

Electroweak Run2 prospects



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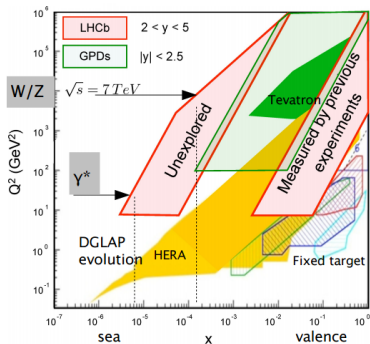


University of
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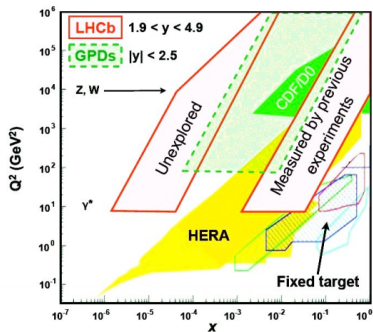
Zurich meeting, Churwalden
September 1-2, 2015

Higher energy!

7 TeV



14 TeV

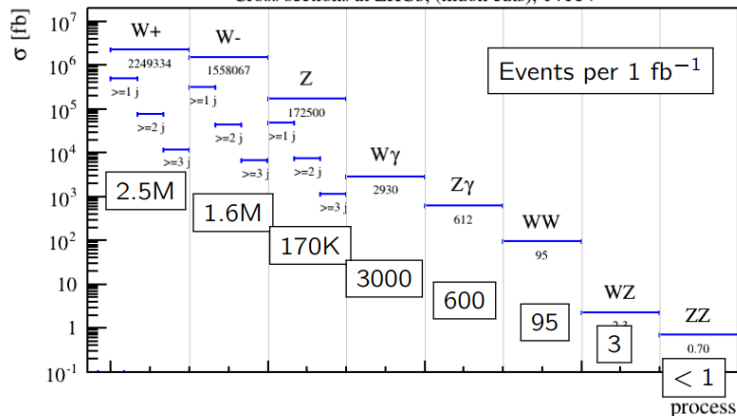


- LHCb cover a very unique region of the phase space that is not accessible for any other experiments.
- One could measure in this regime:
 - W, Z cross section.
 - Drell-Yan cross section.
- These measurements would strongly constrain the PDF in the fits.

Cross section

⇒ Higher energy ⇒ Higher cross section:

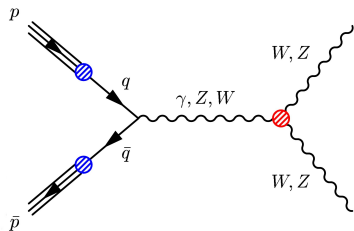
Cross sections at LHCb, (muon cuts), 14TeV



⇒ In contrast to RD the EW measurements should start much sooner as they are not statistically dominated!

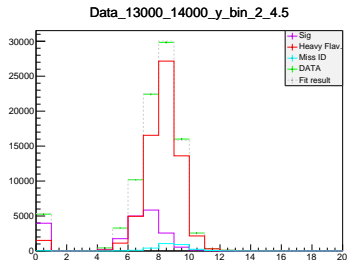
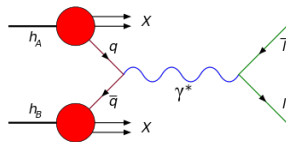
What could we do?

- ⇒ For starters we should start by measurement of Z cross section (already ongoing in the group).
- ⇒ Relatively simple, you don't need much data.
- ⇒ Important for MC tuning.
- ⇒ More interesting: Tripple Gauge Boson Couplings:



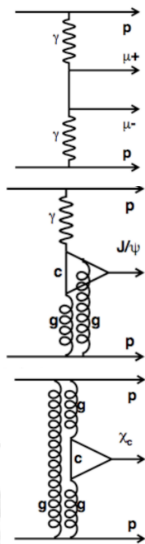
- Clear SM prediction.
- Sensitive to anomalous couplings!
- ATLAS observed a small but consistent deviation in this measurement.

- Very clean theoretical prediction!
- Effectively you are probing the proton PDF.
- Remember that the theory error for all the Higgs calculations comes from PDFs.
- One could improve really the PDFs thanks to special kinematic region of LHCb.
- We could reach lower x region of 10^{-6} , trigger is there! Background needs to be understood.



