

Latest results from ALEPH Y2K LEP SUSYWG results

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So called ADLO

(*) on leave @ cern

ALEPH update

SM processes
Higgs searches
SUSY searches
LEP SUSYWG
combination of
2000 data

Disclaimer

1) All Y2K results are **VERY preliminary**
(But still reliable...)

2) All limits are @ **95% C.L.**
(discovery claims, if any, are @ 5σ ...)

ALEPH performance

Detector ok! ➡ Data quality impressive

DAQ efficiency = 95.4%!!



61.5 pb⁻¹ @ ~204.9 GeV
31.2 pb⁻¹ @ ~206.7 GeV

In good running conditions

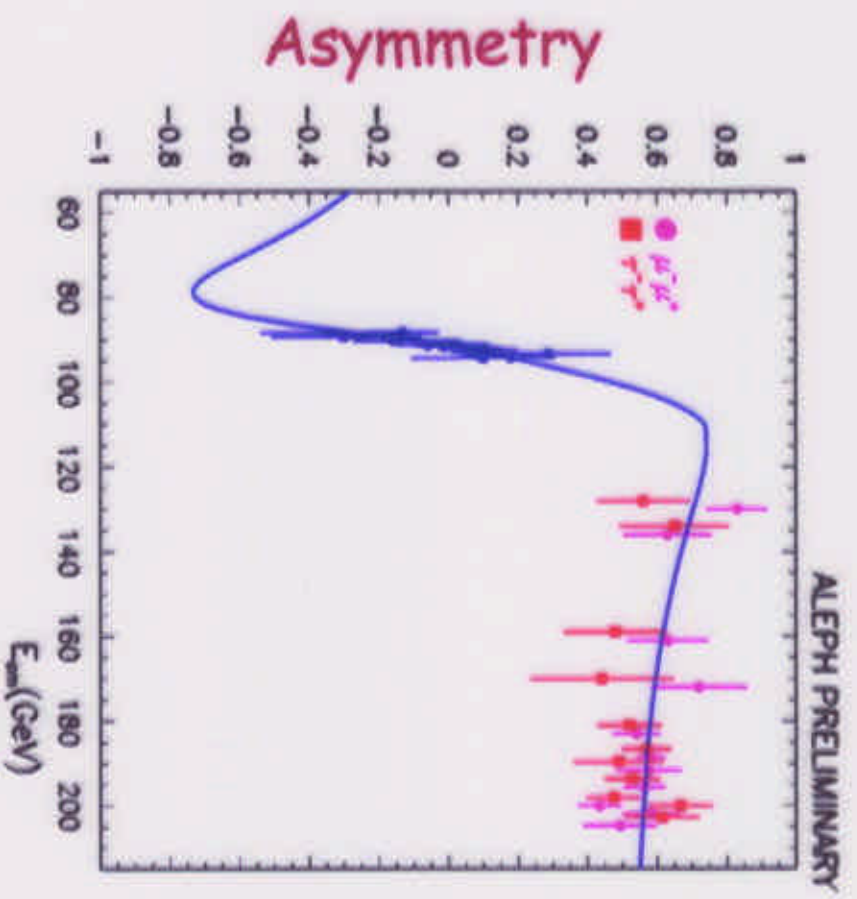
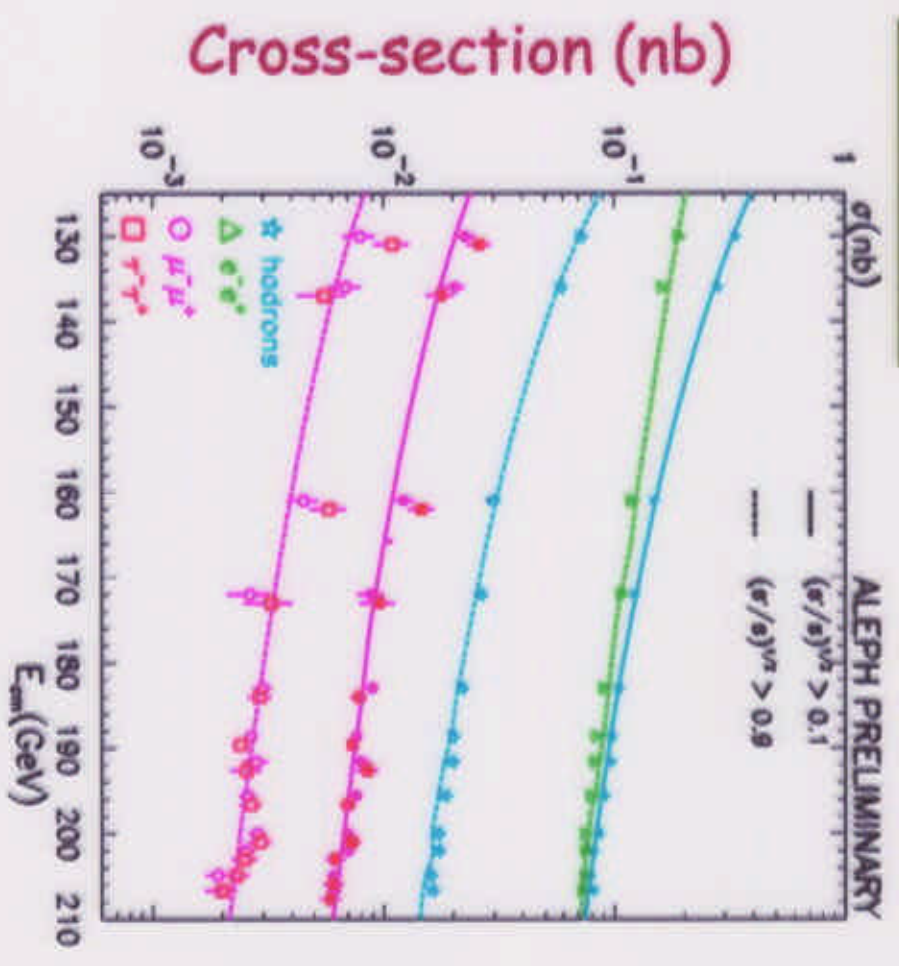
ALEPH results

ON:

SM processes
Higgs searches
SUSY searches

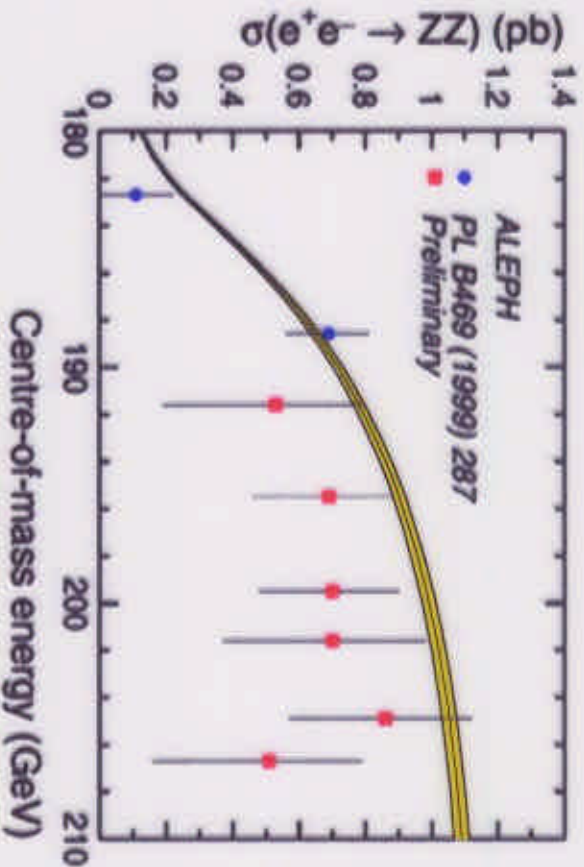
SM processes

2-fermion



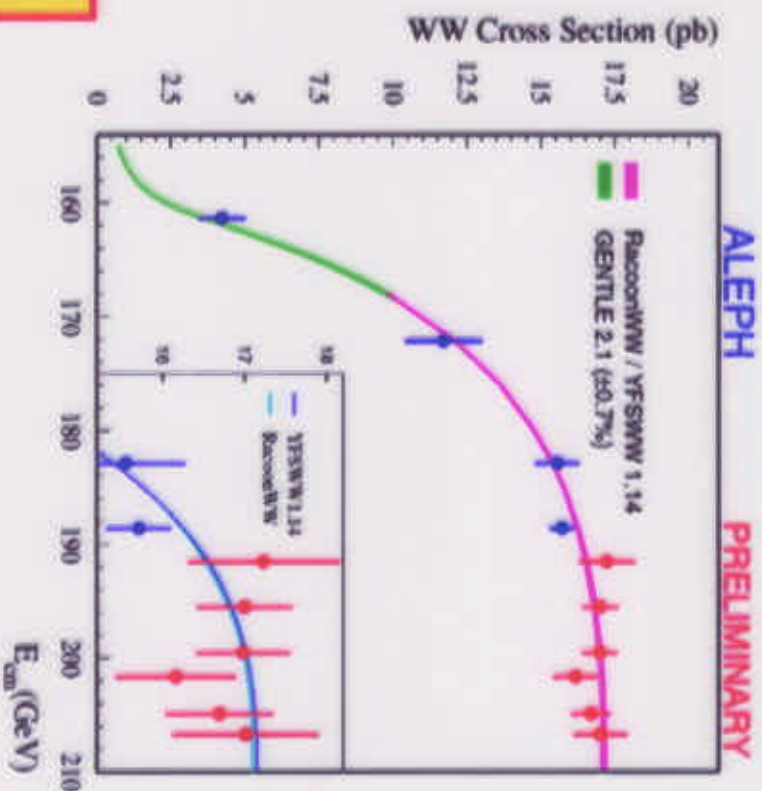
SM processes

4-fermion



$$\sigma_{\text{COO3}}^{\text{WW}} = 16.70 \pm 0.61 \text{ pb @ } 204.9 \text{ GeV}$$

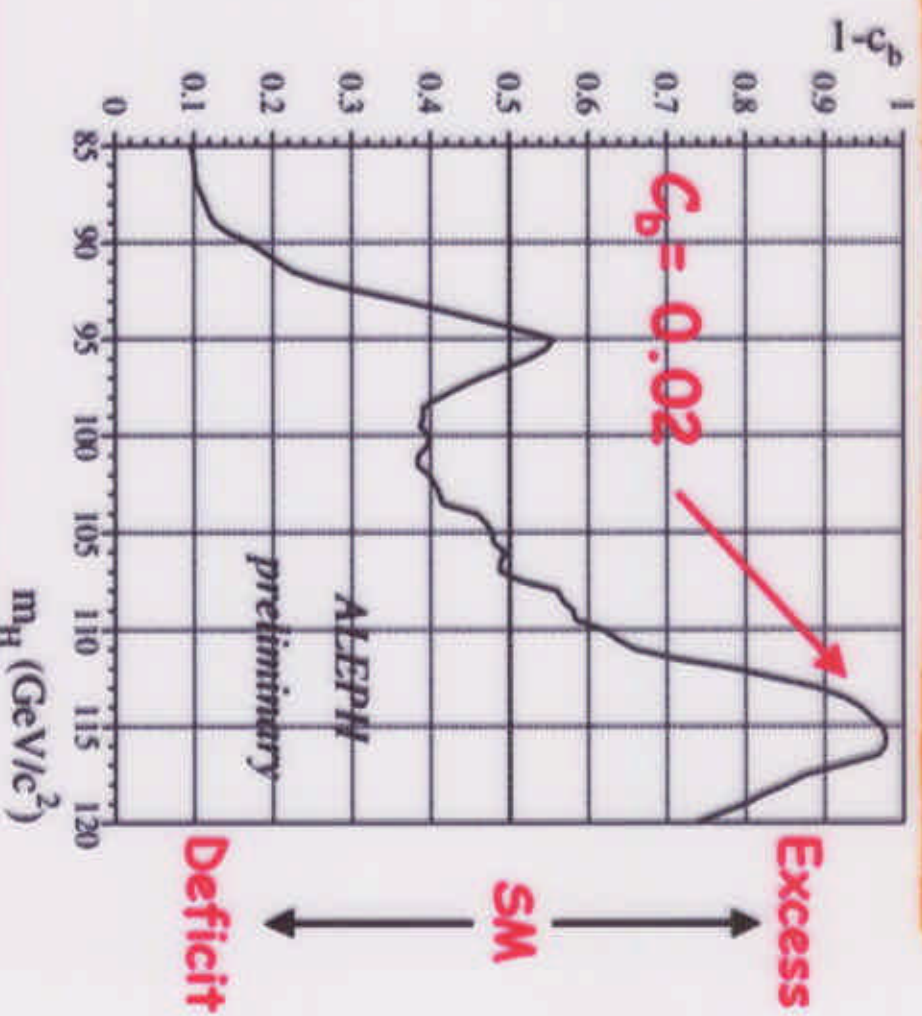
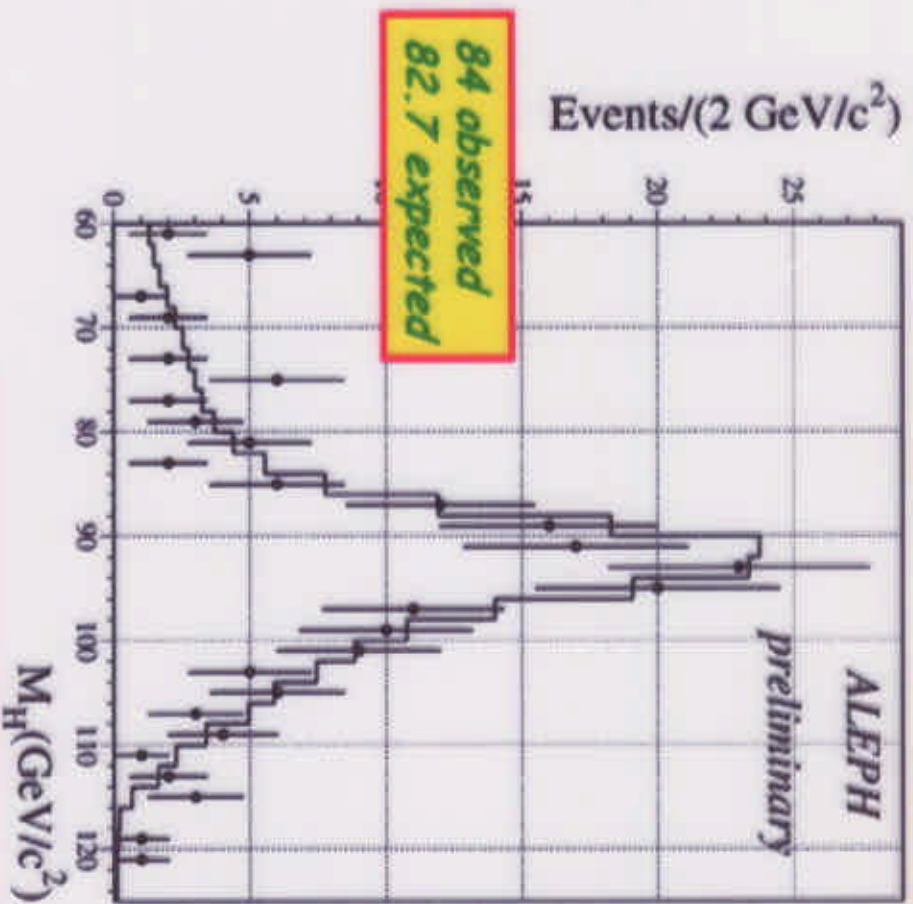
$$\sigma_{\text{COO3}}^{\text{WW}} = 17.01 \pm 0.86 \text{ pb @ } 206.7 \text{ GeV}$$



