Electroweak Run2 prospects

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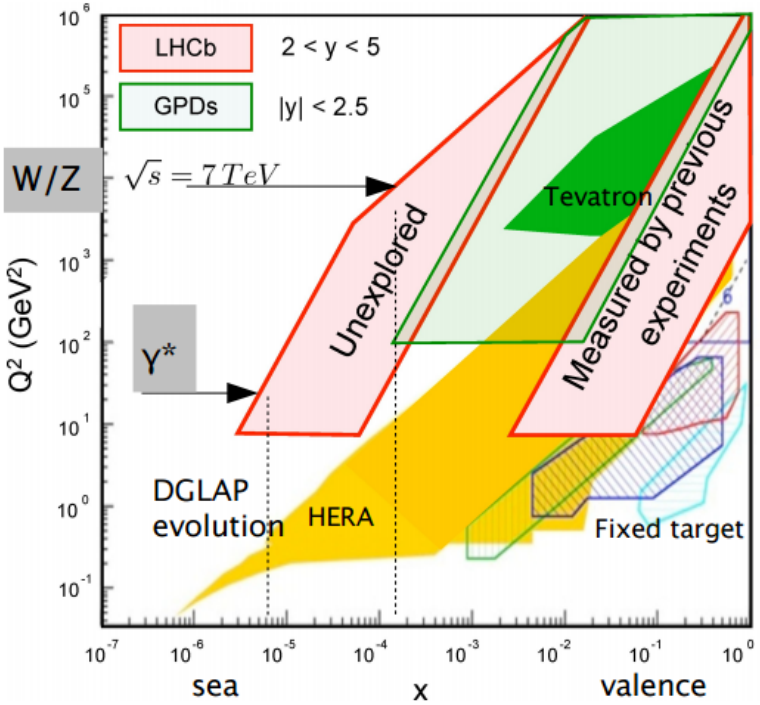
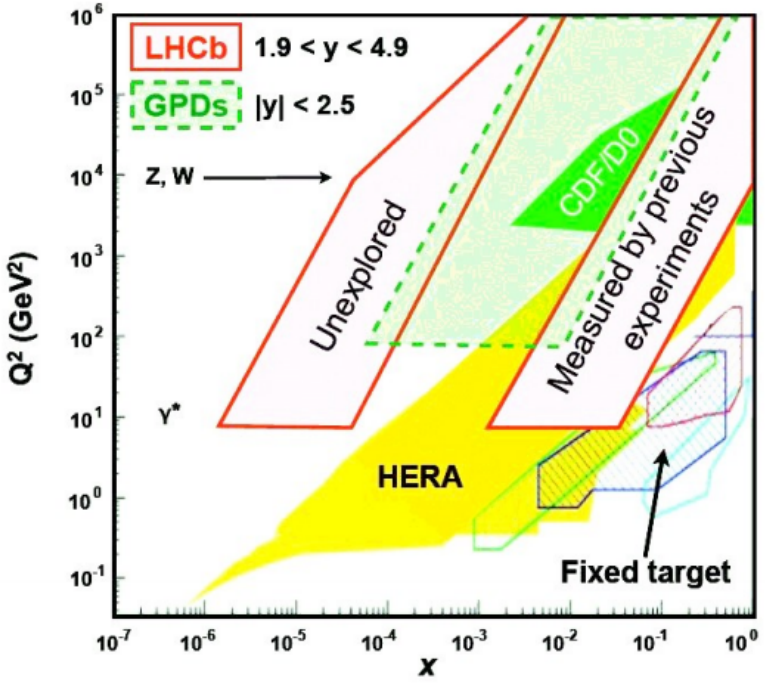
Higher energy!

