Recent results of hadron spectroscopy at LHCb

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On behalf of the LHCb Collaboration

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QCD and the Quark Model

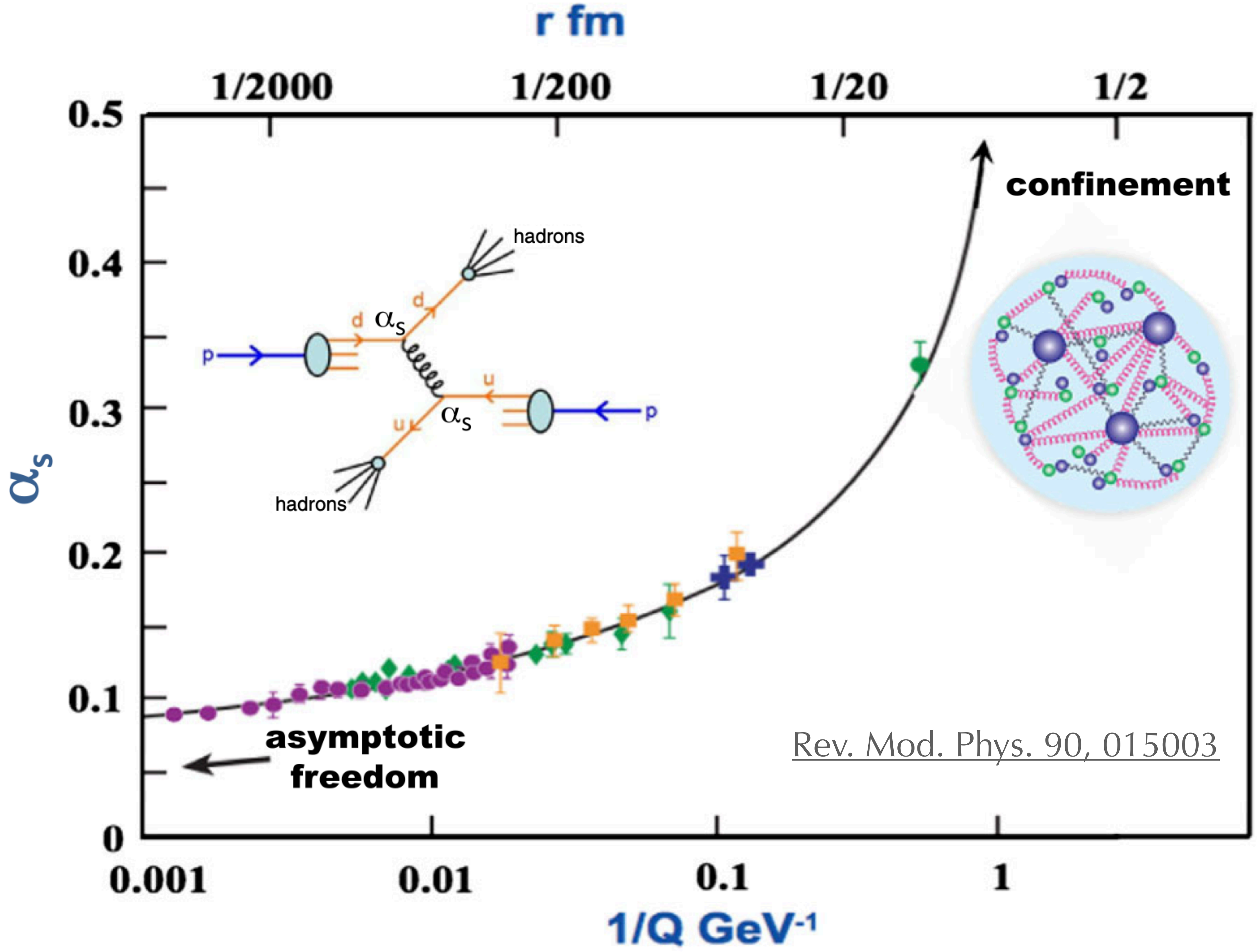
- **Quantumchromodynamic (QCD)** describes (strong) interaction of quarks and gluons

- QCD has strong coupling constant at low energies

  → referred to as confinement

  → quarks and gluons in bound states: hadrons

- QCD predicts a **hadron spectrum**, but non-pertubative regime



Rev. Mod. Phys. 90, 015003

QCD and the Quark Model

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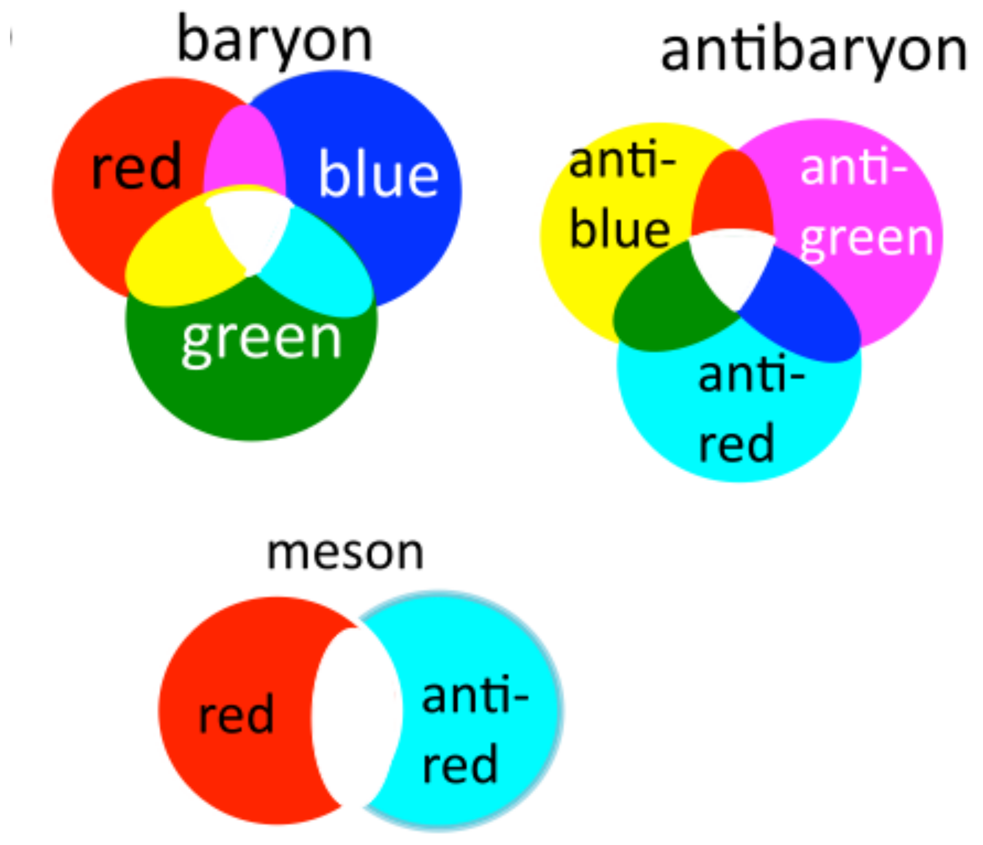
- QCD predicts a **hadron spectrum**, but non-pertubative regime
- **Quark Model** classifies hadrons according to their valence quarks
  1. **Conventional: meson ($q\bar{q}$) or baryon (qqq)**
  2. **Exotic states: tetraquark ($qq\bar{q}\bar{q}$), pentaquark($qqqq\bar{q}$), glueball, …**



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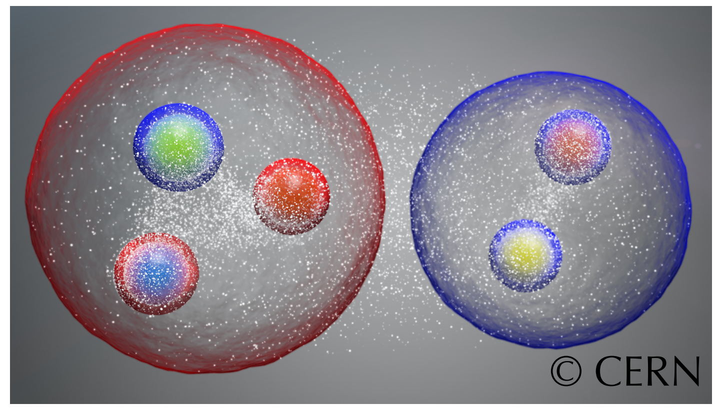


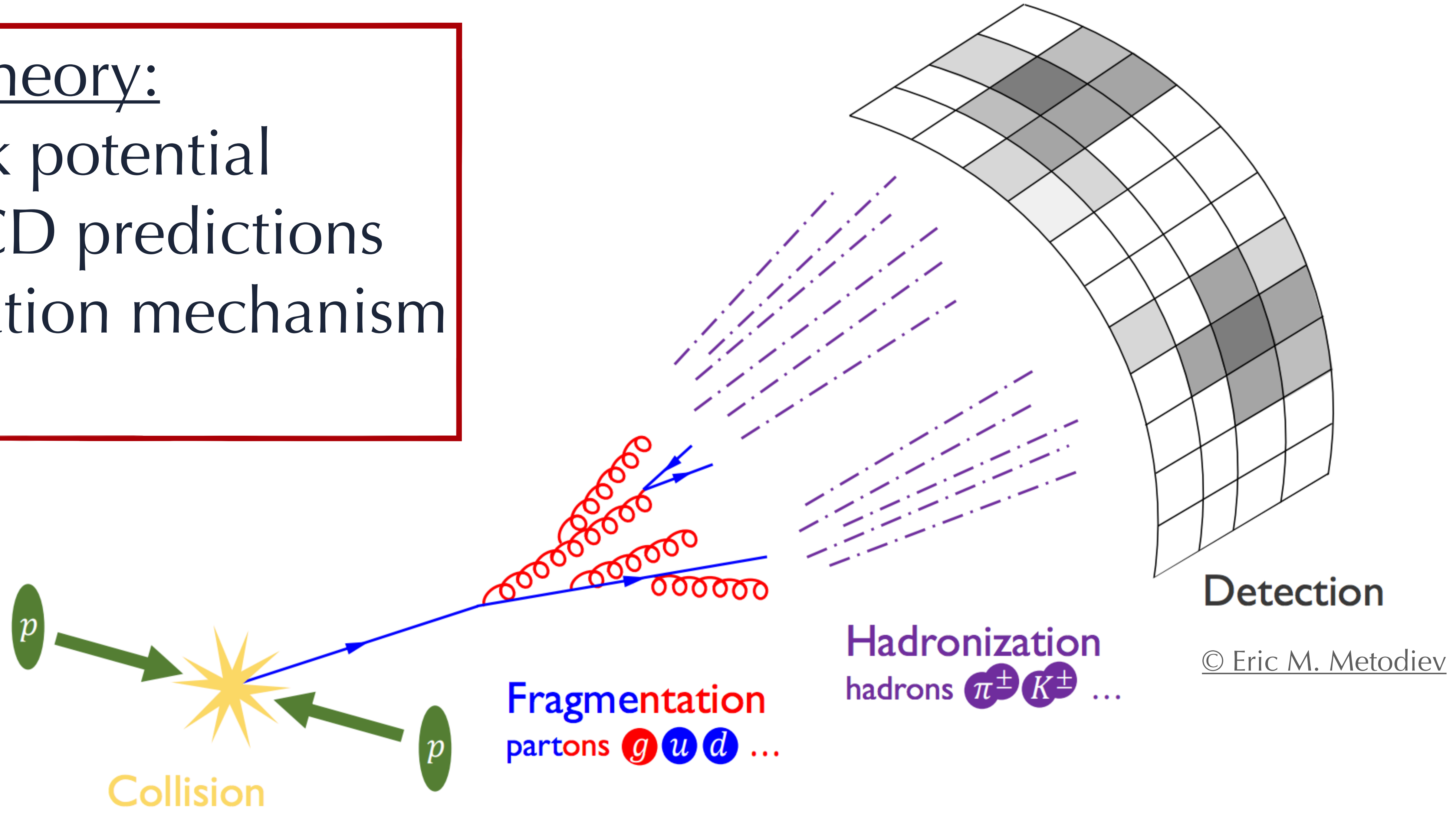
Spectroscopy

- **Quantumchromodynamic (QCD)** describes (strong) interaction of quarks and gluons
- Q
- Q
- Q

Spectroscopy provides:

<u>Theory:</u>

- Inter-quark potential
- Lattice QCD predictions
- Hadronization mechanism
- …



<u>Experiment:</u>

- Spectroscopy of hadrons
- Production of hadrons
- …

Depending of understanding of QCD

What has LHCb measured?

Conventional spectroscopy:

- **Branching fraction measurement of the decay $B^+ \to \psi(2S)\phi(1020)K^+$**

  PRD 111 (2025) 092008

- **Precision measurement of the Ξ_b^0 baryon lifetime**

  LHCb-PAPER-2025-023 PRELIMINARY

- **Measurements of η/η'mixing angles using $B_{(d,s)} \to J/\psi\eta^{(\prime)}$ decays**

  LHCb-PAPER-2025-025 PRELIMINARY

Exotic spectroscopy

- **Observation of the open-charm tetraquark state $T^*_{cs0}(2870)^0$in the $B^- \to D^-D^0K_s^0$ decay**

  PRL 134 (2025) 101901

- **Search for pentaquarks in $\Lambda_b^0 \to \Lambda_c^+D_s^-K^+K^-$ decay**

  LHCb-PAPER-2025-022 PRELIMINARY

- **Amplitude analysis of $B^0 \to \eta_c(1S)K^+\pi^-$ decays**

  LHCb-PAPER-2025-027 PRELIMINARY

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  LHCb-PAPER-2025-023 PRELIMINARY
- **Measurements of η/η'**

