

Comparison and combination of W lepton asymmetry from ATLAS, CMS and LHCb

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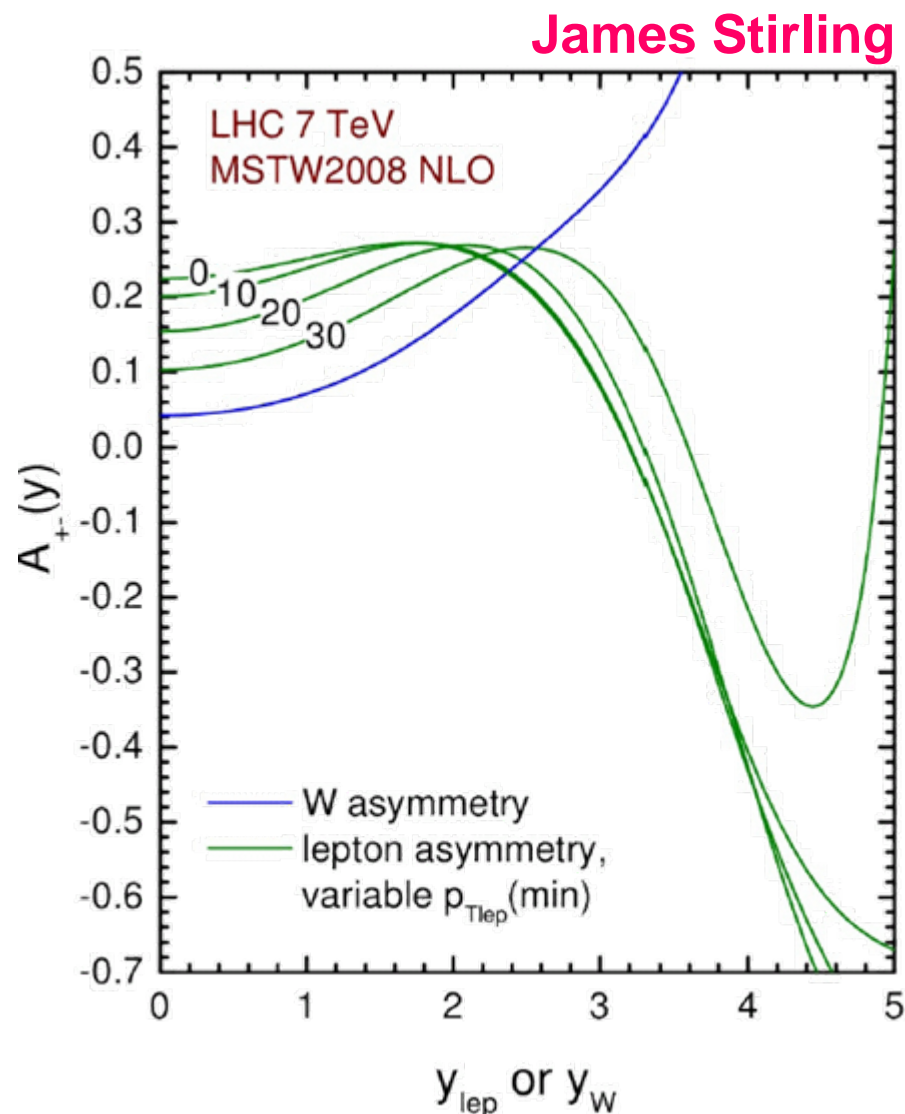
on behalf of the LHC Electroweak
Working Group



