



DELPHI report

Status of DELPHI

SUSY selected topics

- Charginos
- Staus
- Light sbottom

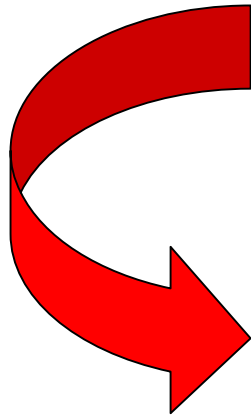
Higgs

DELPHI conclusions



Status

Data taking: summary as of 30-8-2000 and used for the results presented here which are to be considered **VERY preliminary!**



E GeV	Lumi pb ⁻¹	Lifetime(including Bef.Phys.)
102.38	69.6	96.24%
103.06	23.3	95.80%
103.26	60.6	94.77%
104.03	7.3	95.53%

Amazing LEP: thanks !

Problems:

Minor: Vertex Det movements

(order of 20 microns)

Major: Sector 6 of our TPC has died last Friday

Solution:

Z0 running

Modify tracking
code to use only

VD, ID, OD, FCA, FCB, RICH



TPC problem

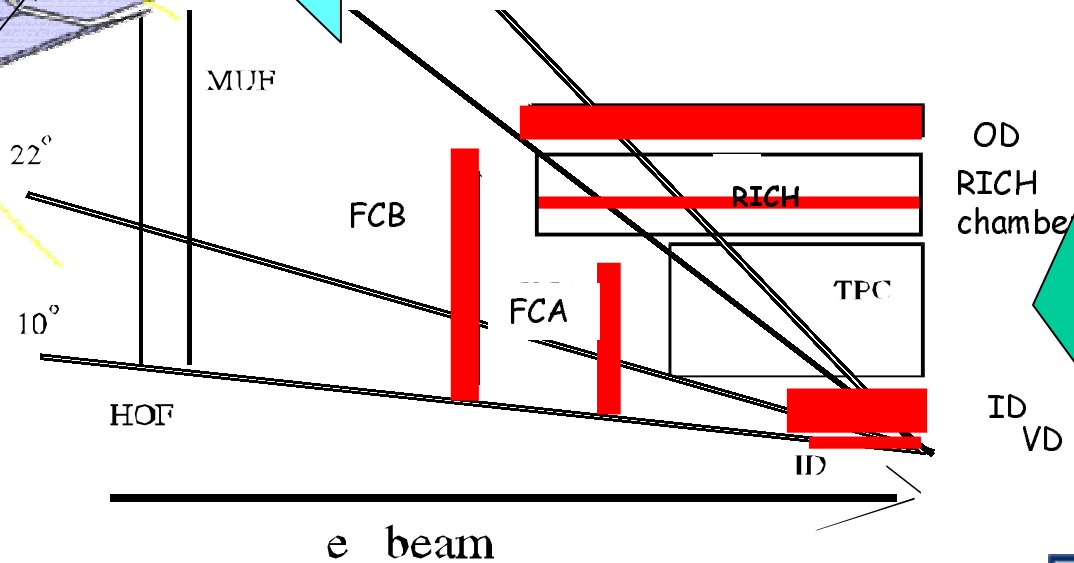
Still trying out 'remote' recovery

In parallel: commission tracking without TPC

1/12 TPC volume affected

Short circuit
between one field
and sense wire

(1 Sep 2000)



5 September 2000

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Susy: charginos 7.53 pb⁻¹ @ 208 GeV

Topology	JJlep	lep-lep	jets	radiative	Total
$3 \leq \Delta M < 5 \text{ GeV}/c^2$					
Obs. events:	0	1	1	0	2
Expect. events:	0.09 $^{+0.157}_{-0.015}$	2.54 $^{+0.232}_{-0.138}$	0.38 $^{+0.166}_{-0.043}$	0.22 $^{+0.158}_{-0.020}$	3.23 $^{+0.362}_{-0.146}$
$5 \leq \Delta M < 10 \text{ GeV}/c^2$					
Obs. events:	0	0	1	0	1
Expect. events:	0.09 $^{+0.157}_{-0.015}$	0.69 $^{+0.178}_{-0.061}$	0.54 $^{+0.168}_{-0.047}$	0.22 $^{+0.158}_{-0.020}$	1.54 $^{+0.331}_{-0.081}$
$10 \leq \Delta M < 25 \text{ GeV}/c^2$					
Obs. events:	0	0	1	0	1
Expect. events:	0.09 $^{+0.157}_{-0.015}$	1.25 $^{+0.182}_{-0.071}$	0.57 $^{+0.165}_{-0.041}$	0.22 $^{+0.158}_{-0.020}$	2.13 $^{+0.332}_{-0.086}$
$25 \leq \Delta M < 35 \text{ GeV}/c^2$					
Obs. events:	0	0	0	0	0
Expect. events:	0.07 $^{+0.155}_{-0.009}$	0.67 $^{+0.165}_{-0.039}$	0.26 $^{+0.156}_{-0.014}$	0.22 $^{+0.158}_{-0.020}$	1.21 $^{+0.317}_{-0.047}$
$35 \leq \Delta M < 50 \text{ GeV}/c^2$					
Obs. events:	0	0	0	0	0
Expect. events:	0.09 $^{+0.155}_{-0.011}$	2.39 $^{+0.235}_{-0.089}$	0.76 $^{+0.160}_{-0.029}$	0.27 $^{+0.157}_{-0.020}$	3.52 $^{+0.360}_{-0.096}$
$50 \text{ GeV}/c^2 \leq \Delta M$					
Obs. events:	0	1	0	0	1
Expect. events:	0.17 $^{+0.156}_{-0.016}$	2.77 $^{+0.238}_{-0.095}$	0.94 $^{+0.159}_{-0.030}$	0.27 $^{+0.157}_{-0.020}$	4.15 $^{+0.363}_{-0.103}$
Total					
Obs. events:	0	2	1	0	3
Expect. events:	0.24 $^{+0.168}_{-0.022}$	5.27 $^{+0.292}_{-0.170}$	1.53 $^{+0.174}_{-0.062}$	0.35 $^{+0.159}_{-0.025}$	7.39 $^{+0.407}_{-0.184}$

Low ΔM
($\Delta M < 25 \text{ GeV}$)

Expected

4.5

Seen

1

Total

(over all ΔM)