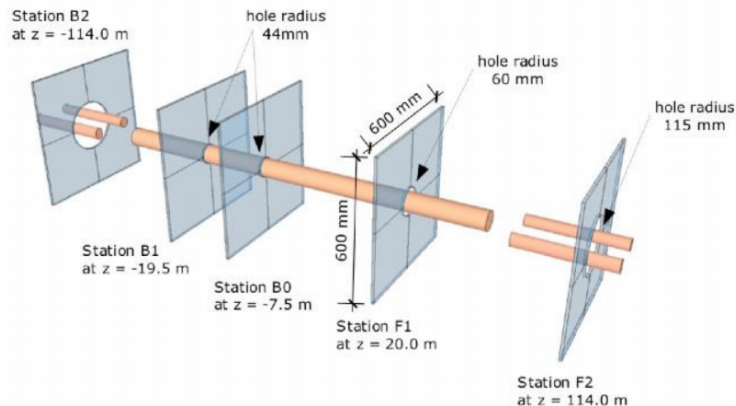
Central Exclusive Production

- Super clean theoretically.
- Signature: protons interact and go to the beam pipe undetected, in the detector you are left with couple of particles.
- Probing PDF and also thanks to DPE we have a link to Higgs Physics.
- Getting sensitive to saturation effects?



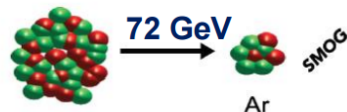
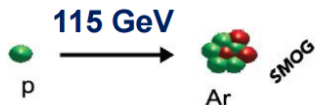
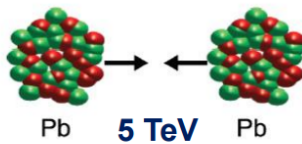
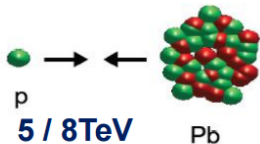
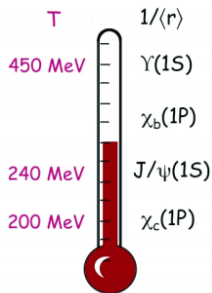
Central Exclusive Production- detector upgrade

- For Run2 LHCb installed: HeRSChelL: High Rapidity Shower Counters
- They cover $5 < \eta < 8$.
- Rejecting the main background for CEP.
- Allows to measure p_T^2 distribution for inelastic events.
- Dedicated L0 trigger for CEP.

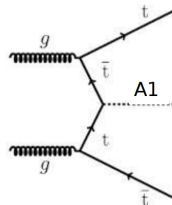
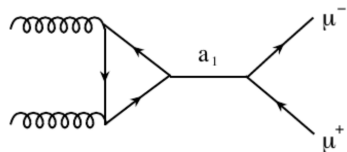


Ion-Ion run

- Tests of all QGP effects:
 - Colour screening.
 - Melting states.
 - Jet quenching.
 - J/ψ suppression.
 - Elliptic flow.
- Cold and hot matter effects.
- SMOG.
- etc.



CP-odd Higgs



- Competitive with ATLAS and CMS
- We have excellent resolution.
- Can probe mass around the Υ s region.

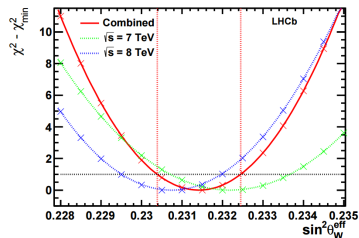
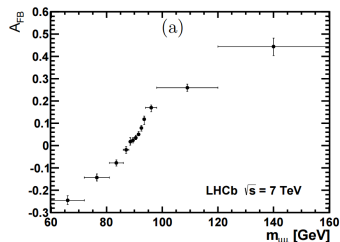
- Katharina already presented our recent measurement of top measurement in the forward region.
- with Run2 data (5 fb^{-1}):
 - $[\ell, b]$: expect $\sim 8300 t\bar{t}$, 5000 t -channel, 600 s -channel, and 180 Wt .
 - $[\ell, \ell, b, b]$: expect $\sim 530 t\bar{t}$.

How about some precision?

- One can measure the A_{FB} in the $Z \rightarrow \mu\mu$ decays:

$$A_{FB} = \frac{\sigma(\cos\theta > 0) - \sigma(\cos\theta < 0)}{\sigma(\cos\theta > 0) + \sigma(\cos\theta < 0)}$$

- This is dependent on the vector and axial couplings $\Rightarrow \sin\theta_W^{eff}$.
- Since LEP time there is a small tension in this measurement.
- With full Run2 data and some smart ideas we might be close to LEP!
- ATLAS and CMS will not not be able to compete.



Summary

- Reach Run2 program in QEE WG measurements:
 1. Drell-Yan
 2. Ion-Ion physics
 3. Cross section measurements
 4. Triple Gauge Couplings
 5. top physics
 6. CEP
 7. $\sin \theta_W^{eff}$

Backup