

Implications wrap-up

Mat Charles (Sorbonne Université / LPNHE)
for the organising committee

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Some numbers

Implications of LHCb measurements and future prospects

16-18 October 2019

CERN

Europe/Zurich timezone

Overview

Timetable

Contribution List

Registration

Participant List

224 participants

First Name

Last Name

Affiliation

- 224 people registered
- 38 speakers
- Typically 15-30 people connected remotely
 - Somewhat fewer at 08:30

Thanks to



- **LHCb Secretariat** (Nathalie, Cindy, Amelie)
 - for handling CERN access, badges, hostel booking validation, welcome drink, booking shuttle, setting up pit visit, ...

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Starts 16 Oct 2019, 08:30

Ends 18 Oct 2019, 14:30

Europe/Zurich



Alexander Lenz

Chris Parkes

Danny van Dyk

Giovanni Passaleva

Guy Wilkinson

Johannes Albrecht

Jure Zupan

Matthew John Charles

Monica Pepe-Altarelli

S Fajfer

Yasmine Sara Amhis

Thanks to



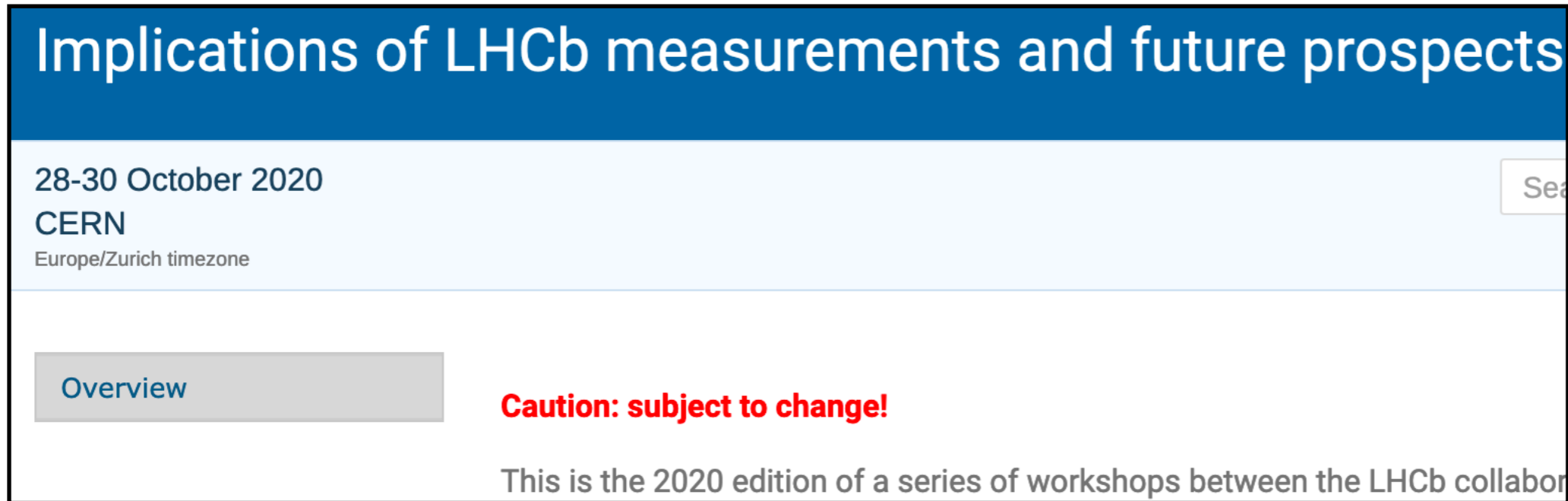
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- **Stream convenors** (Matthew, Fabio, Jinlin, Nathan, Marzia, Peter, Carla, Ricci, Fady, Charlotte, Shanzhen, Feng-Kun, Patricia, Biplab, Tim)
- Mixing and CP violation in Beauty and Charm [[Matthew Kirk](#), [Fabio Ferrari](#), [Jinlin Fu](#), [Nathan Jurik](#), [email all](#)]
- Semileptonic decays, rare decays, and tests of lepton flavour universality [[Marzia Bordone](#), [Peter Stangl](#), [Carla Marin Benito](#), [Ricardo Vazquez Gomez](#), [email all](#)]
- Electroweak physics, heavy flavour production, implications for (n)PDFs, heavy ions, and exotica searches [[Fady Bishara](#), [Charlotte van Hulse](#), [Shanzhen Chen](#), [email all](#)]
- QCD spectroscopy and exotic hadrons [[Feng-Kun Guo](#), [Patricia Magalhaes](#), [Biplab Dey](#), [Tim Evans](#), [email all](#)]

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- **The speakers** and everyone who contributed to the discussion (and put up with the clicker).

