

LHCb Expectations 2018

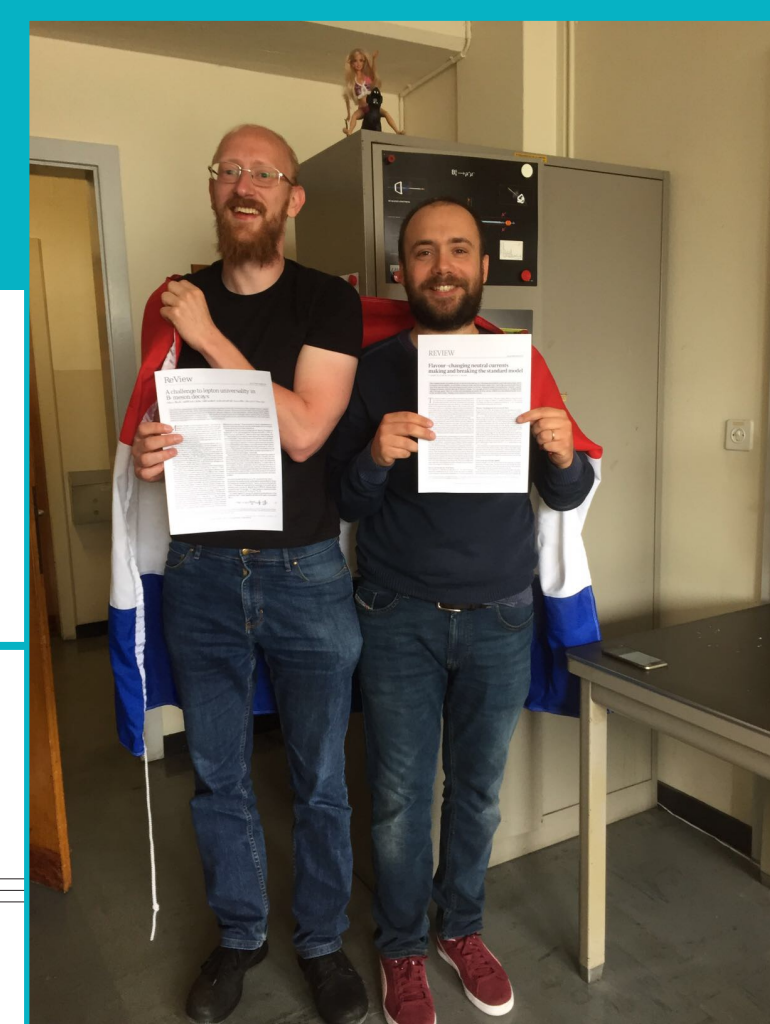
Bfys group



Nikhef

Nikhef Staff Meeting
18 – 1 - 2018

What's going on with leptons? (See Veldhoven!)



1. Neutral current: $b \rightarrow s l^+ l^-$: R_K, R_{K^*}

Statistics, Experimental mistakes, or BSM?
→ Expect 2018: new Results from Run-2!

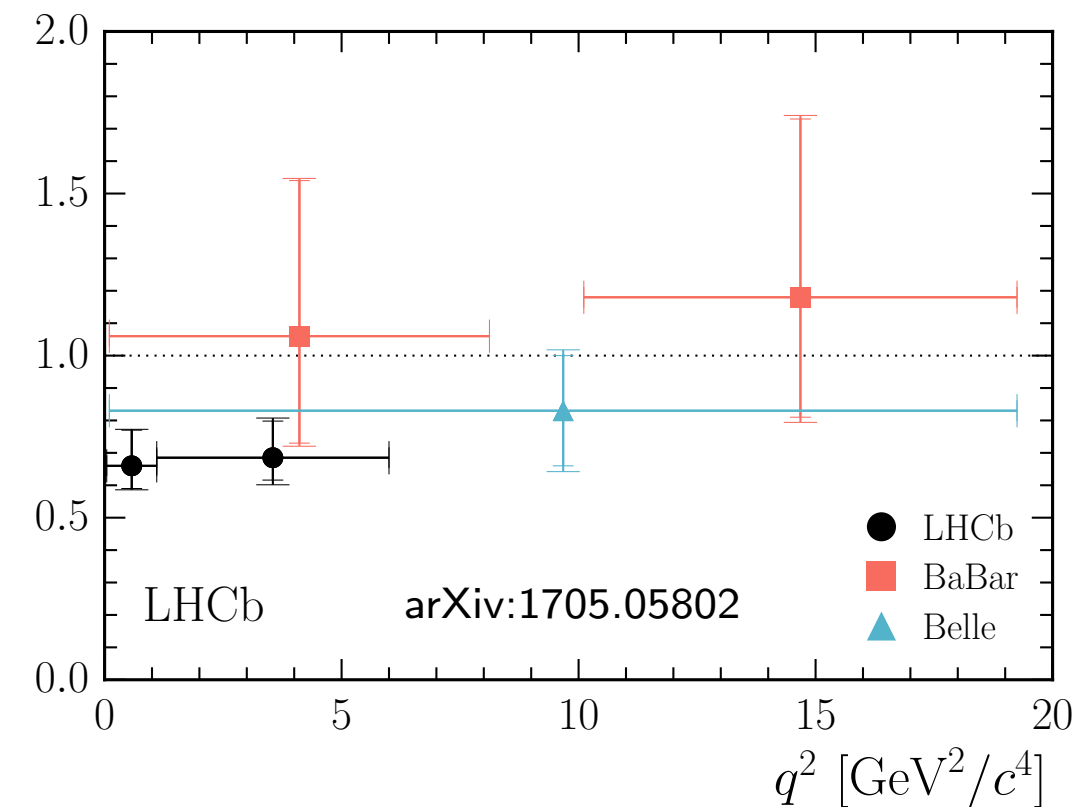
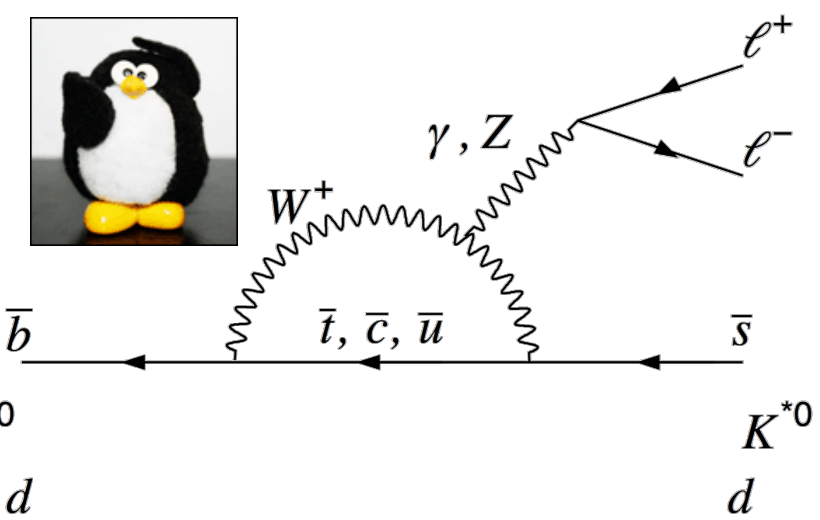
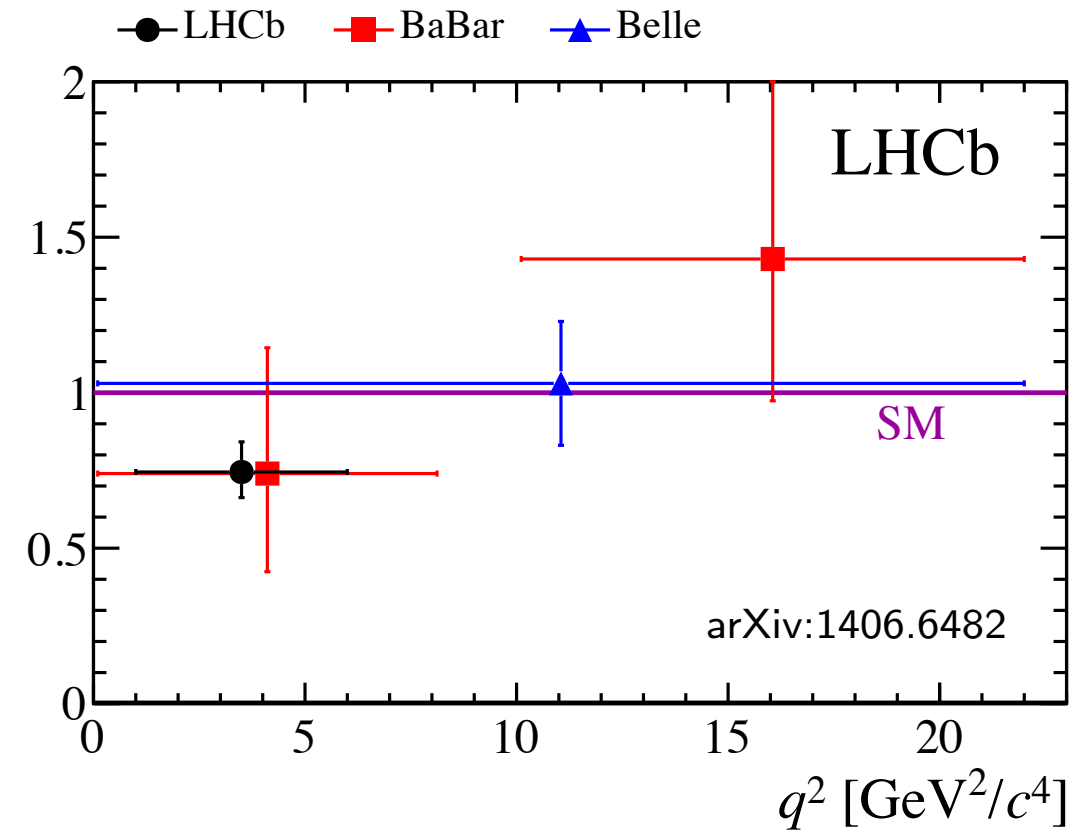
REVIEW

