Future Circular Collider Study Kickoff Meeting
Geneva, 14th February

WG1 – WG2

Launching the main activities

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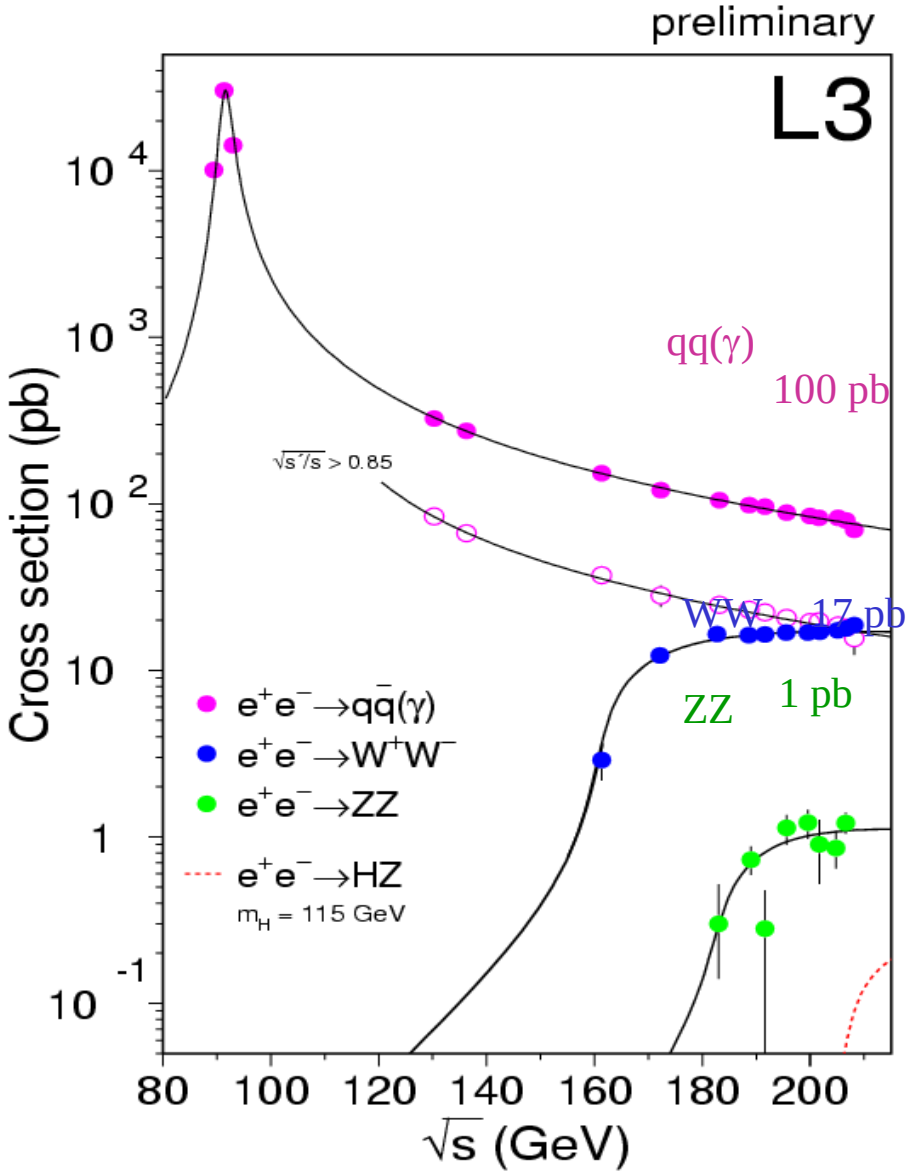
WG1 – main physics objectives

- Understand the experimental precision with which TLEP could measure all electroweak observables by accumulating 10^{12} Z bosons *without longitudinal beam polarization*.
- Set constraints on the size of the sample needed *with longitudinal beam polarization*, as a function of the polarization level, to make it relevant in the physics programme of TLEP.
- (A priori the observables are not limited to the ones of LEP, SLC)

WG2 – main physics objectives

- Understand TLEP potential to measure all observables related to multi-gauge-boson production (di-boson WW, ZZ, Zγ or γγ production, but also tri-boson production like WWγ, WWZ, γγγ, WWH, etc.) above the Z pole.
- Define a strategy for optimal W mass measurement (scan of the WW threshold, direct measurement), and for other W properties, such as width and branching fractions.
- Investigate the use of Z radiative returns for the measurement of the Z invisible width and the beam energy

The starting point: our legacy



Data collected by LEP, per experiment:

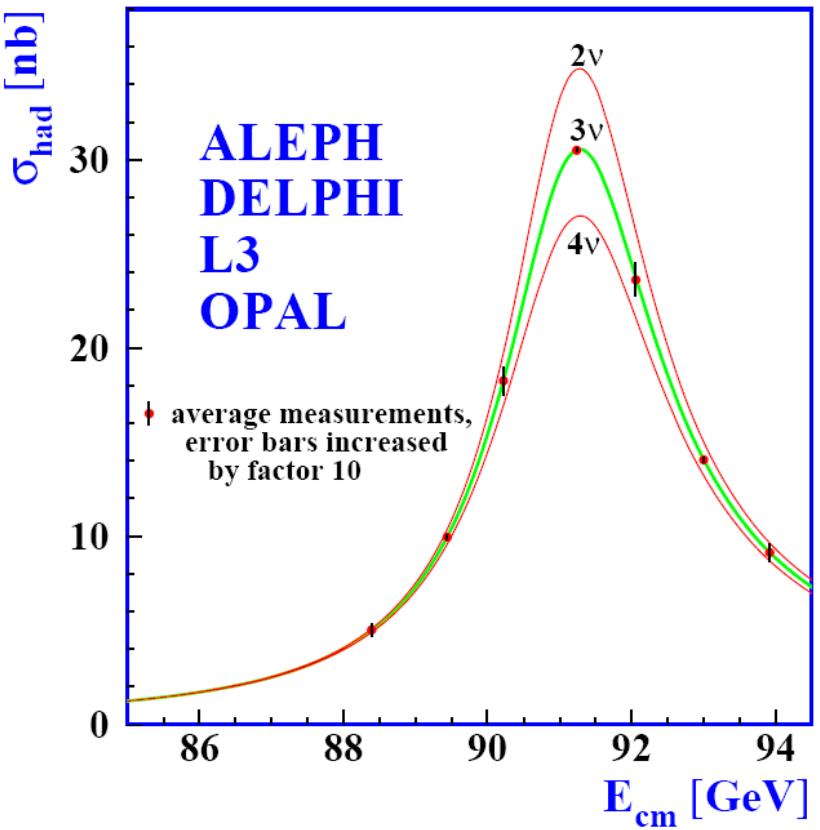
- about 150 pb-1, ($4 \cdot 10^6$ hadronic Z) at the Z peak
- about 700 pb-1 above the WW threshold (10^4 WW pairs)

Data collected by SLC:

- About 150000 Z at 77% polarization

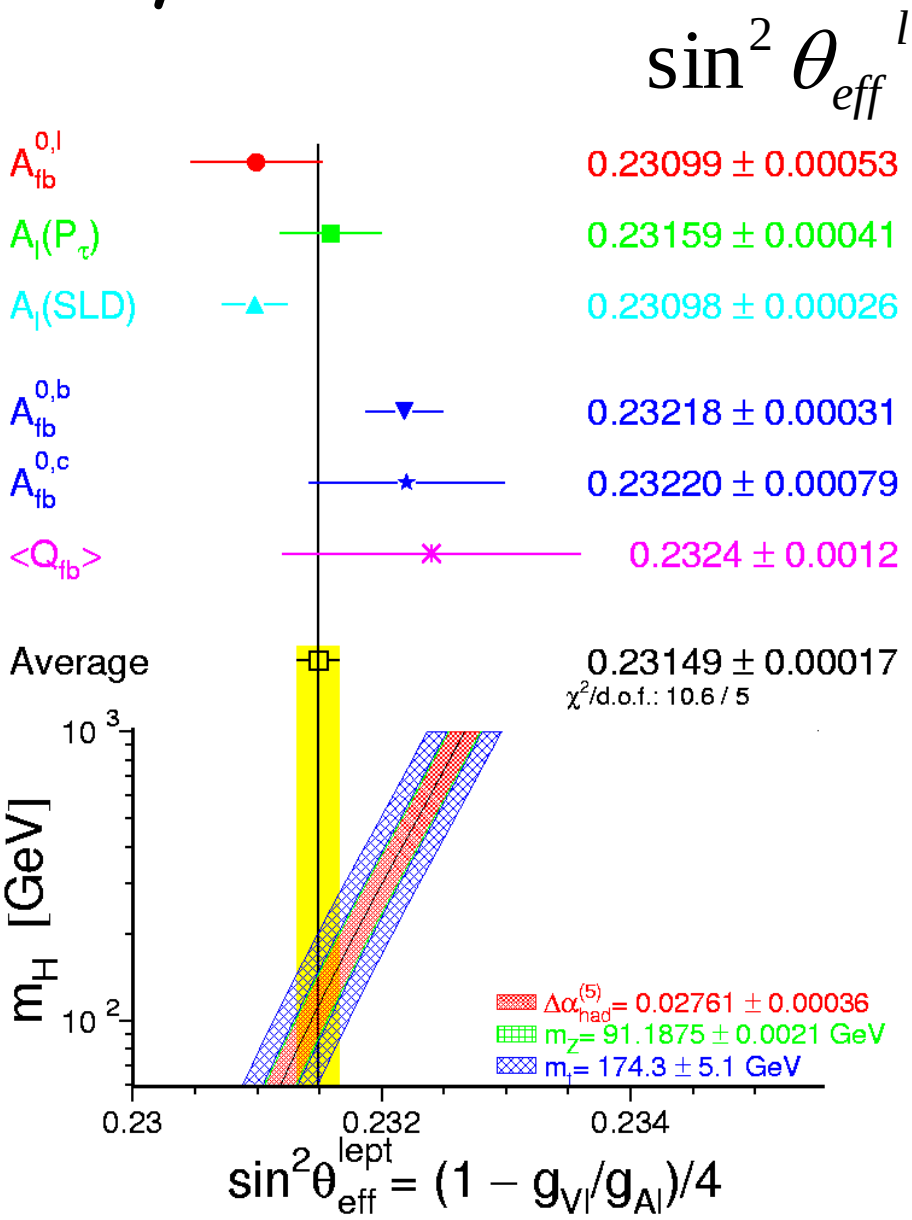
WG1: a subgroup on lineshape

- Understand the precision on centre-of-mass energy for the mass (LEP ~$2 \cdot 10^{-5}$) and the energy spread for the width
- Understand precision on luminosity determination (LEP ~ 610^{-4})
- Check other aspects, e.g. is the theoretical description of the lineshape still adequate ?



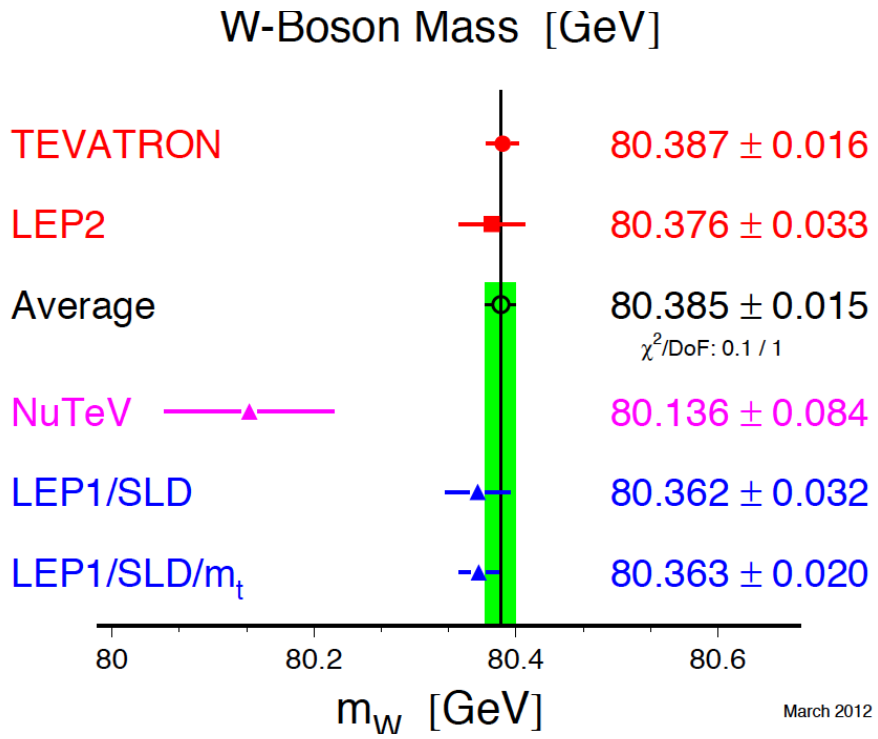
WG1: a subgroup on Asymmetries

- Long standing difference between Alr and $A_{FB}(b)$, **it must be sorted out**
- Understand the potential for a measurement of Alr with polarized beams
- Understand the potential for a direct measurement of the b couplings (again need polarization) (include Rb here)