Ingredients and Issues

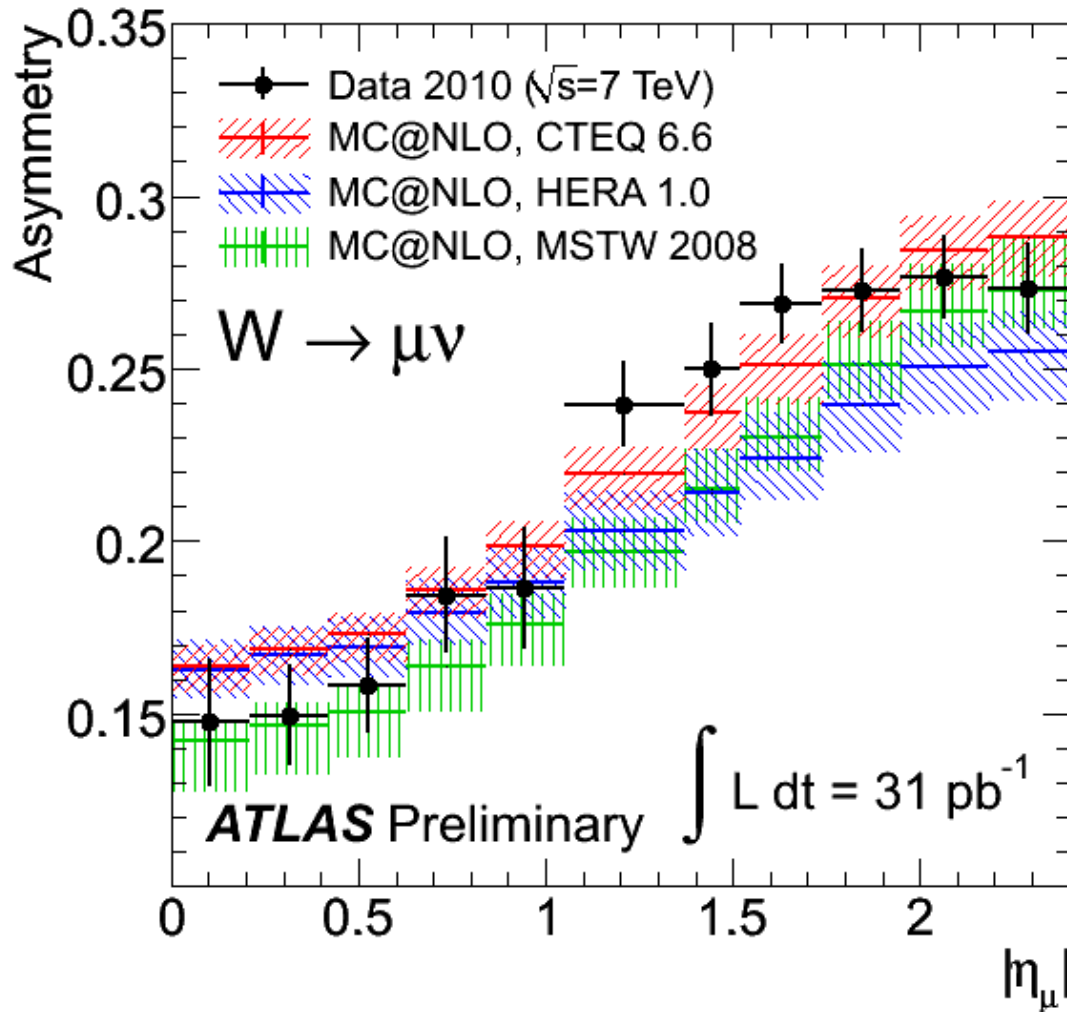


- ATLAS, CMS and LHCb (in rigorous alphabetical order) produced W charge asymmetry measurements vs. lepton pseudorapidity
 - Different η ranges allow to compare measurements and probe larger range
- Analyses use different fiducial selections
 - Muon p_T , E_T^{miss} , m_T





