

Deutsches Elektronen-Synchrotron
(DESY), Hamburg

Nikhef & VU, Amsterdam

Open questions on double parton scattering (from an experimental point of view)

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Many interesting experimental talks:

- DPS in same sign WW at the CMS experiment
→ **Diego Ciangottini**
- DPS measurements at the CMS experiment
→ **Paolo Gunnellini**
- Studies of double parton interactions with the ATLAS detector
→ **Orel Gueta**
- Study of DPS processes at LHCb
→ **Vanya Belyaev**

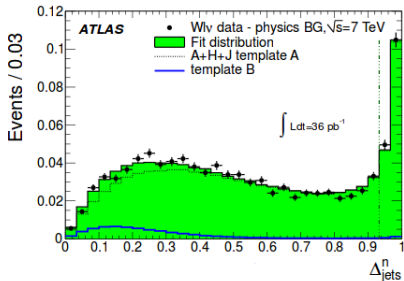
N.B. 20 + 5 min. for each talk!

Prospects for the future:

- ① **DPS energy dependence**
- ② **New sensitive channels?**
- ③ **New sensitive observables?**
- ④ **New phase space?**

N.B. Very personal and (CMS-) biased view!

Is this not a clear evidence of DPS?



$$R_{D^+}^{\Upsilon(2S)/\Upsilon(1S)} = \mathcal{B}_{2/1} \times \frac{\sigma_{\sqrt{s}=7 \text{ TeV}}^{\Upsilon(2S)D^+}}{\sigma_{\sqrt{s}=7 \text{ TeV}}^{\Upsilon(1S)D^+}} = (22 \pm 7)\%$$

$$R_{D^+}^{\Upsilon(2S)/\Upsilon(1S)} = \mathcal{B}_{2/1} \times \frac{\sigma_{\sqrt{s}=8 \text{ TeV}}^{\Upsilon(2S)D^+}}{\sigma_{\sqrt{s}=8 \text{ TeV}}^{\Upsilon(1S)D^+}} = (22 \pm 6)\%$$

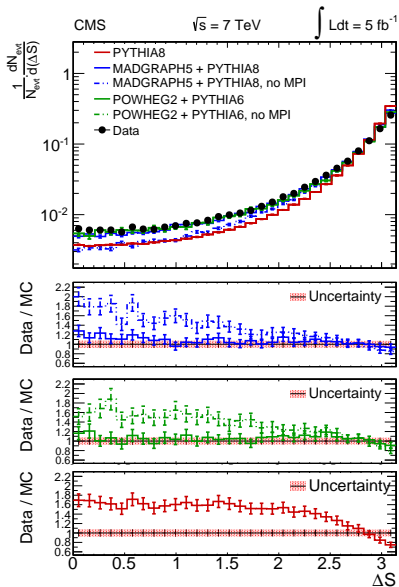
LHCb

ATLAS - CMS: DPS fraction 5-8%

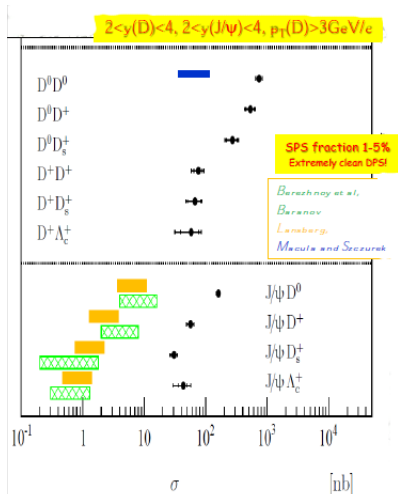
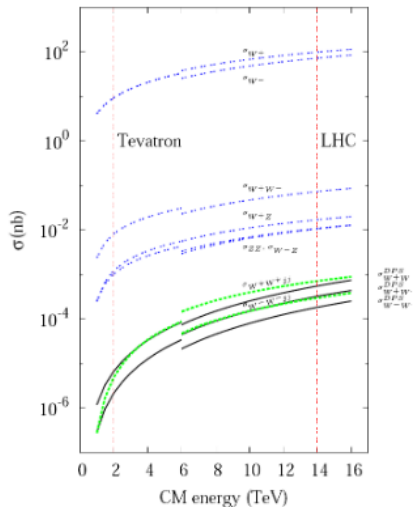
→ Diff. cross sections of DPS-sensitive observables

LHCb: DPS fraction 60 - 90%

→ Total production cross section for sensitive channels



Experimental strategy for DPS measurements (I)



- Investigation of sensitive channels (same-sign WW, $J/\psi + D, \Lambda$)
- Analysis cuts which increase DPS sensitivity

Currently, measurements scan different (and complementary) regions of phase space

Experimental strategy for DPS measurements (II)

1st step

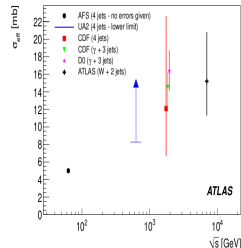
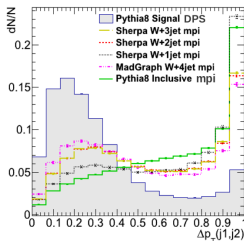
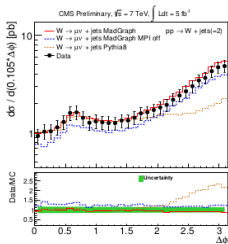
Corrected distributions
DPS-sensitive variables

2nd step

Data interpretation
and unambiguous
definition
of signal and
background templates

3rd step

Extraction of the DPS
fraction and study of
the process
dependence

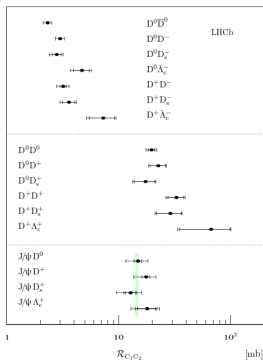
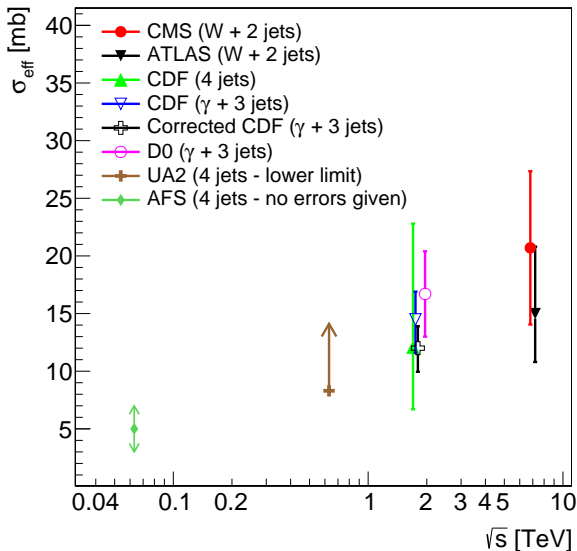


- Compare the data to your own favourite predictions!

4th (future) step: possibility to measure sensitive corners of phase space

Role of the quantity σ_{eff}

- Is the value for σ_{eff} a useful input?
- How can one reduce the exp. unc.?
- Should one try also a global extraction?



**We hope we will have a
very fruitful discussion!**