

LCWS Hamburg, September 2000

Mass and Width Determination:

LHC vs LC

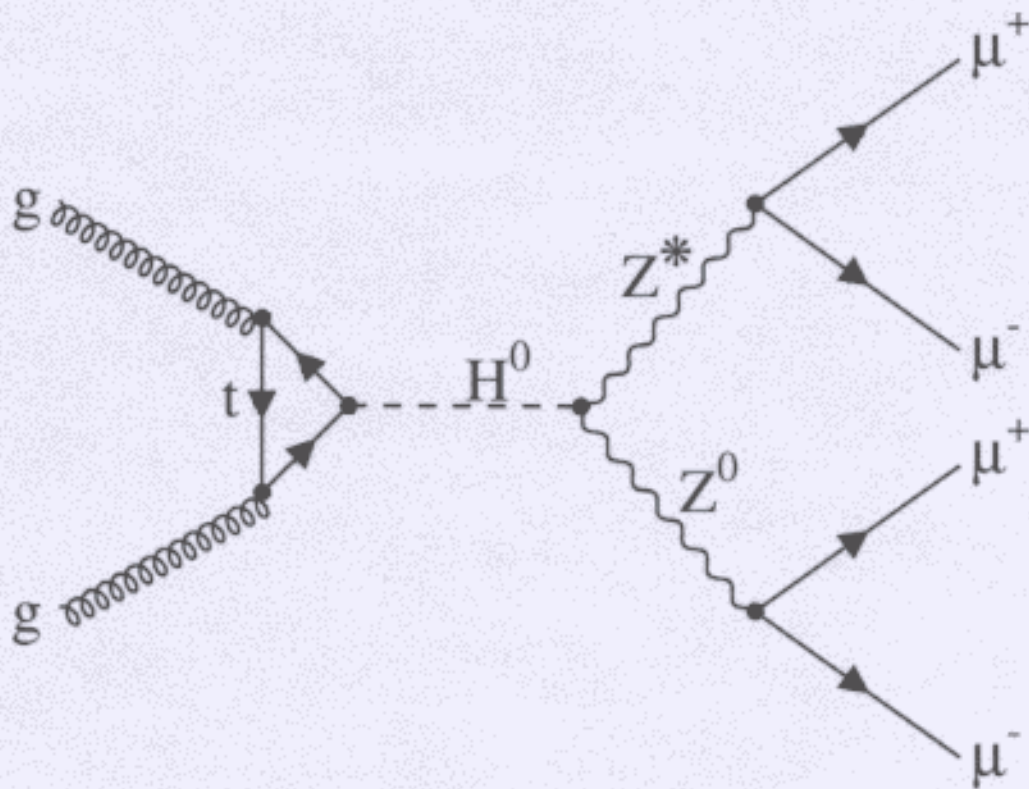