Implications 2020

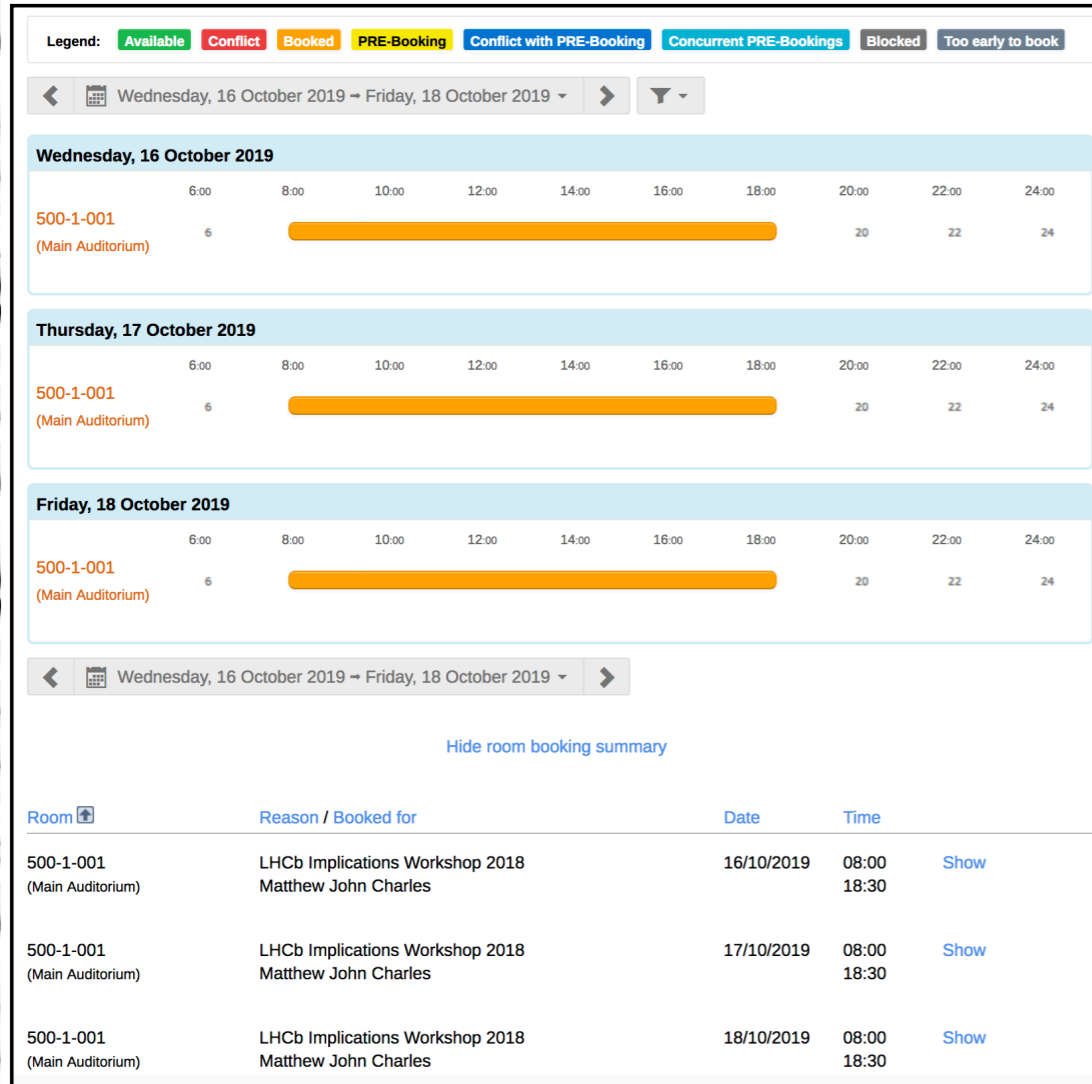


The screenshot shows the top section of an event page. At the top, a dark blue banner contains the event title 'Implications of LHCb measurements and future prospects' in white text. Below this, a light blue header area displays the dates '28-30 October 2020', the location 'CERN', and the time zone 'Europe/Zurich timezone'. A search box is partially visible on the right. Below the header, a grey button labeled 'Overview' is on the left. To its right, a red warning message reads 'Caution: subject to change!'. At the bottom of the screenshot, a line of text states 'This is the 2020 edition of a series of workshops between the LHCb collabor'.

- Wed 28 - Fri 30 October 2020 (and maybe something on **Tue 27 October**, being discussed)
- Save the dates! [<https://indico.cern.ch/e/Implications2020>]
- **Survey** to come soon (call for feedback, fresh ideas). Please send us your thoughts!

Promised more results with Run2...

Implications 2019

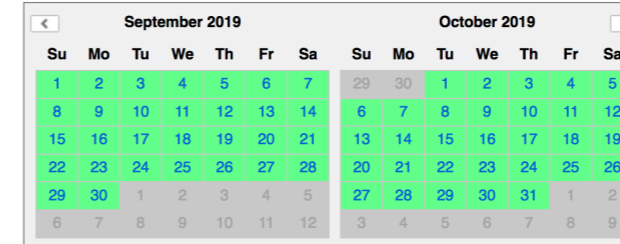


- 16-18 October 2019
- Save the date!
- Still a few hostel rooms left...

