L3 Report

J.J. Blaising

LAPP Annecy

L3 collaboration

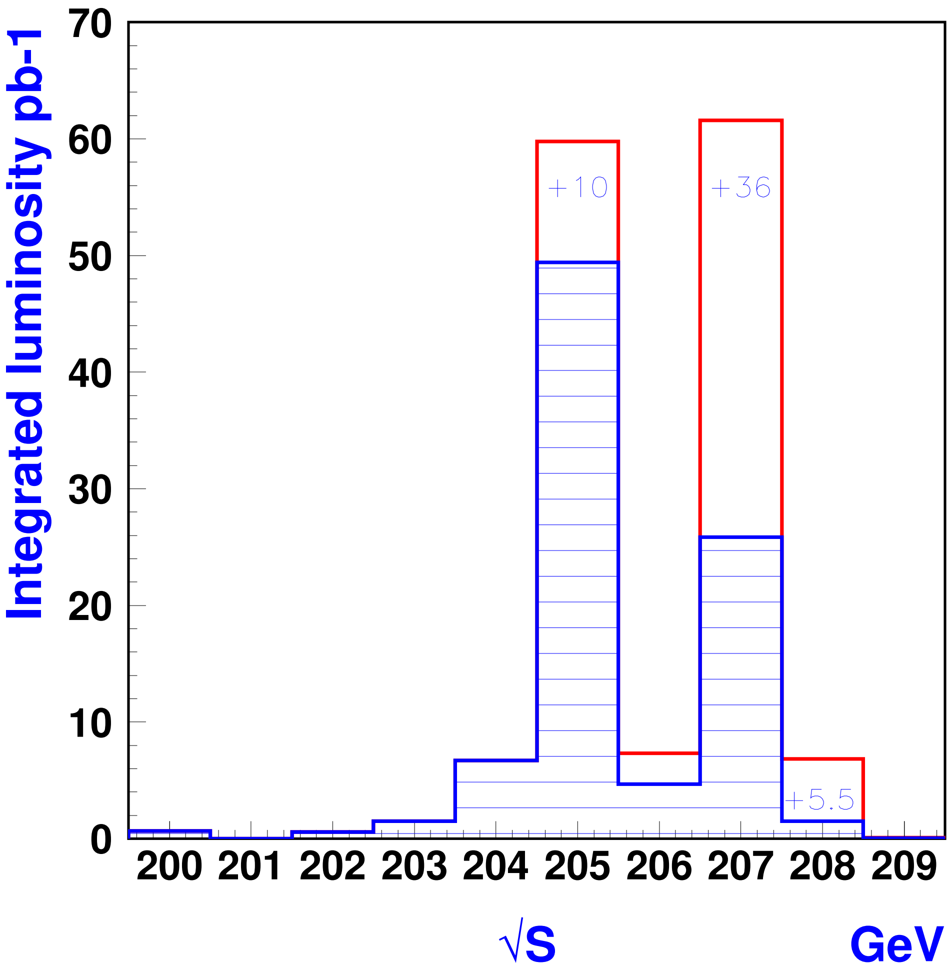
- WW and ZZ
- Higgs searches
- SUSY searches

LEPC 5 September 2000

All results are very preliminary

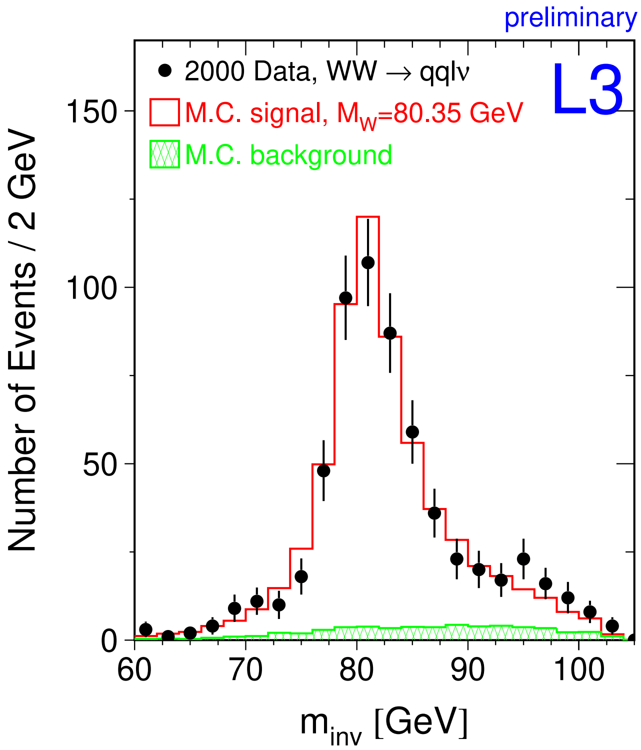
Year 2000 Integrated Luminosity

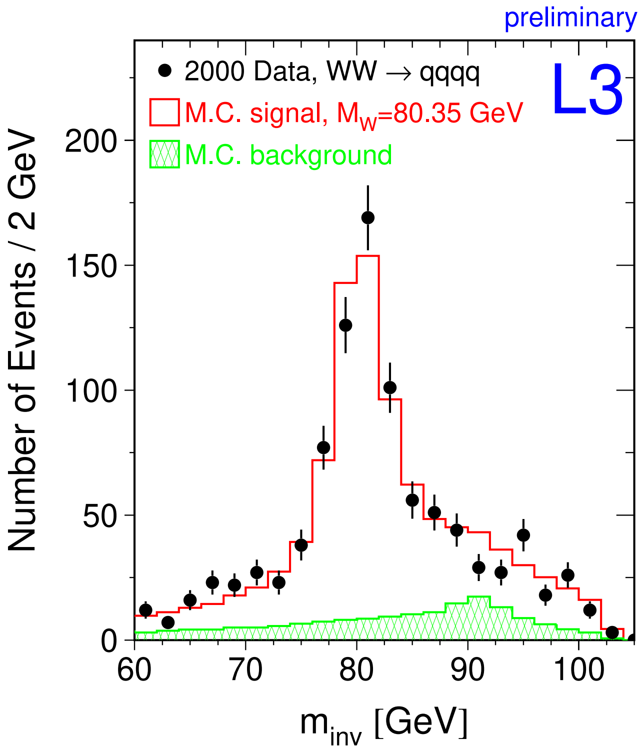
Today's L3 results are based on $\sim$ 145 pb^{-1} of data.
$\sim$ 54 pb^{-1} more since the LEPC.

