ALEPH Status Report

LEPC - July 20 2000

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SM processes

Higgs searches

SUSY searches

Detector performance

Detector working very well, data quality is high

DAQ efficiency = 95.4%

Background conditions are good

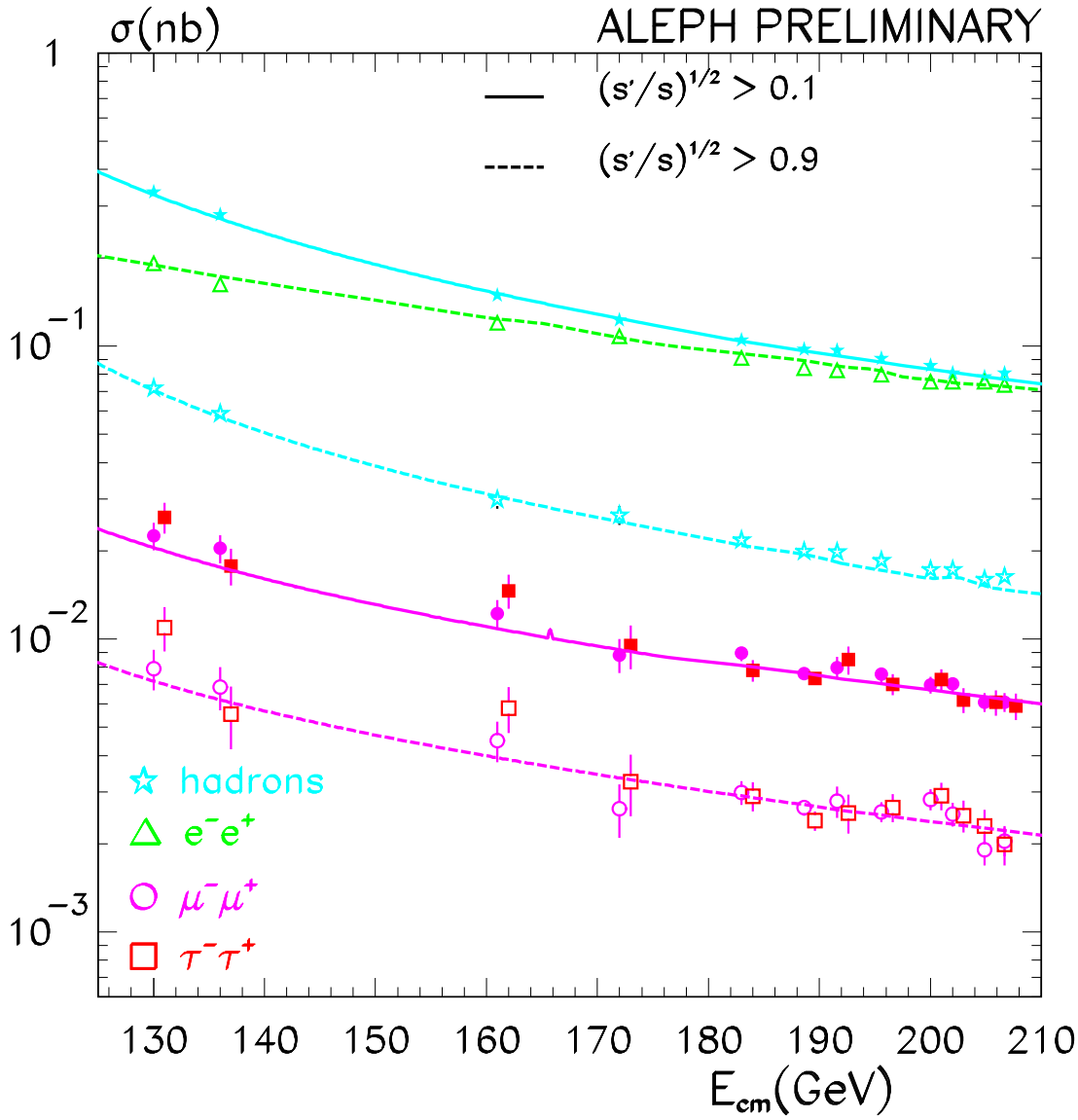
Results based on 92.7 pb^{-1} @ 203-208 GeV

