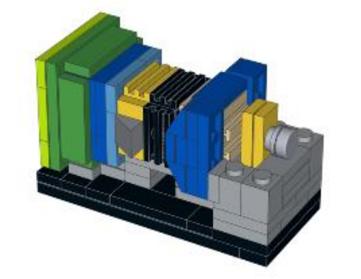
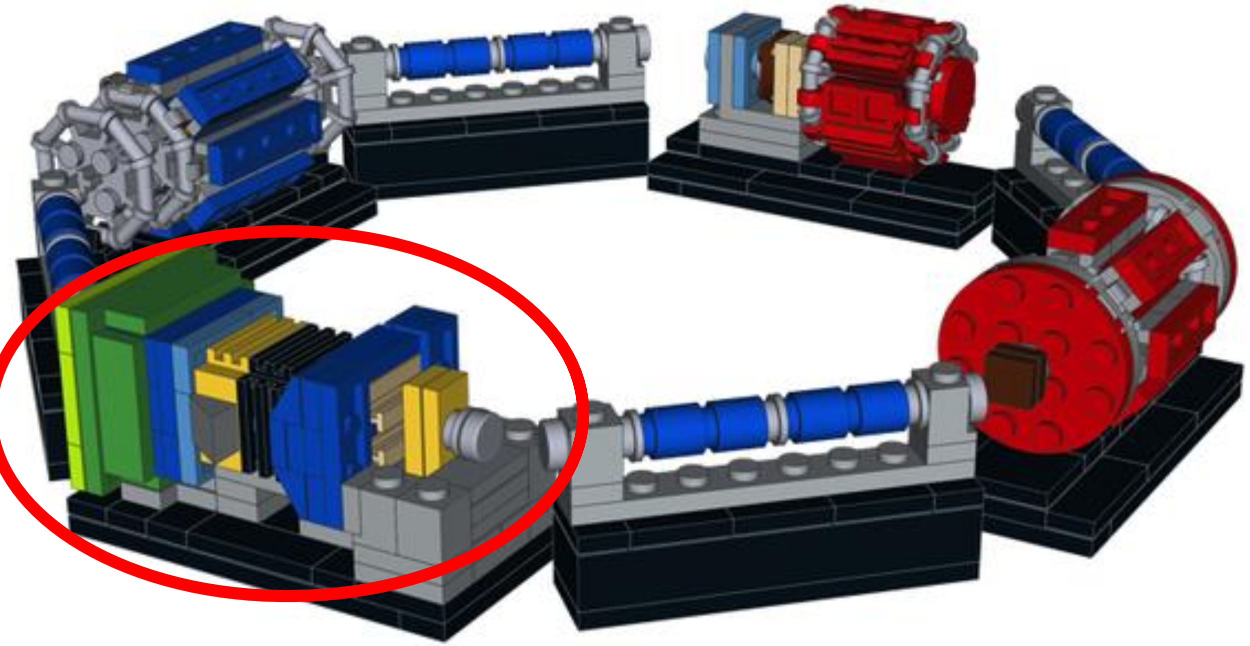


LHCb Status Report

Vanya Belyaev (ITEP/Moscow)
for LHCb Collaboration

LHC, LHCb and three friends

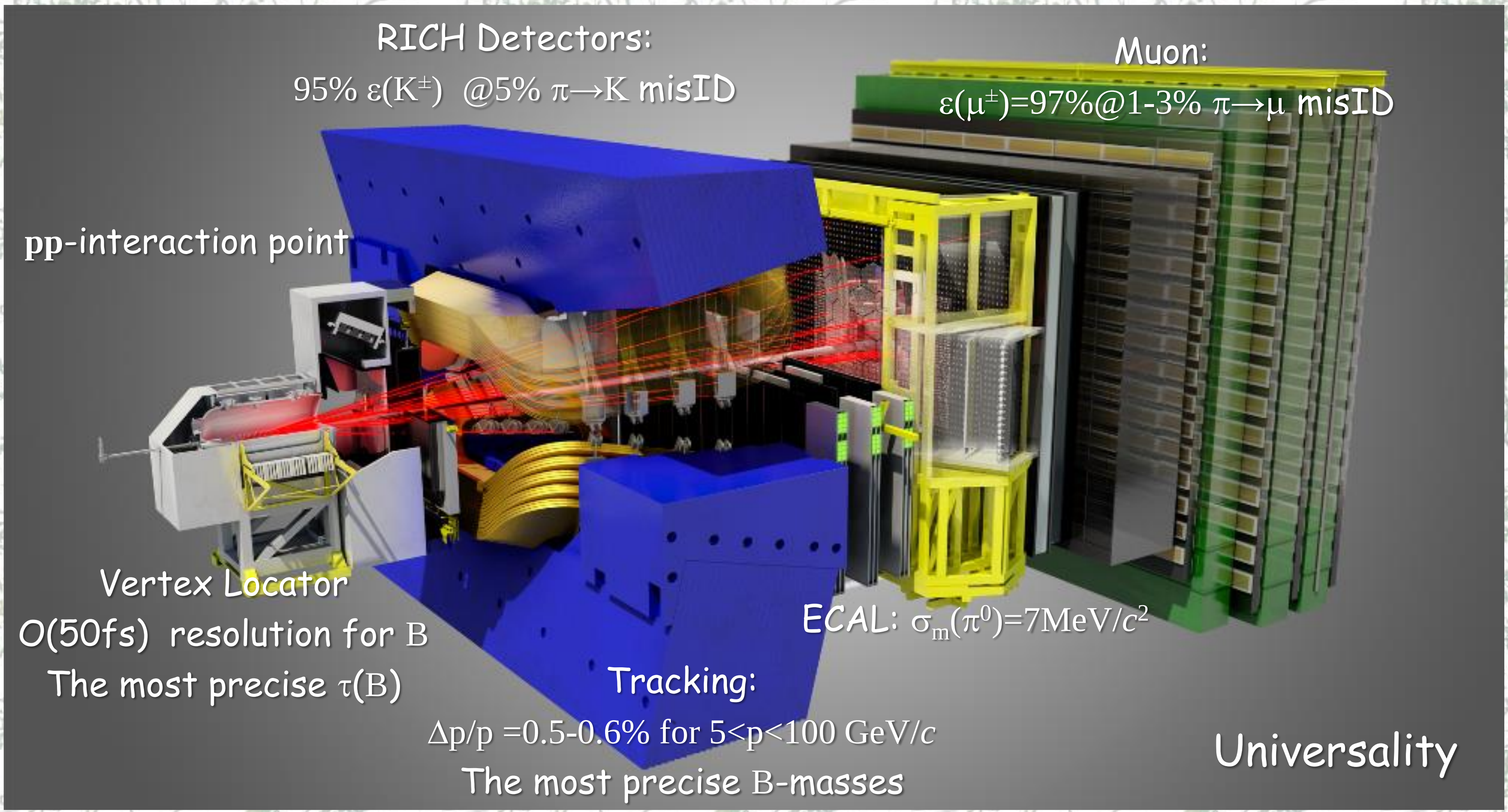


LHCb

Complementarity

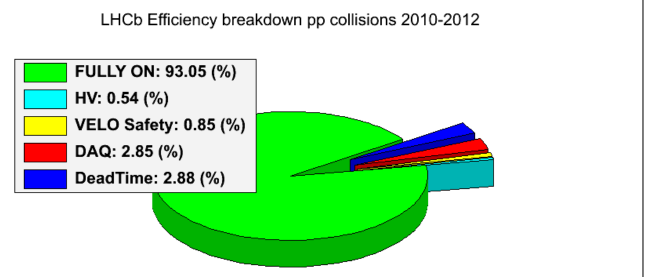
ideas.lego.com/projects/94885

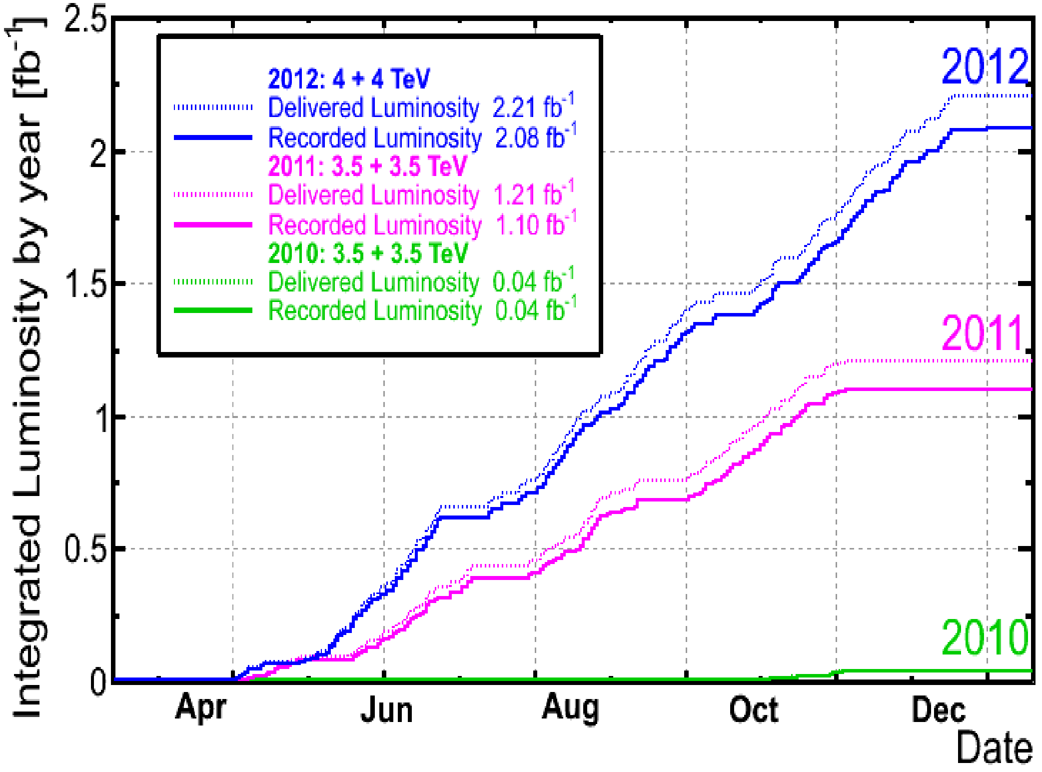
~40% of heavy quarks in <4% of 4π



Run I

- $1 fb^{-1}$@7TeV
- $2 fb^{-1}$@8TeV
- $3.3 pb^{-1}$ @2.76TeV
- $1.6 nb^{-1}$ pA & Ap

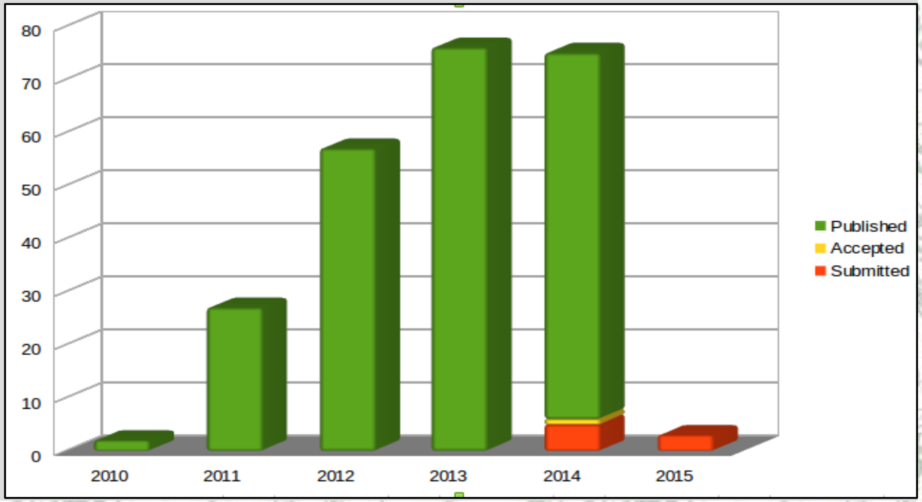




Thanks to LHC accelerator team for the excellent performance of machine

241 papers submitted 4/03/15

- Good rate is kept: 15 new results in 14 weeks since last LHCC
- This week is special: 6 new results are being shown for the first time at *La Thuile*
  - *Moriond EW* and *Moriond QCD* are soon
- Today:
  - 15 posters for LHCC



New papers since last LHCC

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$1fb^{-1}$ vs Full Run 1 dataset

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Beauty&Charm decays, QCD, EW & Exotica

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Universality

Hot-n-fresh La Thuile 2k+15

This week!