ATLAS Measurement



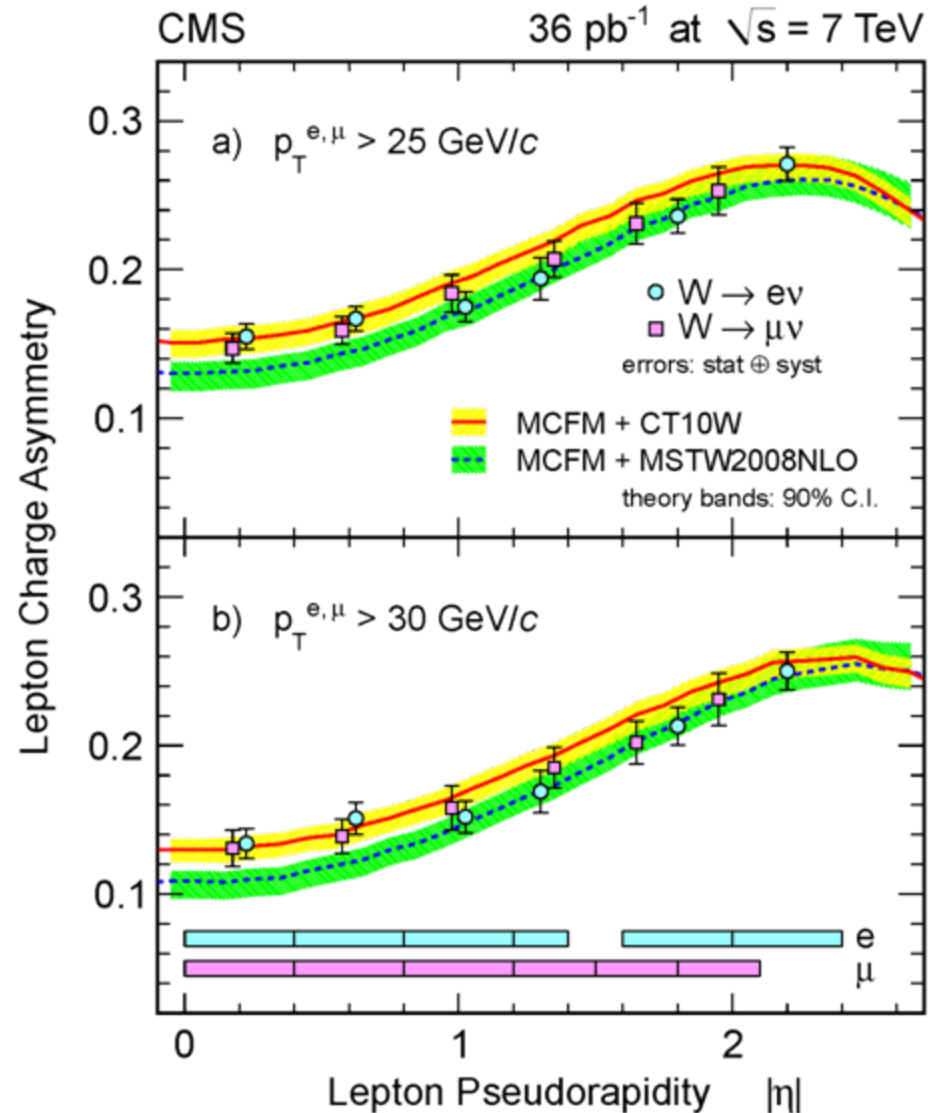
- Muon $p_T > 20 \text{ GeV}$, $E_T^{\text{miss}} > 25 \text{ GeV}$, $m_T > 40 \text{ GeV}$