Nature

Flavour-changing neutral currents making and breaking the standard model

F. Archilli¹, M.-O. Bettler², P. Owen³ & K. A. Petridis⁴

The standard model of particle physics is our best description yet of fundamental particles and their interactions, but it is known to be incomplete. As yet undiscovered particles and interactions might exist. One of the most powerful ways to search for new particles is by studying processes known as flavour-changing neutral current decays, whereby a quark changes its flavour without altering its electric charge. One example of such a transition is the decay of a beauty quark into a strange quark. Here we review some intriguing anomalies in these decays, which have revealed potential cracks in the standard model—hinting at the existence of new phenomena.



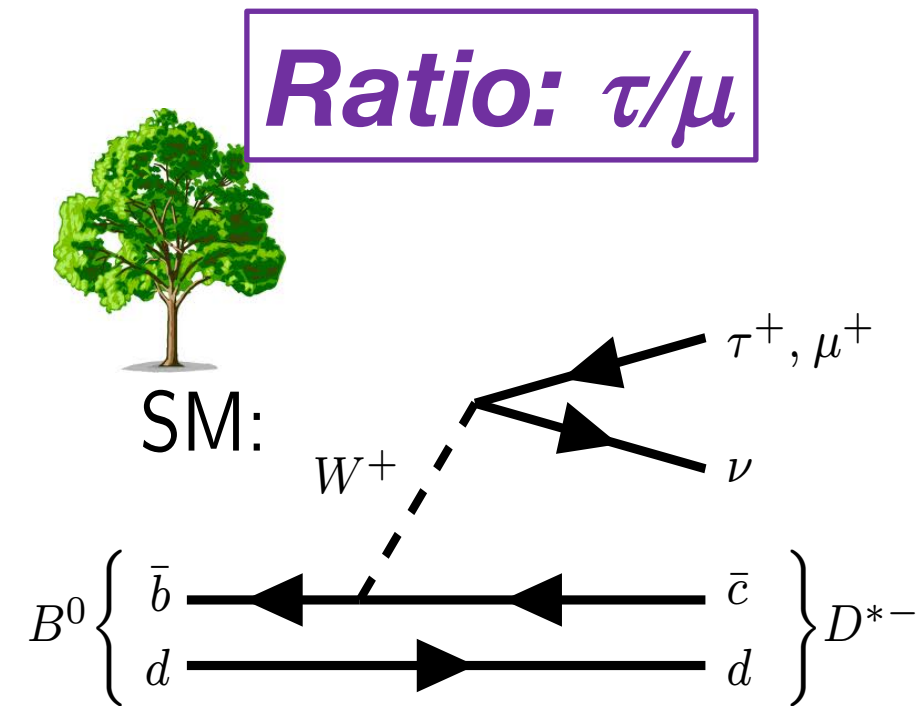
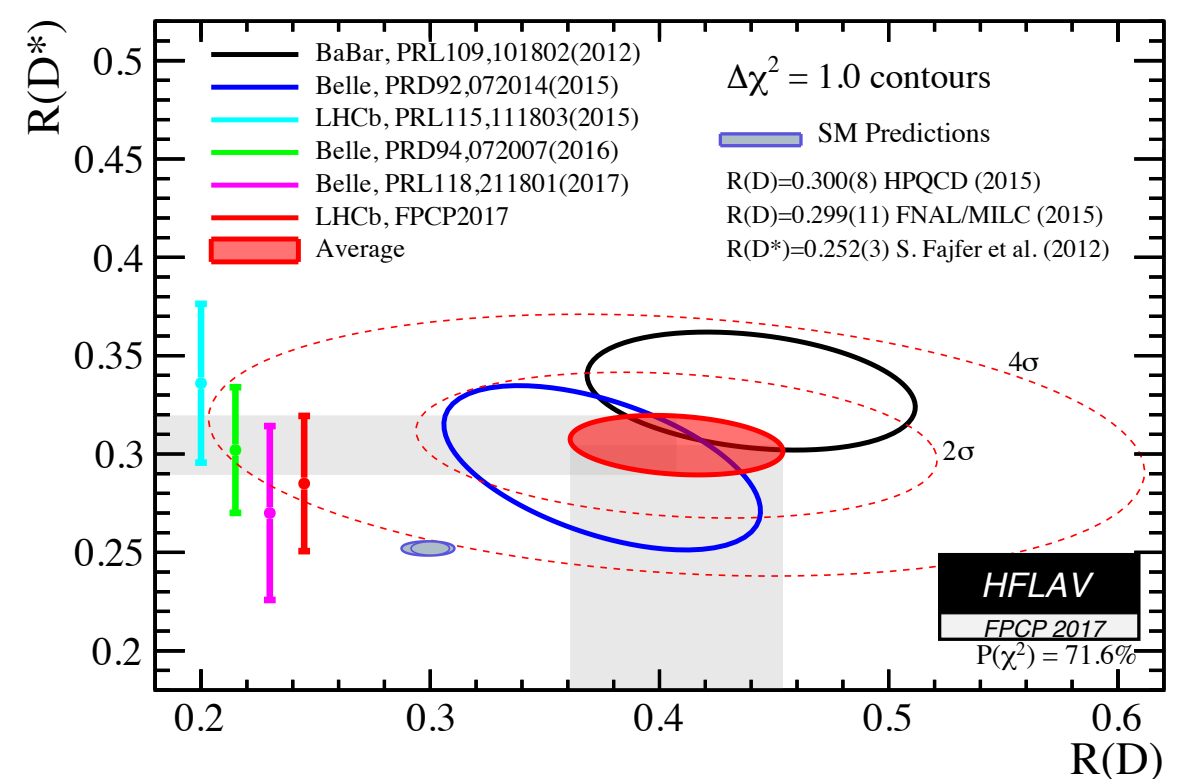
Ratio: μ / e