  LHCb-PAPER-2025-0

A lot of other new results have been covered in

Studies of Bc mesons at LHCb by Y. Wang

and

LHCb results on charmed hadrons by L. Dufour

Exotic spectroscopy

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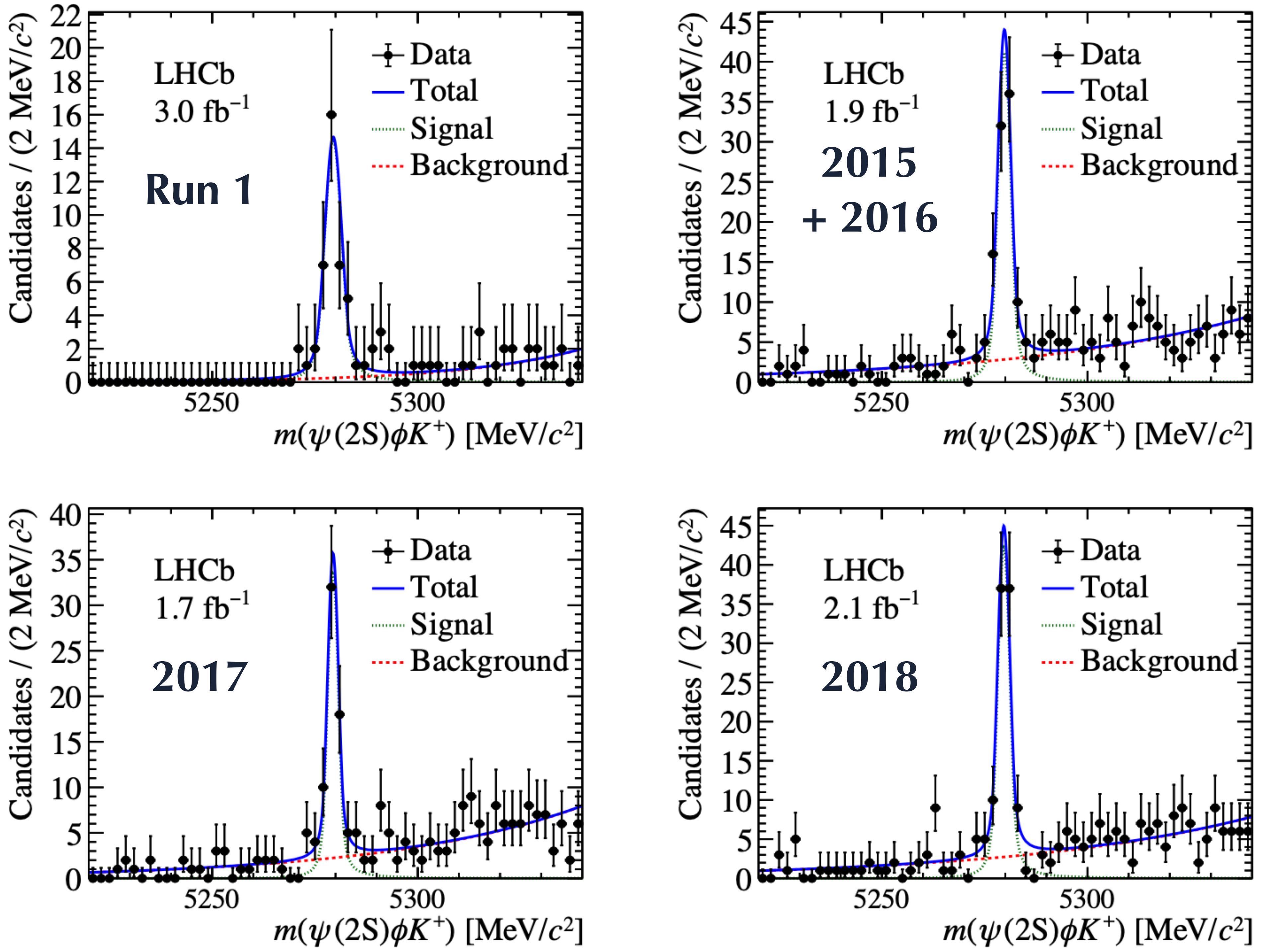
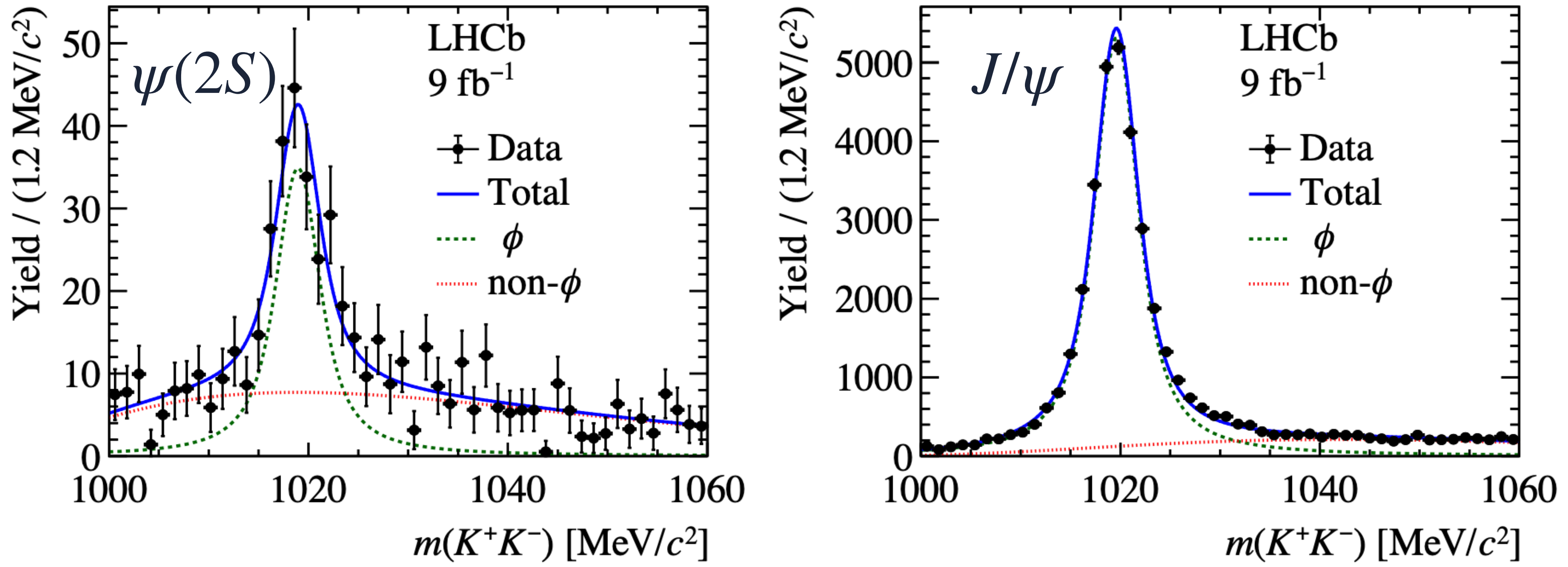
  LHCb-PAPER-2025-027 PRELIMINARY

$B \to \psi(2S)\phi K$ BF measurement

PRD 111 (2025) 092008



Precise $\phi(1020)$ selection **Run 1+2**



- **Exotic states** with $c\bar{c}u\bar{s}$ quark content observed in $B^+ \to J\psi\phi K^+$ PRL 127, 082001
- BF measured relative to J/ψ mode

$$\mathcal{R}_{\rm BF} \equiv \frac{\mathcal{B}(B^+ \to \psi(2S)\phi K^+)}{\mathcal{B}(B^+ \to J/\psi\phi K^+)} = \frac{N_{\rm Signal}}{N_{\rm Norm}}\frac{F_{\rm Signal}}{F_{\rm Norm}}\frac{\epsilon_{\rm Norm}}{\epsilon_{\rm Signal}}\frac{\mathcal{B}(J/\psi \to \mu^+\mu^-)}{\mathcal{B}(\psi(2S) \to \mu^+\mu^-)}$$

From mass fits

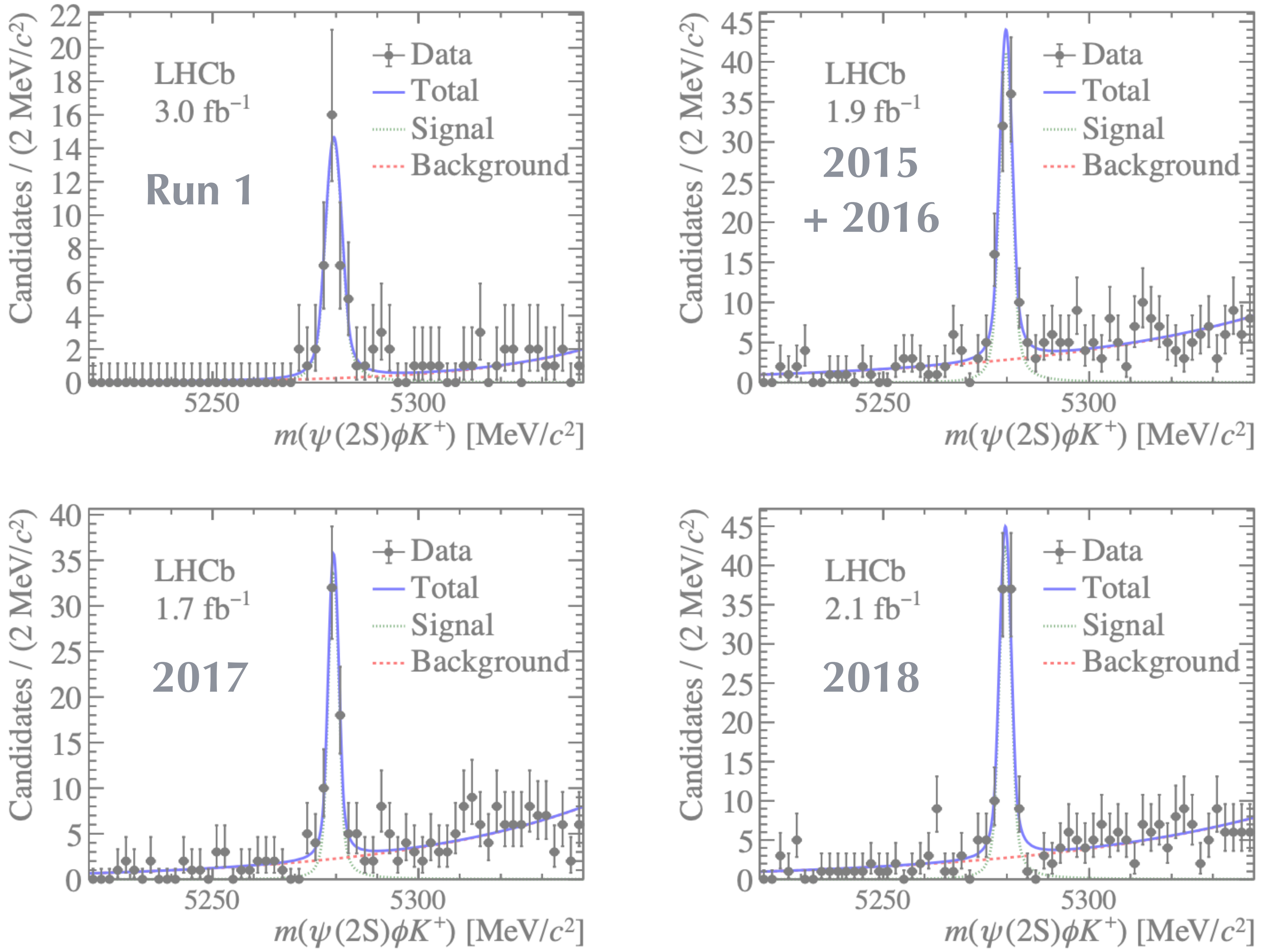
From simulation

From world average

- Individual **unbinned maximum likelihood fits** to extract signal yields
- $\phi(1020)$ **fractions F** determined for combined Run 1+2 sample