Hotel Availability

Select Dates by Clicking on the Calendar

Last update of calendar: 19.10.18 09:20:26



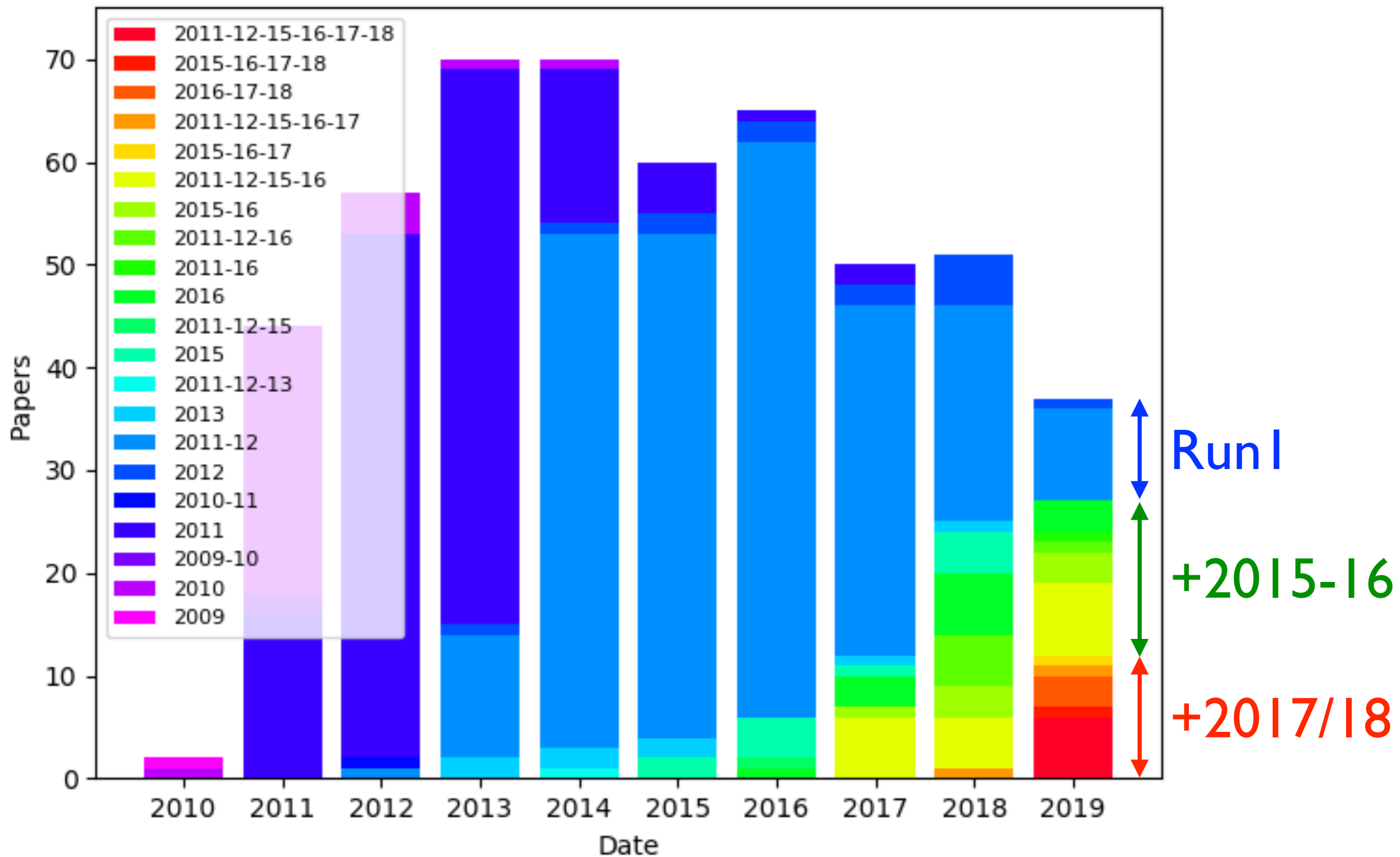
Occupancy level: up to 70% 70% - 85% 85% - 95% Full

- More results with Run2 data (we promise)

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slides from 2018 wrap-up

Promised more results with Run2...