CMS Measurement

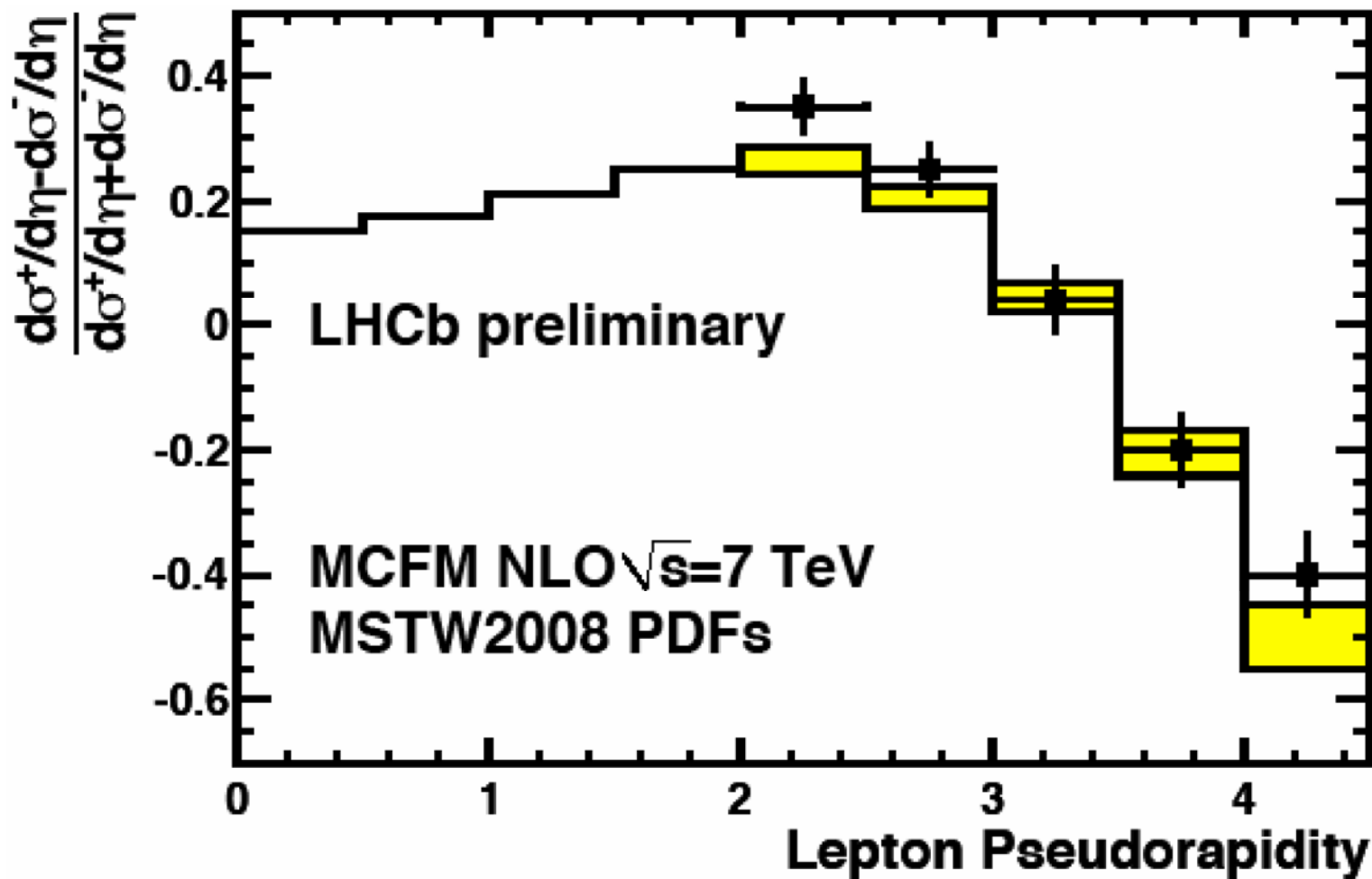


- Lepton $p_T > 25 \text{ GeV}$ and $p_T > 30 \text{ GeV}$
- no E_T^{miss} cut





LHCb Measurement



- $p_T > 20 \text{ GeV}$, + cut correlated with E_T^{miss}



How to put them together?



- Main steps toward harmonization
 - Identify a common set of cuts to be used in the comparison
 - Possibly set some common $|\eta|$ binning, to ease comparison
- Less evident aspects
 - Ensure that additional selection cuts and criteria do not introduce further differences in the ultimate definition of the samples
 - Are some cuts changing jet content? How about Isolation?
 - Are EM corrections consistent among analyses?



What can we do?



- *Comparison* of measurements
 - Produce alternative measurements which can be directly compared
 - Check of robustness of analyses
 - Direct comparison is important achievement by itself
- *Combination* of measurements
 - Each analysis, in its own, used “best” selection
 - We could provide 3 separate results and let PDF fitters deal with correlations
 - Change of cuts introduces degradation, however the combination of the results by the experiments will properly take into account the (un)correlated systematics
 - We can perform combination *before* PDF fit



Action Items & Plan (1)



- Identified minimal set of modifications that let us make first direct comparison
 - ATLAS: remove E_T^{miss} and m_T cuts
 - CMS: lower p_T cut from 25GeV to 20GeV
 - Set of changes allows for comparison, up to EM corrections
- Circulated pieces of information about Monte Carlo samples (generators, cross sections) and $|\eta|$ binning
 - Will try to agree on common binning, in particular in ATLAS/CMS–LHCb overlap region ($2 \sim |\eta| \sim 2.4$)



