

Comments on paper-2011-019-1: A measurement of the cross-section ratio $\sigma(\chi_{c2})/\sigma(\chi_{c1})$ for prompt χ_c production at $\sqrt{s} = 7$ TeV in LHCb

- Abstract
 - ... the two χ_c spin states \rightarrow the $\chi_{c1}(1P)$ and $\chi_{c2}(1P)$ mesons.
 - ... broadly in agreement \rightarrow see comments conclusion.
- Introduction

Many small corrections would not help here. We recommend that the introduction is rewritten to introduce the subject to a more general public, why we think this is important, the interesting history of this topic, and how we organize this paper. We can repeat some information about the formation and decay from the abstract.
- LHCb detector and event selection

CL_γ is vaguely defined as likelihood in line 54 and is called confidence level in line 73. This does not seem consistent. Can this be clarified?
What is the effect of the photon resolution on the mass difference plots in Figure 1?
What do we do with the multiplicity of 1.27 and the estimate of 0.23 % ?
... the reconstructed J/ψ invariant mass \rightarrow the $\mu^+\mu^-$ invariant mass.
- Analysis method

Use scientific notation for ... $38,630 \pm 550 \rightarrow (3.863 \pm 0.055) \cdot 10^4$.
The fit in Figure 1 does not look good above the resonance. The background should be studied by combining γ 's and J/ψ 's from different events.
- Efficiency ratios

Figure 2 should have larger open and filled symbols that can be distinguished in black and white.
What can we say about the agreement between data and MC?
- χ_c polarization effects

We did not like this section. What is the assumption in our analysis?
Announce that the maximal deviation due polarization is indicated separately from the systematic uncertainty in the final results given in Table 3 and Figure 3.
... various scenarios are considered \rightarrow various scenarios can be considered.
... the final result \rightarrow the determined cross section ratio.
- Systematic uncertainties: Intrinsic fit method

Refer to Figure 1.
We consider this deviation a bias with a systematic error that should smaller than 100 %. If we treat the deviation as a systematic uncertainty, we are not consistent.
- Results and conclusions

In the caption of Figure 3: ... data points \rightarrow results assuming the production of unpolarized χ_c mesons.
We cannot judge how the blue curve in Figure 3 is made.
... are broadly in agreement with \rightarrow only agree at $p_T^{J/\psi} > 8$ GeV/c.
(note: c is not a variable, but a constant, and can be written in Roman style)
The conclusion about the blue curve is inconclusive and can be omitted.
- General comment

The Particle Data Group prefers a corresponding cross section ratio with $\psi(2S)$:
<http://pdg.lbl.gov/2011/reviews/rpp2011-rev-psi-chi-branching-ratios.pdf>.