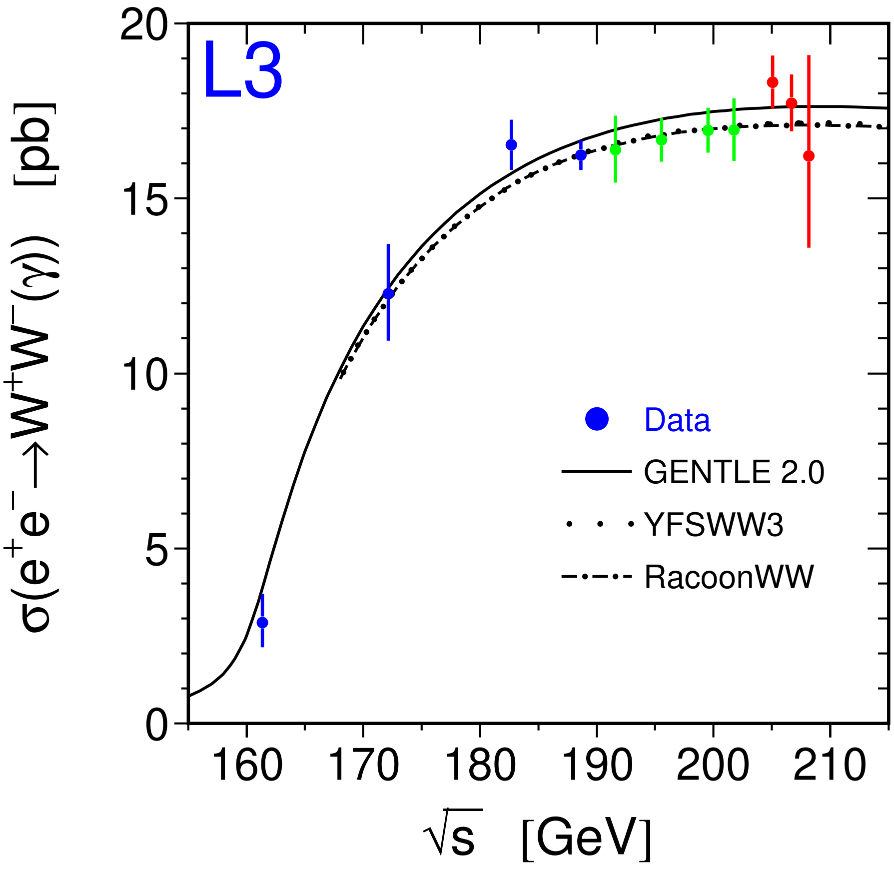


Boson pair production: $e^+e^- \rightarrow W^+W^-$

WW$\rightarrow \ell\nu\ell\nu$, $q\bar{q}\ell\nu$, $q\bar{q}q\bar{q}$

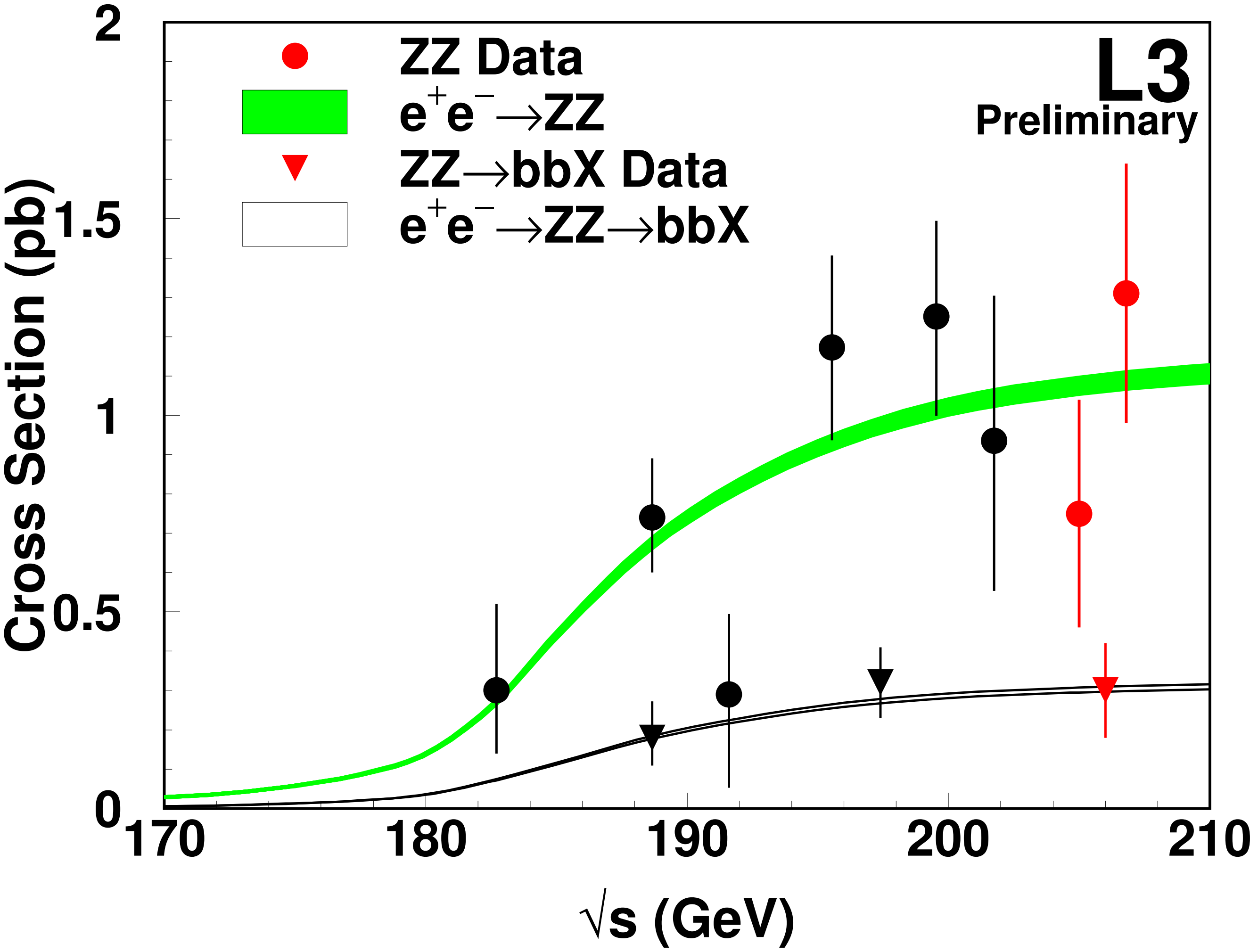






Boson pair production: $e^+e^- \rightarrow Z\,Z$

$ZZ \longrightarrow \; q\bar{q}\ell^+\ell^-, q\bar{q}\nu\bar{\nu}, \ell^+\ell^-\nu\bar{\nu}, \ell^+\ell^-\ell'^+\ell'^-, q\bar{q}q'\bar{q}'$