61.5 pb^{-1} @ 204.9 GeV
31.2 pb^{-1} @ 206.7 GeV

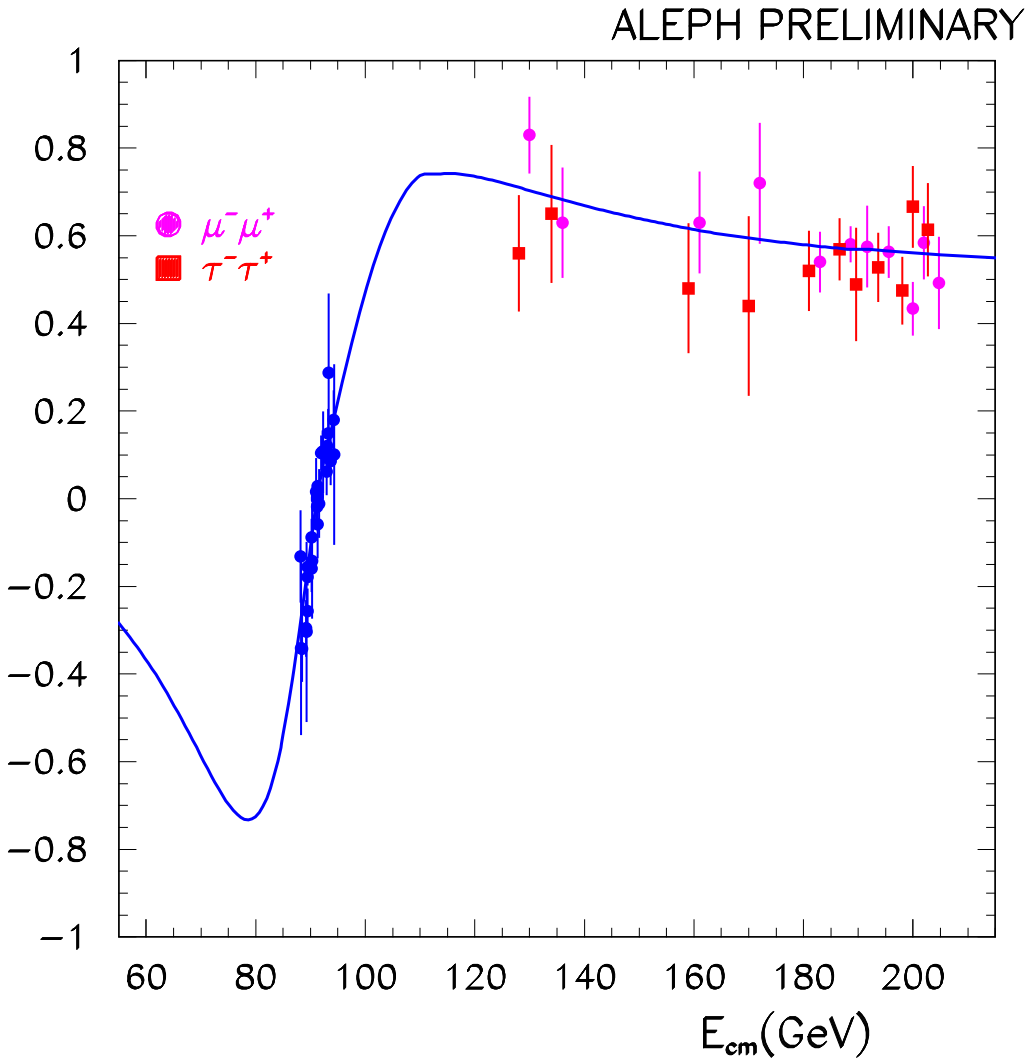
All results are PRELIMINARY

SM processes

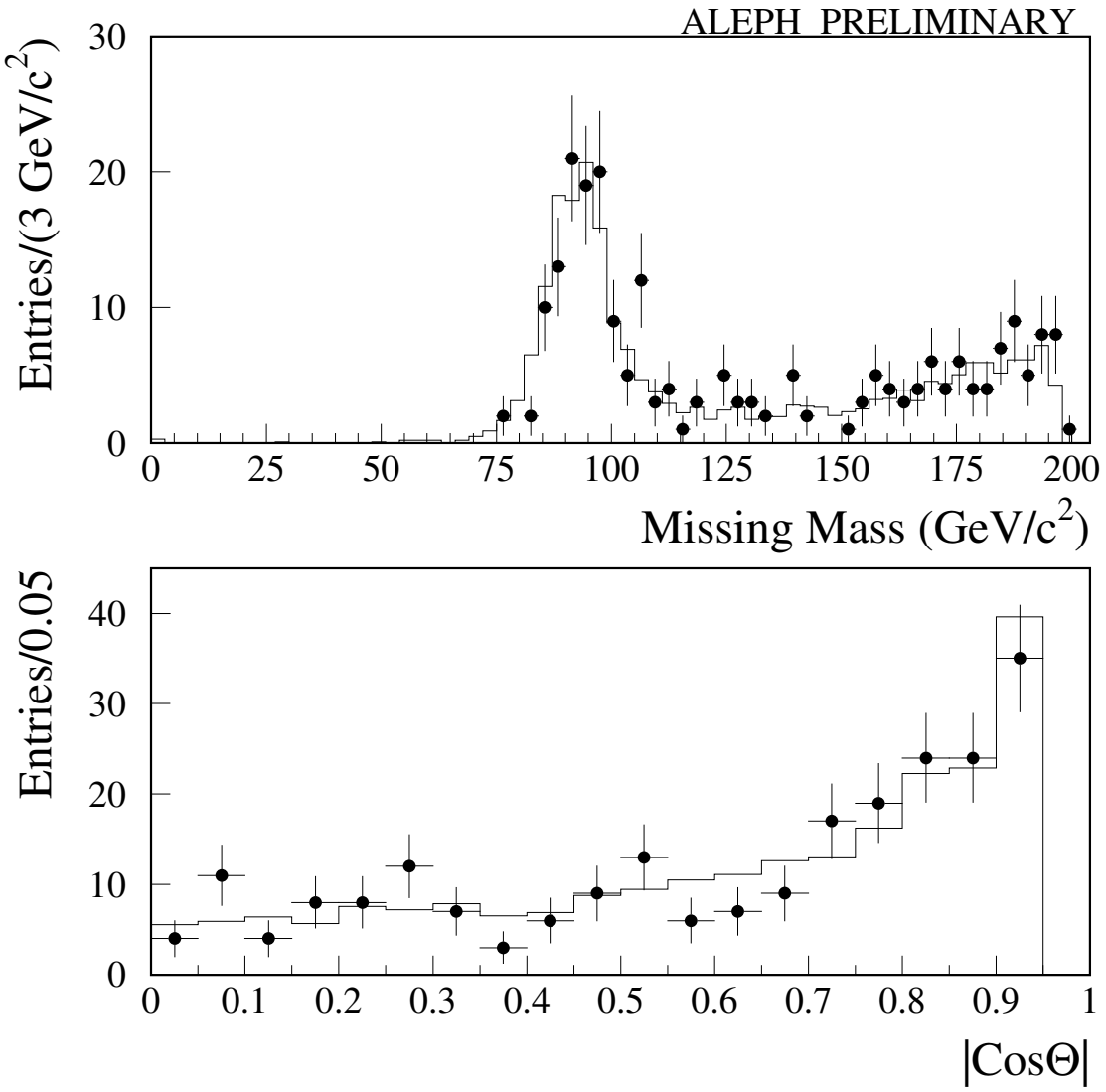
2-fermion cross sections



Lepton asymmetries



Single photon + missing energy