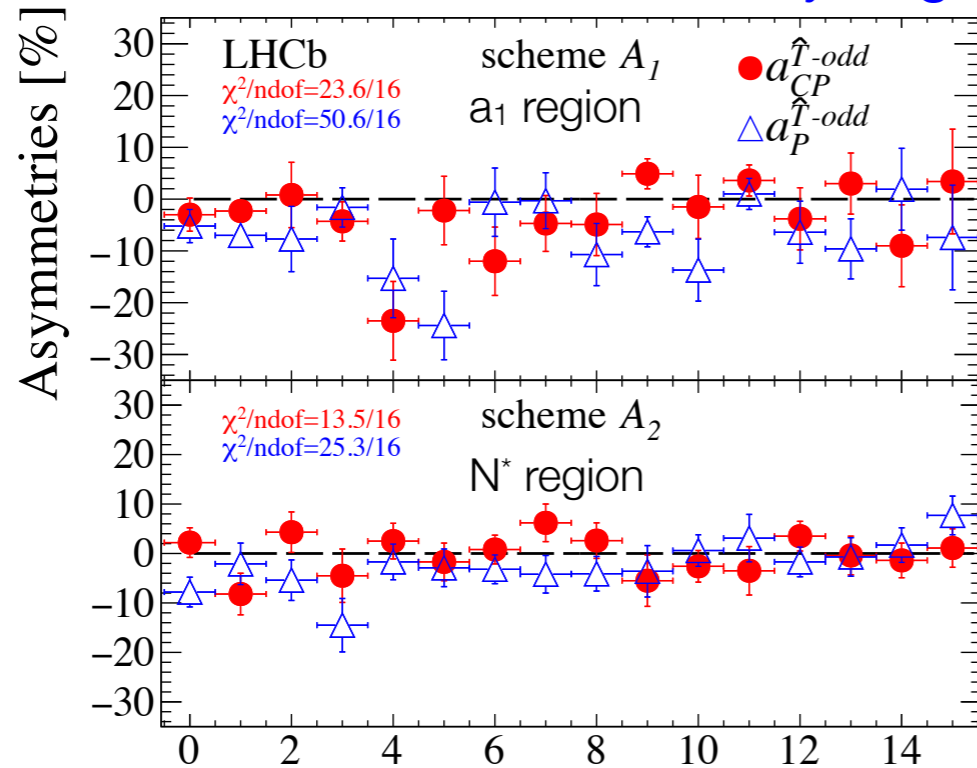
Multibody CPV searches with Run2

Search for CPV in $\Lambda_b^0 \rightarrow p\pi^-\pi^+\pi^-$

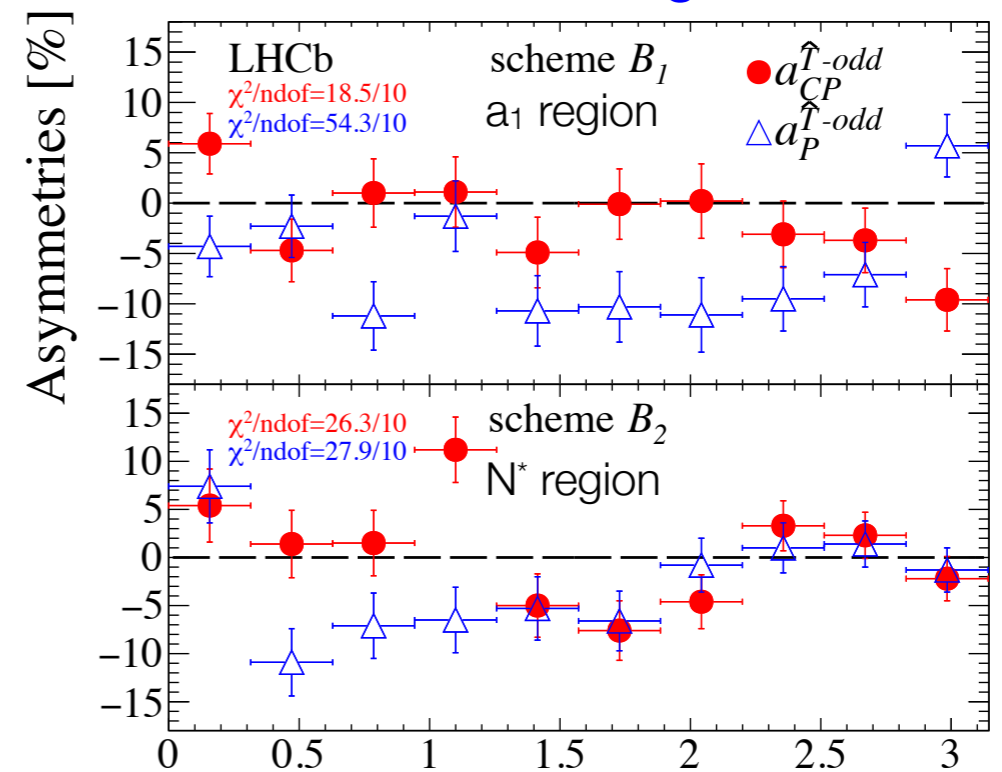
LHCb-PAPER-2019-028

- Update wrt the previous result

Scheme A: based on helicity angles



Scheme B: on Φ angle intervals



$$\begin{aligned}
 \text{Bin } a_{CP}^{\hat{T}-odd} &= (-0.70 \pm 0.70 \pm 0.17) \% \quad \text{Stat. unc.} \\
 a_P^{\hat{T}-odd} &= (3.98 \pm 0.70 \pm 0.17) \% \quad \text{Syst. unc.}
 \end{aligned}$$