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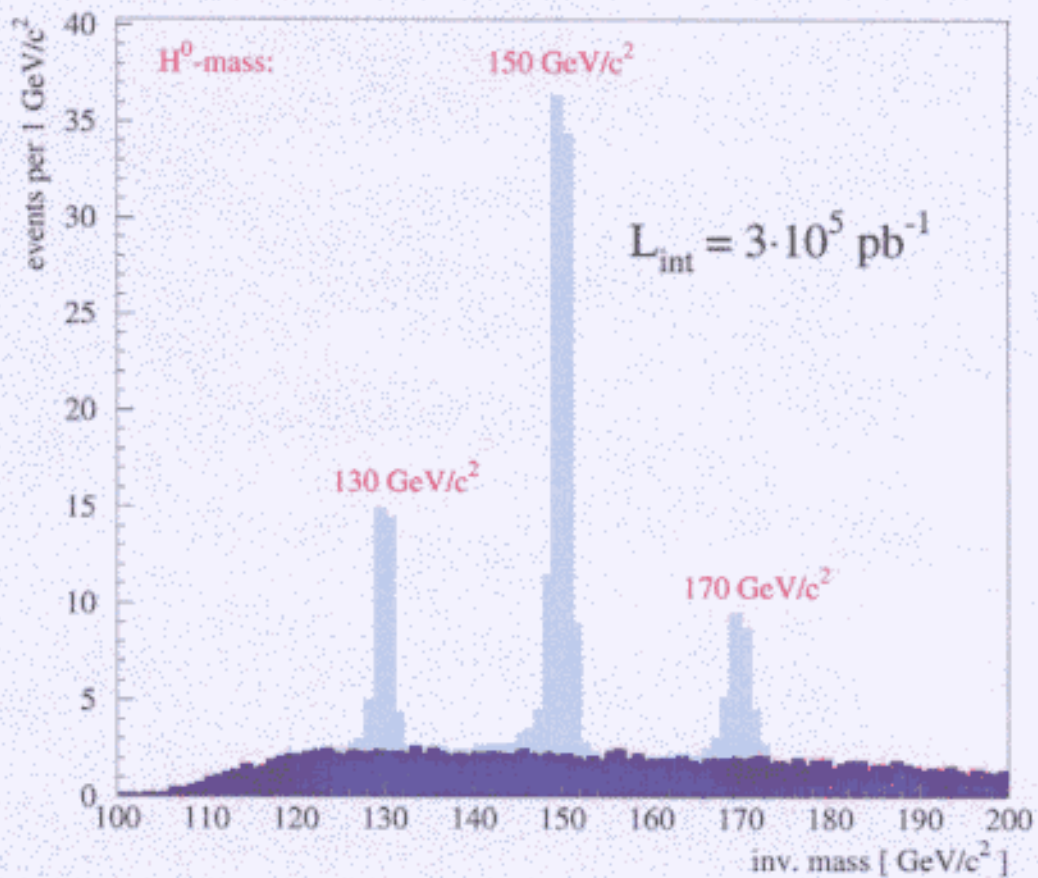
New Results