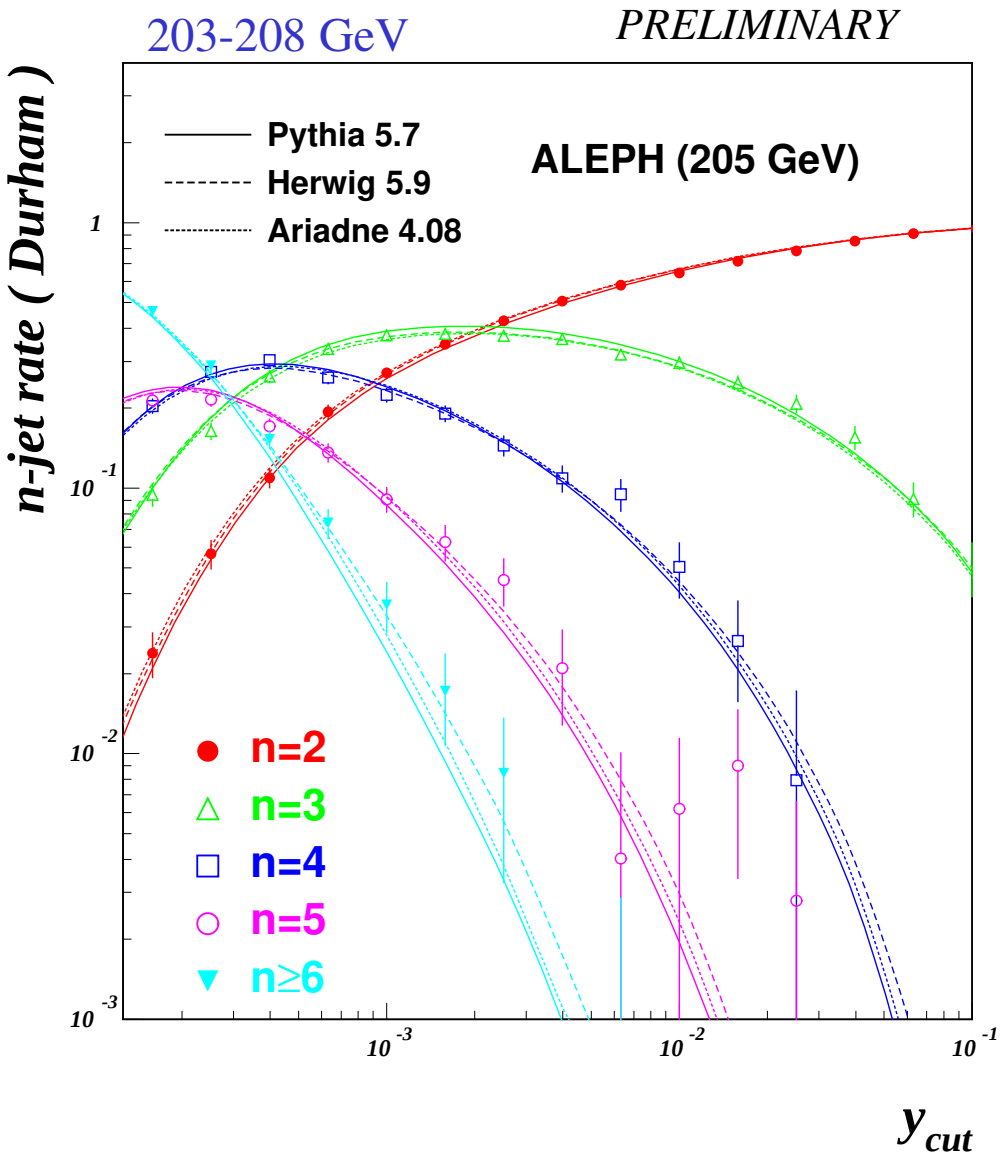


226 observed

c/w

226 expected

QCD - Jet rates



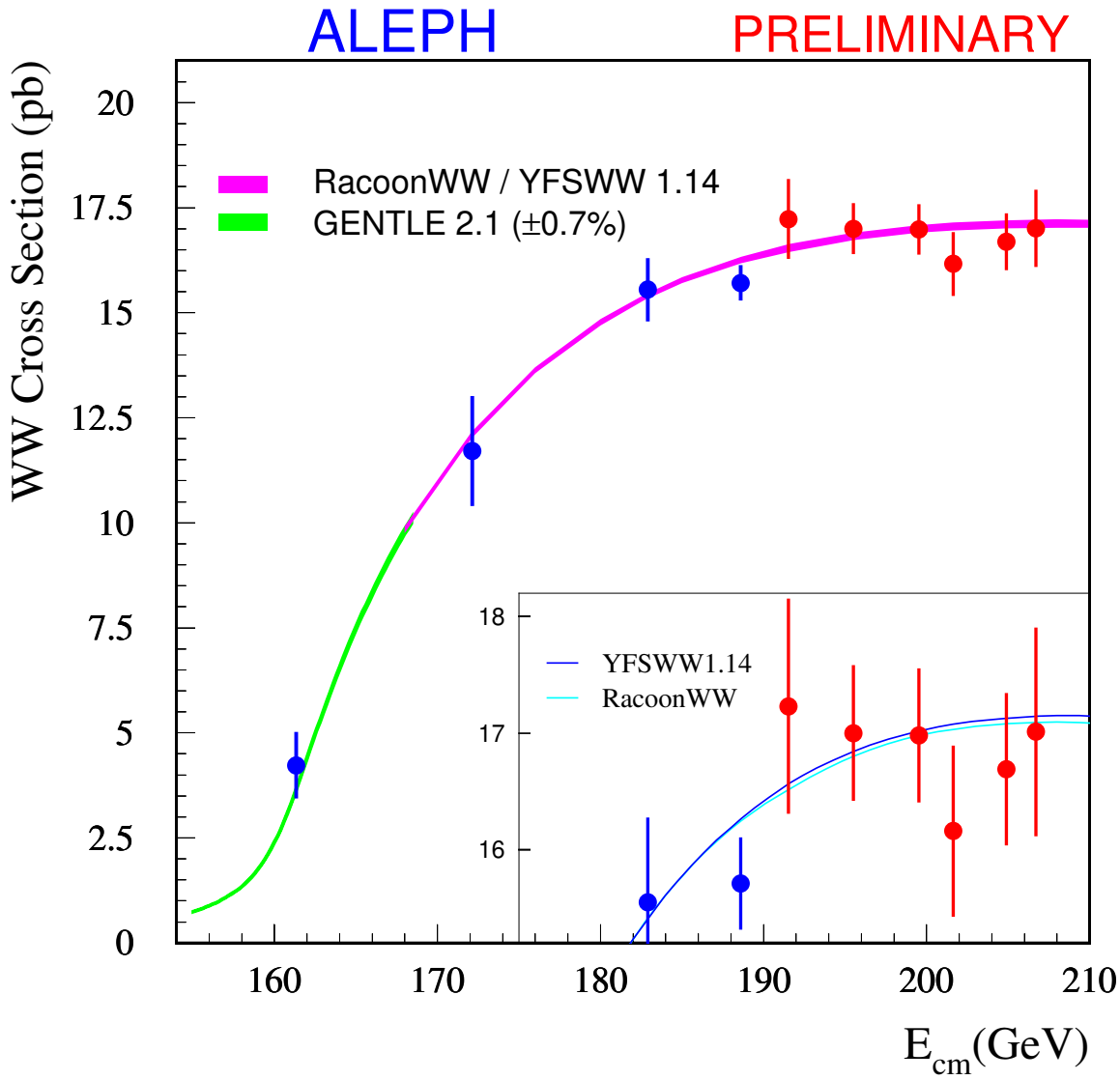
WW cross section

At 204.9 GeV

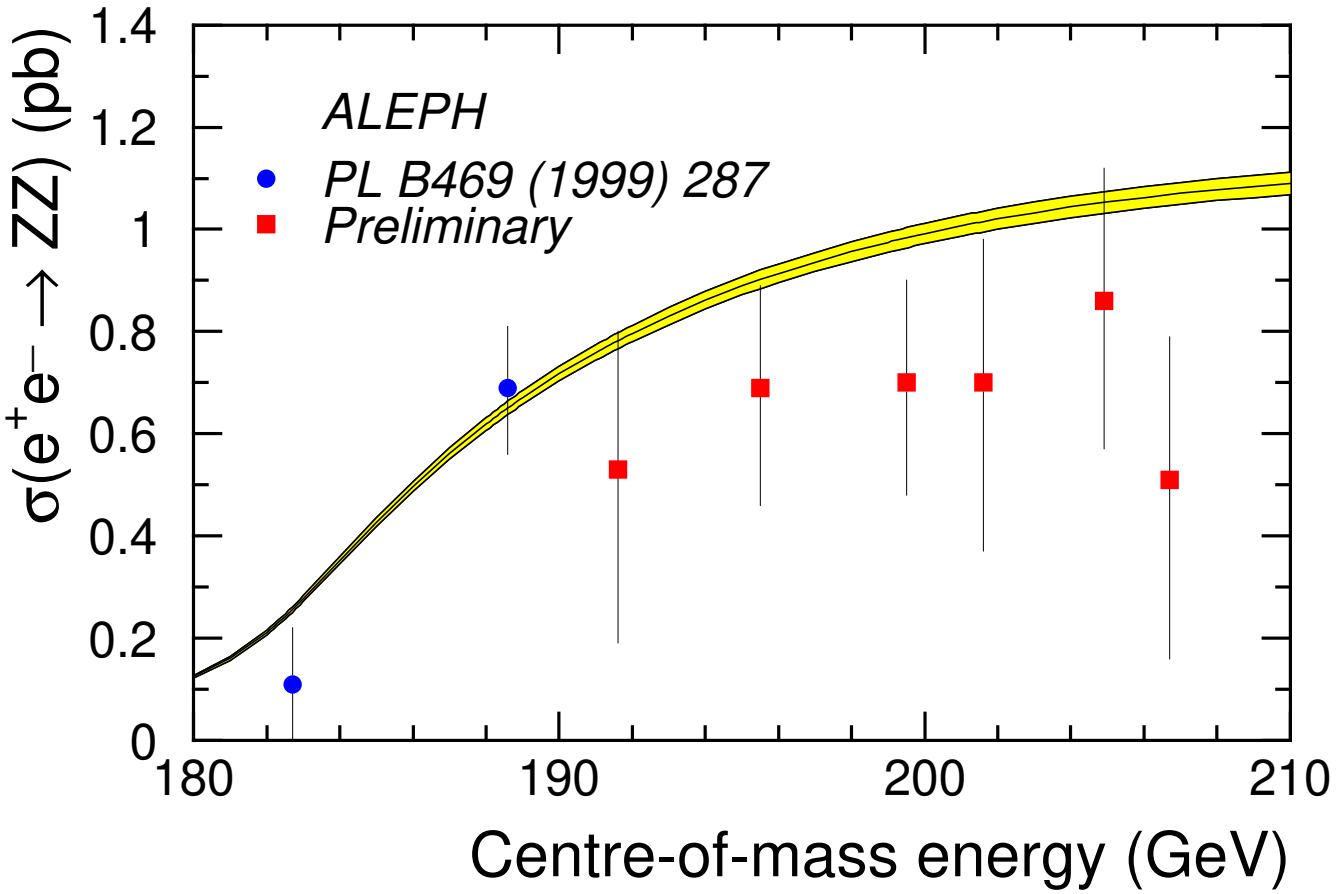
$\sigma^{WW}_{CC03} = 16.70 \pm 0.61$ pb