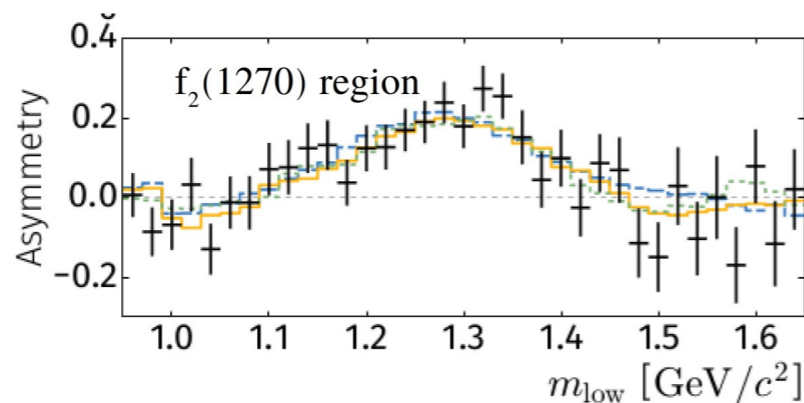
- Integrated measurements:
- CPV at the level of 2.9σ , no CPV integrated in phase space
- First observation of P violation in b-baryon decay at the level of 5.5σ

CPV search with amplitude analysis

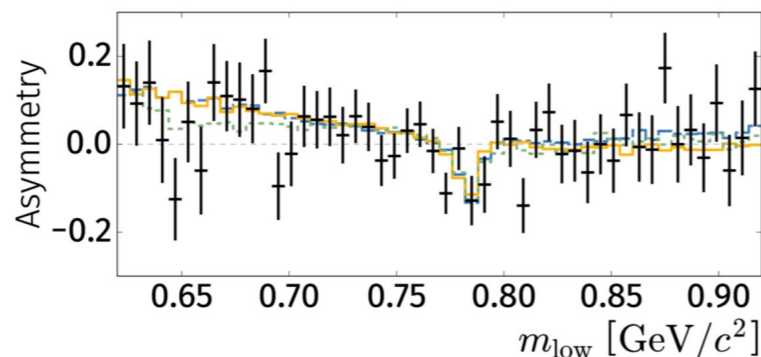
$B^+ \rightarrow \pi^+ \pi^- \pi^+$: results with 3fb^{-1}

ARXIV:1909.05212

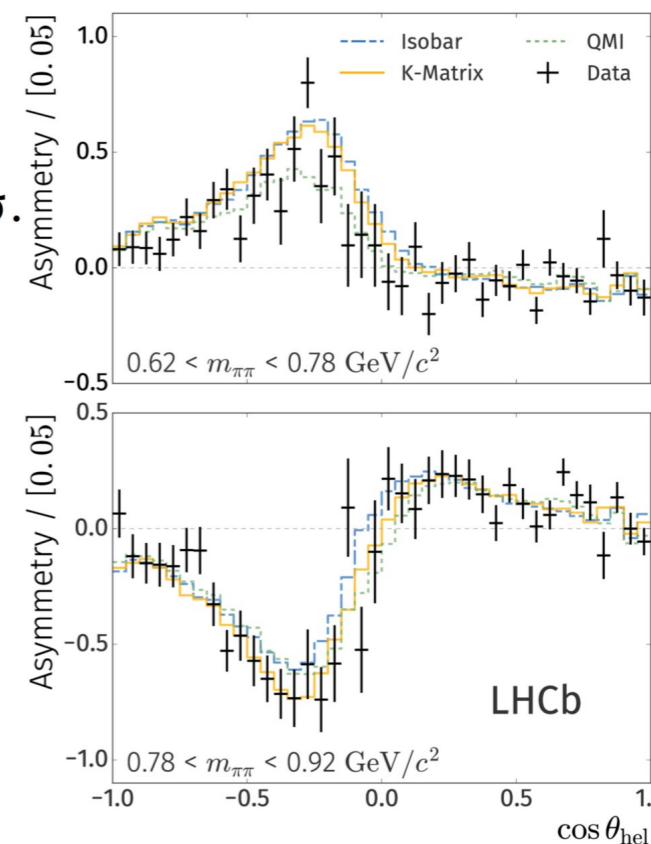
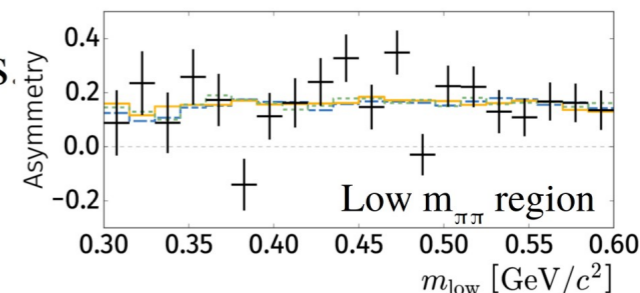
- Significant CPV at low $m(\pi^+\pi^-)$ where only S-wave contributes.
 - Constant until $\sim 2m_K$, and then changes sign.
- Large ($\sim 40\%$) CPV in the region where $f_2(1270)$ is dominant.



- Interference between S- and P- waves is significant beyond 25σ .
 - Right: A_{CP} as a function of the helicity below (top) and above (bottom) the $(\rho-\omega)$ pole
 - Below: integrated A_{CP} vs mass \rightarrow no integrated A_{CP} .