2. Charged current: $b \rightarrow c l^+ \nu$: R_D, R_{D^*}

A Challenge to Lepton Universality in B Meson Decays

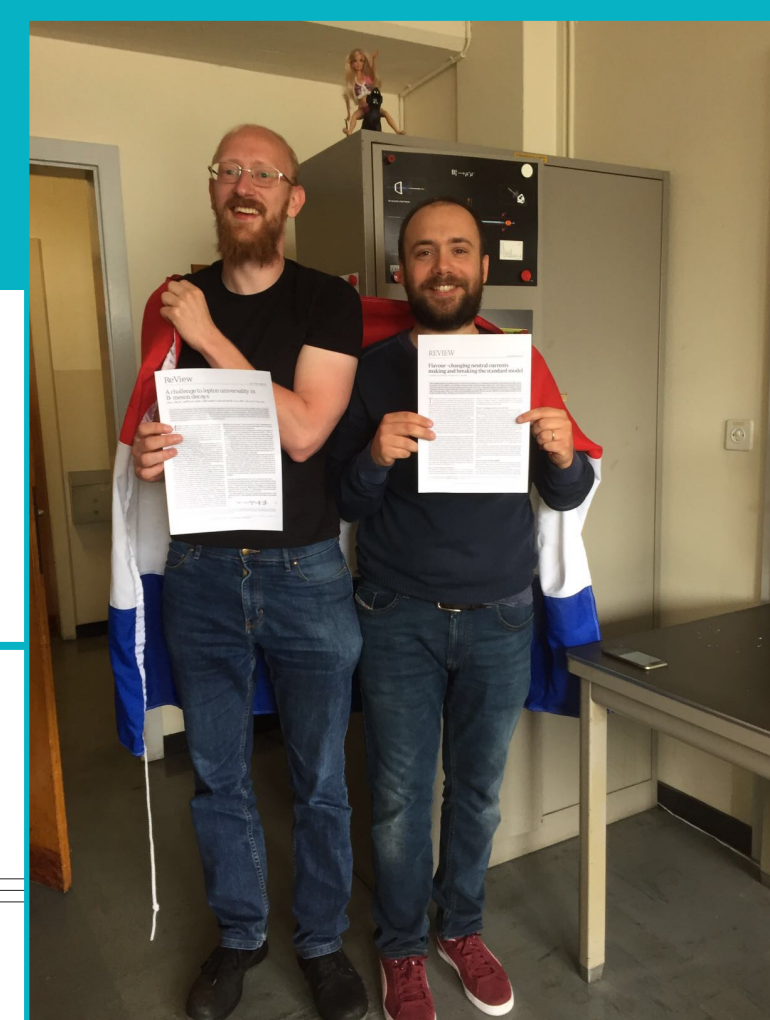
Gregory Ciezarek¹, Manuel Franco Sevilla², Brian Hamilton³, Robert Kowalewski⁴, Thomas Kuhr⁵, Vera Lüth⁶, Yutaro Sato⁷

One of the key assumptions of the Standard Model of fundamental particles is that the interactions of the charged leptons, namely electrons, muons, and taus, differ *only* because of their different masses. While precision tests comparing processes involving electrons and muons have not revealed any definite violation of this assumption, recent studies involving the higher-mass tau lepton have resulted in observations that challenge lepton universality at the level of four standard deviations. A confirmation of these results would point to new particles or interactions, and could have profound implications for our understanding of particle physics.



Ratio: τ / μ

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A Challenge to Lepton Universality in B Meson Decays

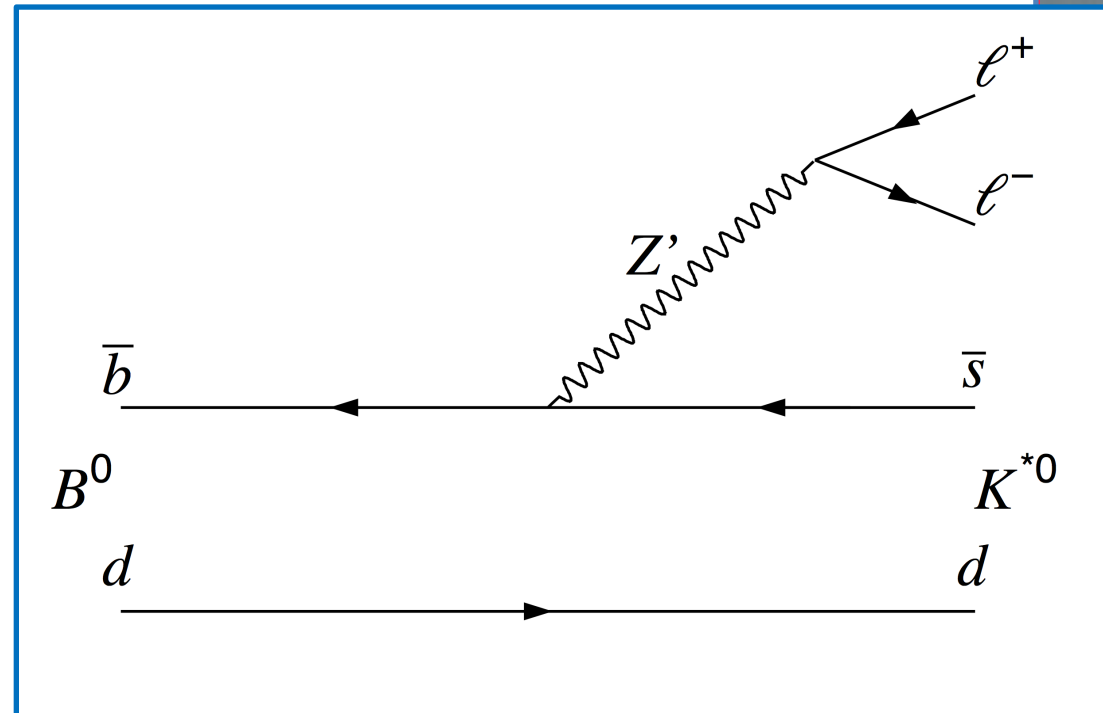
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“Heavy Flavor anomalies”
- Matthias Neubert, ZPW 2018