- After Padova...
- 100 repetition of LHC signal simulation to reduce statistical error.
- Background included in fit.
- Separation of detector resolution and natural width.
- Update of indirect width measurements (LHC/LC).

LHC Higgs Mass Reconstruction

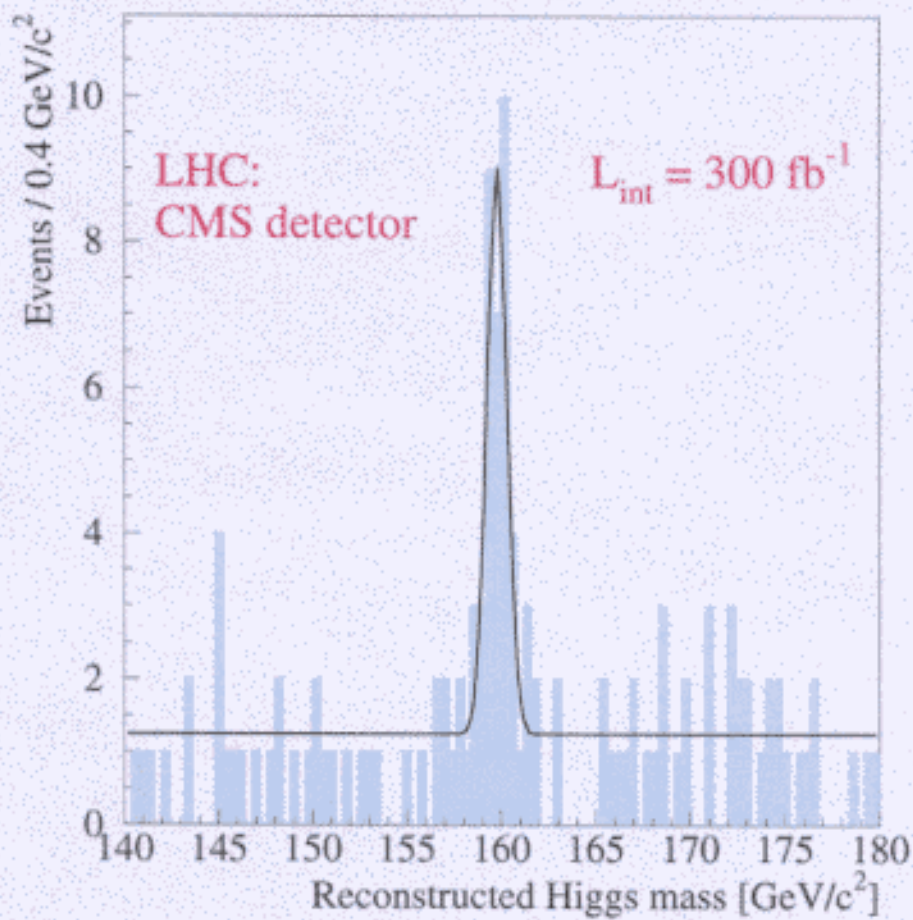


LHC Higgs Reconstruction



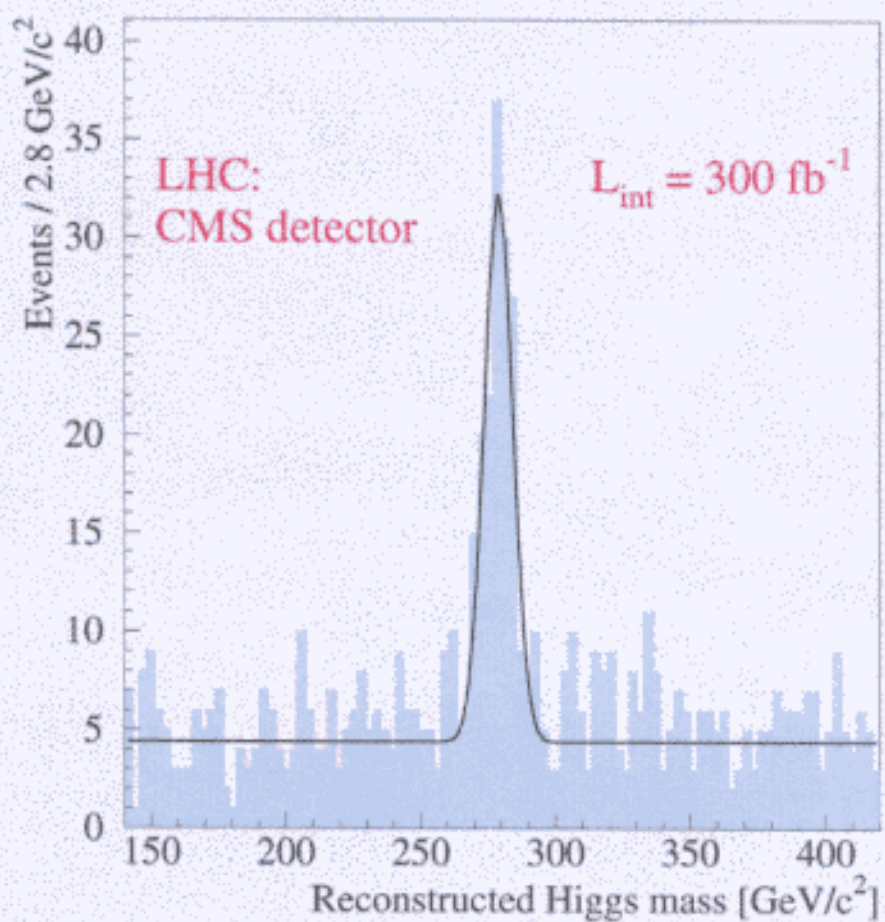
- clear signal above background
- expect ≈ 2 bg. events per 1 GeV
- background: ZZ , Zb \bar{b} , t \bar{t}