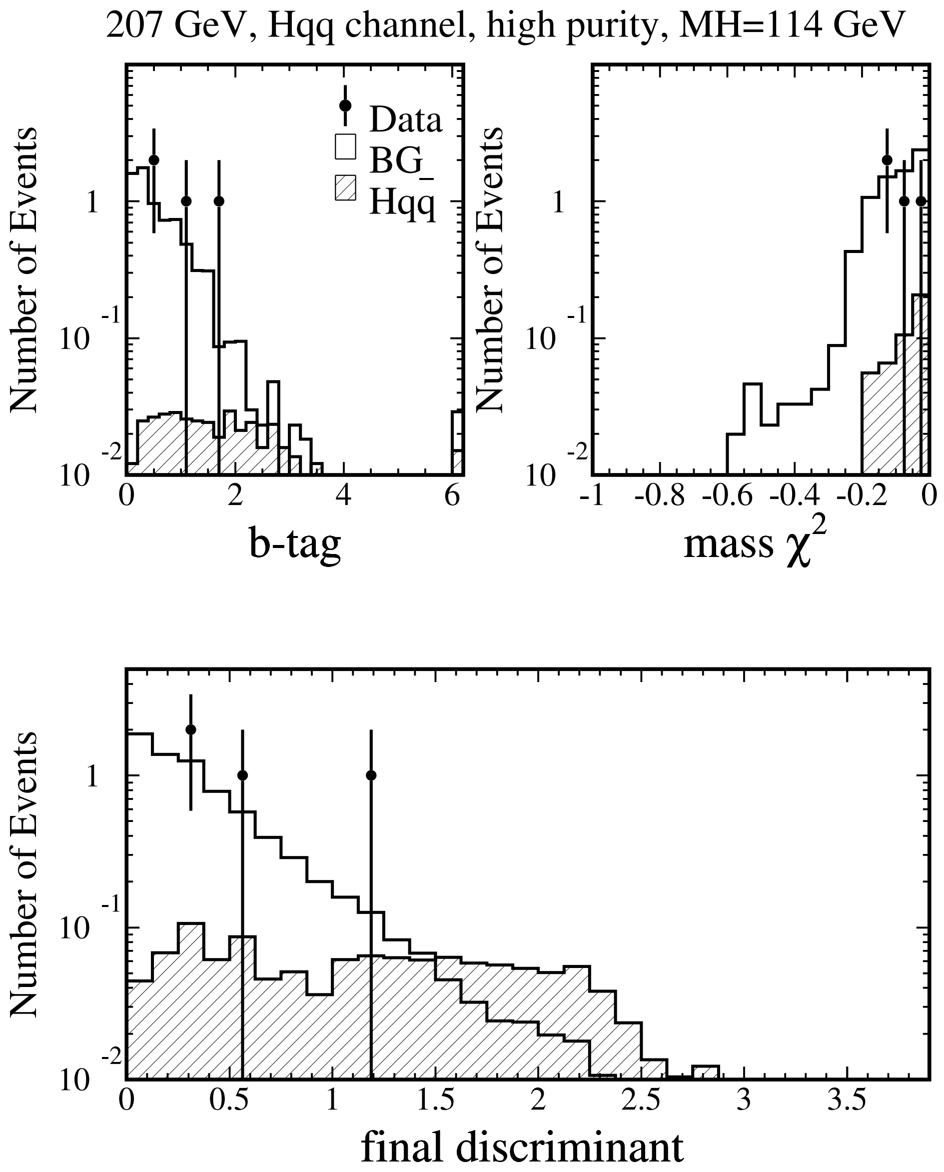


$\sqrt{s}$	Measured $\sigma(ZZ \rightarrow b\bar{b}X)$	SM $\sigma(ZZ \rightarrow b\bar{b}X)$	SM Higgs $M_H = 110$ GeV
206 GeV	0.30 ± 0.12pb	0.30pb	0.16pb