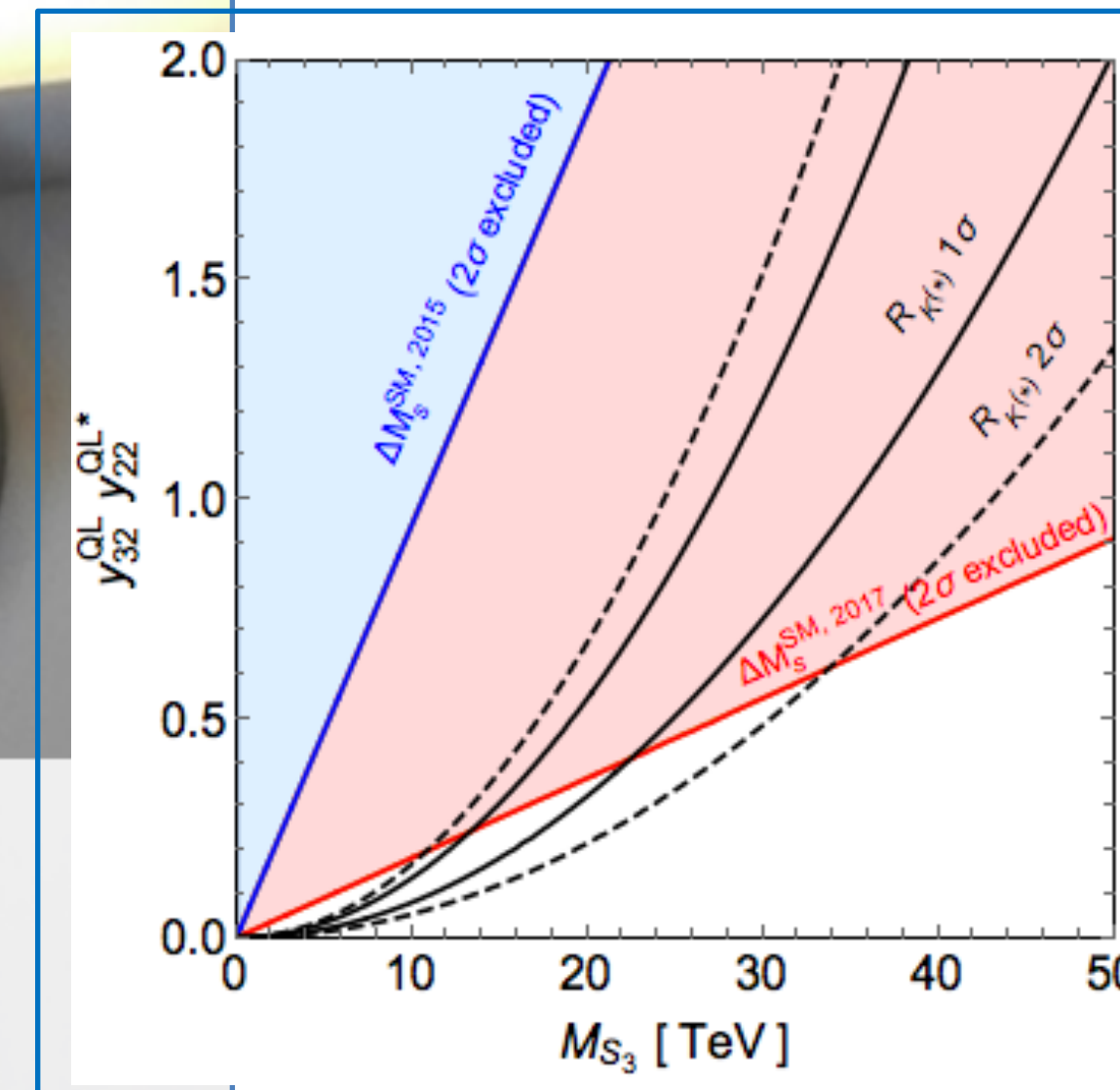
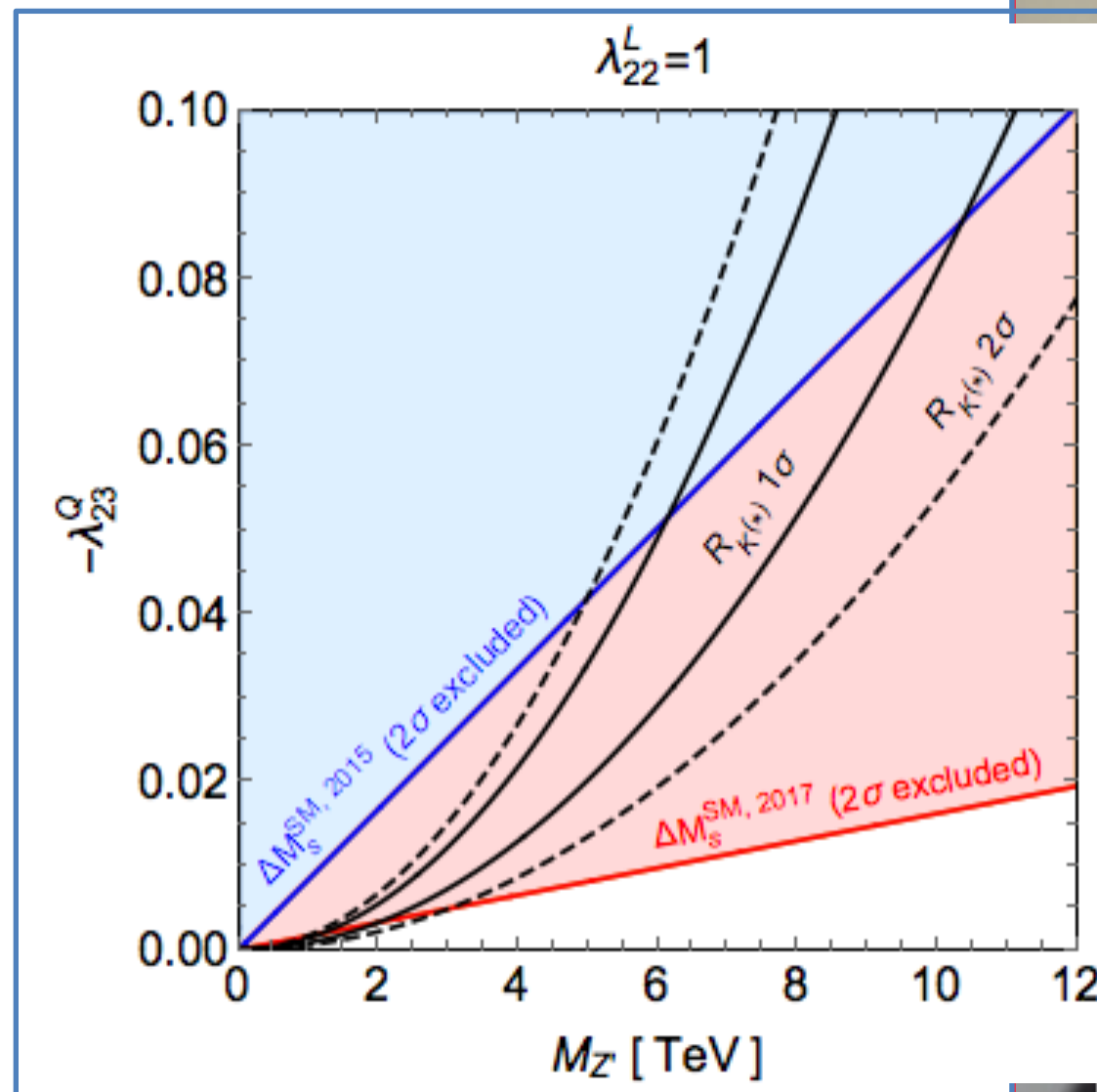
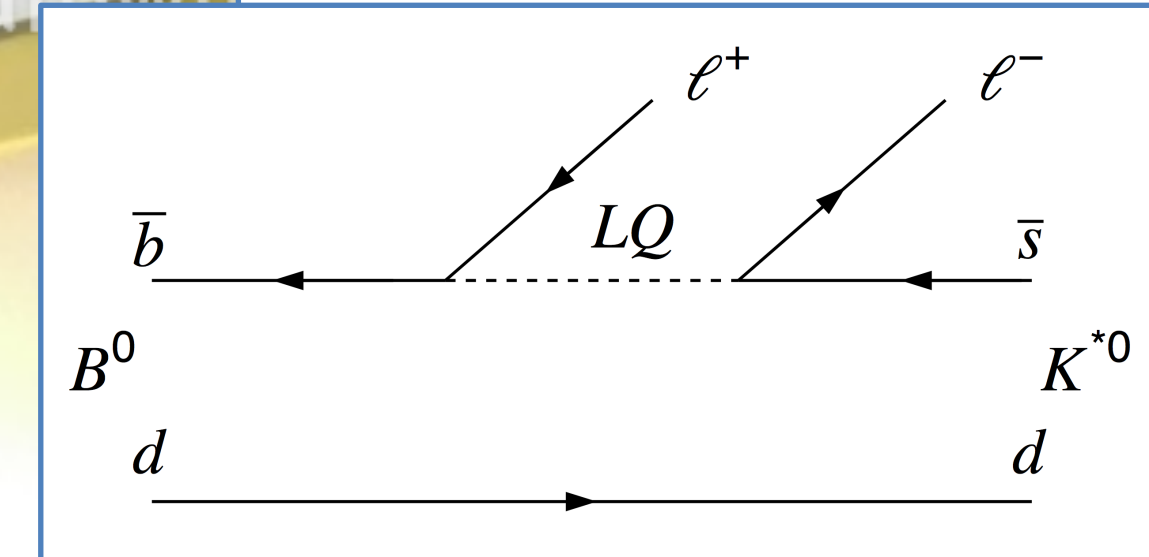
Expectations, Hopes?

