

# FlavBit expansion

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Gambit meeting, Gambit virtual meeting  
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# Quo vadis FlavBit?

⇒ Where we are:

- We are much smaller than other flavour fitting groups, e.g. MasterCode (John Ellis + Isidori + Diego Martinez +... + many other postdocs)
- Even so we now manage to have more or less the same capabilities (in flavour) but they are rapidly expanding.
- MasterCode will have soon the SuFla implemented.
- At present we do not have any target model that the flavour anomalies (see later)



# Quo vadis FlavBit?

⇒ What can we do?

- We can stick to what we have and eventually give the ground to them.
- Or we can do better:
  - Backed and extend EOS!  
Will give us control of all the harmonic uncertainties.
  - Implement the Kaon physics observables.  
Similar pattern of anomalies has been observed in the kaon sector, but there is no real attempt to link them.
  - Add the SM fits! Gambit is powerful fitting machine that can be used not only for SUSY.  
We can be competition to HFAG in the LHCb+Belle2 area.
  - Combine measurements of LHCb + BelleII (Gambit could be used by these collaborations) once available. once available)

# Quo vadis FlavBit?

⇒ How to do it?

⇒ Expand:

- Add at least one experimentalist from BelleII to complement our experimental expertise, this will also allow to promptly implement BelleII and LHCb results and combine them.  
Paul Jackson has kindly already made a list of potential excellent people from BelleII.
- Add theorists with different expertise BSM, fits, hadronic uncertainty.
- We believe that we need a critical mass in order to go to next step and implement most flavour observables.
- We should start having bi-weekly flavour meeting to work toward this goal.

# List of current anomalies in Flavour sector

- $\mathcal{R}(D^*) = \frac{Br(B \rightarrow D^* \tau \nu)}{Br(B \rightarrow D^* \mu \nu)}$
  - Angular distributions  $B \rightarrow K^* \mu \mu$ .
  - All branching fractions of  $b \rightarrow s \ell \ell$  decays.
  - $\varepsilon'/\varepsilon$  in the  $K_L^0 \rightarrow \pi \pi$
- ⇒ They all cluster in the same direction!

# List of current anomalies in Flavour sector

⇒ People are starting to claim already  $5\sigma$  NP discoveries from Flavour:

**Signal of right-handed currents using  $B \rightarrow K^* \ell^+ \ell^-$  observables at the kinematic endpoint.**

Anirban Karan,<sup>1</sup> Rusa Mandal,<sup>1</sup> Abinash Kumar Nayak,<sup>1</sup> Rahul Sinha,<sup>1</sup> and Thomas E. Browder<sup>2</sup>

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The decay mode  $B \rightarrow K^* \ell^+ \ell^-$  is one of the most promising modes to probe physics beyond the standard model (SM), since the angular distribution of the decay products enable measurement of several constraining observables. LHCb has recently measured these observables using  $2.36 \text{ fb}^{-1}$  of data as a binned function of  $q^2$ , the dilepton invariant mass squared. We show that LHCb data implies a  $5\sigma$  overall signal for new physics and provides unambiguous evidence for right-handed currents, which are absent in the SM. These conclusions are derived in the maximum  $q^2$  limit and are free from hadronic corrections. Our approach differs from other approaches that probe new physics at low  $q^2$  as it does not require estimates of hadronic parameters but relies instead on heavy quark symmetries that are reliable at the maximum  $q^2$  kinematic endpoint.

⇒ Thank God(or not...) this approach is not really well received by the community!

⇒ The Flavour physics has one nice advantage: A single deviation will not convince anyone!

⇒ We need a consistent shift of deviations and a bullet prove procedure with fitting them!

# Proposal

- Nico+Marcin have been in contact with Buras and Bobeth which are experts in Model building and BSM fits.
- Jack contacted potential BelleII candidates.
- Nazila contacted Aoife Bharucha.

# Quo vadis FlavBit?

⇒ Comments/Thoughts?

