

Gauge bosons (W/Z)

A report to the
PDG Advisory Committee,
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(* Deceased)
(Encoders/Overseers)

Introduction

- **CC+AG: W/Z responsibility since 1992
(Except 1994-96 when only the Z was covered)**
- **Will mention here the evolution of statistics, current status, methodology, any special points and expectations from now (October 2008) to March 2010 – time for next hardcopy edition.**

Carlo Caso

- **CC+AG: W/Z responsibility since 1992**

Carlo passed away mid-2007 after battling cancer for a number of years.

- **I personally knew him since 1984 on the LEBC (charm) experiment at CERN.**
- **He was an excellent physicist and very meticulous, as needed in PDG!**
- **Very mature, fully understanding the collaborative spirit and yet able to make a point without offending anyone.**
- **He was also a wonderful human being, very warm, humorous, full of life.**
- **We remember him and pay tribute to him.**

Introducing Martin Grünewald

- **Ph.D. on L3, LEP**
- **CERN Post-Doc Fellow**
- **Prof at Dublin**
- **University of Ghent**

- **Excellent training and expertise in electroweak physics**
- **Convener of LEPEWWG, member of TEVEWWG**
- **Very suited to the W/Z sections of PDG**

Coding and data entry – a reminder

- **After Literature Search => CC (MG) & AG read papers independently and make notes.**
- **Comparison => exchange and compare notes; decide action on each paper via e-mail/meeting (at CERN/Mumbai)**
- **Code the data as pdf file; exchange file; check it**
- **pdf file to LBNL (Piotr) for entry; sends updated listing for checking and correction if needed.**
- **Sent to verifiers. Evaluate and include their comments/ suggestions as necessary.**
- **Enter non-PDG fit results. Update/ write new mini-reviews.**
FINALIZE AND LAST CHECK (mostly) AT LBNL.

Evolution of statistics

- **Papers read:**

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

- **Nodes (Particle properties):**

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

- **Pages in RPP**

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

Brief recapitulation

- **1992-2002: period of intense activity in W/Z, with LEP (ADLO), SLC (SLD), TEVATRON Run-I (CDF,D0) producing a torrent of data and publications.**
 - **The number of NODES and PAGES in RPP increased by a factor of 3.**
 - **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.**
- role of LEP working groups (see next slide).**

Working groups

- **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**
Klaus Monig => CC for Z -> b bbar/c cbar
AG for Z-lineshape, W-mass, branching ratios
THIS LEP WG → PDG INTERFACE PLAYED A CRITICAL ROLE OVER THE YEARS.
- **Now TEVATRON EWWG has taken shape and plays a similar role for RUN-II data on W and Z – Martin Grunewald.**

Mini-reviews

- **PDG: Providing world averages a crucial task (most quoted reference).**
- **Consequence of complicated averaging procedures: Long mini-reviews as explanations**
→ **Notes on Z-boson, W-mass.**
- **Mini-reviews also useful to**
Clarify terminology, give latest preliminary results on important quantities.

Mini-reviews - 2

- **Other mini-reviews:**
on W-TGC's (gamma WW, ZWW),
ZZ γ , 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.
 - For RPP06, a critical evaluation was carried out of the Z mini. Sent to expert referees, who made a number of suggestions for improvement and for correction (e.g. in references).
For RPP08 MG suggested some changes and these are incorporated.
- This turned out to be a very worthwhile exercise and we believe the Z mini definitely reads better !

Status in RPP 2006/08

- **Z: line-shape and lepton forward-backward asymmetry related data finalized in RPP 2002.**
- **LEP1: remaining Z related papers, [Z \rightarrow heavy flavor (b, c)]
 \rightarrow For RPP 06, these are now all finalized and published.**

LEP2: Final papers on W related measurements

\rightarrow For RPP 06, most are published, but some still remain,

e.g., Delphi: W mass & width; W-TGC's; Opal: W BR's

\rightarrow For RPP08: Delphi and Opal results published, but FINAL LEP averaging still to be done. WE HOPE: SOON

- **Tevatron Run II: RPP08 has CDF measurements on W mass & width (the most precise by any one experiment). TGCs also measured.**

Carlo Caso & Atul Gurtu:

Report on W/Z to PDG Advisory Committee, LBNL, 24 September 2006

Expectations for W/Z for RPP 2010

- **Remnant LEP averaging will be available.**
- **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). With delay in LHC startup Tevatron could have a slightly prolonged role to play (modulo funding).**
- **We hope LHC will become operational in 2009 and some results on W/Z make it for RPP 10.**

Thank you.

Carlo Caso & Atul Gurtu:
Report on W/Z to PDG Advisory Committee, LBNL, 24 September 2006