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# Implications of LHCb measurements & future prospects

## Welcome and introduction

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Many thanks for support to:

- CERN
- IPPP
- ERC

Guy Wilkinson  
Tim Gershon  
Frederic Teubert  
Gilad Perez  
John Ellis

# Purpose of workshop

LHCb already produced interesting results with the  $37 \text{ pb}^{-1}$  collected in 2010, and the  $\sim 370 \text{ pb}^{-1}$  collected this summer. With the full  $\sim 1.1 \text{ fb}^{-1}$  accumulated this year (and more expected in 2012) the possibilities are very exciting indeed !

LHCb now truly embarked on 'frontier physics' ! True in many areas, especially:

- Charm physics
- CPV in b-decays
- 'Rare' b-decays

The focus of this week's workshop. To what your appetite I will show a slide on each

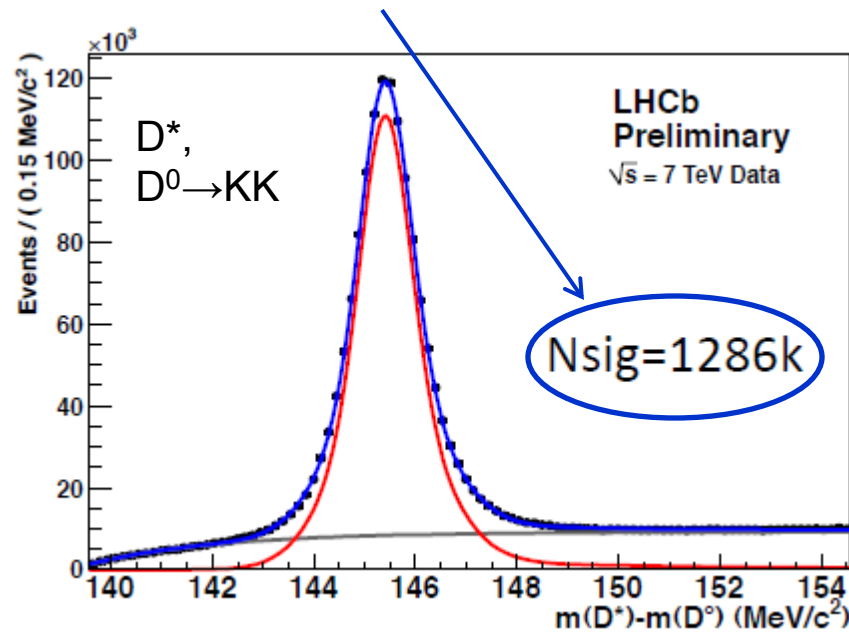
What we would like to discuss over the next two days:

- what constraints do our existing measurements place on NP models ?
- given the unprecedented sensitivity of the data of this (and future) year(s) where can expect to make an impact on finding/characterising NP ?
- are there new discriminating observables to pay particular attention to ?

# Charm physics

Prompt charm x-sec at 7 TeV  $\sim 7\text{mb}$ . LHCb writes out charm events at  $\sim 1\text{ kHz}$ . Very large, clean, samples being collected, particularly in low topology modes

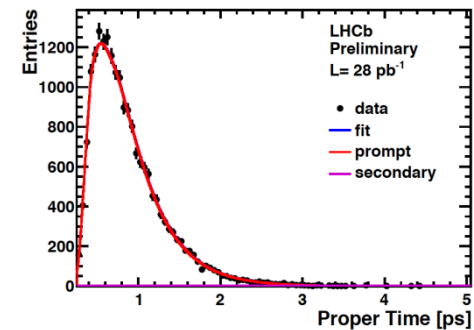
$\sim 10\text{x}$  Belle sample in  $540\text{ fb}^{-1}$  [PRL 670 (2008) 190] !