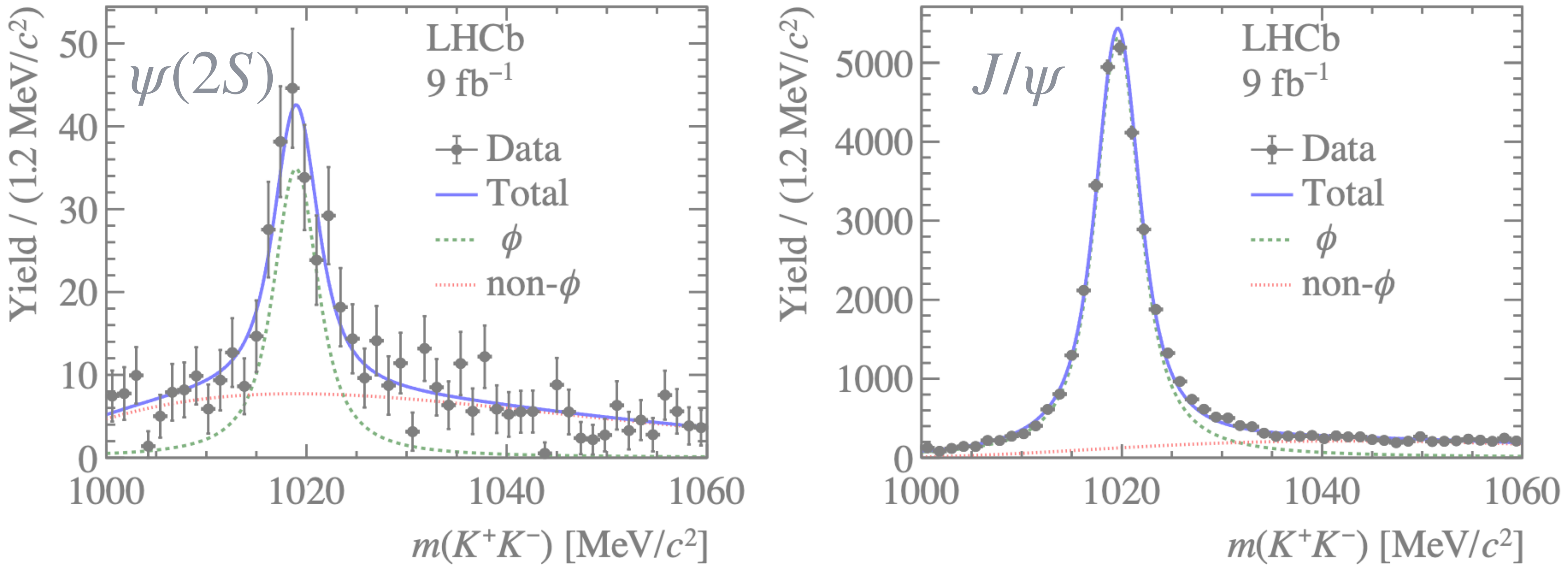
$B \to \psi(2S)\phi K$ BF measurement

PRD 111 (2025) 092008



Precise $\phi(1020)$ selection

Run 1+2

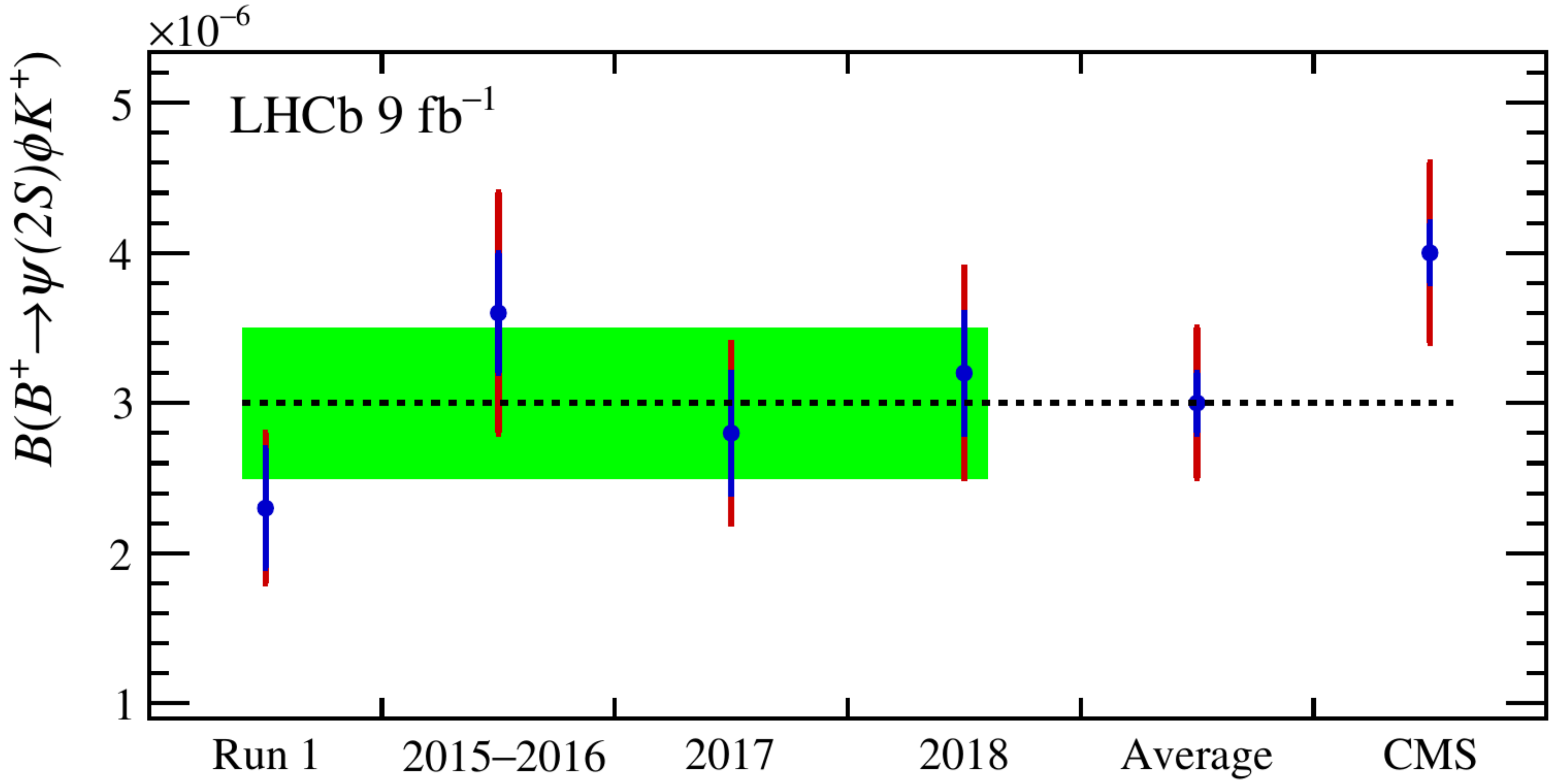


$$\mathcal{R}_{\rm BF} = \frac{\mathrm{B}(B^+ \to \psi(2S)\phi K^+)}{\mathrm{B}(B^+ \to J/\psi\phi K^+)} = 0.061 \pm \underset{\text{stat.}}{0.004} \pm \underset{\text{syst.}}{0.009}$$

with the world average of $B^+ \to J\psi\phi K^+$ BF

$$\mathrm{B}(B^+ \to \psi(2S)\phi K^+) = (3.0 \pm \underset{\text{stat.}}{0.2} \pm \underset{\text{syst.}}{0.5} \pm \underset{\text{ext.}}{0.2}) \times 10^{-6}$$

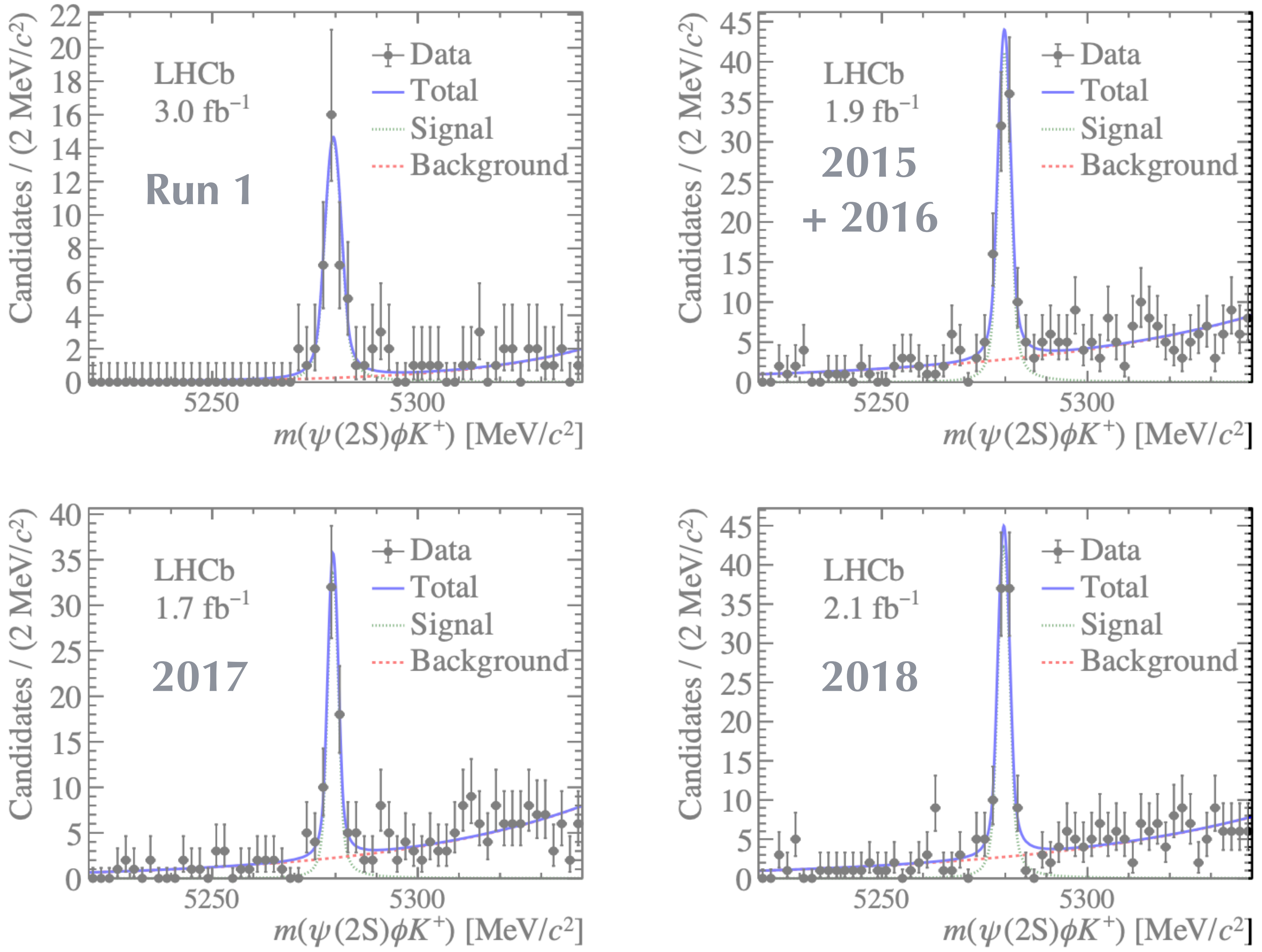
Most precise measurement, compatible with CMS



PL B764 (2017) 66

$B \to \psi(2S)\phi K$ BF measurement

PRD 111 (2025) 092008



Precise $\phi(1020)$ selection

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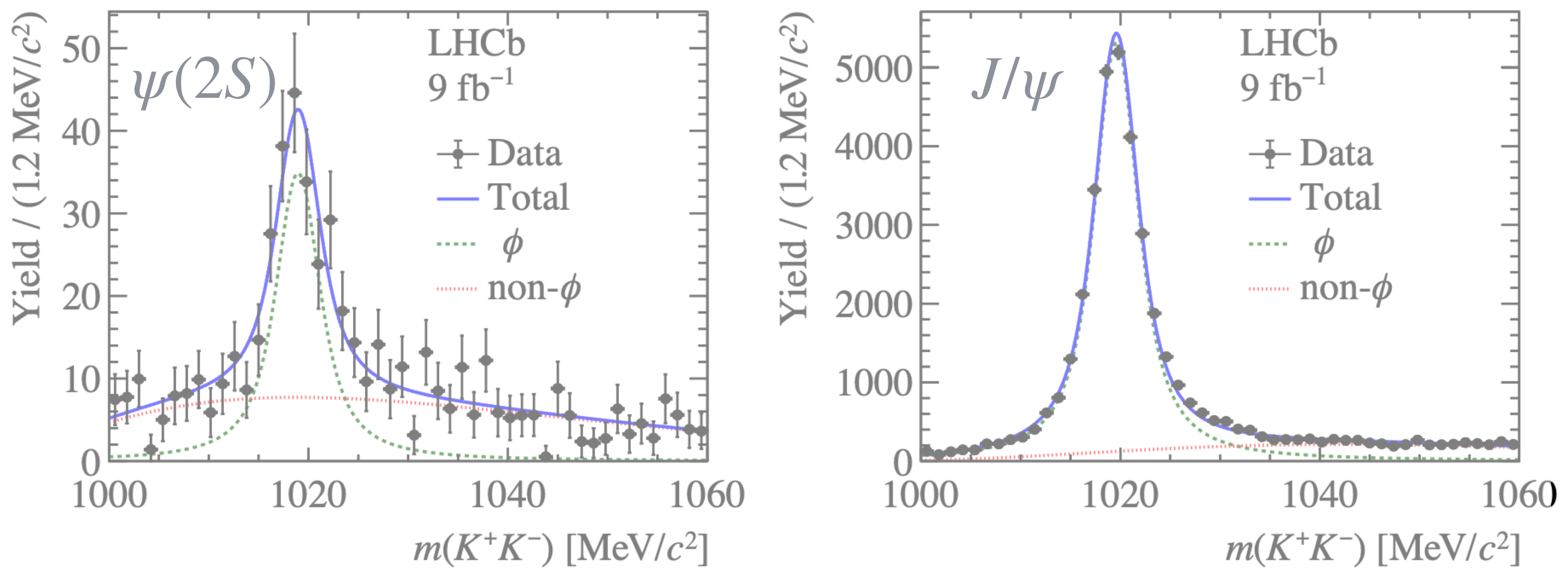

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Most precise measurement, compatible with CMS

- $\psi(2S)$ **decay** mode 80x smaller phase space

  & BF 15x smaller than for $B^+ \to J\psi\phi K^+$

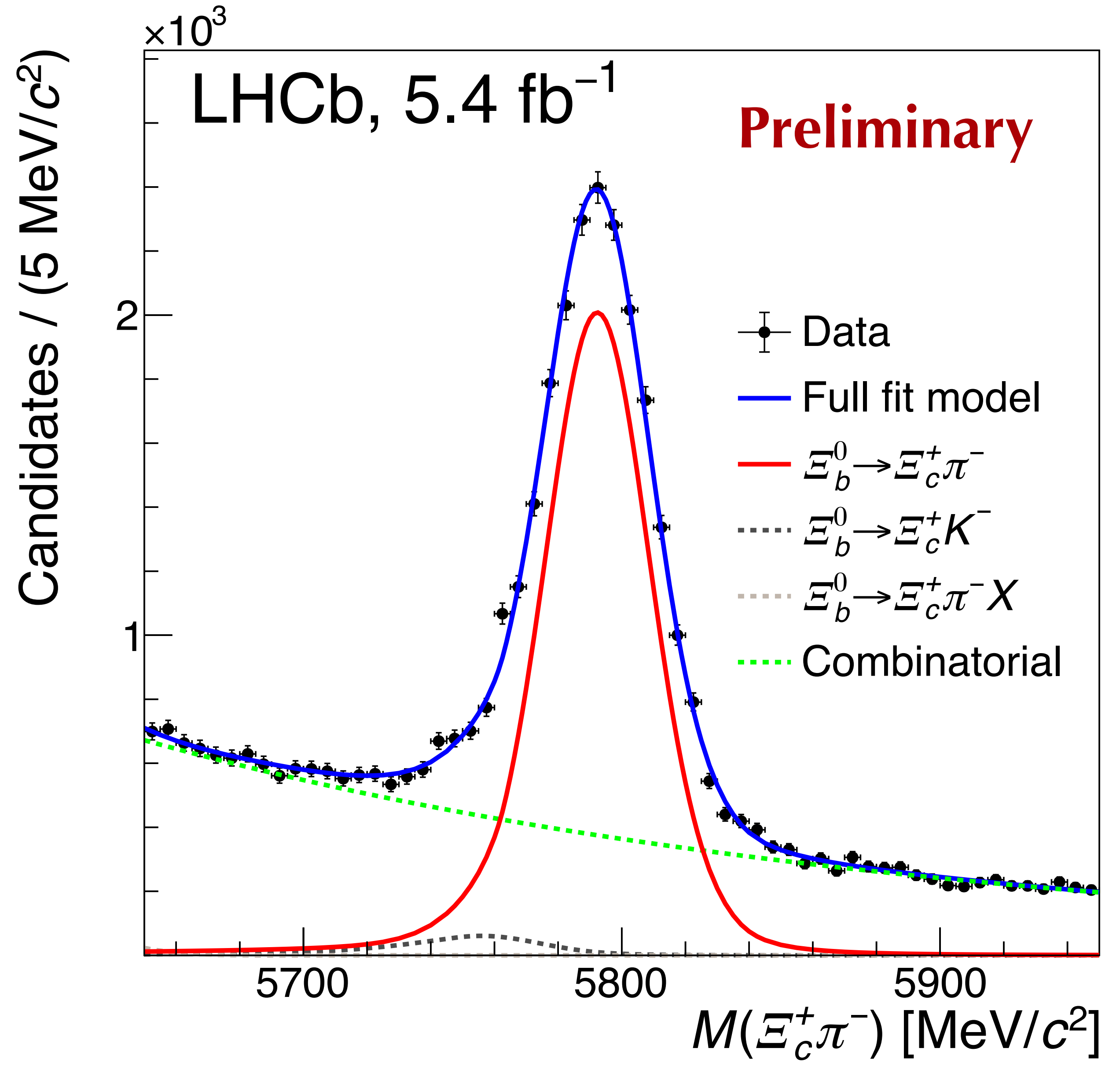
  → about 5 times **greater amplitude** compared to J/ψ