• New gauge bosons Z', W'



LIVE

• LeptoQuarks LQ



BREAKING NEWS

NEW PHYSICS IN LEPTONS

11:57



THIS CHANGES OUR VIEW OF THE UNIVERSE SAYS DR. NIELS TUNING

Patrick Koppenburg

LHCb

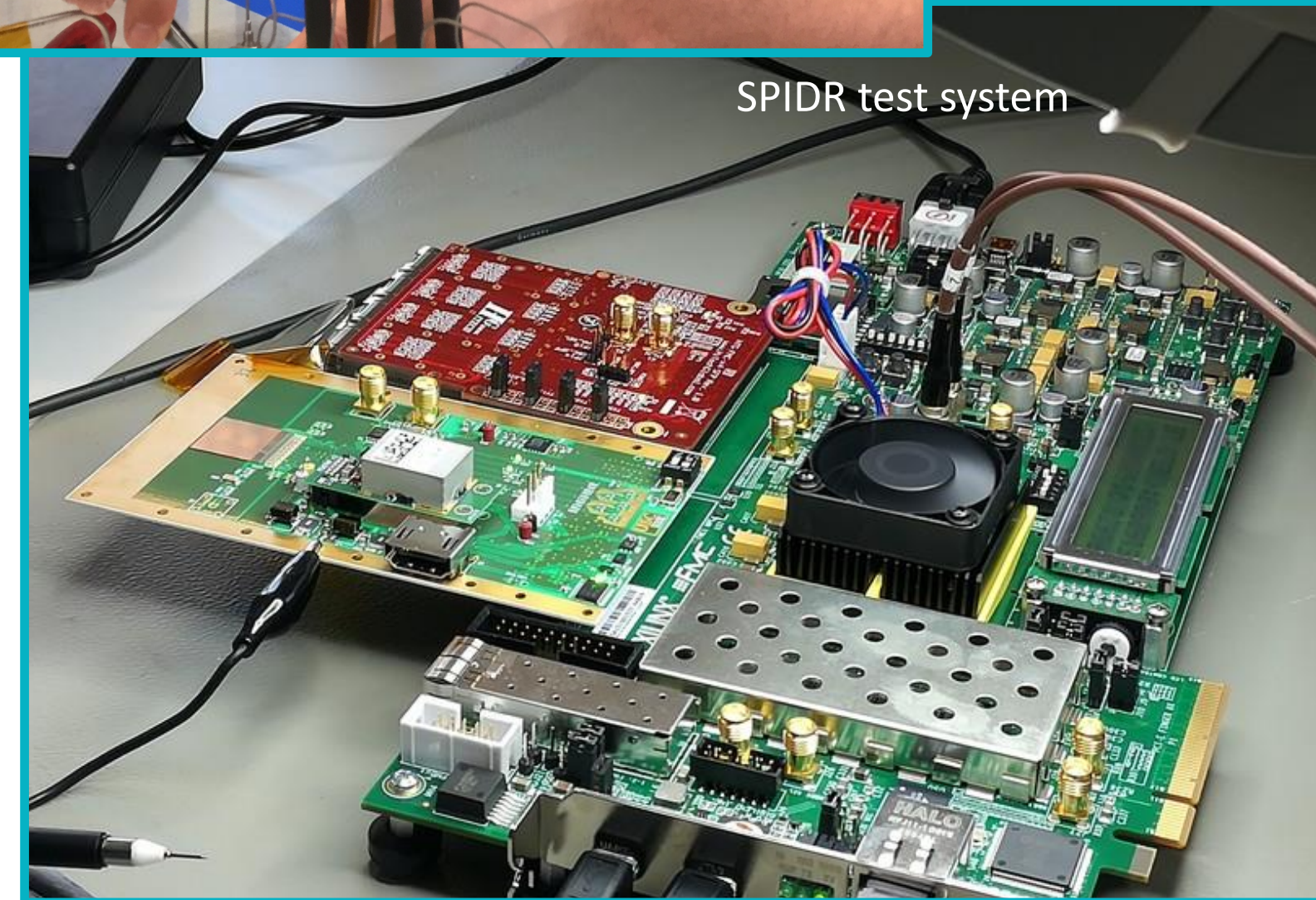
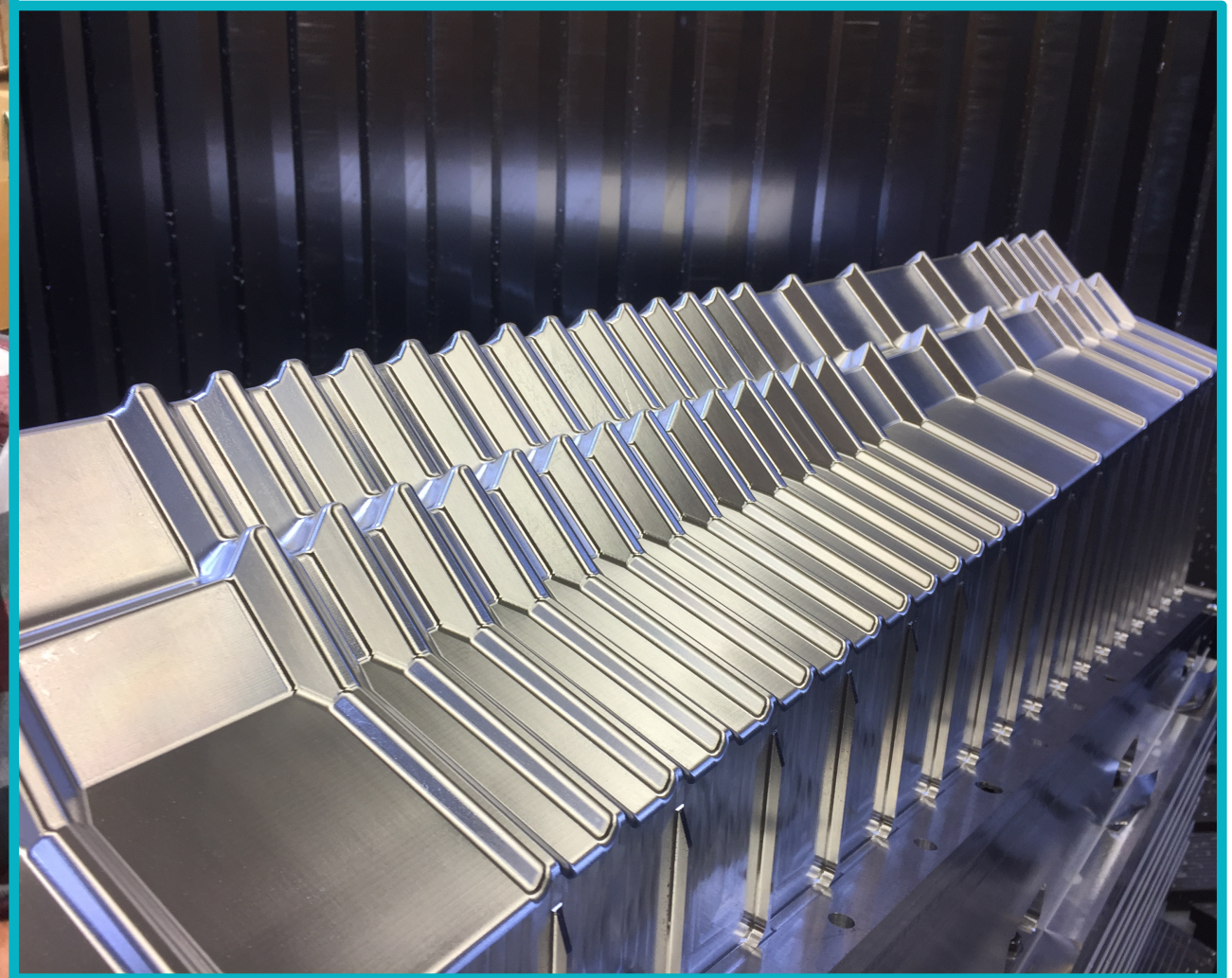
Jamboree — 12/12/2017 [13 / 15]