At 206.7 GeV

$\sigma^{WW}_{CC03} = 17.01 \pm 0.86$ pb

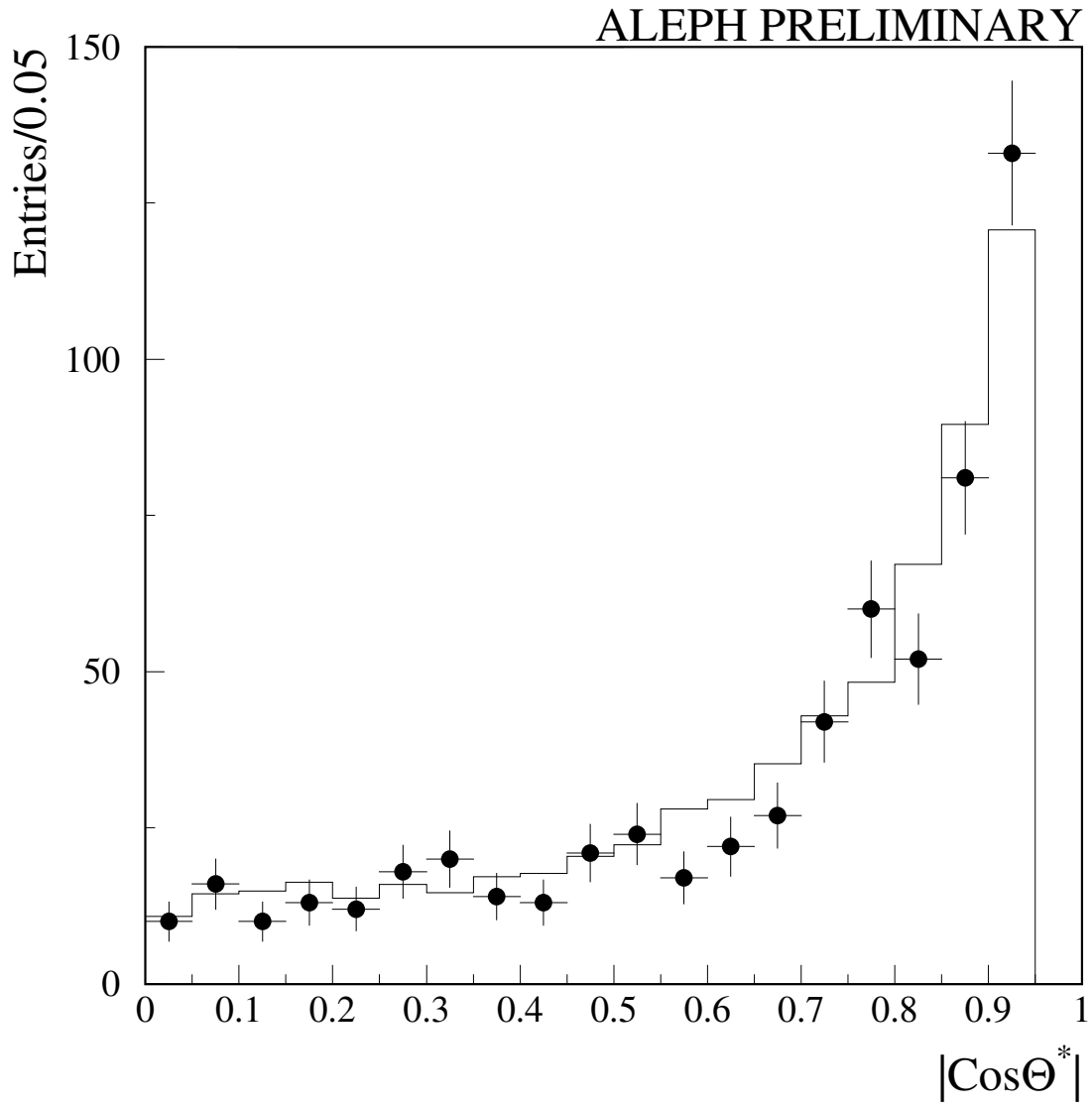


ZZ cross section



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

$\gamma\gamma$ production



605 observed

c/w

640 expected

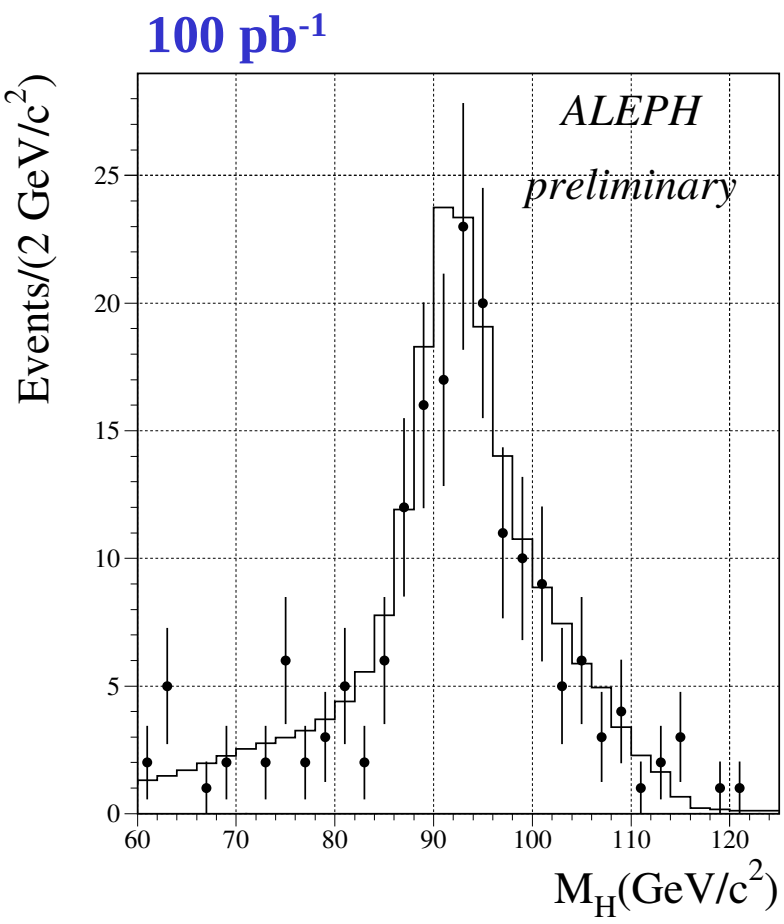
Higgs searches

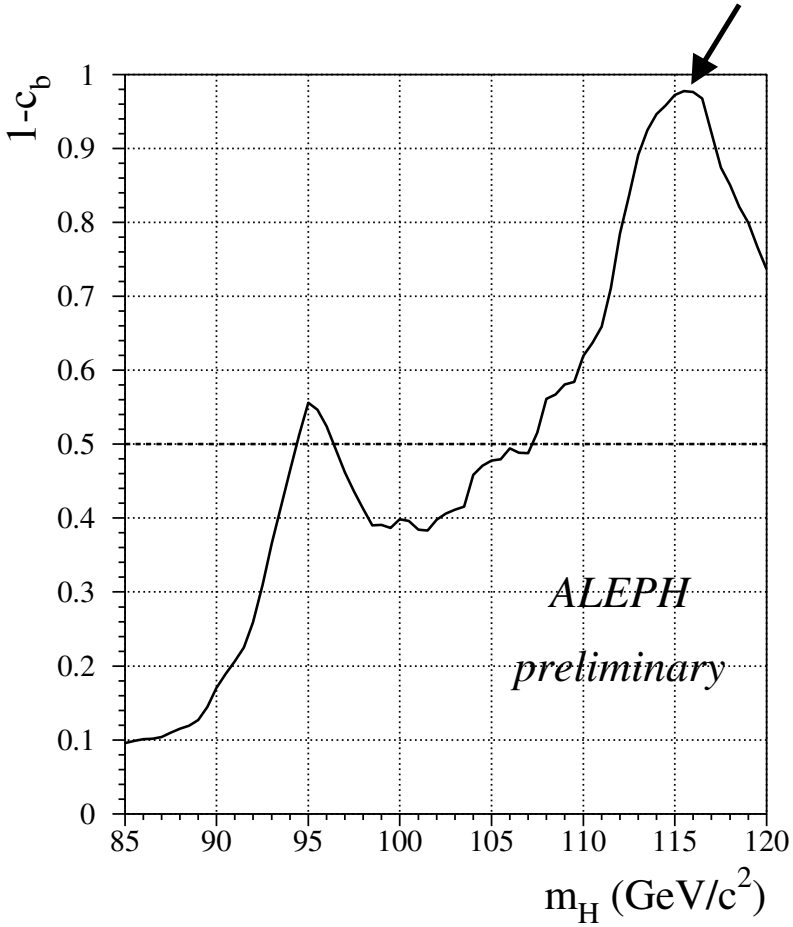
SM Higgs

84 observed c/w 82.7 expected

C_b= 0.02

100 pb^{-1}





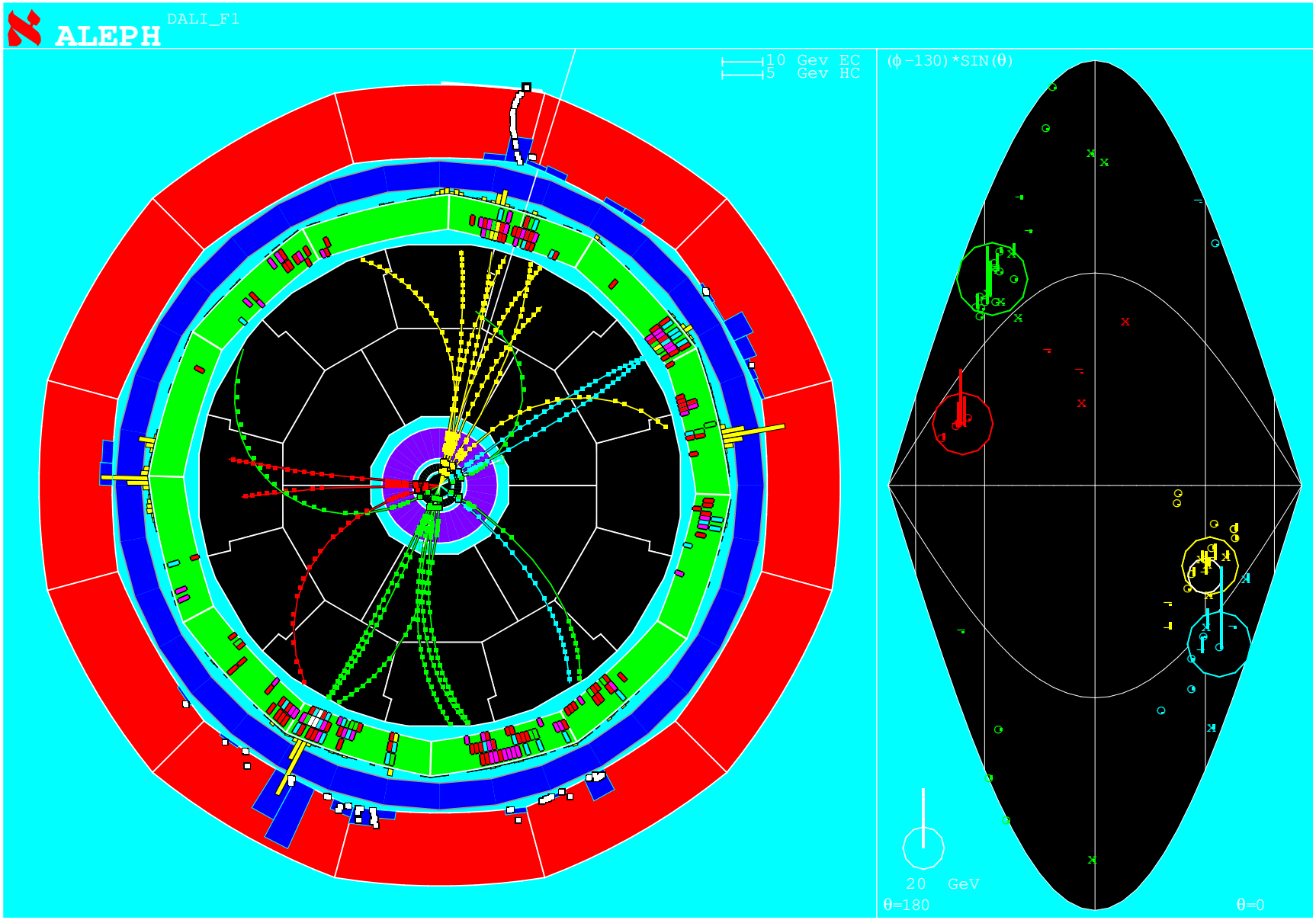
Excess

SM

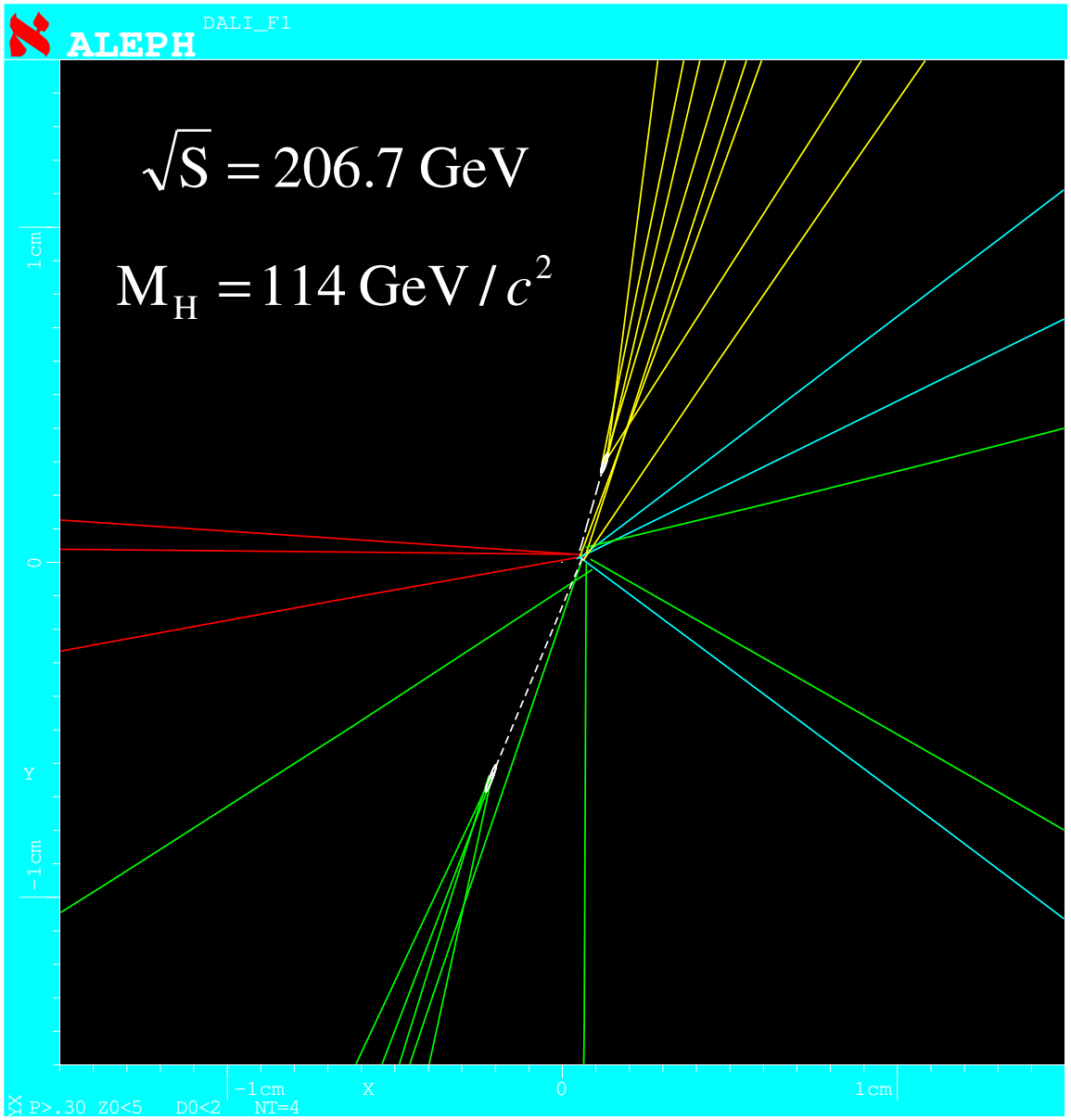
Deficit

$M_H > 111.1$ GeV/c^2 (112.3 GeV/c^2 exp)

