

**Comments by VU-Nikhef in Amsterdam on LHCb-CONF-2011-036-001:
Measurement of Υ production cross-section in pp collision at $\sqrt{s} = 7$ TeV in
LHCb**

We find that the paper is clear and well written.

We would welcome a discussion of the amount of feed-down from the higher resonances as the models describe only direct production.

How is the integrated differential cross-section determined? By averaging the binned ones or by fitting the total mass spectrum as a single bin?

It would be nice to work out the correlated and uncorrelated uncertainties separately, by dividing Table 1 in two parts with this errors. Luminosity and maybe the global cuts should be specified as separate uncertainty in the tables.

Would it be possible to determine the polarization with limited accuracy to reduce the main uncertainty? Can we do that only with more data?

- Title, lines 2-3.
Add plural 's' for the 'cross-sections' and 'collisions'.
- Abstract, line 5.
Add 'to $\mu^+\mu^-$ ' after 'branching fraction' or 'dimuon' before it.
Add indices 1S, 2S and 3S for the different branching fractions ' $\mathcal{B}^{1S}(\mu^+\mu^-)$ ' in the results.
- Introduction, line 17-18.
Remove 'all' in 'but all fail to'. Or write 'The existing models for Υ production fail to'.
Reference [1] does not refer to Υ measurements, but to J/ψ measurements.
- Line 22.
'Dramatic' is felt too dramatic.
- Line 27.
Add 'centre-of-mass' to '7 TeV'.
- The LHCb detector and dataset, lines 31, 37.
A suggestion for the section title is 'The LHCb detector, data and Monte-Carlo'.
Replace 'a large-area strip detector' by 'silicon strip detectors'.
- Lines 45-46.
Remove the text within parentheses and rewrite it in one or two sentences.
'At L0 one or two muon candidates are required with a transverse momentum p_T larger than 1.4 GeV/c for one muon, and 0.56 and 0.48 GeV/c for two muons.'
Replace 'At HLT, the line used tightens' (jargon) by an acceptable formulation, like: 'At HLT the dimuon mass is required to be larger than 2.9 MeV/c², and ...'.
- Lines 49-50.
Remove 'of each subdetector'.
- Cross-section determination, lines 58-60.
After ' Υ production' add 'of the different 1S, 2S and 3S states'.
Add index 'iS' in the branching fraction ' $\mathcal{B}^{iS}(\mu^+\mu^-)$ ' and in ' Υ^{iS} ' in Eq. (1).
Insert 'is' after ϵ , \mathcal{L} , and \mathcal{B} and 'are' before 'the rapidity ... bin sizes'.

- Lines 63-64.
Consider to remove the well-known definition of y .
- Υ selection, lines 66-67.
Consider ' Υ analysis' instead of ' Υ selection'.
Add 'particle' before 'tracks'.
- Line 73.
Use ' $e^{(p_T \cdot (m-M))}$ ', in stead of 'exp'.
Define M .
Why is M used in the background?
- Lines 78-79.
Rewrite as 'Signal yields are obtained for $\Upsilon(1S)$, $\Upsilon(2S)$, and $\Upsilon(3S)$ of $\dots \pm 112$. The mass resolution σ of the $\Upsilon(1S)$ peak is $53.9 \text{ MeV}/c^2$ and the resolution of the $\Upsilon(2S)$...peaks ...'.
- Line 82.
The widths are fixed for each (p_T, y) bin: Is that justified? Is a systematic uncertainty assigned to this assumption?
- Line 83.
Specify the 'small number of entries'.
- Line 88.
Clarify by adding 'total': 'The total efficiency for each (p_T, y) bin '
- Line 89.
It is not clear what is meant by 'on the trigger' \rightarrow Replace by 'with respect to triggered events', for example.
- Systematic uncertainties, lines 108-109.
Remove or change the lower limit of 0% for the uncertainty.
The asymmetric uncertainties should be given in stead of 16 and 17%.
Don't use the shorthand notation with parentheses for the different states.
How is the integration done?
- Figure 2.
Use ϵ also in the caption and rotate ϵ at the axes to avoid confusion with ω .
Take the full vertical scale between 0 and 1 and use the same size marks in both figures.
- Table 1.
Replace 'entering in the cross-section measurement' by 'entering the cross-section measurement' or by 'of the measured cross-section'.
Remove three times 'VALUE'.
Remove 'on ϵ '.
Remove or change the lower limits of 0% for the uncertainty.
Remove 'unknown'.
The number of digits is inconsistent. Write 1.0%.
We miss a total systematic uncertainty and a discussion how to combine the correlated uncertainties in the integrated cross section.

- Results. Line 123.
Move the range in p_T and y to the text above the equations, as is also done in the abstract.
- Lines 126, 156, and 162.
Is a factor three an agreement?
Here different comparisons are made with CMS and ATLAS. In all three cases should be said that comparisons are made in the common range of p_T and y ?
- Lines 130, 135.
Replace 'plot' by 'figure'.
- Line 131-134.
Add space between) and [20].
Skip explanation in brackets of figures, '(CSM... band)' and '(hatched ... band)'
- Lines 144-147.
Replace ' $\times \mathcal{B}(\mu^+\mu^-)$ ' by a text as 'times the dimuon branching ratio'.
The sudden change of style of writing by using 'we' in 'we have also' may be reconsidered.
Add index 'iS' and 'lS' in the branching fraction ' $\mathcal{B}^{iS}(\mu^+\mu^-)$ '.
We prefer an Equation number for this and other equations.
Replace 'statistics' by 'size of the data sample' or 'number of selected events'.
- Conclusions. Lines 166-167.
Remove the subjective statement 'This confirms ... large.'
- Figure 3.
Take $5 \cdot 10^{-1}$ as upper limits and 10^{-4} as lower limits. Place the legend only in the top figure or in the same way as in Fig. 4.
Consider '(top), (middle), (bottom)' in front of the items, so that the caption reads as Figure 1:(top) Differential
Replace the complicated expression at the vertical axes by $d^2\sigma/dp_T dy$ (nb/(GeV/c)) and give the full expression (horizontally) in the caption with the correct pairing of parentheses.
The Figures and the Tables use different units for the cross-section (nb and pb).
Produce the plots for the figures without the light yellow background.
- Figure 3.
 10^{-3} might be used for the lower limits.
- References. Line 182.
Add a reference to a CDF publication about Υ production.