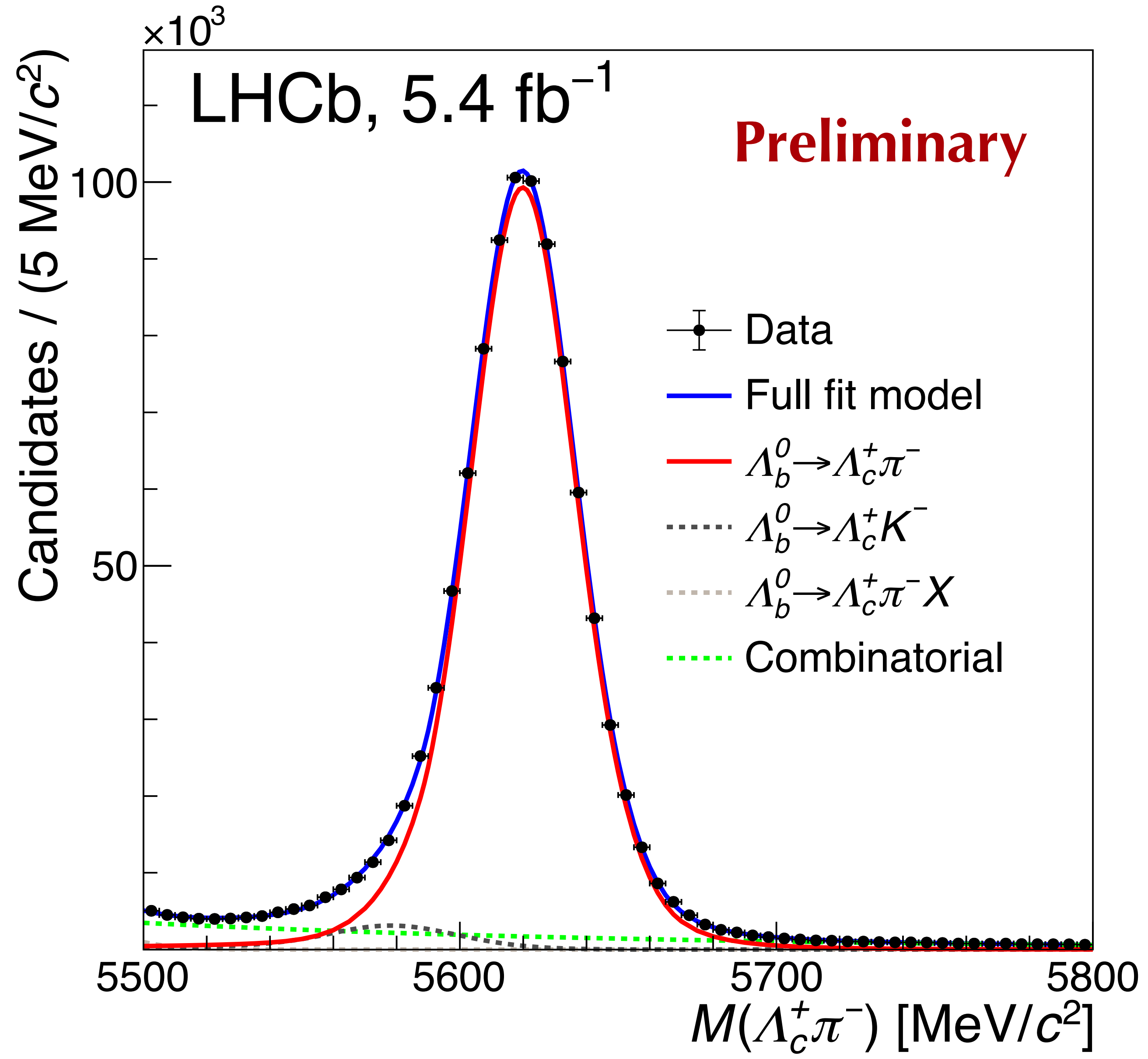
  → potential access to **high-mass resonant contributions**

  e.g. $\chi_c(4700)$
- **More data** needed for dedicated **search of exotics**

Ξ_b^0 lifetime measurement

LHCb-PAPER-2025-023





- Measurement of b baryon lifetimes tests the **spectator quark contribution** on total decay widths
  → **ratio of lifetimes** most precise predictions
- Decay modes chosen for the **absence of hyperons**
- Update from the Run 1 LHCb measurement PRL 113 (2014) 032001
- 5.4 fb^{-1} from Run 2

$$R(t) = \frac{N[\Xi_b^0 \to \Xi_c^+\pi^-](t)}{N[\Lambda_b^0 \to \Lambda_c^+\pi^-](t)} \cdot \frac{\epsilon[\Xi_b^0 \to \Xi_c^+\pi^-](t)}{\epsilon[\Lambda_b^0 \to \Lambda_c^+\pi^-](t)} = R_0 \exp(\lambda t)$$

With $\lambda = \dfrac{1}{\tau_{\Lambda_b^0}} - \dfrac{1}{\tau_{\Xi_b^0}}$

Therefore $r_\tau = \dfrac{\tau_{\Xi_b^0}}{\tau_{\Lambda_b^0}} = \dfrac{1}{1 - \lambda \tau_{\Lambda_b^0}}$

Ξ_b^0 lifetime measurement

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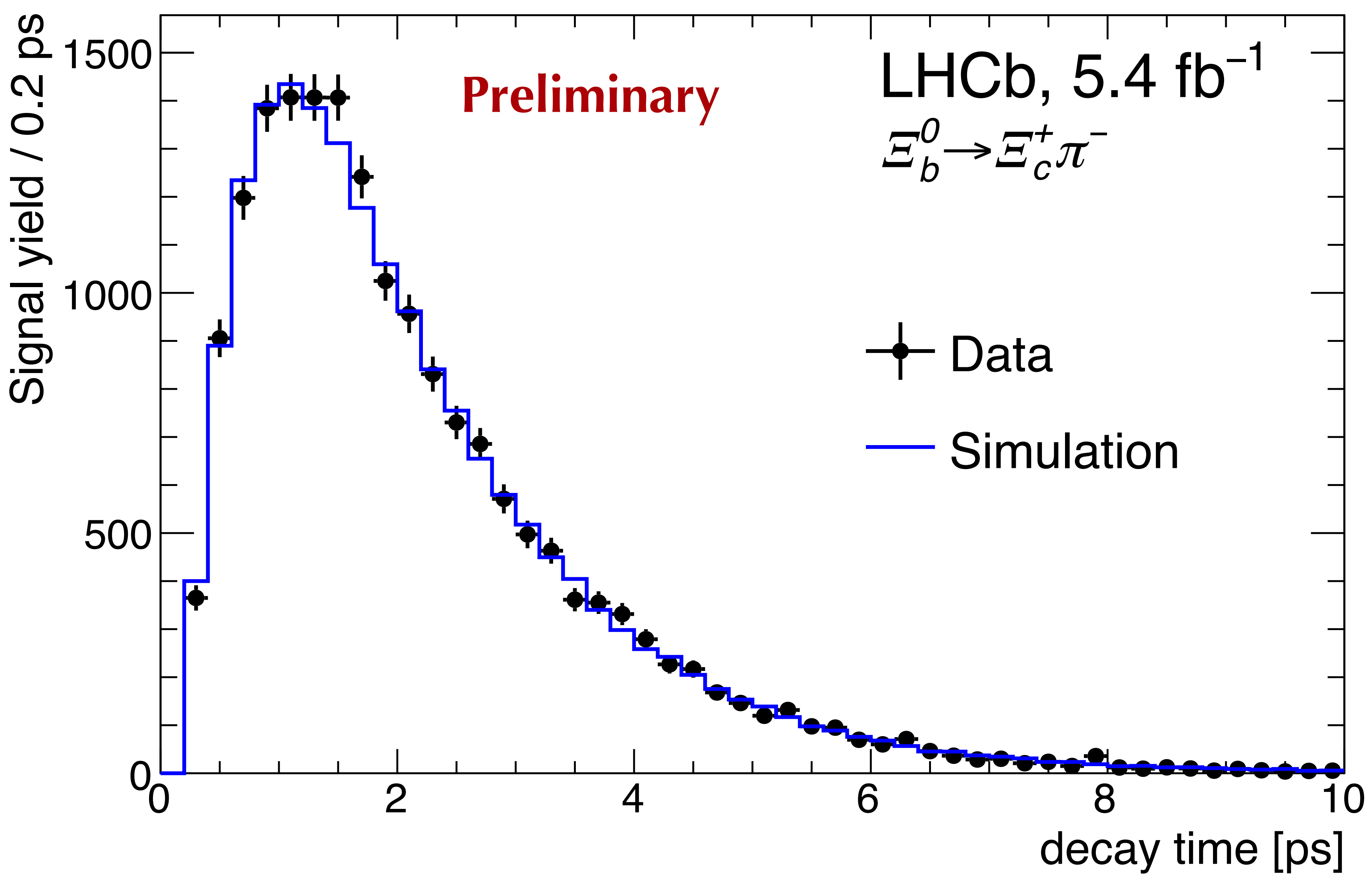
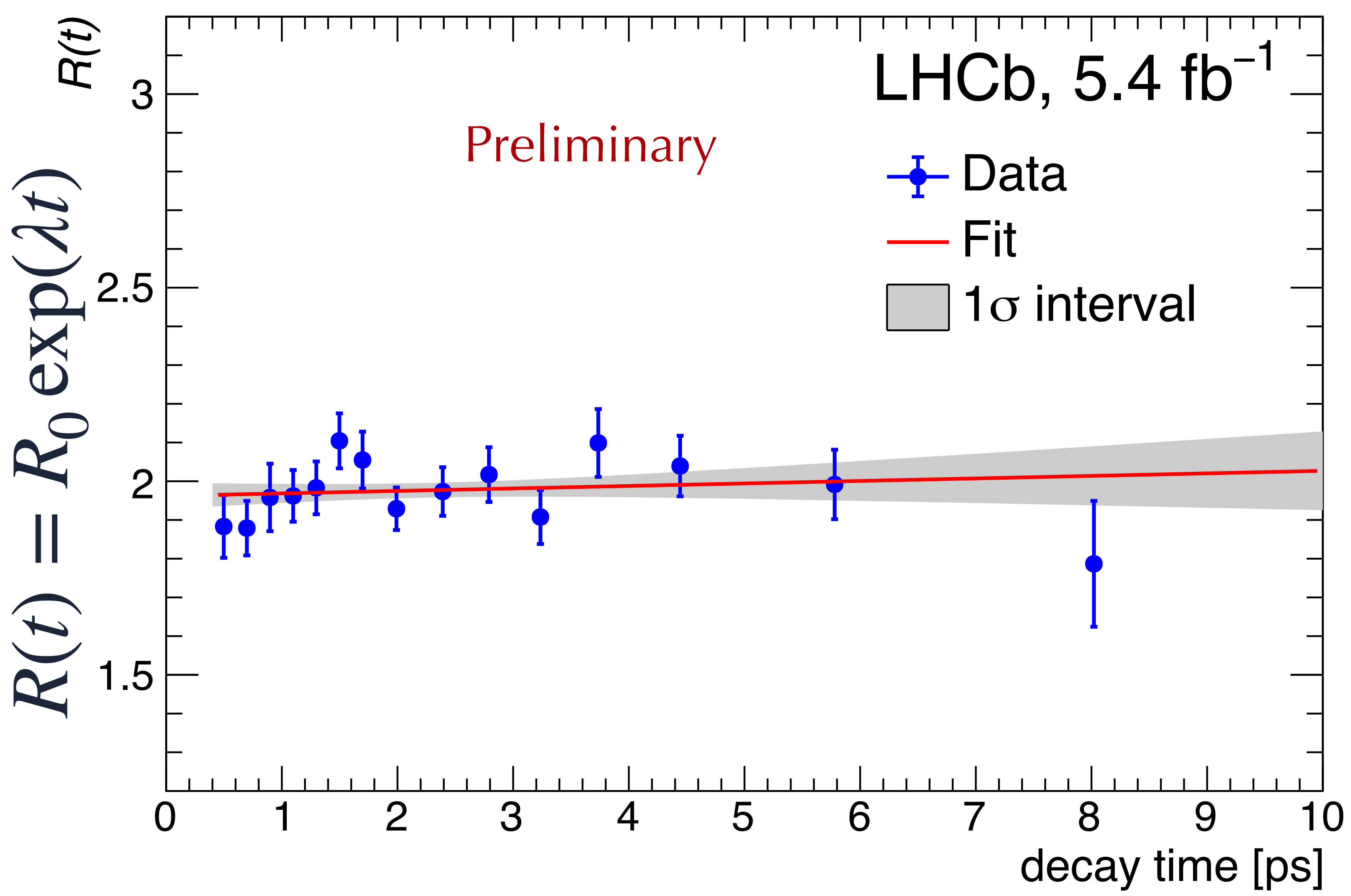
NEW



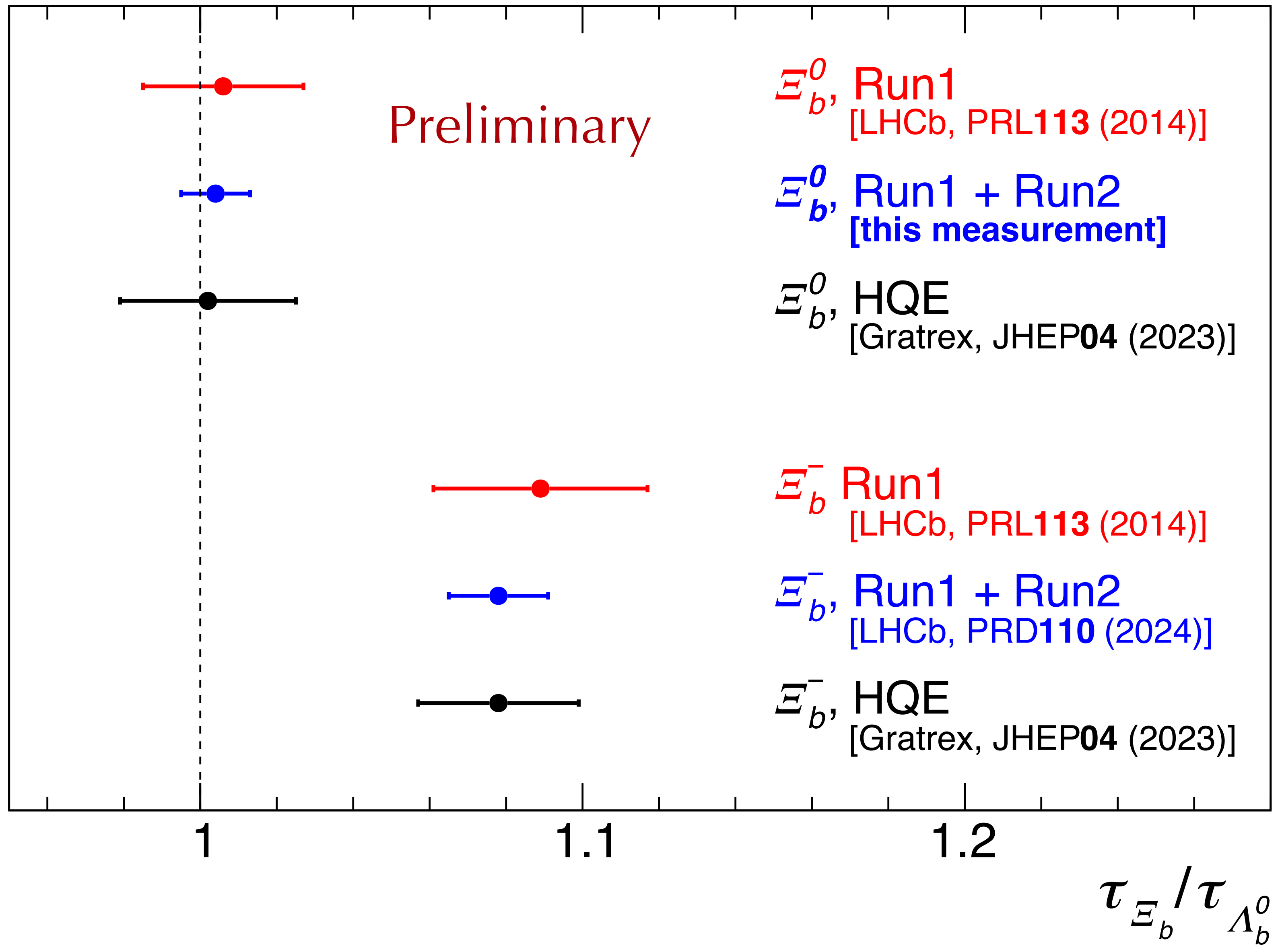


- For $R(t) = R_0 \exp(\lambda t)$ yields and efficiencies determined in **decay-time bins**

$$r_\tau^{\text{Run2}} = 1.004 \pm \underset{\text{stat.}}{0.009} \pm \underset{\text{syst.}}{0.006}$$

$$\tau_{\Xi_b^0}^{\text{Run2}} = 1.473 \pm \underset{\text{stat.}}{0.014} \pm \underset{\text{syst.}}{0.009} \pm \underset{\text{ext.}}{0.009}\ \text{ps}$$