SM Higgs bbqq candidate



SM Higgs bbqq candidate - vertex region



Fermiophobic Higgs

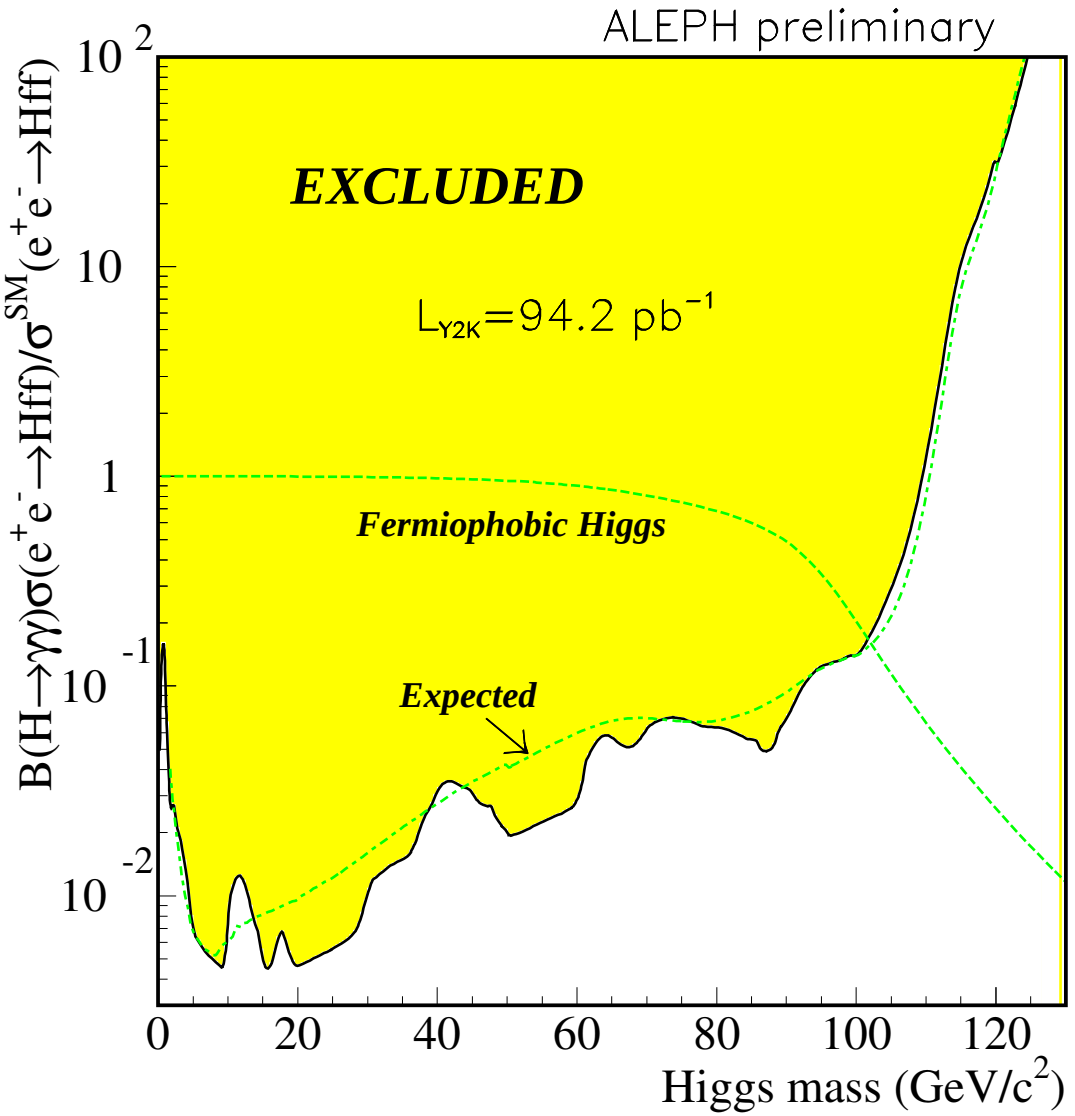
$e^+e^- \rightarrow HZ, H \rightarrow \gamma\gamma$

2 obs / 2.2 exp

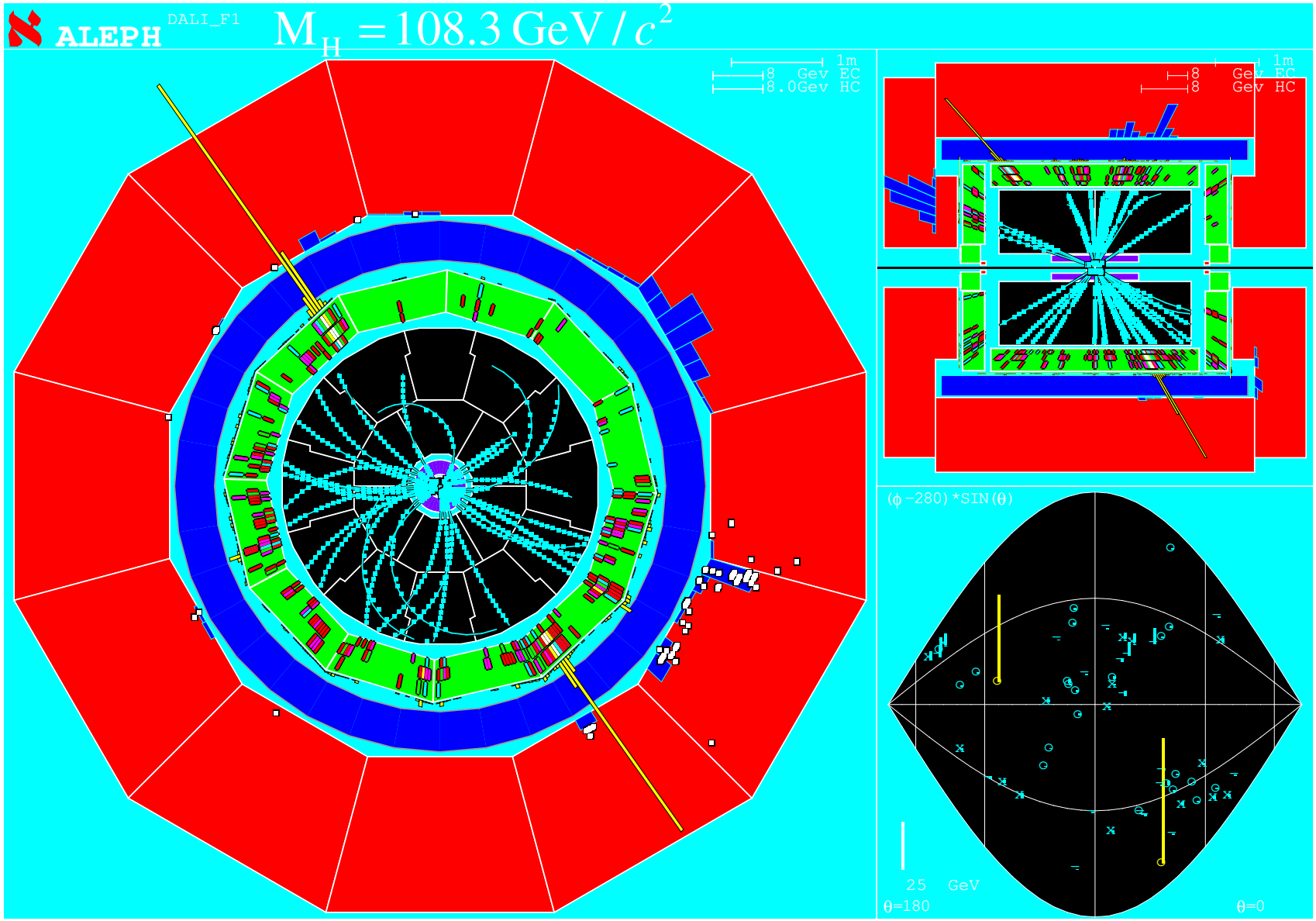
Fermiophobic Higgs

$M_H > 101.7$ GeV/ c^2

(exp 102.2 GeV/ c^2)