$$\sigma(ZZ) / \sigma(ZZ)_{\text{SM}} = 0.79 \pm 0.09$$



SM Higgs



$M_H > 111.1 \text{ GeV}/c^2$ (112.3 GeV/c² exp)

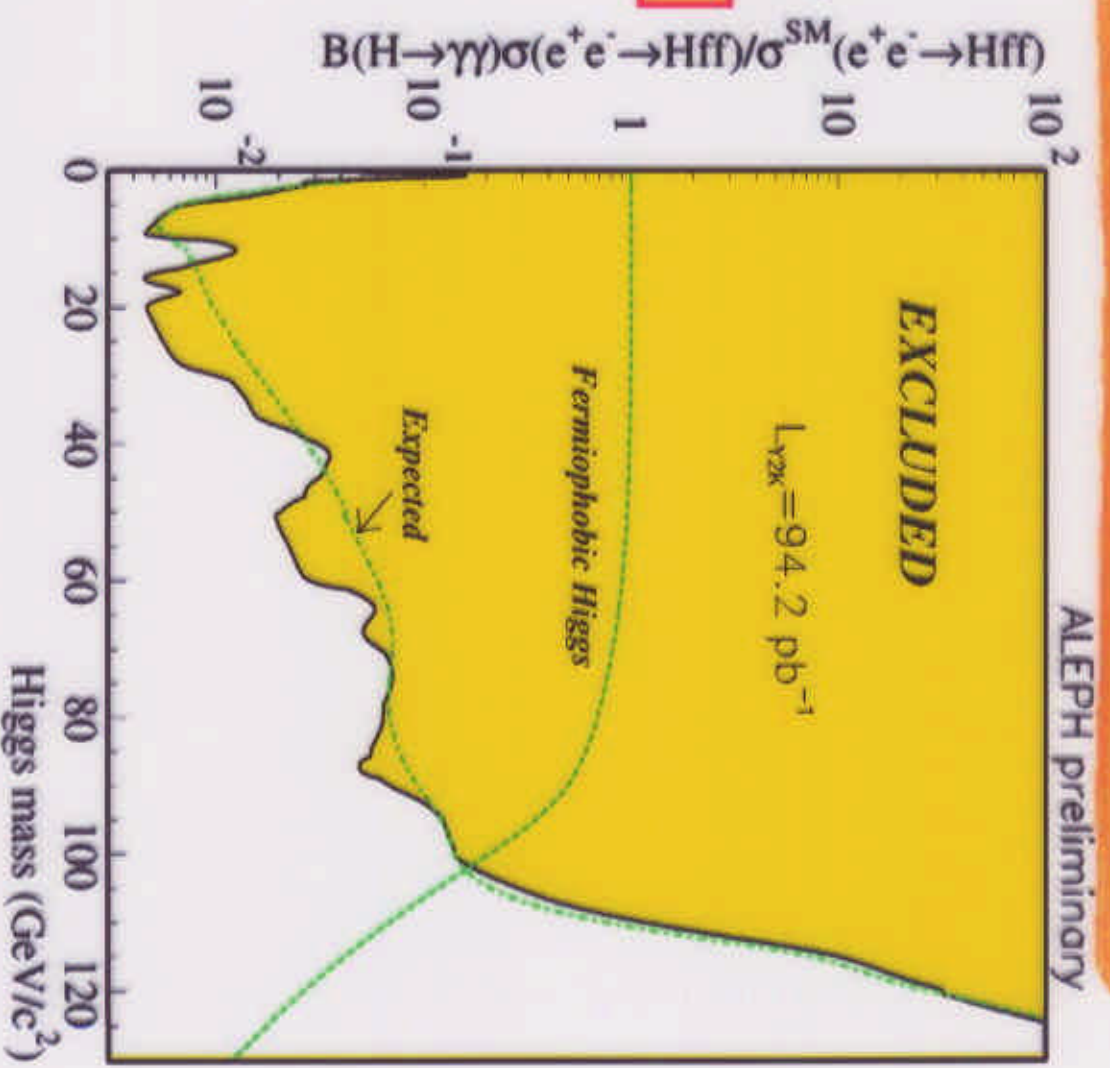


Fermiophobic Higgs



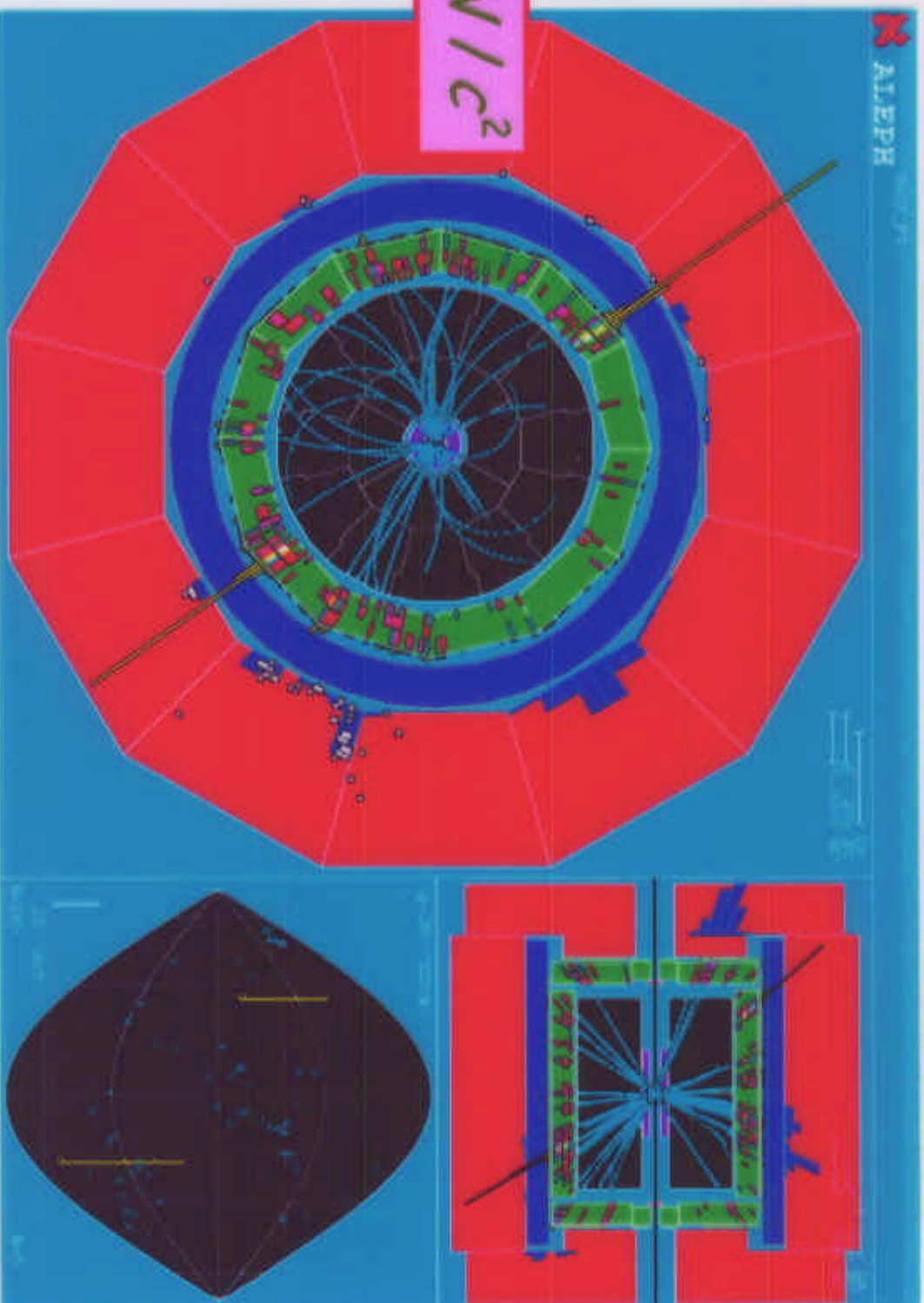
2 observed w.r.t. 2.2 expected

$M_H > 101.7 \text{ GeV}/c^2$
(102.2 GeV / c^2 exp)



$H \rightarrow \gamma\gamma$ candidate

$$M_H = 108.3 \text{ GeV}/c^2$$



SUSY searches

MSSM
MSSM with \mathcal{R}_p
GMSB

MSSM Sfermions

Squarks



Channel	# observed events	# expect. events
$\tilde{t} \rightarrow c\chi$	7	5.2
$\tilde{t} \rightarrow b\ell\tilde{\nu}$	1	0.7
$\tilde{b} \rightarrow b\chi$	2	1.1

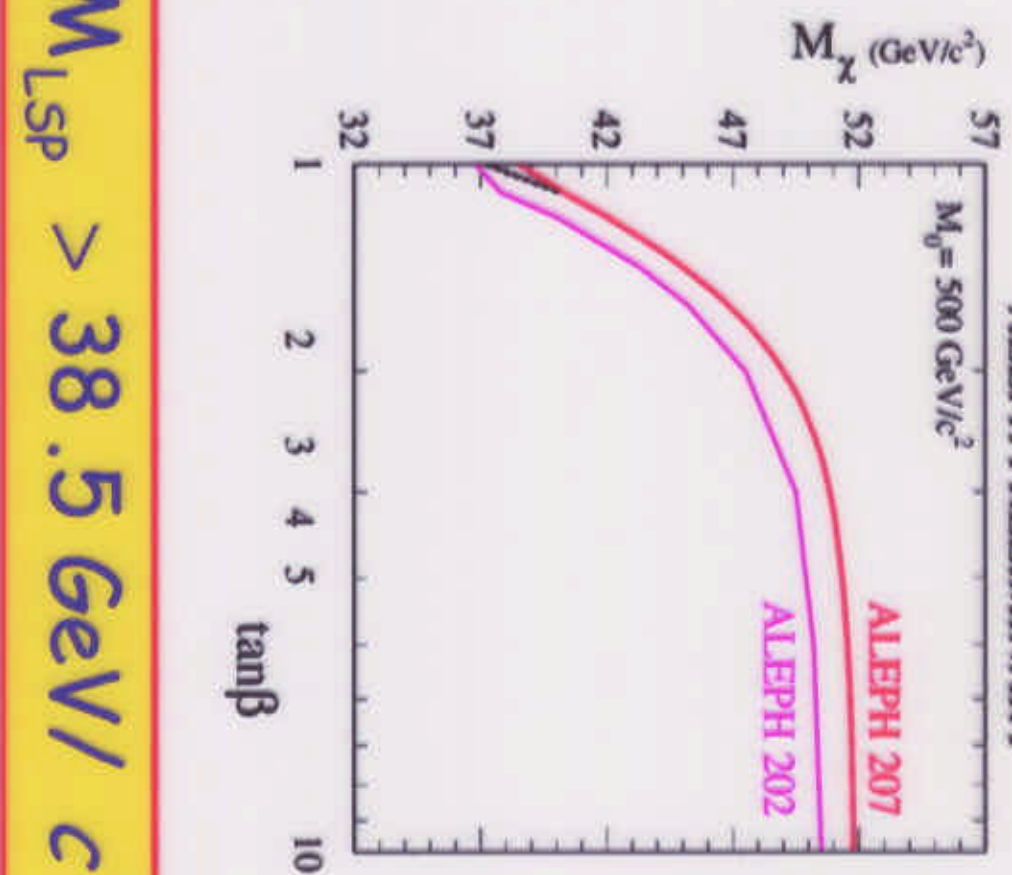
Sleptons (High ΔM)



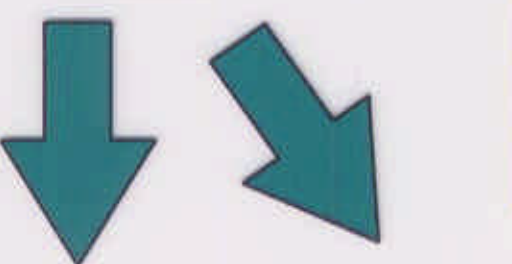
Channel	# observed events	# expect. events
$\tilde{e} \rightarrow e\chi$	20	18.4
