

Wrap-up

GDR-Intensity workshop:

Virtual b-baryon fest



November 5 - 6, 2020

IJCLab, Orsay (France)

Bâtiment 100 - Salle des Conseils
15 rue Georges Clémenceau
91405 Orsay, France

Organising committee :

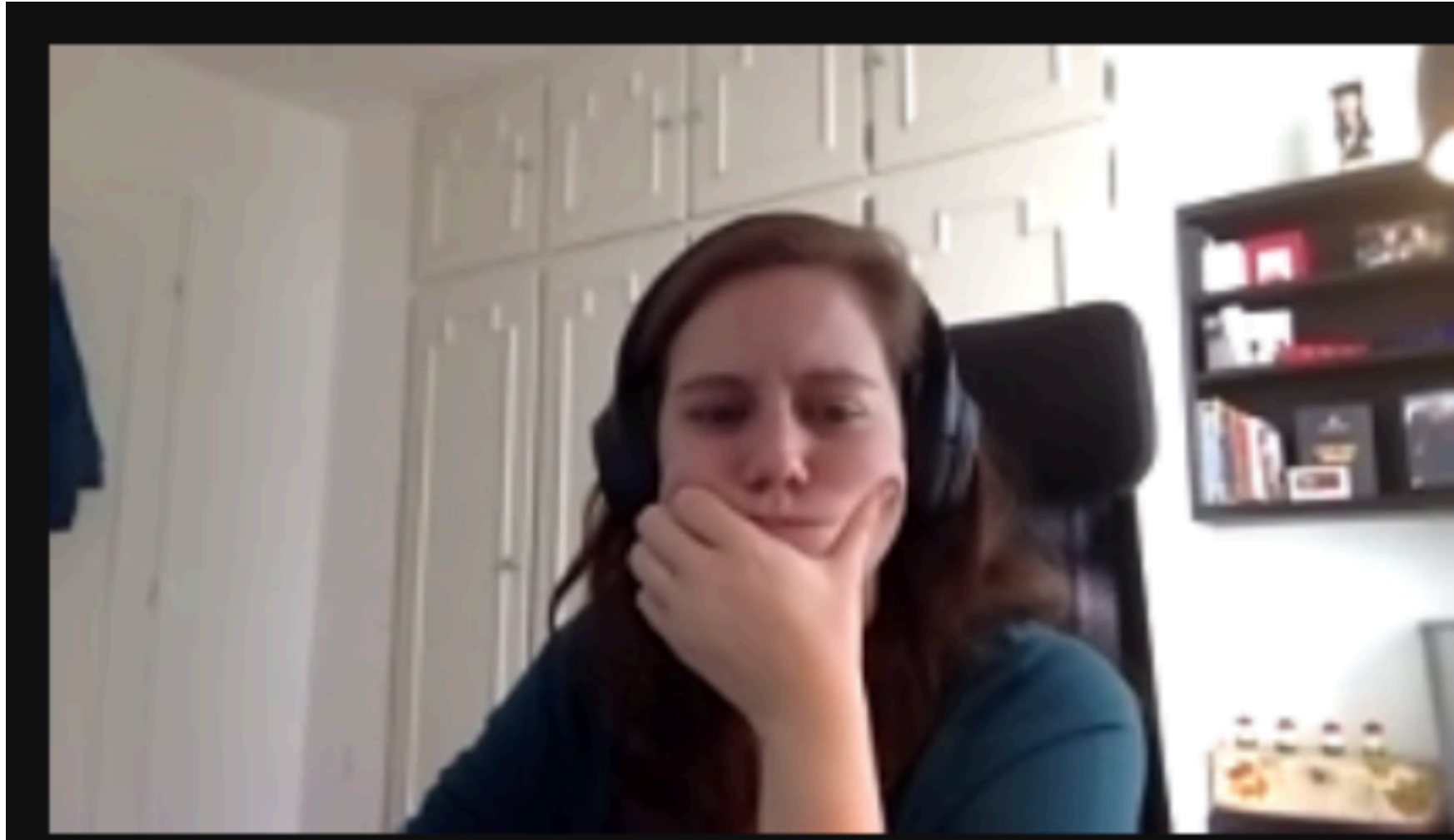
Yasmine Amhis
Sébastien Descotes-Genon
Carla Marin Benito
Danny van Dyk

Proposal for naming our little community

“b-baryon freaks”

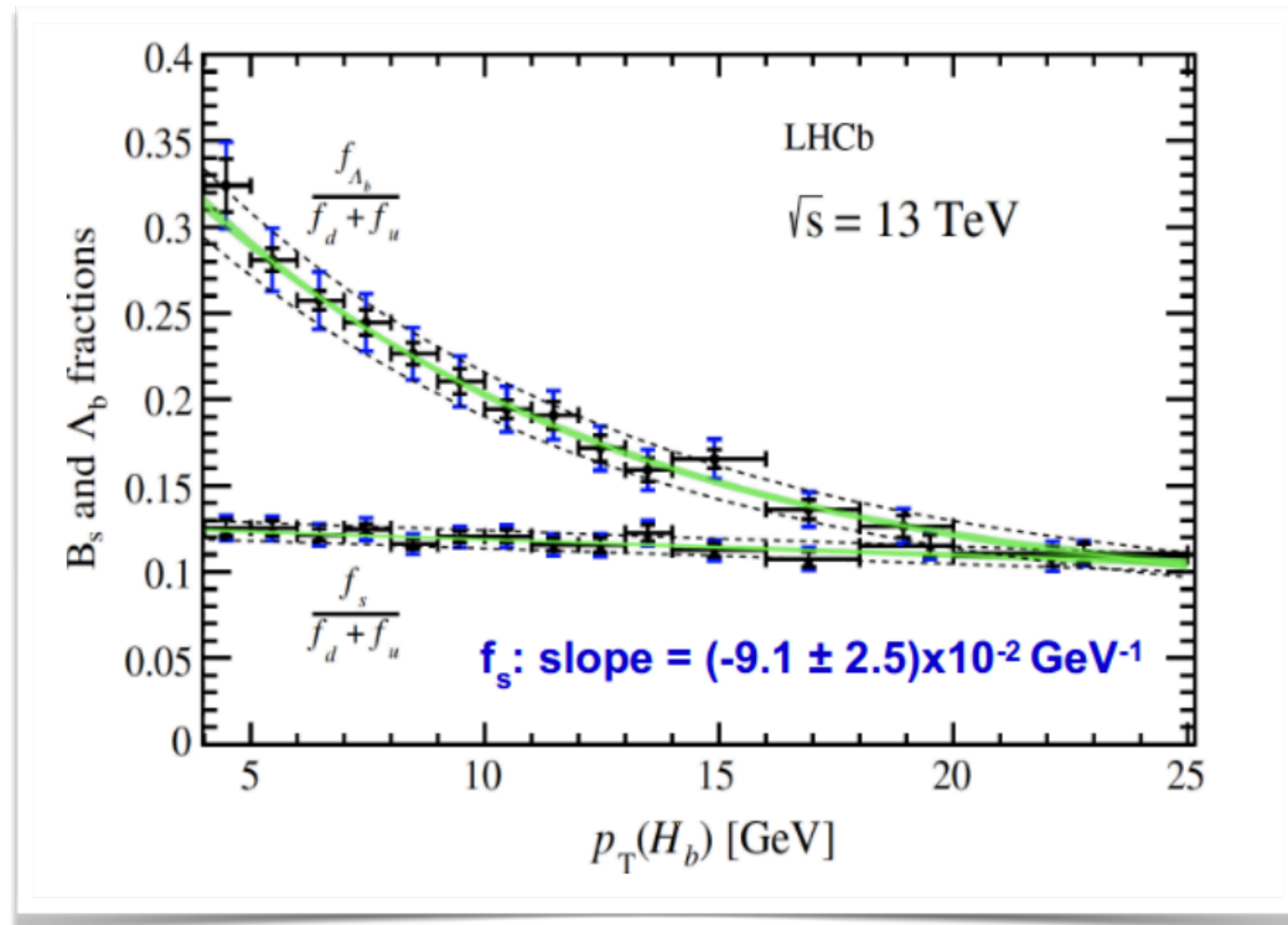


Your very focused hosts



have been paying attention...

Vitali
wishes to see this
also for Ξ_b^- and Σ_b^-



$$\mathcal{R}_{2^{1+}/P} = \frac{\mathcal{B}(\Lambda_b^0 \rightarrow \Lambda_c^+ K^-)}{\mathcal{B}(\bar{B}^0 \rightarrow D^+ K^-)}$$

$$\mathcal{R}_{2^{1+}/V} = \frac{\mathcal{B}(\Lambda_b^0 \rightarrow \Lambda_c^+ K^-)}{\mathcal{B}(\bar{B}^0 \rightarrow D^{*+} K^-)}$$

Tobias hopes that LHCb
will measure these ratios.