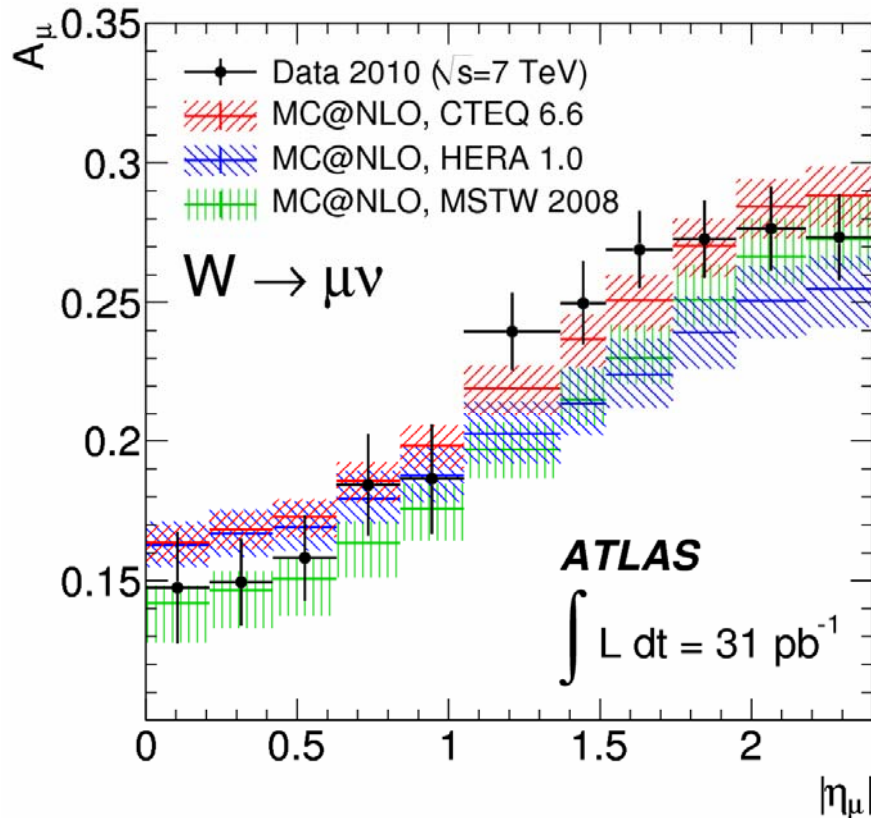
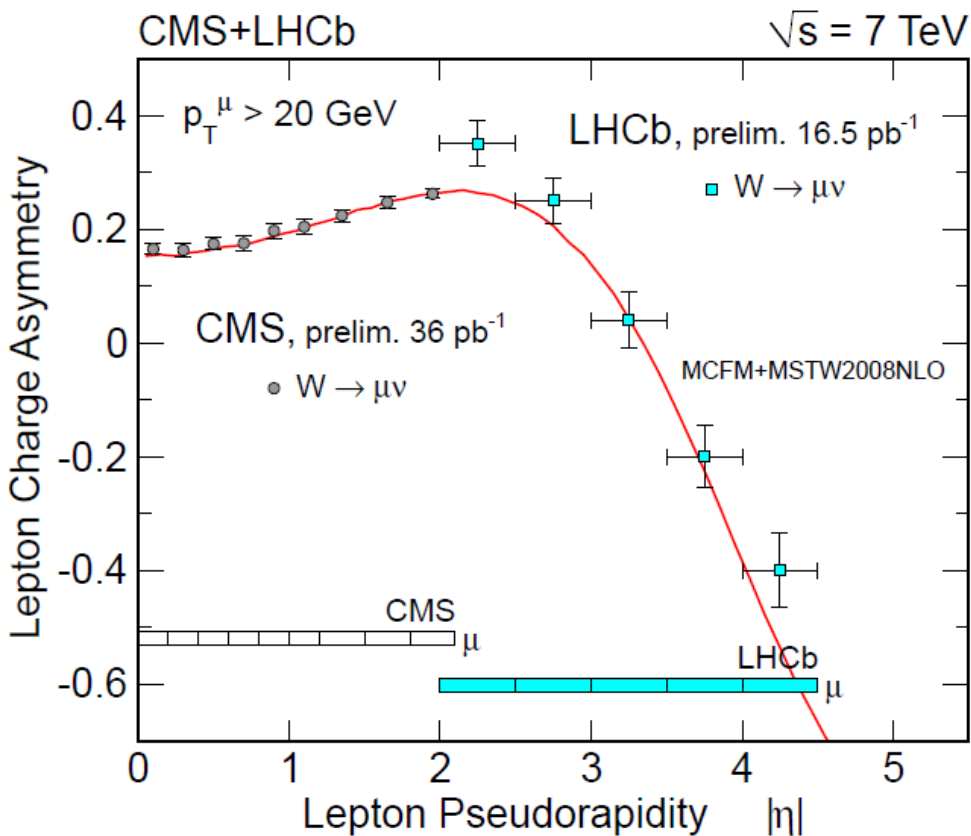
Action Items & Plan (2)



- We agreed on making combination of measurements
 - Combination would properly handle the correlated systematics providing the most reliable input for global PDF studies
 - Whatever plan for combination is drawn by the group will be discussed within the EW analysis groups of the individual experiments, before approval
- LHCb (and ATLAS?) could provide measurement with lepton $p_T > 25\text{GeV}$ and $p_T > 30\text{GeV}$
 - Compare with default CMS measurement
 - Measurement with different p_T cuts provides additional information
 - Especially in the forward region, one changes the bulk of the rapidity values for the W , and thus x_1 and x_2



Very Preliminary Results



- Lowered p_T cut to 20GeV for CMS
- Still m_T and E_T^{miss} cuts in ATLAS