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Amplitude analysis with Run2

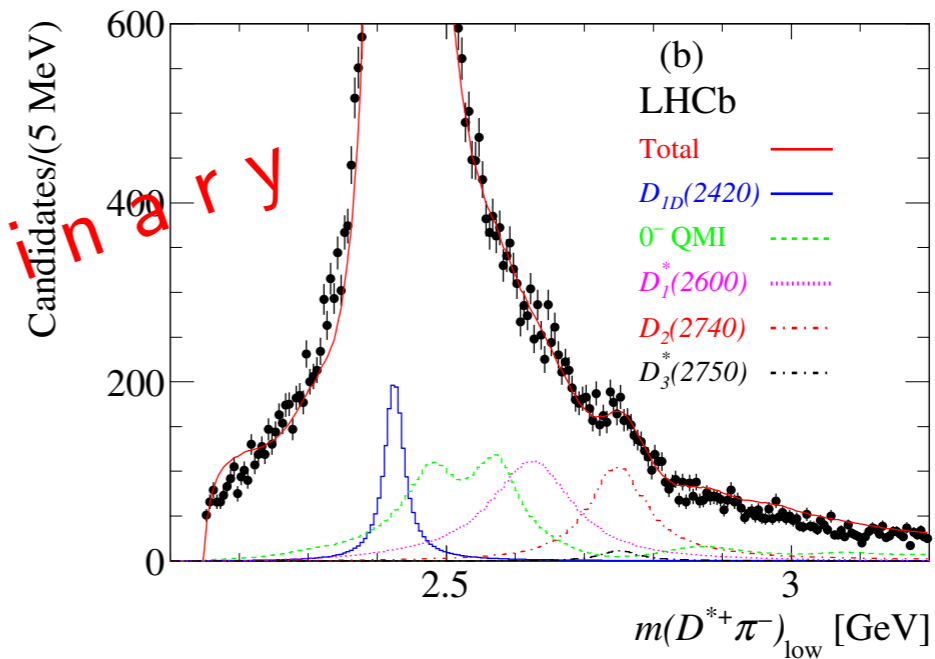
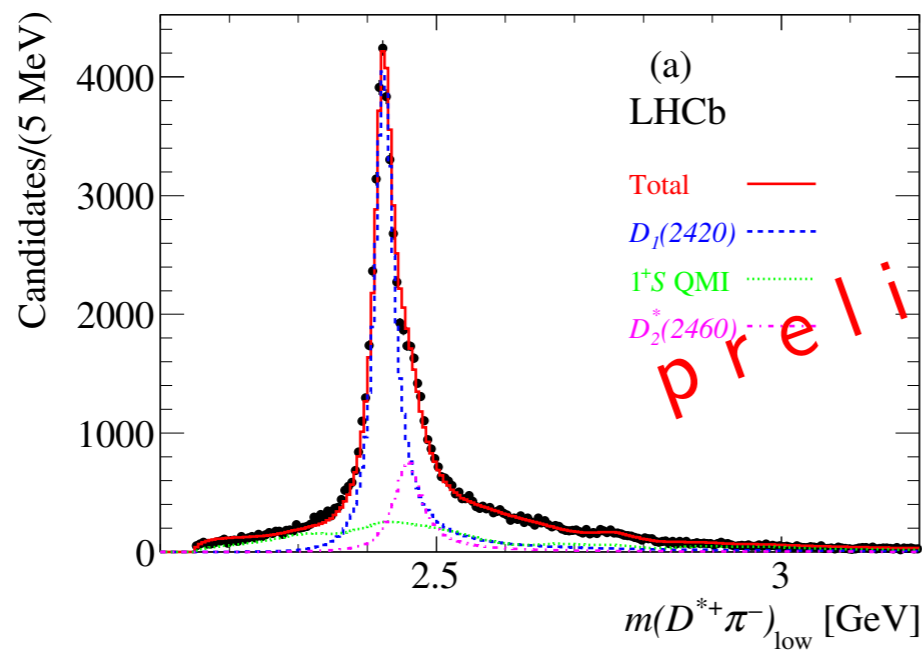
Open-charm spectroscopy in $B^- \rightarrow D^{*+} \pi^- \pi^-$

Preliminary!

Fit results with the final model:

[LHCb-PAPER-2019-027, in preparation]

- Quasi-model-independent for $J^P = 0^-$ and 1^+ S-wave (> 1 state)
- Breit-Wigner amplitudes for the rest



State	J^P	M (MeV)	Γ (MeV)
$D_1(2420)$	1^+	$2424.8 \pm 0.1 \pm 0.6$	$33.6 \pm 0.3 \pm 2.8$
$D_1(2430)$	1^+	$2411 \pm 3 \pm 10$	$309 \pm 9 \pm 41$
$D_0(2550)$	0^-	$2518 \pm 2 \pm 10$	$199 \pm 5 \pm 20$
$D_1^*(2600)$	1^-	$2641.9 \pm 1.8 \pm 4.5$	$149 \pm 4 \pm 20$
$D_2(2740)$	2^-	$2751 \pm 3 \pm 12$	$102 \pm 6 \pm 27$
$D_3^*(2750)$	3^-	$2753 \pm 4 \pm 6$	$66 \pm 10 \pm 14$

