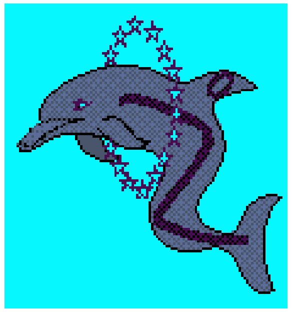
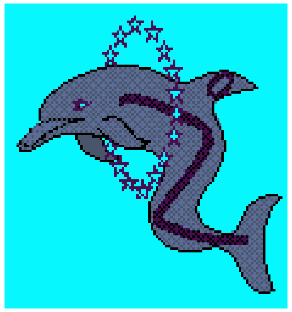
To be or not to be ...
HIGGS-like ?



Pierre Lutz
Saclay
on behalf of the
DELPHI coll.



- Modifications concerning the sample up to Sept. 1st.
- How do we deal with one dead TPC sector ?
- DELPHI results for SM (and MSSM) neutral Higgs bosons.

still PRELIMINARY results!

Luminosities

♣ Ante mortem TPC-S6

$$\mathcal{L}_{ref} = 163.5 \text{ pb}^{-1}$$

Modifications :

- (partial) reprocessing
- changes in b-tagging algo.
- optim. in hqq analysis

♢ Death of TPC-S6 (1 Sept.)

♡ Post mortem TPC-S6

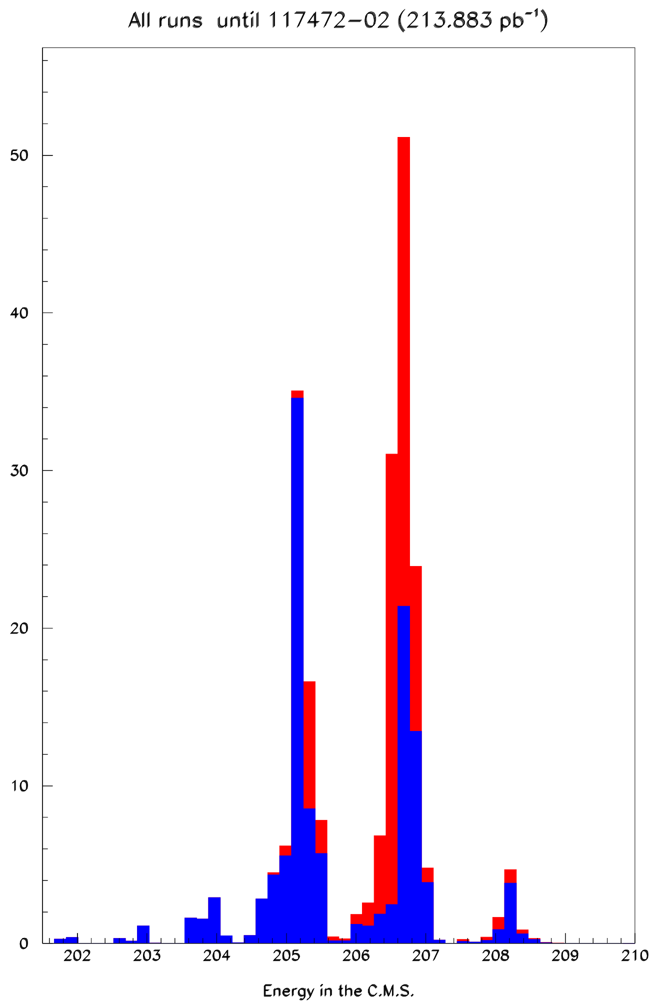
$$\mathcal{L}_{new} = 50.4 \text{ pb}^{-1}$$

Data are usable thanks to :

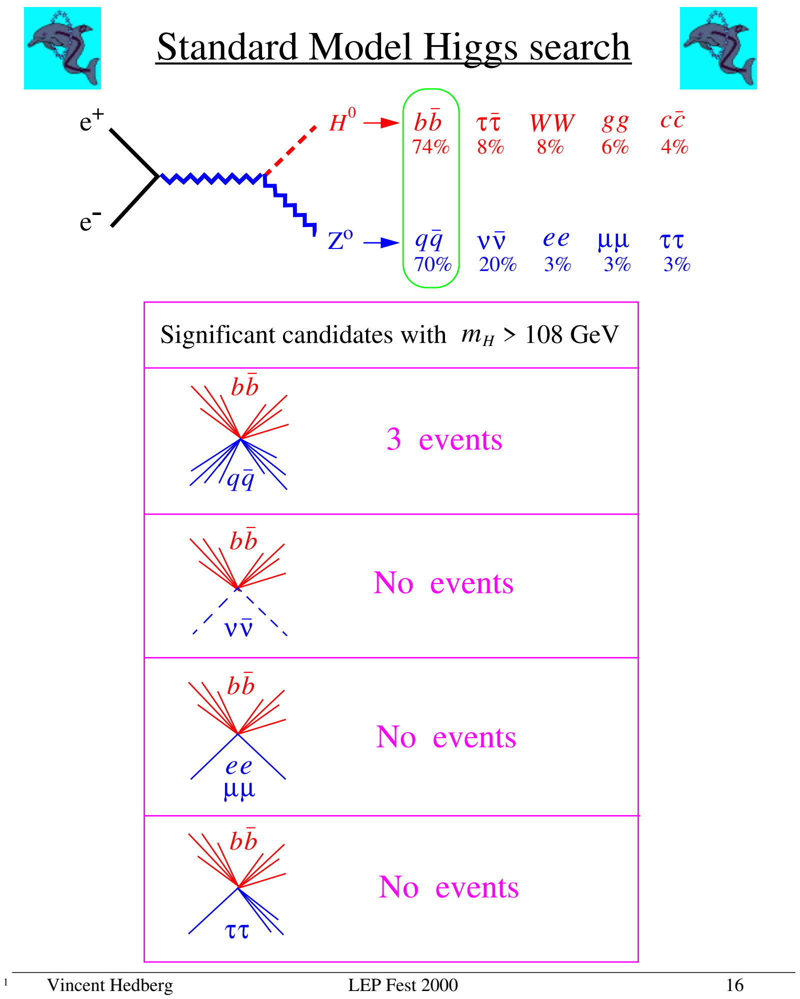
- new pattern
- dedicated simulation
- b-tagging needs care