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LHCb-PAPER-2015-009 "Differential branching fractions and angular analysis of $\Lambda_b \to \Lambda^0\mu^+\mu^-$" **This morning**

Inelastic pp cross-section

LHCb-PAPER-2014-057 arXiv:1412.2500

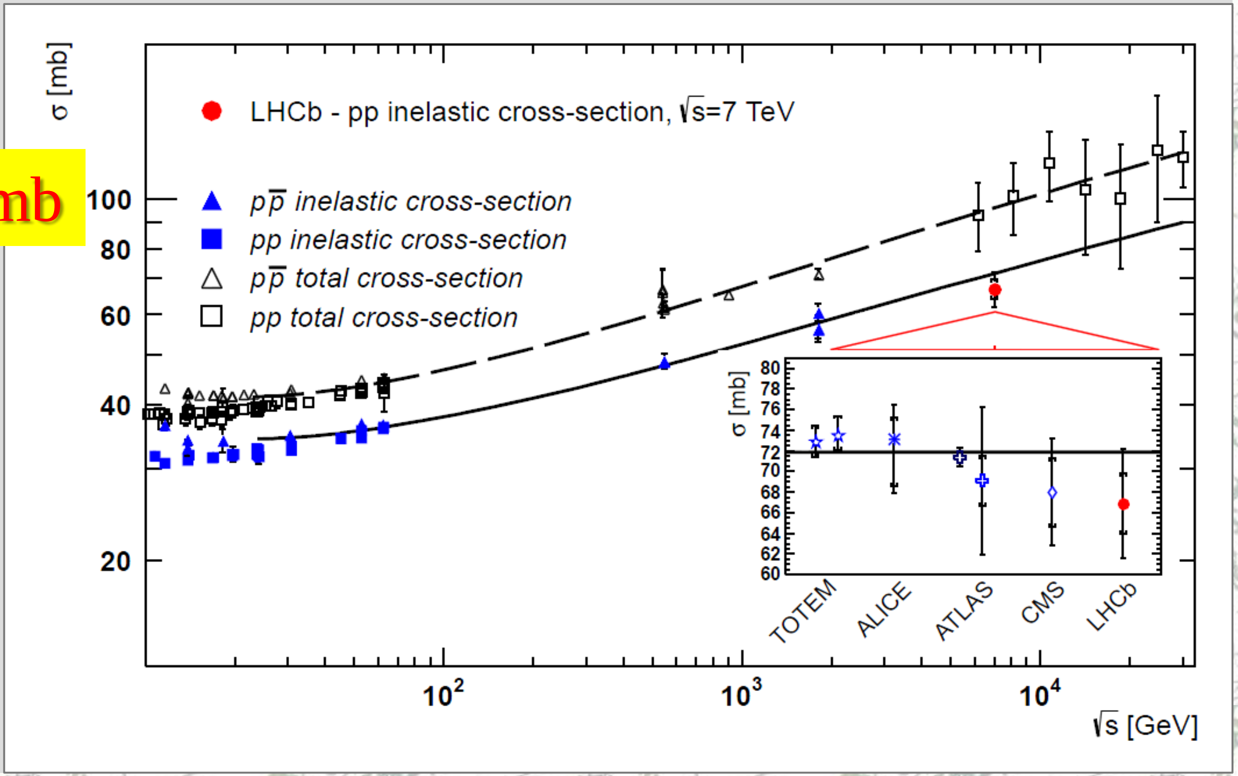
- Use 2010 data, $\sqrt{s}$=7TeV, L=2nb^{-1} with very low pileup
- Cross-section for at least one track with p_T>200MeV/c and 2.0<η<4.5

  σ=55.0±2.4mb Systematic dominates: $\sigma(L)$=3.5% (for 2010 data)

  1.7% for 2k+11
  1.2% for 2k+12
- Extrapolation to 4π

  Pythia 8.201

σ=66.9±2.9$_{(exp)}$±4.4$_{(ext)}$mb



The measurement for all LHC detectors..

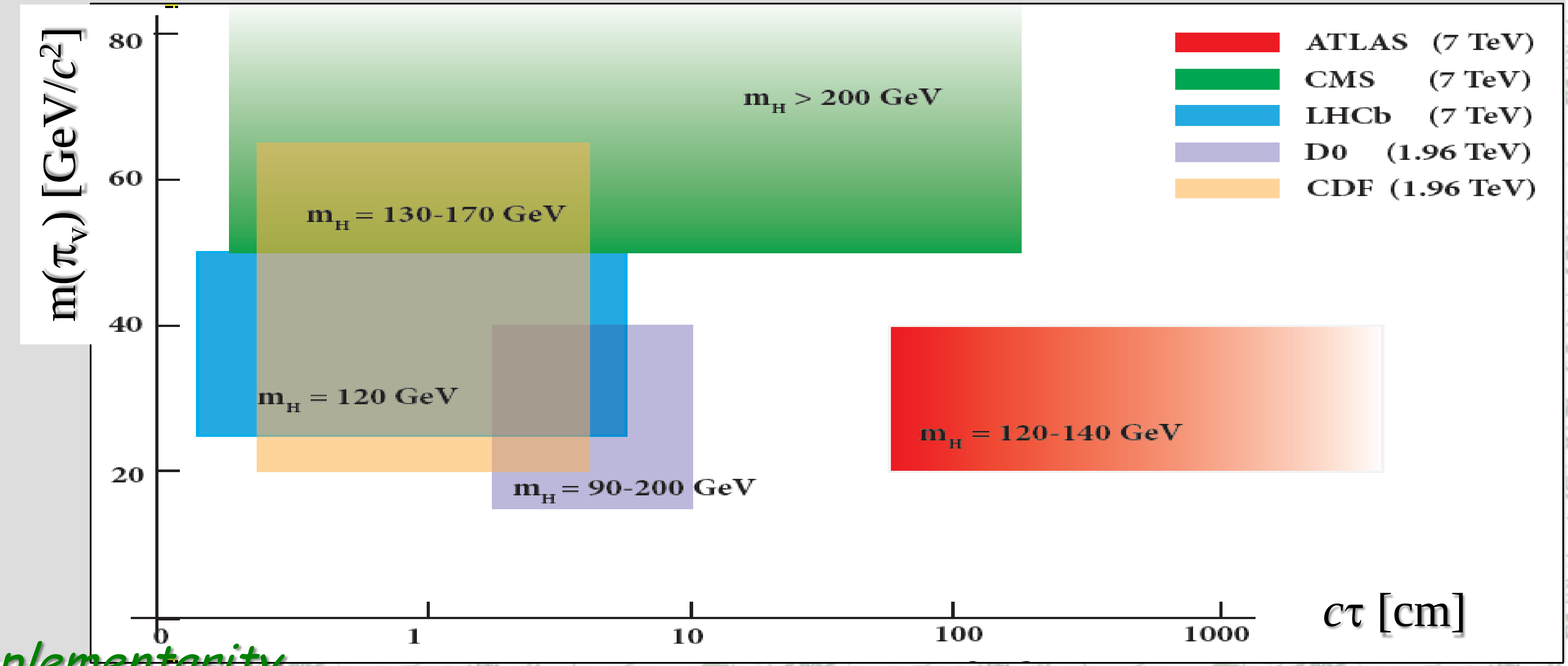
Synergy

Massive Long-lived particles

Poster

LHCb-PAPER-2014-062 arXiv:1412.3021

- Generic search for heavy $25<m<50\mathrm{GeV}/c^2$ long-lived $1<\tau<200\mathrm{ps}$ particles via *displaced two-jet vertices*
- *Hidden Valley* $H\rightarrow\pi_v\pi_v$ as benchmark



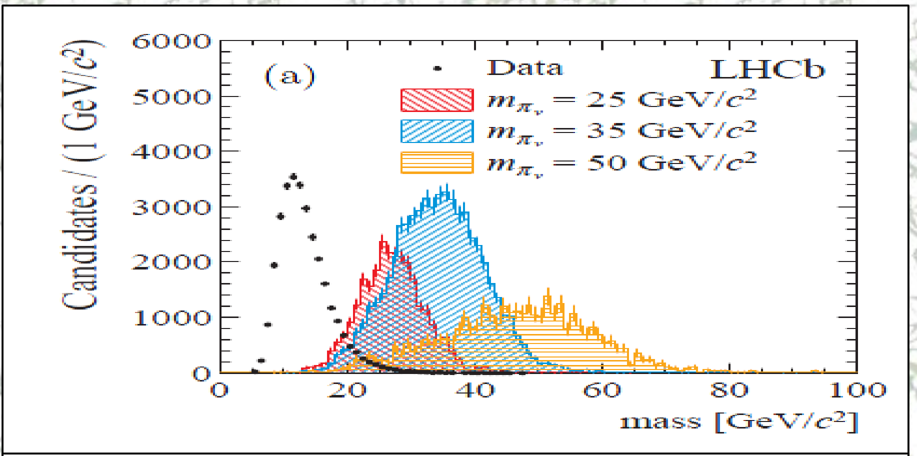
Complementarity

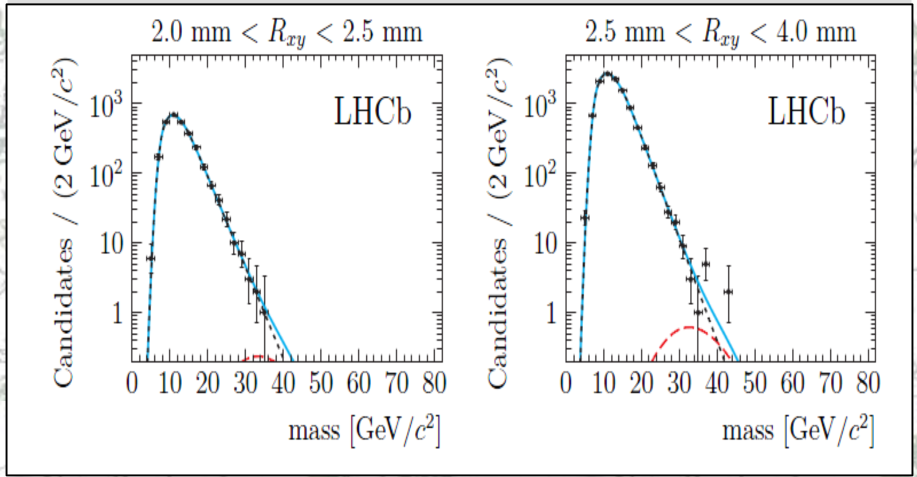
Massive Long-lived particles

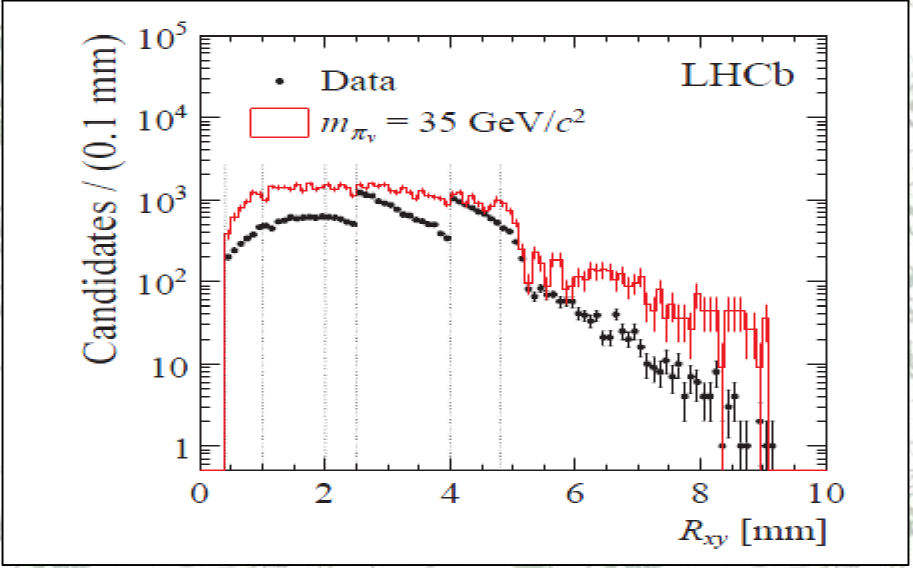
Poster

LHCb-PAPER-2014-062 arXiv:1412.3021

- Reconstruct $\pi_v \to b\bar{b}$ with two b-tagged jets
- "Material veto"
- Fit mass in 5 bins R_{xy}
  - no signal is observed





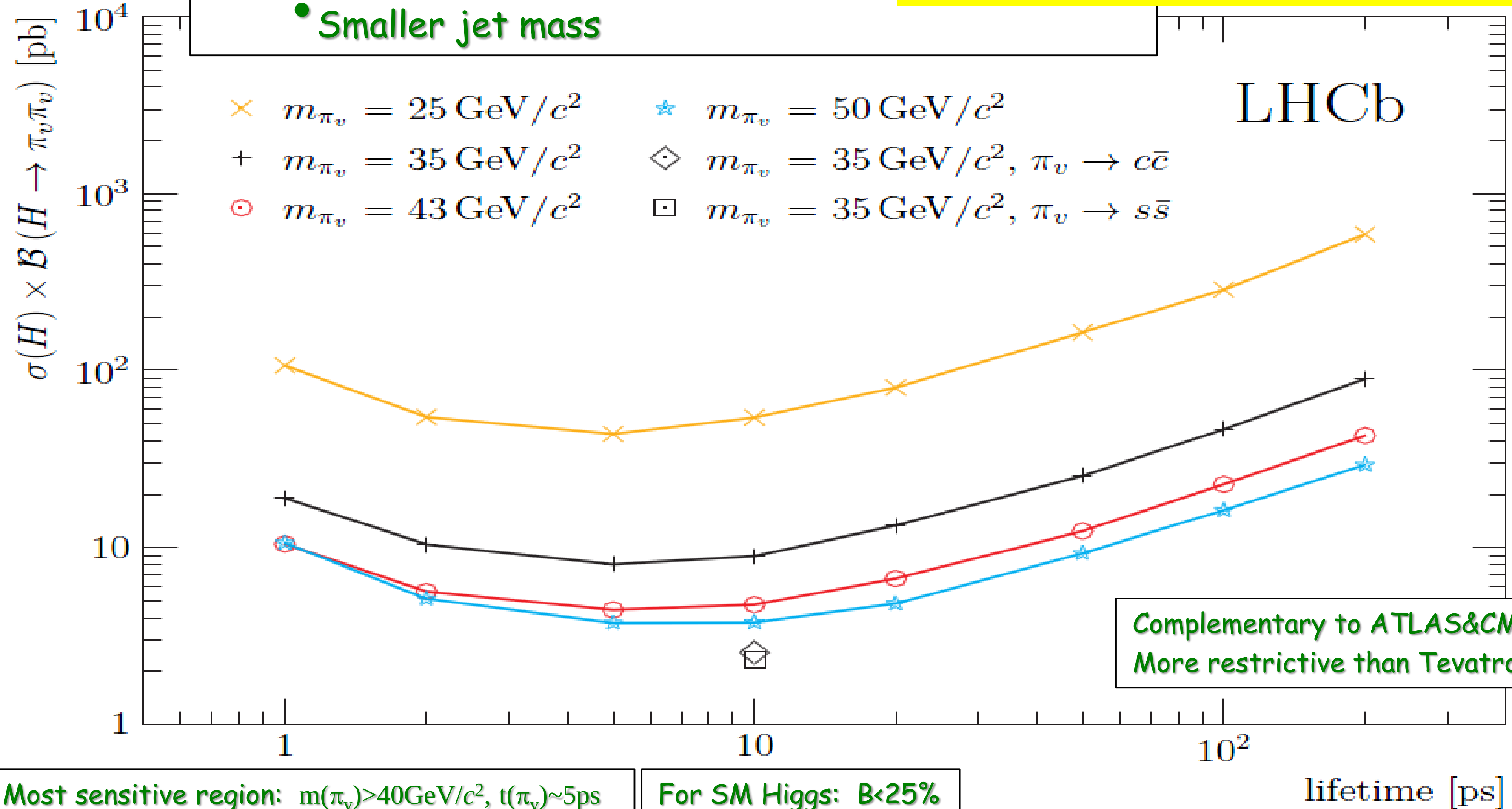


Massive Long-lived particles

Upper limits are better for decays into light quarks:

- Large multiplicity
- Smaller jet mass

LHCb-PAPER-2014-062 arXiv:1412.3021



Complementary to ATLAS&CMS
More restrictive than Tevatron

Most sensitive region: $m(\pi_v)>40\mathrm{GeV}/c^2$, $t(\pi_v)\sim 5\mathrm{ps}$

For SM Higgs: B<25%

B^{**}

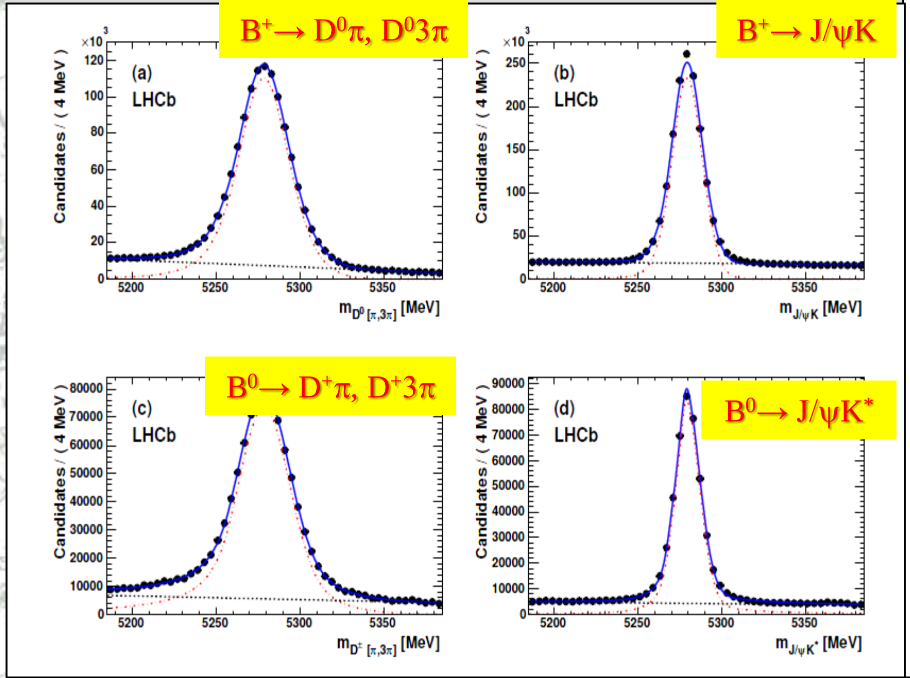
LHCb-PAPER-2014-067 arXiv:1502.02638

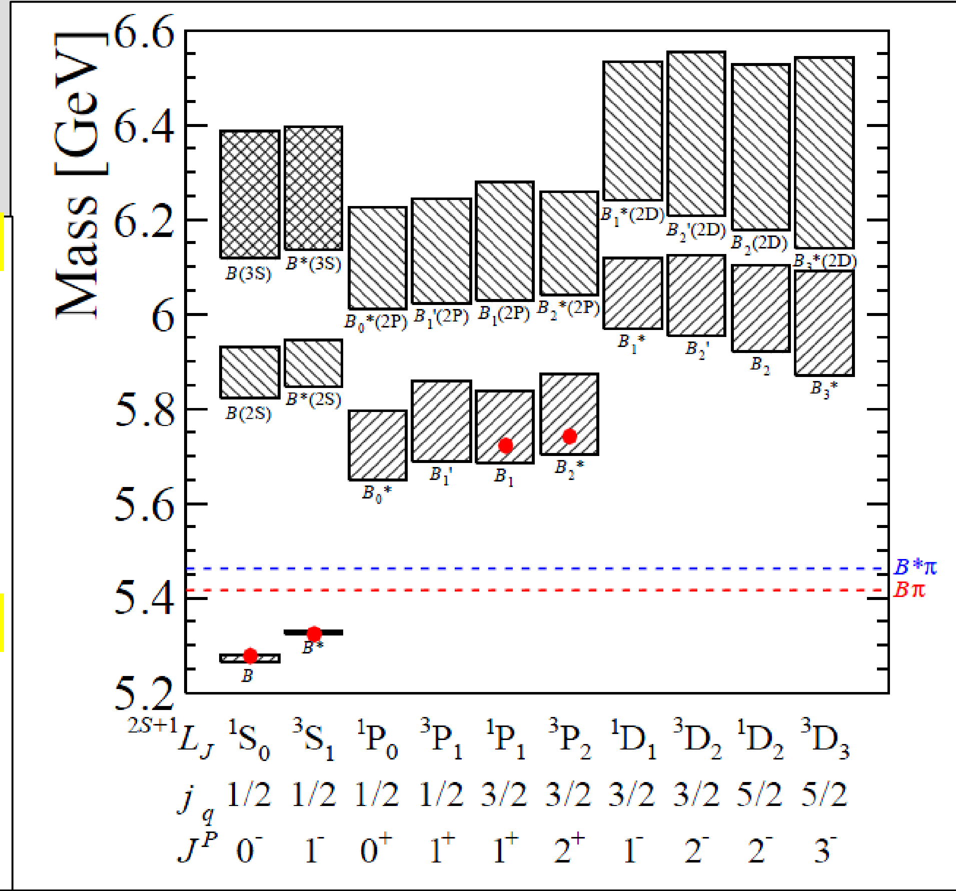
- A lot of B^{**} states are predicted. Only two are measured (D0,CDF)
- Important for understanding HQET

1.2M B^0 in 3 modes

2.5M B^+ in 3 modes

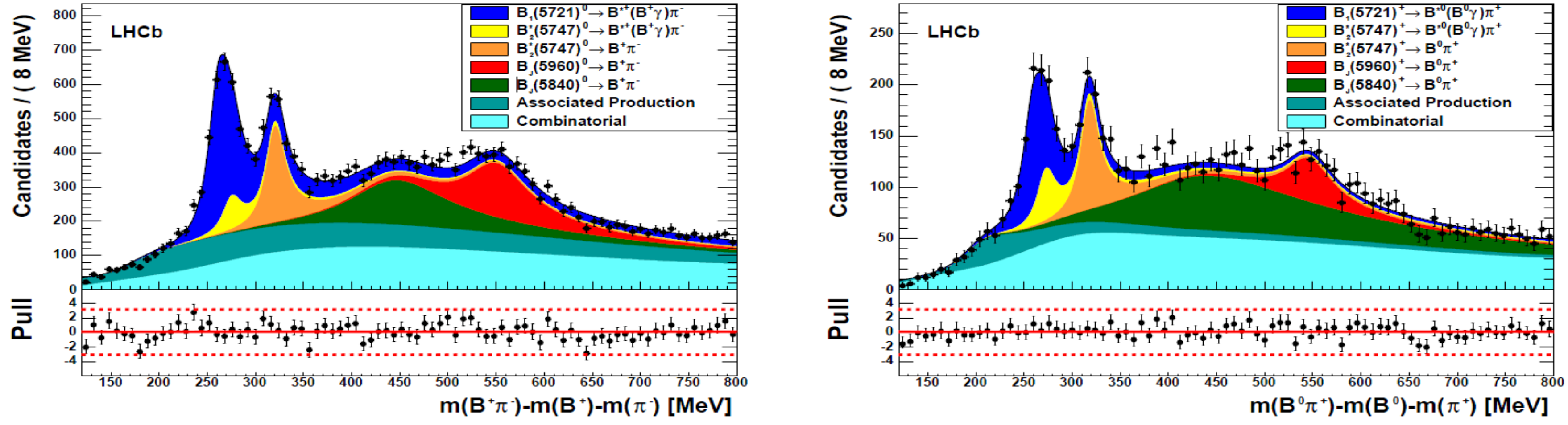
Purity >80% for all cases





$B_1(5721)^{0,+}$ & $B_2(5747)^{0,+}$

LHCb-PAPER-2014-067 arXiv:1502.02638



$$
\begin{aligned}
m_{B_1(5721)^0} &= 5727.7 \pm 0.7 \pm 1.4 \pm 0.17 \pm 0.4 \ \text{MeV}\,,\\
m_{B_2^*(5747)^0} &= 5739.44 \pm 0.37 \pm 0.33 \pm 0.17 \ \text{MeV}\,,\\
m_{B_1(5721)^+} &= 5725.1 \pm 1.8 \pm 3.1 \pm 0.17 \pm 0.4 \ \text{MeV}\,,\\
m_{B_2^*(5747)^+} &= 5737.20 \pm 0.72 \pm 0.40 \pm 0.17 \ \text{MeV}\,,\\
\Gamma_{B_1(5721)^0} &= 30.1 \pm 1.5 \pm 3.5 \ \text{MeV}\,,\\
\Gamma_{B_2^*(5747)^0} &= 24.5 \pm 1.0 \pm 1.5 \ \text{MeV}\,,\\
\Gamma_{B_1(5721)^+} &= 29.1 \pm 3.6 \pm 4.3 \ \text{MeV}\,,\\
\Gamma_{B_2^*(5747)^+} &= 23.6 \pm 2.0 \pm 2.1 \ \text{MeV}\,.
\end{aligned}
$$

stat syst m(B) m(B*)-m(B)

The most precise measurement

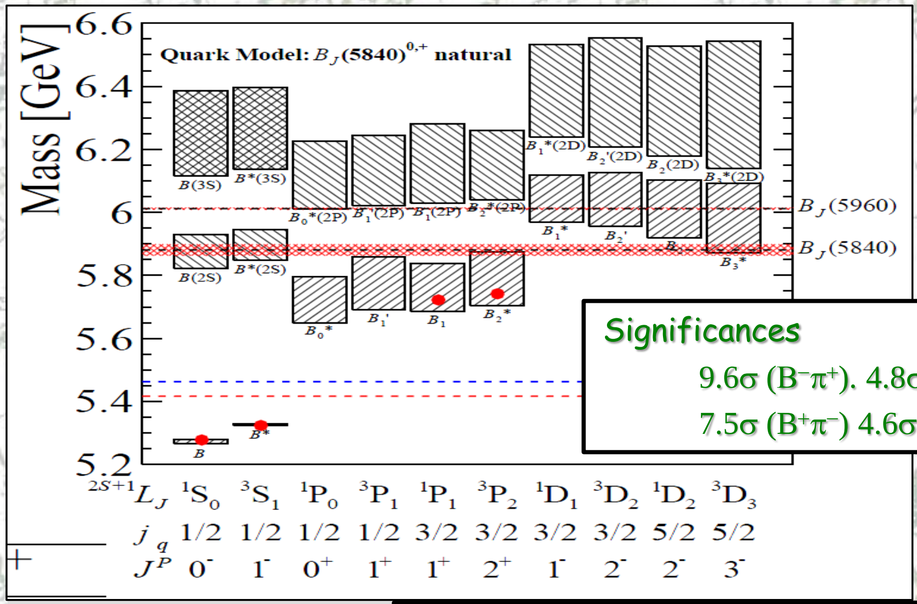
$$
\frac{\mathcal{B}\left(B_2^*(5747)^0 \to B^{*+}\pi^-\right)}{\mathcal{B}\left(B_2^*(5747)^0 \to B^{+}\pi^-\right)} = 0.71 \pm 0.14 \pm 0.30\,,
$$

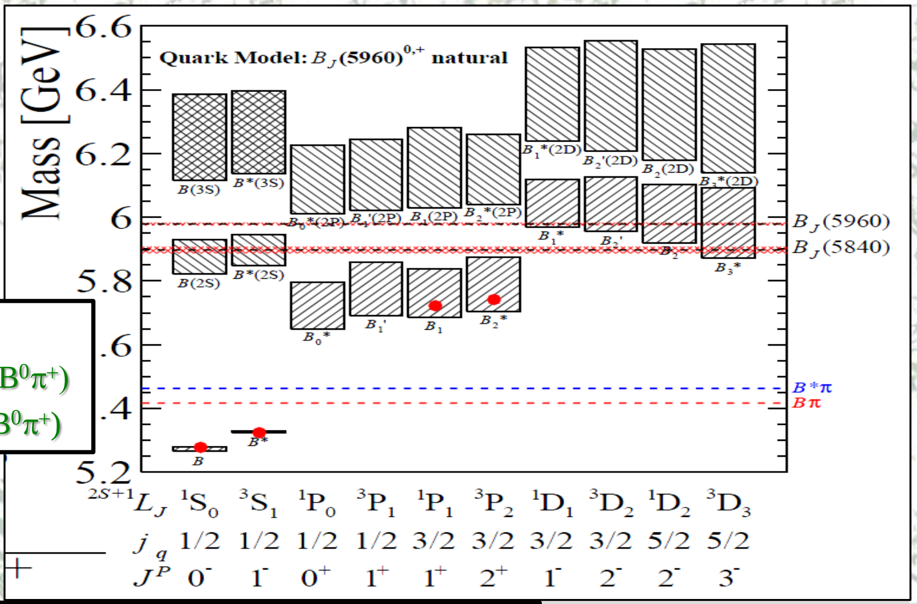
$$
\frac{\mathcal{B}\left(B_2^*(5747)^+ \to B^{*0}\pi^+\right)}{\mathcal{B}\left(B_2^*(5747)^+ \to B^{0}\pi^+\right)} = 1.0 \pm 0.5 \pm 0.8\,,
$$

Significance for $B^*\pi > 3.7\sigma$ (syst. included)

If high mass structures are resonances…

LHCb-PAPER-2014-067 arXiv:1502.02638





Significances

9.6σ ($B^-\pi^+$). 4.8σ($B^0\pi^+$)

7.5σ ($B^+\pi^-$) 4.6σ($B^0\pi^+$)

$B_J(5960)^{0,+}$ parameters are close to measurement by CDF but more precise.
In quark models $B_J(5840)$ and $B_J(5960)$ would correspond to $B(2S)$ and $B^*(2S)$

Fit parameter		$B^+\pi^-$	$B^0\pi^+$
$B_J(5840)^{0,+}$	μ	471 ± 22	455 ± 26
$B_J(5840)^{0,+}$	Γ	107 ± 20	215 ± 27
$B_J(5960)^{0,+}$	μ	552 ± 4	547 ± 4
$B_J(5960)^{0,+}$	Γ	82 ± 10	61 ± 15

Fit parameter		$B^+\pi^-$	$B^0\pi^+$
$B_J(5840)^{0,+}$	μ	444 ± 5	425 ± 15
$B_J(5840)^{0,+}$	Γ	119 ± 17	229 ± 27
$B_J(5960)^{0,+}$	μ	575 ± 6	547 ± 5
$B_J(5960)^{0,+}$	Γ	56 ± 7	61 ± 14

Rare semileptonic decays and angular analyses

Powerfull way to look for New Physics: Higgses, Supersymmetry, etc..

