

Which calorimeter for the $h \rightarrow \gamma\gamma$

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Which process

Introduction

- Nominal $E_{\text{cms}} = 350 \text{ GeV}$
- $\mathcal{L} = 500 \text{ fb}^{-1}$
- Use CIRCE for effective $\mathcal{L}(\text{s}^{-1}/\text{s})$
- Use PYTHIA 6.115 for generation of physics processes

Signal

- $\text{BR}(h \rightarrow \gamma\gamma) = 3 \cdot 10^{-3}$
- $N_{\text{signal}} = 188$ expected

Background

- the processes are $e^+e^- \rightarrow Z Z$, $W W$ and $Z \gamma$
- $N_{\text{back.}} = 10.8 \cdot 10^6$

Which detector simulation

	Tracks	photon	neutral Hadron
min. energy (GeV)	0.2	0.25	0.5
min. θ (degrees)	8	6	6
effic.	99.5	100.	100.

Tracking

values from the CDR 96 (depending on θ_{CH})

ECAL

$$\frac{\Delta E}{E} = \frac{0.15}{\sqrt{E}} \oplus 0.01$$

$$\delta\theta = \delta\phi = 0.9^\circ$$

HCAL

$$\frac{\Delta E}{E} = \frac{0.50}{\sqrt{E}} \oplus 0.01$$

$$\delta\theta = \delta\phi = 0.9^\circ$$

Calorimetric reconstruction

- cut the distance γ /closest ch. track $> 2\text{cm}$
- angular resolution is a function $(E, \delta\theta, \phi)$
- merging all calor. object if $\Delta\theta, \phi < 1.5 \delta\theta, \phi$

Missing in the fast sim.