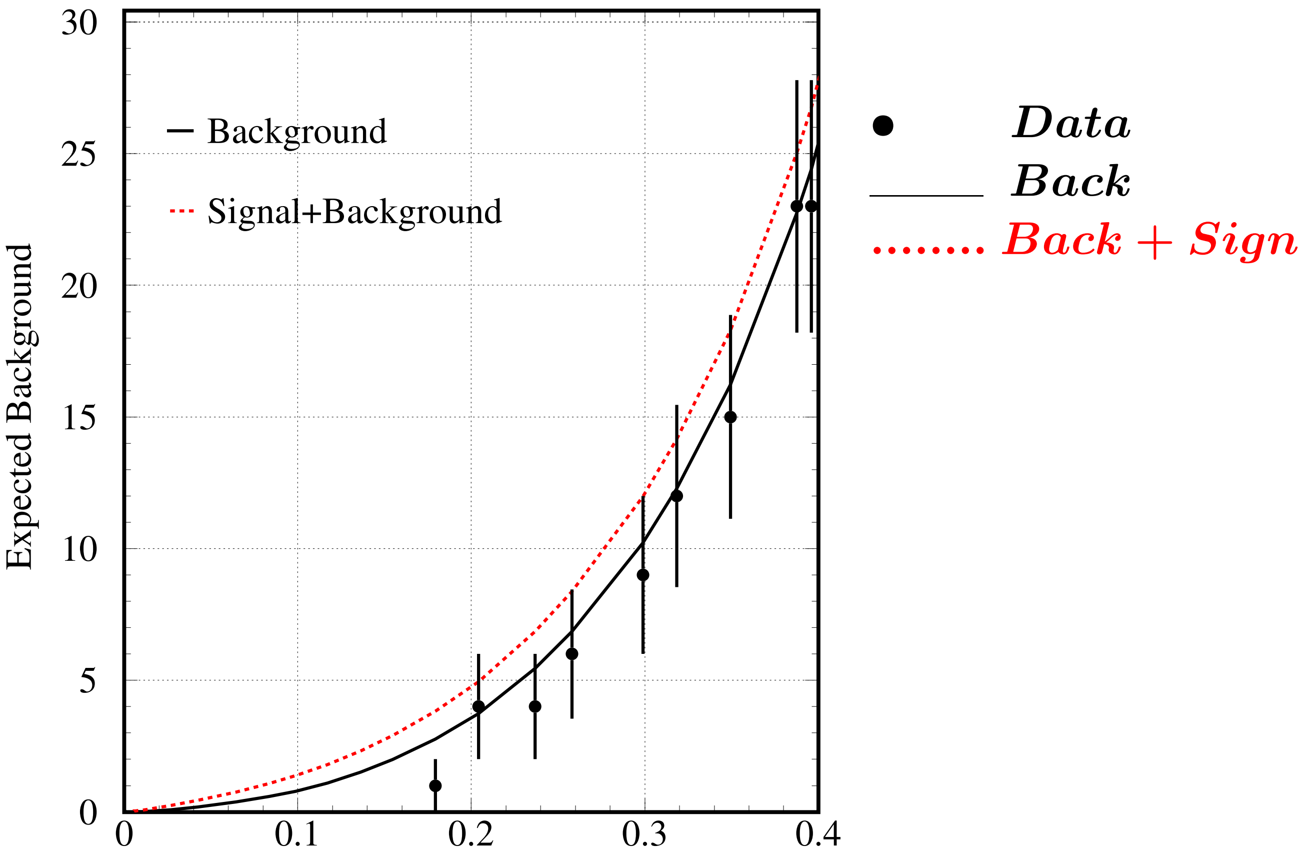
SM Higgs

hZ $\longrightarrow \mathrm{b\bar{b}q\bar{q}}, \mathrm{b\bar{b}}\nu\bar{\nu}, \mathrm{b\bar{b}}\ell^+\ell^-, \tau^+\tau^-\mathrm{q\bar{q}}$

- **selection cuts are optimised using MC signal and bkgd events in order to maximise s/b**
- **build a final (M_H dependent) discriminant combining:**
  neural network, B-tag and Mass variables.



SM Higgs

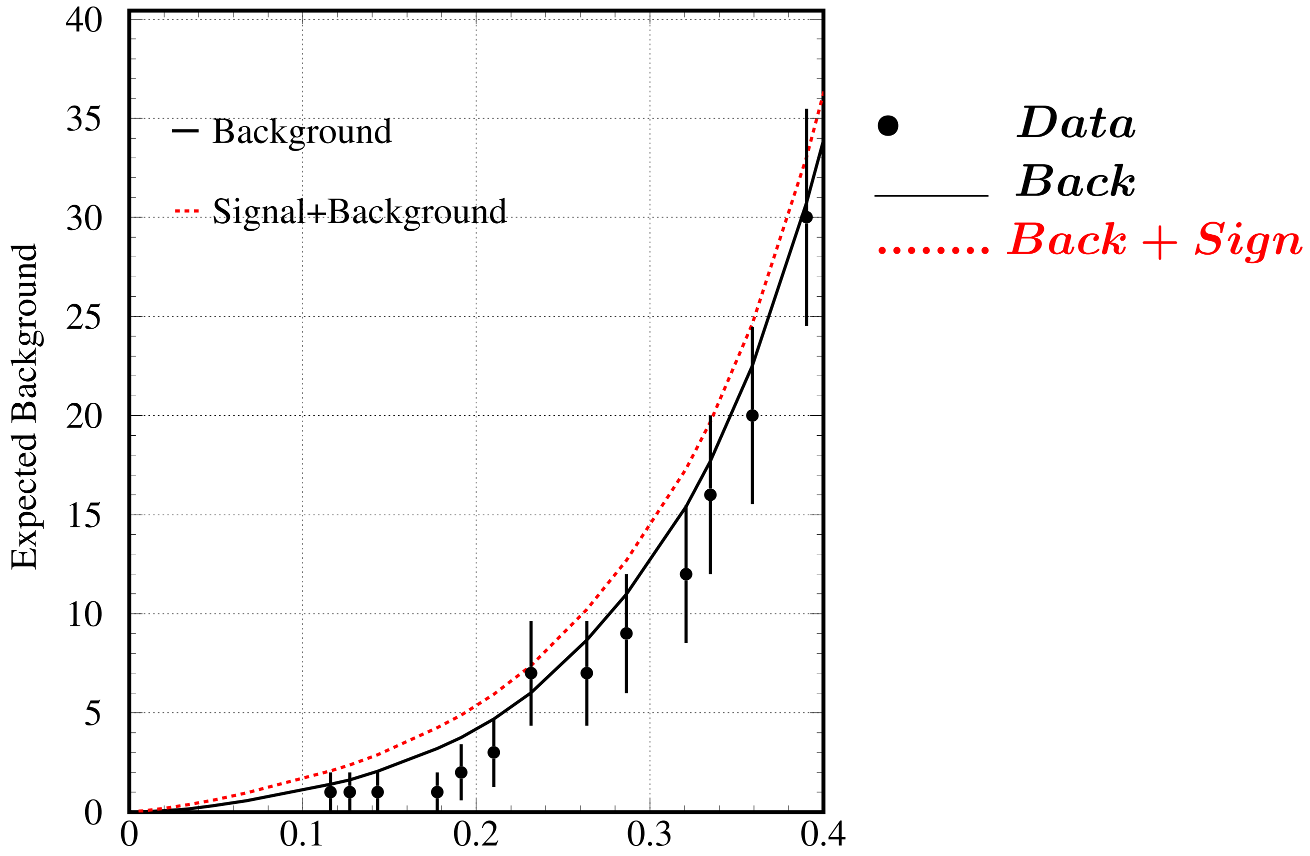


Cumulative efficiency (Hqq, $M_H = 114$ GeV)