Carla wonders
what uncertainties
to expect here?

- Λ_b fragmentation fraction f_{Λ_b} can be determined from hadronic decays by means of our results once data becomes available

“shocking slide!”

- "chiral-odd" LCDAs:

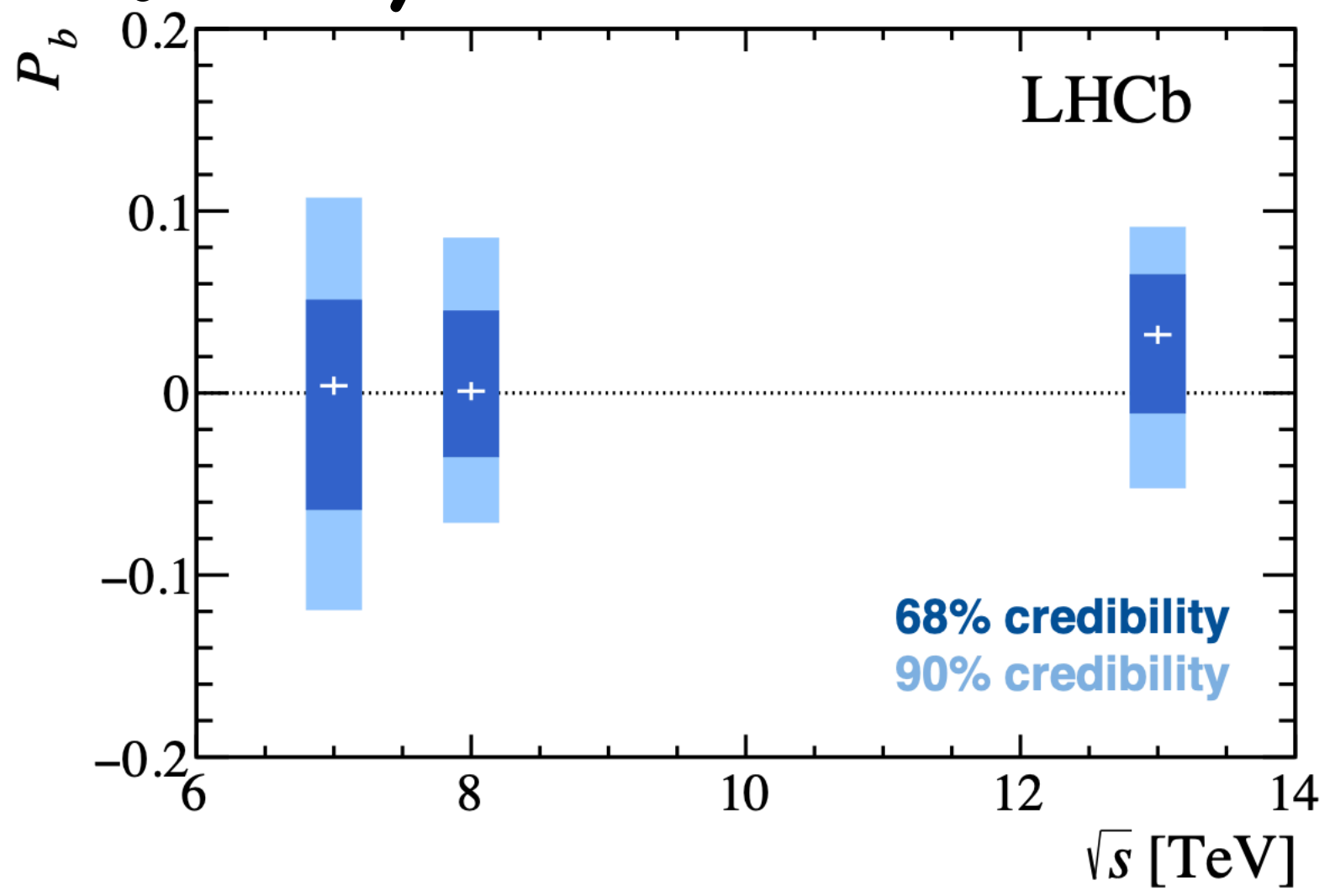
$$\begin{aligned}\epsilon^{abc} \langle 0 | u^a(\tau_1 n) C \gamma_5 \not{n} d^b(\tau_2 n) h_V^c(0) | \Lambda_b(v, s) \rangle &= f_{\Lambda_b}^{(2)} \tilde{\phi}_2(\tau_1, \tau_2) u_{\Lambda_b}(v, s) \\ \epsilon^{abc} \langle 0 | u^a(\tau_1 n) C \gamma_5 \not{\bar{n}} d^b(\tau_2 n) h_V^c(0) | \Lambda_b(v, s) \rangle &= f_{\Lambda_b}^{(2)} \tilde{\phi}_4(\tau_1, \tau_2) u_{\Lambda_b}(v, s)\end{aligned}$$

- "chiral-even" LCDAs:

$$\begin{aligned}\epsilon^{abc} \langle 0 | u^a(\tau_1 n) C \gamma_5 d^b(\tau_2 n) h_V^c(0) | \Lambda_b(v, s) \rangle &= f_{\Lambda_b}^{(1)} \tilde{\phi}_3^S(\tau_1, \tau_2) u_{\Lambda_b}(v, s) \\ \epsilon^{abc} \langle 0 | u^a(\tau_1 n) C \gamma_5 \frac{i \sigma_{\mu\nu} \bar{n}^\mu n^\nu}{4} d^b(\tau_2 n) h_V^c(0) | \Lambda_b(v, s) \rangle &= f_{\Lambda_b}^{(1)} \tilde{\phi}_3^\sigma(\tau_1, \tau_2) u_{\Lambda_b}(v, s)\end{aligned}$$

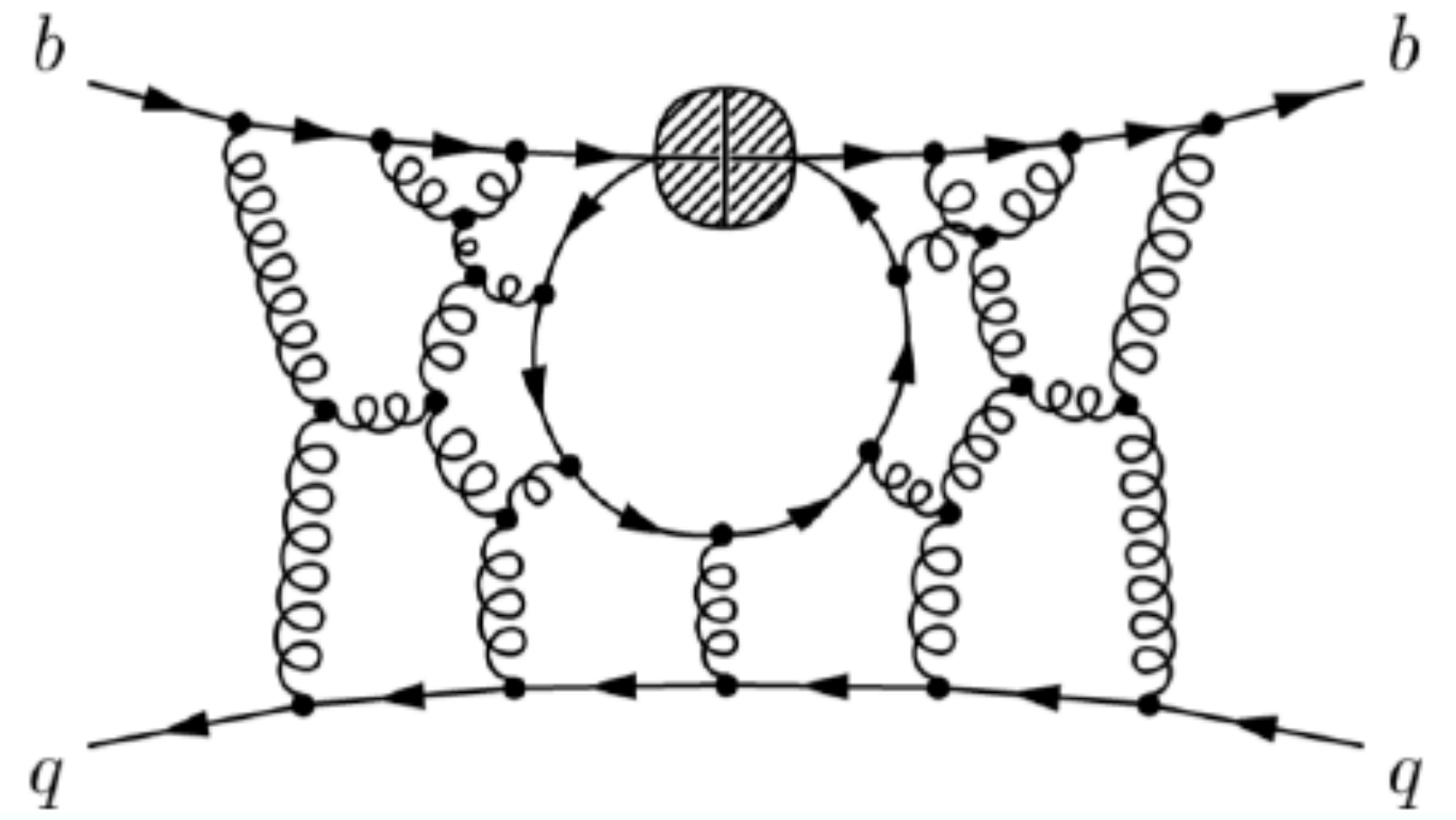
Danny wonders if the N_b polarisation could be measured as a function of P_L and η

LHCb [JHEP 06 (2020) 110]



Looking forward to seeing the impact of this contribution on the Λ_b lifetime.