Mixing of 1^+ states (S- and D-wave amplitudes):

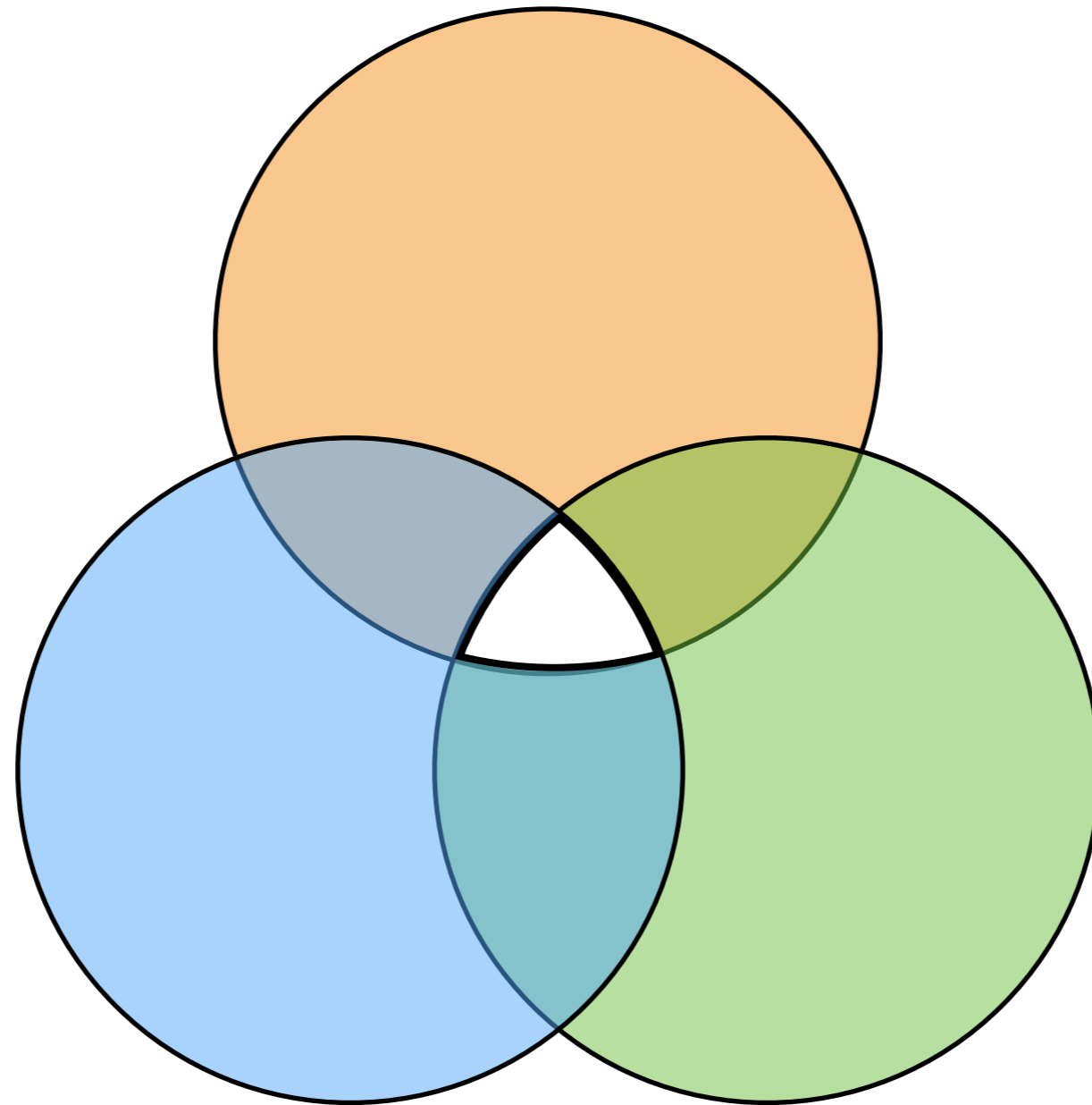
$$A^{D_1'} = A^{1S} \cos \omega - A^{1D} \sin \omega e^{i\psi}$$

$$A^{D_1} = A^{1S} \sin \omega + A^{1D} \cos \omega e^{i\psi}$$

$$\omega = -0.063 \pm 0.019 \pm 0.021$$

$$\psi = -0.29 \pm 0.09 \pm 0.08$$

CPV searches in multibody decays with amplitude analysis with Run2



CPV searches in multibody decays with amplitude analysis with Run2

... soon*.