- **Combine result** with Run 1 considering correlated systematics



Run 1+2 average

$$r_\tau = 1.004 \pm \underset{\text{stat.}}{0.008} \pm \underset{\text{syst.}}{0.005}$$

$$\tau_{\Xi_b^0}^{\text{Run2}} = 1.475 \pm \underset{\text{stat.}}{0.012} \pm \underset{\text{syst.}}{0.008} \pm \underset{\text{ext.}}{0.009}\ \text{ps}$$

Factor 2 improvement to Run 1, in **agreement** with HQE

η/η' mixing angles in $B_{(s)} \to J/\psi\eta^{(\prime)}$

- **Mixing measurements** test non-perturbative regime of QCD

  → minimal description with angle Φ_{P}

  → **glueball/η'** mixing with angle Φ_{G}

- LHCb Run 1 results $\Phi_{\mathrm{P}} = (43.5^{+1.4}_{-2.8})^\circ$ and $\Phi_{\mathrm{G}} = (0.0 \pm 24.6)^\circ$

  Nucl.Phys. B867 (2013) 547 JHEP 01 (2015) 024

LHCb-PAPER-2025-025

NEW

$$R_d = \frac{\mathrm{B}(\mathrm{B}^0 \to \mathrm{J}/\psi\eta')}{\mathrm{B}(\mathrm{B}^0 \to \mathrm{J}/\psi\eta)} \cdot \frac{\Phi^3(B^0 \to J/\psi\eta)}{\Phi^3(B^0 \to J/\psi\eta')} = \tan^2\Phi_{\mathrm{P}} \cdot \cos^2\Phi_{\mathrm{G}}$$

$$R_s = \frac{\mathrm{B}(\mathrm{B}^0_s \to \mathrm{J}/\psi\eta')}{\mathrm{B}(\mathrm{B}^0_s \to \mathrm{J}/\psi\eta)} \cdot \frac{\Phi^3(B^0_s \to J/\psi\eta)}{\Phi^3(B^0_s \to J/\psi\eta')} = \cot^2\Phi_{\mathrm{P}} \cdot \cos^2\Phi_{\mathrm{G}}$$

η/η' mixing angles in $B_{(s)} \to J/\psi\eta^{(\prime)}$

LHCb-PAPER-2025-025

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- **Mixing measurements** test non-perturbative regime of QCD
  - → minimal description with angle Φ_P
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- LHCb Run 1 results $\Phi_P = (43.5^{+1.4}_{-2.8})^\circ$ and $\Phi_G = (0.0 \pm 24.6)^\circ$
- Using the **full Run 1+2** dataset and reconstruction of **two η/η' final states $\pi^+\pi^-\gamma\gamma$** and **$\pi^+\pi^-\gamma$**
- Selection optimised for $B^0_{(s)}$ mass resolution

$$R_d = \frac{\mathrm{B}(B^0 \to J/\psi\eta')}{\mathrm{B}(B^0 \to J/\psi\eta)} \cdot \frac{\Phi^3(B^0 \to J/\psi\eta)}{\Phi^3(B^0 \to J/\psi\eta')} = \tan^2\Phi_P \cdot \cos^2\Phi_G$$

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η/η' mixing angles in $B_{(s)} \to J/\psi\eta^{(\prime)}$

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- Using the **full Run 1+2** dataset and reconstruction of **two η/η' final states $\pi^+\pi^-\gamma\gamma$** and $\pi^+\pi^-\gamma$
- Selection optimised for $B^0_{(s)}$ mass resolution
- The ratio of branching fractions for both final states are within 0.5σ and are combined
- Branching fractions are **most precise determination** to date, **compatible** with Run 1 results

Preliminary

Combined BF ratios

$$\frac{\mathcal{B}(B^0 \to J/\psi\eta')}{\mathcal{B}(B^0 \to J/\psi\eta)} = 0.48 \pm 0.06\,(\text{stat.}) \pm 0.02\,(\text{syst.}) \pm 0.01\,(\text{ext.}),$$

$$\frac{\mathcal{B}(B^0_s \to J/\psi\eta')}{\mathcal{B}(B^0_s \to J/\psi\eta)} = 0.80 \pm 0.02\,(\text{stat.}) \pm 0.02\,(\text{syst.}) \pm 0.01\,(\text{ext.}),$$

$$\frac{\mathcal{B}(B^0 \to J/\psi\eta)}{\mathcal{B}(B^0_s \to J/\psi\eta)} = (2.16 \pm 0.16\,(\text{stat.}) \pm 0.05\,(\text{syst.}) \pm 0.07\,(\text{ext.})) \times 10^{-2},$$

$$\frac{\mathcal{B}(B^0 \to J/\psi\eta')}{\mathcal{B}(B^0_s \to J/\psi\eta')} = (1.33 \pm 0.12\,(\text{stat.}) \pm 0.05\,(\text{syst.}) \pm 0.04\,(\text{ext.})) \times 10^{-2},$$

LHCb-PAPER-2025-025

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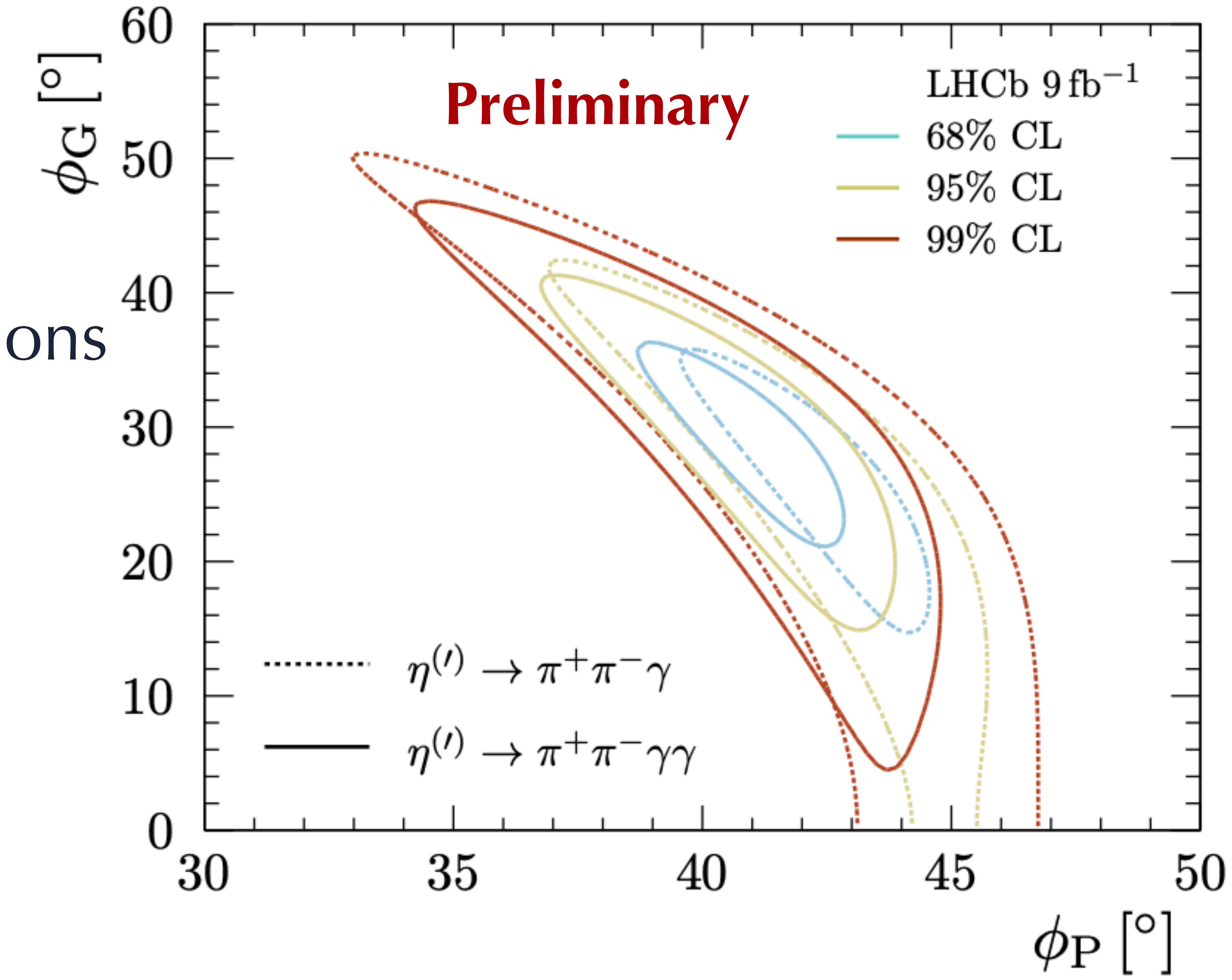
  - $\rightarrow$ minimal description with angle Φ_P
  - $\rightarrow$ **glueball/η'** mixing with angle Φ_G
- LHCb Run 1 results $\Phi_P = (43.5^{+1.4}_{-2.8})^\circ$ and $\Phi_G = (0.0 \pm 24.6)^\circ$
- Using the **full Run 1+2** dataset and reconstruction of **two η/η' final states $\pi^+\pi^-\gamma\gamma$** and **$\pi^+\pi^-\gamma$**
- Angles from likelihood profile method
  - **Φ_P value compatible** with Run 1, pheno. and lattice predictions
  - **Φ_G 4σ off from zero**
- **Hints of glueball/η' mixing** and/or sizeable contributions from **OZI-suppressed decay topologies**