7 TeV



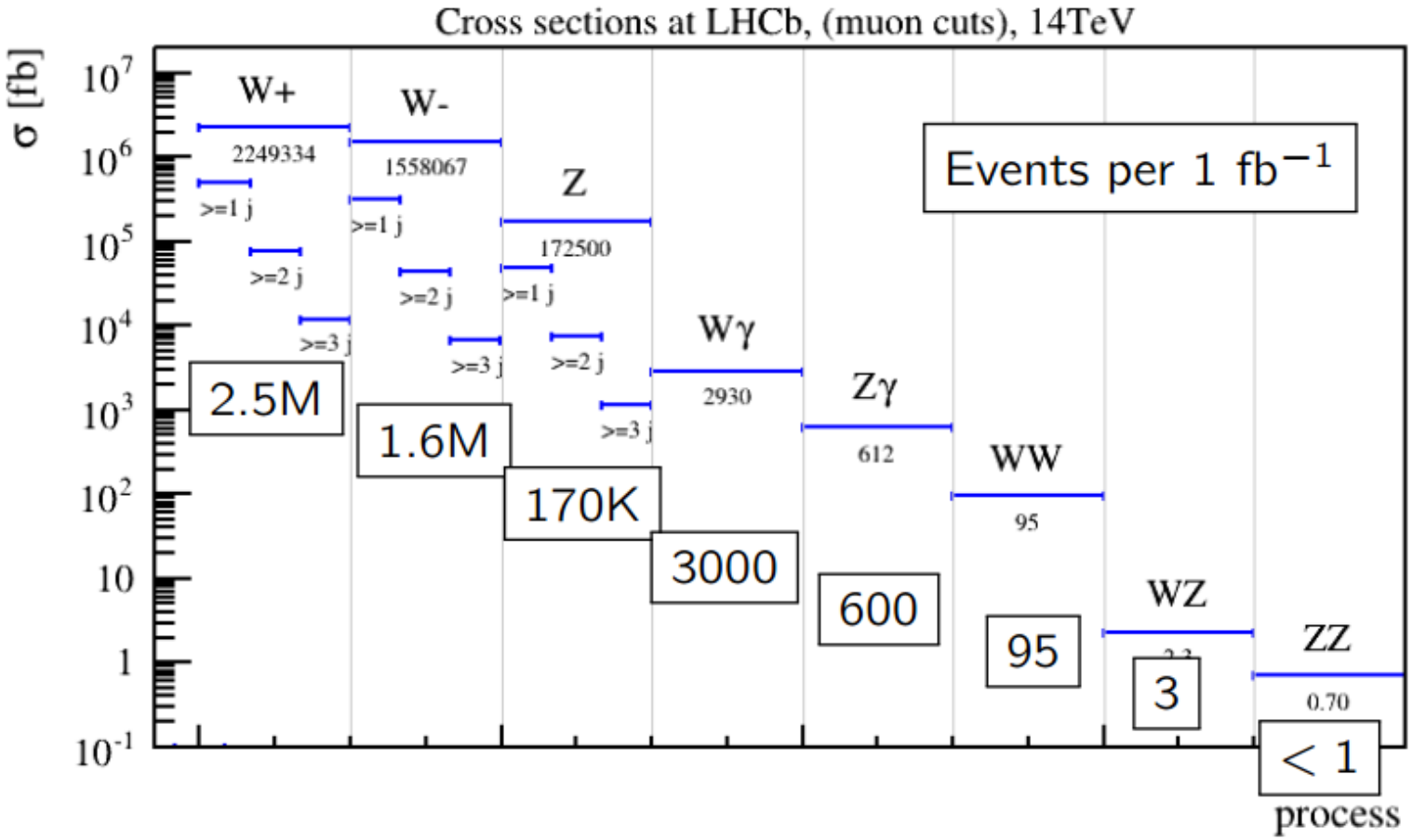
14 TeV



- 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.
- This measurements would strongly constrain the PDF in the fits.

Cross section

⇛ Higher energy ⇛ Higher cross section:

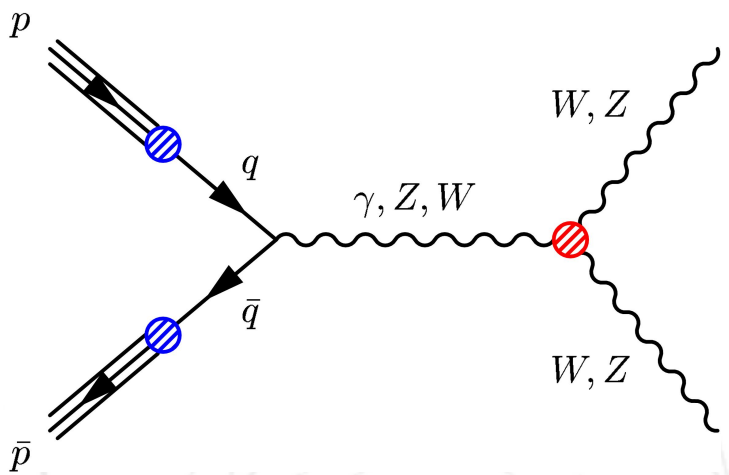


⇛ In contrast to RD the EW measurements should start much sooner as they are not statistically dominated!