$\tilde{\mu} \rightarrow \mu\chi$	19	16.5
$\tilde{\tau} \rightarrow \tau\chi$	10	10.0

MSSM Charginos + Neutralinos

Channel	# obs events	# exp events
$\chi\chi'$	1	1.2
$\chi^+\chi^-$	6	4.5



@ large m_0



$M_{\text{LSP}} > 38.5 \text{ GeV}/c^2$

R_p results

$L\bar{L}\bar{E}$ Searches	# obs evts	# exp evts	$U\bar{D}\bar{D}$ Search	# obs evts	#exp evts
Leptons + hadrons	4	4.4	4 broad jets	58	59
4 leptons	1	2.9	4 jets	353	355
2 leptons + 2 taus	0	0.9	Many jets	4	4.5
4 taus	0	2.0	Many jets + lepton	11	8.6
Acoplanar leptons	92	100	4 jets + 2 leptons	3	2.4
4 leptons + E_{miss}	0	3.4	Many jets + 2 leptons	3	3.3
6 leptons + E_{miss}	0	0.6	4 jets + E_{miss}	33	38
$L\bar{Q}\bar{D}$ Search	# obs evts	# exp evts	Many jets + E_{miss}	40	36
Multijets + leptons	7	5.8			
2 jets + 2 Taus	6	5.5			
2 jets + E_{miss}	16	11.3			
4 jets	378	395			