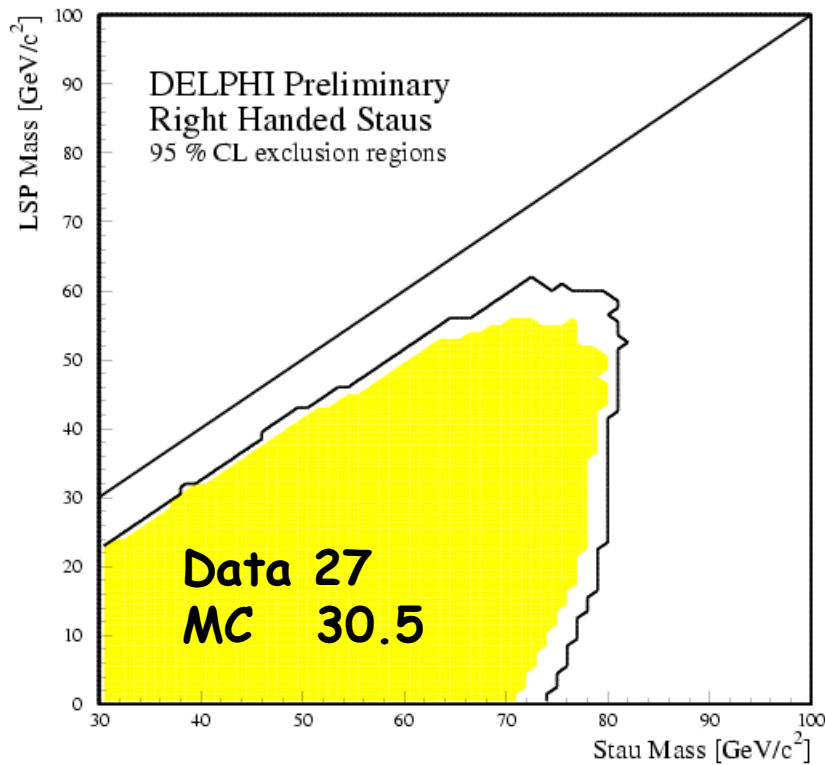
3 obs/7.4 exp



SUSY: $\tilde{\tau}$: two analyses

Luminosity 145.6 pb⁻¹

Br($\tilde{\tau} \rightarrow \tau$ LSP) from SUSYgen

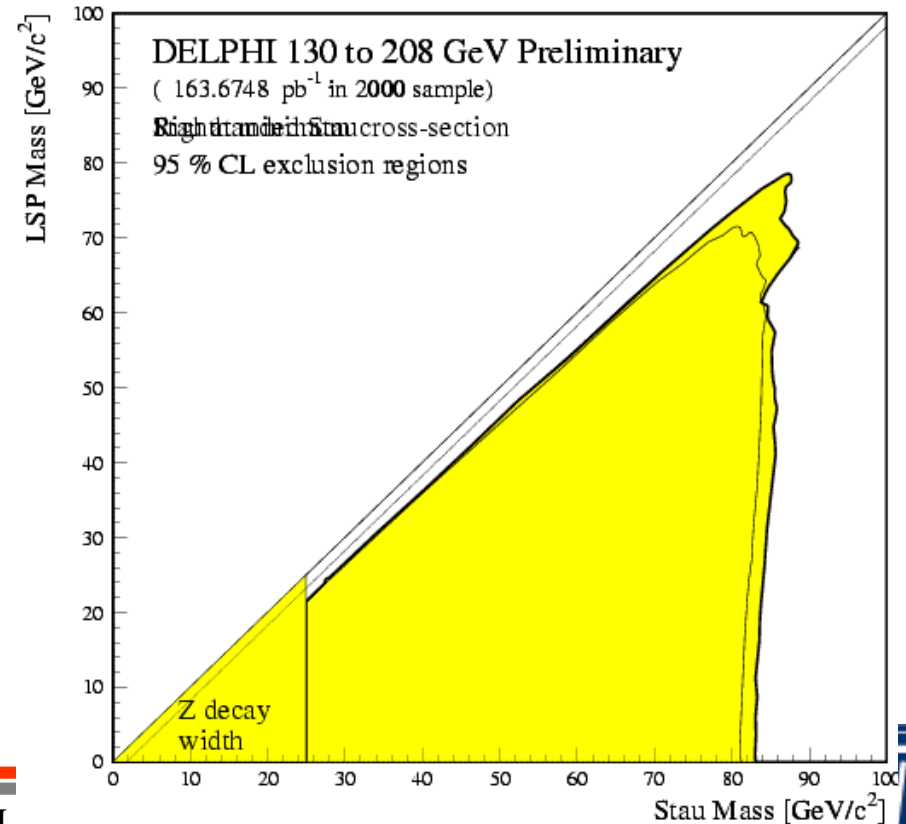


Luminosity 163.7 pb⁻¹

Low Δm Data 6 MC 10.6

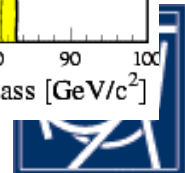
High Δm Data 12 MC 13

Br($\tilde{\tau} \rightarrow \tau$ LSP) = 100%



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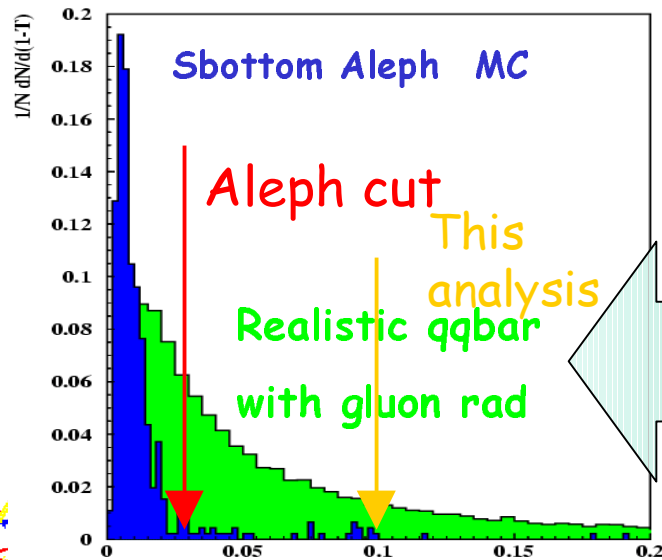
Can Delphi Find the Aleph Light sbottom ?

analysis following ALEPH selection :

- hadronic preselection
- s-prime > 55% \sqrt{s}
- $|\cos \theta| < 0.7$
- **thrust > 0.9** → softer cut (!)
- soft btag
- "LEP 1"-lepton identification
- lepton pairs : acolinearity < 8°

	opposite sign	same sign
e e	3 (8.0)	3 (7.3)
e μ	8 (6.1)	6 (3.5)
$\mu \mu$	6 (12.3)	11 (12.4)
all	17 (26.3)	20 (23.1)

Observed (Expected)



*efficiency on ALEPH signal MC: 14%
signal generated without
gluon radiation, hence efficiency with
ALEPH cut is overestimated by ≥ 3*



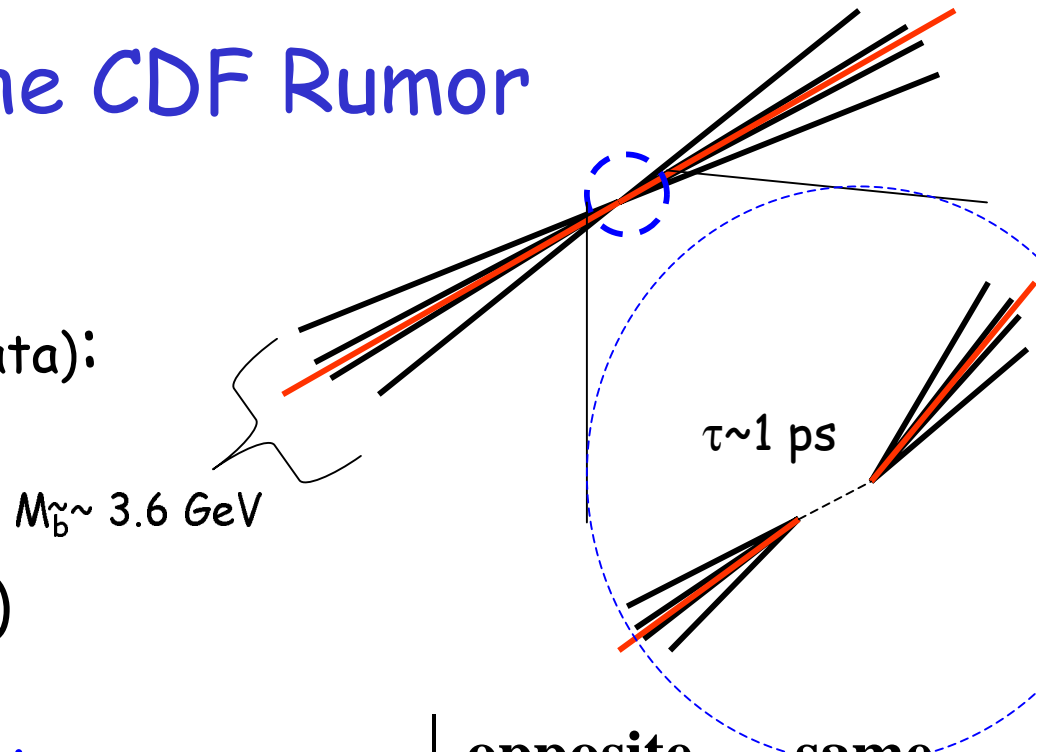
DELPHI Check of the CDF Rumor

R_b like analysis ('97 - '99 data):

- hadronic preselection
- s-prime > 85% \sqrt{s}
- W rejection cut ($E_{\min} * \theta_{\min}$)
- soft btag
- "LEP 1"-lepton identification

⇒ sbottom efficiency 16%

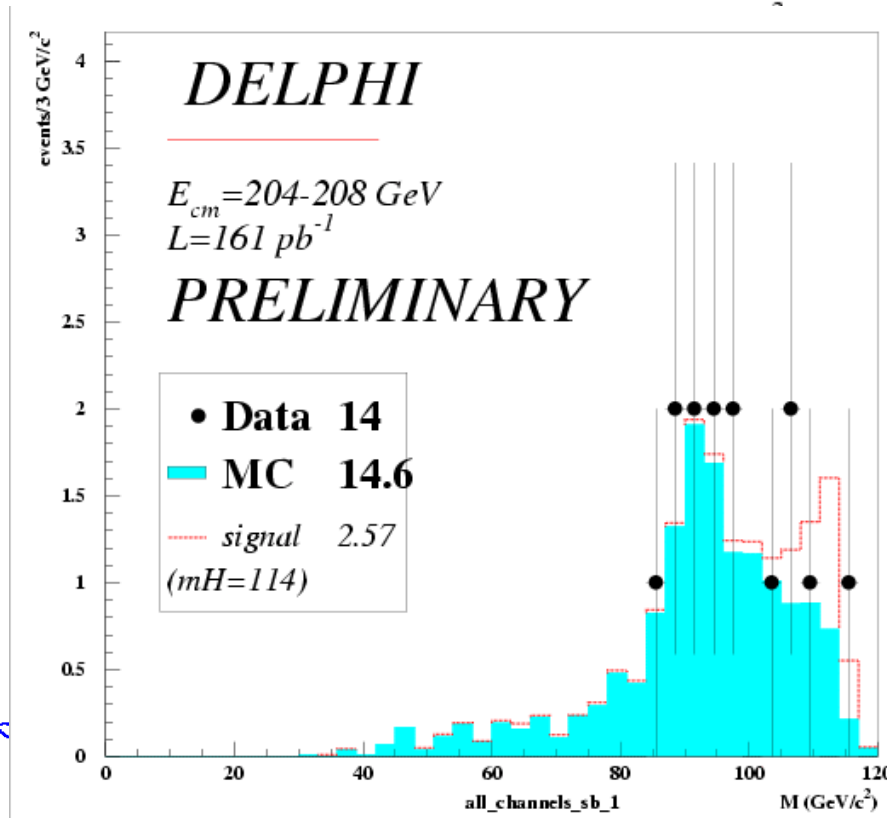
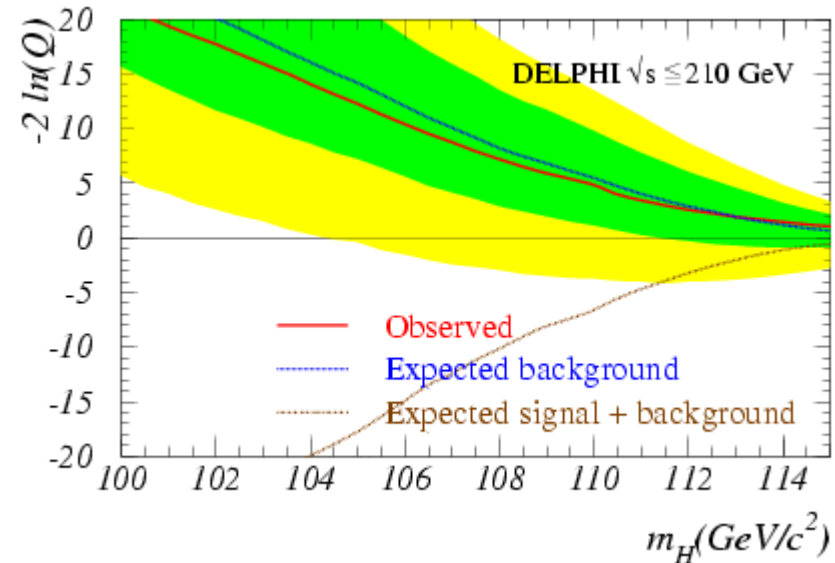
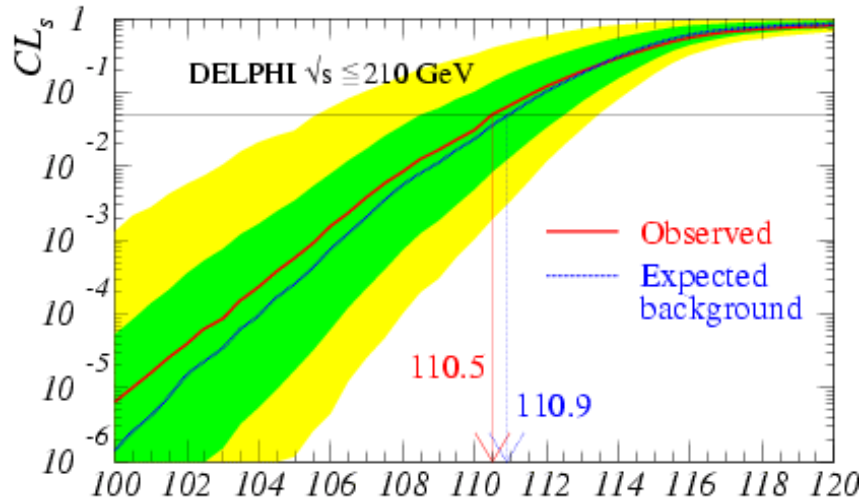
$$\tilde{b} \rightarrow c \ell \tilde{\nu} \quad \ell = \mu, e$$



	opposite sign	same sign
opposite side	41 (40.4)	37 (42.0)
same side	33 (36.8)	18 (18.0)



