Gauge bosons (W/Z) in PDG-RPP

A report to the
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Evolution of statistics

- **Papers read:**

1992	94	96	98	2000	02	04	06	08	10	2012
?	80	86	93	98	83	31	49	44	37	23

- **Nodes (Particle properties):**

	1992	94	96	98	2000	02	04	06	08	10	2012
Z	47	75	107	128	134	134	140	145	148	152	152
W		14	14	15	28	30	30	34	34	34	34

- **Pages in RPP**

	1992	94	96	98	2000	02	04	06	08	10	2012
Z	7	13	15	18	18	20	21	22	21	22	22
W	2	3	3	5	7	7	7	7	7	8	9

Brief recapitulation

- **LEP: To obtain best LEP average measurements, results from the four experiments obtained over several years had to be combined using averaging procedures which accounted for correlated errors.**

- **LEP Working groups devised proper averaging procedures to account for correlations**
  - between experiments (same beams/M.C. models/theory input to extract measurements)
  - between different data runs/ years
  - due to use of > 1 measurements within a fit to extract the best value of a quantity

- **LEP Electroweak Working Group; LEP W-group**

- **THIS LEP WG → PDG INTERFACE PLAYED A CRITICAL ROLE OVER THE YEARS.**

Working groups Tevatron, LHC

- **TEVATRON EWWG played a similar role for RUN-II data on W and Z**
- **Expectedly, an LHC ElectroWeak Working Group exists and we are on the mailing list**
- **As we will see later, for the Triple Gauge Couplings LEP, Tevatron and LHC experiments have different ways of presenting results and it needs to be dealt with**

Mini-reviews

- **PDG: Providing world averages a crucial task (most quoted reference).**
- **Purpose of MINI-REVIEW: Explain complicated averaging procedures, clarify terminology, present preliminary results:**

  - Long mini-reviews: Notes on Z-boson, W-mass.

  - Shorter ones on: W-TGC's (γWW, ZWW),

  ZZγ, Z$\gamma\gamma$, ZZV Couplings

  Anomalous W/Z Quartic couplings.

- **All are revised for every hardcopy/WEB edition, and a new one written if necessary.**

Expectations for W/Z for RPP 2010 (as seen in Oct 2008)

- **Remnant LEP averaging will be available.**
  (As we will see, some still remain!! 2013?)

- **New results from Tevatron Run II:**
  on many measurements on W, Z, including mass, width, BR's, couplings. More accurate W mass would make Higgs mass prediction more precise to confront with LHC (or even Tevatron).

  Didn't come for 2010 but we have the most precise W-mass values from Tevatron now for the 2012 edition!!

Expectations for 2012 and actual situation

- Expectation: further improvements on W parameters from Tevatron: W-mass, width, TGC's etc.

  →**Well Tevatron certainly did it!! W mass, TGC's.**

- Expectation: contributions from the LHC on properties, couplings related to W and Z. (Rediscovery of SM physics, possible surprises? In TGC's?)

  →**YES! We have the first results from LHC on the TGC's**

  But due to late start of LHC (2011) not as much as anticipated. SM still reigns supreme…

Expectations for 2013-14

- **LEP:** The final LEP-2 combos should be available for the 2013 (2014?) update
- **Tevatron:** some improvements in W-mass & TGC's ??
- **LHC: many new results expected from full 2011-12 data**

Watch out for

- Even more precision determination of W-mass

  → while a Higgs may have been found, internal consistency checks of SM would benefit greatly

- More precise determination of TGC's

  → could indicate BSM physics

Issues to sort out for 2014 RPP

- **There will be no LEP quartic (QGC) combination based on last (2004) results, so we may make one of our own… if it's too problematic will have to consider what to do…**

- **The issue of TGC conventions:**
  TeV: with form factors
  LEP: without form factors, using gauge constraints,
  LHC: without form factors, using HISZ constraints

- **Need to understand the LEP/LHC conventions a bit better as the situation has got somewhat confused**

- **To work closely with the LHC EWWG**

Contd… TGC issues

- Question of how to address the publications in the book: make/keep separate averages for TeV vs LEP vs LHC?
- Quote only the (best) results w/o a combination? Combine LEP & LHC (both no form-factors, but perhaps different constraints)?
- List LEP for now and LHC in the long run (precision wise)?
- **need to make a choice and cut down on the proliferation of such variants and the corresponding tables, as they confuse the issue and the reader**

Workshop at CERN

- **Working Group on Electroweak precision measurements at the LHC, and PDF4LHC, 8 – 10 Oct**

  4-3-006 - TH Theory Conference Room
- chaired by Michelangelo Mangano (CERN)
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- **Wednesday, October 10, 2012**
- **09:00 - 13:00 Gauge boson pair production and TGCs**

- **Exactly what the doctor ordered!!**
- **Fortunately I am at CERN and will attend**

Thank you