2. Non-perturbative analogue: Eye contractions



Comparison to theory predictions

Measured its $BR(\Lambda_b \rightarrow \Lambda^0 \gamma)$ for the first time:

$$B(\Lambda_b^0 \rightarrow \Lambda \gamma) = (7.1 \pm 1.5 \pm 0.6 \pm 0.7) \times 10^{-6}$$

Theory predictions:

Wang, Li, Lu	Light-cone sum rules	2009	$6.3^{+1.7}_{-1.2}$ (twist 3), 7.3 ± 1.5 (twist 6)
Mannel, Wang	Heavy quark limit	2011	$7.7^{+2.2}_{-1.9}$
Gan, Liu, Chen, Huang	Light-cone sum rules	2012	$0.61^{+0.14}_{-0.13}$ (Ioffe), $19.9^{+3.4}_{-3.1}$ (CZ)
Gutsche et al.	Cov constituent q model	2013	4
Faustov, Galkin	Relativistic quark model	2017	10

Can we learn something about FF by measuring $\frac{\Lambda_b \rightarrow \Lambda(1520)\gamma}{\Lambda_b \rightarrow \Lambda\gamma}$?

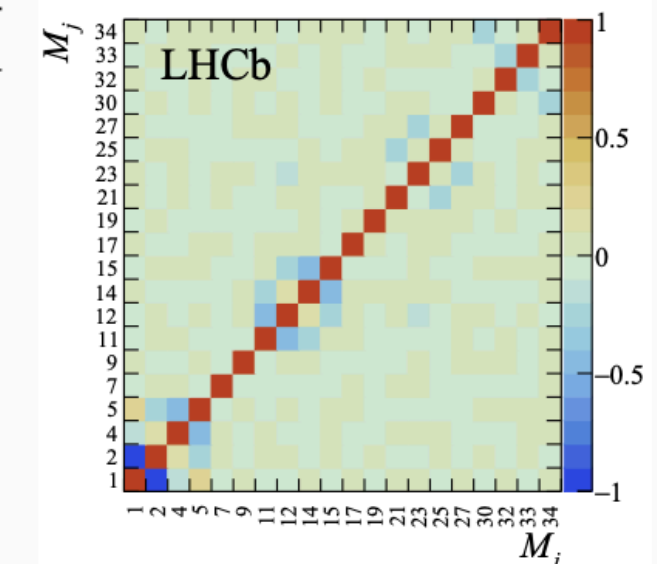
Looking forward to seeing the potential of CMS!

- B-parked data set opens several prospects for b baryon studies
- The possibility to continue B-parking efforts in Run-3 is currently under discussion

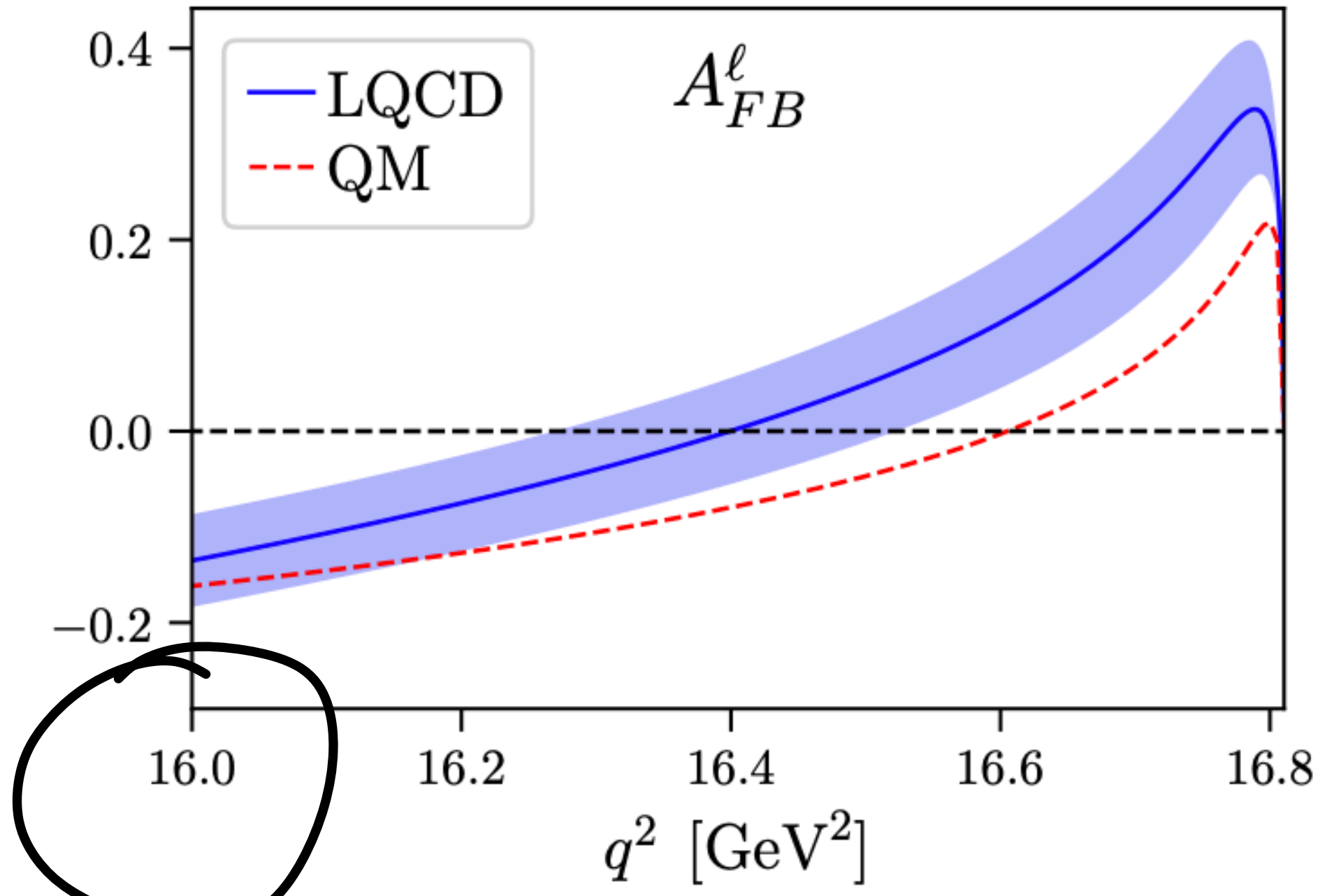
For his birthday Danny would like to see also the regular with analysis of modes with $\Psi(2S)$

- ▶ full angular distribution of $\Lambda_b \rightarrow \Lambda(\rightarrow p\pi)J/\psi$ recently measured for the first time [LHCb PAPER-2020-005 2004.10563]
- ▶ measurements constrain residues of the non-local matrix elements