Higgs Mass Reconstruction



$$m_{\text{H}}^{\text{rec}} = 159.8 \pm 0.1 \text{ GeV}/c^2$$

LHC Higgs Reconstruction



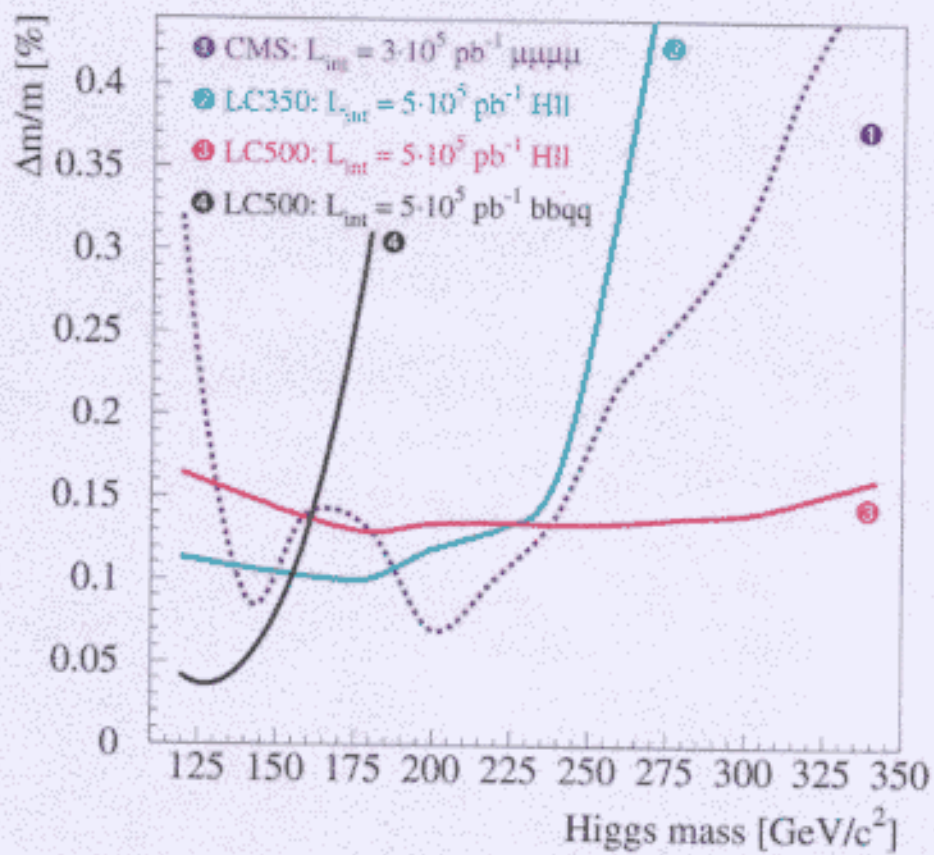
$$m_{\text{H}}^{\text{rec}} = 278.9 \pm 0.6 \text{ GeV}/c^2$$

Higgs Mass Reconstruction

mean of 100 signal simulations
randomization of background according to expected rate.

Mass	Rec. Mass	Error
120	120.0	0.38
140	139.9	0.13
160	160.0	0.23
180	179.9	0.24
200	199.9	0.13
220	219.8	0.21
240	239.8	0.34
260	259.8	0.57
280	279.8	0.74
300	299.7	0.95
320	320.0	1.3
340	340.2	1.6

Higgs Mass Determination LHC vs LC



Higgs Width Determination LHC

Mass	Det. Res.	Rec. Width	Error	Th. Width
120	0.35	0.34	0.49	0.004
140	0.63	0.74	0.15	0.008
160	0.63	0.96	0.30	0.077
180	0.76	1.5	0.69	0.63
200	0.96	1.5	0.15	1.4
220	1.1	2.2	0.26	2.3
240	1.4	2.1	0.21	3.4
260	1.6	3.3	0.28	4.8
280	1.8	4.1	0.51	6.5
300	2.0	6.4	1.0	8.5
320	2.3	8.8	1.2	10.9
340	2.4	10.9	1.1	13.8

Cross check:
BW fit folded with detector resolution.