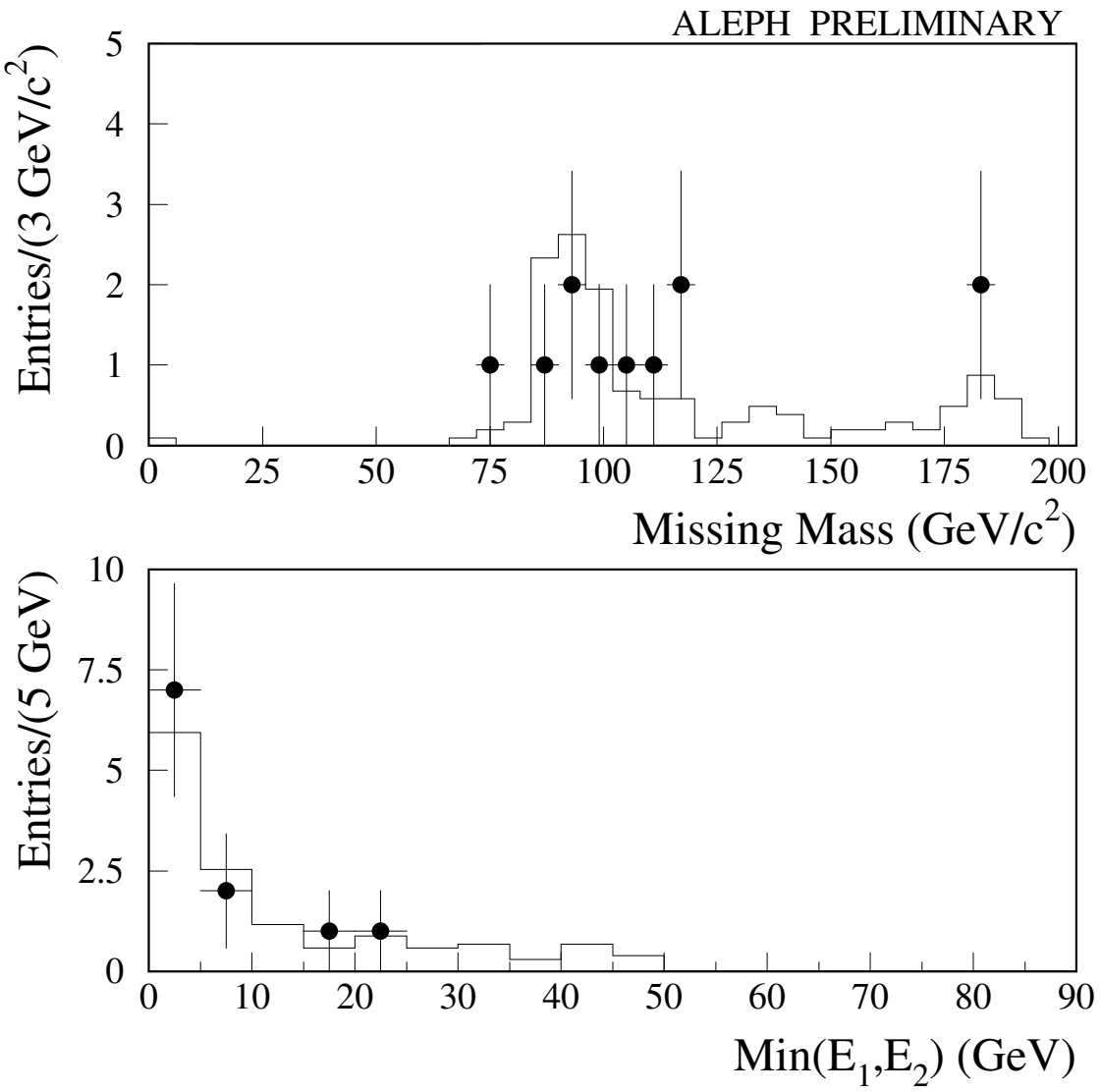


Fermiophobic Higgs candidate



SUSY searches

GMSB: χ NLSP



$\gamma\gamma$ + missing E

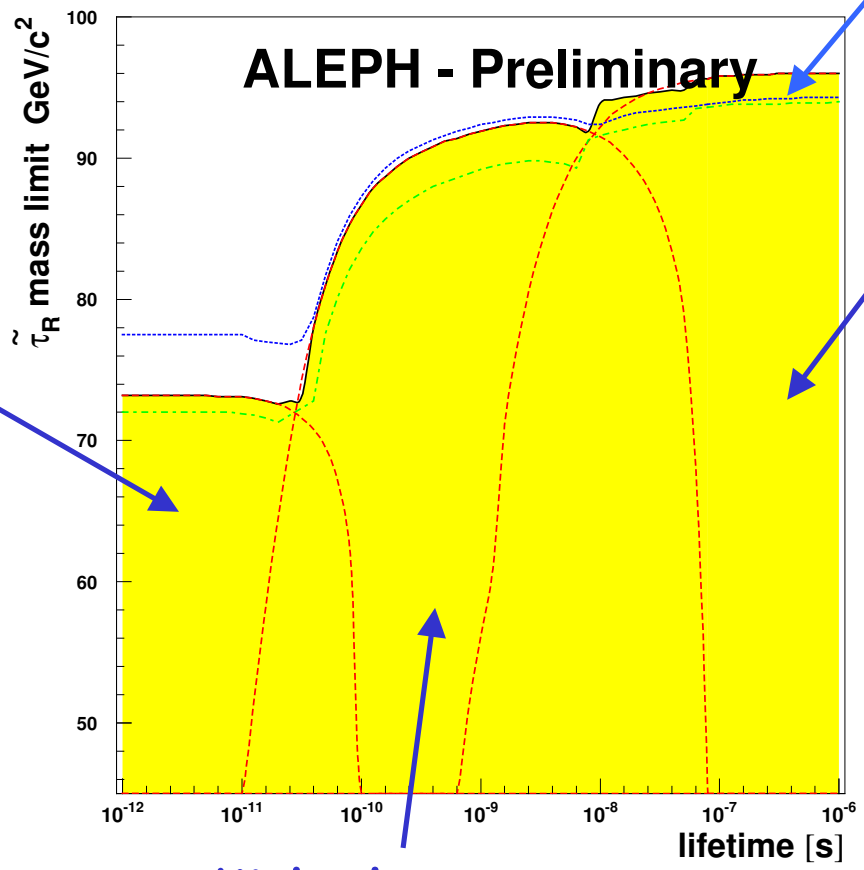
	# obs	# exp
preselection	10	8.2
GMSB	0	0.7

(E>36 GeV)

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

GMSB: $\tilde{\tau}$ NLSP

Three search topologies depending on $\tau_{\tilde{\tau}}$



Expected limit

Stable heavy leptons (0 obs/ 0.6 exp)

Acoplanar leptons

Kinks, large impact parameter (0 obs/0.3 exp)

Lifetime independent mass limit

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

RPV - UDD results

Search	SUSY signal	#exp events	# obs events
4 broad jets*	$\tilde{q}$	59	58
4 jets*	χ^+, χ	355	353
Many jets	χ^+, χ	4.5	4
Many jets + lepton	χ^+, χ	8.6	11
4 jets + 2 leptons	$\tilde{\ell}$	2.4	3
Many jets + 2 leptons	$\tilde{\ell}$	3.3	3
4 jets + E_{miss}*	$\tilde{\nu}$	38	33
Many jets + E_{miss}*	$\tilde{\nu}$	36	40

* sliding mass cut

RPV - LQD results

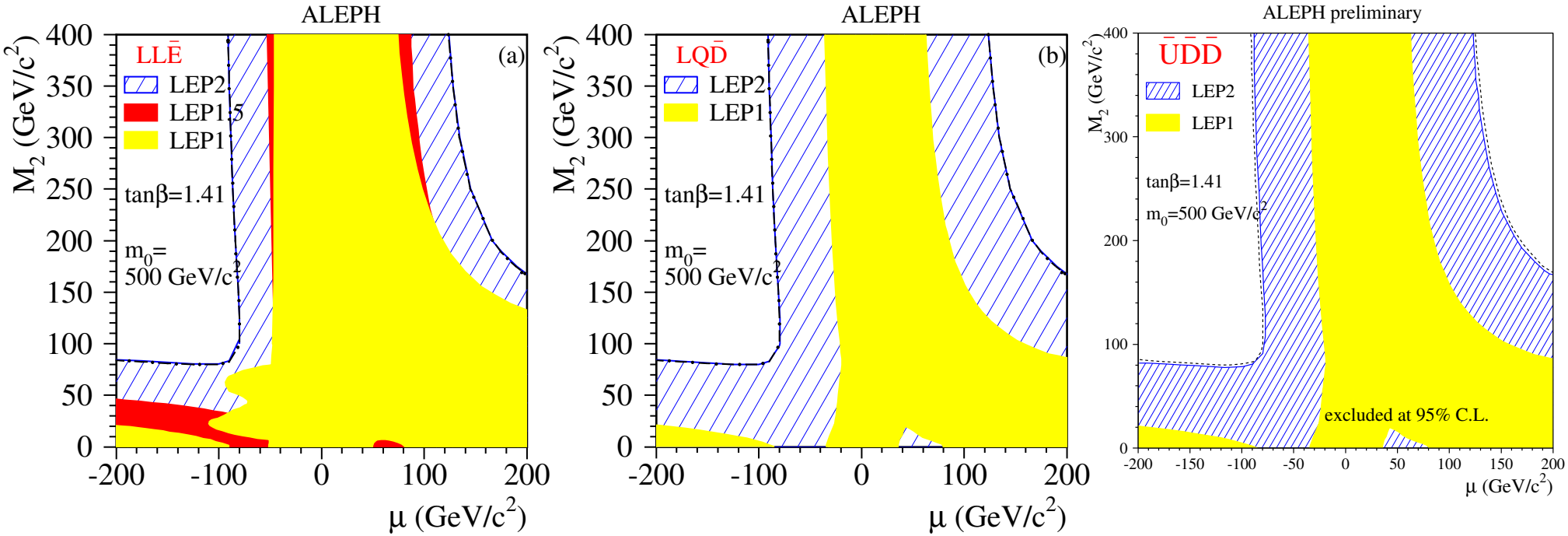
Search	SUSY signal	# exp events	# obs events
Multijets +leptons	χ^+	5.8	7
2 jets + 2 Taus	$\tilde{q}$	5.5	6
2 jets + E_{miss}*	$\tilde{q}$	11.3	16
4 jets	$\tilde{\ell},\tilde{\nu}$	395	378