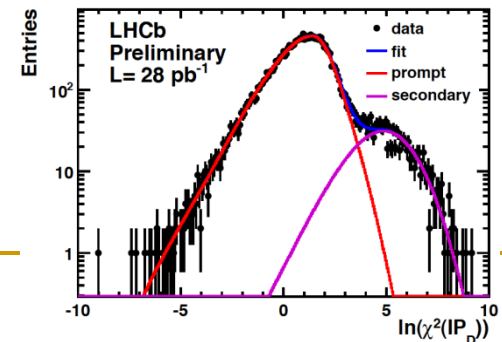
$\sim 35\%$  of total 2011 sample

Good systematic control has been demonstrated with 2010 data

- Lifetime trigger acceptance



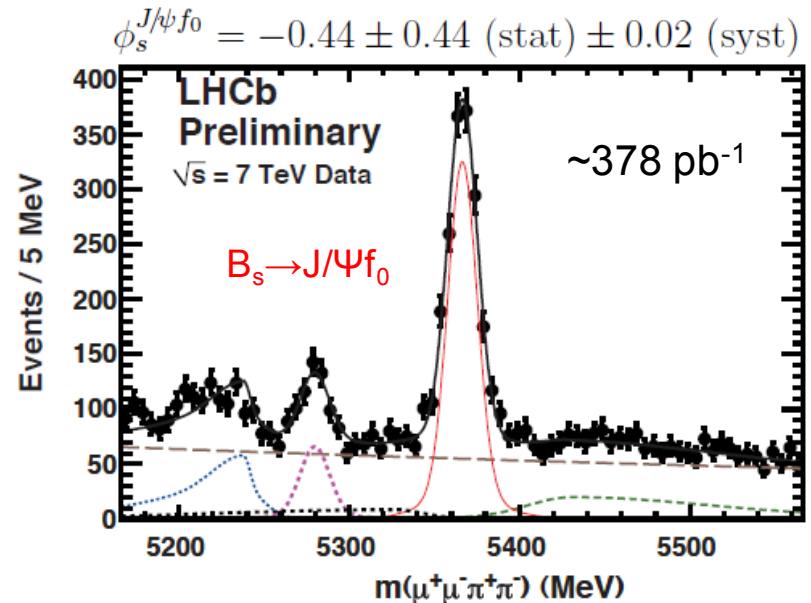
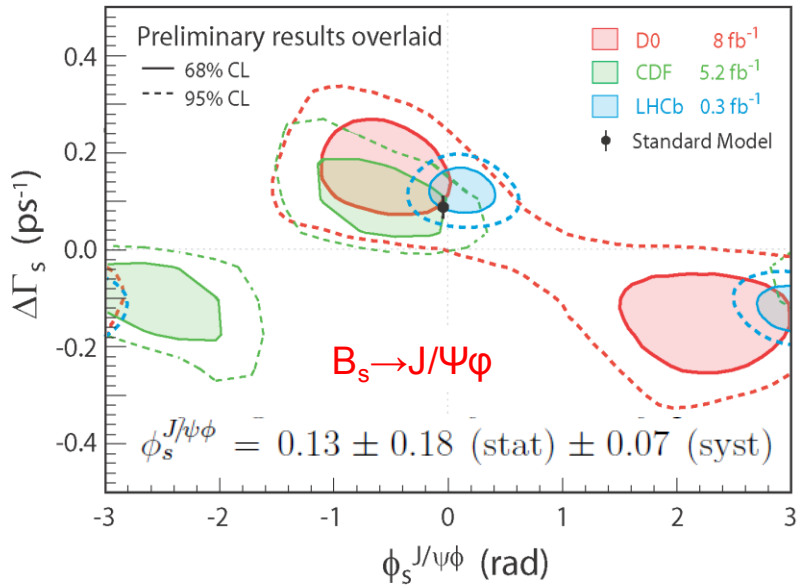
- Separation of prompt & secondary



# $\Phi_s$ with $\sim 300 \text{ pb}^{-1}$

LHCb has measured  $\phi_s$  in both  $B_s \rightarrow J/\Psi\phi$  and  $J/\Psi f_0(980)$

LHCb-CONF-2011-049



LHCb-CONF-2011-051

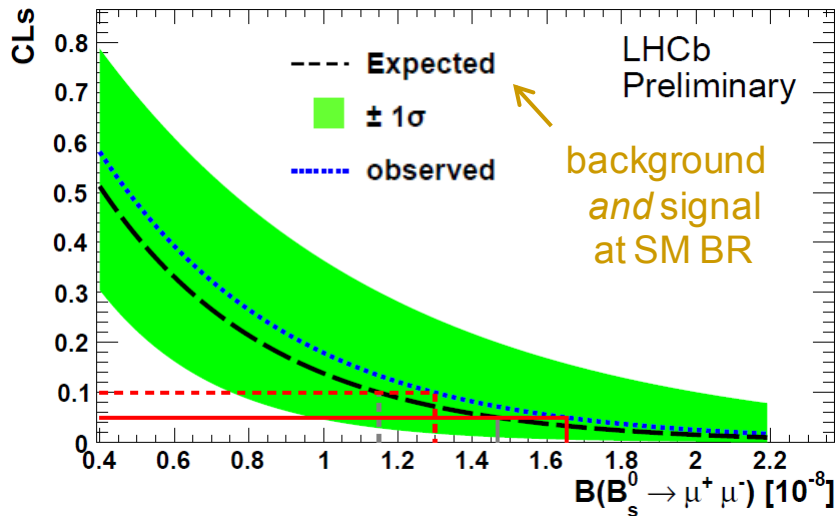
LHCb combination for Lepton-Photon [LHCb-CONF-2011-056] :