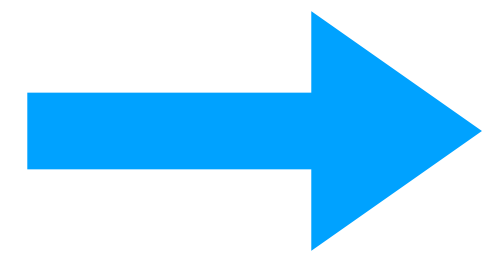
	7 TeV	8 TeV	13 TeV
M_1	$0.374 \pm 0.007 \pm 0.003$	$0.373 \pm 0.004 \pm 0.002$	$0.380 \pm 0.003 \pm 0.001$
M_2	$0.253 \pm 0.014 \pm 0.005$	$0.254 \pm 0.008 \pm 0.003$	$0.239 \pm 0.006 \pm 0.002$
M_4	$-0.286 \pm 0.017 \pm 0.008$	$-0.268 \pm 0.011 \pm 0.009$	$-0.273 \pm 0.008 \pm 0.006$
M_5	$-0.157 \pm 0.025 \pm 0.008$	$-0.181 \pm 0.015 \pm 0.007$	$-0.179 \pm 0.011 \pm 0.005$
M_7	$0.051 \pm 0.029 \pm 0.005$	$0.025 \pm 0.018 \pm 0.003$	$0.022 \pm 0.013 \pm 0.002$
M_9	$-0.017 \pm 0.029 \pm 0.005$	$-0.011 \pm 0.018 \pm 0.003$	$-0.027 \pm 0.013 \pm 0.002$
M_{11}	$0.005 \pm 0.014 \pm 0.004$	$0.003 \pm 0.009 \pm 0.004$	$-0.005 \pm 0.006 \pm 0.002$
M_{12}	$-0.004 \pm 0.018 \pm 0.005$	$0.010 \pm 0.011 \pm 0.004$	$0.006 \pm 0.008 \pm 0.003$
M_{14}	$0.007 \pm 0.025 \pm 0.007$	$-0.015 \pm 0.016 \pm 0.007$	$-0.009 \pm 0.012 \pm 0.003$
M_{15}	$-0.027 \pm 0.032 \pm 0.008$	$0.009 \pm 0.021 \pm 0.008$	$-0.006 \pm 0.016 \pm 0.005$
M_{17}	$0.008 \pm 0.039 \pm 0.006$	$-0.002 \pm 0.025 \pm 0.004$	$0.011 \pm 0.018 \pm 0.003$
M_{19}	$-0.006 \pm 0.038 \pm 0.004$	$-0.015 \pm 0.025 \pm 0.004$	$-0.003 \pm 0.018 \pm 0.002$



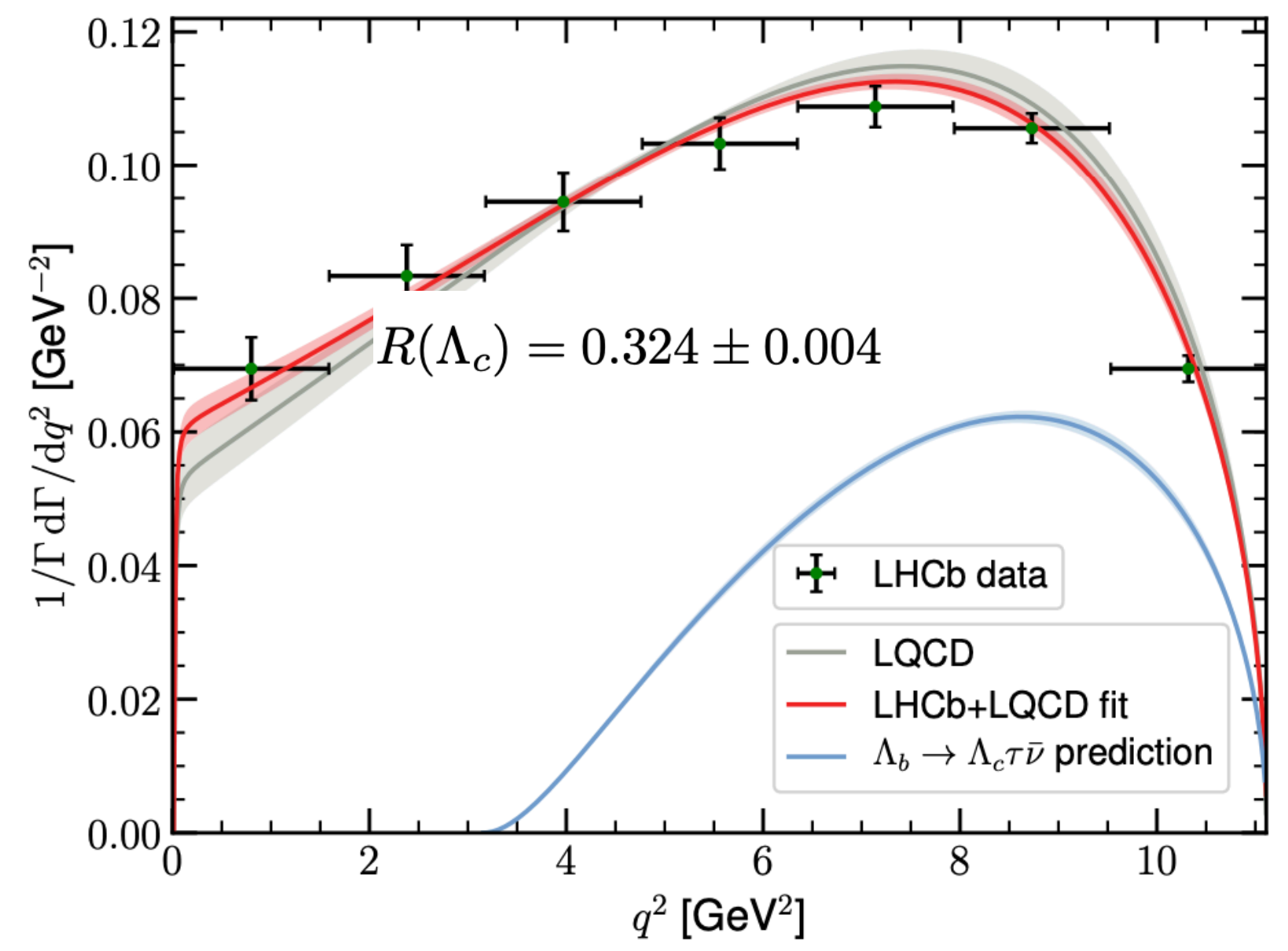
see talk by Tom Blake



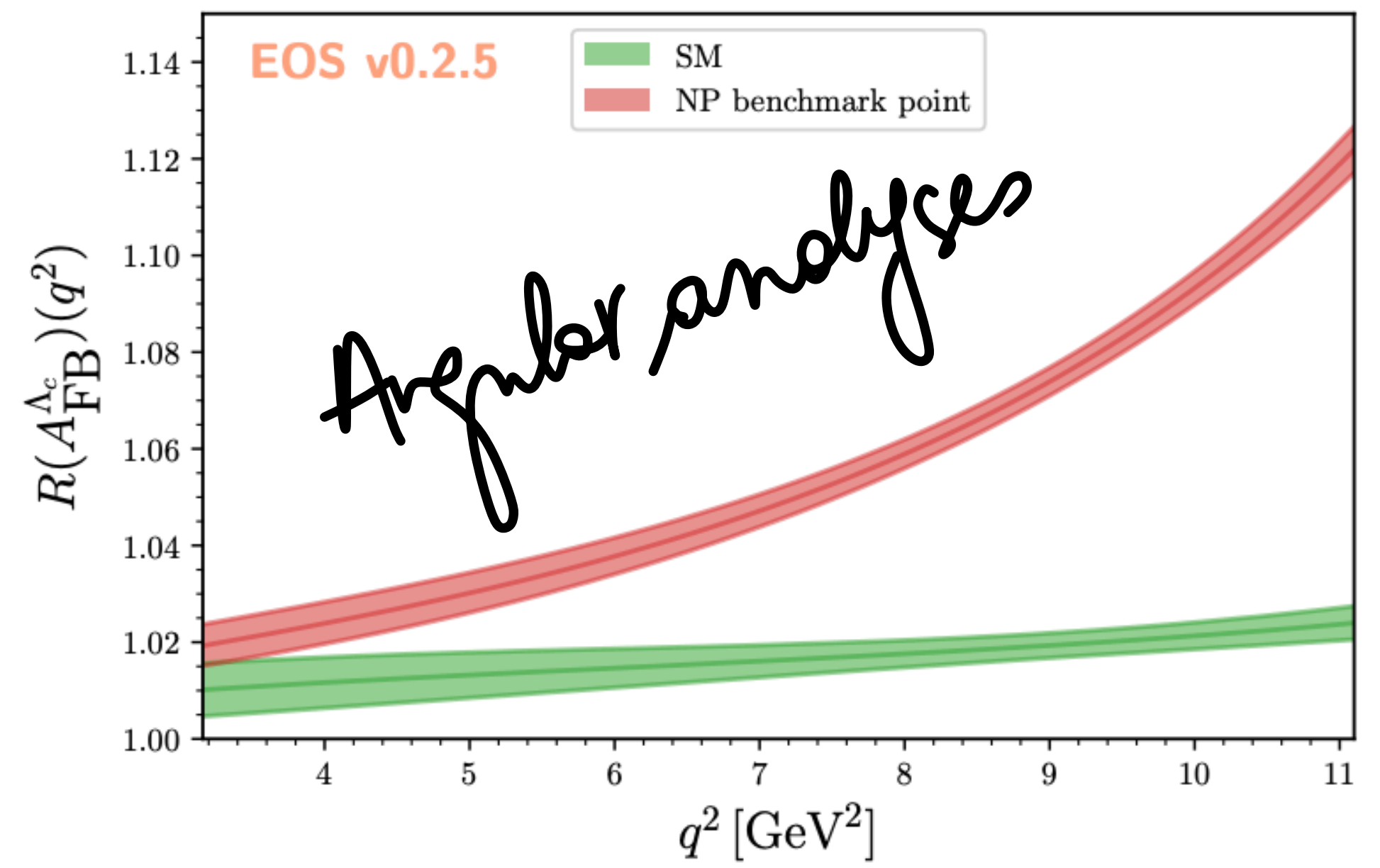
↳ Hope to see predictions for other q^2 regions.