Measured angles

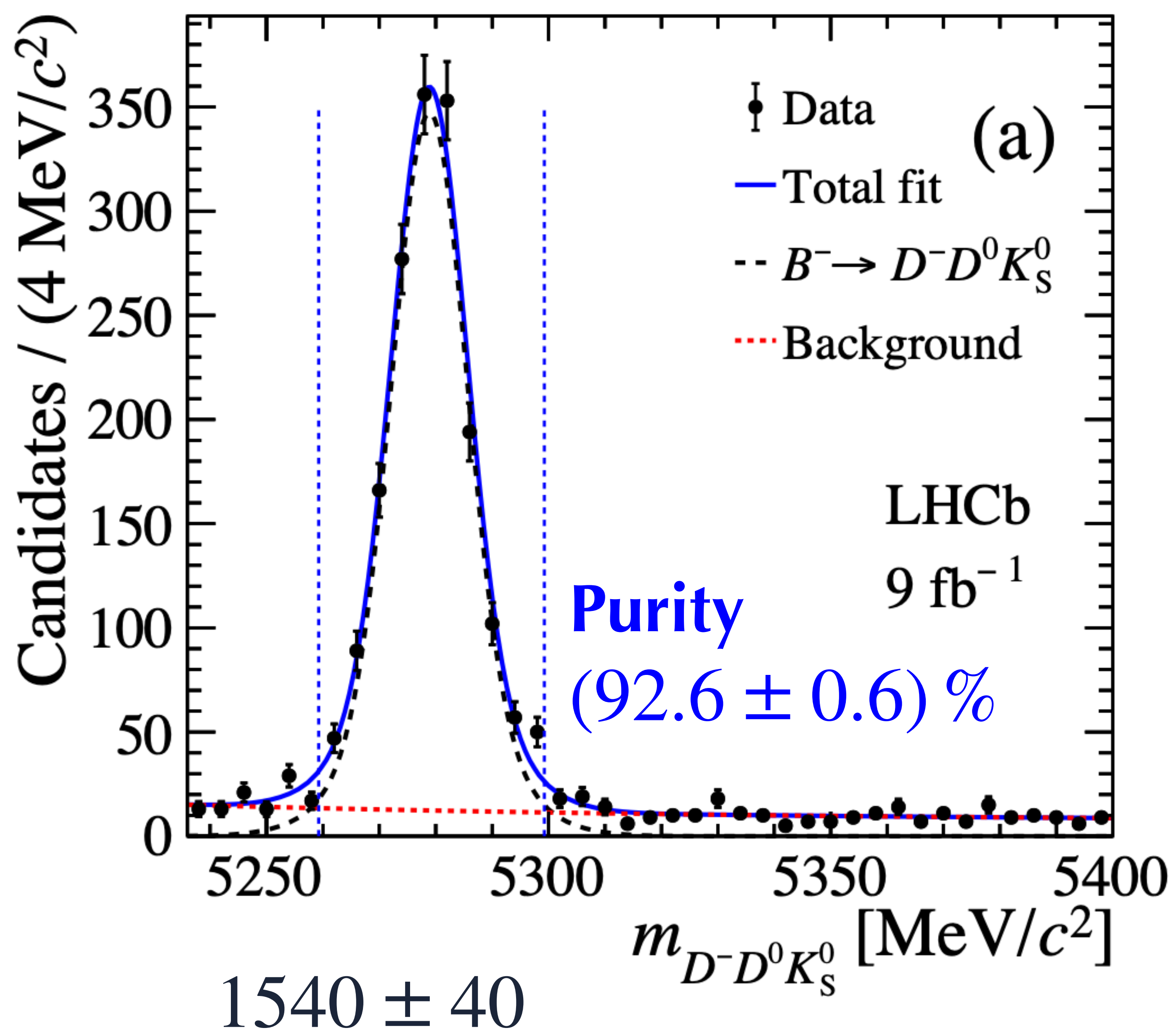
$\Phi_P = (41.6^{+1.0}_{-1.2})^\circ$

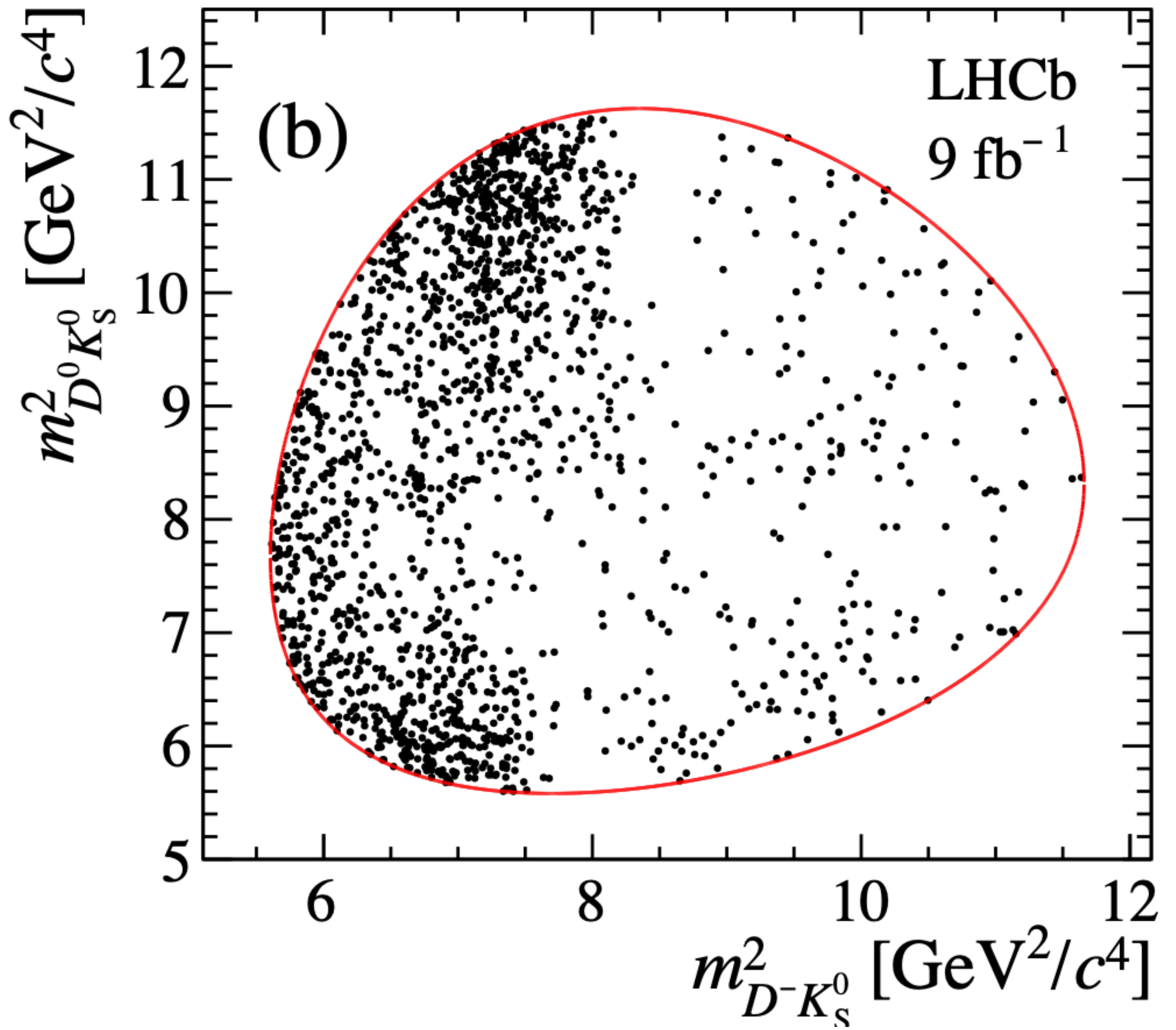
$\Phi_G = (28.9^{+3.9}_{-4.0})^\circ$



Tetraquark $T^*_{cs0}(2870)^0$

PRL 134 (2025) 101901





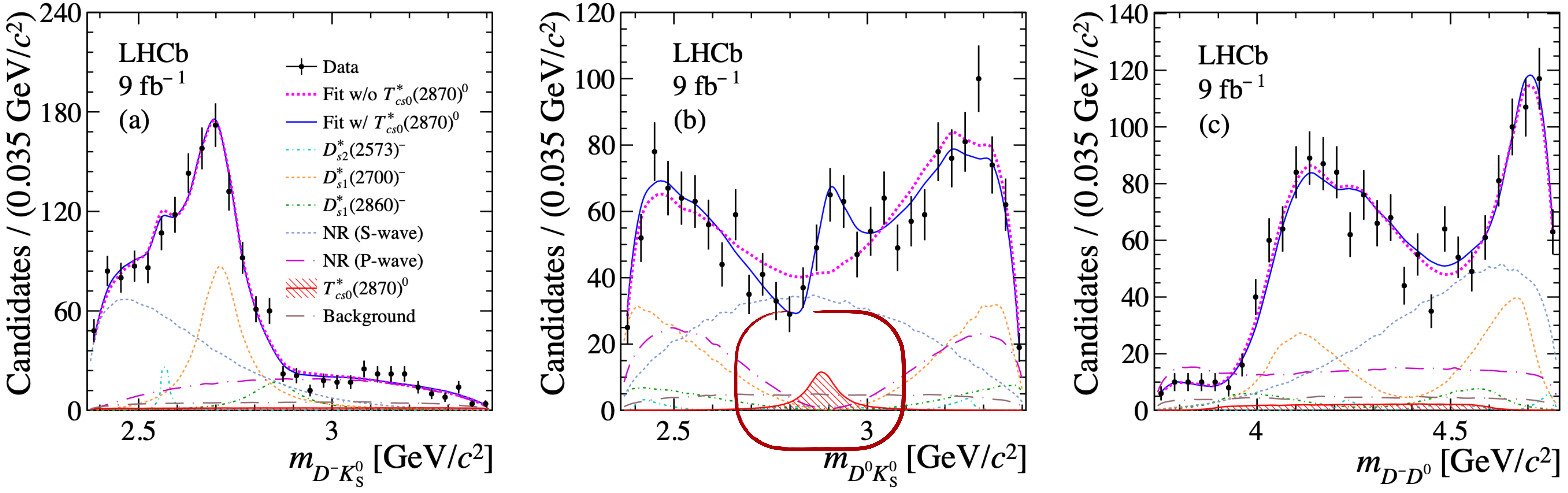
- **First open charm tetraquarks** $T^*_{cs0}(2870)^0$ and $T^*_{cs1}(2900)^0$ with $J^P = 0^+$ and 1^- observed in $B^- \to D^- D^+ K^-$
  - → could be compact tetra quark or $\bar{D}^{(*)} K^*$ hadronic molecule
  - → both cases assume **isospin symmetry**
- **Amplitude analysis** of $B^- \to \bar{D}^- D^0 K^0_s$ sensitive to open charm tetraquark $(c\bar{u}s\bar{d})$ in the $D^0 K^0_s$ system
- For the signal PDF **two interfering decay** sequences
  - → $B^- \to D^{*-}_{sJ}(\to D^- K^0_s) D^0$ and $B^- \to T^*_{cs0}(\to D^0 K^0_s) D^-$
- various components of D^{*-}_{sJ}, T^*_{cs0} are investigated with **independent amplitudes**
  - → $D^*_{s2}(2573)^-$, $D^*_{s1}(2700)^-$, $D^*_{s1}(2860)^-$, NR (S-, P-wave)
  - → $T^*_{cs0}(2870)^0$, $T^*_{cs1}(2900)^0$

PRL 134 (2025) 101901

- **Observation** of a resonant $J^P = 0^+$ structure, named $T^*_{cs0}(2870)^0$, in the $D^0K^0_s$ system with 5.3σ significance, **no observation** of $T^*_{cs1}(2900)^0$
- Relative decay width provide precise tests of the **isospin symmetry**

$$R_{\rm I}(T^{*0}_{cs}) = \frac{\mathcal{B}(B^- \to D^- D^0 \overline{K}^0)\mathrm{FF}(T^{*0}_{cs} \to D^0 K^0_{\rm S})}{\mathcal{B}(B^- \to D^- D^+ K^-)\mathrm{FF}(T^{*0}_{cs} \to D^+ K^-)}$$

- $R_{\rm I}(T^*_{cs0}(2870)^0) = 3.3 \pm 1.1_{\text{stat.}} \pm 1.1_{\text{syst.}} \pm 1.1_{\text{ext.}}$ and $R_{\rm I}(T^*_{cs1}(2900)^0) = 0.15 \pm 0.15_{\text{stat.}} \pm 0.05_{\text{syst.}} \pm 0.05_{\text{ext.}}$



$$M(T^{*0}_{cs0}) = 2883 \pm 11 \pm 8\,\mathrm{MeV}/c^2$$
$$\Gamma(T^{*0}_{cs0}) = 87^{+22}_{-47} \pm 17\,\mathrm{MeV},$$
$$\mathrm{FF}(T^{*0}_{cs0} \to D^0 K^0_{\rm S}) = (2.6 \pm 1.2_{\text{stat.}} \pm 0.4_{\text{syst.}})\%,$$

Isospin violation indicated for $T^*_{cs1}(2900)^0$ decays

Pentaquark search $\Lambda_b^0 \to \Lambda_c^+ D_s^- K^+ K^-$

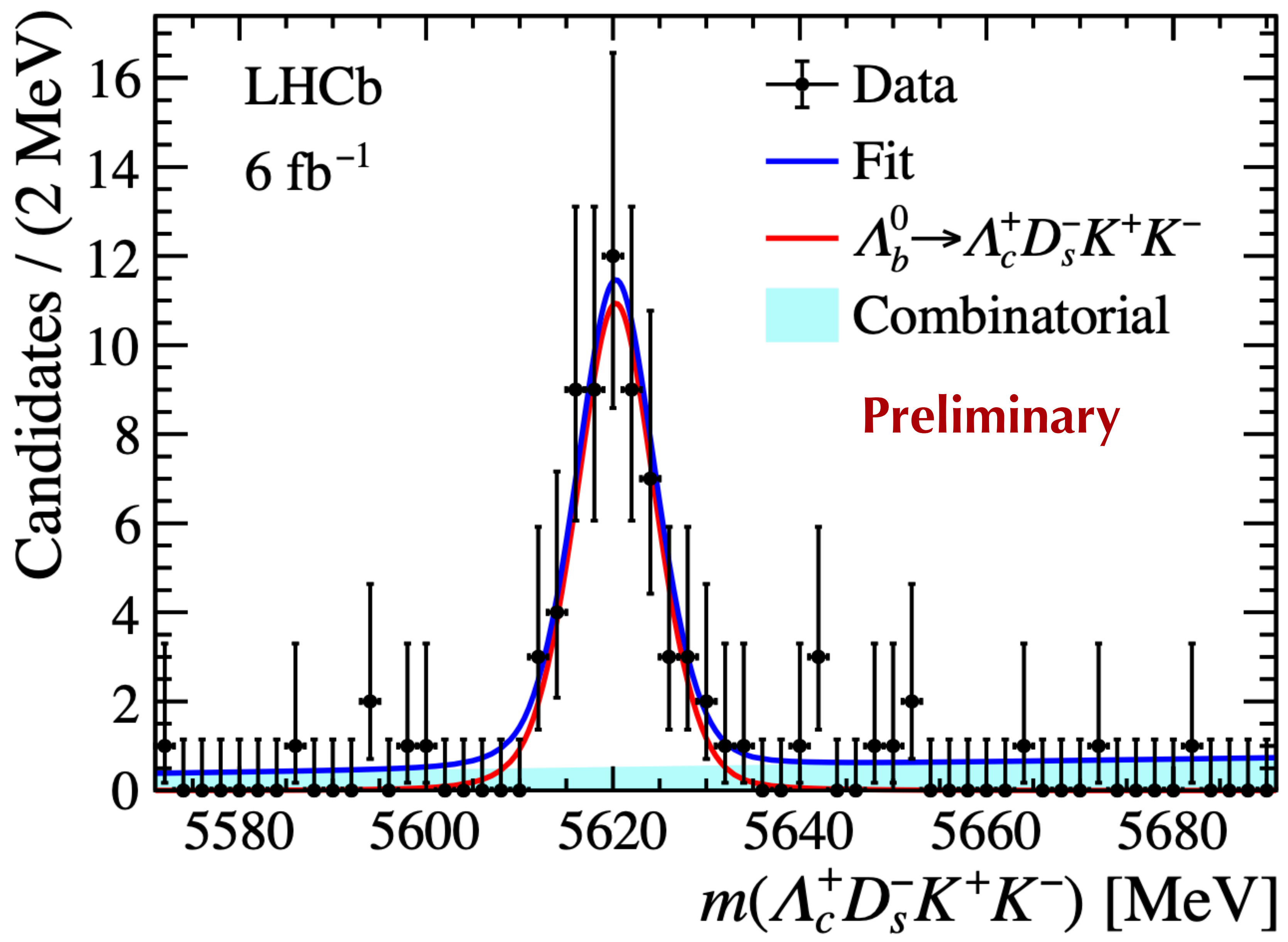
LHCb-PAPER-2025-022

NEW

- **Pentaquark $P^0_{c\bar{c}s}$ observed** in $B^- \to J/\psi \Lambda \bar{p}$ and evidence for in $\Xi_b^- \to J/\psi \Lambda K^-$ decays
  PRL 131 (2023) 031901   Sci. Bull. 66 (2021) 1278
- $\Lambda_b^0 \to \Lambda_c^+ D_s^- K^+ K^-$ interesting since

  → ϕ provides larger phase space

  → **potential access** to pentaquark candidates $P_{c\bar{c}s}(4338)^0$ and $P_{c\bar{c}s}(4459)^0$
- Full Run 2 dataset



- Cabibbo favoured normalisation mode $\Lambda_b^0 \to \Lambda_c^+ D_s^-$
- BF determined with unbinned maximum likelihood fit

First observation of the decay

$$\frac{\mathcal{B}(\Lambda_b^0 \to \Lambda_c^+ D_s^- K^+ K^-)}{\mathcal{B}(\Lambda_b^0 \to \Lambda_c^+ D_s^-)} = 0.0141 \pm \underset{\text{stat.}}{0.0019} \pm \underset{\text{syst.}}{0.0012}$$

Pentaquark search $\Lambda_b^0 \to \Lambda_c^+ D_s^- K^+ K^-$

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PRL 131 (2023) 031901 · Sci. Bull. 66 (2021) 1278

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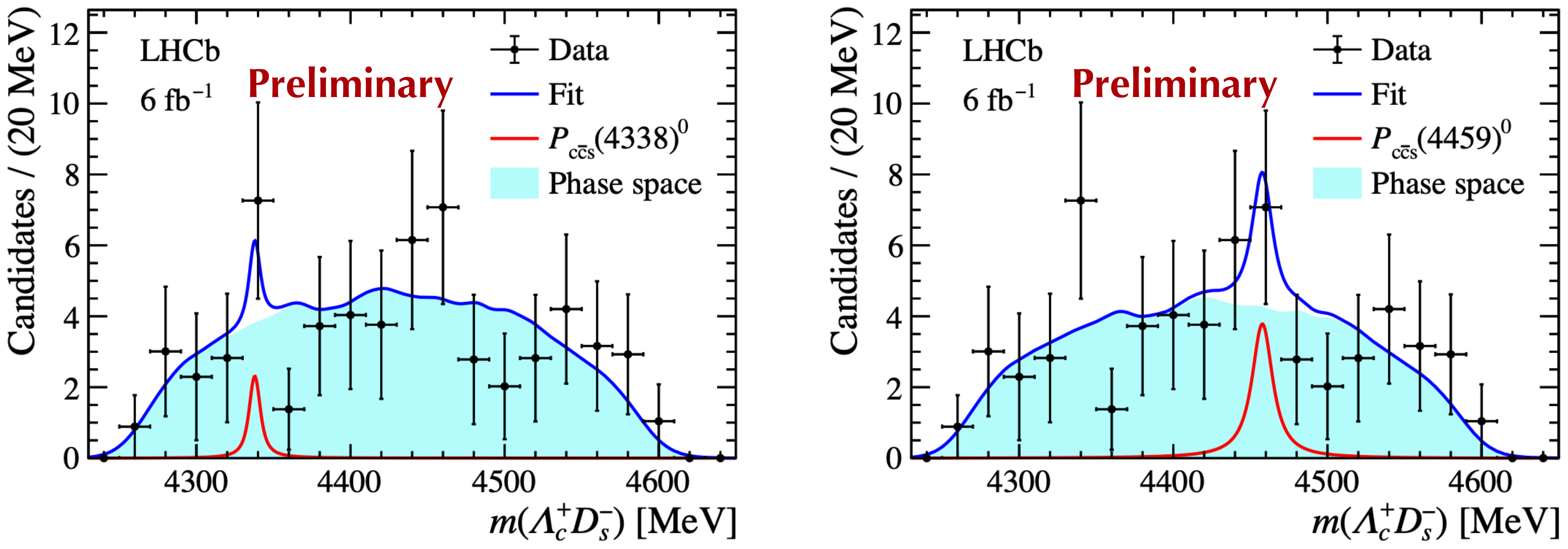