♠ Total luminosity (oct. 25th)

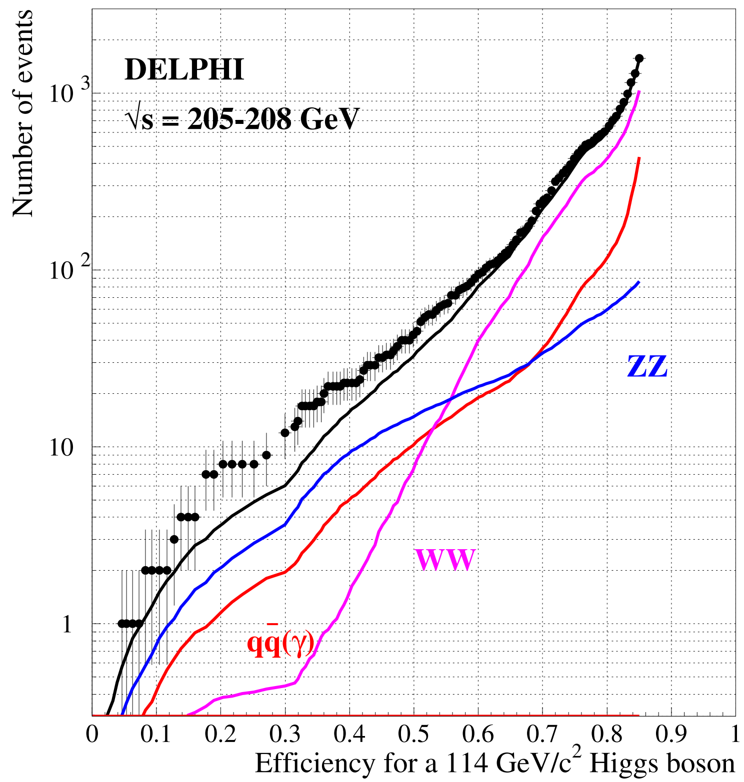
$$\mathcal{L}_{tot} = 213.9 \text{ pb}^{-1}$$



The LEP Fest situation



characterised by a slight excess of b-tagged 4-jet events (in ZZ, hZ and hA)

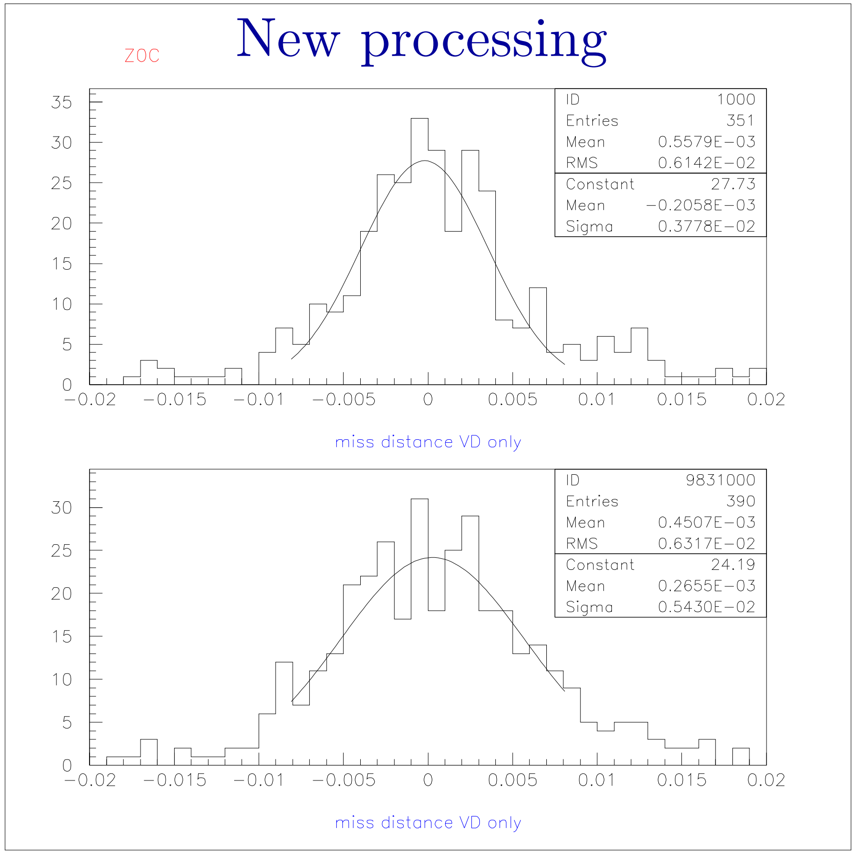


Why a new processing ?

