Implications of LHCb measurements & future prospects

Welcome and introduction

Many thanks for support to:
- CERN
- IPPP
- ERC

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Frederic Teubert
Gilad Perez
John Ellis
Purpose of workshop

LHCb already produced interesting results with the 37 pb$^{-1}$ collected in 2010, and the $\sim$370 pb$^{-1}$ collected this summer. With the full $\sim$1.1 fb$^{-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 whet 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 ~ 7mb. LHCb writes out charm events at ~1 kHz. Very large, clean, samples being collected, particularly in low topology modes.

~10x Belle sample in 540 fb⁻¹ [PRL 670 (2008) 190]!

Good systematic control has been demonstrated with 2010 data:

- Lifetime trigger acceptance
- Separation of prompt & secondary

~35% of total 2011 sample
Φs with ~300 pb⁻¹

LHCb has measured φs in both Bs→J/Ψφ and J/Ψf₀(980)

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

\[ \phi_s = 0.03 \pm 0.16 \text{ (stat)} \pm 0.07 \text{ (syst)} \text{ rad} \]

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) $pb^{-1}$

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

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

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

Around ~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
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.