

Top & EW Report

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TeV4LHC
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Working Group Meeting

- For this meeting we asked the speakers to brainstorm of what should be included in the report:
 - EW Theory
 - **Stefan Berge:** Uncertainties in W and Z boson production
 - **U.Baur, S.Berge, G.Montagna, P.Nadolsky, A.Vicini, D.W., C.-P.Yuan:** Discussion of the organization of the tuned comparison, interpretation of the results (estimate of theoretical uncertainties).
 - EW Experiment
 - **Dave Waters:** W and Z production
 - **Andrew Askew:** Di-boson cross sections
 - **Chris Hays:** W mass measurement
 - **Jan Stark:** Discussion of focus for the W mass section
 - **Pavel Murat:** Outline of the EW experimental section

Electroweak Section

Sections 1, 2: Introduction, Theory

1. Introduction (P.Murat,D.W.)

- Brief description of what this entire section is about

2. Theoretical Studies

2. 1 Overview of available calculations for single W/Z production that include EW radiative corrections:

HORACE (C.Carloni Calame,G.Montagna,A.Vicini)

WGRAD/ZGRAD (U.Baur,D.W.)

WINHAC/ZINHAC(?) (+SANC (?)) (S.Jadach, W.Placzek)

S.Dittmaier/M.Kraemer

RESBOS (S.Berge, P.Nadolsky,C.-P.Yuan)

PYTHIA+PHOTOS (P.Golonka)

W/Z distributions at NNLO QCD (K.Melnikov)

[Diboson production (?)]

2.2 Tuned Comparison for single W/Z production of single W and Z integrated cross sections and distributions (Tevatron and LHC). (authors of HORACE,W/ZINHAC,W/ZGRAD,Resbos,PHOTOS)

- We will agree on a default set of input parameters, PDFs, cuts etc., e.g.,

LHC/Tevatron : $p_T(l) > 25$ GeV, $E_{T\text{miss}} > 25$ GeV, $|\eta_{\text{lepton}}| < 1.2$ (and larger eta coverage) , photon-lepton recombination cuts

and compare observables relevant for
W mass and W width measurements, luminosity monitoring,
new physics searches at high Z invariant masses, extraction of quark PDFs.

2.3 Assessment of theoretical uncertainties (authors of HORACE,W/ZINHAC, W/ZGRAD, Resbos,PHOTOS, and Heidi Schellman, Pavel Murat, Michael Schmitt)

- Missing higher order corrections (from tuned comparison, EW Sudakov logs, renormalization scheme dependence,...)
- PDF uncertainties
- q_T resummation (small x effects, ...) (see talks by S.Berge and P.Nadolsky)

2.3 cont.

Study of propagation of theor. uncertainties in cross sections to uncertainties in W mass (for different methods, e.g., $M_T(l\nu)$, cross section ratios), W width, extraction of quark PDFs, luminosity, ... , taking into account “realistic” detector effects (?)

- Provide results of parton level NLO MCs to experimentalists as 4-vectors + weights
- Quantify effects of rad. corrections, differences in predictions of different calculations as shifts, e.g., in W mass, W width, Luminosity,

2.4 Summary table (jointly with experimental section)

Confrontation of present and anticipated experimental uncertainties with theoretical uncertainties => Conclusions for the Tevatron and the LHC

Section 3/4: Experiment

Section 3: W/Z production and Di-boson production

Coordinators: Dave Waters (CDF) and Andrew Askew (D0)

– agreed + Heidi Schellman + Michael Schmitt (not in the room when appointed) + conveners

3.1 Brief summary of the Run II physics

- single W/Z boson production cross sections (inclusive and differential)
- di-boson production WW/WZ/ZZ and Wg/Zg

3.2 Calibration strategies

3.3 High-Pt lepton Identification techniques

3.4 Trigger strategies

3.5 MC generator tuning strategies (jointly with theory)

3.6 PDF's:

- quantification: at which point will we become sensitive at the 3 sigma level

3.7 Luminosity

- what does it take to use W production for lumi normalization?
- trigger monitoring at the level of ~1% ?
- acceptance monitoring

3.8 "New" experimental techniques (see talk by D.Waters)

- R measurements (inclusive Pt-based)
- W-charge asymmetry with W-mass

3.9 Physics issues (common with QCD and Landscape)

- How "clean" are our samples we use to calibrate physics predictions?

Section 4: W-Mass systematics (Coordinators: Chris Hays + Jan Stark, see their talks)

4.1 Event generation and the theoretical inputs (jointly with theory)

- W production model
- Parton distributions

4.2 Momentum scale

4.3 Energy scale - non-linearities

4.4 Hadronic response

4.5 Fast MC describing physics at the level of 10^{-3} can only rely on in-situ calibration

4.6 Accounting for material in the inner detector

Please contact the Top-EW conveners

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or the section coordinators for

feedback/suggestions and/or if you would

like to help writing the report.