Two problems this year :
VD internal instabilities and TPC drift velocity calibration

- On August 16th-17th a Z calibration run has been taken on Delphi request in order to study these problems.
- Two months were necessary to understand and correct both defects.
- These tracking problems had an influence on b-tag. (10% loss in efficiency)
- All data since June 16th have been reprocessed.

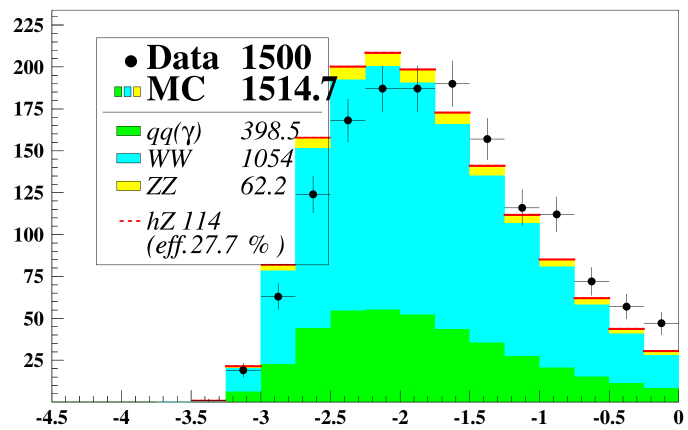
New processing

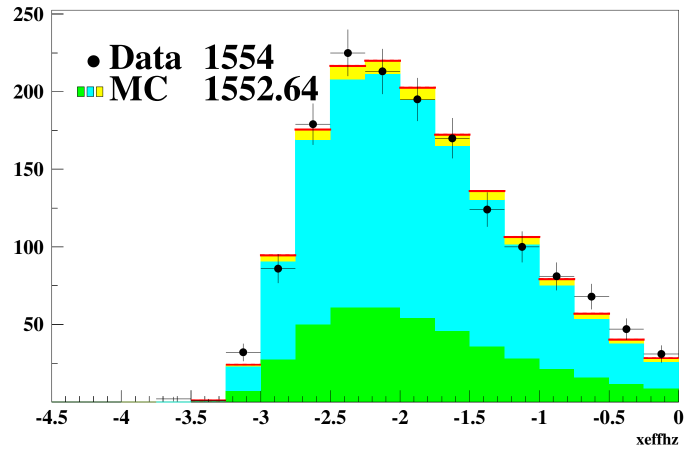


Old processing
Missing dist for Z $\rightarrow \mu\mu$ evts

new features include : new calibration files, use of tracks without TPC info, correction for gluon splitting, corrections for jet-energy/angle. dependences.

OLD **NEW**



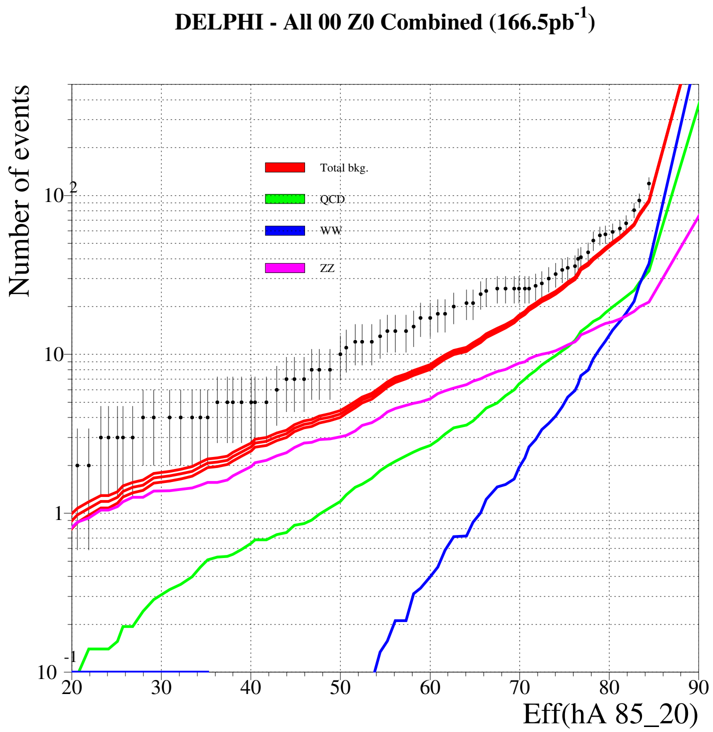


DATA/MC agreement for non btagged 4-jet events.

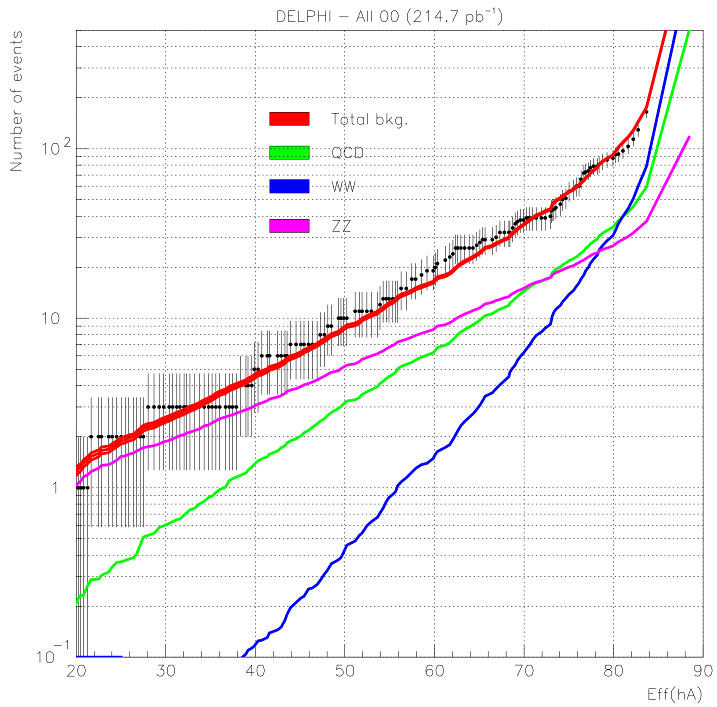
example of results from these changes.