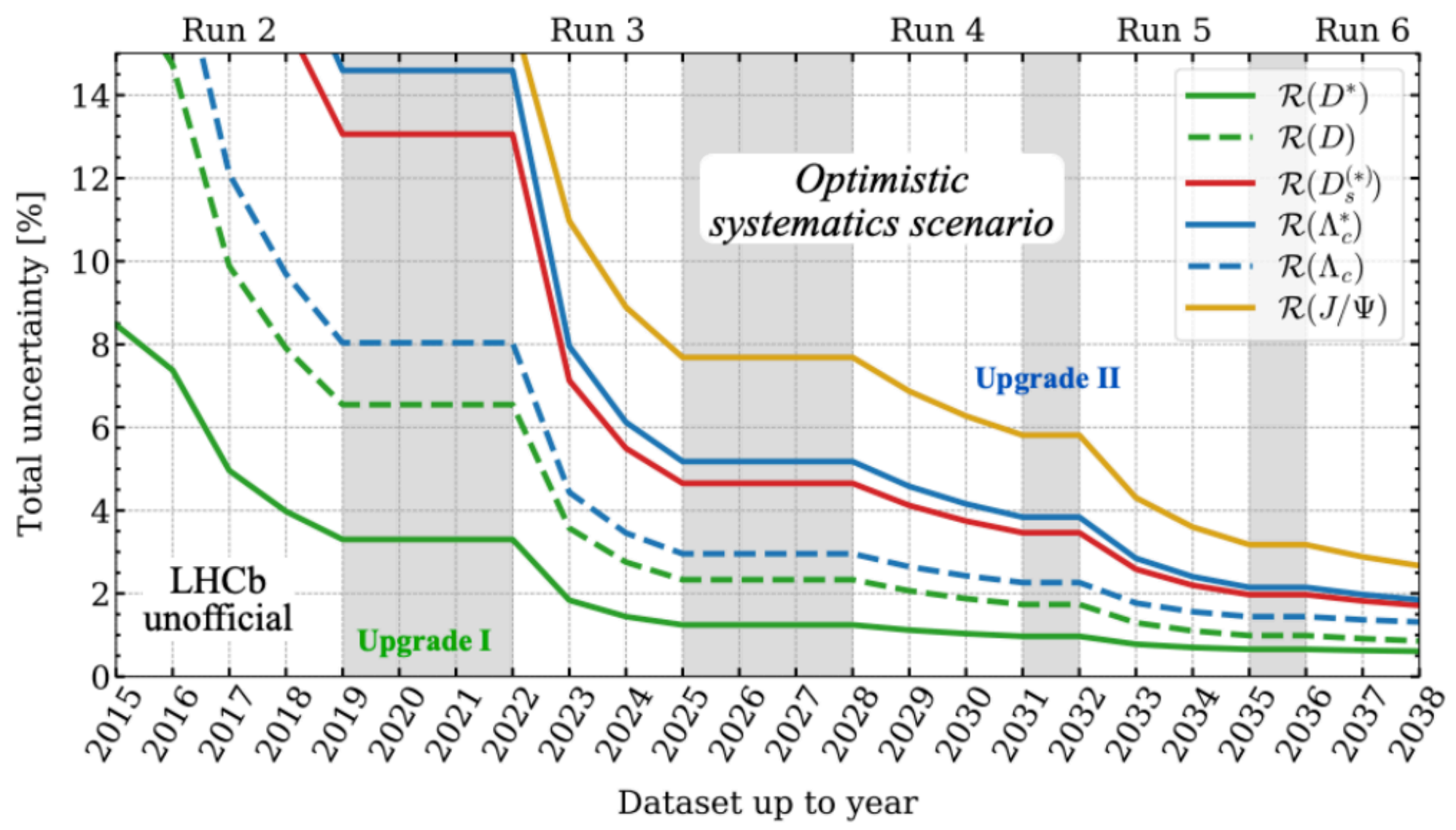
What about
 τ in
 $b \rightarrow c \tau$



$$R(A_{\text{FB}}^{\Lambda_c}) \equiv \frac{[A_{\text{FB}}^{\Lambda_c}]_{\ell=\tau}}{[A_{\text{FB}}^{\Lambda_c}]_{\ell=\mu}}$$

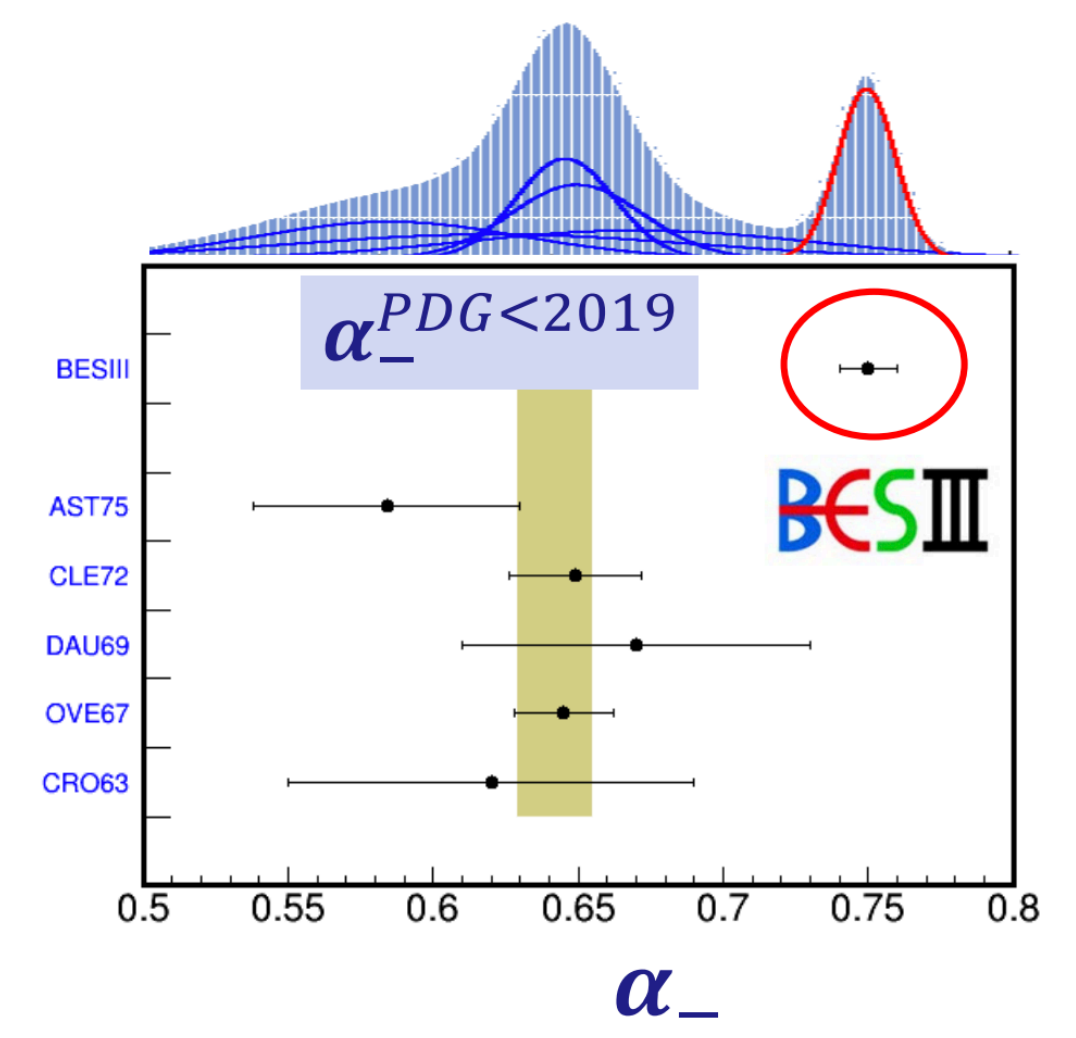


LHCb will be busy for quite some time.