Higgs: std model



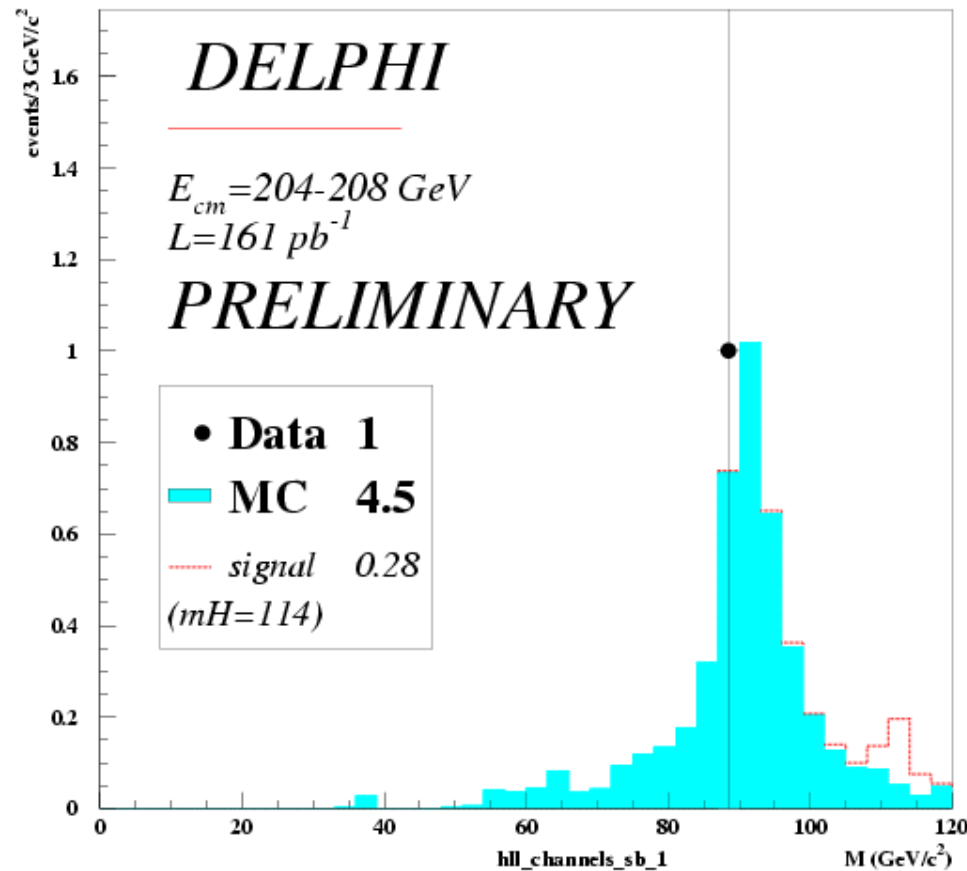
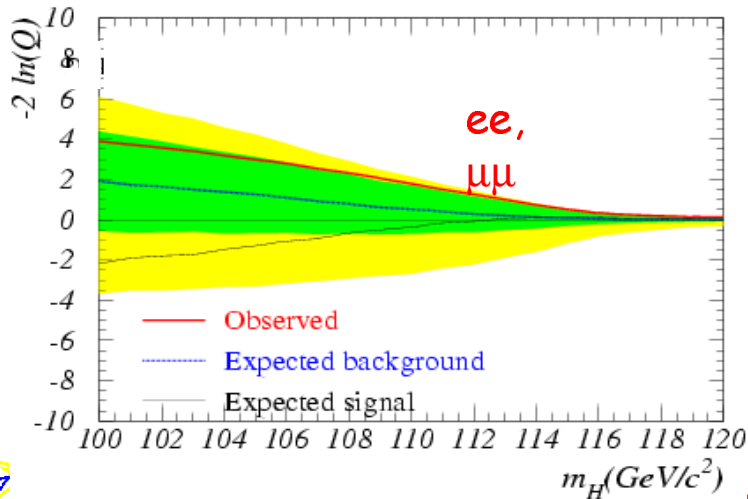
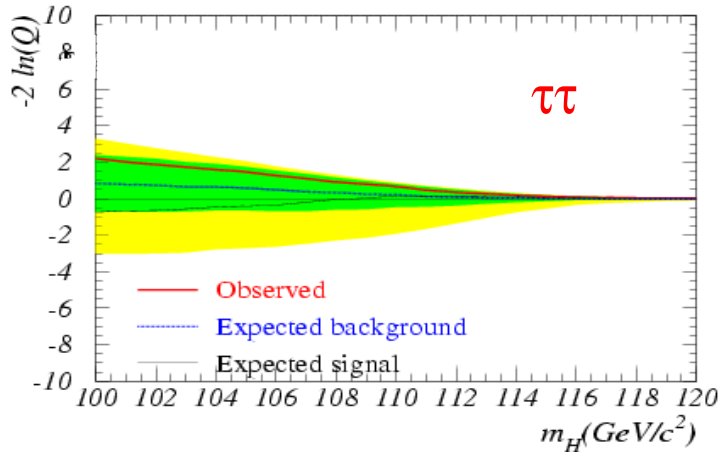
Result consists of an excess in 4 jet channel and a deficit in the leptonic and missing energy channels



Higgs: 2 jets 2 leptons

Very clean signal... but we do not see it...

6%

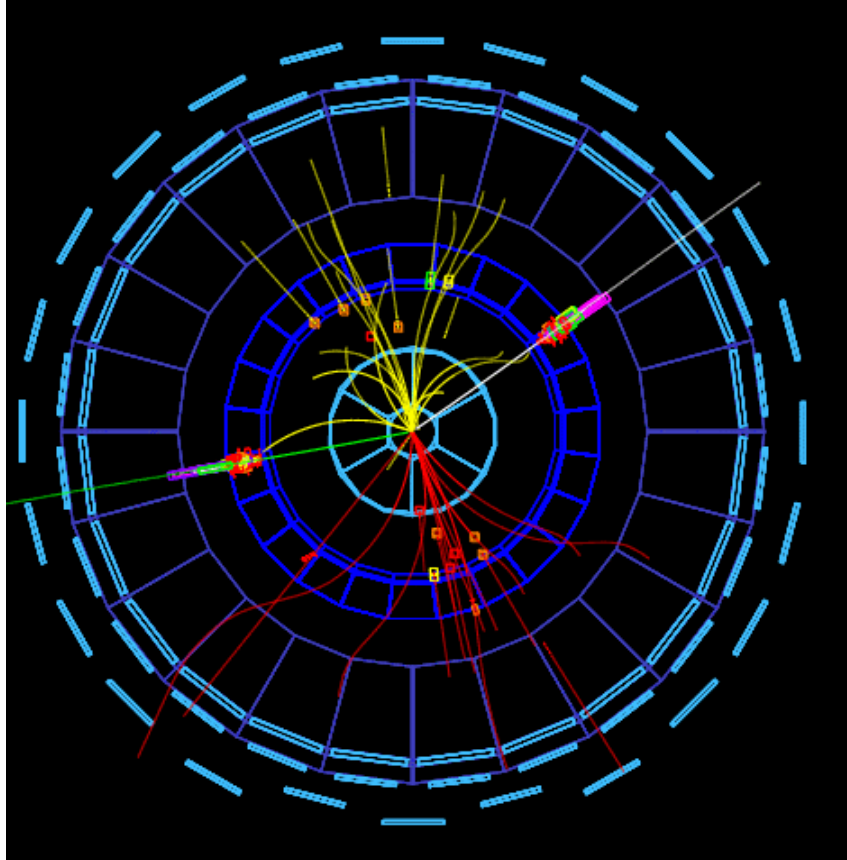


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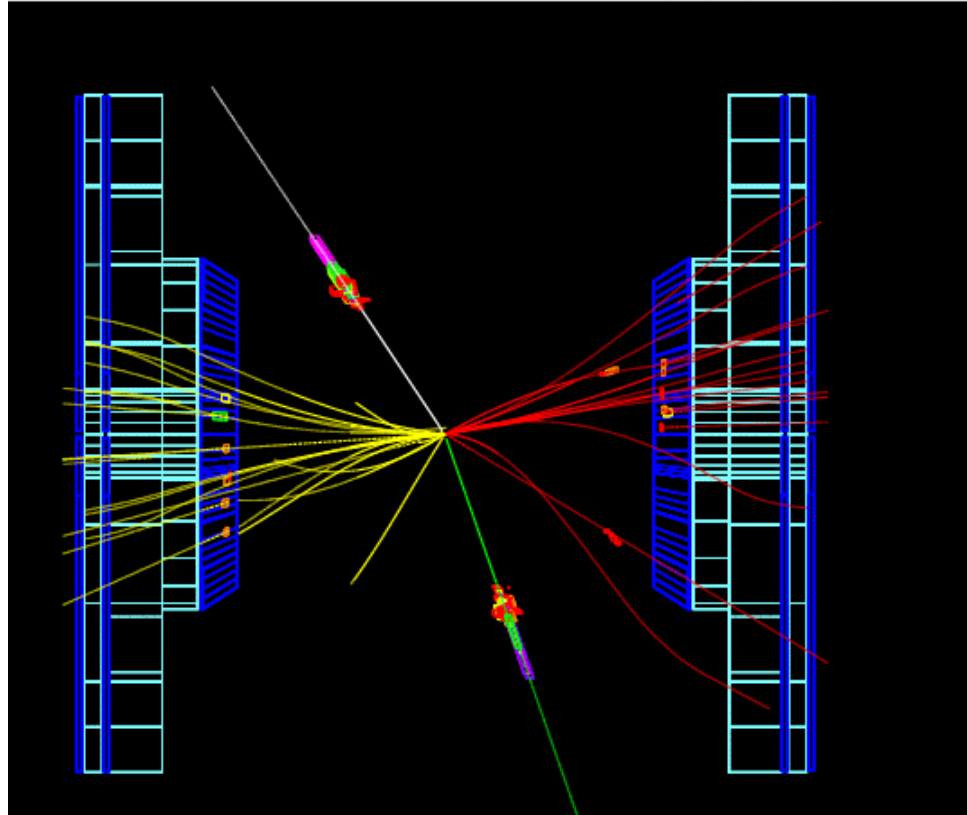
DELPHI	Run: 111886	Evt: 551	TD	TR	TS	TK	TV	ST
Beam: 102.6 GeV	Proc: 29-Jun-2000	Act	0	18	0	42	0	0
DAS: 29-Jun-2000	Scan: 1-Sep-2000	Deact	(	0	1248	1	0	1
07:29:16	tan+DSI	Deact	0	0	0	0	0	0
		Deact	(	0	1	0	1	0



eeqq

$E_{cm} = 205.2 \text{ GeV}$
 $Mass = 110.2 \text{ GeV}$

DELPHI	Run: 111886	Evt: 551	TD	TR	TS	TK	TV	ST	PA
Beam: 102.6 GeV	Proc: 29-Jun-2000	Act	0	18	0	42	0	0	0
DAS: 29-Jun-2000	Scan: 1-Sep-2000	Deact	(	0	1248	1	0	1	0
07:29:16	tan+DSI	Deact	0	0	0	0	0	0	0
		Deact	(	0	1	0	1	0	0