brem. from electron

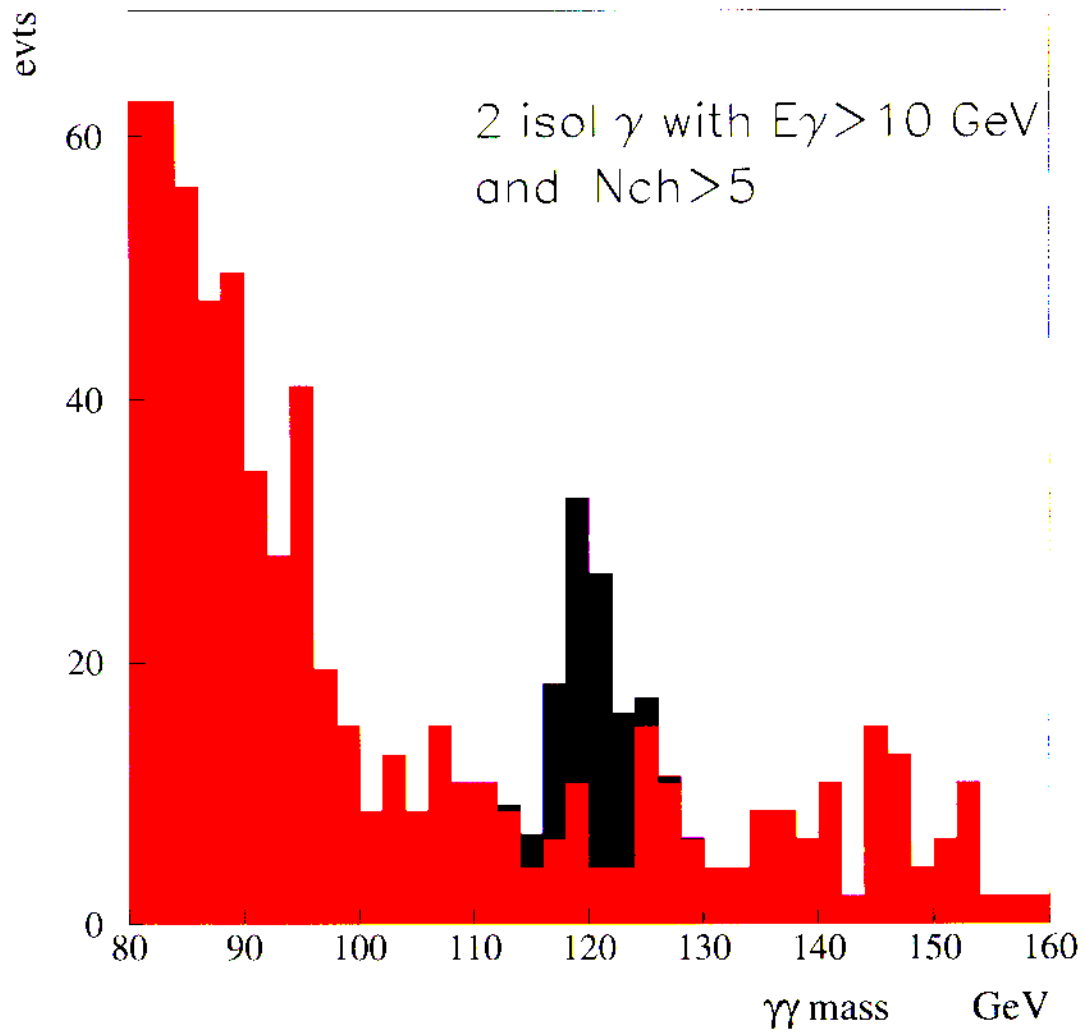
Noise

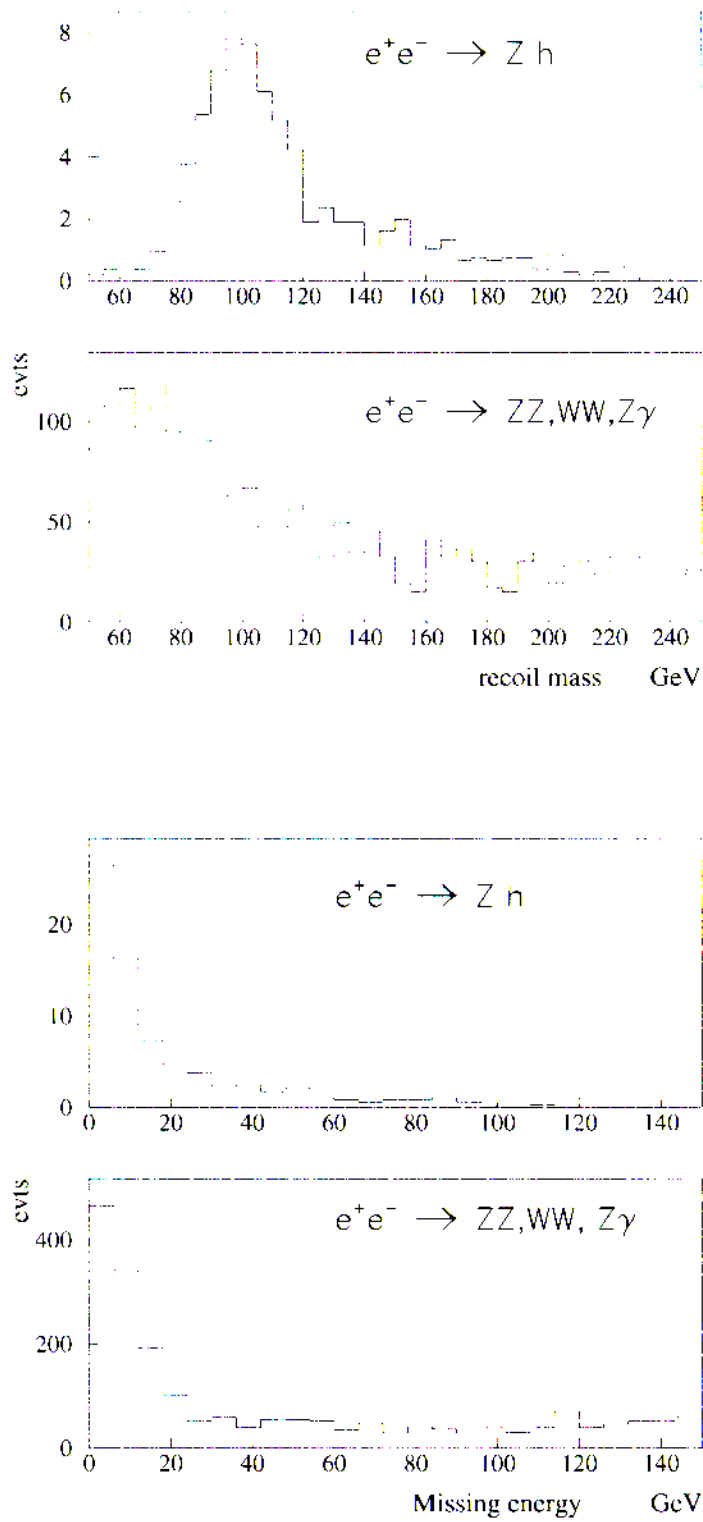
Selection