Many topologies:
good agreement with
SM expectation

GMSB results

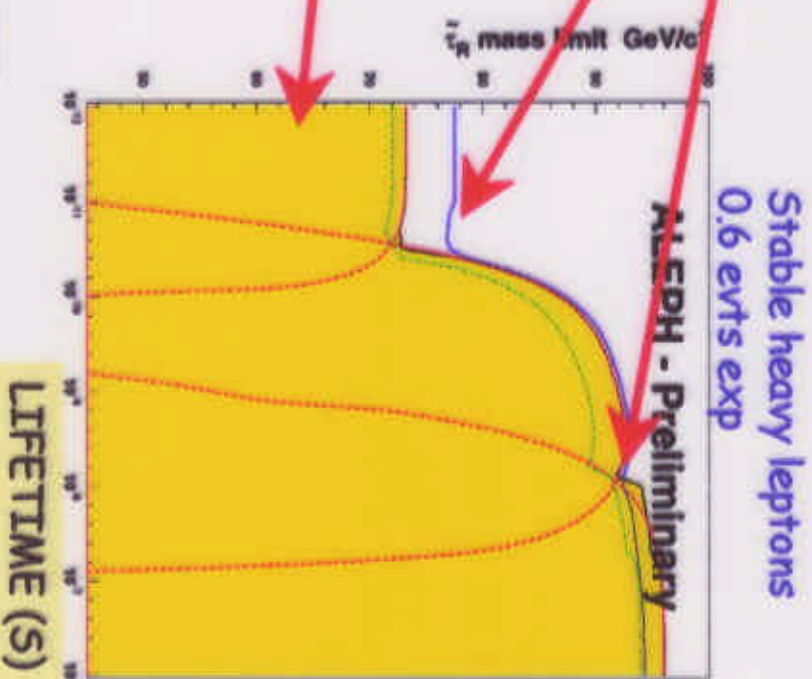
Searches	# obs evts	# exp evts
$\gamma + \tilde{E}$	10	8.2
χ NSLP	0	0.7
$\tilde{\tau}$ NSLP	0	0.9

$E_\gamma > 36 \text{ GeV}$

Large impact parameter
+ kinks 0.3 evts exp

$$M_\chi > 97 \text{ GeV}/c^2$$

$$M_{\tilde{\tau}_R} > 73 \text{ GeV}/c^2$$



LEP SUSYWG Y2K results



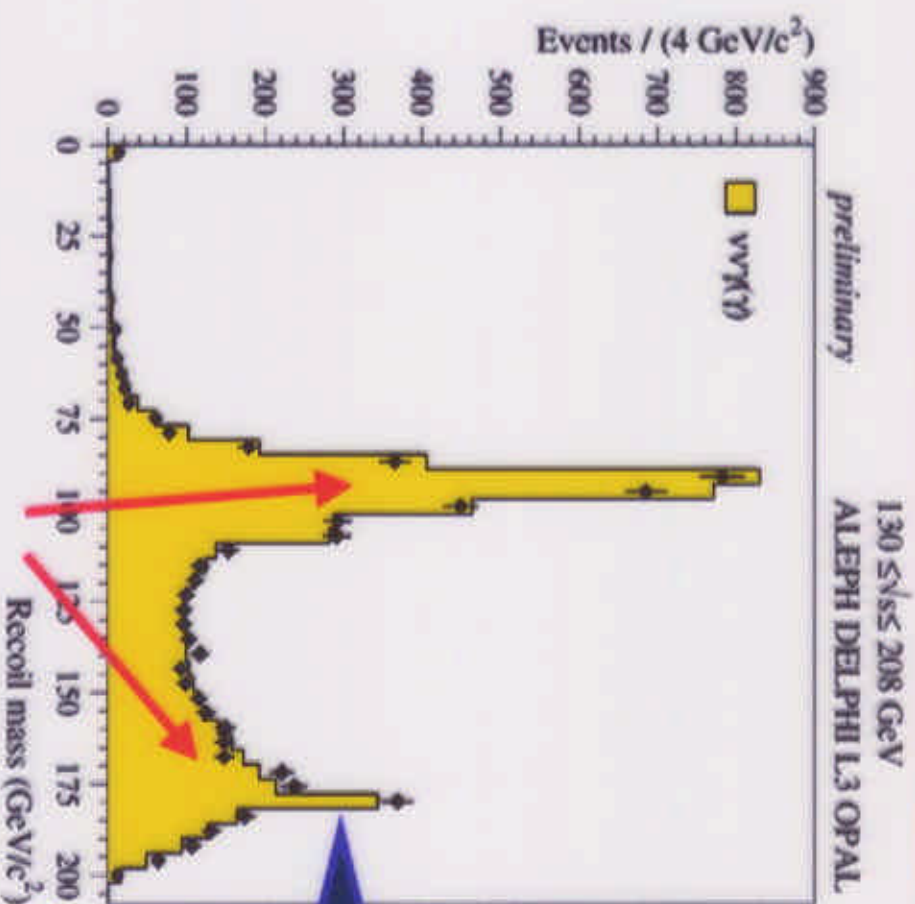
Special year:

- 1 Fast combination of on-line results
- 2 Try to spot anomalies a.s.a.p.

The LEP experiment has collected 2.1fb^{-1} $\sqrt{s} = 183\text{-}209\text{ GeV}$

103.4pb^{-1} @ $\sqrt{s} > 206.6\text{GeV}$
 5.8pb^{-1} @ $\sqrt{s} > 207.5\text{GeV}$

Single photons

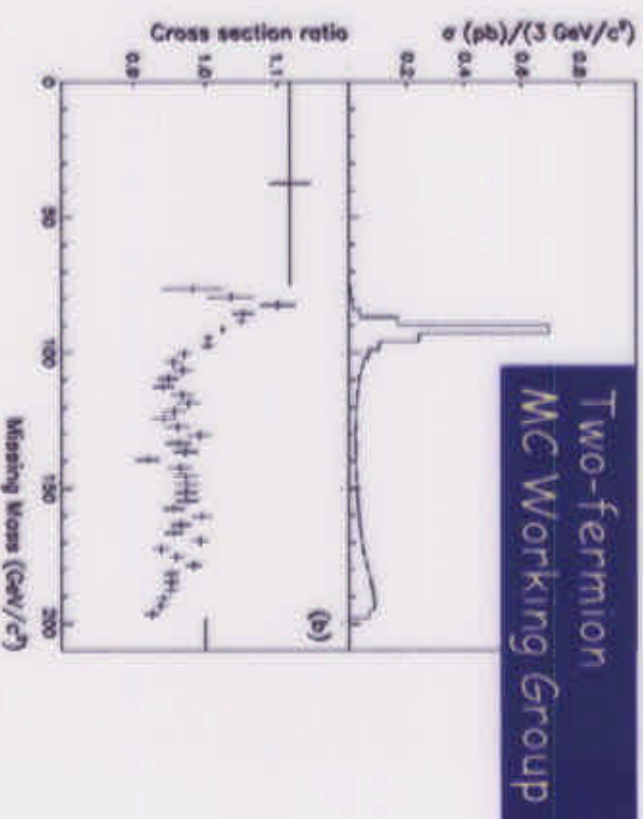
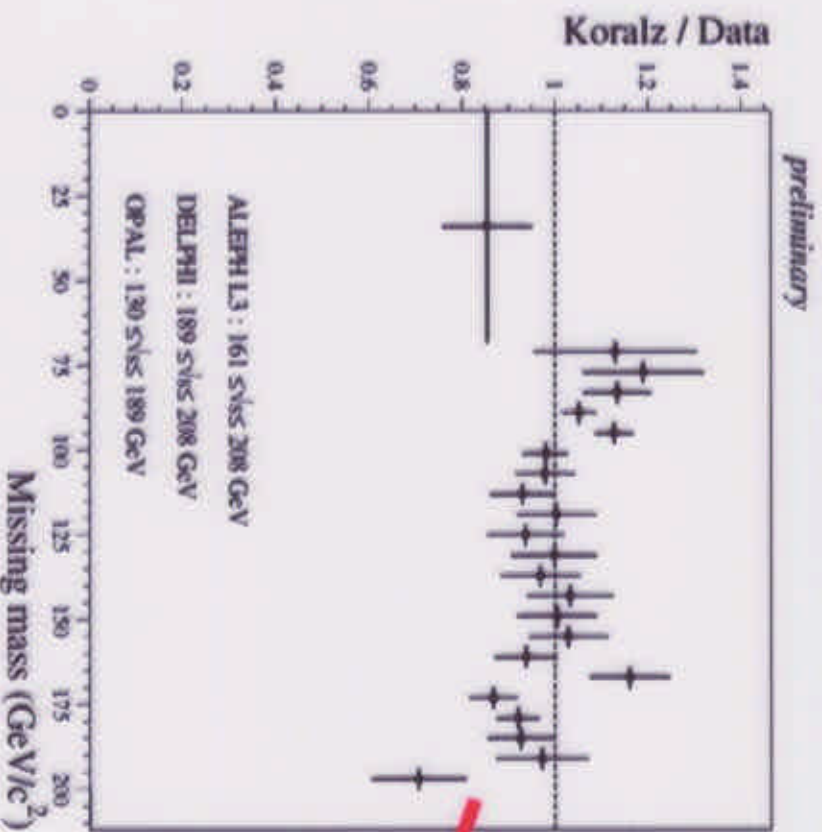