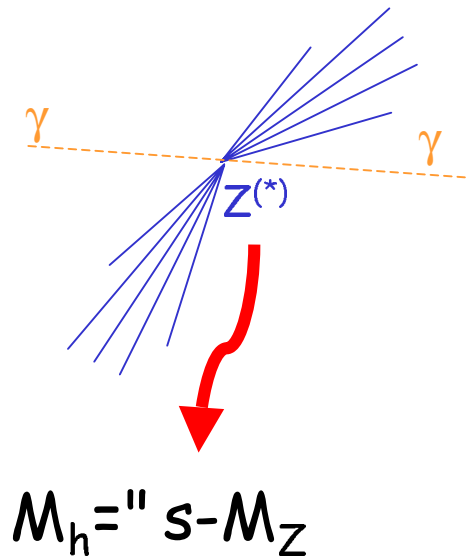


Little significance
because of low b-tagging

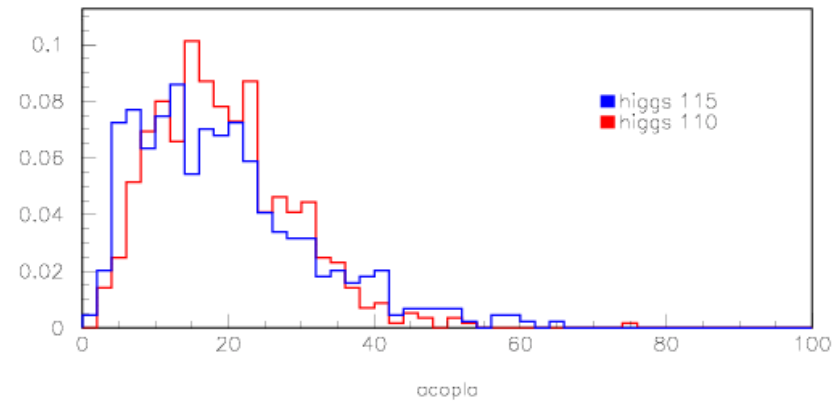
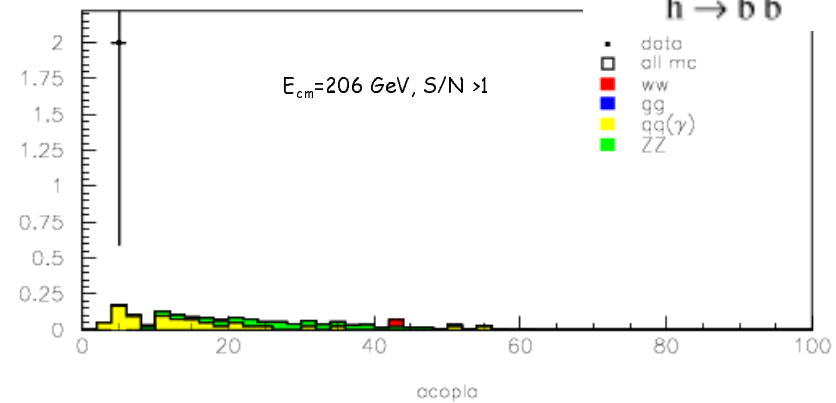


Two jets & missing energy

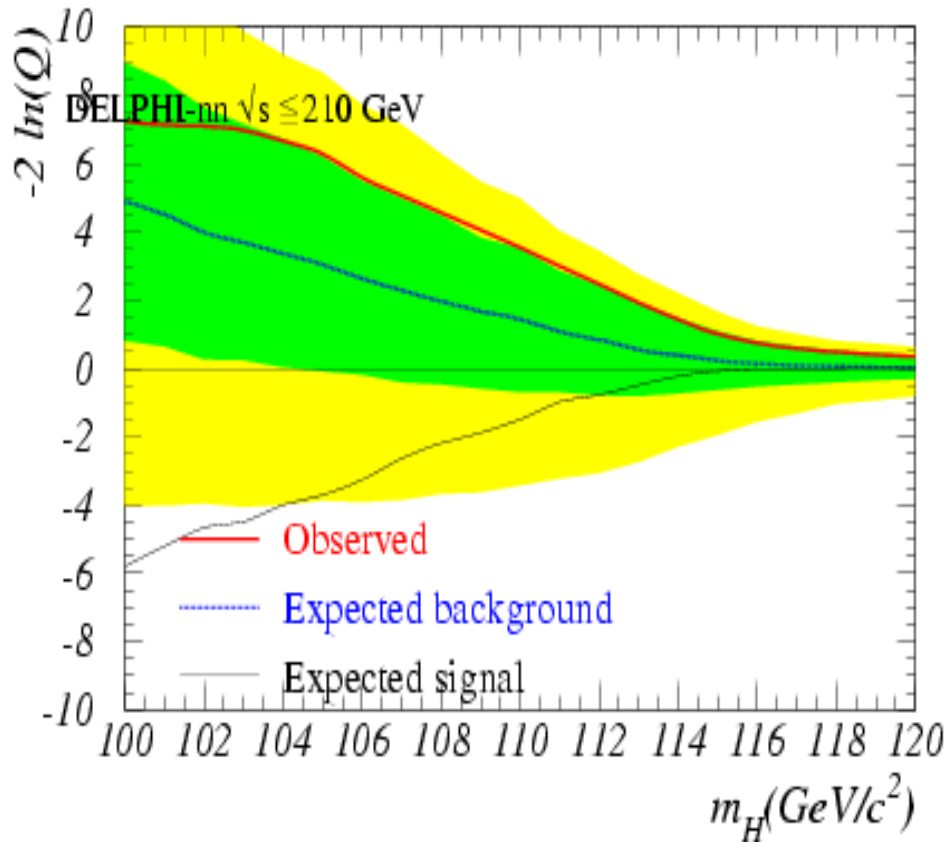
- Difficult channel: main worry is the double radiative returns to the Z resonance (γ s lost in pipe)



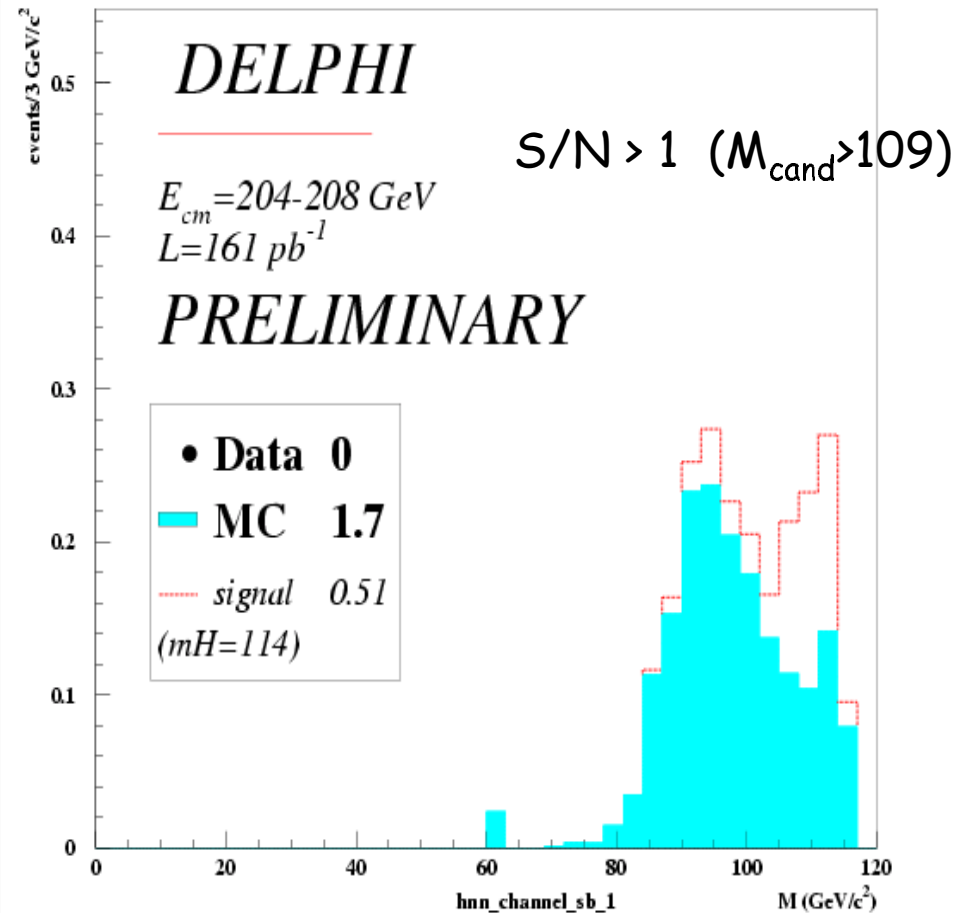
19%

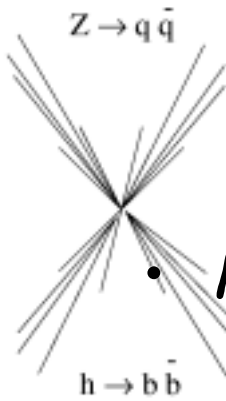


Two jets & missing energy (cont.)



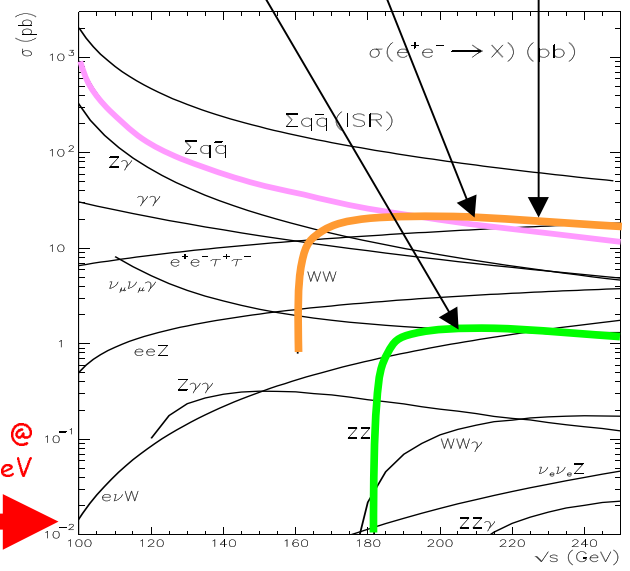
..it not there either ...