⇓ efficiency ⇑ Sign/Back (purity)

Efficiency (%)	Data	Back	Sign
50	66	54.9	2.9
35	15	16.2	2.1
15	0	2.0	0.9

SM Higgs



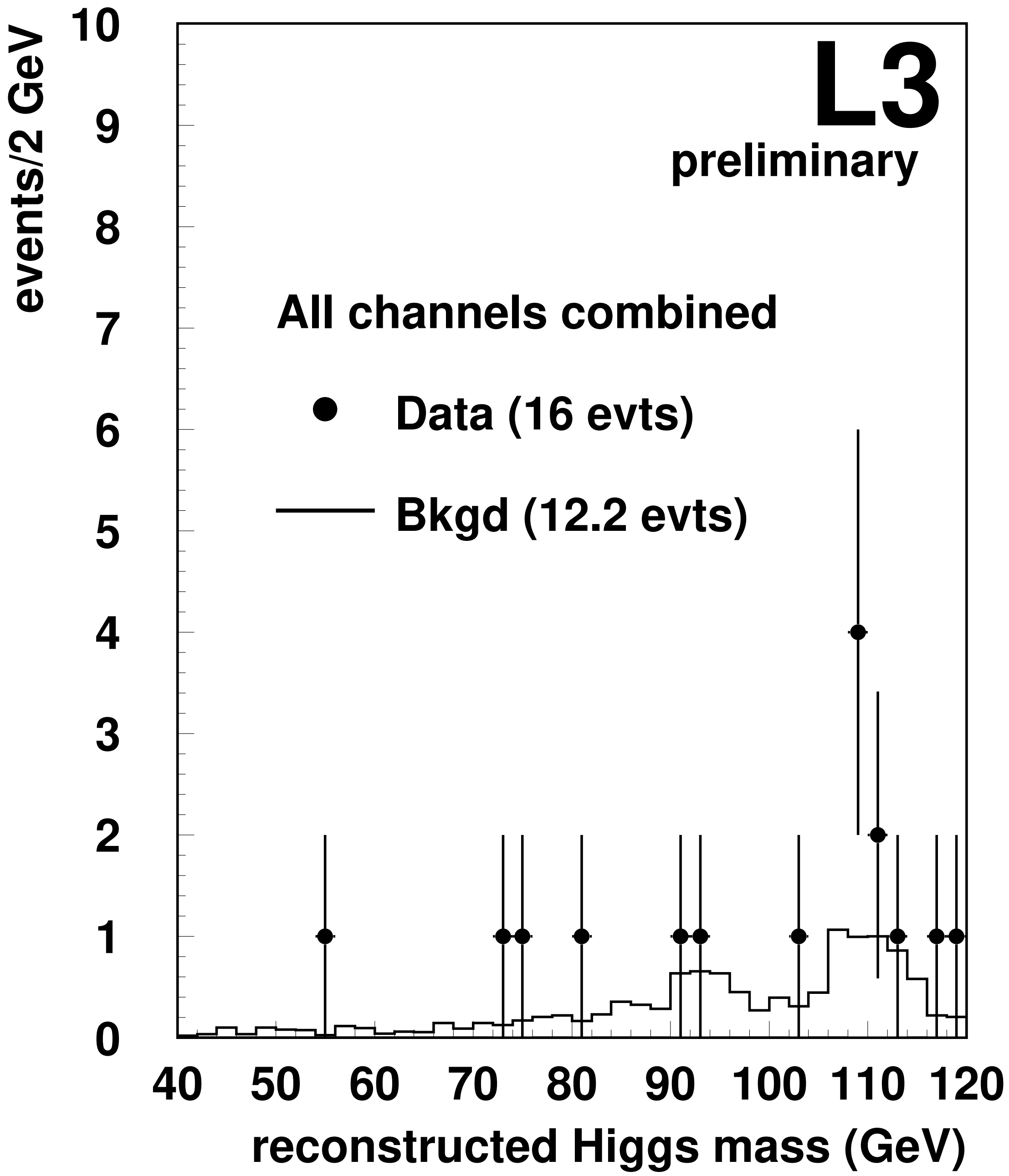
Cumulative efficiency (M$_H$ $= 114$ GeV)

⇓ efficiency ⇑ Sign/Back (purity)

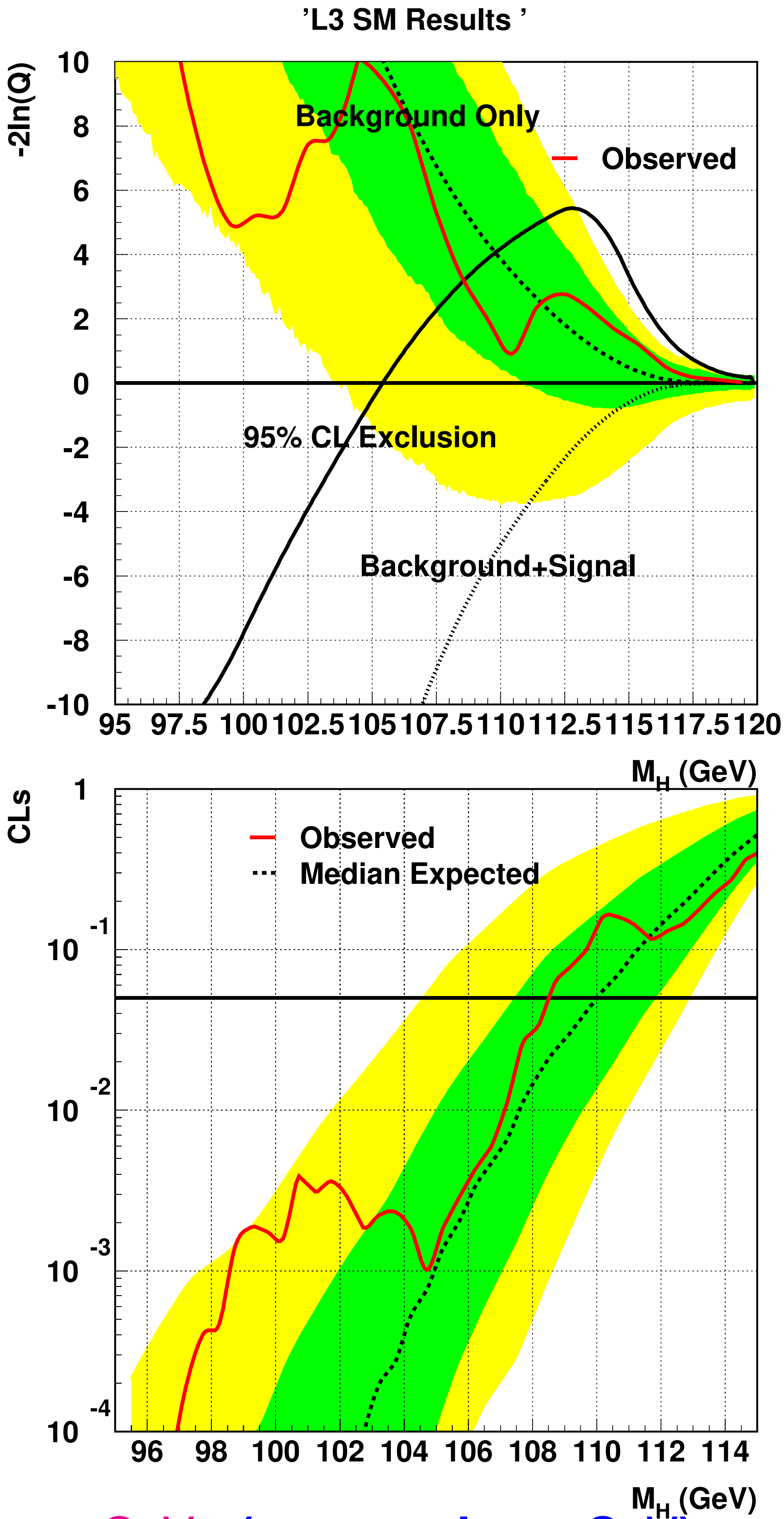
Efficiency (%)	Data	Back	Sign
50	84	75.3	4.4
35	20	22.5	4.0
15	1	2.0	1.3