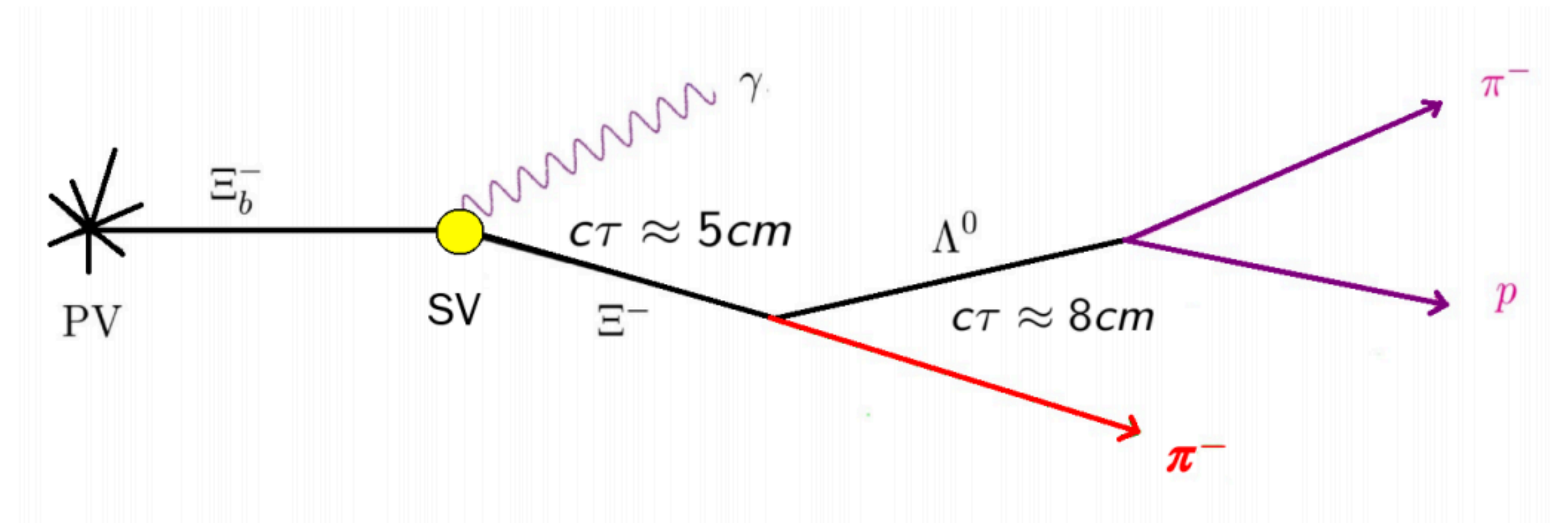
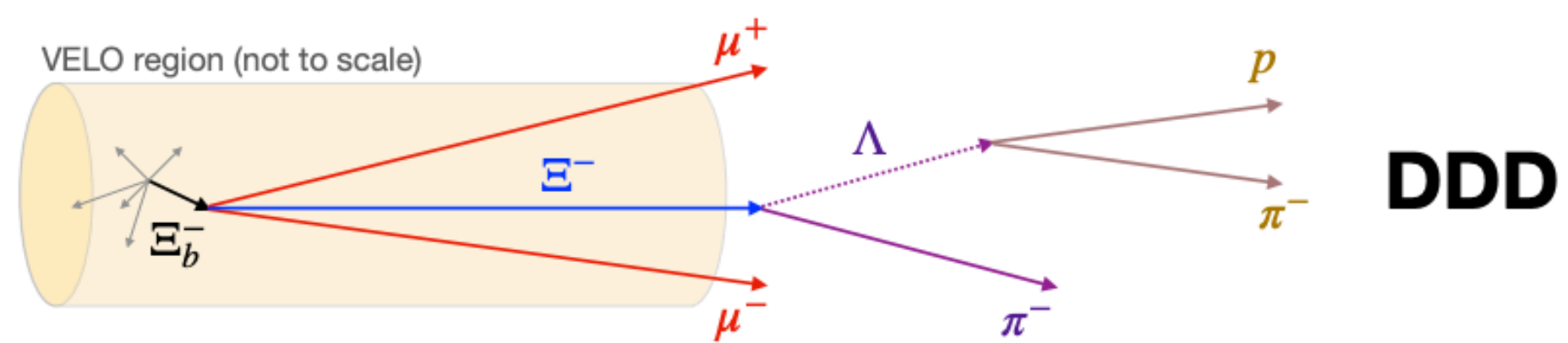
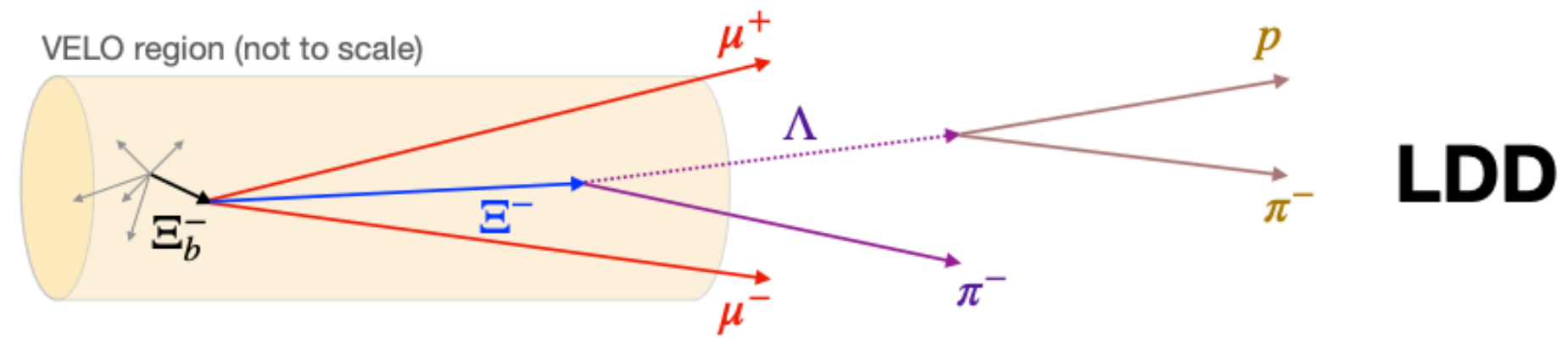
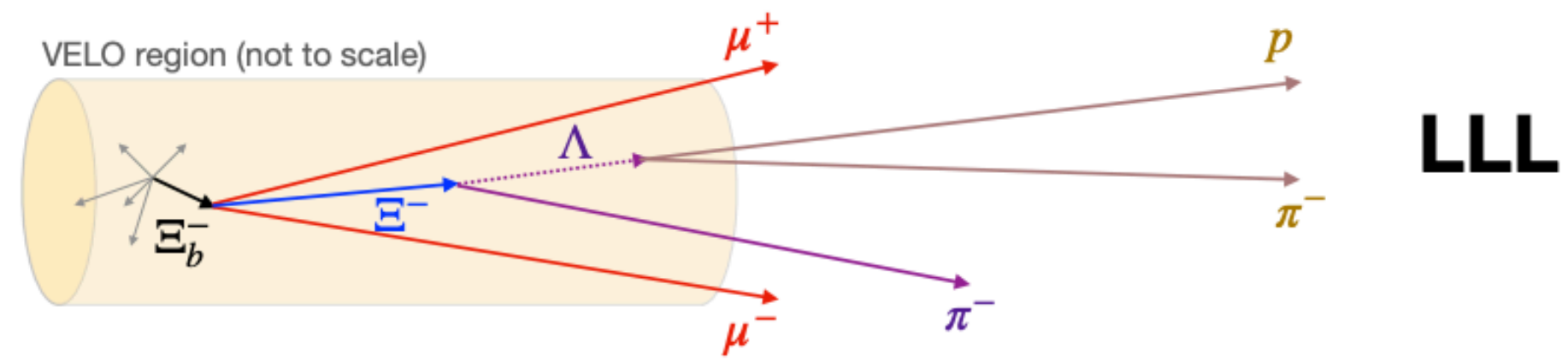