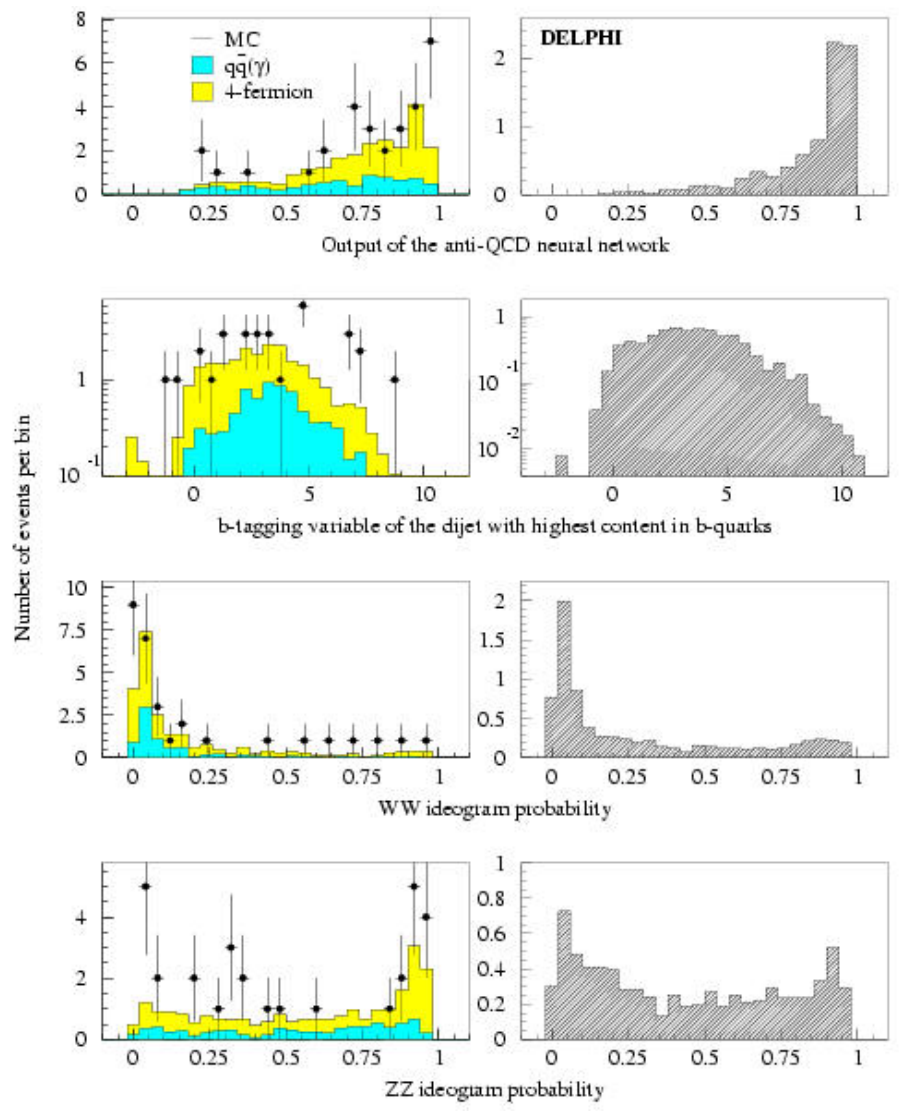
60% 4 jets

- Main worries are
 - QCD (bb gluon, gluon)
 - WW (γ)
 - ZZ (γ)

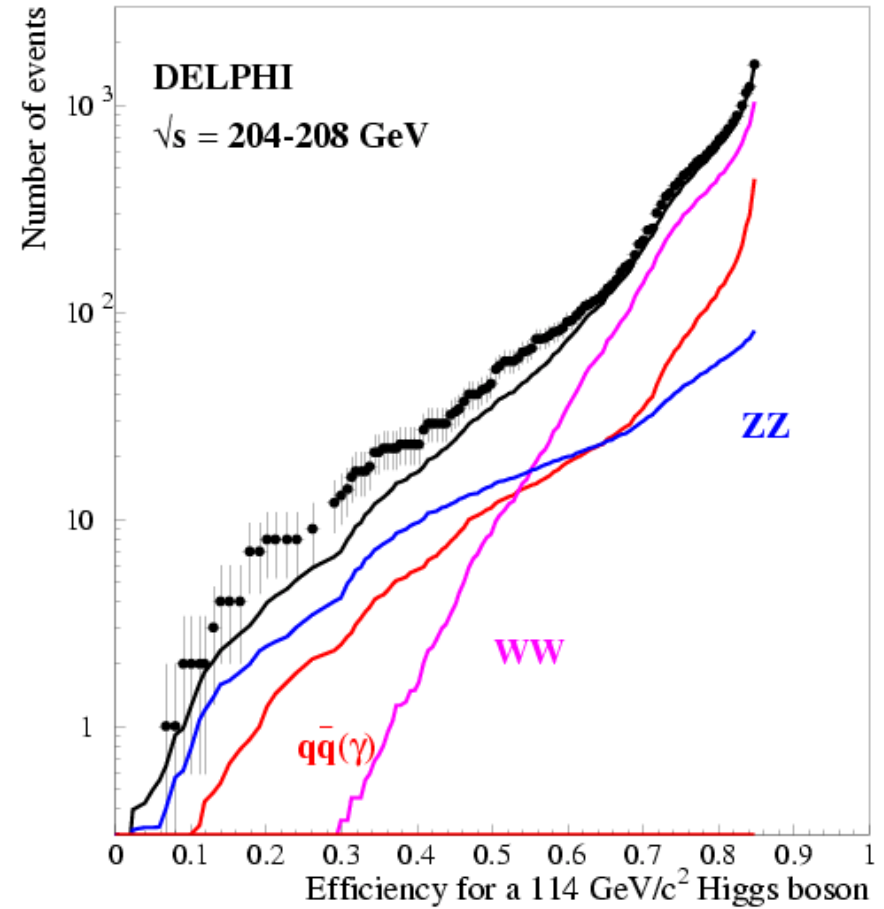
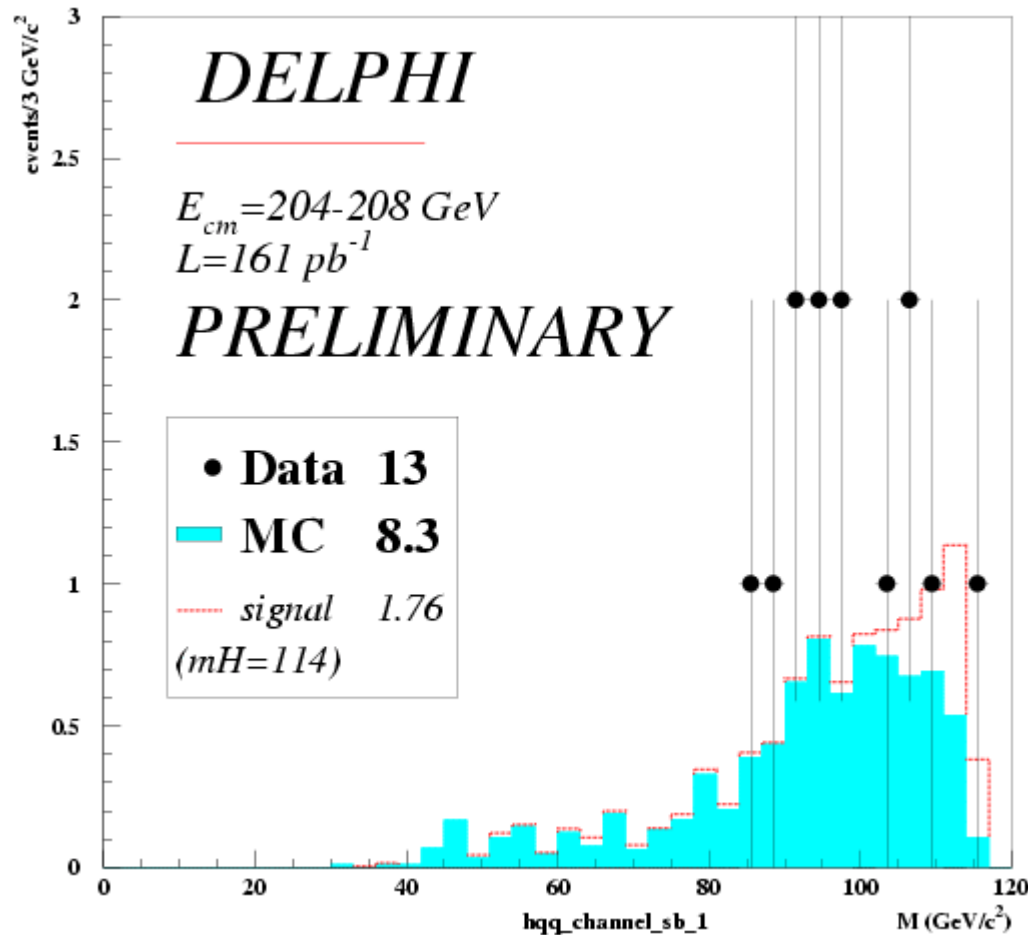


- Main tool b-tagging

Higgs Signal



4 jets: excess of b -tagged events



... there are many ways to skin a cat ...