What's going on with the upgrade?

1. Construct SciFi modules and electronics



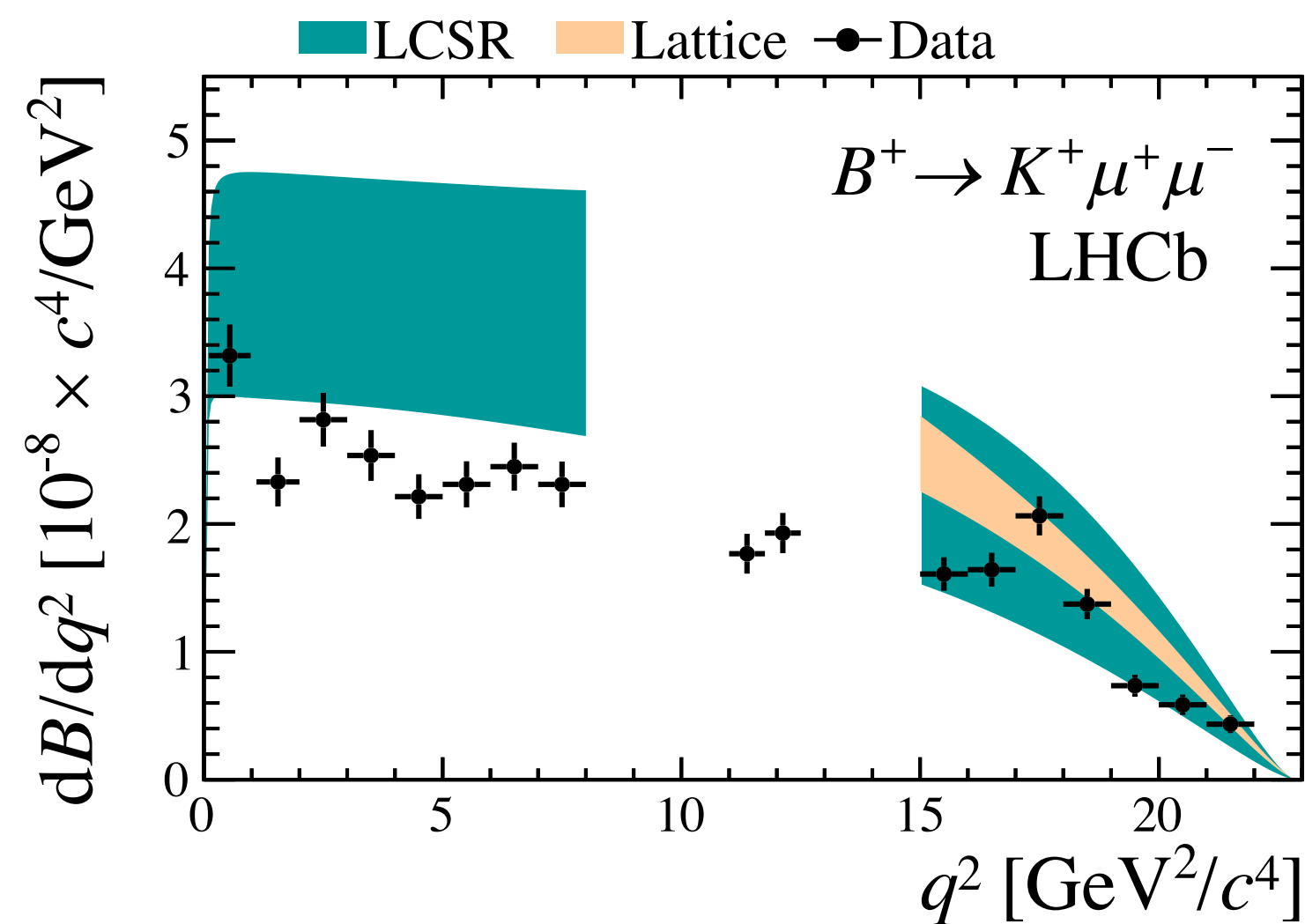
2. Construct Velo modules, electronics and RF box.