Effects of new proc./new btagging on hA into 4b analysis

OLD (LEP Fest)



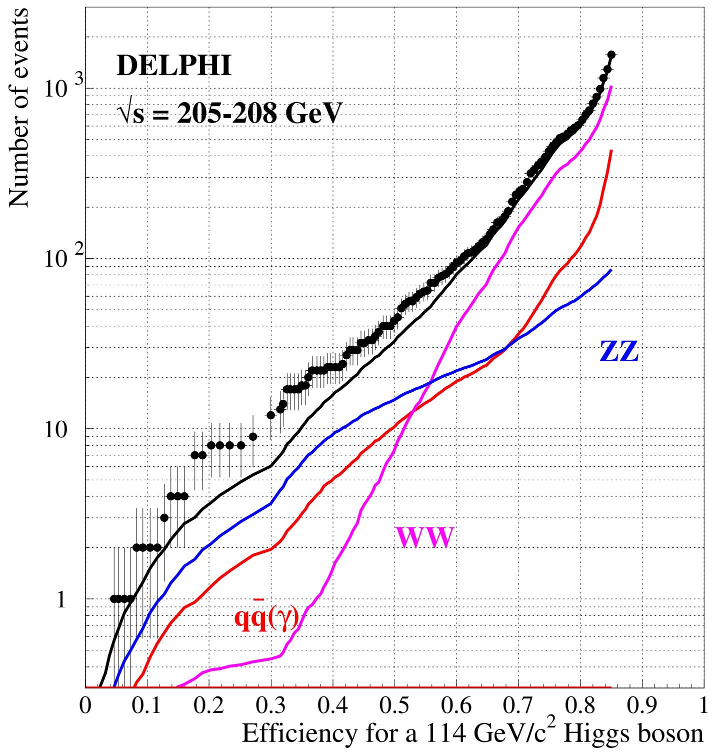
NEW (today)



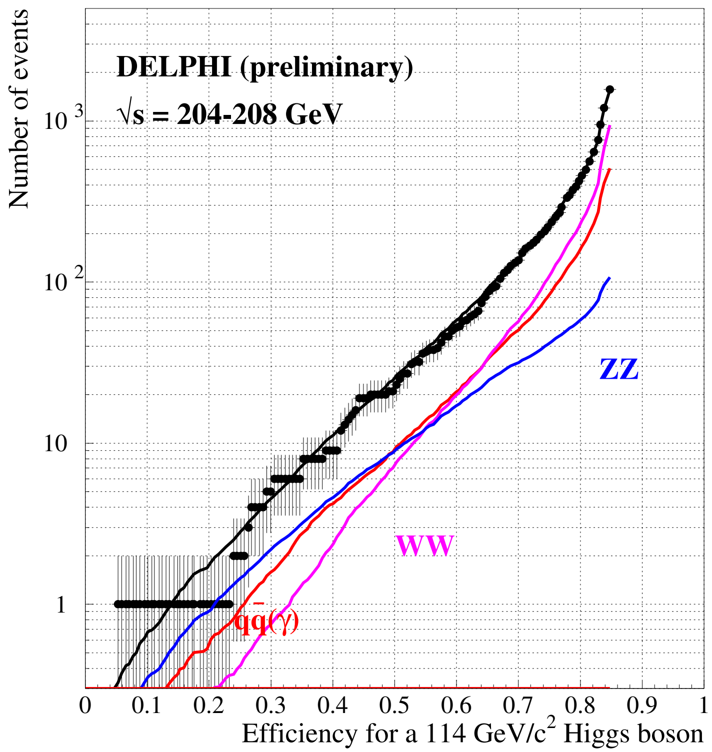
Hqq new optimisation in Hqq analysis

optimisation at high mass foreseen since long.
OLD ana. : 2 consecutive NNs ; 8 anti-QCD var.
then 4 var : 1 anti-QCD, 1 btag, 1 anti-WW, 1 anti-ZZ
NEW ana. : only 1 NN with 13 variables (only 2 are new)

OLD (LEP Fest)