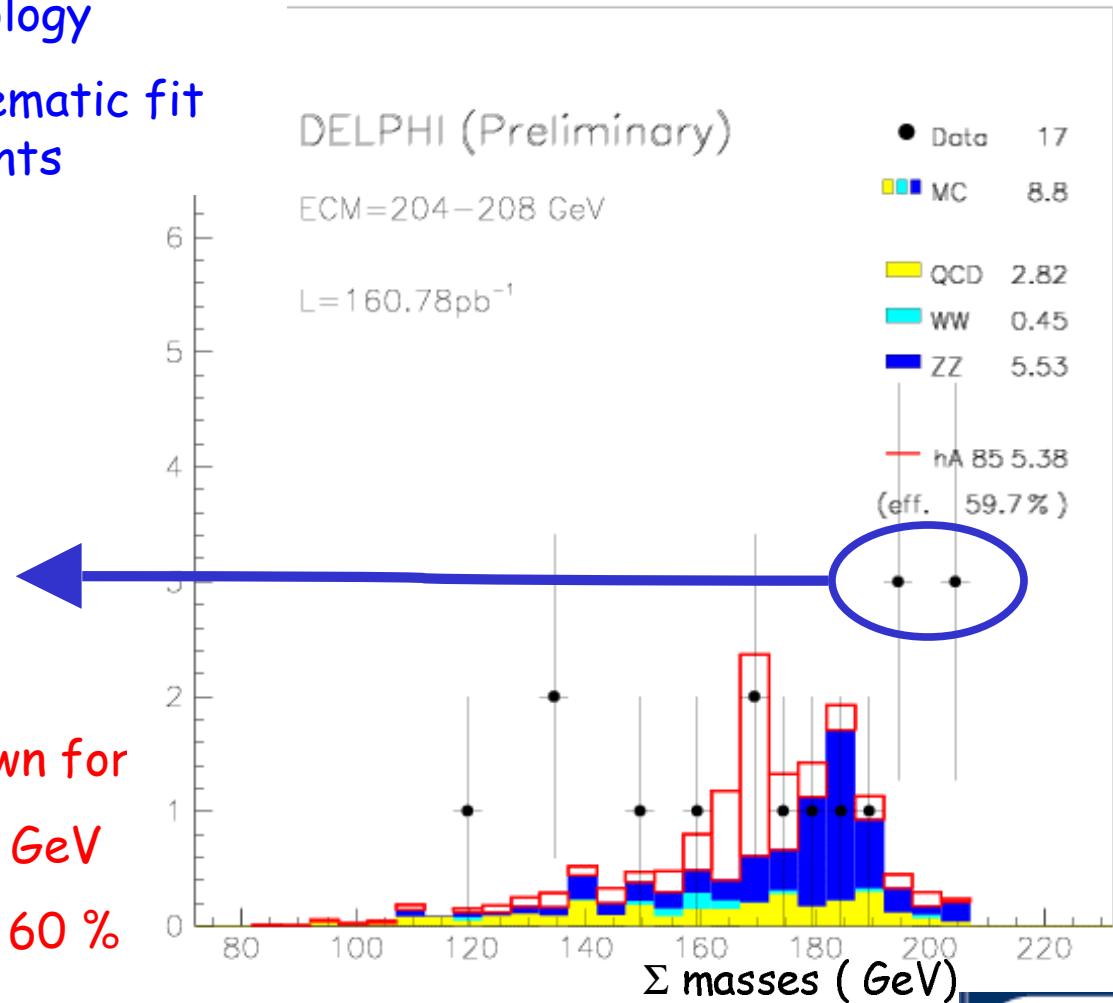


Equal masses production (e.g. SUSY hA)

- Analysis the same as for Higgs 4 jets
- Require 4 b compatible topology
- Mass determined from kinematic fit 5c with equal mass constraints

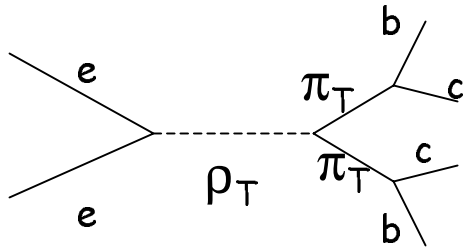
High mass candidates common with std higgs analysis

Signal shown for
 $M_h = M_A = 85 \text{ GeV}$
Efficiency 60 %



Technicolor

Scalar boson (from scalar field generating masses) is a condensate of new particles. Versions of technicolor 'theory' not yet excluded by LEP1 allow for light particles possibly visible directly or indirectly at LEP2 (techni- π or techni- ρ)



- Analysis the same as for Higgs 4 jets
- Kinematic fit 5c with equal mass constraints

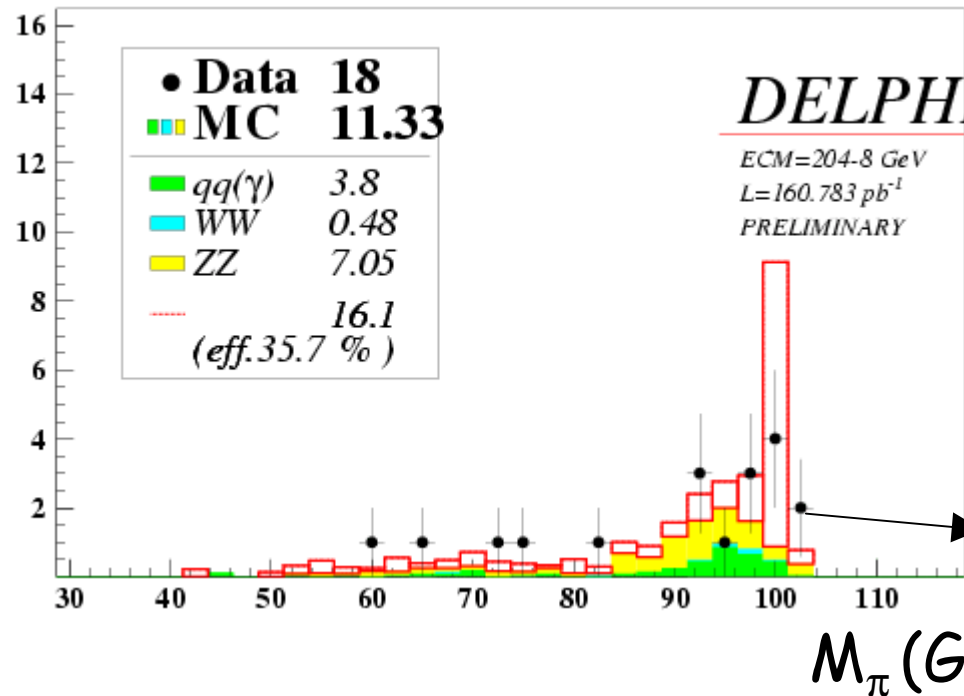
Signal:

$$N_{\text{doublets}} = 9$$

$$M_{\text{technip}} = 225 \text{ GeV}$$

$$M_{\text{techni}\pi} = 99 \text{ GeV}$$

$$E_{\text{cm}} = 205 \text{ GeV}$$



High mass events in common with 4 jets higgs analysis

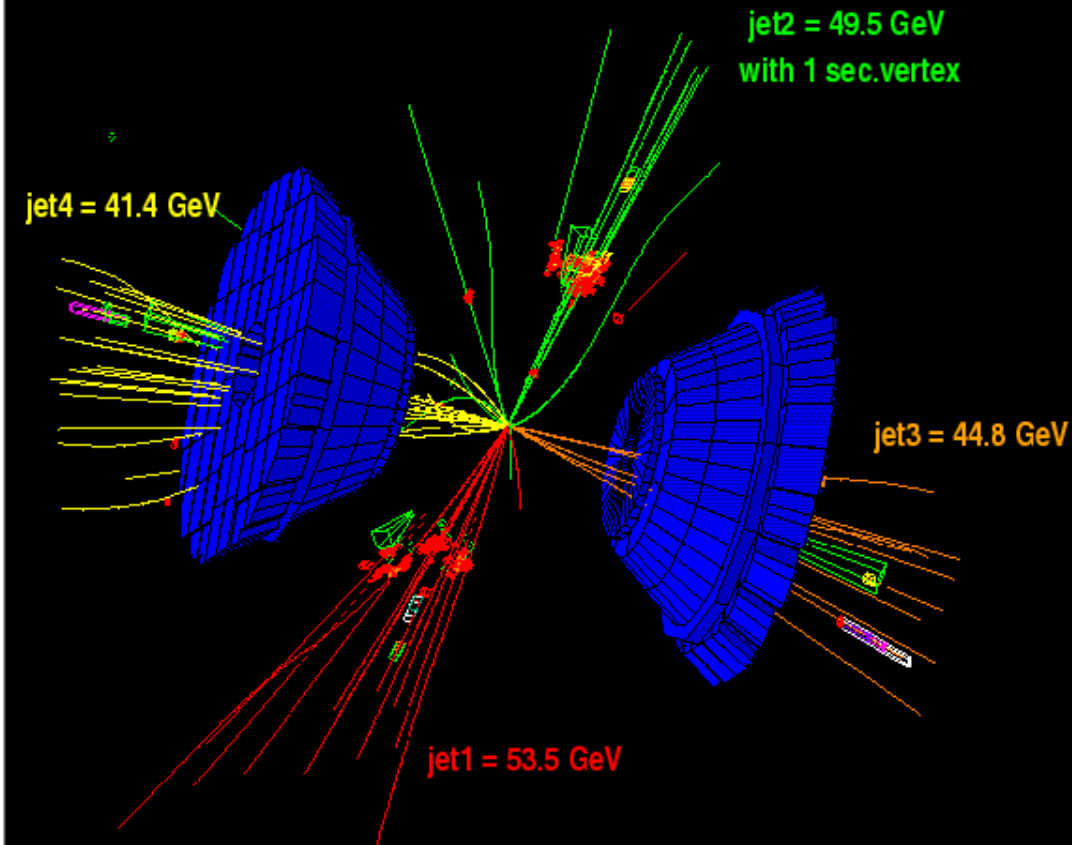


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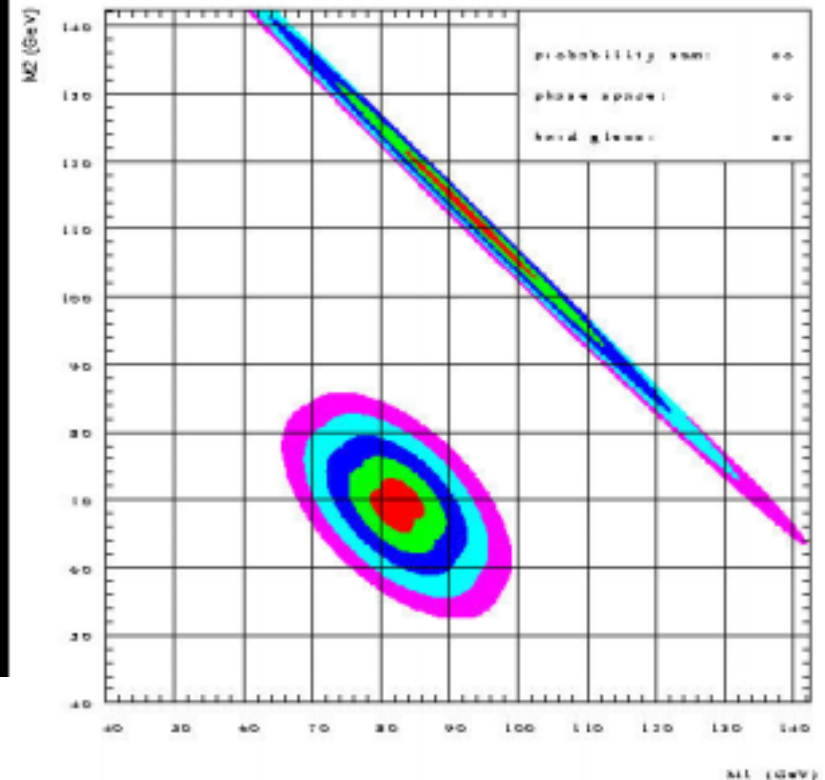