SM Higgs

For illustration purpose
Mass hypothesis independent selection
B-tag cut such as S/B $\sim$ 0.3

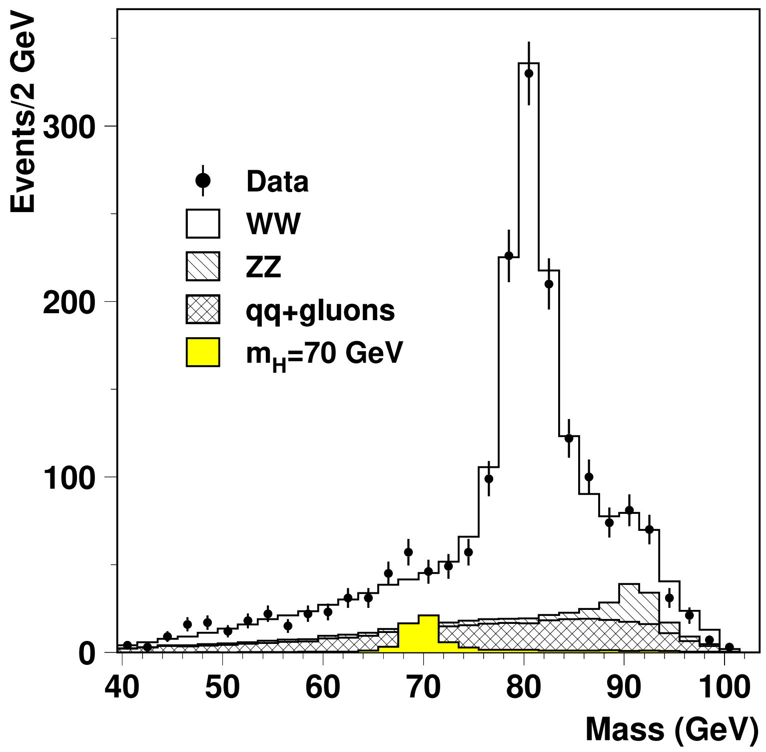


SM Higgs

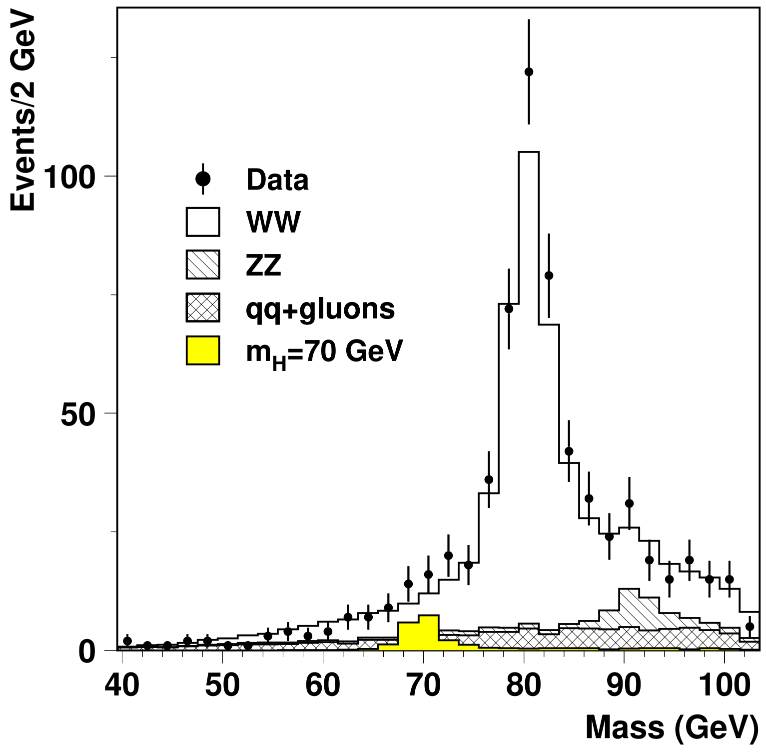


$M_H > 108.5$ GeV **(expected** 110 GeV**)**

Charged Higgs



$189 - 202$ GeV $Data$



$204 - 208$ GeV $Data$

R_p conserving Susy Searches

Constrained MSSM (Heavy Gravitino, R_p):