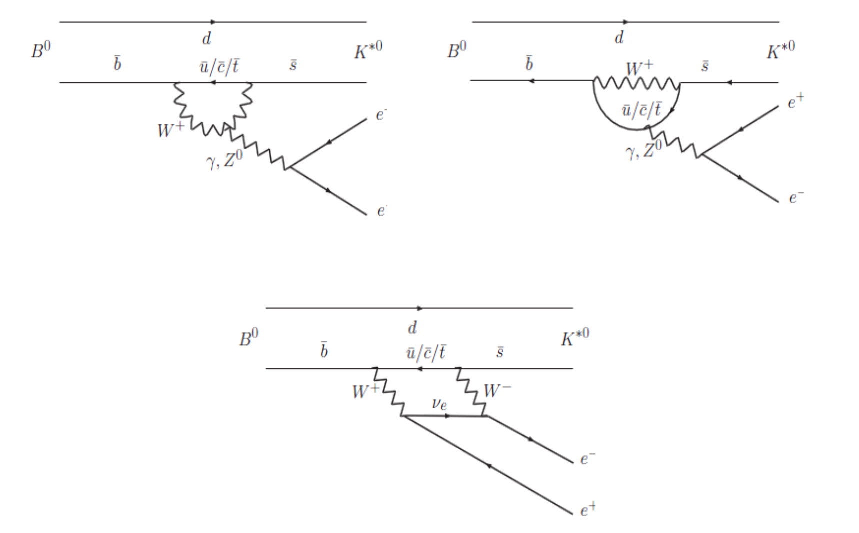
- Rare semileptonic penguin decays are in the centre of LHCb physics program, e.g. $B\to K^*\mu\mu$
- Many observables accessible through angular analysis (in q^2 bins) have reduced hadronic uncertainties and thus allow probing of New Physics
- $B\to K^*e^+e^-$ allows study of (very) low q^2 region (dominated by virtual photon): sensitivity to right currents

LHCb-PAPER-2014-066 arXiv:1501.03038

- $\Lambda_b\to \Lambda^0 \mu^+\mu^-$ has different helicity structure; different hadronic uncertainties - Λ_b is "simpler" than B^0-meson; Λ_0 is own polarimeter …

Results of 3fb^{-1} analysis is being reported ***just now*** at La Thuile

More news on semileptonic penguins in pipeline



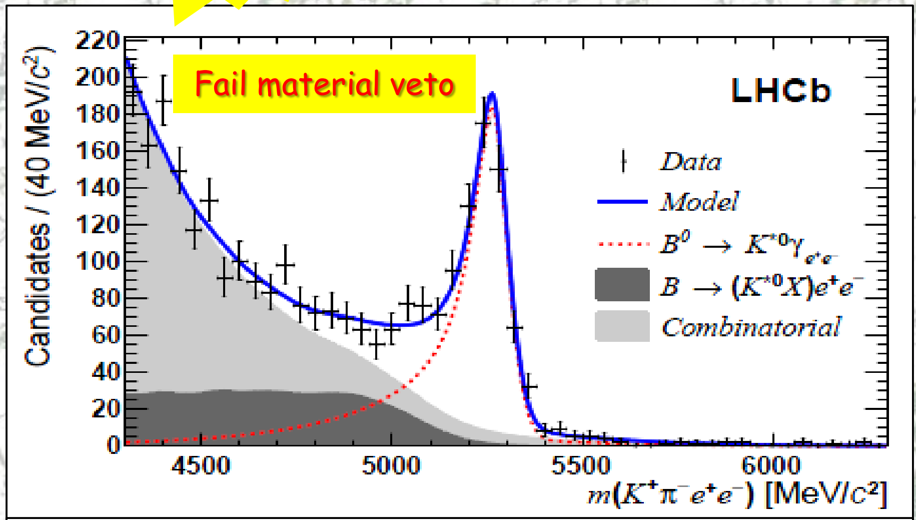
$$H_{eff} = -\frac{4G_F}{\sqrt{2}} V_{tb} V_{ts}^* \sum_i \Big[\underbrace{C_i(\mu) O_i(\mu)}_{\text{left-handed part}} + \underbrace{C_i'(\mu) O_i'(\mu)}_{\text{right-handed part suppressed in SM}} \Big]$$

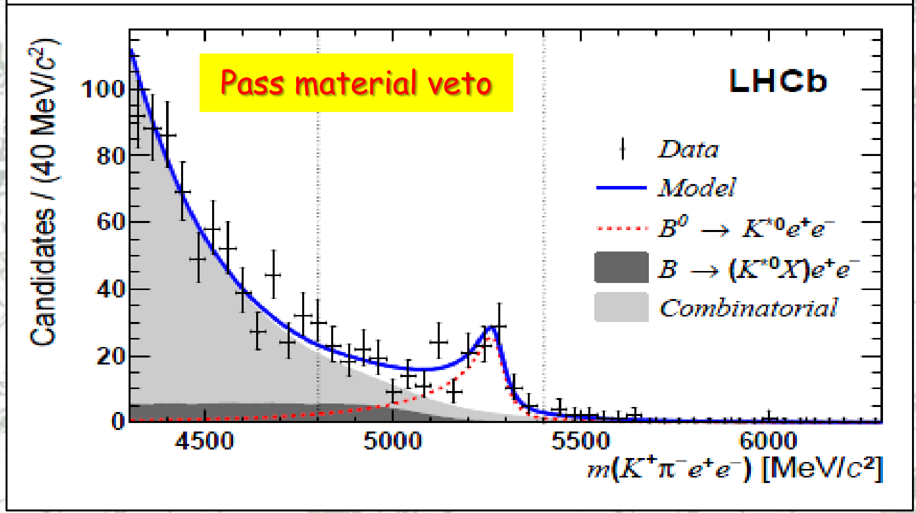
i = 1,2	Tree
i = 3 − 6,8	Gluon penguin
i = 7	Photon penguin
i = 9,10	Electroweak penguin
i = S	Higgs (scalar) penguin
i = P	Pseudoscalar penguin

$B^0 \to K^{*0} e^+e^-$ at low q^2

Poster

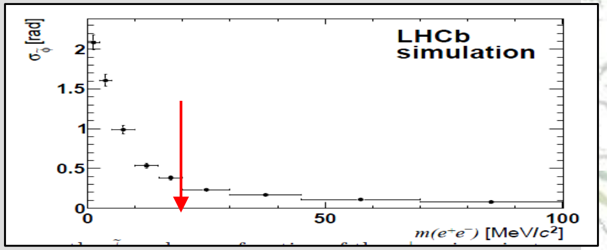
LHCb-PAPER-2014-066 arXiv:1501.03038



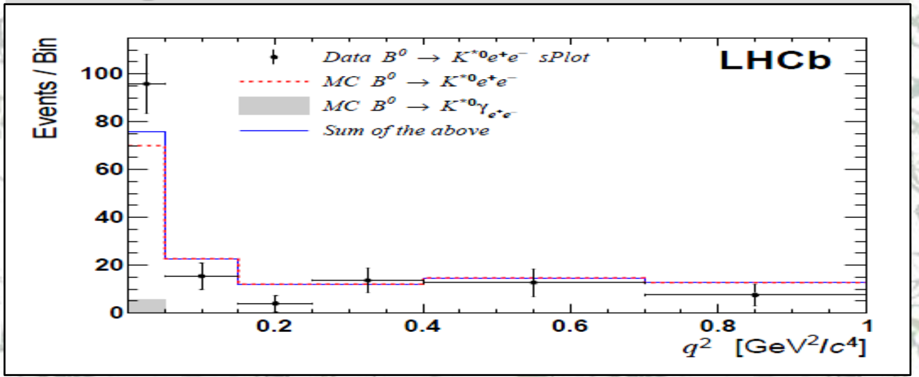


$0.0004<q^2<1 GeV/c^2$

- Degradation of angular resolution at very low q^2



- Dominant background $B0 \to K^{*0}\gamma$ with conversion: Material veto!
- Signal: 150 ± 17 $B^0 \to K^{*0}e^+e^-$ events



Poster

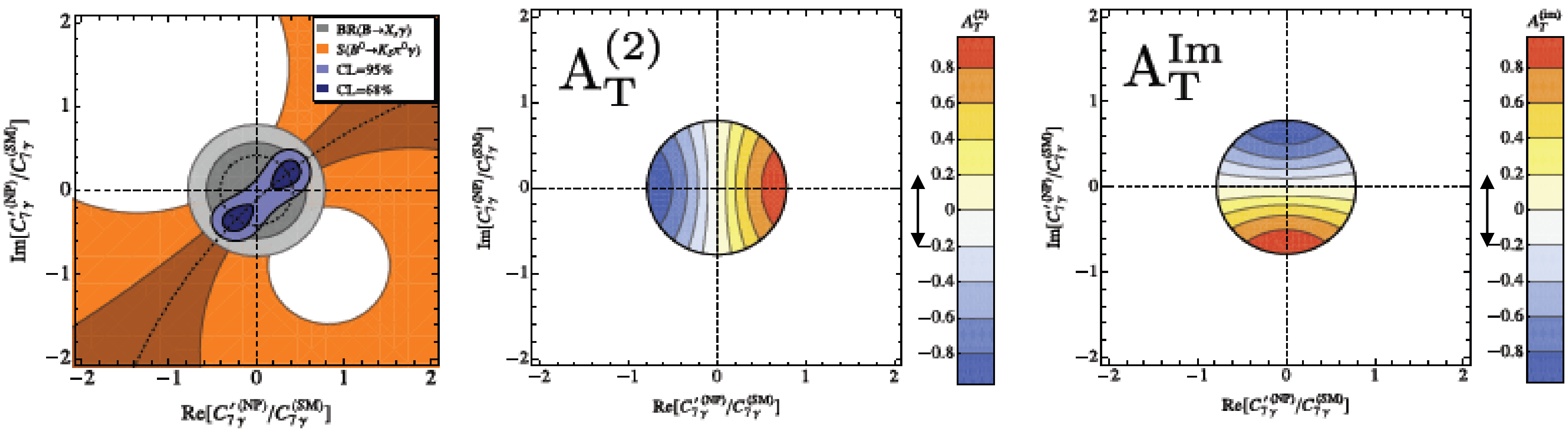
$B^0 \to K^{*0} e^+e^-$ at low q^2

LHCb-PAPER-2014-066 arXiv:1501.03038

- Angular analysis $\cos\theta_l$, $\cos\theta_K$ and *folded* ϕ

$$
\begin{aligned}
F_L &= 0.16 \pm 0.06 \pm 0.03 \\
A_T^{(2)} &= -0.23 \pm 0.23 \pm 0.05 \\
A_T^{\mathrm{Im}} &= +0.14 \pm 0.22 \pm 0.05 \\
A_T^{\mathrm{Re}} &= +0.10 \pm 0.18 \pm 0.05,
\end{aligned}
$$

Contours based on B-factory results



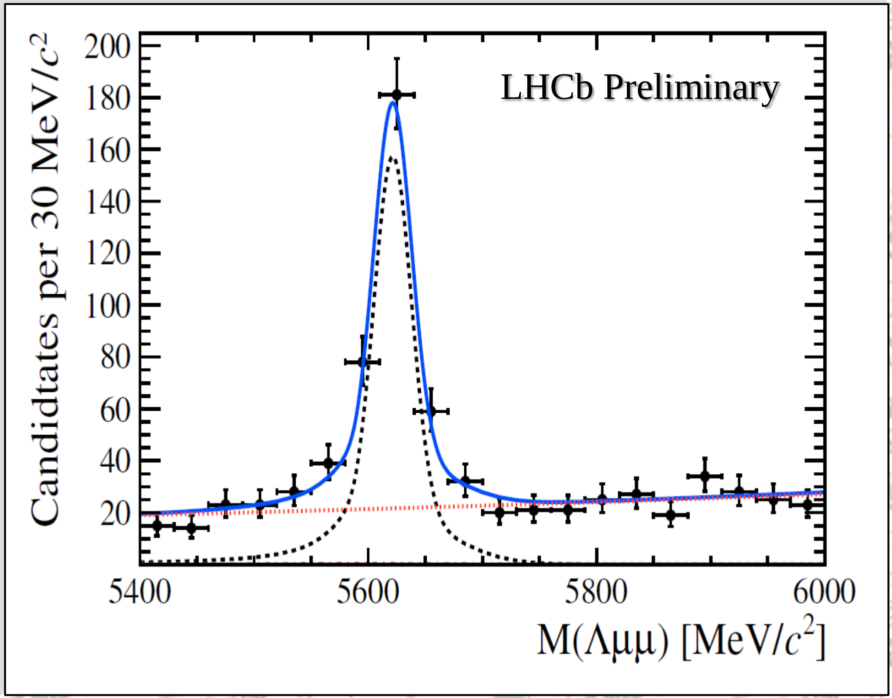
Becirevic *et al.* JHEP 08 (2012) 090

$\Lambda_b \to \Lambda^0 \mu^+ \mu^-$

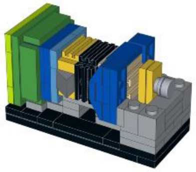
Poster

LHCb-PAPER-2015-009

- Different spin structure probes helicity structure of Hamiltonian
- Different hadronic uncertainties
  - Λ_b is somehow a bit more simple than B^0
- Weakly decaying Λ^0 allows to determine helicity
- New analysis, 3fb^{-1}
  - ~300 events
- *Differential decay rate and full angular analysis*