DELPHI Run: 15070 Evts: 2470
 Beam: 103.4 GeV Proc: 24-Jul-2000
 DAS: 24-Jul-2000 Scan: 80-Jul-2000
 13:09:42 Tam-DST



DELPHI qqbb

$E_{cm} = 206.8 \text{ GeV}$
 Mass = 114 GeV



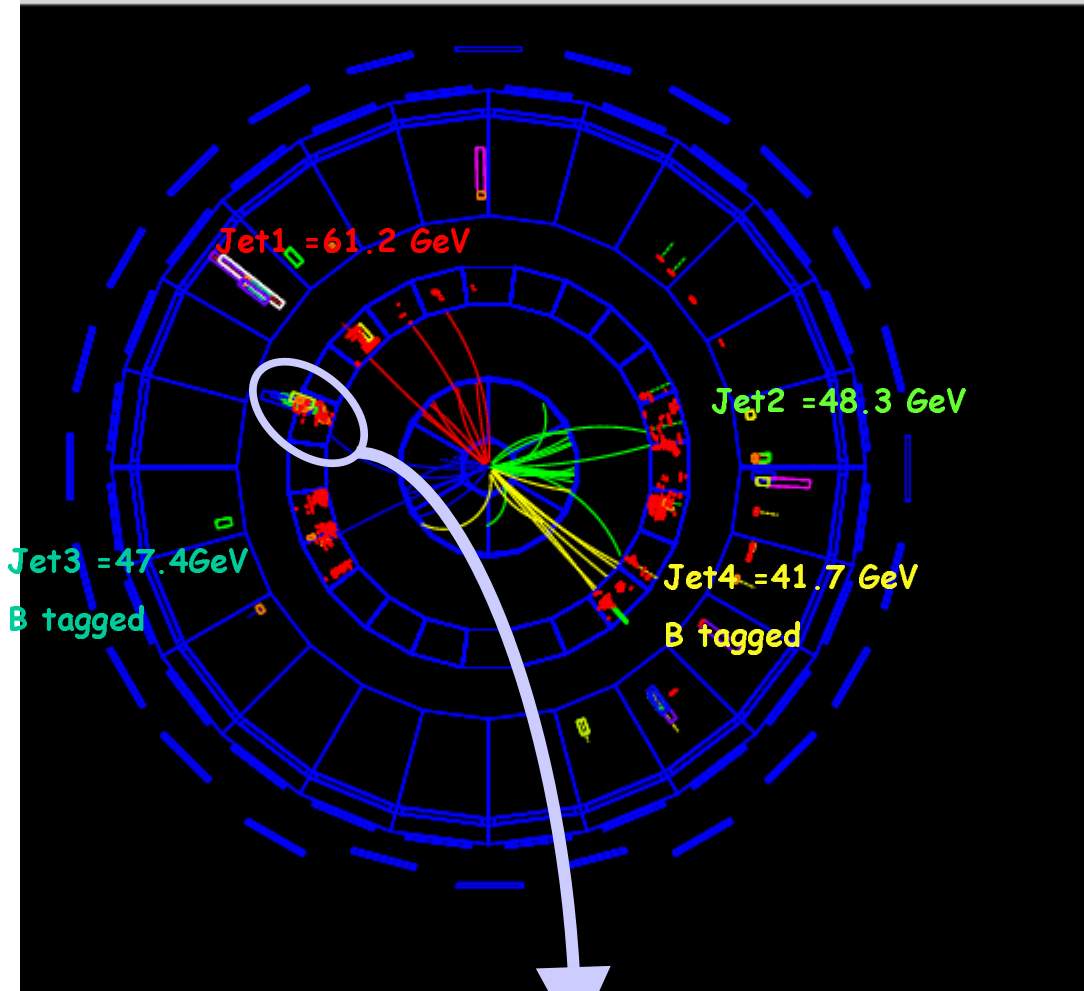
Comments:

- Moderate b-tag
- Non negligible probability to be a WW

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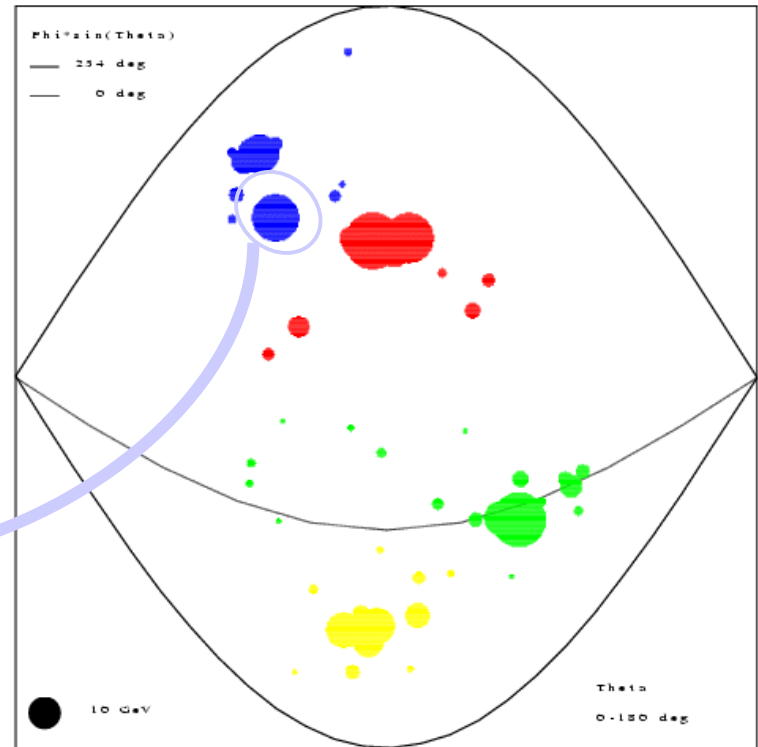


DELPHI Run: 114700 Evt: 5728
 Beam: 102.7 GeV Proc: 27-Aug-2000
 DAS: 27-Aug-2000 Scan: 31-Aug-2000
 03:50:56 Tan+DST



DELPHI qqbb

$E_{cm} = 206.5 \text{ GeV}$
 Mass = 113.6 GeV



**Comments: 20 GeV photon/ π^0 ,
 might be Initial State radiation**



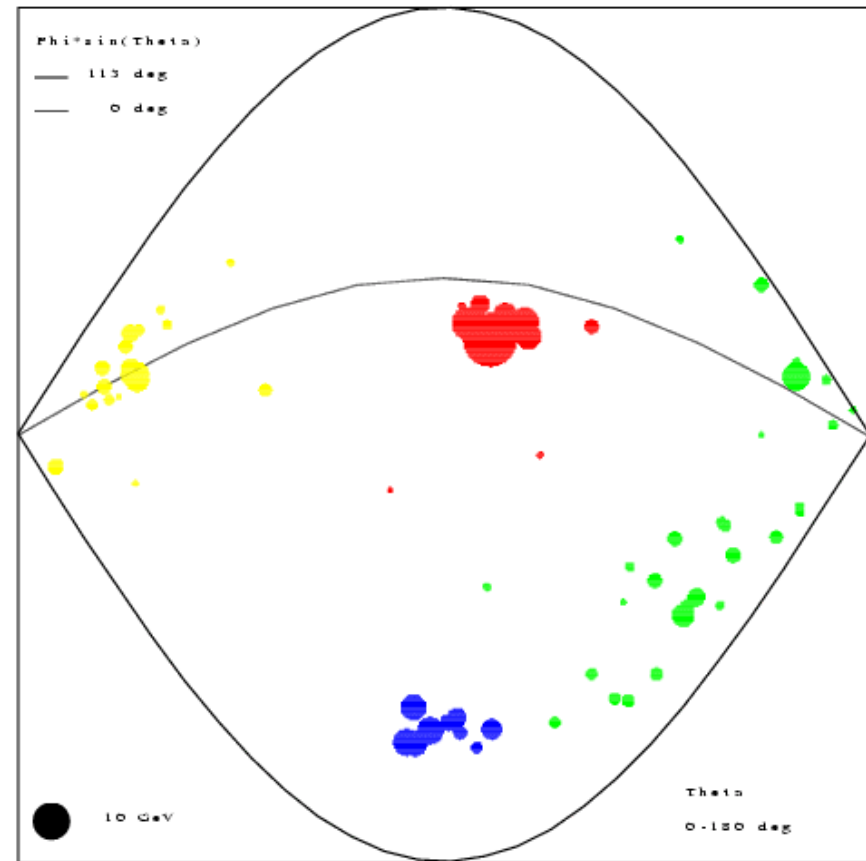
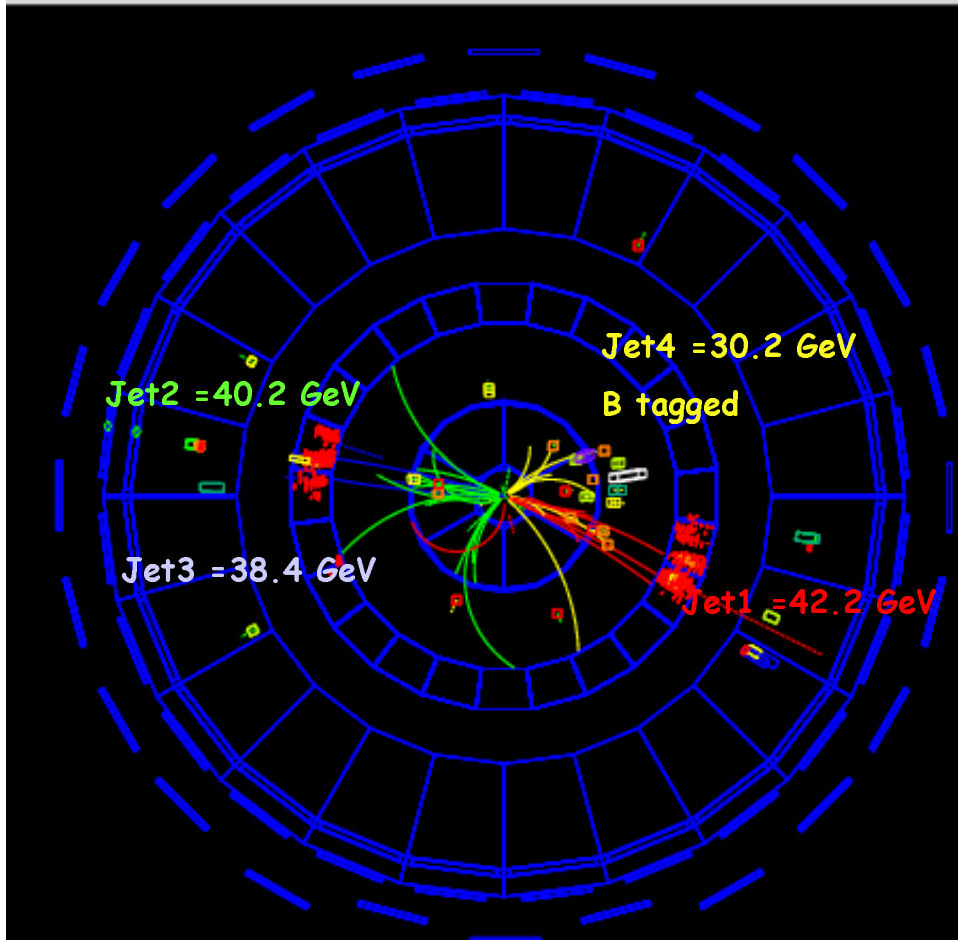
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DELPHI Run: 114085 Evt: 947
 Beam: 103.3 GeV Proc: 12-Aug-2000
 DAS: 12-Aug-2000 Scan: 16-Aug-2000
 10:59:35 Tan+DST