$P_{c\bar{c}s}$ **searches in** $\phi(1020)$ **window**

- Search for hidden-charm pentaquarks with strangeness in $\Lambda_c^+ D_s^-$ **invariant mass**
- No significant signal observed

Limit on production ratio set at 95% CL

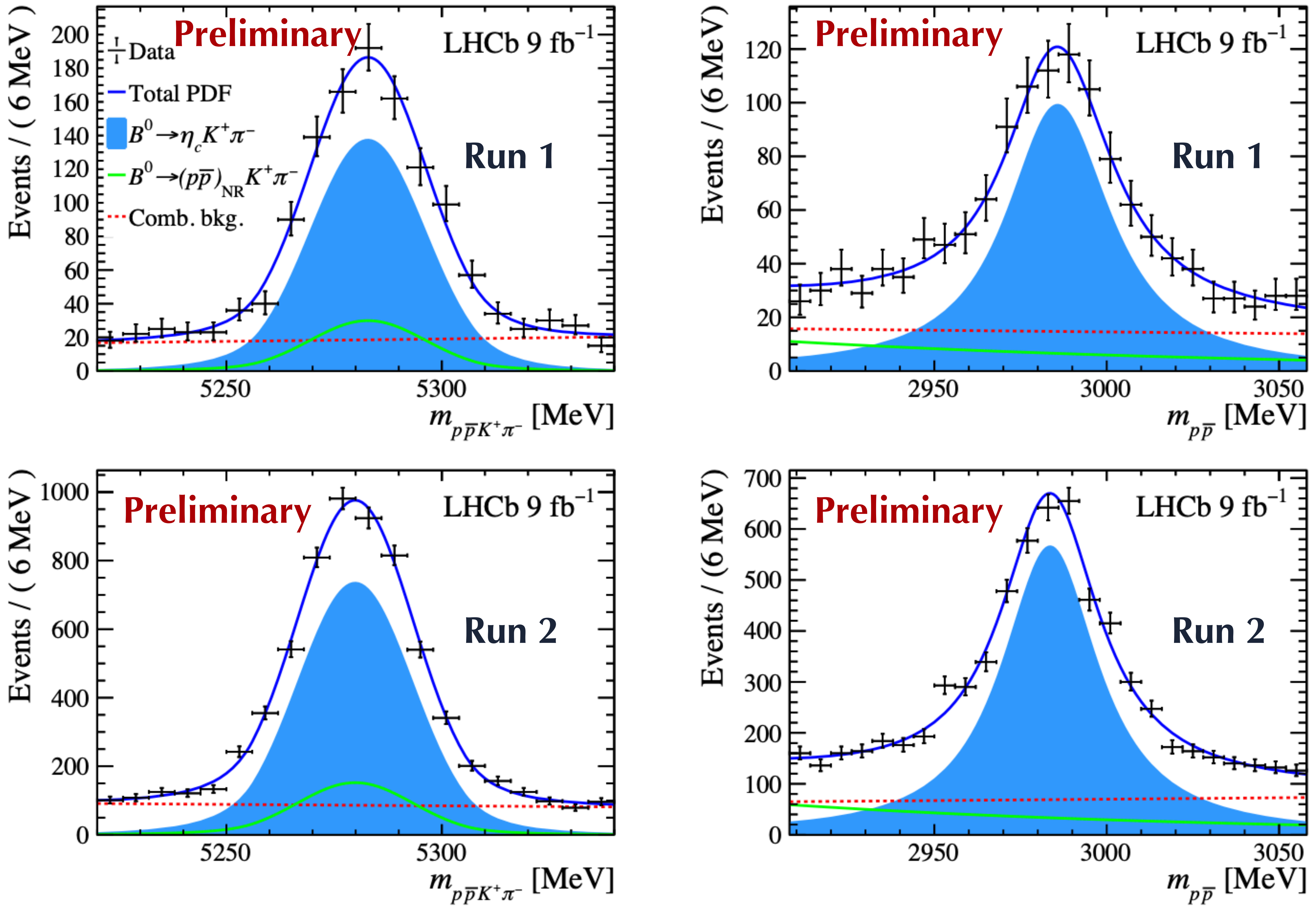
$$\mathcal{R}_{P^0_{c\bar{c}s}} = \frac{\mathcal{B}(\Lambda_b^0 \to \Lambda_c^+ D_s^- K^+ K^-)}{\mathcal{B}(\Lambda_b^0 \to \Lambda_c^+ D_s^-)} \cdot \mathcal{B}(P^0_{c\bar{c}s} \to \Lambda_c^+ D_s^-)$$

$$\mathcal{R}_{P_{c\bar{c}s}(4338)^0} < 0.12$$

$$\mathcal{R}_{P_{c\bar{c}s}(4459)^0} < 0.20$$

Amplitude analysis $B^0 \to \eta_c(1S)K^+\pi^-$

LHCb-PAPER-2025-027



- **Update** of the 4.7 fb^{-1} analysis using the full Run 1+2 dataset
- Inclusive $B^0 \to \eta_c(1S)K^+\pi^-$ BF measured
- Normalised by $B^0 \to J/\psi K^+\pi^-$ and inclusive BF extracted with world average of J/ψ BF

NEW

With the world average of $B^0 \to J/\psi K^+\pi^-$ BF

$$\mathrm{B}(B^0 \to \eta_c(1S)K^+\pi^-) = (5.82 \pm 0.20 \pm 0.23 \pm 0.55) \times 10^{-4}$$

stat. syst. ext.

Compatible with world average

Amplitude analysis $B^0 \to \eta_c(1S)K^+\pi^-$

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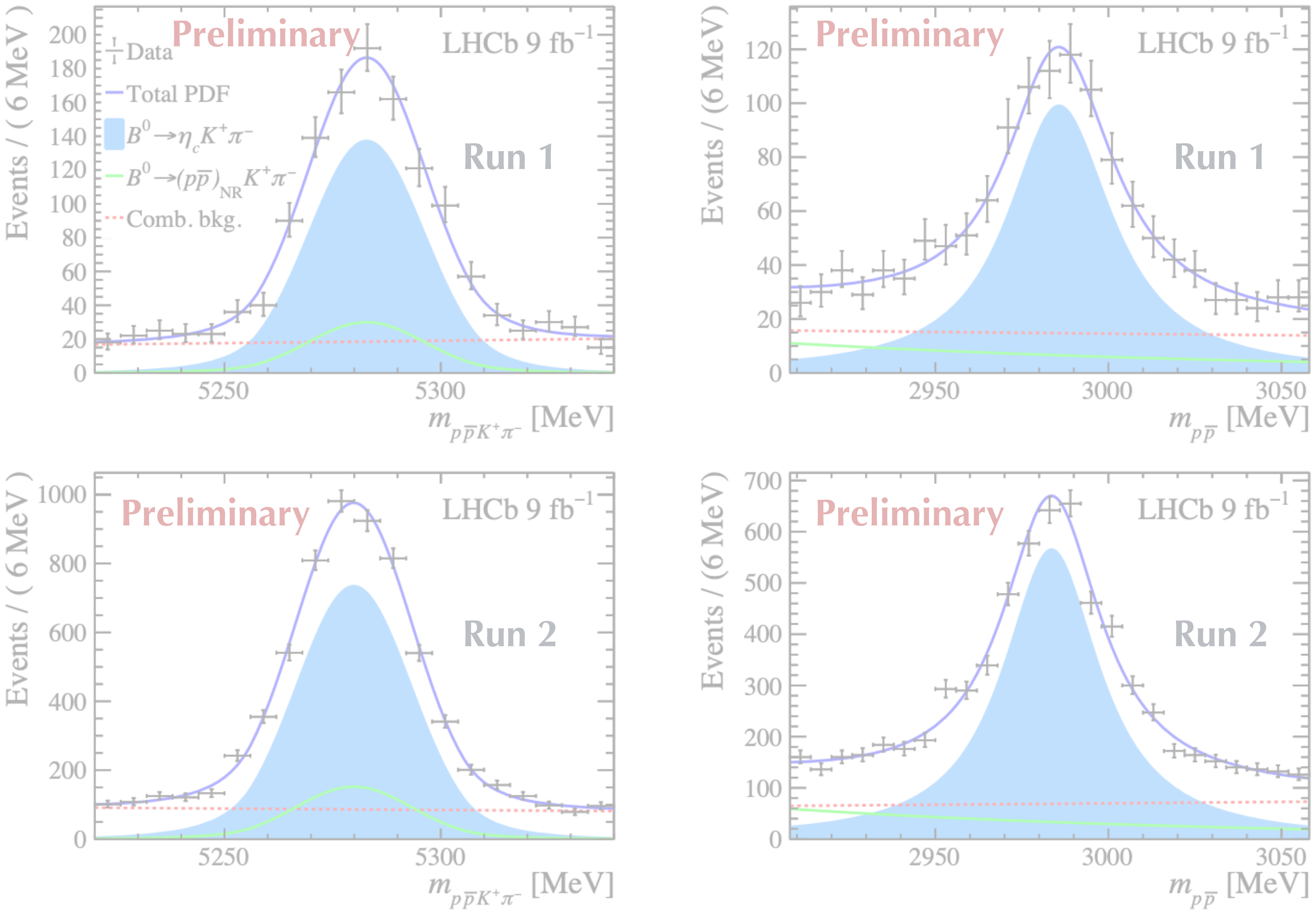

Decay	Branching ratio $[10^{-5}]$
$B^0 \to \eta_c(1S)K^*(892)(\to K^+\pi^-)$	$28.69 \pm 1.21 \pm 1.13^{+2.21}_{-1.98} \pm 2.71$
$B^0 \to \eta_c(1S)K^*(1410)(\to K^+\pi^-)$	$2.62 \pm 0.82 \pm 0.10^{+1.86}_{-1.80} \pm 0.25$
$B^0 \to \eta_c(1S)K_0^*(1430)(\to K^+\pi^-)$	$17.92 \pm 2.80 \pm 0.71^{+3.26}_{-2.56} \pm 1.69$
$B^0 \to \eta_c(1S)(K^+\pi^-)_{\rm SVP}$	$8.96 \pm 1.42 \pm 0.35^{+1.63}_{-1.28} \pm 0.84$
$B^0 \to \eta_c(1S)K_2^*(1430)(\to K^+\pi^-)$	$2.15 \pm 0.53 \pm 0.08^{+0.76}_{-1.16} \pm 0.20$
$B^0 \to \eta_c(1S)K^*(1680)(\to K^+\pi^-)$	$1.22 \pm 0.52 \pm 0.05^{+0.76}_{-0.99} \pm 0.12$
$B^0 \to \eta_c(1S)K_0^*(1950)(\to K^+\pi^-)$	$1.40 \pm 2.56 \pm 0.06^{+1.57}_{-1.40} \pm 0.13$

NEW

- **Update** of the 4.7 fb^{-1} analysis using the full Run 1+2 dataset
- **Inclusive $B^0 \to \eta_c(1S)K^+\pi^-$** BF measured
- Normalised by $B^0 \to J/\psi K^+\pi^-$ and inclusive BF extracted with world average of J/ψ BF

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Compatible with world average

- **Scaling** inclusive BF with fit fractions from amplitude analysis to access **exclusive** K^* BF

Amplitude analysis $B^0 \to \eta_c(1S)K^+\pi^-$

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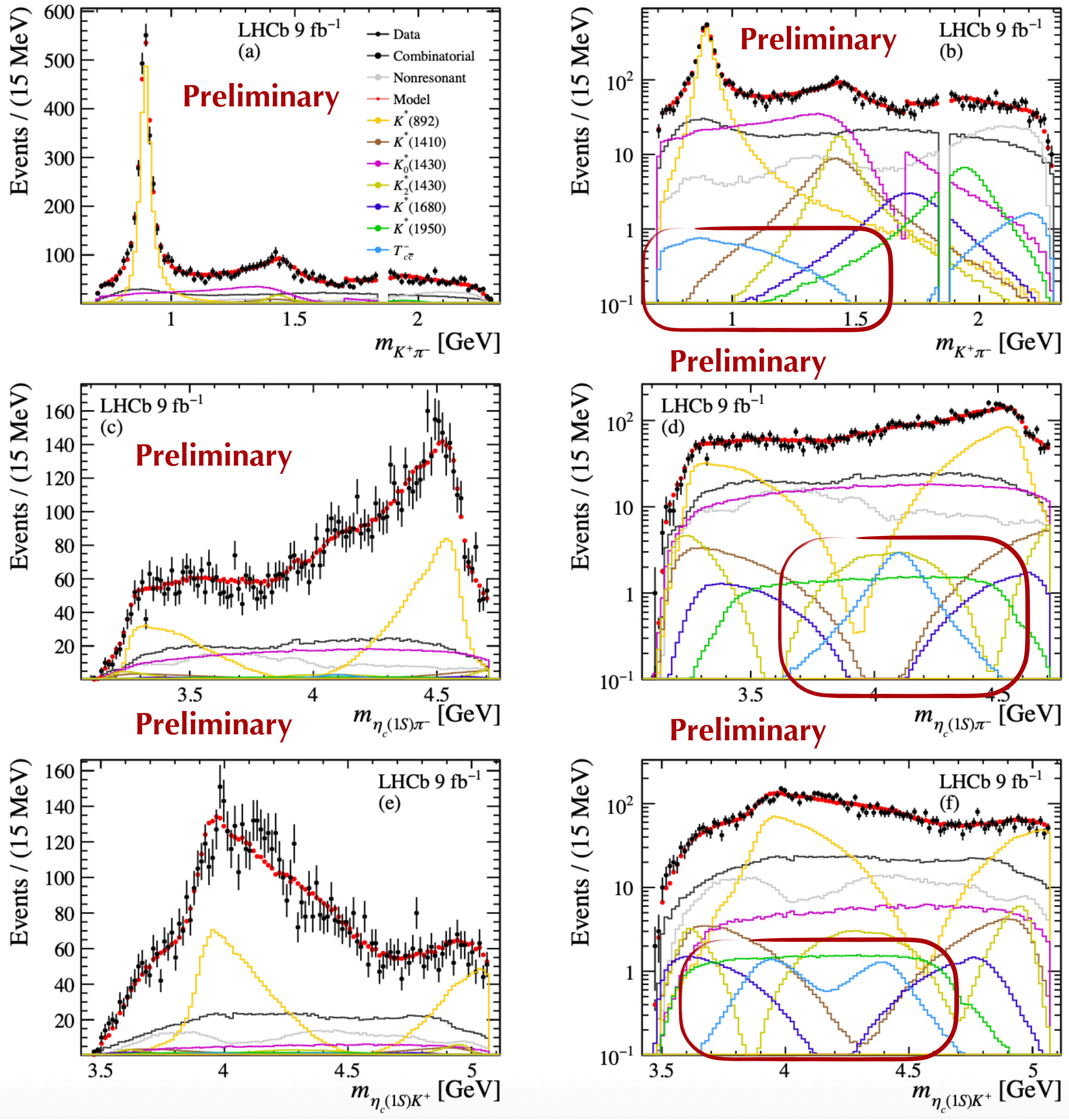