$$\phi_s = 0.03 \pm 0.16 \text{ (stat)} \pm 0.07 \text{ (sys)} \text{ rad.}$$

Non-SM hint from CDF/D0 not confirmed, but this only the start - we go on!

# $B_s \rightarrow \mu\mu$ at LHCb with 300 (+37) $\text{pb}^{-1}$

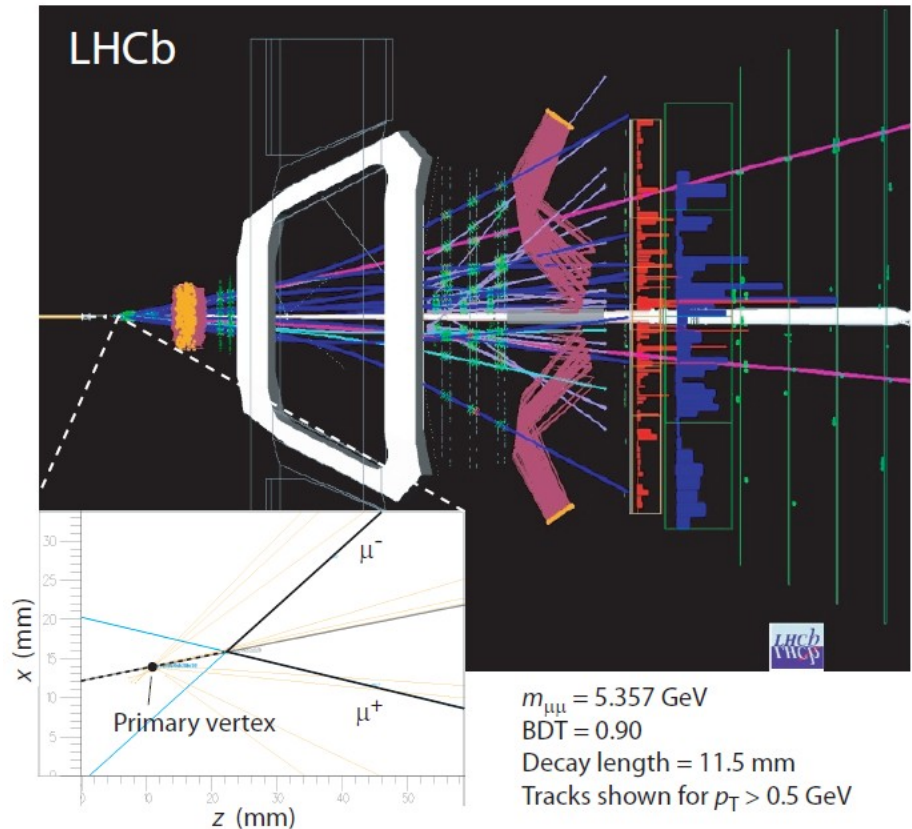
No excess seen... but plausible candidates already being observed



Observed limit at 95% (90%) C.L.  
(including 37  $\text{pb}^{-1}$  from with 2010):

$$1.5 (1.2) \times 10^{-8}$$

Around  $\sim 5x$  SM BR, and closing fast...



# Meeting structure

- Thurs morning : CPV and rare decays of charm
- Thurs afternoon (14:00→): CPV in b-hadrons
- Thurs evening (18:00) : Social drink in 'Glass Box'
- Fri morning (8:45→) : 'Rare' b-decays and Summary

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# Looking forward

We hope that the discussions that we are starting this week will continue over the coming months. We shall also consider the possibility of organising a second meeting next Spring, to digest what we have learnt from the full 2011 dataset. Furthermore, it may then make sense to summarise our conclusions in a document:

- useful in its own right (for LHCb certainly!);
- could constitute a useful submission to the ‘Strategy for European Particle Physics’ discussions;
- the executive summary of this write-up would be a good starting point for the flavour-physics part of the summary document of the ongoing ‘Implication of LHC results for TeV-scale physics’ workshop.

Let us discuss this possibility between sessions over throughout today & tomorrow