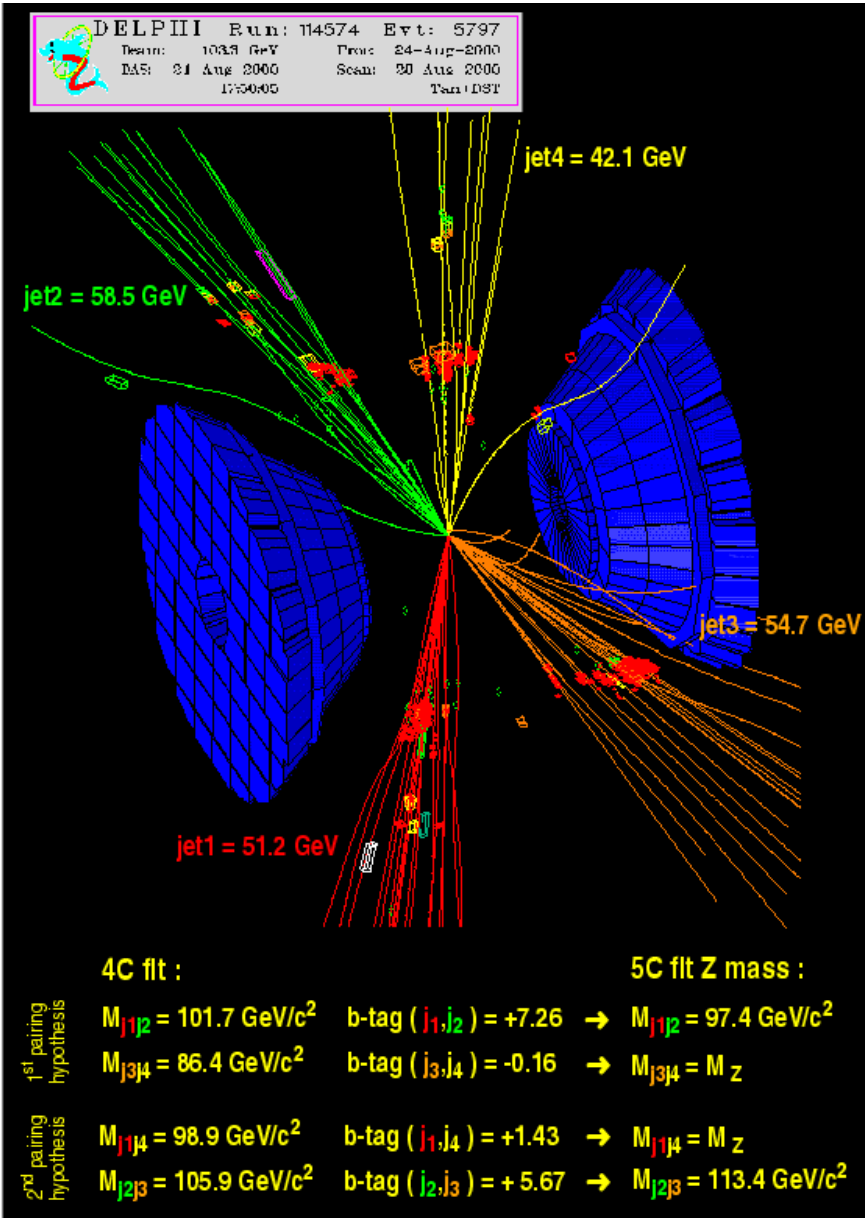
DELPHI qqbb

$E_{cm} = 206.6 \text{ GeV}$
 $Mass = 114.3 \text{ GeV}$



Comments: compatible with WW but relatively high b-tag hence OK. Only worry is relatively large rescaling of jet energies.



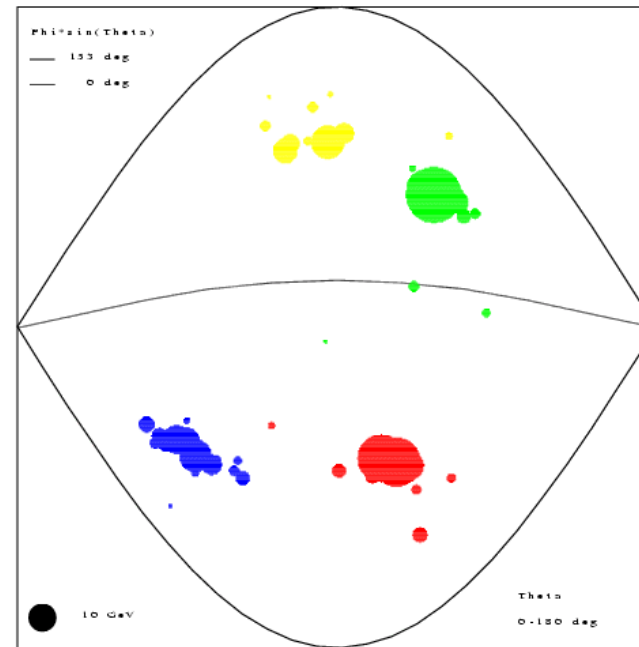


DELPHI bb(bb)

$E_{cm} = 206.5 \text{ GeV}$

Mass= 97.4 (b ranking)
 113.4 (kin. fit)

Might be the **Golden** candidate but pairing chosen (by ranking jets by b-tag) is the one with lower mass



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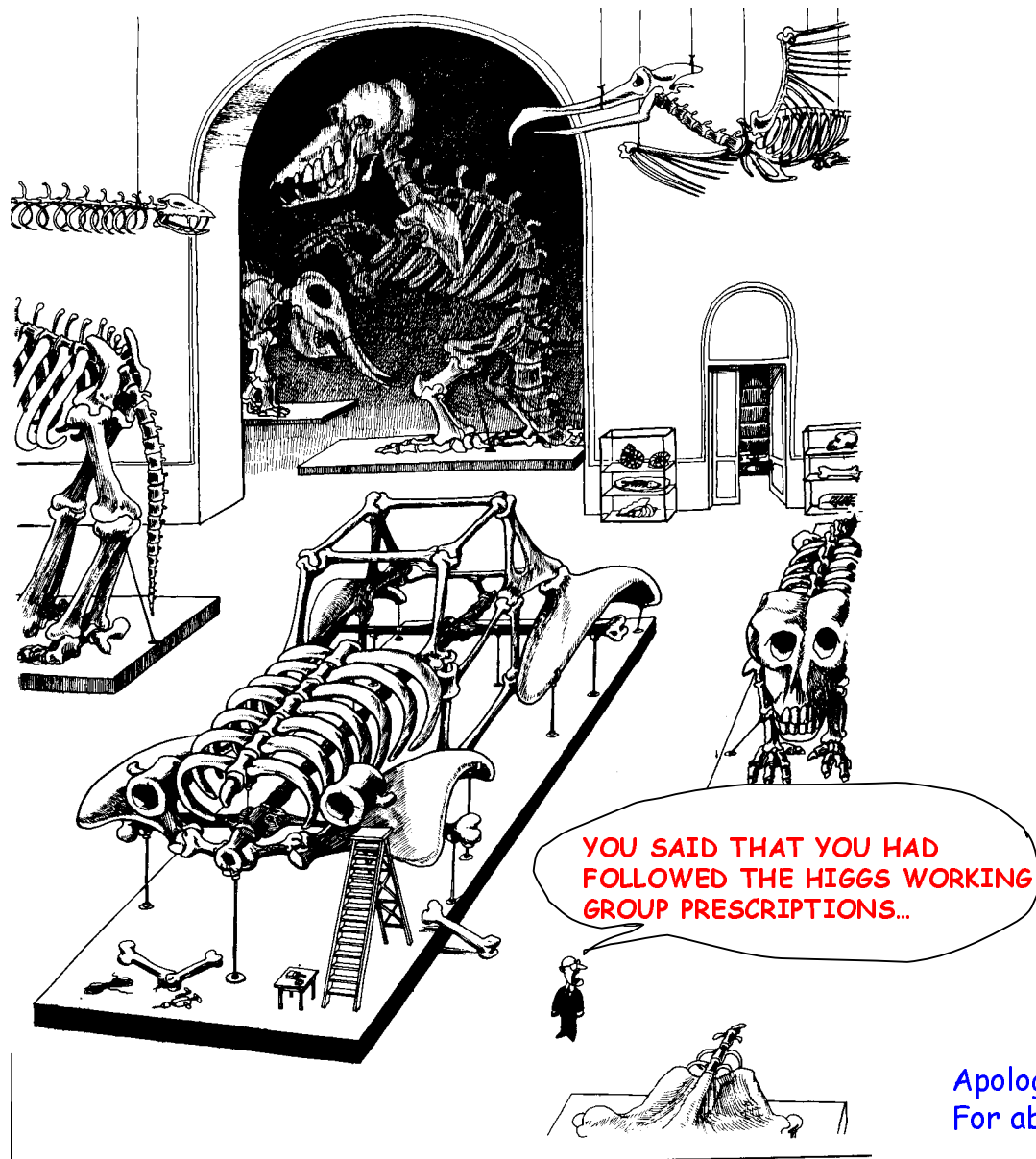
T.Camporesi,



DELPHI conclusions

- Excess seen in b-tagged, high mass, 4-jet events
- Doubling of Luminosity at $E_{cm} \sim 207$ GeV will allow LEP community to decide between fluctuation and possible discovery
- DELPHI requests to schedule NOW an extension until December and assess the situation once an additional 65pb^{-1} has been accumulated at 207 GeV
- *Aim should be to have a solidly established conclusion for the December Council meeting*
- *We welcome any additional Z running ASAP for our tracking calibrations*





Apologies to Quino
For abusing his original cartoon



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