What could we do?

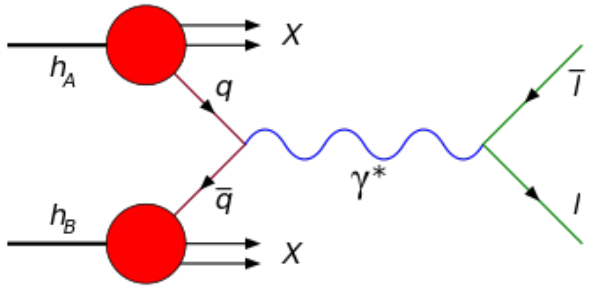
$\Rightarrow$ For starters we should start by measurement of Z cross section.
$\Rightarrow$ Relativity simple, you don't need much data.
$\Rightarrow$ Important for MC tuning.
$\Rightarrow$ More interesting: Tripple Gauge Boson Couplings:

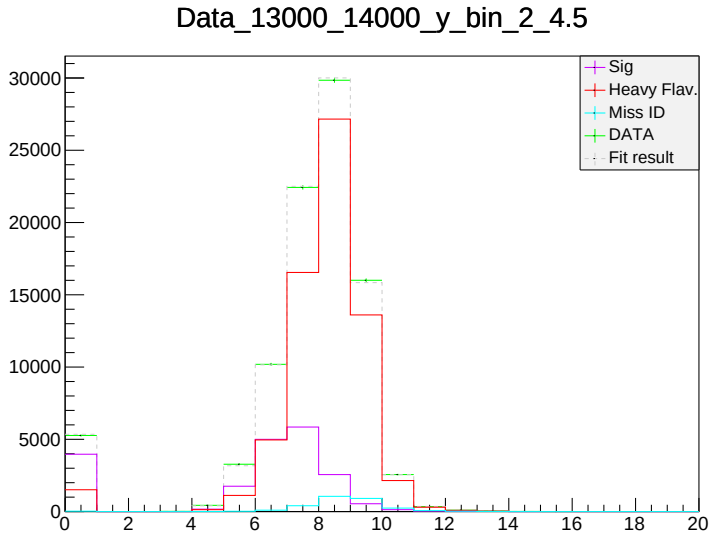
- Clear SM prediction.
- Sensitive to anomalous couplings!
- ATLAS observed a small but consistent deviation in this measurement.



Drell-Yan

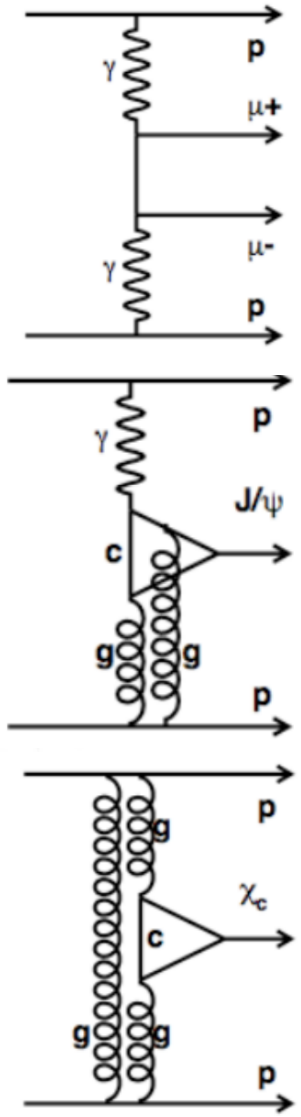
- Very clean theoretical prediction!
- Effectively you are probing the proton PDF.
- Remember that the theory error for all the Higgs calculations comes from PDFs.
- One could improve really the PDFs thanks to special kinematic region of LHCb.