Extra: Branching Ratios $b \rightarrow s$ decays

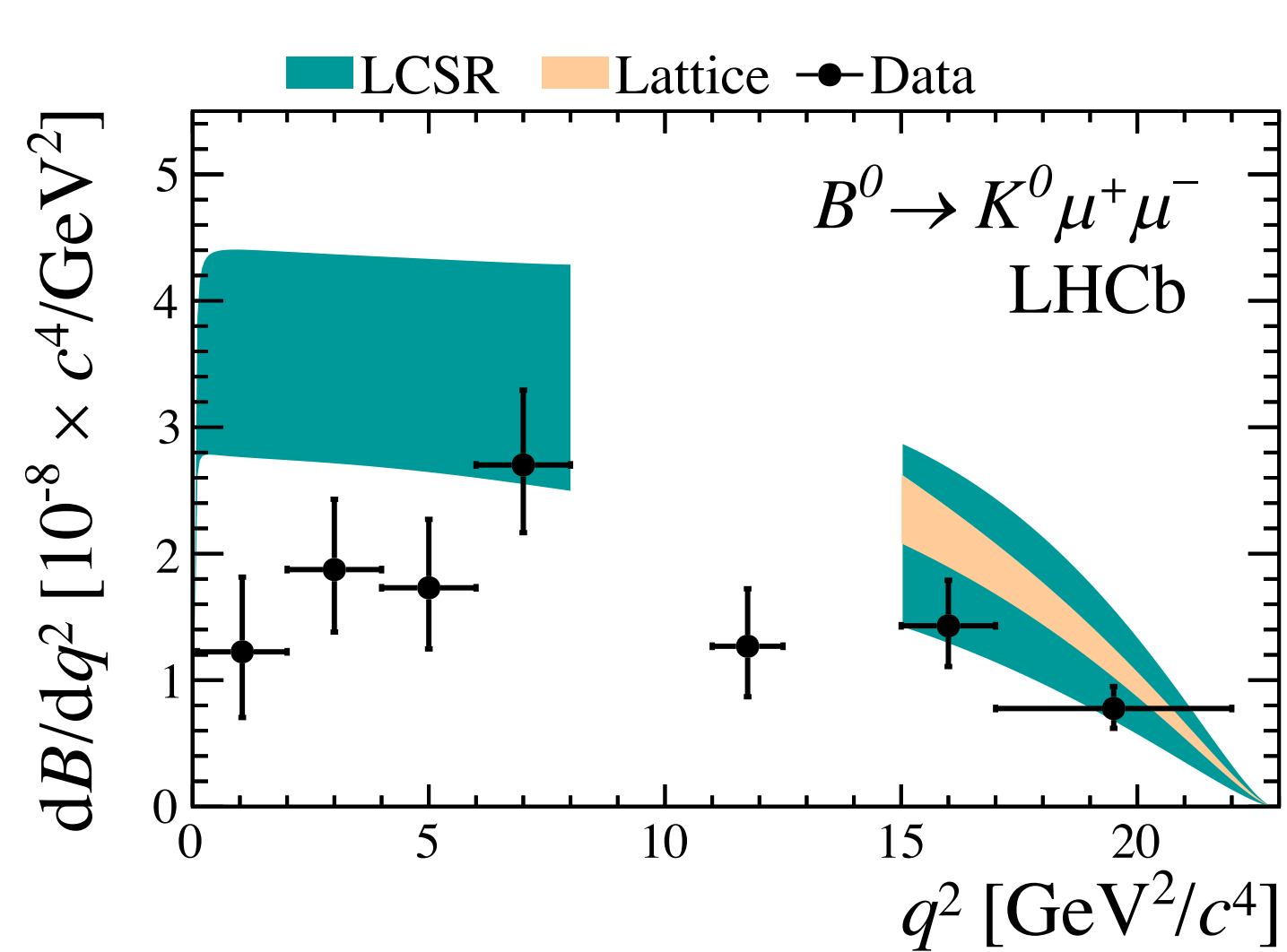
$$B^+ \rightarrow K^+ \mu^+ \mu^-$$

JHEP 06 (2014) 133



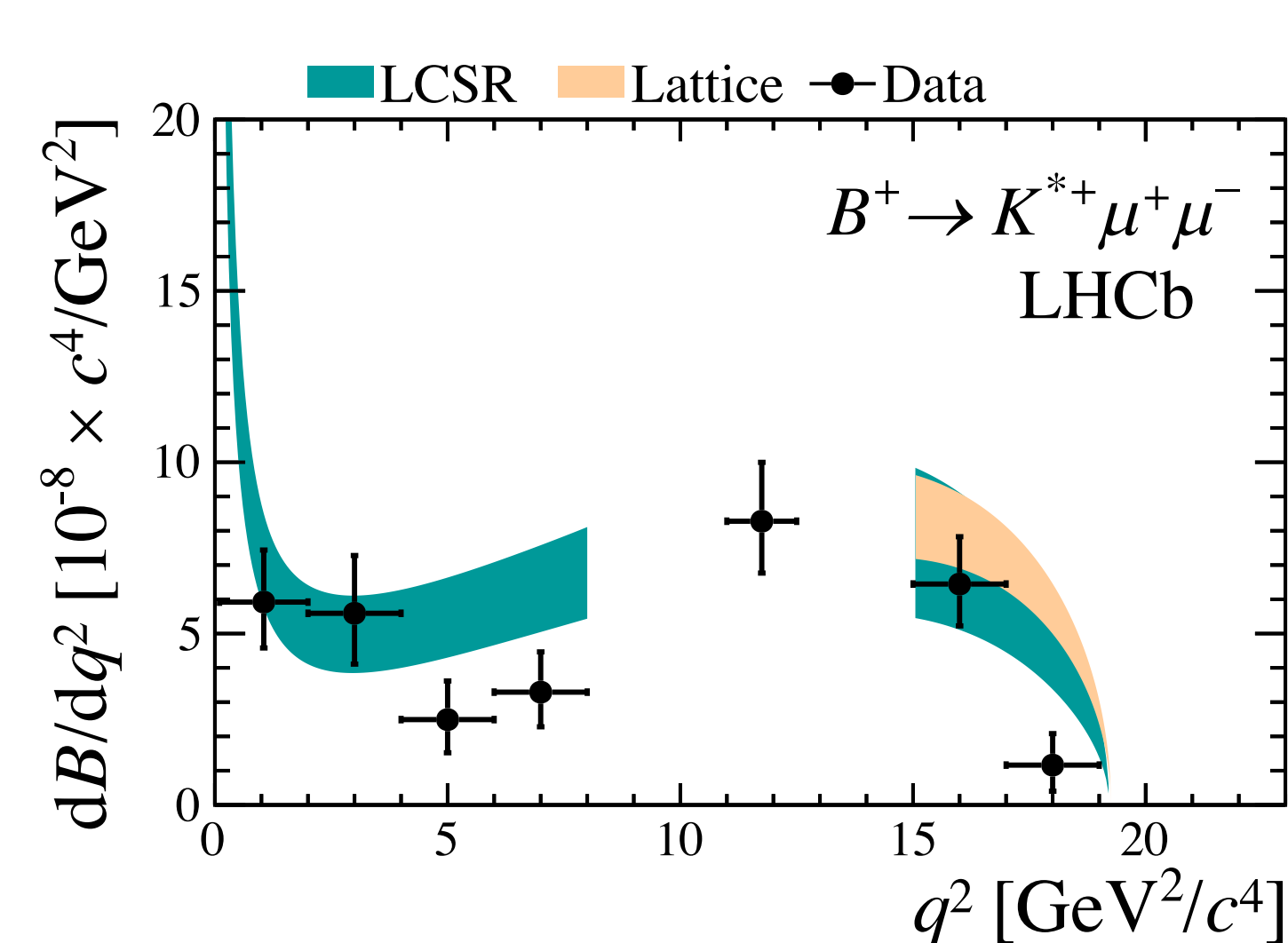
$$B^0 \rightarrow K^0 \mu^+ \mu^-$$

JHEP 06 (2014) 133



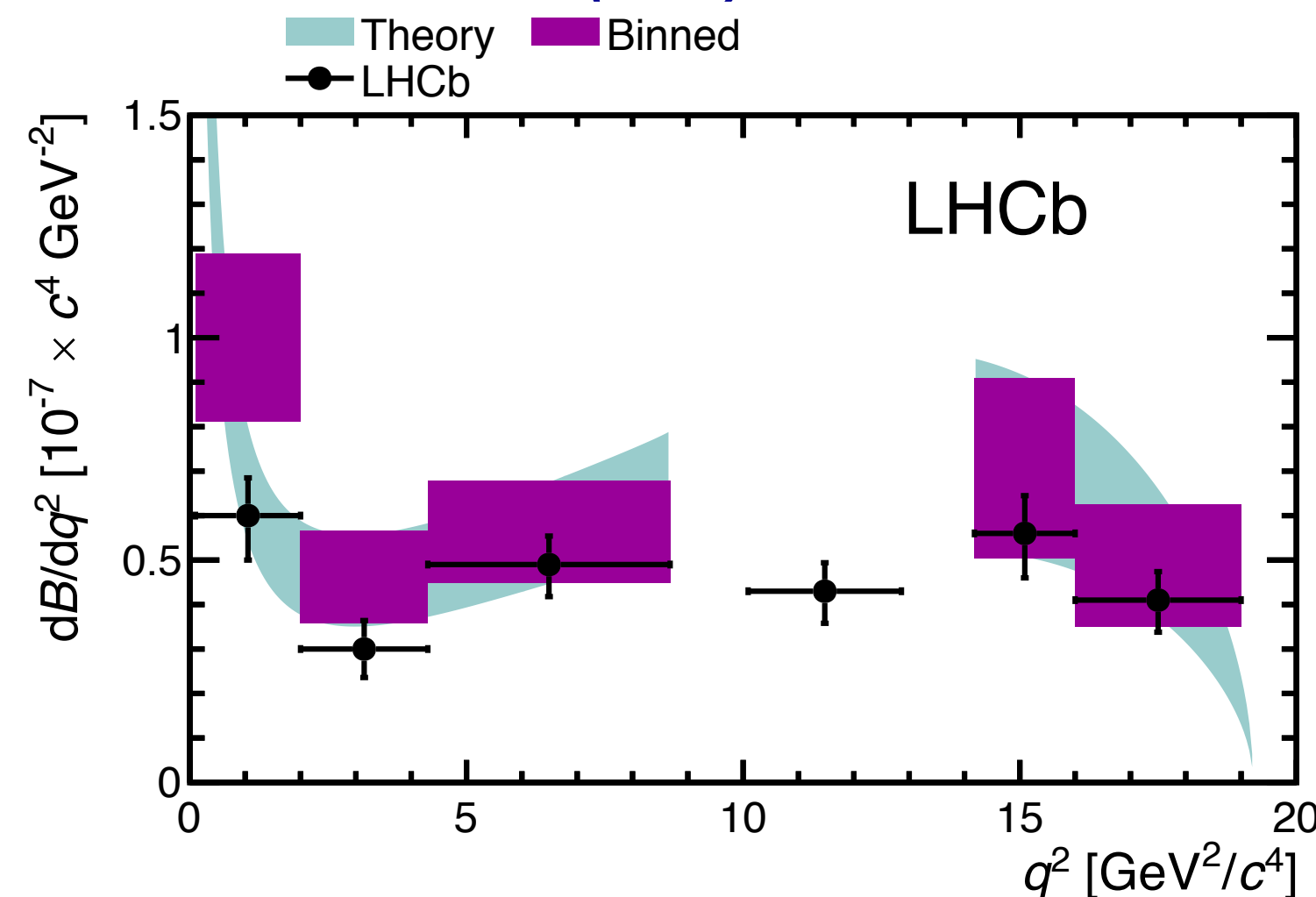