$\Lambda \rightarrow p \pi^- : \alpha_- = 0.750 \pm 0.009 \pm 0.00$

Very important



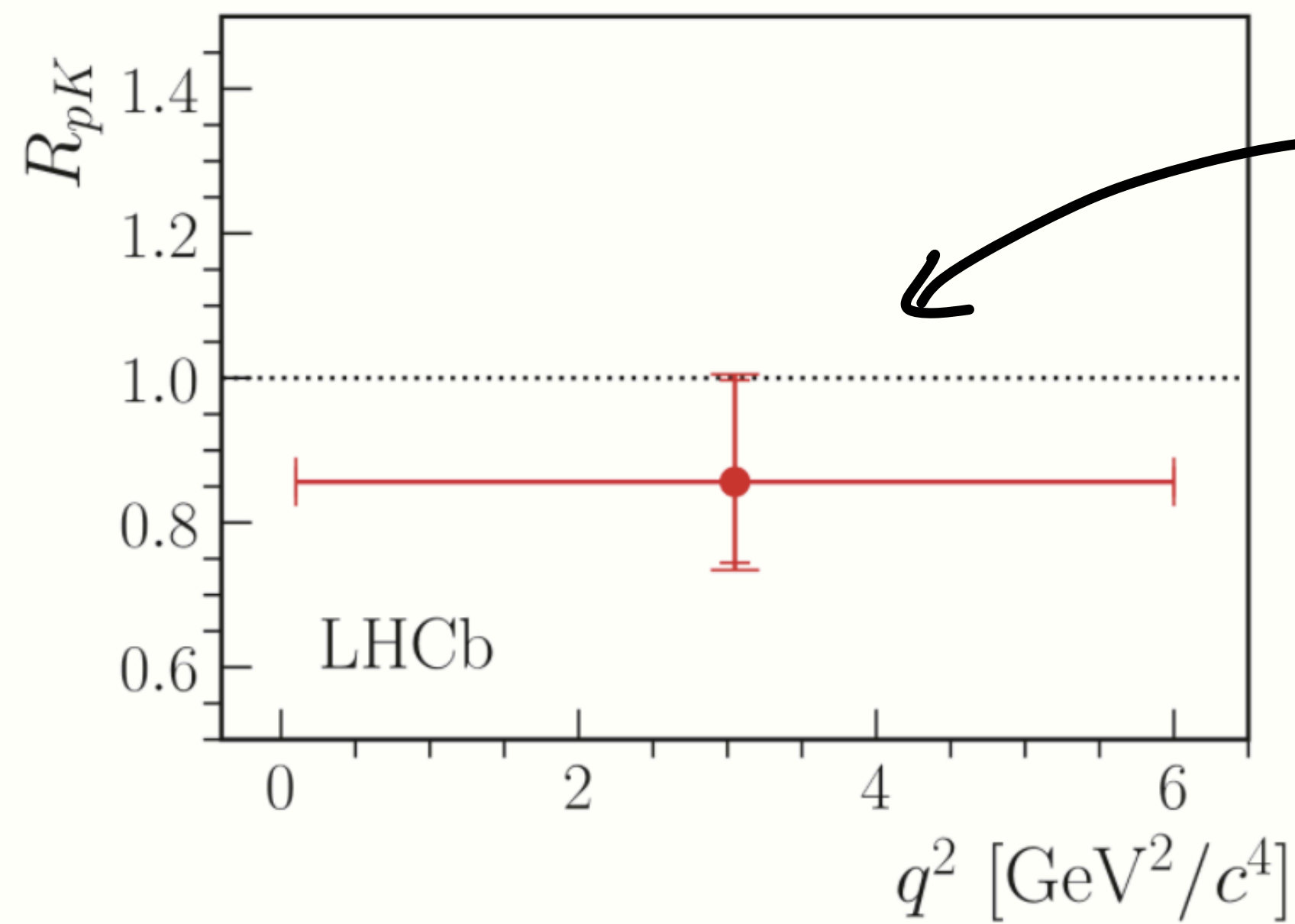
With more data, able to reach more complicated topologies



↳ photon polarisation

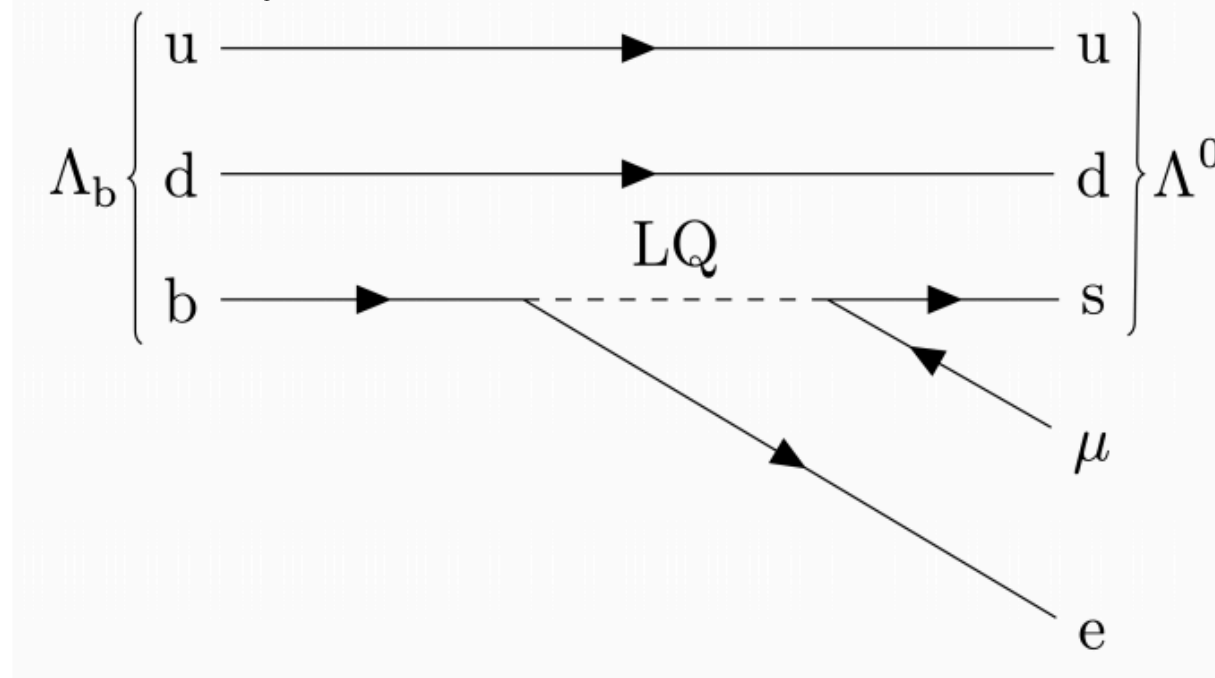
$$\oplus \Omega_b \rightarrow \Omega$$

$$\uparrow 3/2$$

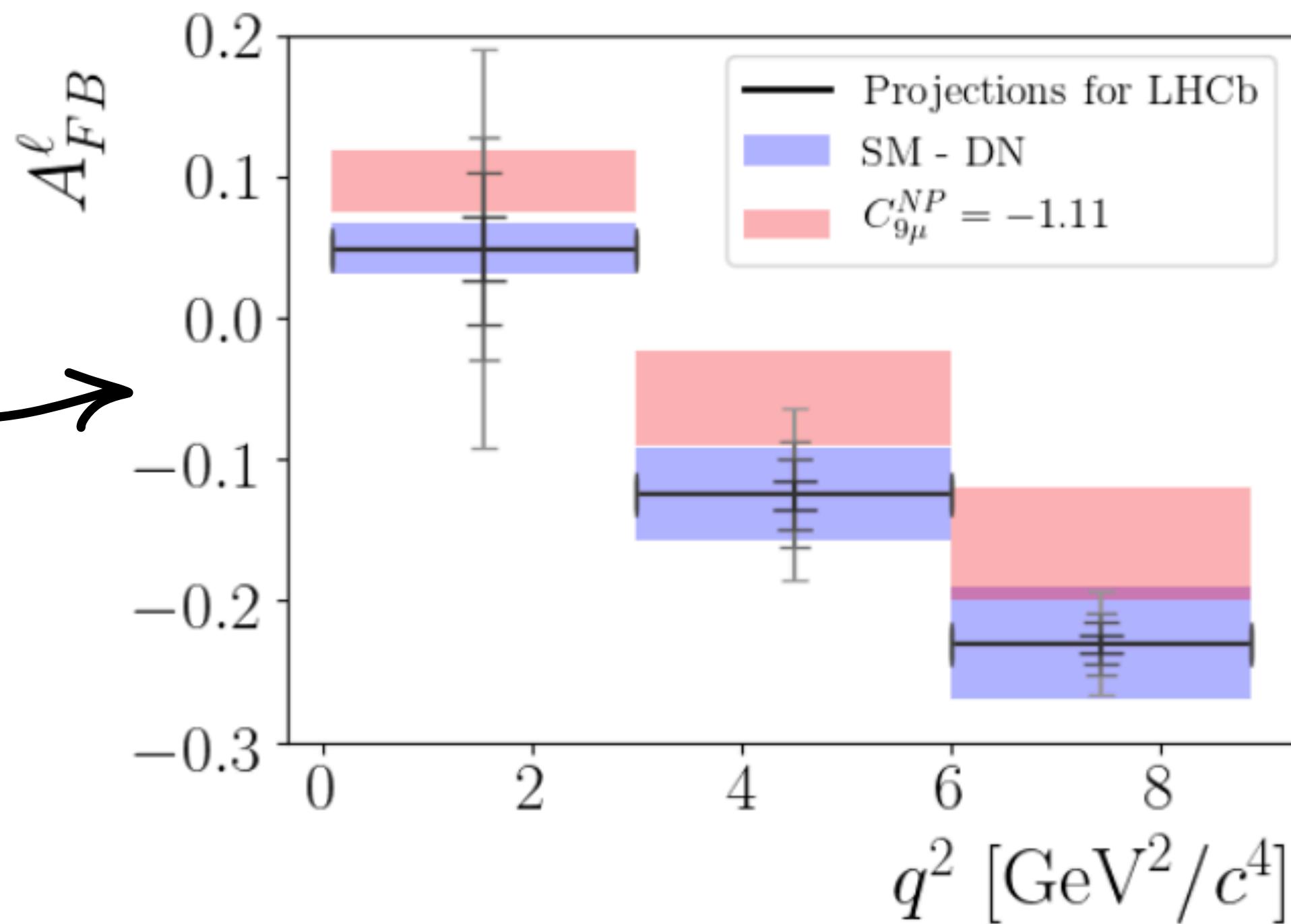


Hope that the central value will not get closer to unity with more data and see R_n .

