mW combination ATLAS-Tevatron
Update

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Published results

Tevatron result CTEQ6.6

ATLAS result CT10

CMS, LHCb…

Common PDF set

δm_W (Tevatron)

δm_W (ATLAS)

Correlation ρ

Combined results

m_W combined

Selection cuts

CDF	ATLAS
$30<p_t^{l,\nu}<55$ GeV, $60<m_T<100$ GeV, $u_T<15$ GeV, $\|\eta\|<1$	$p_t^{l,\nu}>30$ GeV, $m_T>60$ GeV, $u_T<30$ GeV, $\|\eta\|<2.4$

PDF uncertainties

Dominant uncertainty in both measurements

ATLAS: CT10 for central value + uncertainties + envelope with CT14, MMHT
uses constraints from pTZ data : consider only PDF-induced variations on the pTW/pTZ ratio

Tevatron: CTEQ6.6 for central value; CTEQ6.6 + MSTW2008 for uncertainties.
—> no envelope of different PDF uncertainties taken into account. Difference between CTEQ6.6 and MSTW2008 quoted to be 6 MeV but not considered. No pTZ constraint used.

—> decorrelate uncertainty quoted in ATLAS from the envelope = 3.8 MeV and decorrelate the uncertainty for the parton shower PDF uncertainty.

Look at MSTW (added to the samples thanks to Josh/Jan/Fabrice)

Shifts (MeV)

Preliminary

MSTW2008—> CT10	p_T^{l+}	p_T^{l-}	m_T^{+}	m_T^{-}
2 TeV	+9.9	+6.2	+6.7	+4.1

CTEQ6.6—> CT10	p_T^{l+}	p_T^{l-}	m_T^{+}	m_T^{-}
2 TeV	+8.4	+8.4	+7.3	+6.8

The double difference is at most 3 MeV (different from the 6 MeV quoted in the Tevatron paper)

Shifts (MeV)

Preliminary

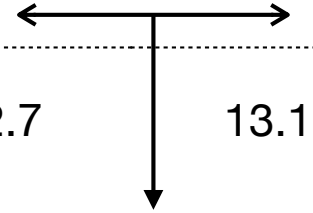
CT10—> MSTW2008	p_T^{l+}	p_T^{l-}	m_T^+	m_T^-
7 TeV eta 1	+5.9	-14.4	+13.9	-18.0
7 TeV eta 2	+7.9	-9.8	+6.2	-10.8
7 TeV eta 3	+33.9	-16.6	+33.4	-12.0
7 TeV eta 4	+53.8	-25.5	+56.8	-26.2

CT10—> CTEQ6.6	p_T^{l+}	p_T^{l-}	m_T^+	m_T^-
7 TeV eta 1	-4.0	-6.3	-7.7	-3.8
7 TeV eta 2	-12.6	-1.5	-16.8	-1.8
7 TeV eta 3	-17.7	+8.6	-15.5	+9.9
7 TeV eta 4	-11.1	+16.4	-11	+12.6

Large double differences

mW uncertainties (MeV)

2 TeV pT&mT	CTEQ6.6 /1.645	CT10 /1.645	MSTW2008 90%	MSTW2008 68%
Stat	9.4*	9.7*	10.1*	9.2*
PDF	12.9	14.3	20.3	9.4
Total	16.0	17.3	22.7	13.1



2.16

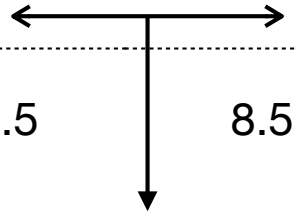
Compatible with the scaling factor from Tevatron 2.15

If scaled by 2.16, CTEQ6.6 number will be 9.82 compatible with MSTW2008 and with the published Tevatron result

** to be updated with proper stat correlation between pT and mT*

mW uncertainties (MeV)

7 TeV pT&mT	CTEQ6.6 /1.645	CT10 /1.645	MSTW2008 90%	MSTW2008 68%
Stat	6.8	7.4	7.1	6.1
PDF	8.4	10.0	11.5	5.8
Total	10.8	12.5	13.5	8.5



1.98

MSTW PDF uncertainties: 1.7 factor smaller than CT10 for 7 TeV

pTl observable

Correlations

Preliminary

MSTW	1.	2.	3.	4.
1. W^+ 2 TeV	1	1	0.04	0.66
2. W^- 2 TeV	1	1	0.08	0.62
3. W^+ 7 TeV	0.04	0.08	1	-0.48
4. W^- 7 TeV	0.66	0.62	-0.48	1

pTl observable

Correlations

Preliminary

CT10	1.	2.	3.	4.
1. W^+ 2 TeV	1	0.99	0.26	0.51
2. W^- 2 TeV	0.99	1	0.31	0.52
3. W^+ 7 TeV	0.26	0.31	1	-0.23
4. W^- 7 TeV	0.51	0.52	-0.23	1

CTEQ6.6	1.	2.	3.	4.
1. W^+ 2 TeV	1	1	0.37	0.45
2. W^- 2 TeV	1	1	0.36	0.46
3. W^+ 7 TeV	0.37	0.36	1	-0.42
4. W^- 7 TeV	0.45	0.46	-0.42	1

Few % stat uncertainties to be evaluated on the correlations

Next steps

- ATLAS parameterisations and tool on git (to be updated with more refined smearing)
- In order to combine we will need also the effects on mW of the other systematics to setup a complete machinery (even though they are mostly decorrelated)
- Update the stat correlation for 2 TeV
- Add the pTZ constraint for the ATLAS results
- Evaluate the correlations and the mW combined value and uncertainty for other PDF sets. Agreed on CT14, MMHT, and NNPDF3.1.