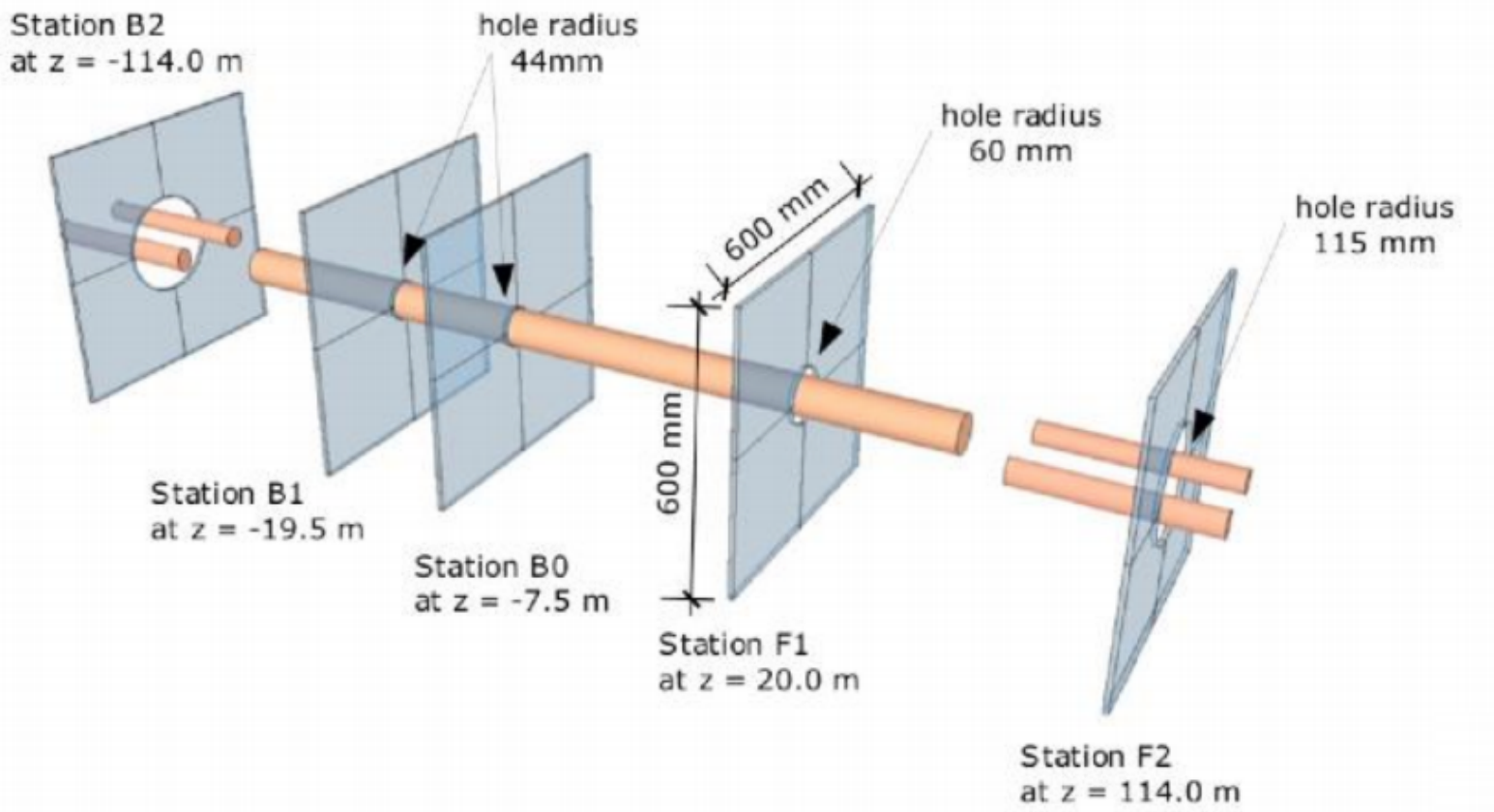
Central Exclusive Production

- 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.