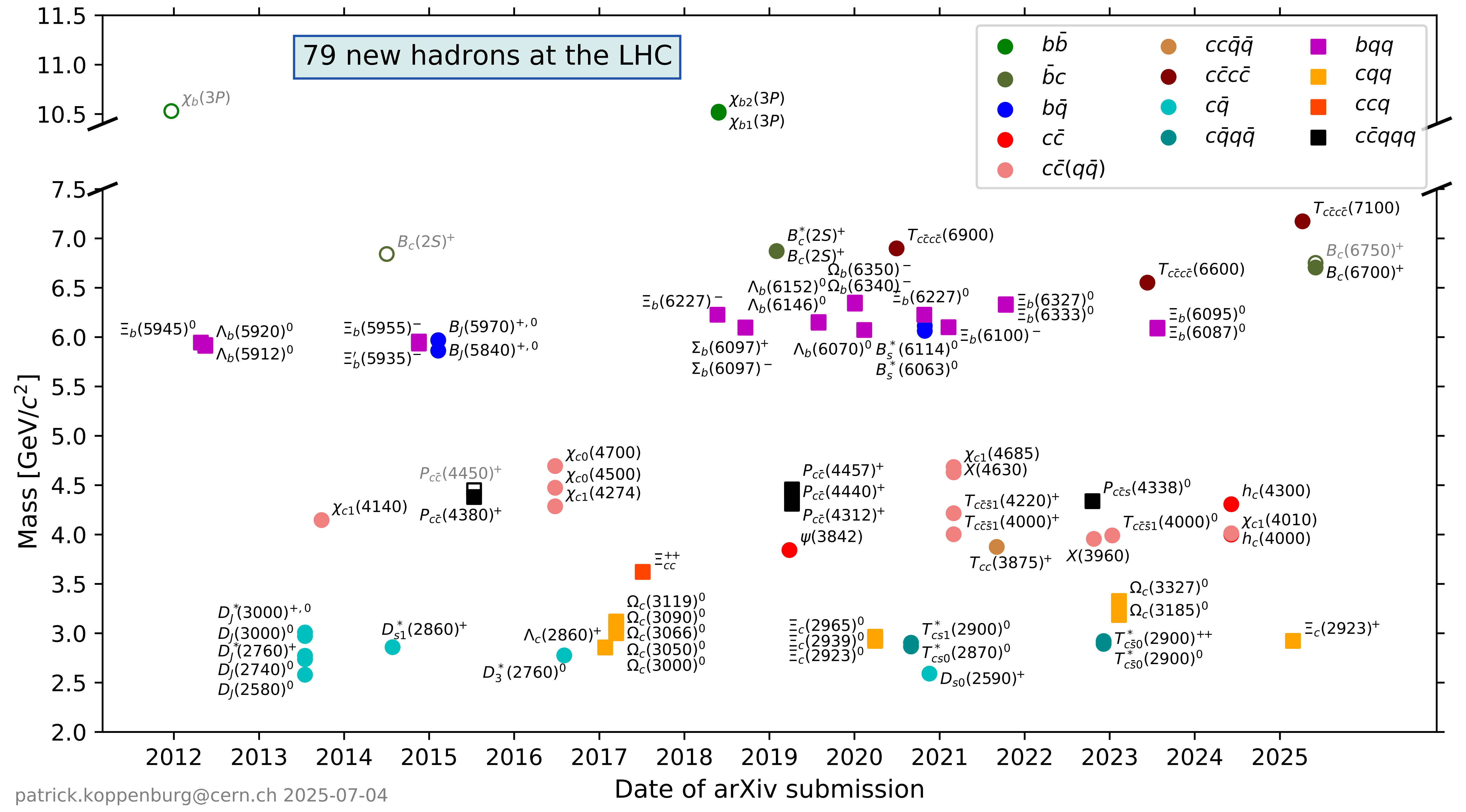
- LHCb analysis with 4.7 fb^{-1}reported evidence of $T_{c\bar{c}}(4100)^-$
- **extended amplitude fit** with 9 fb^{-1} dataset including $T_{c\bar{c}}(4100)^-$
- **Improved data description** with fit fraction of 1.1 ± 0.5 %

Parameter	Value
$m_{T_{c\bar{c}}(4100)^-}$	4106 ± 23 MeV
$\Gamma_{T_{c\bar{c}}(4100)^-}$	514 ± 166 MeV

- **No significant access** found when including systematic uncertainties
- This results **supersedes** previous measurement EPJ C78 (2018) 1019

Conclusion

- Great potential for **understanding QCD** with spectroscopy
- **70** of 79 new **hadrons discovered at LHCb**



- Several preliminary and **new results hadron spectroscopy**
- **New measurement** and more results using the Run 1+2 and new Run 3 data with **large trigger improvements** on the way! Stay tuned!

Backup

Additional recent measurements

Conventional spectroscopy:

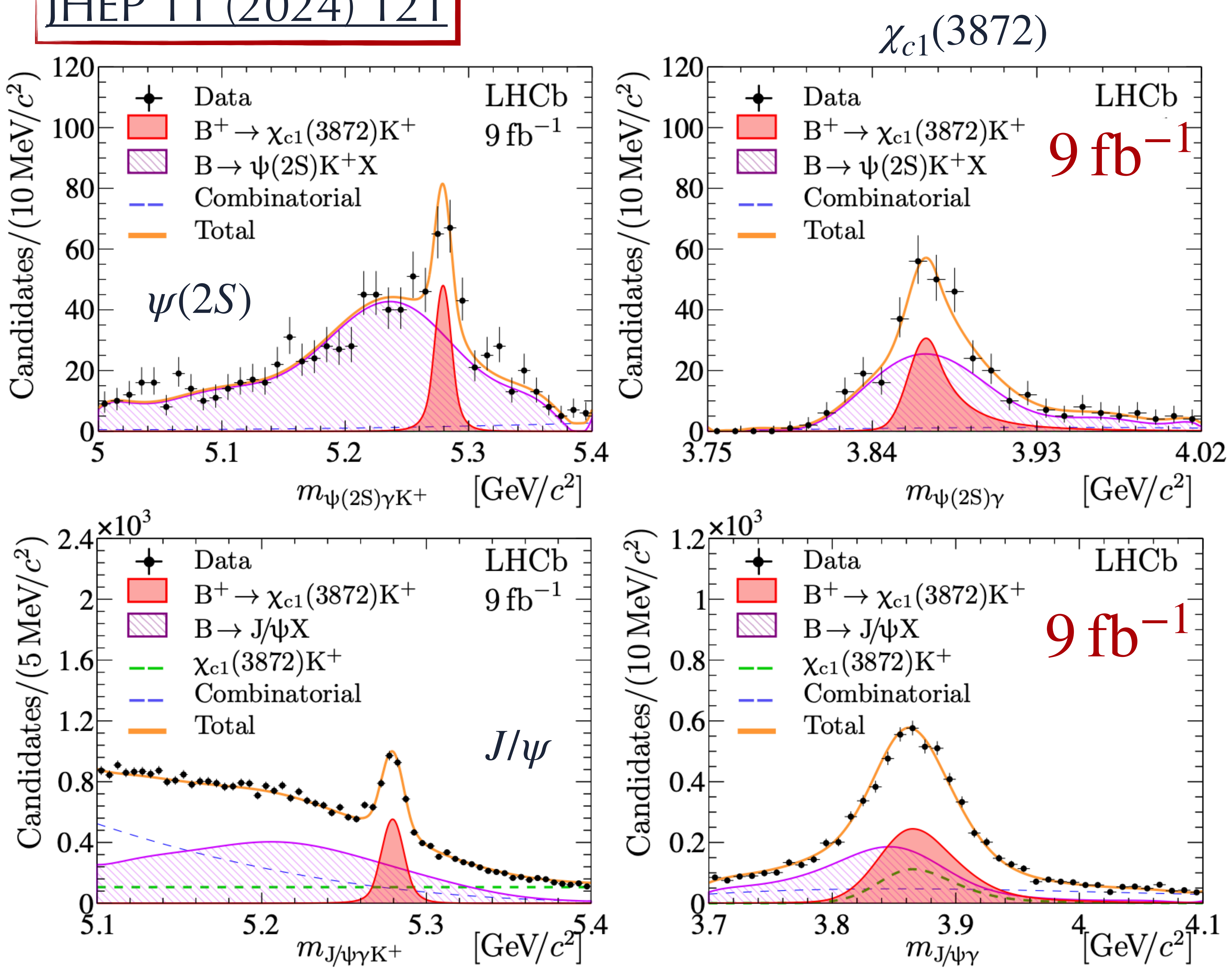
- Measurement of the mass difference and relative production rate of the Ω_b^- and Ξ_b^- baryons *PRD 108 (2023) 052008*
- Observation of New Baryons in the $\Xi_b^-\pi^+\pi^-$ and $\Xi_b^0\pi^+\pi^-$ Systems *PRL 131 (2023) 171901*
- Observation of $\Xi_b^0 \to \Xi_c^+ D_s^-$ and $\Xi_b^- \to \Xi_c^0 D_s^-$ decays *EPJ C 84 (2024) 237*
- Precision measurement of the Ξ_b^- baryon lifetime *PRD 110 (2024) 072002*
- Observation of muonic Dalitz decays of $\chi_b$mesons and precise spectroscopy of hidden-beauty states *JHEP 2410 (2024) 122*
- Study of the rare decay $J/\psi \to \mu^+\mu^-\mu^+\mu^-$ *JHEP 2412 (2024) 062*

Exotic spectroscopy

- Probing the nature of the $\chi_1(3872)$ state using radiative decays *JHEP* 2411 (2024) 121
- Amplitude analysis of $B^+ \to \psi(2S)K^+\pi^+\pi^-$ decays *JHEP* 2501 (2025) 054
- Study of $D_{s1}(2460)^+ \to D_s^+\pi^+\pi^-$ in $B \to \bar{D}^{(*)}D_s^+\pi^+\pi^-$ decays *Sci. Bull.* 70 (2025) 1432-1444

Nature of $\chi_{c1}(3872)$

JHEP 11 (2024) 121



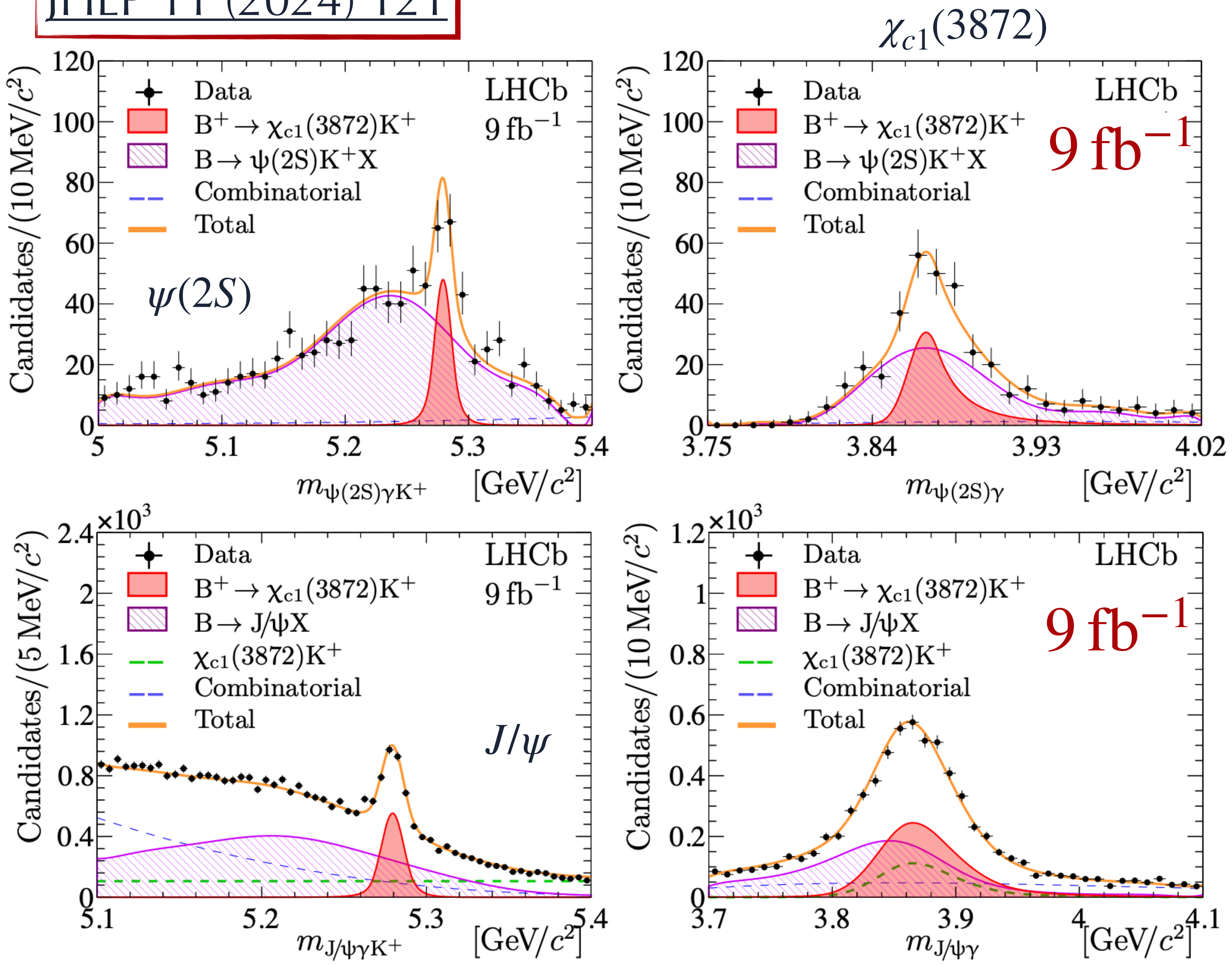
- $\chi_{c2}(3872)$ discovered in 2003 in $B^+ \to J/\psi\pi^+\pi^-K^+$ decays
- **Hadronic state** appears very close to **threshold**

  → potential sign for hadronic molecule
- Prediction of radio of **partial radiative decay width** largely depend on model

$$\mathscr{R}_{\psi\gamma}^{\mathrm{mol}} = \frac{\Gamma_{\chi_{c1}(3872} \to \psi(2S)\gamma}{\Gamma_{\chi_{c1}(3872} \to J/\psi\gamma} \ll 1$$

Nature of $\chi_{c1}(3872)$

JHEP 11 (2024) 121



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- 4D simultaneous unbinned maximum likelihood fit with the two decay modes and the Run 1 and Run 2 data taking periods

First observation with 4.8 (6.0)σ of $\chi_{c1}(3872) \to \psi(2S)\gamma$

$$\mathscr{R}_{\psi\gamma} = 1.67 \pm \underset{\text{stat.}}{0.21} \pm \underset{\text{syst.}}{0.12} \pm \underset{\text{ext.}}{0.04}$$

Disfavours a hadronic molecule