new physics may appear as an
excess in the tail
(gravitinos, extra-dimensions...)

Discrepancies Data Vs SM expectation due to MC generator

Single photons

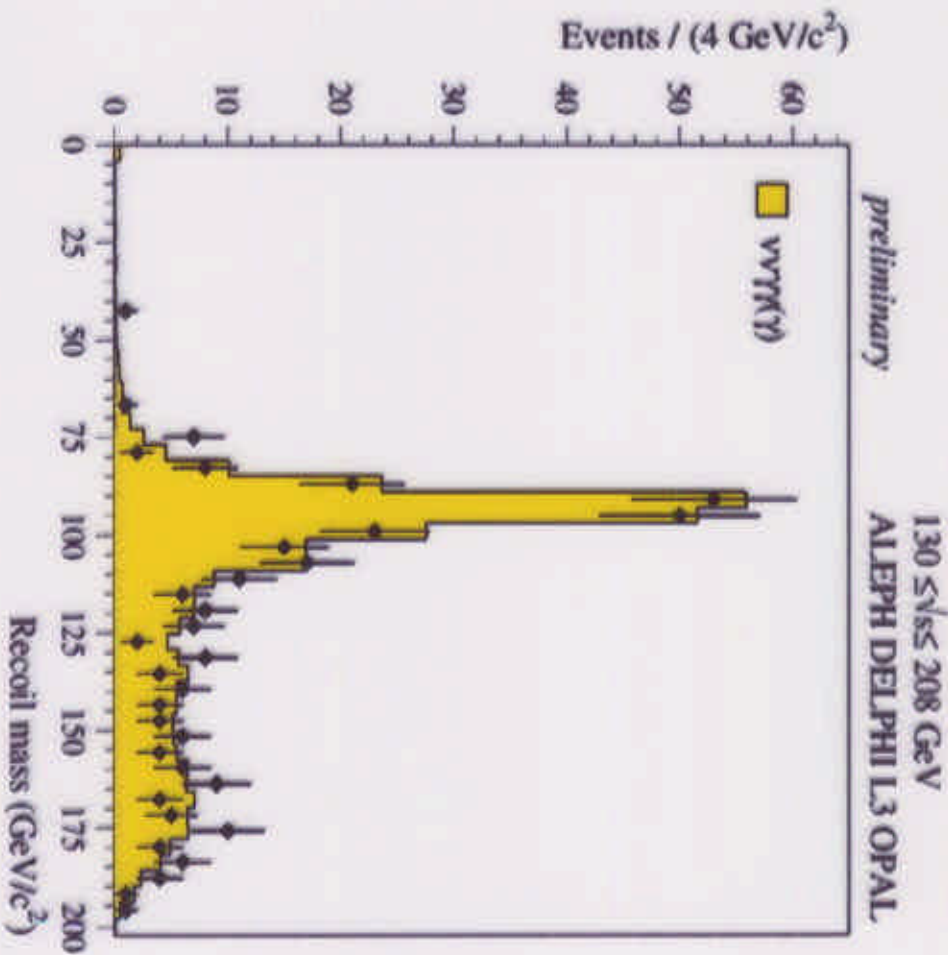
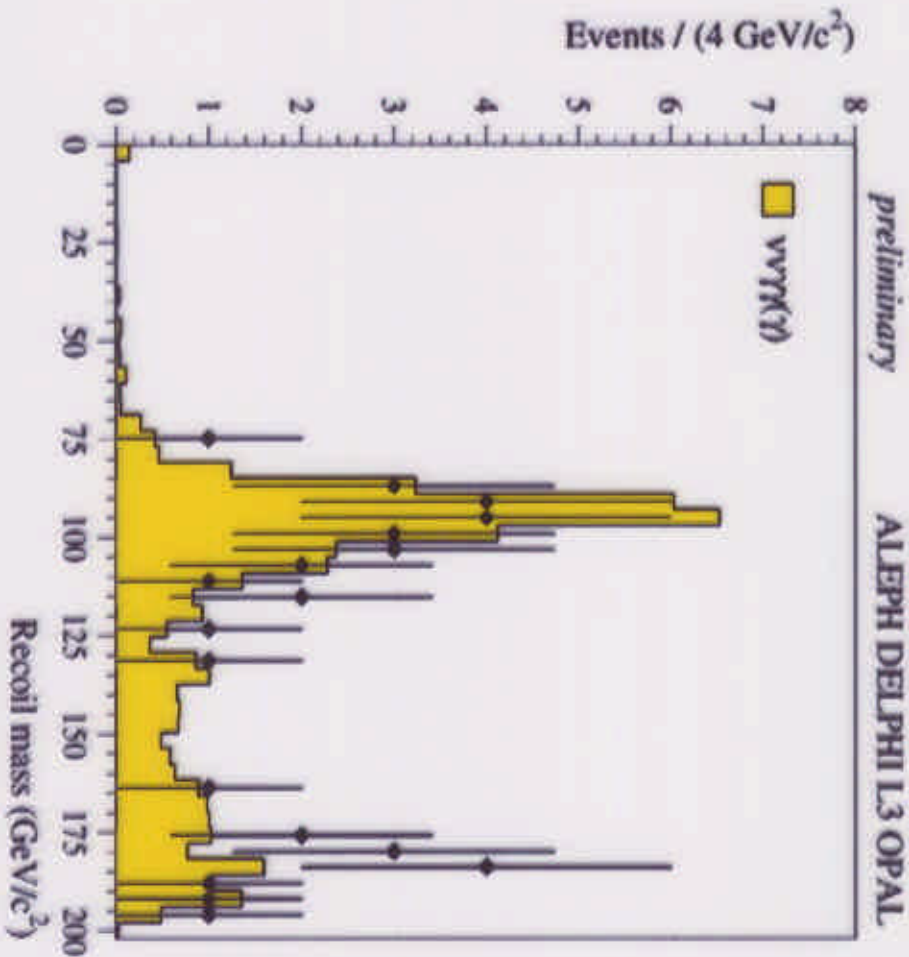
Background estimation based mainly on **KoralZ** data seem to favour **NUNUGPV**