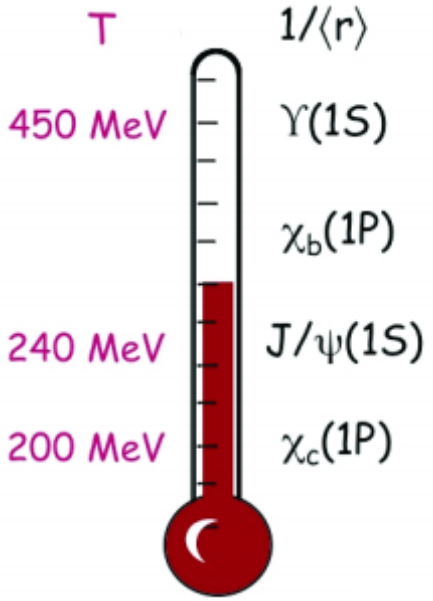
Central Exclusive Production- detector upgrade

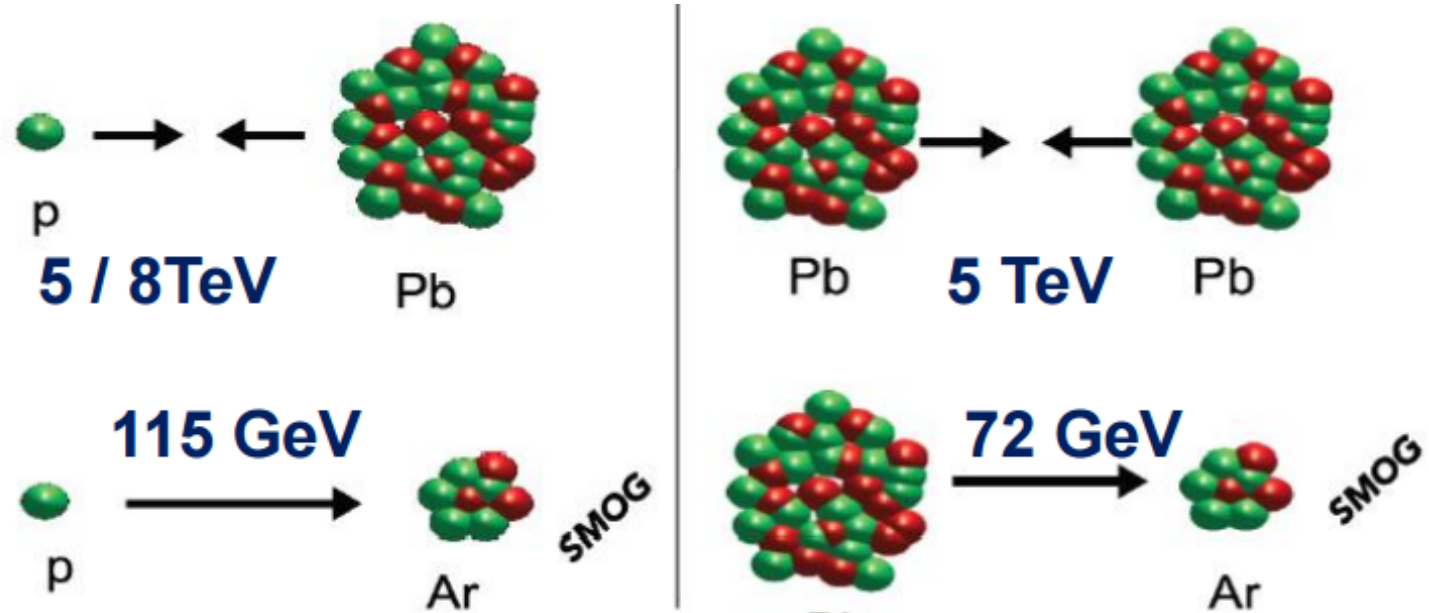
- For Run2 LHCb installed:HeRSCheL: High Rapidity Shower Counters
- They cover $5 < \eta < 8$.
- Rejecting the main background for CEP.