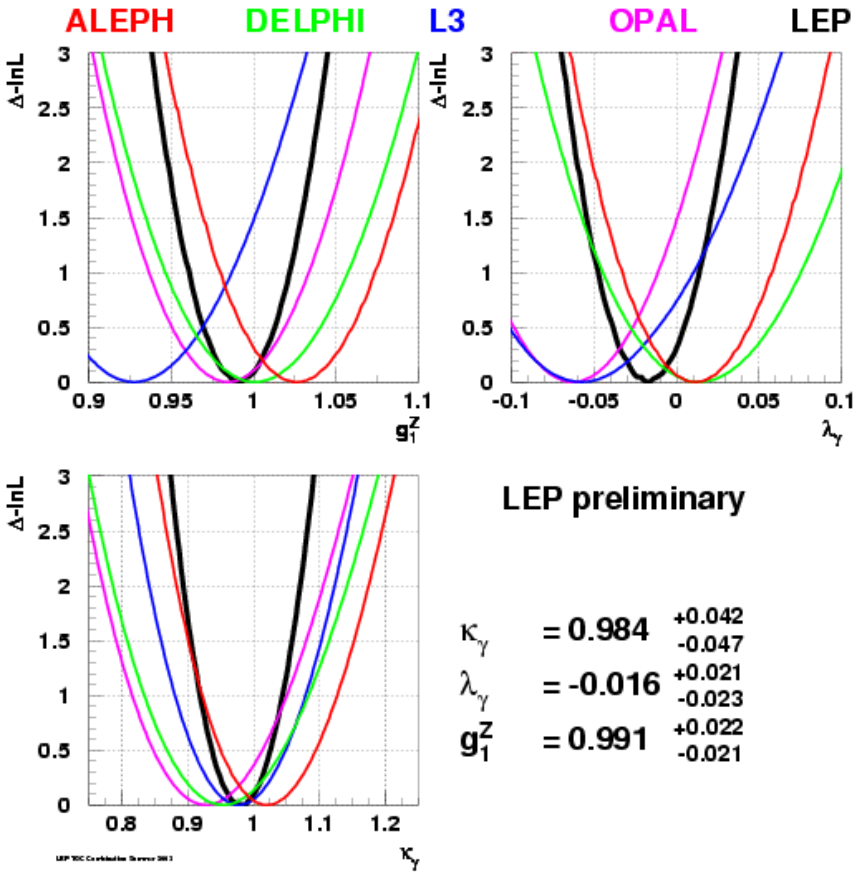
WG2: subgroup on precision measurement of the W mass

- Understand how to perform a precise measurement from the WW threshold scan
- Revisit the LEP2 method of direct reconstruction (there is room for improvement, e.g. beam energy, large statistics on semileptonic events, etc.)



WG2: subgroup on triple and quartic boson couplings

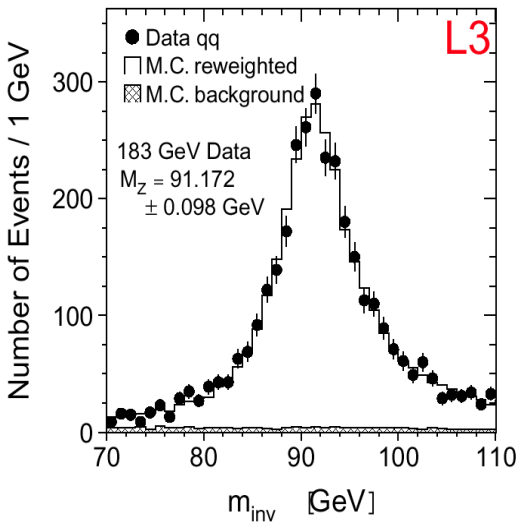
- Understand TLEP potential, taking into account that LHC has already reached LEP precision for the charged triple gauge couplings (neutral and quartic couplings are even better).



WG2: subgroup on Z radiative returns

- Study the use of radiative returns for the determination of the beam energy (extend the study to other dibosons)
- Understand the precision which can be reached for the Z invisible width

Radiative return



Proposal for initial subgroups (can split them in the future)

- WG1 (a) : Z lineshape
- WG1 (b) : asymmetries at the Z
- WG2 (a) : W mass and W properties
- WG2 (b) : Triple and quartic couplings
- WG2 (c): Z radiative returns

Some objectives of subgroup work

- Understand achievable precisions and limitations (e.g. measurement of non- electroweak observables, measurement of the beam energy, measurement of the longitudinal polarization, theoretical uncertainties, etc.), and contribute to proposing ways to alleviate them.
- Set constraints on the performance and the relevance of the various sub-detectors, as well as on the experimental environment, to make the experimental precision match or approach the expected statistical accuracy.
- Define the software needs to make possible these measurements and their interpretation with the required precision (online, generator, simulation, reconstruction, analysis, global fits, ...).