Lower Higgs Bosons Masses

Comparison with

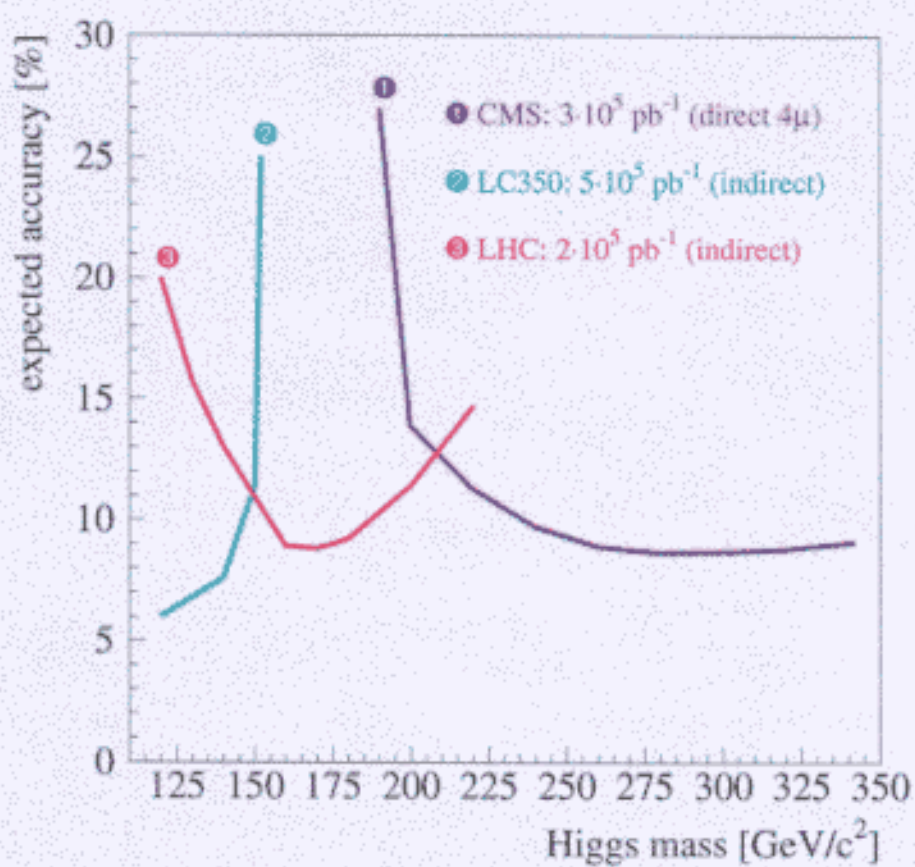
indirect methods via fusion production

$W^+W^- \rightarrow H$

Decay modes:

- LHC: $H \rightarrow W^+W^-$, D. Zeppenfeld et.al.
- Special thanks to Dieter for high-mass point.
- LC: $H \rightarrow b\bar{b}$, K. Desch et.al.

Higgs Width Determination: LHC vs LC



Conclusions

- LHC Higgs mass and width reconstruction in the range 120 to 340 GeV.
- More precise LHC mass values.
- Uncertainty to averaging (mean vs. median) under study.
- Mass resolution around 0.1%.
- Unfolding of natural width in the 4μ LHC study.
- Complementarity between indirect methods (LHC and LC) and direct method (LHC).
- Coverage of the whole mass range about 10% relative error to the expected SM width.
- Final update for width determination before Chicago meeting.
- LC-PHSM-2000-037
- Recall: bbA , $\gamma\beta$ LC-PHSM-2000-036