Acoplanar photon pairs

Y2K only : **38 obs/46.1 exp**

130-208 GeV: **318 obs/332.9 exp**



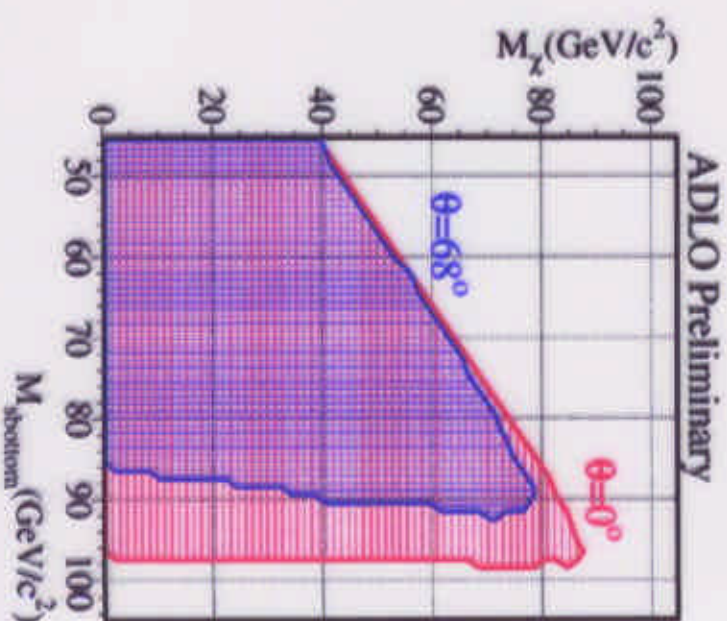
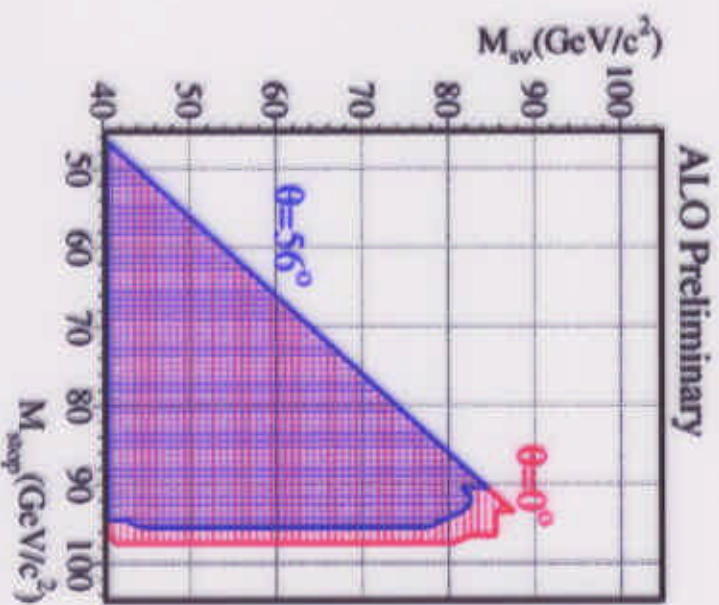
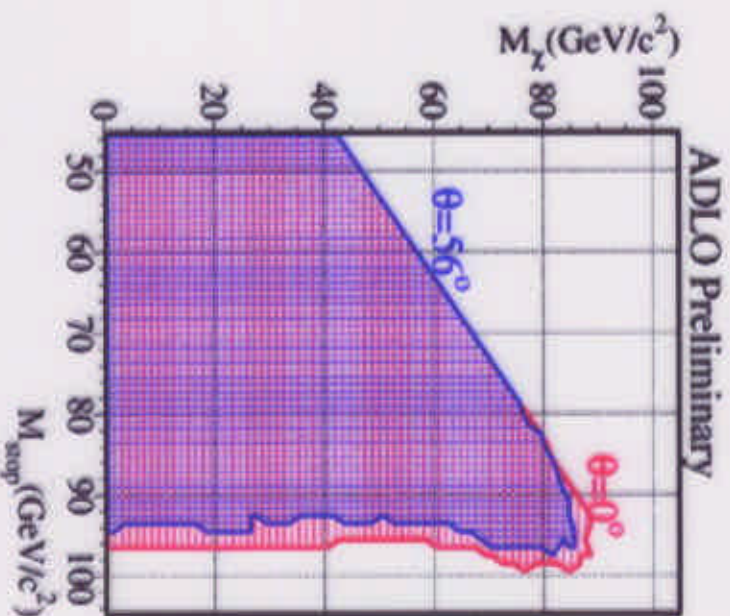
Squark search

$$\tilde{t} \rightarrow c\chi : M_{\tilde{t}} > 95(92) \text{ GeV} / c^2 \text{ for } \vartheta_{\text{mix}} = 0^\circ(56^\circ)$$

$$\tilde{t} \rightarrow b\tilde{V} : M_{\tilde{t}} > 97(94) \text{ GeV} / c^2 \text{ for } \vartheta_{\text{mix}} = 0^\circ(56^\circ)$$

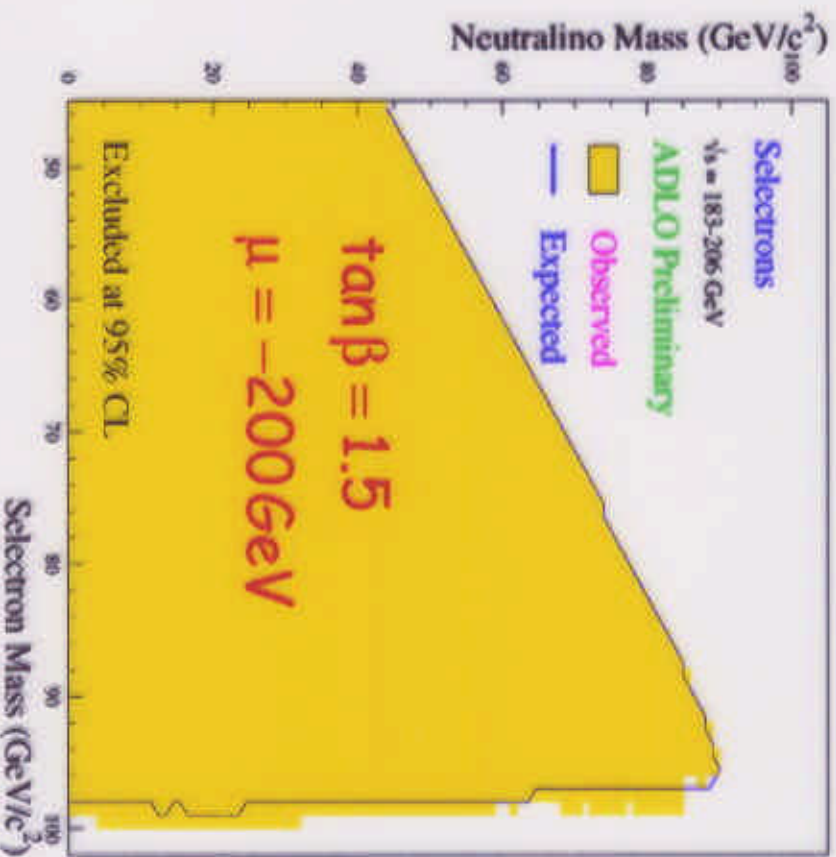
for $\Delta M > 15 \text{ GeV} / c^2$

$$\tilde{b} \rightarrow b\chi : M_{\tilde{b}} > 96(85) \text{ GeV} / c^2 \text{ for } \vartheta_{\text{mix}} = 0^\circ(68^\circ)$$