- the $\tilde{\chi}_1^0$ is the is the Lightest S-Particle (LSP)
  stable and invisible
- Signature: missing E, acoplanar $\ell\ell, \mathrm{jj}, \mathrm{jj}\ell, 4\mathrm{j}$
- Signal topology and associated background depend on $\Delta\mathrm{M} = \mathrm{M}_{\tilde{\mathrm{p}}} - \mathrm{M}_{\mathrm{LSP}} \sim E_{vis}$

for each topology

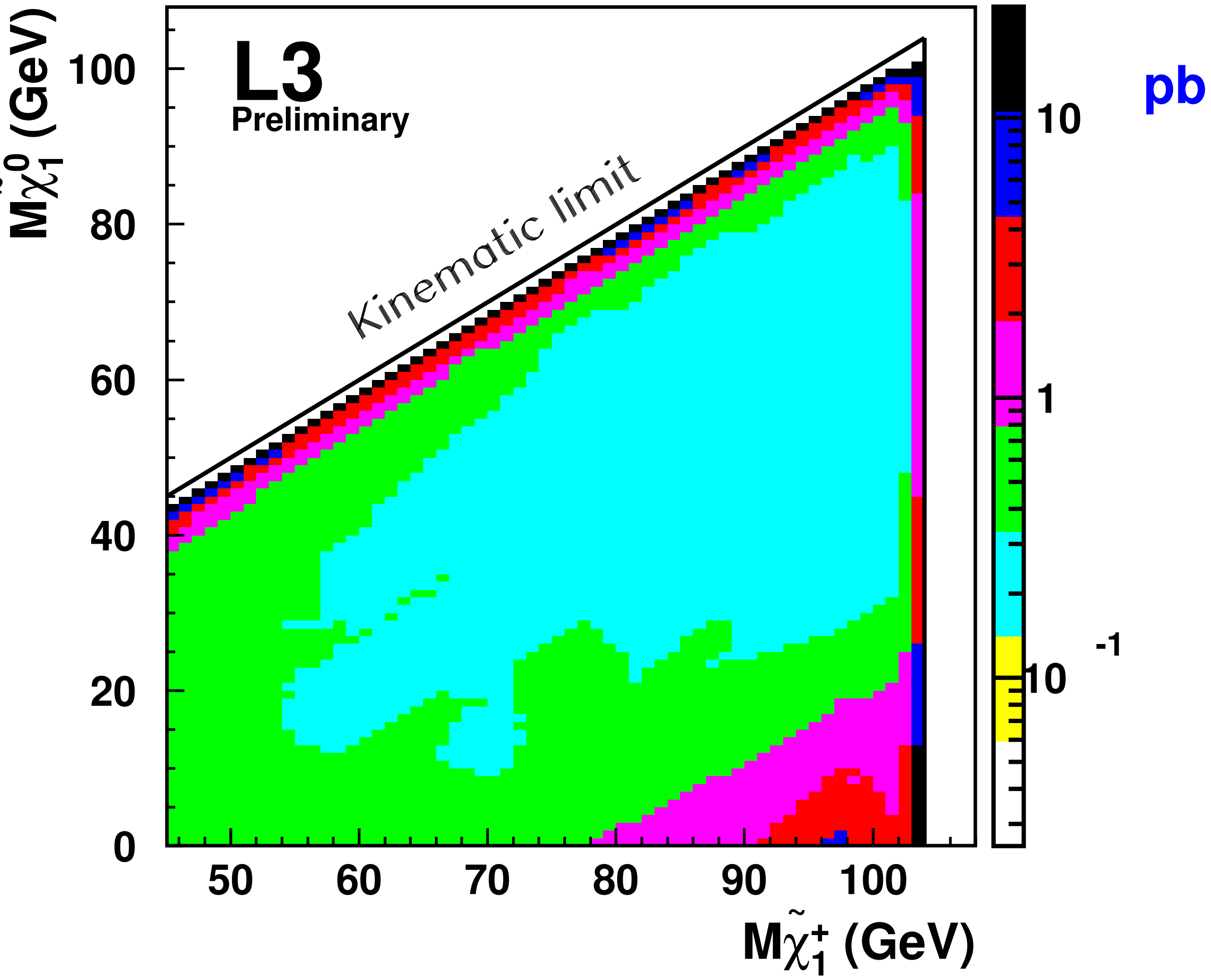
- selection cuts are optimised using M.Carlo signal and bkgd events in order to maximise s/b in 3 ΔM ranges

$$e^+e^- \rightarrow \tilde{\chi}_1^+ \tilde{\chi}_1^- \rightarrow \tilde{\chi}_1^0 \tilde{\chi}_1^0 W^{+*} W^{-*}$$

	Δ M=$M_{\tilde{\chi}_1^\pm} - M_{\tilde{\chi}_1^0}$							
	Low Δ M		Medium Δ M		High Δ M		.OR.	
$\sqrt{s}$ (GeV)	N_{data}	N_{exp}	N_{data}	N_{exp}	N_{data}	N_{exp}	N_{data}	N_{exp}
205	19	13.7	16	8.0	6	8.2	41	30.1
207	13	11.0	5	6.6	6	6.8	24	24.5
208	0	1.3	1	0.9	0	0.7	1	2.8
205-208	32	26.1	22	15.5	12	15.9	66	57.6

No Excess

Charginos Searches 205 - 208 GeV



Cross section upper limit

$$e^+e^- \rightarrow \tilde{\chi}_1^+ \, \tilde{\chi}_1^- \rightarrow \tilde{\chi}_1^0 \, \tilde{\chi}_1^0 \; W^{+*} \, W^{-*}$$

Very low ΔM Chargino Searches

For very low Δ M $= \mathrm{M}_{\tilde{\chi}_1^\pm} - \mathrm{M}_{\tilde{\chi}_1^0}$ values

Use ISR γ to trigger and to suppress the two photon background.