Results with Run2

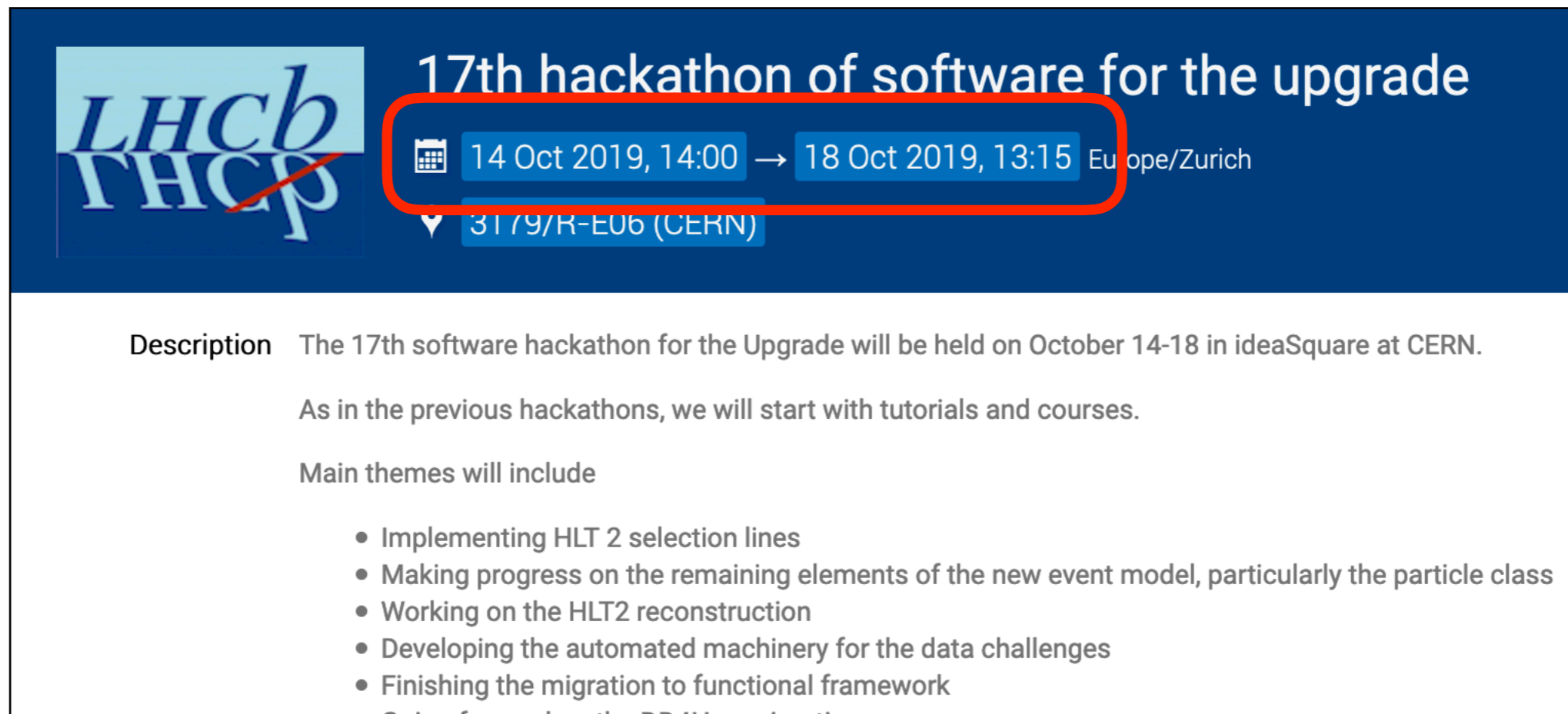
- ... and updates on certain awaited measurements in progress.

Soon: more results with Run3

- We are, right now, building the Run3 trigger

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The screenshot shows a calendar event for the 17th LHCb/HCP hackathon. The event title is "17th hackathon of software for the upgrade". The dates and times are "14 Oct 2019, 14:00 → 18 Oct 2019, 13:15" in Europe/Zurich. The location is "3179/R-E06 (CERN)". The description states that the hackathon will be held on October 14-18 in ideaSquare at CERN, starting with tutorials and courses. The main themes include implementing HLT 2 selection lines, making progress on the new event model, working on HLT2 reconstruction, developing automated machinery for data challenges, and finishing the migration to a functional framework.

LHCb
HCP

17th hackathon of software for the upgrade

14 Oct 2019, 14:00 → 18 Oct 2019, 13:15 Europe/Zurich

3179/R-E06 (CERN)

Description The 17th software hackathon for the Upgrade will be held on October 14-18 in ideaSquare at CERN.

As in the previous hackathons, we will start with tutorials and courses.

Main themes will include

- Implementing HLT 2 selection lines
- Making progress on the remaining elements of the new event model, particularly the particle class
- Working on the HLT2 reconstruction
- Developing the automated machinery for the data challenges
- Finishing the migration to functional framework
- Going forward on the DD4hep migration

Soon: more results with Run3

- We are, right now, building the Run3 trigger
- In Run 3, we're doing two key things:
 - Improving the trigger efficiency for hadronic decays
 - Increasing the instantaneous luminosity
 - (plus several essential hardware upgrades to enable these)
- Both are great news...
- ... but it means a **new, hard limit** to our physics programme: how many bytes we can write out.
- Solution: **be smart*** and selective.
- Danger: if we don't select it, it's gone forever.
- Corollary: **if you have a new, clever idea, please get in touch,** make sure we're going to select the events needed.

See you next year!