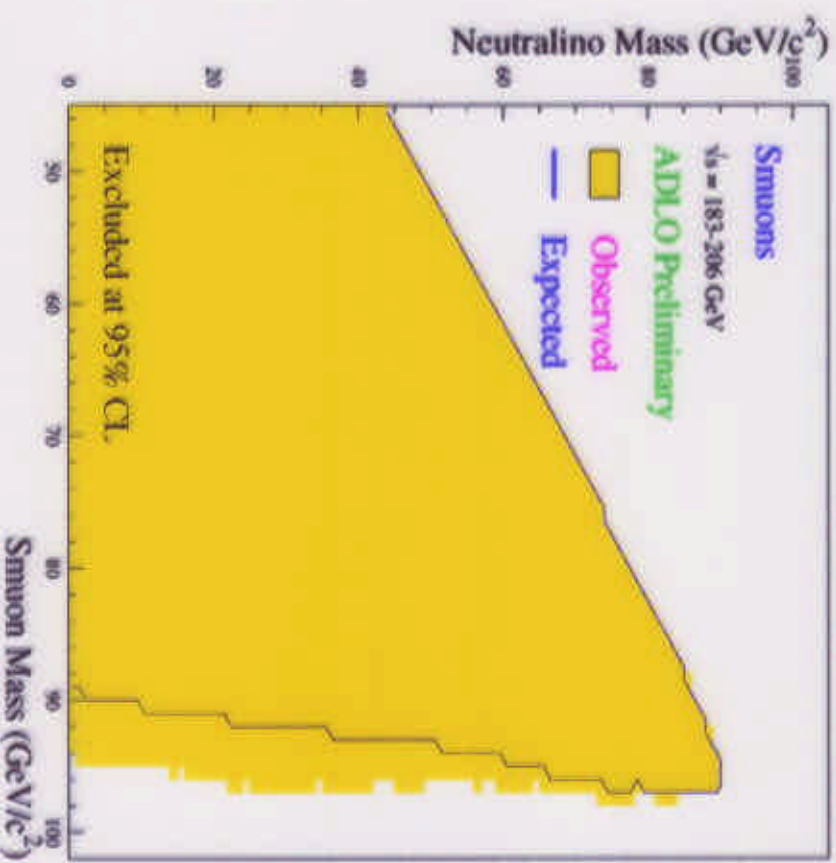


Slepton search

$$M_{\tilde{e}} > 98 \text{ GeV} / c^2$$



$$M_{\tilde{\mu}} > 94 \text{ GeV} / c^2$$

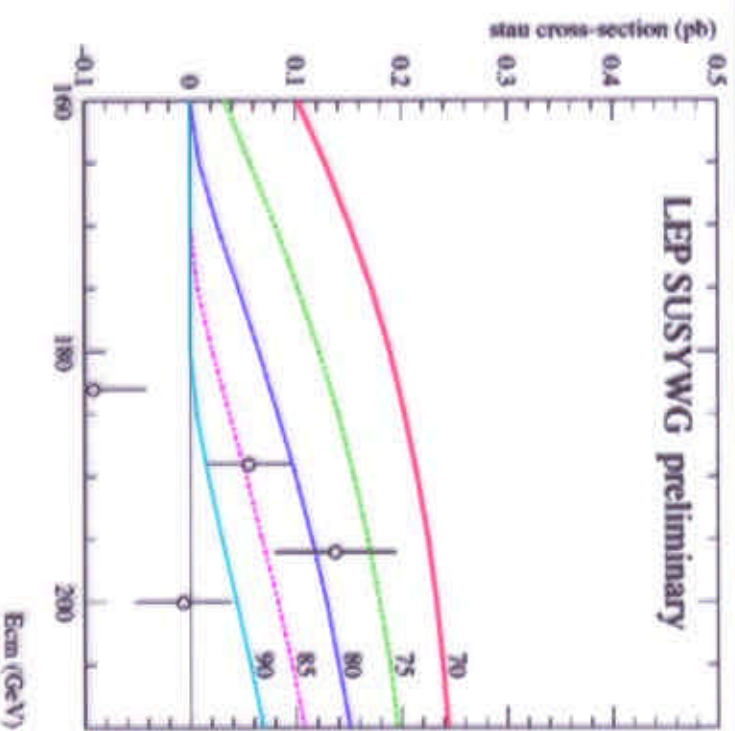


$$\text{for } \Delta M > 15 \text{ GeV} / c^2$$

Stau saga

In SUSY2K : $\sqrt{s} \leq 202 \text{ GeV}$

Excess observed by all four experiments



$$M_{\tilde{\tau}} = 85 \text{ GeV} / c^2$$

$$M_{\tilde{\chi}} = 22 \text{ GeV} / c^2$$

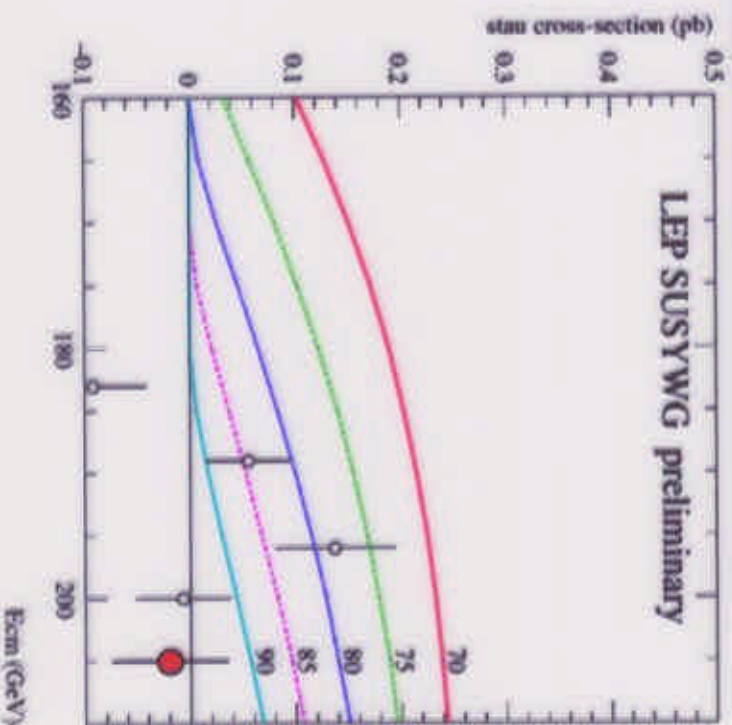


	Data	SM exp
ALEPH	50	38.0
DELPHI	82	71.4
L3	70	55.3
OPAL	66	57.7

Stau in Y2K

In ICHEP2000 : $\sqrt{s} > 202 \text{ GeV}$

Excess not confirmed



$$M_{\tilde{\tau}} = 85 \text{ GeV} / c^2$$

$$M_{\tilde{\chi}} = 22 \text{ GeV} / c^2$$



	Data	SM exp
ALEPH	10	10.0
DELPHI	18	19.7
L3	12	9.3
OPAL	9	12.6

Conclusion

In Y2K LEP experiments performed all standard searches.

with $\sim 90 \text{ pb}^{-1}/\text{exp}$ @ 203-209 GeV

The $\tilde{\tau}$ anomaly observed with previous year data is not confirmed.

Overall good agreement with SM predictions
No evidence for new physics at high energy (yet)

Discovery potential will still increase (mainly χ^\pm)