RPV - LLE results

Search	SUSY signal	# exp events	# obs events
Leptons + hadrons	χ^+	4.4	4
4 leptons	$\tilde{\nu}$	2.9	1
2 leptons + 2 taus		0.9	0
4 taus		2.0	0
Acoplanar leptons	$\tilde{\ell}$	100.	92
4 leptons + E_{miss}		3.4	0
6 leptons + E_{miss}		0.6	0

RPV : μ–M_2 exclusion limits

RPV Charginos excluded up to kinematic limit



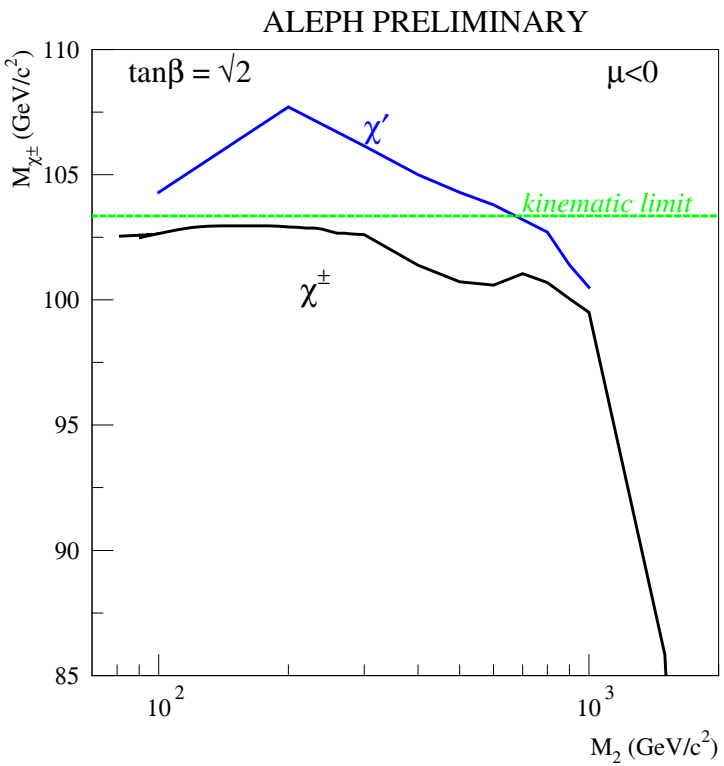
Charginos + Neutralinos

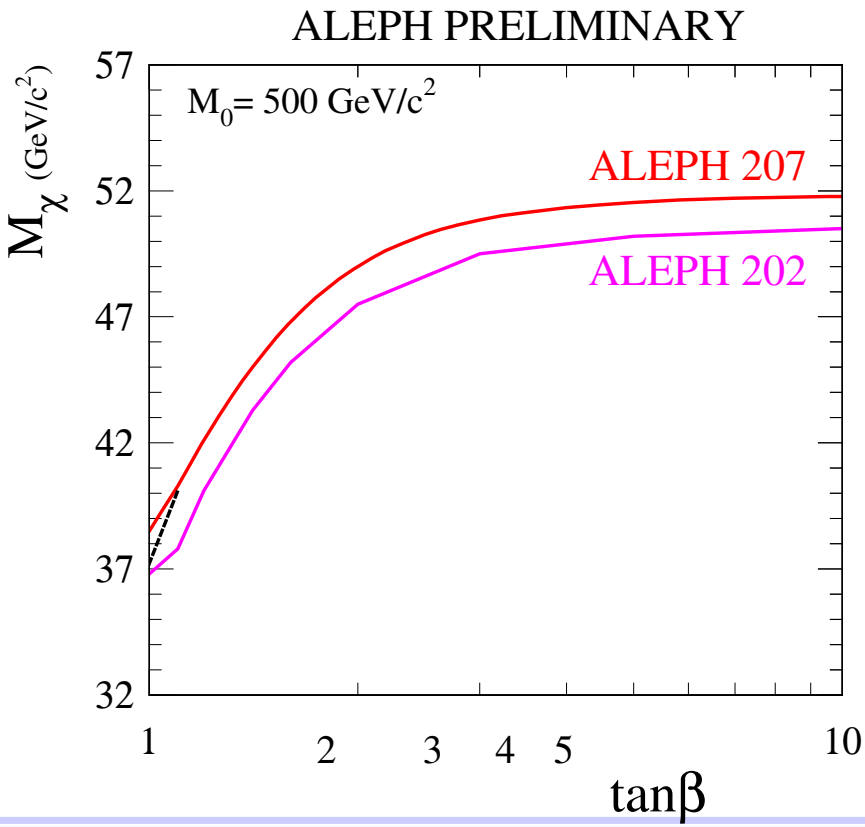
Channel	# exp	# obs
$\chi\chi'$	1.2	1
$\chi^+\chi^-$	4.5	6

For large M_0

$M_{LSP} > 37.2\ GeV/c^2 \quad (\chi^{\pm})$

$M_{LSP} > 38.5\ GeV/c^2 \quad (\chi^{\pm}, \chi)$

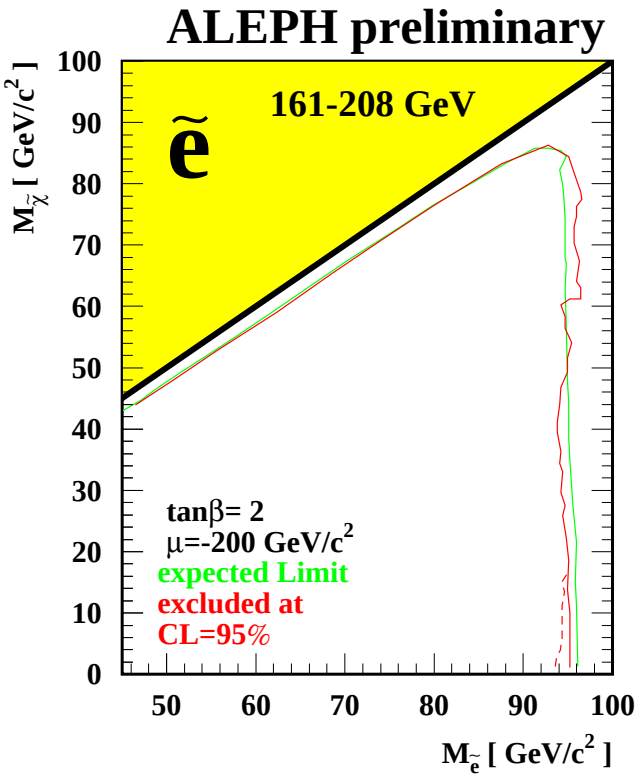


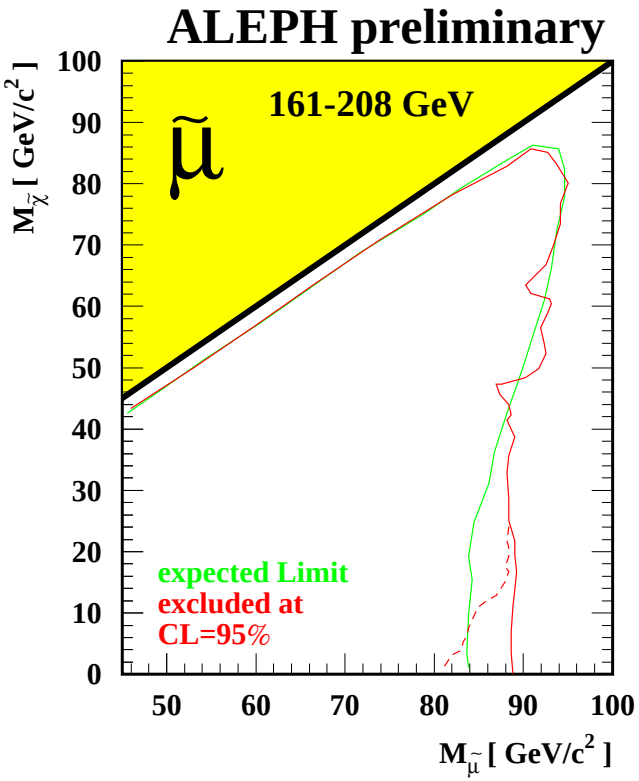


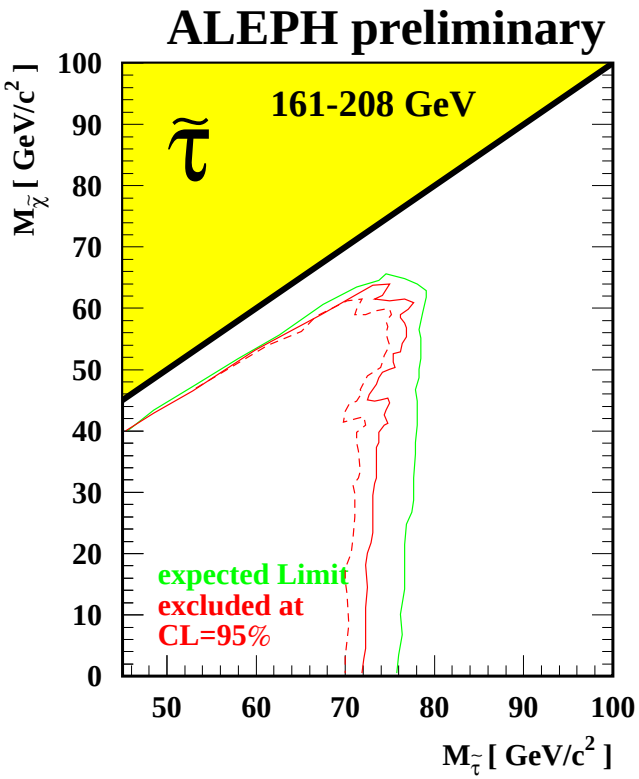
Sleptons

High ΔM →

Channel	# expected events	# observed events	Limit (GeV) At M_χ=0
ee	18.4	20	95
μμ	16.5	19	88
ττ	10.0	10	72