The result is being reported ***just now*** *for the first time at La Thuile conference*



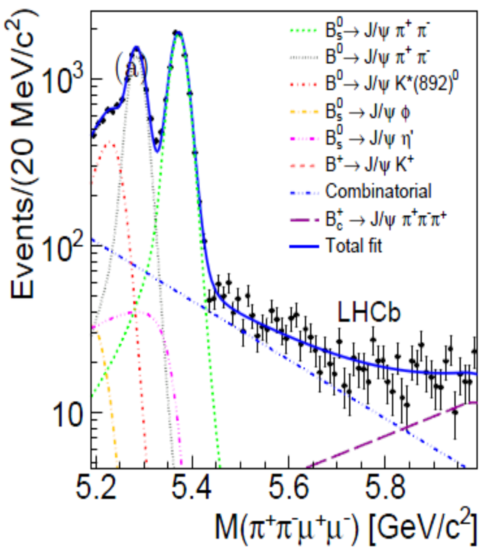
Study of rare B_s and B^0 decays in $\pi^+\pi^-\mu^+\mu^-$ final state

Poster

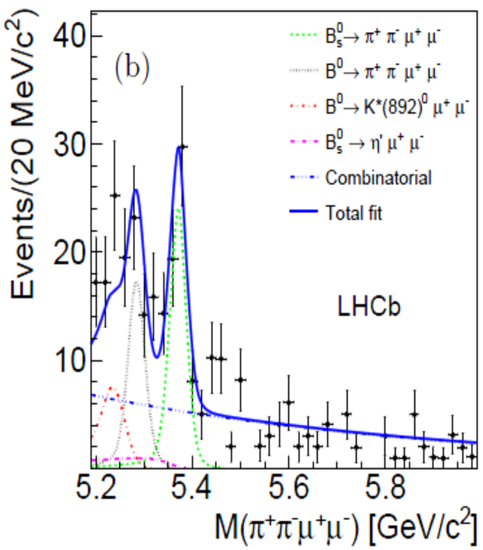
LHCb-PAPER-2014-063 arXiv:1412.6433

- $B_s \to f^0\mu^+\mu^-$ in SM: sum of $b \to s$ *penguin* and *box* contributions
- $B^0 \to \rho^0\mu^+\mu^-$ in SM sum of $b \to d$ *penguin* (suppressed as $|V_{td}/V_{ts}|^2$) and *box*
- $\phi \to \mu^+\mu^-$ $J/\psi \to \mu^+\mu^-$ and $\psi' \to \mu^+\mu^-$ are excluded

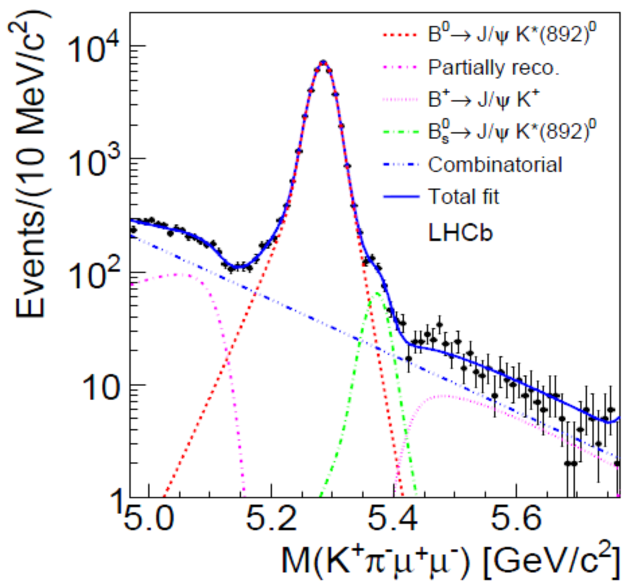
$J/\psi\ \pi^+\pi^-$



Signals: $\pi^+\pi^-\mu^+\mu^-$



Normalization: $B^0 \to J/\psi K^{*0}$



Study of rare B_s and B^0 decays in $\pi^+\pi^-\mu^+\mu^-$ final state

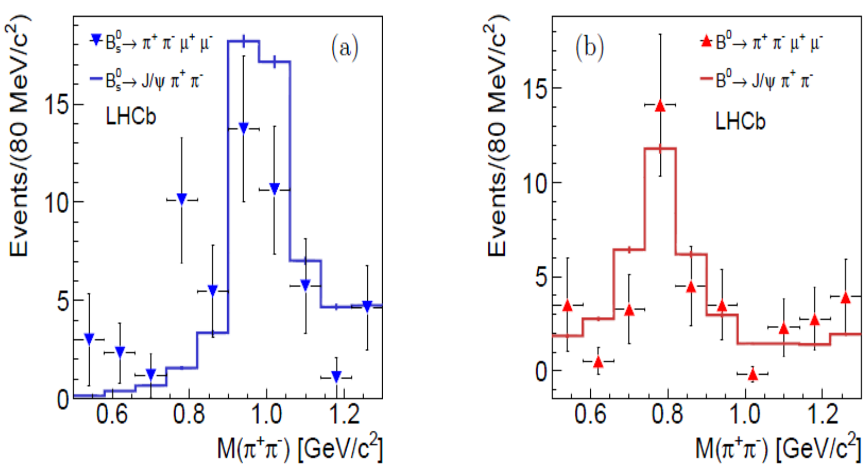
Poster

LHCb-PAPER-2014-063 arXiv:1412.6433

- $B_s \to \pi^+\pi^-\mu^+\mu^-$ Significance 7.3σ
- $B^0 \to \pi^+\pi^-\mu^+\mu^-$ Significance 4.8σ

$$\frac{\mathcal{B}(B_s^0 \to \pi^+\pi^-\mu^+\mu^-)}{\mathcal{B}(B^0 \to J/\psi(\to \mu^+\mu^-)K^*(892)^0(\to K^+\pi^-))} = (1.67 \pm 0.29\,(\text{stat}) \pm 0.13\,(\text{syst})) \times 10^{-3},$$
$$\frac{\mathcal{B}(B^0 \to \pi^+\pi^-\mu^+\mu^-)}{\mathcal{B}(B^0 \to J/\psi(\to \mu^+\mu^-)K^*(892)^0(\to K^+\pi^-))} = (0.41 \pm 0.10\,(\text{stat}) \pm 0.03\,(\text{syst})) \times 10^{-3}.$$

$$\mathcal{B}(B_s^0 \to \pi^+\pi^-\mu^+\mu^-) = (8.6 \pm 1.5\,(\text{stat}) \pm 0.7\,(\text{syst}) \pm 0.7\,(\text{norm})) \times 10^{-8} \text{ and}$$
$$\mathcal{B}(B^0 \to \pi^+\pi^-\mu^+\mu^-) = (2.11 \pm 0.51\,(\text{stat}) \pm 0.15\,(\text{syst}) \pm 0.16\,(\text{norm})) \times 10^{-8},$$



$\text{Br}(B_s^0 \to f_0(980)\mu^+\mu^-)$	
$\left(5.21^{+3.23}_{-2.06}\right) \times 10^{-7}$	[PRD79,014013]
$\left(9.5^{+3.1}_{-2.6}\right) \times 10^{-8}$	[PRD81,074001]
$(1.67 \pm 0.61) \times 10^{-7}$	[PRD81,074001]
$(0.81 - 2.02) \times 10^{-8}$	[PRD80,016009]
$(0.63 - 3.37) \times 10^{-9}$	[PRD80,016009]
$\text{Br}(B^0 \to \rho(770)^0\mu^+\mu^-)$	
$\left(5.0^{+2.1}_{-2.6}\right) \times 10^{-8}$	[PRD56,5452] [HEP-PH/9609503]
$\left(8.6^{+3.4}_{-4.5}\right) \times 10^{-8}$	[PRD53,3672] [HEP-PH/9609503]

B-meson decays into two vector mesons

LHCb-PAPER-2014-068, LHCb-PAPER-2015-006

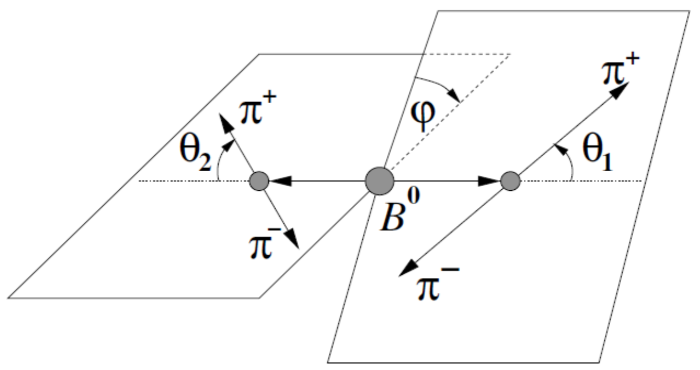
- Amplitude analysis of $B^0 \to (\pi^+\pi^-)(\pi^+\pi^-)$
  - Colour suppressed
  - Powerful constraint for angle α of unitarity triangle
  - Evidence from Belle and BaBar $f_L = \frac{|A^0_{\rho\rho}|^2}{|A^0_{\rho\rho}|^2+|A^{\parallel}_{\rho\rho}|^2+|A^{\perp}_{\rho\rho}|^2}$
    - Large difference in longitudinal polarization fraction
- *CP*-asymmetries and polarization fractions in $B_s \to K^{*0}\overline{K}^{*0}$
  - Triple Product asymmetries
  - Polarization fractions for vector current

Both analyses will be reported for the first time ***this afternoon*** *at La Thuile conference*

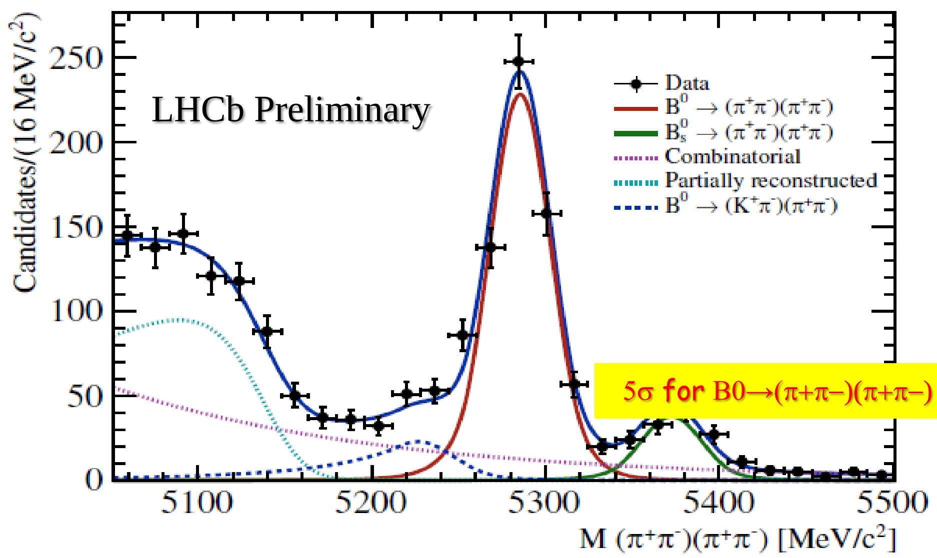
$B^0 \to (\pi^+\pi^-)(\pi^+\pi^-)$

LHCb-PAPER-2015-006

- Rich resonance structure: ρ^0, ω, f_0, f_2,..

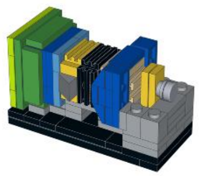


$$\frac{d^5\Gamma}{d\cos\theta_1\, d\cos\theta_2\, d\varphi\, dm_1^2\, dm_2^2} = \frac{9}{8\pi}\Phi_4(m_1,m_2)\left|\sum_{i=1}^{11} A_i f_i(m_1,m_2,\theta_1,\theta_2,\varphi)\right|^2,$$



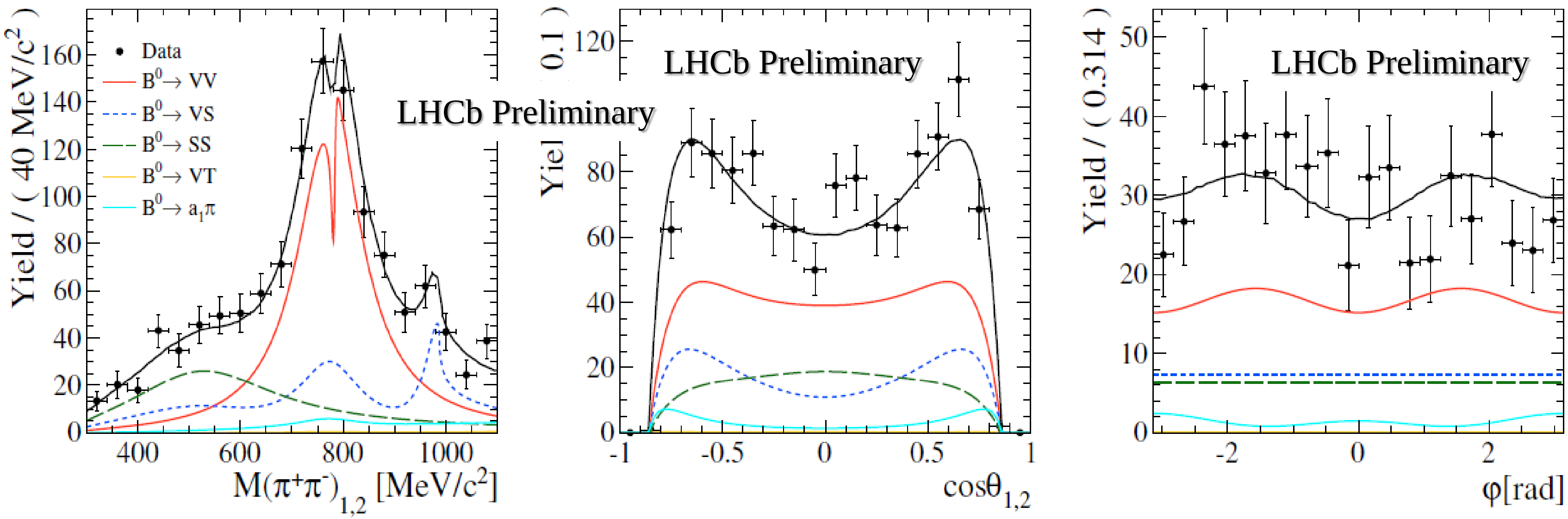
5σ for B0→(π+π−)(π+π−)

- >600 signal decays
- 11 terms in amplitude analysis



$B^0 \to (\pi^+\pi^-)(\pi^+\pi^-)$

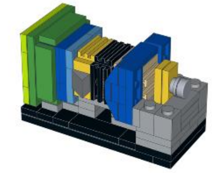
LHCb-PAPER-2015-006



$$f_L = \frac{|A^0_{\rho\rho}|^2}{|A^0_{\rho\rho}|^2+|A^{\parallel}_{\rho\rho}|^2+|A^{\perp}_{\rho\rho}|^2}$$

Belle	$f_L = 0.21^{+0.22}_{-0.26}$
BaBar	$f_L = 0.75^{+0.12}_{-0.15}$
LHCb 2k+15	[redacted] $^{+0.048}_{-0.058}$ (stat) $\pm$ 0.033 (syst).

