP violation.



Rare Processes and Precision: Future

- Inclusive processes $B \to X_s \ell^+ \ell^-$ can be accessed at Belle II. Theoretically under better control than exclusive decays at low q^2. Effect of the hadronic mass cut?
- LHCb with 50 fb^{-1} or 300 fb^{-1} will have sufficient statistics to make precision measurements of $b \to d$ transitions, e.g. full angular analysis of $B_s \to K^* \mu^+ \mu^-$ with precision similar to the one we currently have for the $B_d \to K^* \mu^+ \mu^-$ decay
  $\to$ need robust hadronic models for $b \to d$ decays.
- At Tera-Z factories (FCC-ee or CEPC) expect up to 1000 reconstructed $B_d \to K^* \tau^+ \tau^-$ events. Need reliable theory predictions (most of accessible q^2 range is above open charm threshold). Also expect $\mathcal{O}(10^{10} - 10^{11})$ polarized Λ_b baryons. What can one learn from them?

$\Rightarrow$ lots of theory work required to fully exploit the expected future high precision flavor measurements