$$B^+ \rightarrow K^{*+} \mu^+ \mu^-$$

JHEP 06 (2014) 133



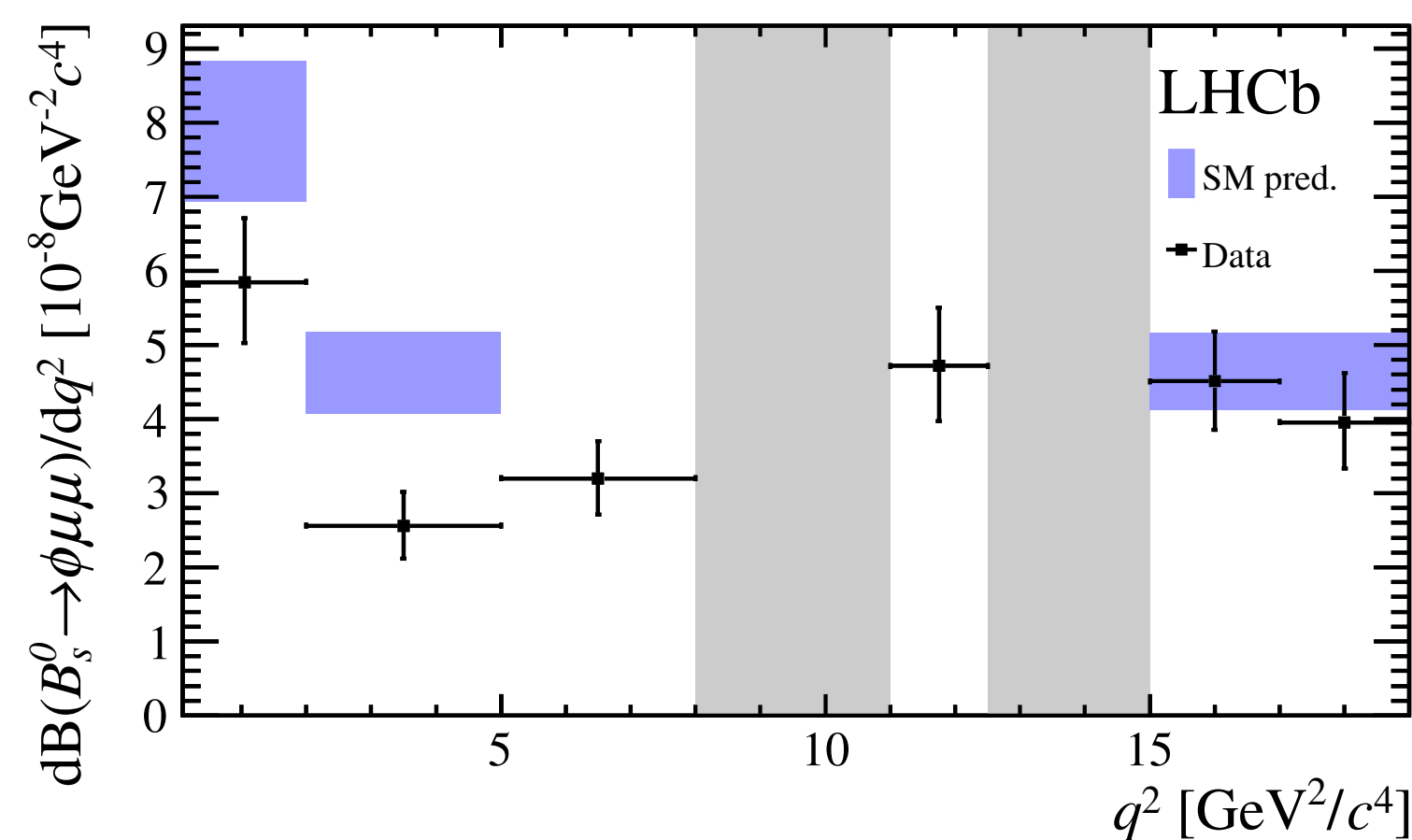
$$B^0 \rightarrow K^{*0} \mu^+ \mu^-$$

JHEP 08 (2013) 131



$$B_s \rightarrow \phi \mu^+ \mu^-$$

JHEP 09 (2015) 179



$$\Lambda_b \rightarrow \Lambda \mu^+ \mu^-$$

JHEP 06 (2015) 115