Significant improvement in precision!

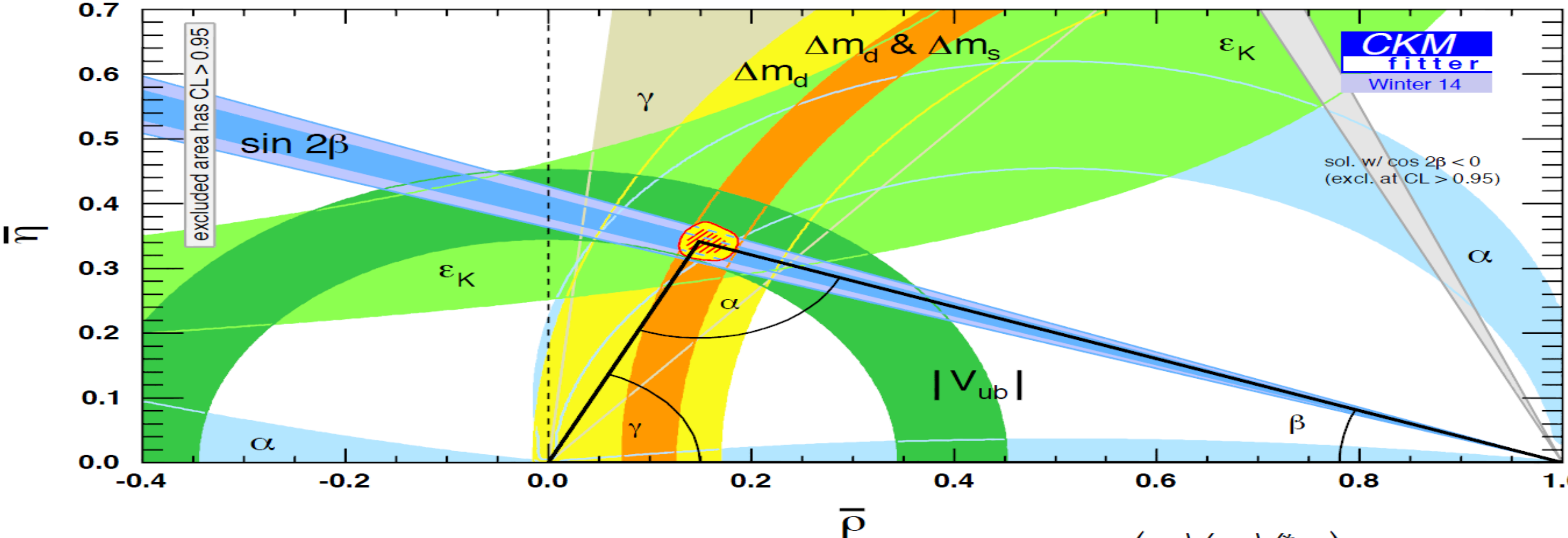


$\sin 2\beta$ from $B^0 \to J/\psi K_S$

Poster

LHCb-PAPER-2015-004

- **Golden mode for B-factories**



$$V_{ud}V_{ub}^* + V_{cd}V_{cb}^* + V_{td}V_{tb}^* = 0 \qquad \beta = \arg\left(-\frac{V_{cd}V_{cb}^*}{V_{td}V_{tb}^*}\right)$$

- current world average: $\sin 2\beta = 0.679 \pm 0.020$ **dominated by B-factories**

From global fits: $\sin 2\beta = 0.771^{+0.017}_{-0.041}$

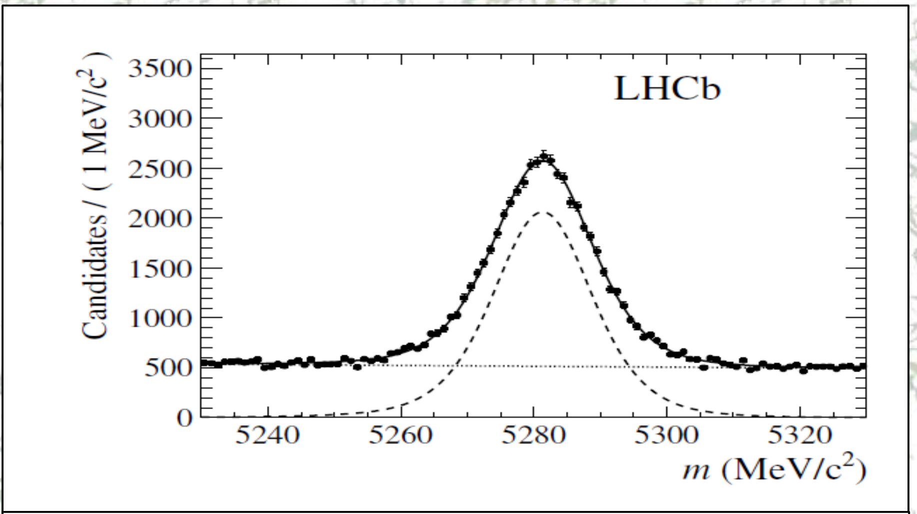
The analyses has been reported for the first time yesterday afternoon at La Thuile conference

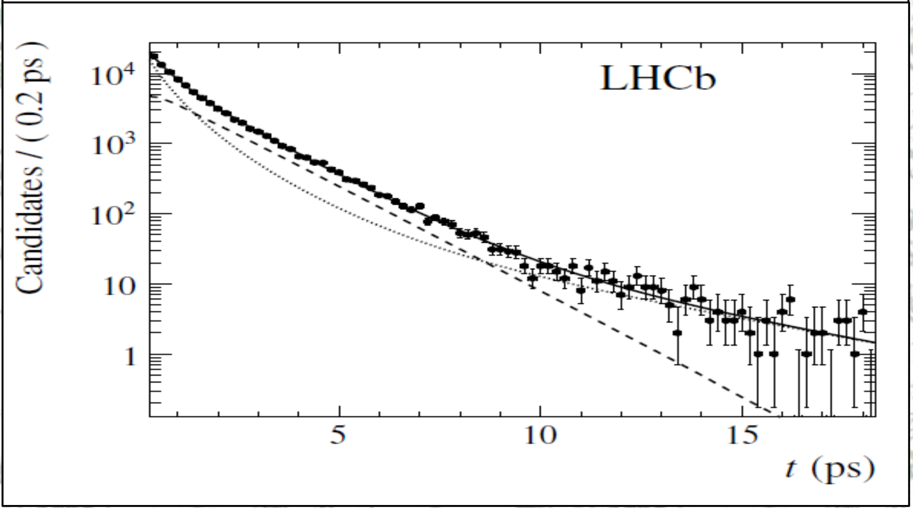
$\sin2\beta$ from $B^0 \to J/\psi K_S$

Poster

LHCb-PAPER-2015-004

- Full statistic
- Improved tagging
  - For the first time same side pion tag: fragmentation pions and pions from $B^{**+} \to B^0\pi^+$
  - 41560± 210 flavour tagged decays
- Sophisticated fit
  - Seven dimensions
    - Mass, decay time, decay time uncertainty, tagging categories....
  - 24 disjoined categories
  - 83 floating parameters
  - Make use of measured production asymmetries, Δm_d, …



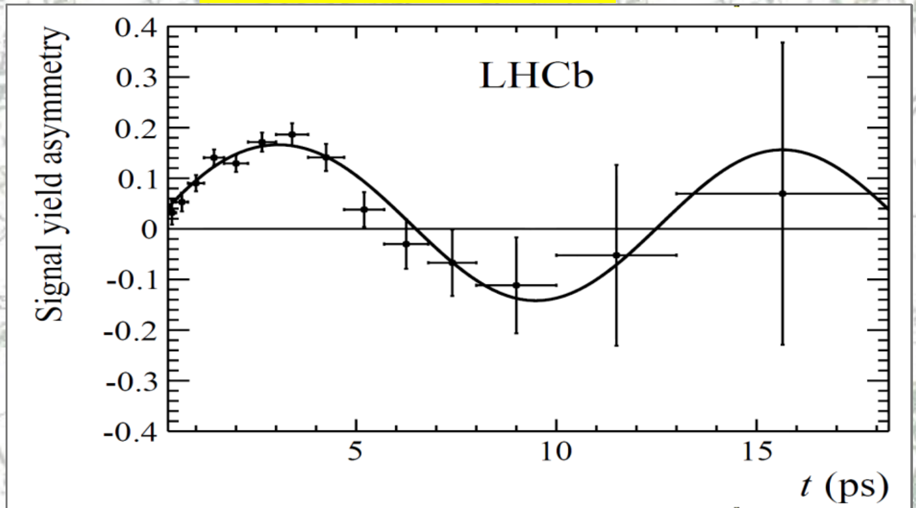


Poster

$\sin 2\beta$ from $B^0 \to J/\psi K_S$

LHCb-PAPER-2015-004

Precision comparable with B-factories, still statistically dominated

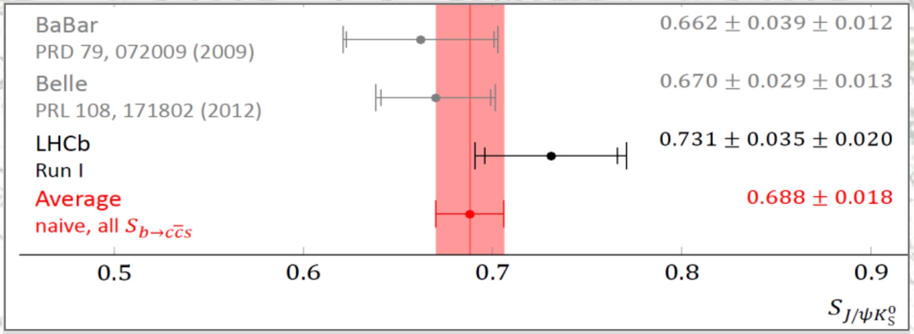


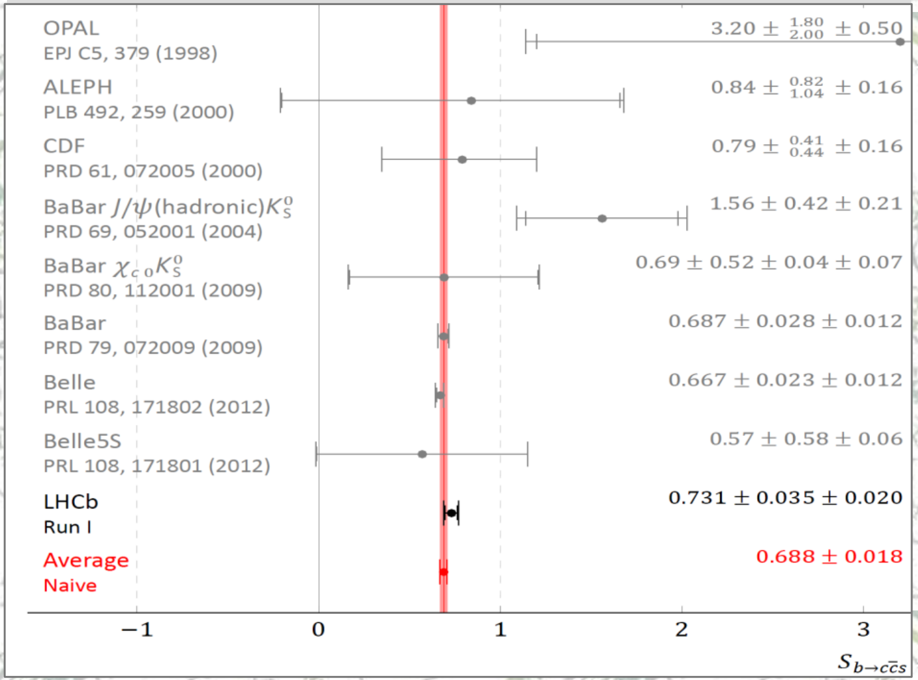
$$\mathcal{A}(t) \equiv \frac{\Gamma(\overline{B}^0(t) \to J/\psi K^0_S) - \Gamma(B^0(t) \to J/\psi K^0_S)}{\Gamma(\overline{B}^0(t) \to J/\psi K^0_S) + \Gamma(B^0(t) \to J/\psi K^0_S)} = \frac{S \sin(\Delta m\, t) - C \cos(\Delta m\, t)}{\cosh(\frac{\Delta\Gamma t}{2}) + A_{\Delta\Gamma} \sinh(\frac{\Delta\Gamma t}{2})}.$$

$$\mathcal{A}(t) = S \sin(\Delta m\, t) - C \cos(\Delta m\, t).$$

$$S = 0.729 \pm 0.035 \pm 0.020$$

$$C = -0.033 \pm 0.032 \pm 0.005$$



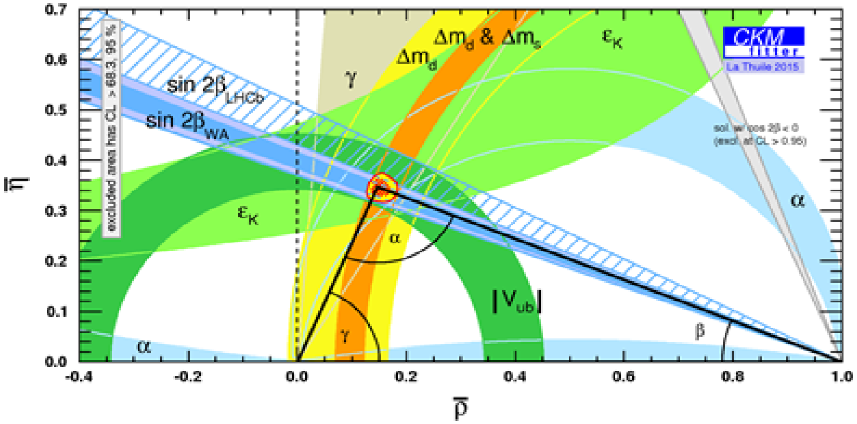


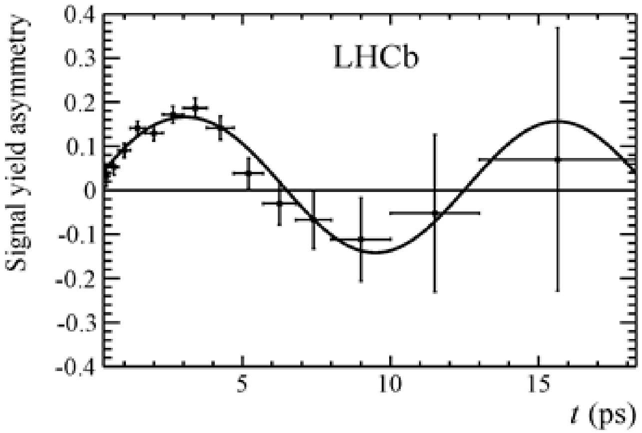
http://cern.ch/lhcb-public

3 March 2015: Matter-antimatter trigonometry with LHCb.

Precise measurement of the unitarity triangle angle β.

