



EPFL Testing Lepton Flavour Universality in $b \rightarrow s\ell\ell'$ decays at LHCb

What is Lepton Flavour Universality (LFU)?

For the Standard Model of particle physics the 3 lepton generations are identical except for their masses.

LHCb is the 'precision experiment' of the Standard Model, with a goal of e.g. 1% (with a precision of 0.5% on relative BR).

Standard Model: $b \rightarrow s\ell\ell'$ decays

New Physics: $b \rightarrow s\ell\ell'$ decays

Why $b \rightarrow s\ell\ell'$ decays?

Present theory models cannot be used to study LFU. We need full amplitude knowledge at 10^4 GeV to see physics contributions. Any particle can enter loop diagrams.

How to test LFU?

With values of branching fractions, etc.

Why the LHCb detector?

Single arm forward spectrometer

Specialised to precision measuring $b \rightarrow s$ decays

Reconstructed to precision between signal and background

Small contributions from QCD non-resonant decays

Abundant identification of identified particles

40,000 to 100,000 events from $b \rightarrow s\ell\ell'$ decays

A specific decay: $b \rightarrow s\ell\ell'$

Measurement of $BR(b \rightarrow s\ell\ell')$ using the measured high- q^2 $b \rightarrow s\ell\ell'$ decays

For $b \rightarrow s\ell\ell'$ decays, the high- q^2 region is the most sensitive to new physics

For $b \rightarrow s\ell\ell'$ decays, the high- q^2 region is the most sensitive to new physics

Yields from fits

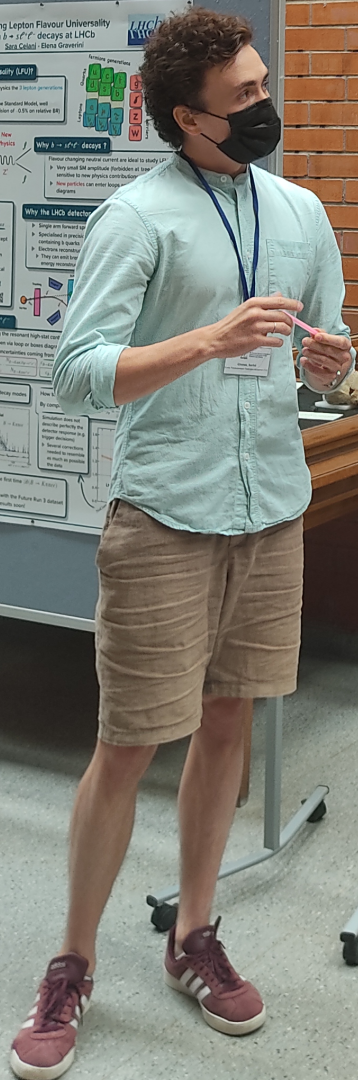
Fit to the $B \rightarrow s\ell\ell'$ decays in the high- q^2 region

Outlook

Presented abstracts to be reviewed for the 14th Int. Symp. on Heavy Flavor Physics (SHFLP) in the summer of 2022

More abstracts will be presented with the Future Bc_s Collaboration

Collaboration will be working with the Future Bc_s Collaboration



EPFL Evaluation of the PETsys TOPPETZ ASIC SiPM Readout System in the Scintillating Fibre Tracker (ScFi) prototype

Señal Cholak (senal.cholak@com.uchicago.edu) on behalf of EPFL SND group

Evaluation of parameters of the following configuration:

- Low-mass Scintillating Fibre Tracker (ScFi) technology
- Silicon Photomultiplier (SiPM)
- PETsys TOPPETZ ASIC Evaluation Kit (e-kit)

Forming together a 128 channels tracker prototype with readout from both sides

total area: 42.42 cm²
128 channels
256 pads
100 pads per channel
pad size: 17.5 μm x 14.2 μm

Timing calibration

The absolute time measured by each channel is not the same by default. These time offsets are measured with a laser. Illustrating each channel - Absolute offsets remain constant in time.

Energy calibration

Energy thresholds are calibrated with a dark current rate scan technique. Energy is measured in QDC and TOT modes. Linearity of both methods is verified with injections of electrical pulses.

Coincidence time resolution measurement

We evaluate the CTR in setup with a ²²Na source. Signals arrived to both sides are clustered and evaluated. Achieving 300 ps CTR on -5σ clusters!

Does this ASIC fit to our detector?

From the prototype to employment at SND

ScFi tracker module of the SND@LHC experiment is designed and assembled at EPFL. TOPPETZ ASIC is used for the readout FEBs. To be installed already this September!

SciFi

SciFi Detector Upgrade

SciFi components

Assembly

Commissioning

POCO
SHOT ON POCO M2 PRO