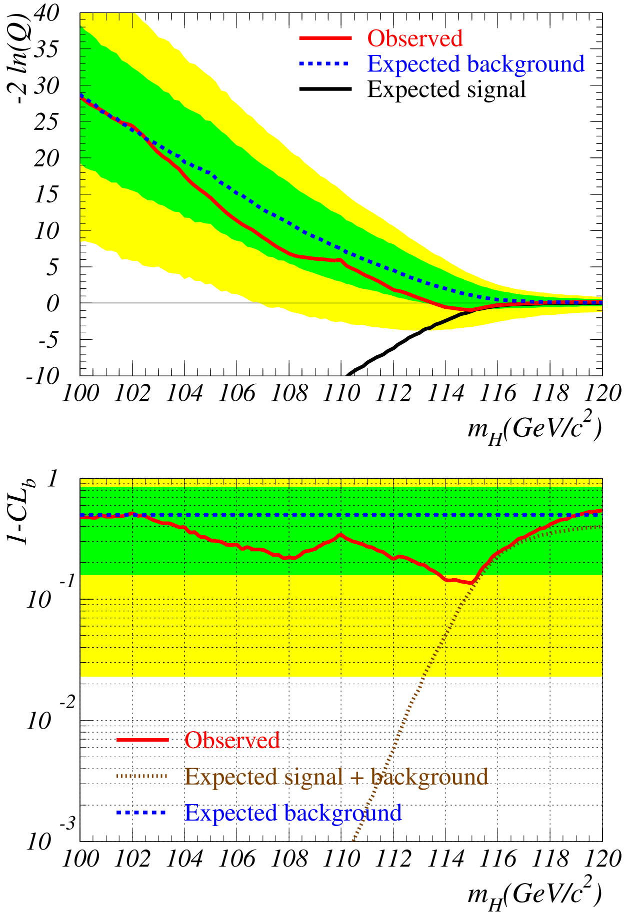


NEW ana.

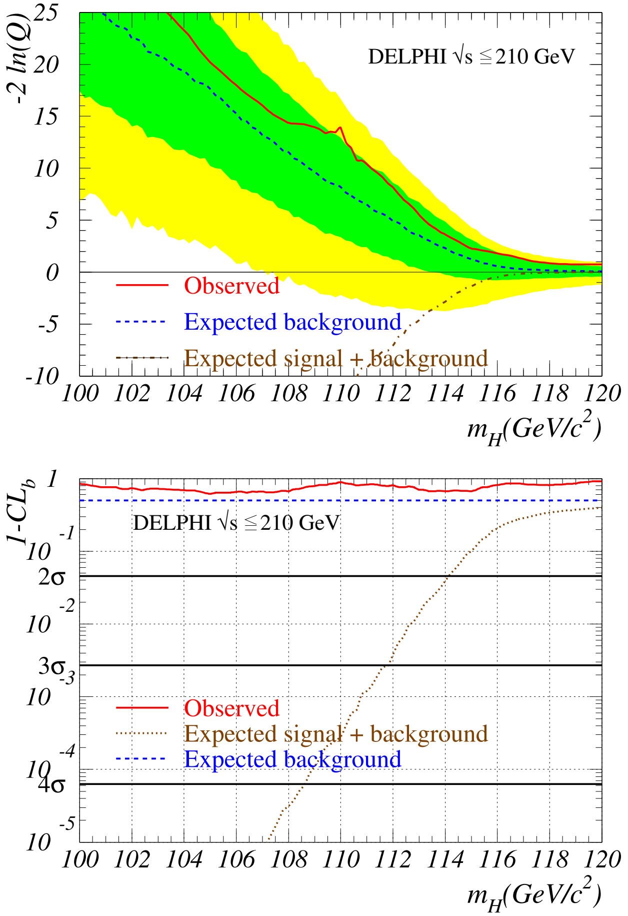


SM Higgs - new reference sample

OLD (LEP fest)