Today at Les Rencontres de Physique de la Vallée d'Aoste, La Thuile, Italy, the LHCb collaboration presented an important result in our quest to understand the nature and origin of CP violation, which is a difference in behaviour between matter and antimatter. The result, derived from a careful analysis of the full run 1 data sample, is a measurement of the angle β of the 'unitarity triangle'. This triangle is a geometrical representation of CP violating and associated parameters in the Standard Model. One side is defined to have unit length, the other two sides and three angles can be measured independently in different decays of beauty hadrons. It is the task of experimental physicists to measure these properties and see if they provide a consistent description of the triangle. Any discrepancy would point to signs of New Physics beyond the Standard Model. LHCb has already performed the world's most precise measurements of γ, one of the other triangle angles, see 11 September 2014 news, and the mixing frequency of B_s mesons, see 7 November 2012 news, which is an essential ingredient for the determination of the side opposite to the angle γ.

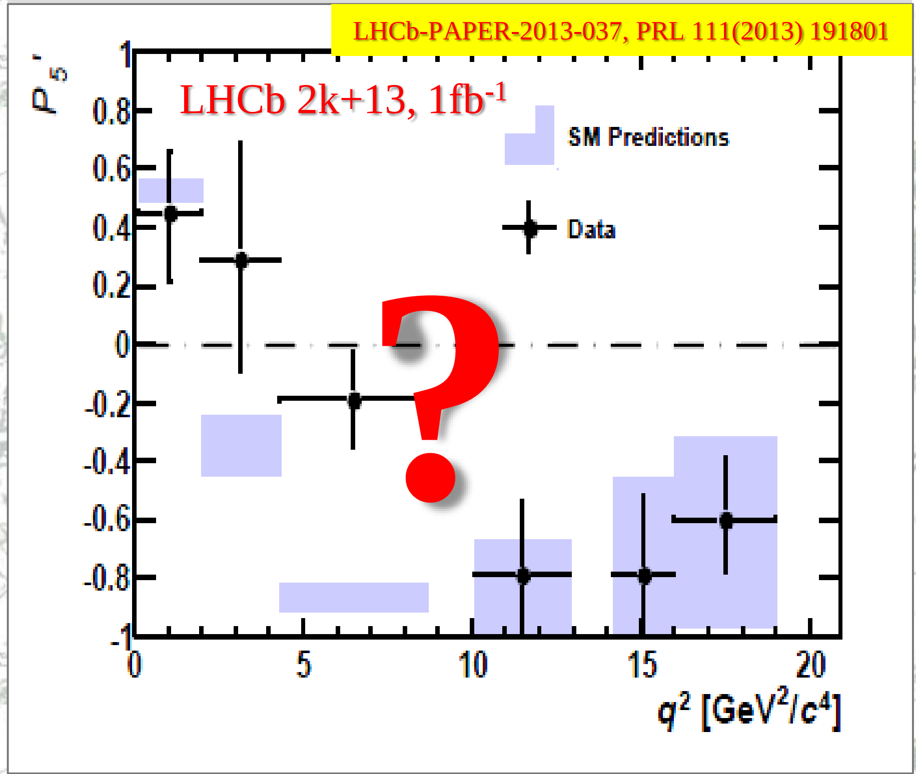




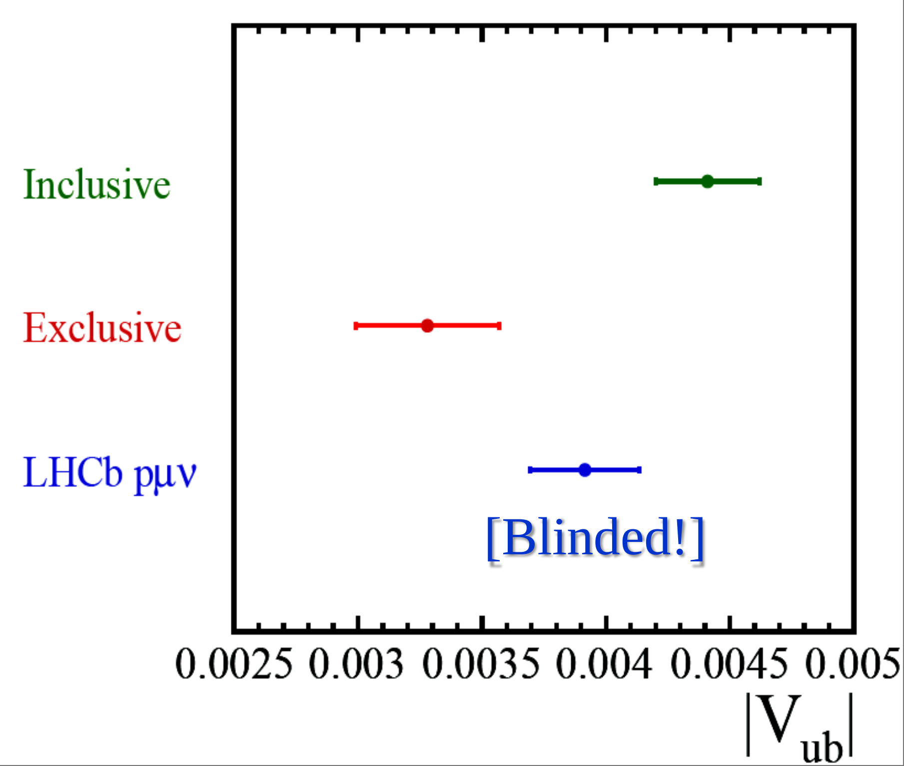
Next: Moriond EW

Angular analysis of $B^0 \to K^{*0}\mu^+\mu^-$ with 3fb^{-1}

LHCb-PAPER-2013-037, PRL 111(2013) 191801



Precise measurement of $|V_{ub}|$ using $\Lambda_b \to p\mu^-\nu$



Preparation to Run II: LS1

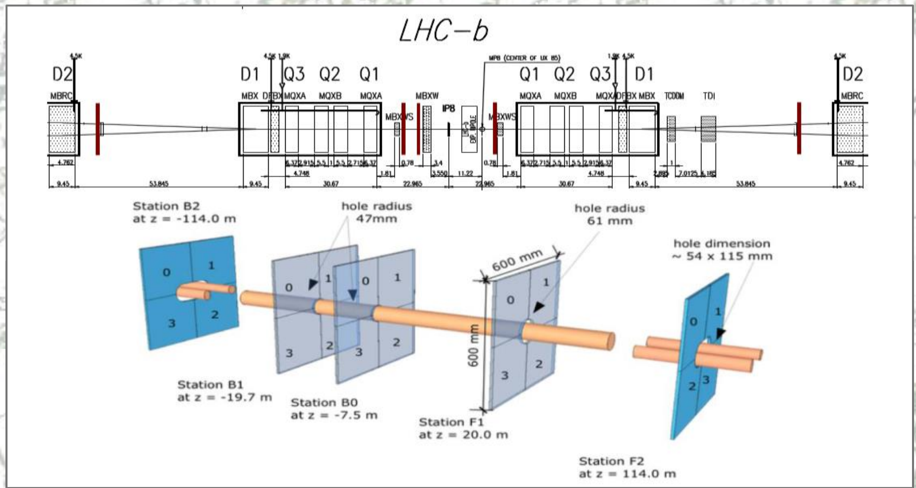
- Muon: HV, groundings, ….
- Hcal: 15% of PMTs are replaced
- Ecal: monitoring fibers are replaced
- OT: repair modules in situ
- Rich: HPD exchange
- Consolidation of cooling, gas, power, shielding, …
- Beam-pipe, new support
- Dipole, mag.field remeasured
- …

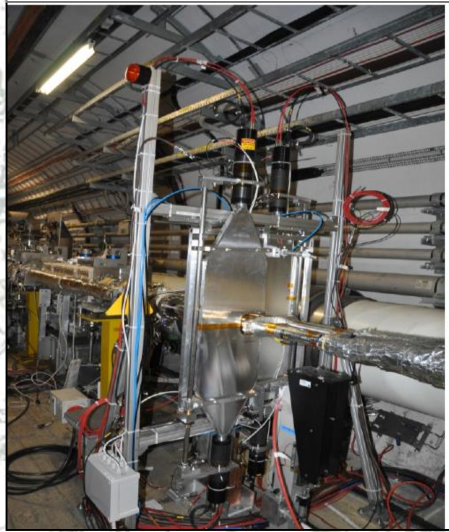
~1350 impacts in total

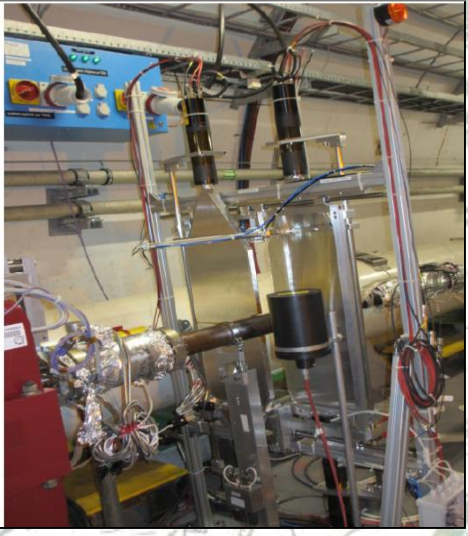
Outreach visitor platform: 31kvisitors during LS1

LHCb is closed, all LS1 activity is completed

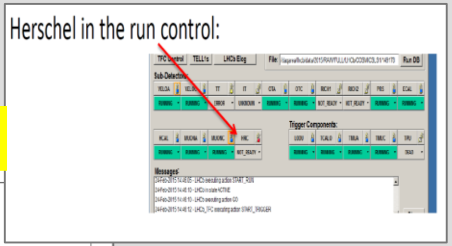
Herschel



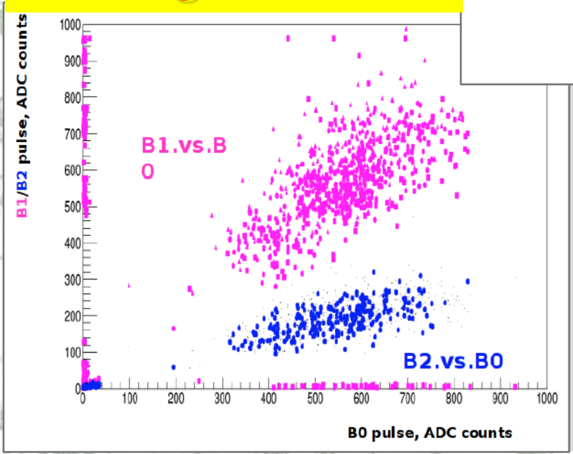




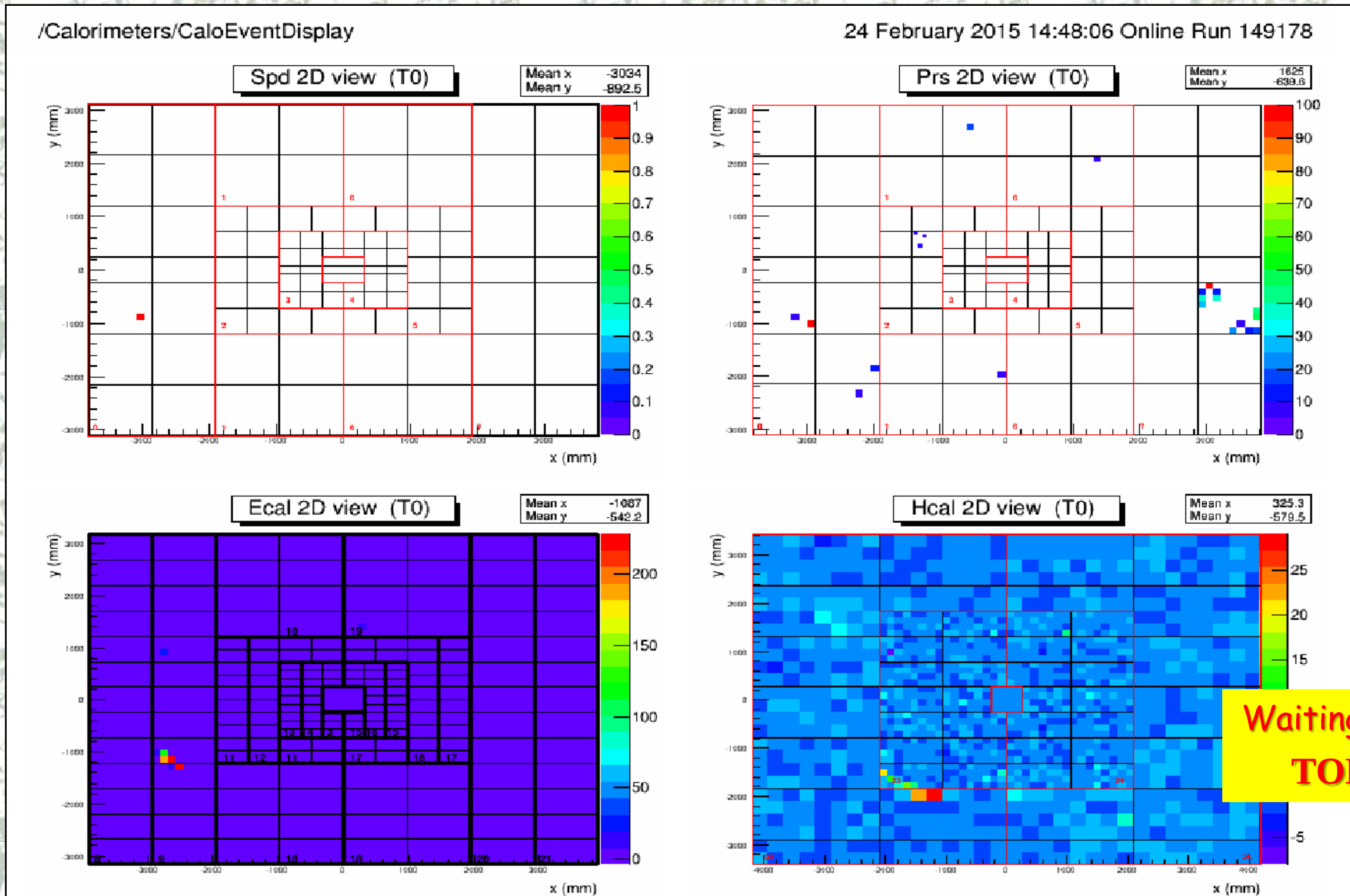
- Scintillating counters with high η coverage
- Important for CEP and diffractive physics