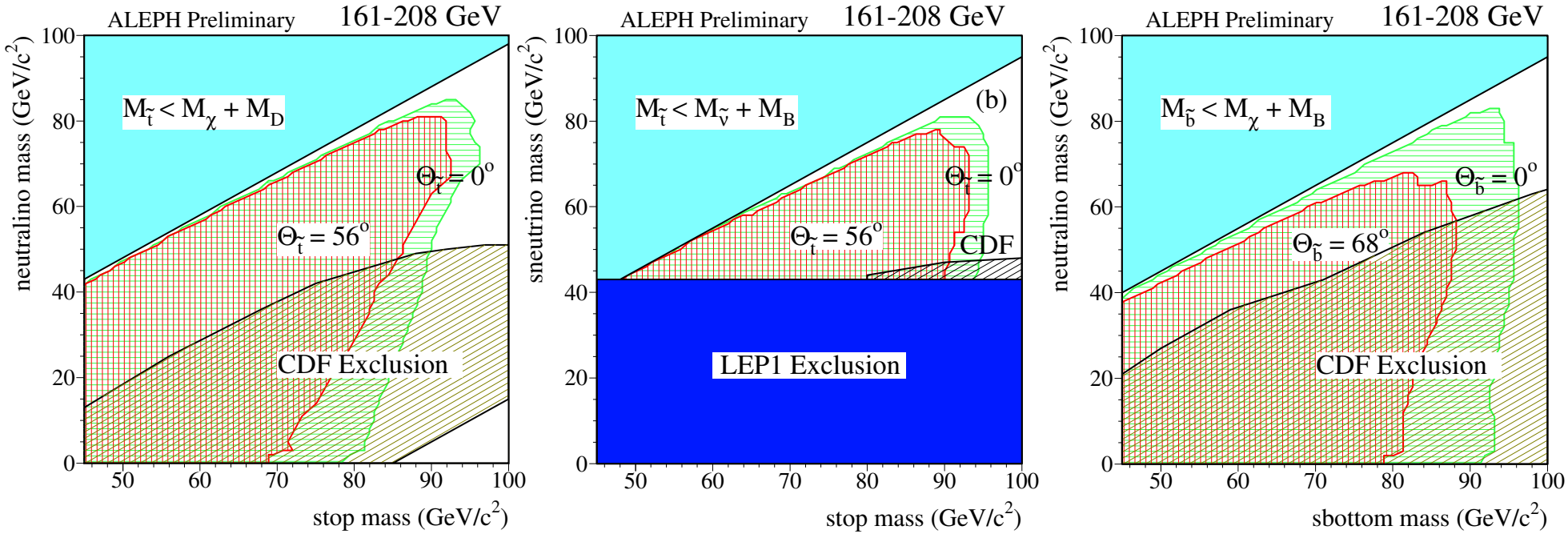






Squarks

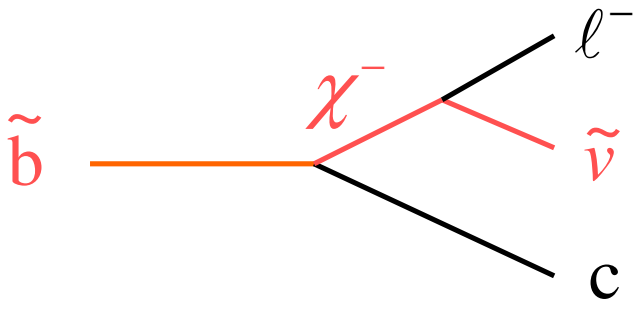
Channel	# expected events	# observed events
$\tilde{t} \to c\chi$	5.2	7
$\tilde{t} \to b\ell\tilde{\nu}$	0.7	1
$\tilde{b} \to b\chi$	1.1	2



Light sbottom search

As as result of a communication from CDF

Search for $e^+e^- \rightarrow \tilde{b}\bar{\tilde{b}}$,

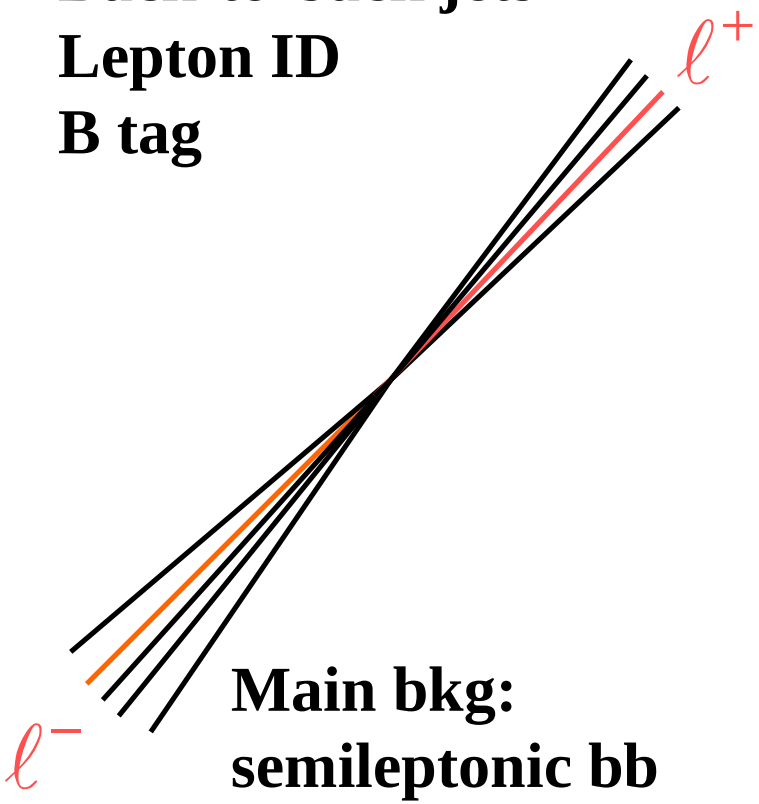


with,

- $M_{\tilde{b}} \approx 4\,\mathrm{GeV}/c^2$
- $M_{\tilde{\nu}} \approx 0\,\mathrm{GeV}/c^2$
- $\tau_{\tilde{b}} \approx 1\,\mathrm{ps}$
- $B(\tilde{b} \rightarrow c\mu^-\tilde{\nu}) = B(\tilde{b} \rightarrow ce^-\tilde{\nu}) = 0.5$
- $\tilde{b}$ and $\tilde{\nu}$ mix and decouple from the Z

Selection at LEP2

Back-to-back jets
Lepton ID
B tag



Main bkg:
semileptonic bb

Cuts:

- **hadronic preselection**
- **2 opposite sign charged leptons**
- **acoplanarity < 8^0**
- **$E(l_1)>0.2*ELEP$, $E(l_2)>0.1*ELEP$**
- **$|\cos\theta_{thrust}| < 0.7$**
- **$\log(P_{uds}) < -1.7$**

Efficiency = 27%
Background: ~100% qq
78% bb
18% cc
4% uds

Results

ELEP (GeV)	L(pb^{-1})	#exp	# obs
161	11	0.7	1
172	11	0.7	4
183	59	3.6	9
189	174	10.7	19
192	29	1.7	1
196	80	4.4	6
200	86	4.6	8
202	42	2.5	5
205	94	4.7	3
Total	586	33.6	56
Same sign	411	24.0	27

($Eff_{sbottom}$=1.5%)

Status

Probability of such a fluctuation $=2.5\ 10^{-4}$

Including 10% systematics $=2\ 10^{-3}$

Analysis is very new

Details given to LEP SUSYWG

Statistics not a problem at sbottom factories

Running requests

1. To run immediately in a mode which will give maximum luminosity
   at the highest energy - assumed to be 2 x 2.

2. To take at least 10 pb^{-1} at the highest energy using the reserve if necessary.

3. Continue to take data at high energy after the scheduled end of run
   until such time as the Higgs reach for a 3 sigma discovery,
   estimated on the basis of a three month continuation,
   is excluded at 95% confidence level.

4. If point 3 is reached before the end of September the collaboration
   considers that a dedicated run of 200pb^{-1} for the W mass at threshold
   will provide an excellent increase in the accuracy of the measurement
   of this fundamental parameter

5. A 0.5 pb^{-1} calibration run at the Z peak at the end of the run

6. Energy calibration should be a priority

Conclusions

All standard searches performed on 93 pb-1 @ 203-208 GeV

Good agreement with SM predictions

No evidence of new physics at high energy

Cannot rule out light sbottom production

Two good high mass Higgs candidates observed
(1 SM, 1 fermiophobic)

Congratulations to LEP operations and RF groups!