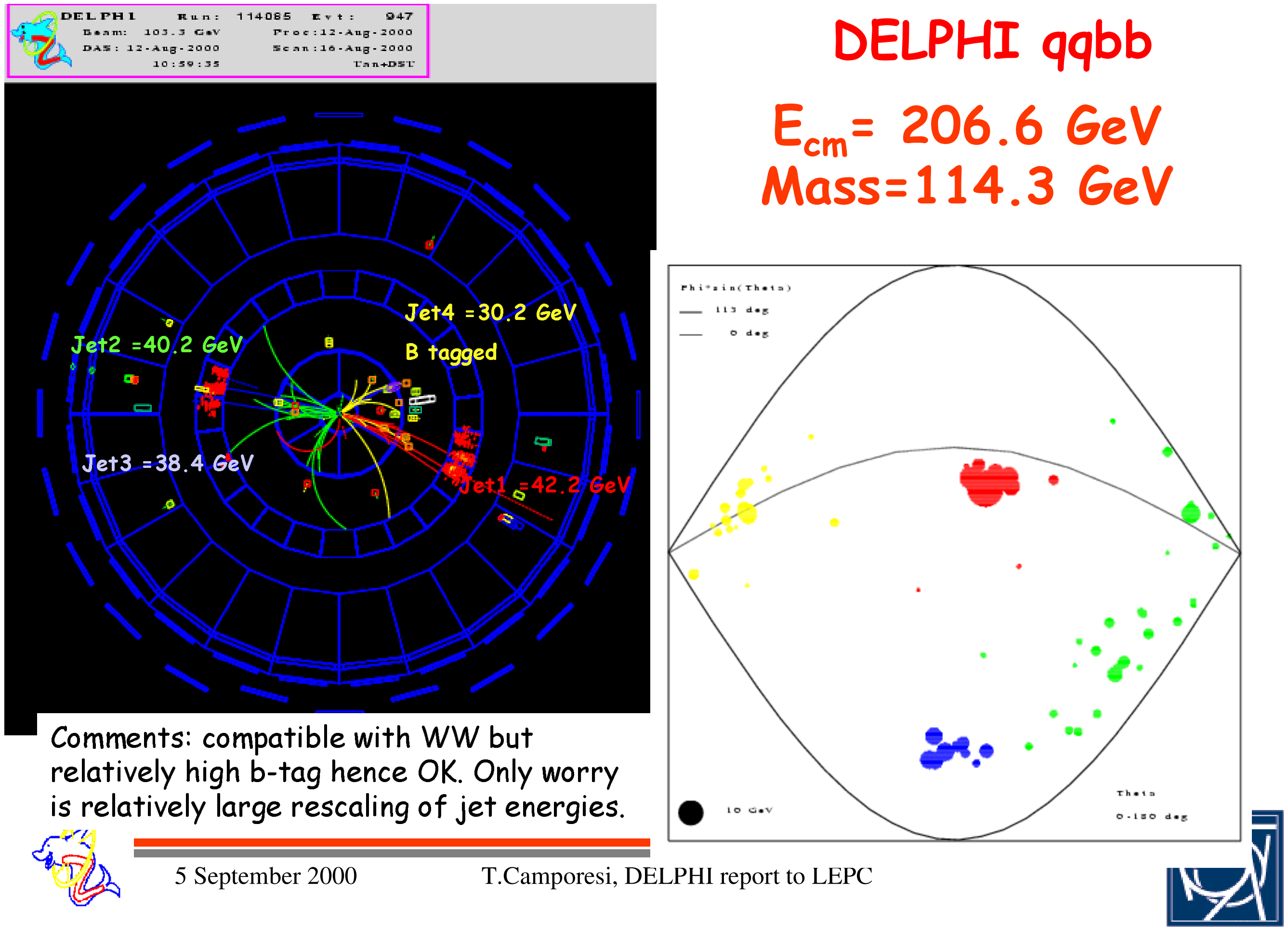


NEW ref. sample



expected limit improved by 0.4 GeV

What happens with our most significant candidate ?



SM Higgs - new reference sample

What happens with our most significant candidate ?

Event 947	old proc. old btag old ana.	old proc. new btag old ana.	new proc. old btag old ana.	new proc. new btag new ana.
mass	114.26	114.26	114.26	114.26
WW prob.	0.94	0.94	0.94	0.94
btag	2.16	2.17	0.70	0.72
ANN	0.96	0.96	0.79	0.71
s/b	3.3	3.3		0.39

contributions to the btag from the individual variables.

variables	old proc.	new proc.	diff.
IP only	0.89	-0.24	-1.1
+ SV mass	0.80		
+ SV ener	0.77		
+ SV Pt	1.36		-1.6
+ lepton	1.60	0.12	-1.5
+ rapid.	2.16	0.72	-1.4

Z data and associated dedicated simulation

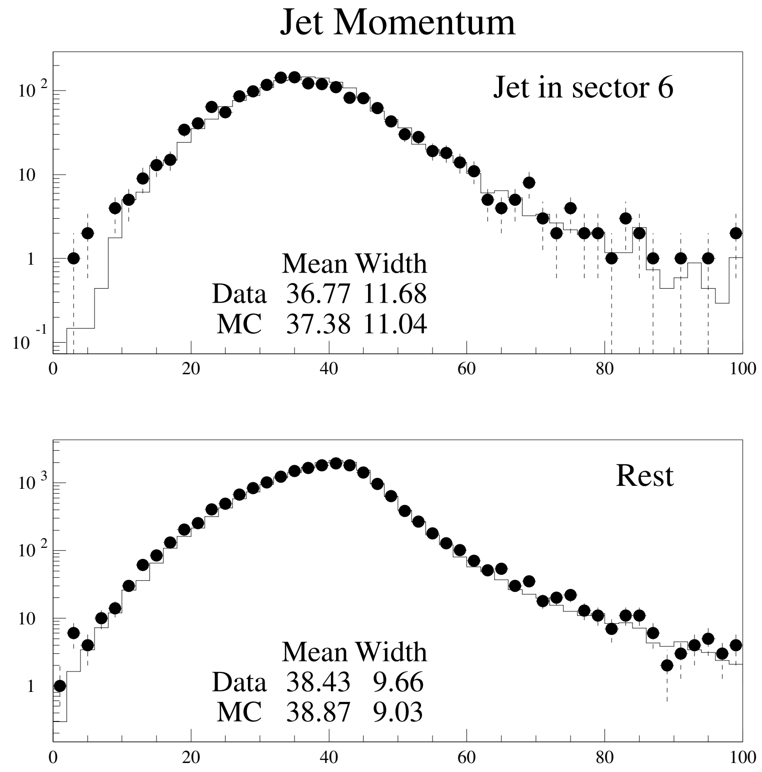
2-jet events selected

For jets inside S6, on average :

- one charged track is lost.
- 4 GeV of ch. energy lost.
- 3 GeV recovered by calorimetry.