Natural extensions of this work ↓



Looking forward to the measurements! and theory uncertainties to go down.



Thank you for your participation !

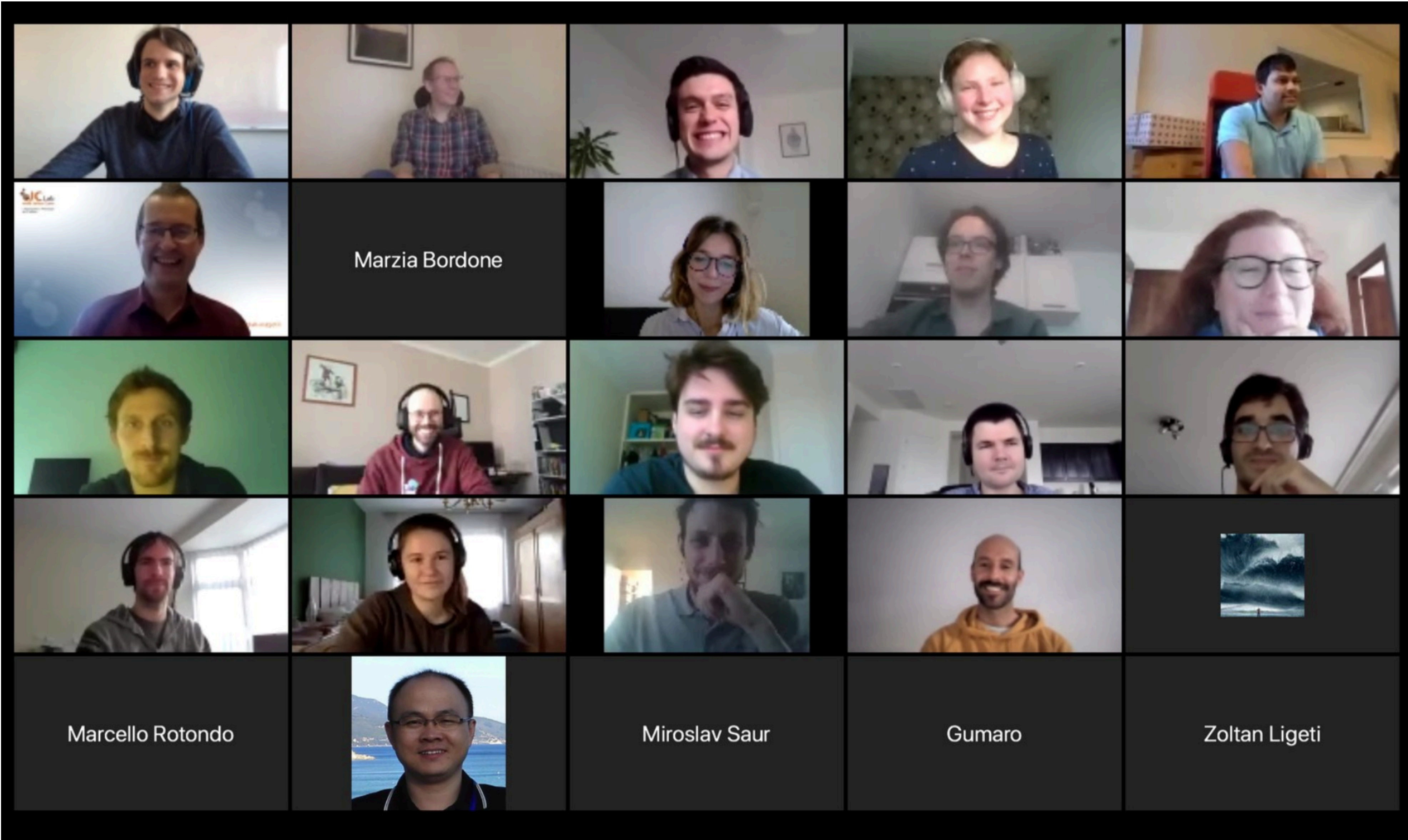


and please stay safe !

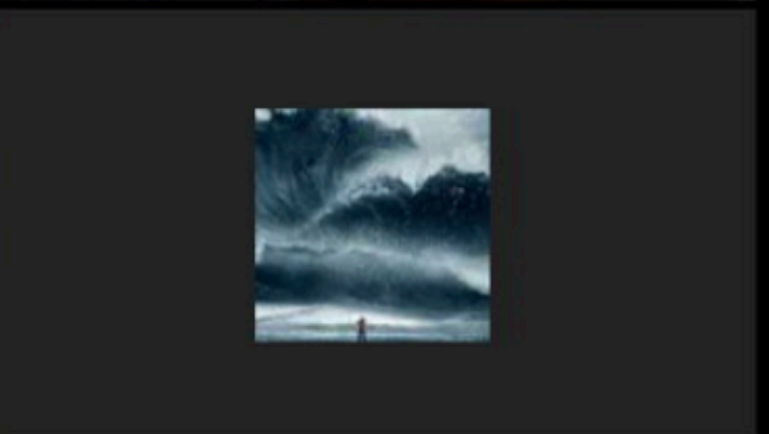
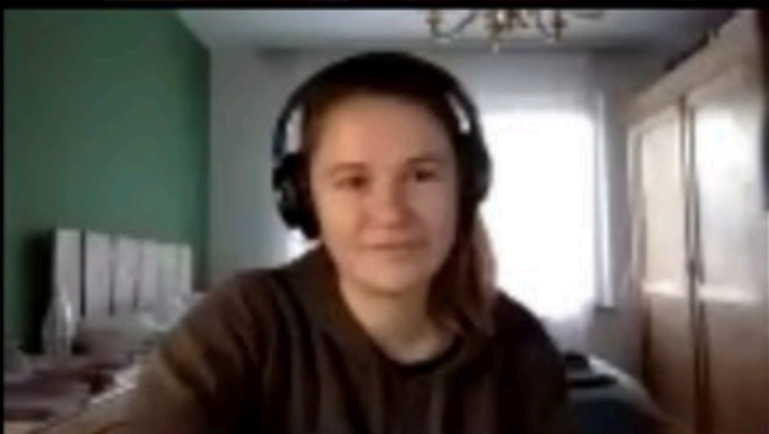
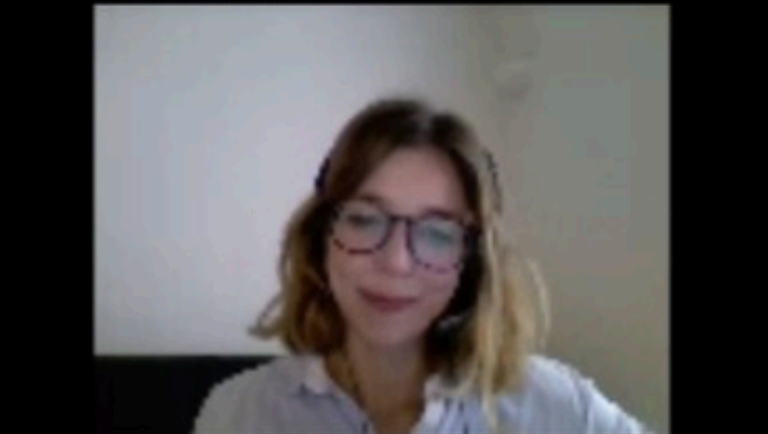
A screenshot of a Zoom meeting grid showing 20 participants in a 4x5 layout. The participants are:

- Row 1: Danny van Dyk, carlamarinbenito, yasmine.sara.amhis@cern.ch, Andrzej Kupsc, mick.mulder@cern.ch
- Row 2: Paul Swallow, thuber, Vitalii Lisovskyi, Tom Blake, mnovoa
- Row 3: Anja Beck, Abhijit Mathad, Sébastien Descotes-Genon, Marzia Bordone, Felicia
- Row 4: Maarten van Veghel, anna.lupato@cern.ch, Philipp Boer, Mat Charles, thomas.peter.jones@cern.ch
- Row 5: Stefan Meinel, Olcyr Sumensari, Luis Miguel Garcia Martin, Janina, Méril Reboud

The bottom control bar includes: Mute, Stop Video, Participants (34), Chat, Share Screen, Record, Reactions, and Leave.



Marzia Bordone



Marcello Rotondo



Miroslav Saur

Gumaro

Zoltan Ligeti