$\mathrm{e}^+\mathrm{e}^- \rightarrow \tilde{\chi}_1^+ \, \tilde{\chi}_1^- \, \gamma \rightarrow \tilde{\chi}_1^0 \, \tilde{\chi}_1^0 \, \gamma X$

Use 1998 and 1999 data (assuming no signal) for background prediction.

selection	low ΔM $\sim$ 3GeV	very low ΔM $\sim$ 1GeV	ultra low ΔM $\sim$ 300MeV	OR
2000 (128.5 pb^{-1})	5	2	3	7
1998-99 scaled	4.4 ± 1.2	1.6 ± 0.7	0.9 ± 0.5	5.3 ± 1.3

No Excess

R_p violating SUSY Searches

- The $\tilde{\chi}^0_1$ is the Lightest Susy Particle (LSP)
  $\tilde{\chi}^0_1$ can decay
- Signature: large multiplicity of leptons and/or jets

for the λ''_{ijk} coupling, ΔB, $\tilde{\chi}^0_1 \rightarrow \bar{u}_i \bar{d}_j \bar{d}_k$

charginos searches:

R–Parity violation results for 204$\leq \sqrt{s} \leq$ 206 GeV $\mathcal{L} = 70.2\ pb^{-1}$		
Signal	N observed	N expected
$\tilde{\chi}^+_1 \tilde{\chi}^-_1 \rightarrow W^* \, W^* \, qqq \, qqq$	63	66.9

R–Parity violation results for $\sqrt{s} >$ 206 GeV $\mathcal{L} = 81.6\ pb^{-1}$		
Signal	N observed	N expected
$\tilde{\chi}^+_1 \tilde{\chi}^-_1 \rightarrow W^* \, W^* \, qqq \, qqq$	72	77.8

No Excess

Summary

Higgs
Susy
Exotic
searches updated

with the present
detector calibrations and simulation

No excess is observed in 145 pb^{-1}

Congratulations

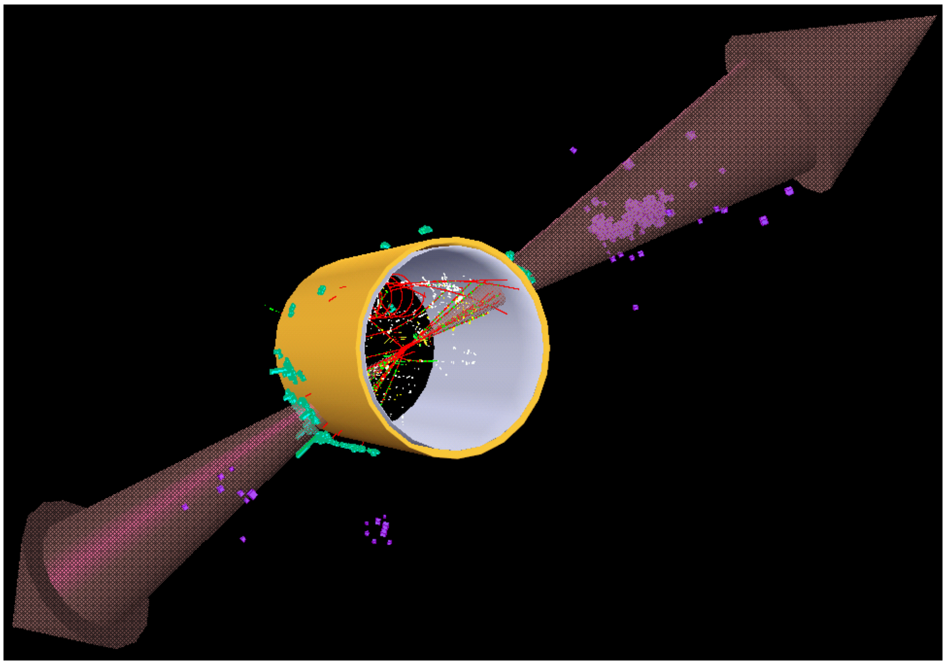
Many thanks to:

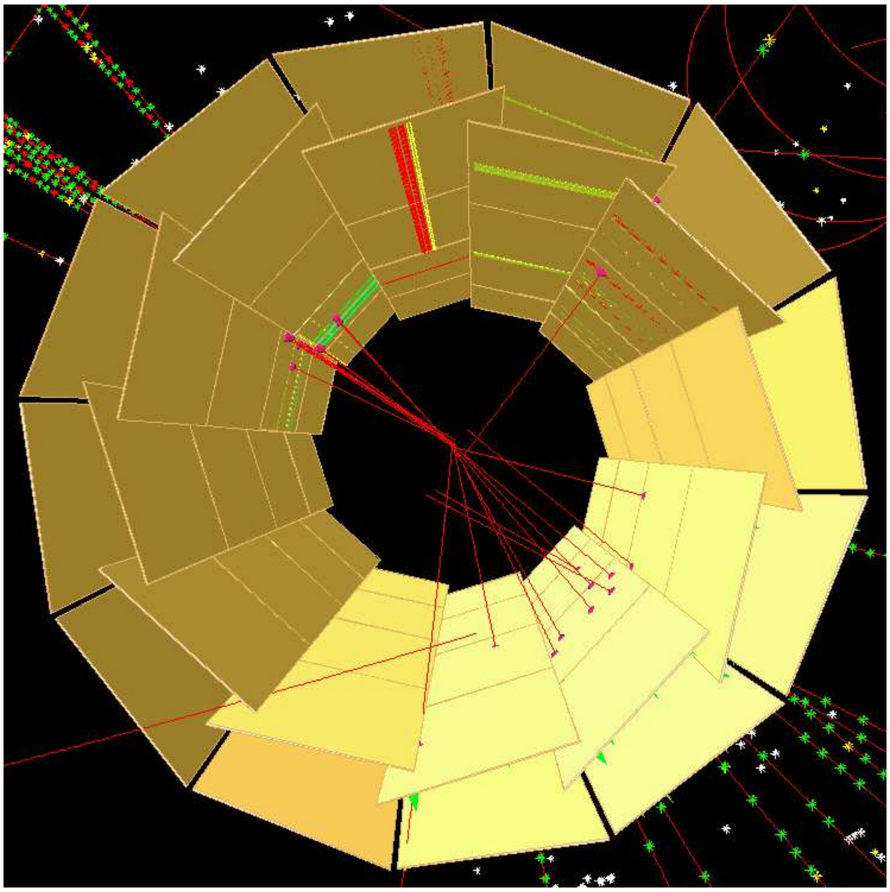
The Accelerator divisions.

The CERN and L3 technical support.

$qq\nu\nu$ event

$\sqrt{s} = 208.4$ GeV, $M_H = 118$ GeV





qqqq **event**

$\sqrt{s} = 206.7$ GeV, $M_H = 115.2$ GeV