Kinematic var. OK

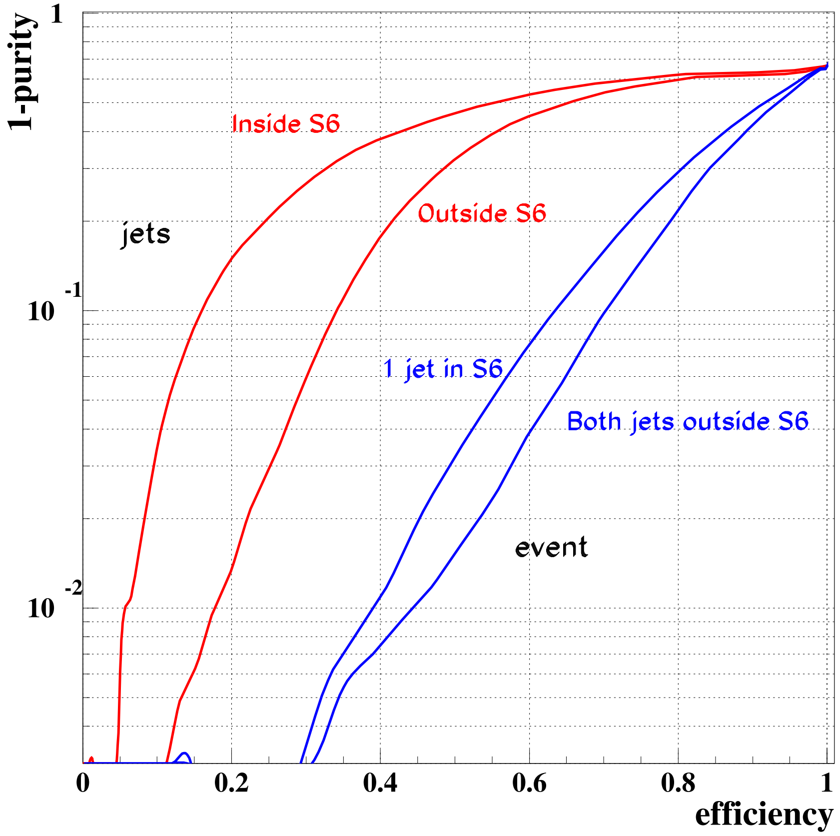
Kinematic fits OK



Pierre Lutz
DELPHI/Saclay

Z data and associated dedicated simulation

2-jet events selected

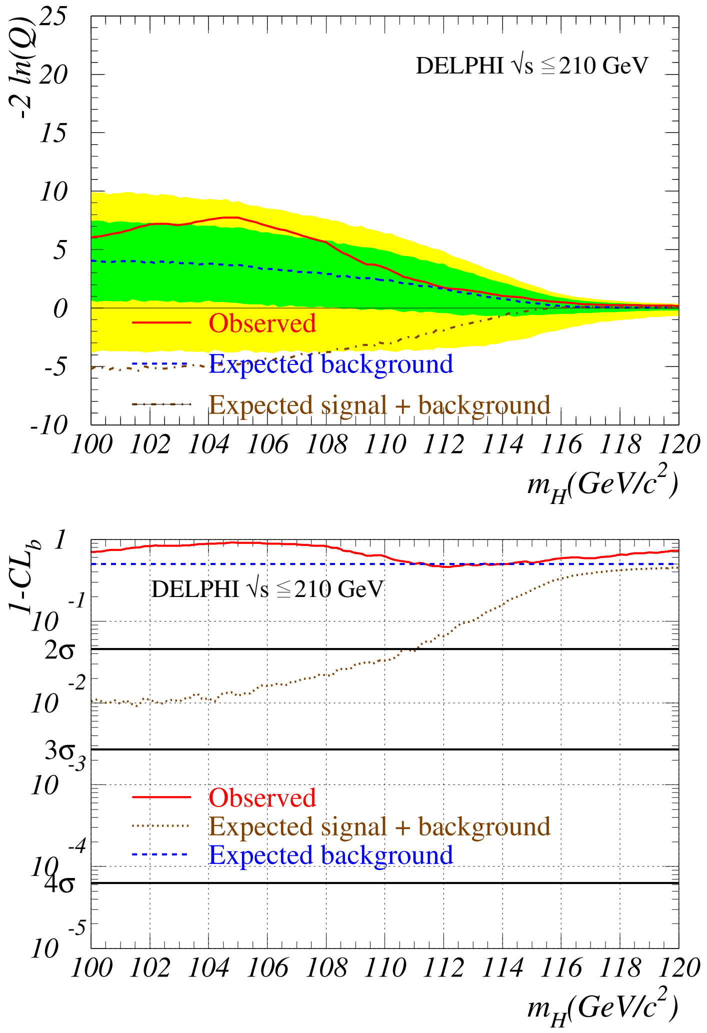


- Absence of TPC makes IP resolution much worse.
- Appropriate changes in the b-tagging algo.
- For jets in S6 b-tagging eff. is 2 times worse.
- But the event b-tag is in good shape.
- B-tagging is "surprisingly" good in this situation.

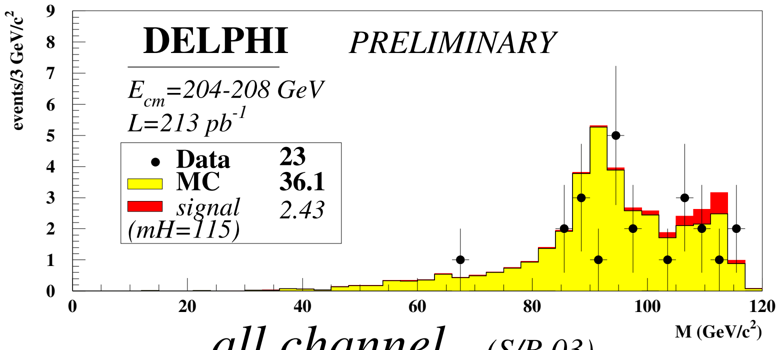
SM Higgs - results on sample without S6

$$\mathcal{L} = 50.4\ \mathrm{pb}^{-1}$$

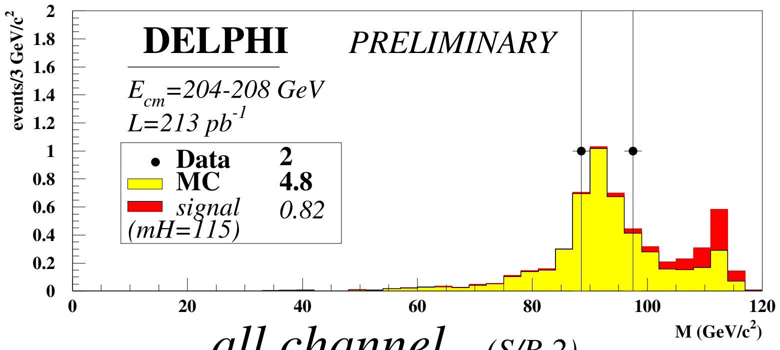
- same overall behaviour as for the earlier data
- slight deficit below 110 GeV
- perfectly bkgd-like above