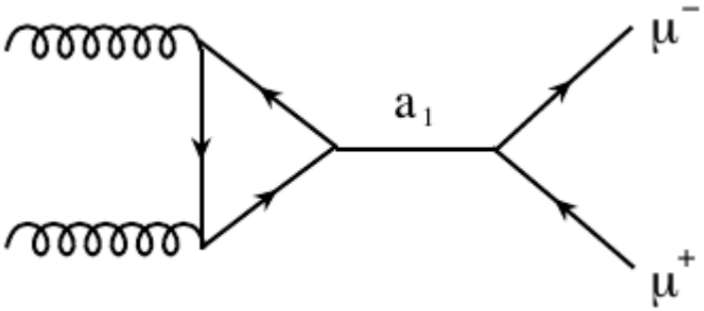
Ion-Ion run

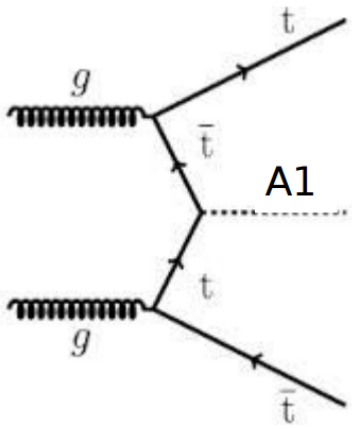
- Tests of all QGP effects:
  - Colour screening.
  - Melting states.
  - Jet quenching.
  - J/ψ suppression.
  - Elliptic flow.
- Cold and hot matter effects.
- SMOG.
- etc.





CP-odd Higgs





- Competitive with ATLAS and CMS
- We have excellent resolution.
- Can problem mass around the Υs region.

top physics

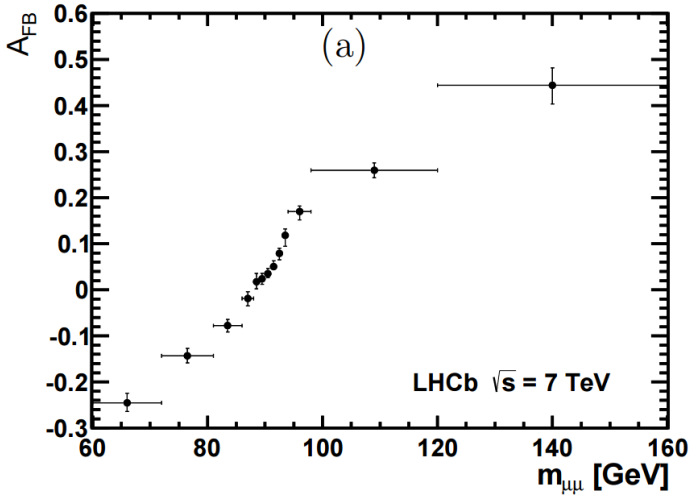
- Katharina already presented our recent measurement of top measurement in the forward region.
- with Run2 data ($5\ \mathrm{fb}^{-1}$):
  - $[\ell, b]$: expect $\sim 8300\ t\bar{t}$, $5000\ t$-channel, $600\ s$ -channel, and $180\ Wt$.
  - $[\ell, \ell, b, b]$: expect $\sim 530\ t\bar{t}$.

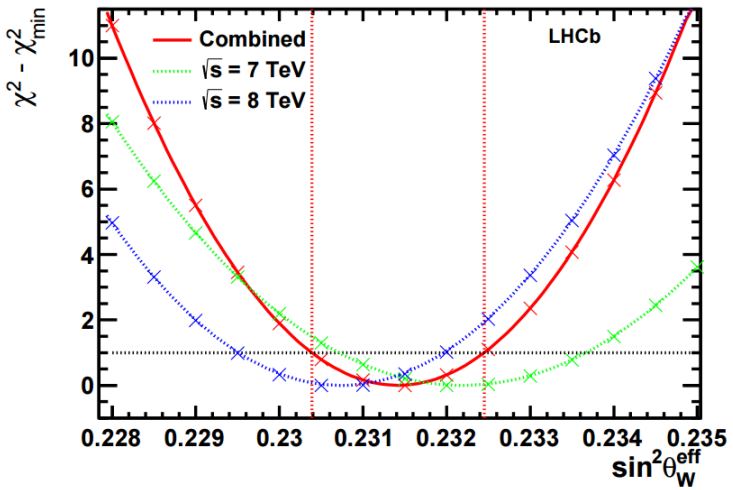
How about some precision?

- One can measure the A_{FB} in the $Z \to \mu\mu$ 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!





Summary

- Reach Run2 program in Electroweak 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