Herschel @November TED

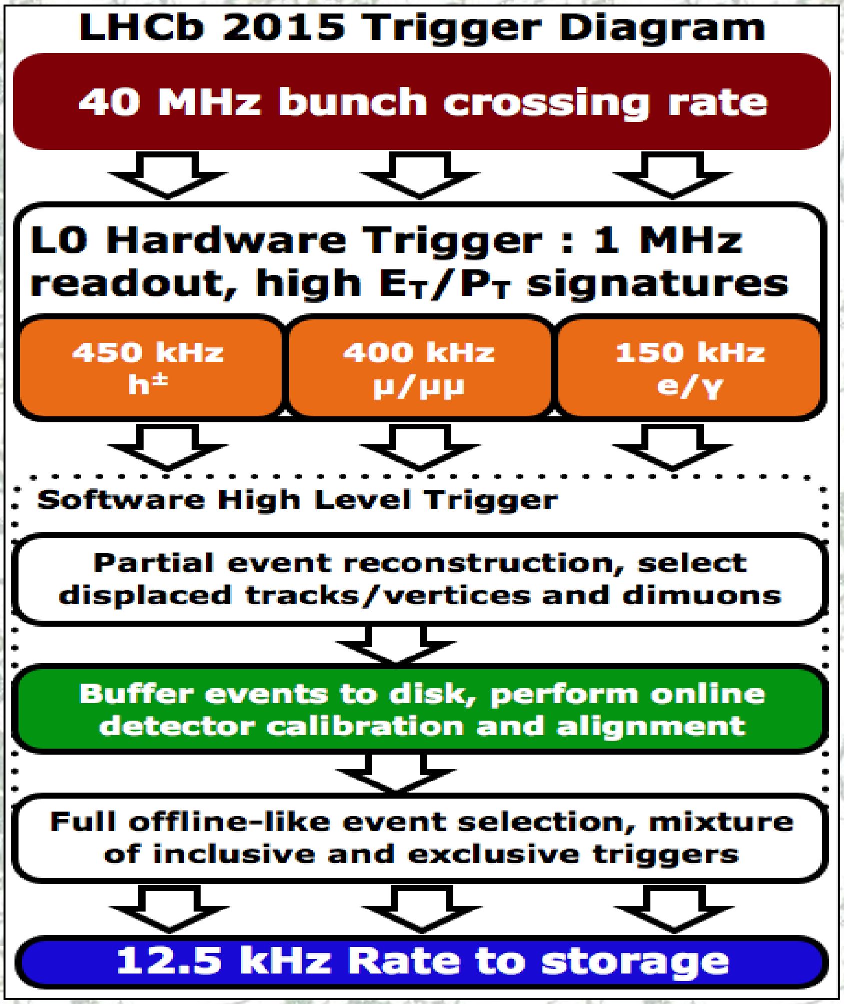


Commissioning: Cosmics



Waiting for TED shots
TOMORROW!

Trigger in 2k+15



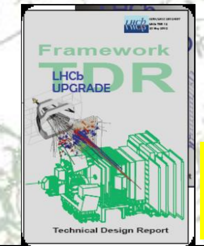
- More powerful
- More robust
- More flexible
- More selective
- More efficient

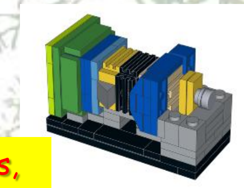
… just better

New:

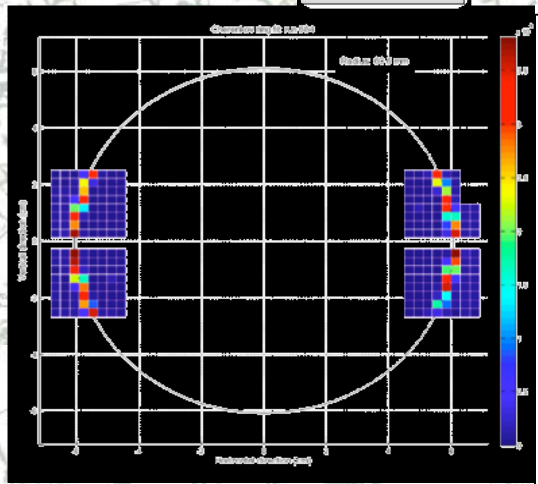
- on-line calibration in between Hlt1 and Hlt2
- Off-line quality of data after trigger:
  - Analyses with on-line data "Turbo-stream"

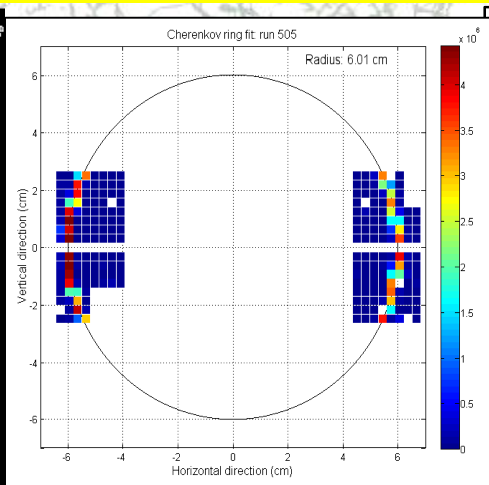
Next: Upgrade

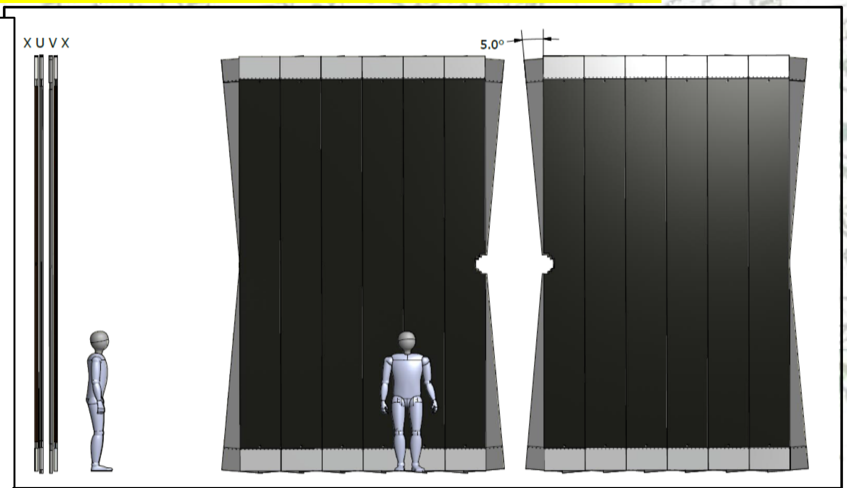


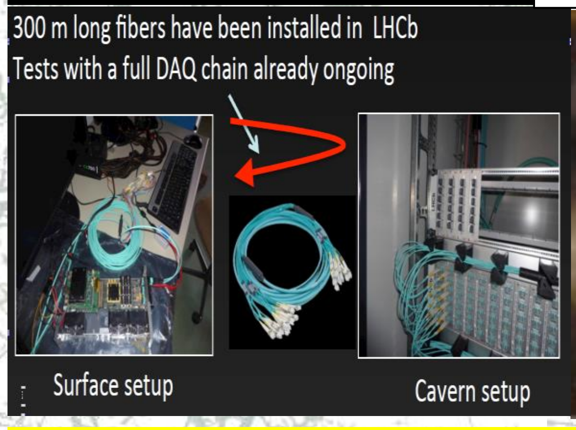


LHCb is finalizing the R&D in most areas and preparing Engineering Design Reviews, followed by Production Readiness Reviews in the end of the year









A list of milestones is closely monitored by the LHCC; the already tight schedule does not allow for much margin

Upgrade: the target

Type	Observable	LHC Run 1	LHCb 2018	**LHCb upgrade**	Theory
B_s^0 mixing	$\phi_s(B_s^0 \to J/\psi\,\phi)$ (rad)	0.049	0.025	**0.009**	~ 0.003
	$\phi_s(B_s^0 \to J/\psi\ f_0(980))$ (rad)	0.068	0.035	**0.012**	~ 0.01
	$A_{\rm sl}(B_s^0)$ (10^{-3})	2.8	1.4	**0.5**	0.03
Gluonic penguin	$\phi_s^{\rm eff}(B_s^0 \to \phi\phi)$ (rad)	0.15	0.10	**0.018**	0.02
	$\phi_s^{\rm eff}(B_s^0 \to K^{*0}\bar{K}^{*0})$ (rad)	0.19	0.13	**0.023**	< 0.02
	$2\beta^{\rm eff}(B^0 \to \phi K_S^0)$ (rad)	0.30	0.20	**0.036**	0.02
Right-handed currents	$\phi_s^{\rm eff}(B_s^0 \to \phi\gamma)$ (rad)	0.20	0.13	**0.025**	< 0.01
	$\tau^{\rm eff}(B_s^0 \to \phi\gamma)/\tau_{B_s^0}$	5%	3.2%	**0.6%**	0.2 %
Electroweak penguin	$S_3(B^0 \to K^{*0}\mu^+\mu^-; 1 < q^2 < 6\,{\rm GeV}^2/c^4)$	0.04	0.020	**0.007**	0.02
	$q_0^2\ A_{\rm FB}(B^0 \to K^{*0}\mu^+\mu^-)$	10%	5%	**1.9%**	$\sim 7\%$
	$A_{\rm I}(K\mu^+\mu^-; 1 < q^2 < 6\,{\rm GeV}^2/c^4)$	0.09	0.05	**0.017**	~ 0.02
	$\mathcal{B}(B^+ \to \pi^+\mu^+\mu^-)/\mathcal{B}(B^+ \to K^+\mu^+\mu^-)$	14%	7%	**2.4%**	$\sim 10\%$
Higgs penguin	$\mathcal{B}(B_s^0 \to \mu^+\mu^-)$ (10^{-9})	1.0	0.5	**0.19**	0.3
	$\mathcal{B}(B^0 \to \mu^+\mu^-)/\mathcal{B}(B_s^0 \to \mu^+\mu^-)$	220%	110%	**40%**	$\sim 5\,\%$
Unitarity triangle angles	$\gamma(B \to D^{(*)}K^{(*)})$	7°	4°	**0.9°**	negligible
	$\gamma(B_s^0 \to D_s^{\mp}K^{\pm})$	17°	11°	**2.0°**	negligible
	$\beta(B^0 \to J/\psi\,K_S^0)$	1.7°	0.8°	**0.31°**	negligible
Charm *CP* violation	$A_\Gamma(D^0 \to K^+K^-)$ (10^{-4})	3.4	2.2	**0.4**	–
	ΔA_{CP} (10^{-3})	0.8	0.5	**0.1**	–

Summary

- LHCb continues analysis of Run I results:
  - 241 papers, 6 new results this week, some new results are prepared for ***incoming conferences***

Stay tuned!

- Most results are in agreement with Standard Model
  - There is room for improvement both with statistics and systematic
- LHCb is ready for Run II
  - Closed; TED shots tomorrow
- LHCb is preparing for long future (Upgrade)

LHCb @ Student's poster session

Do not miss the excellent opportunity to talk with young LHCb students: 17:00, extension rest. 1

LHCb @ Student's poster session

Electroweak physics in forward region at LHCb
Measurement of the semileptonic CP asymmetry in $B^0\overline{B}^0$ *mixing with LHCb*
CP violating phase ϕ_s *and penguin pollution in* $B_s \to J/\psi K^+K^-$ *with LHCb*
Production asymmetries of neutral B *mesons in* pp *collisions*
Angular analysis of the $B^0 \to K^{*0}e^+e^-$ *decay in the low-*q^2 *region at LHCb*
CKM angle γ *at LHCb*
Search for CP violation in $D^0 \to \pi^+\pi^-\pi^0$ *decays with LHCb*
$\Lambda_b \to \Lambda^0\mu^+\mu^-$ *branching fraction and angular analysis*
Study for the rare B_s *and* B^0 *decays into the* $\pi^+\pi^-\mu^+\mu^-$ *final state at LHCb*
$\sin 2\beta$ *with* $B^0 \to J/\psi K_S$ *at the LHCb experiment*
LHCb's Real-time alignment in Run II
Topological Trigger developments at LHCb
Flavour tagging with the LHCb experiment