SM Higgs - results on total sample



all channel (S/B 03)



all channel (S/B 2)

Mass plots

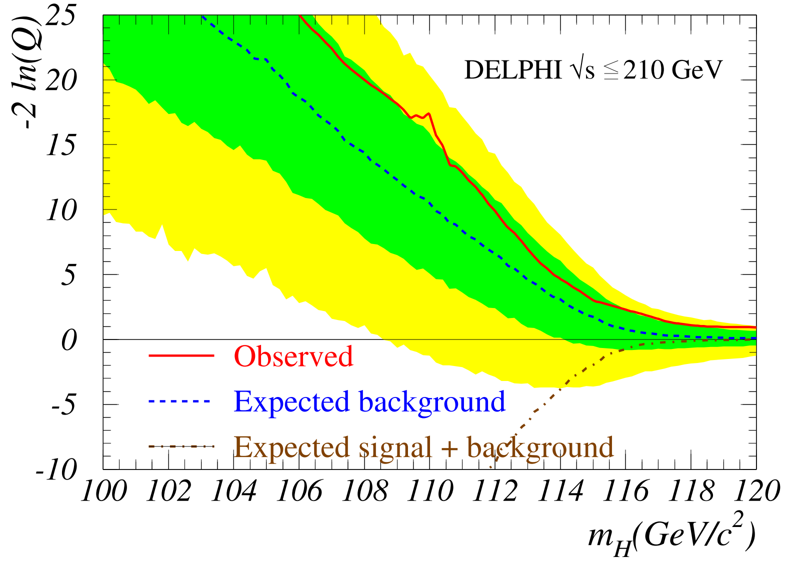
sel.	loose	med.	tight
Hqq	10/10.2/1.6	4/3.2/1.0	1/0.5/0.42
$H\nu\nu$	5/6.3/0.56	0/1.5/0.34	0/0.7/0.26
Hll	7/15.7/0.14	3/7.6/0.12	1/2.4/0.07
$\tau\tau$qq	1/3.6/0.11	1/2.8/0.10	0/0.9/0.05
all ch.	23/36.1/2.4	8 /15.2/1.53	2 /4.8/ 0.82

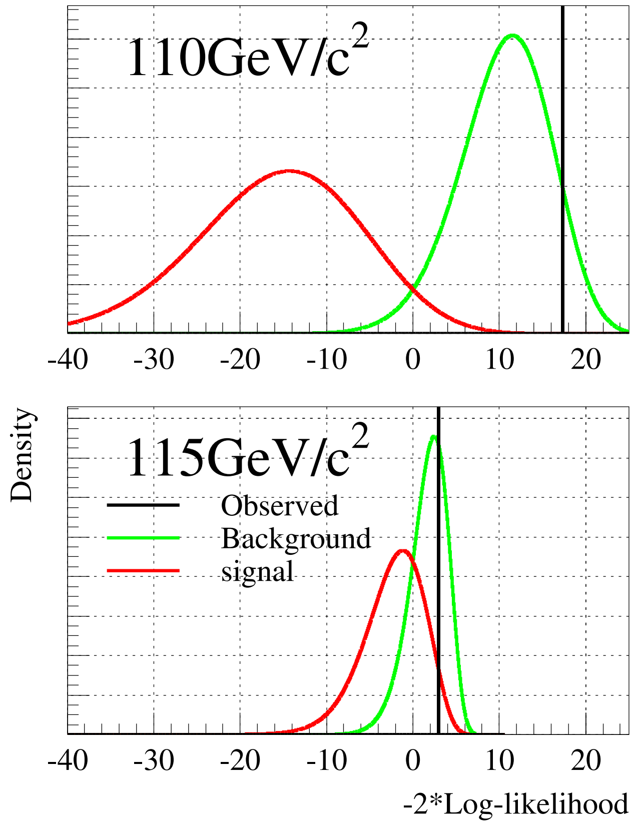
clear deficit in Hll

Pierre Lutz
DELPHI/Saclay

SM Higgs - results on total sample

deficit side within 1σ
coming mainly from Hll.
no single event with
weight at 115 GeV above .5





- Expected limit : 113.5 GeV
- Observed limit : 113.8 GeV

Conclusions

DELPHI Conclusions

- No excess !
- The deficit in Hll channels translates into an overall deficit.
- Delphi excludes a Higgs below 113.8 GeV, not higher !

- Evidence from HWG combination is perfectly compatible with what is expected from a 115 GeV SM Higgs.
- **DELPHI therefore requests to run next year as 150-200 $\mathbf{pb^{-1}}$ at E $>$ 208 GeV might allow us to be much more excited next year at this time.**
- The coming shutdown will be one of the most intensive of Delphi history : access and repair of TPC require major decabling.

Many thanks to the Delphi Higgs team and the LEP Higgs Working group.