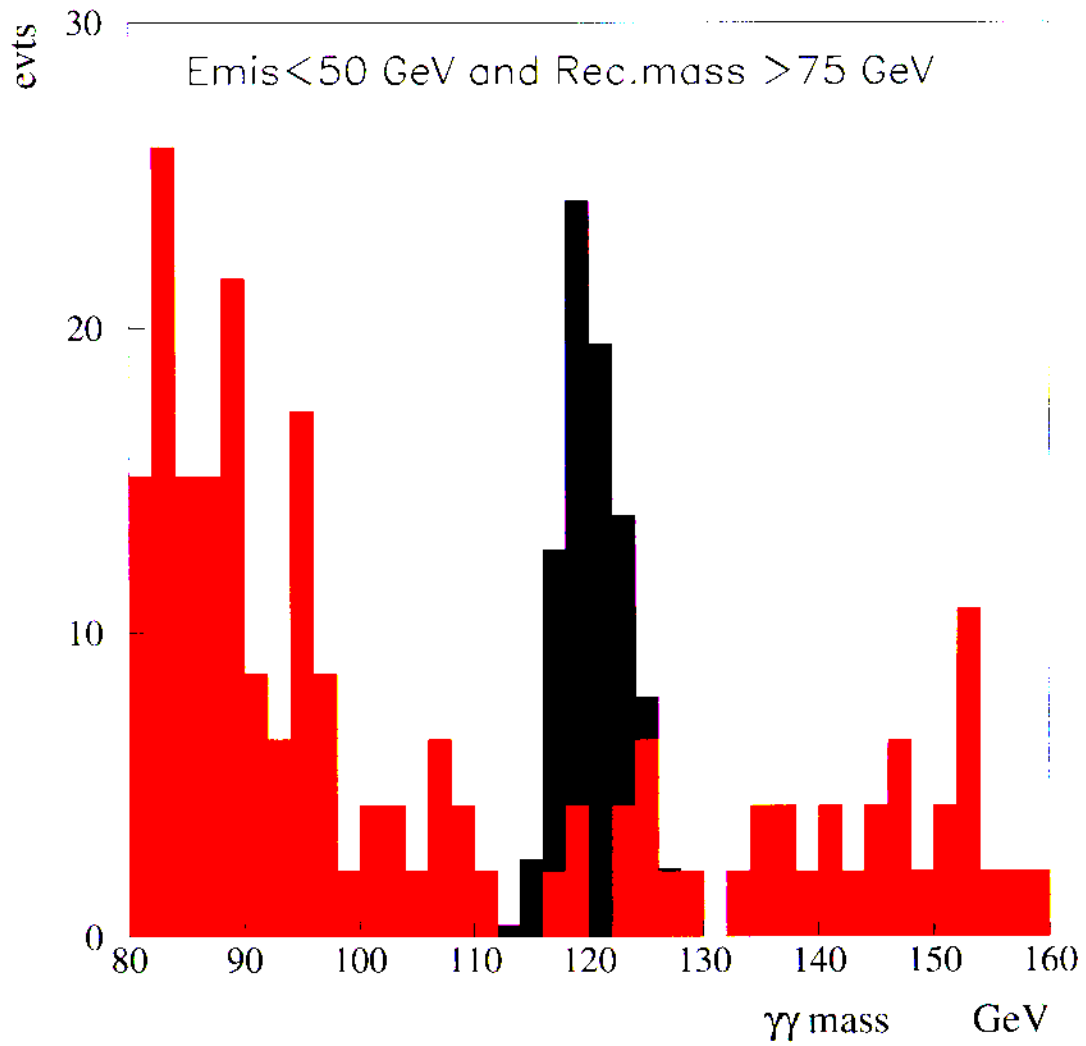
- $E_\gamma > 10 \text{ GeV}$
- No ch. track or another calor. object within 8 degrees.
- Total number of CH. track > 5

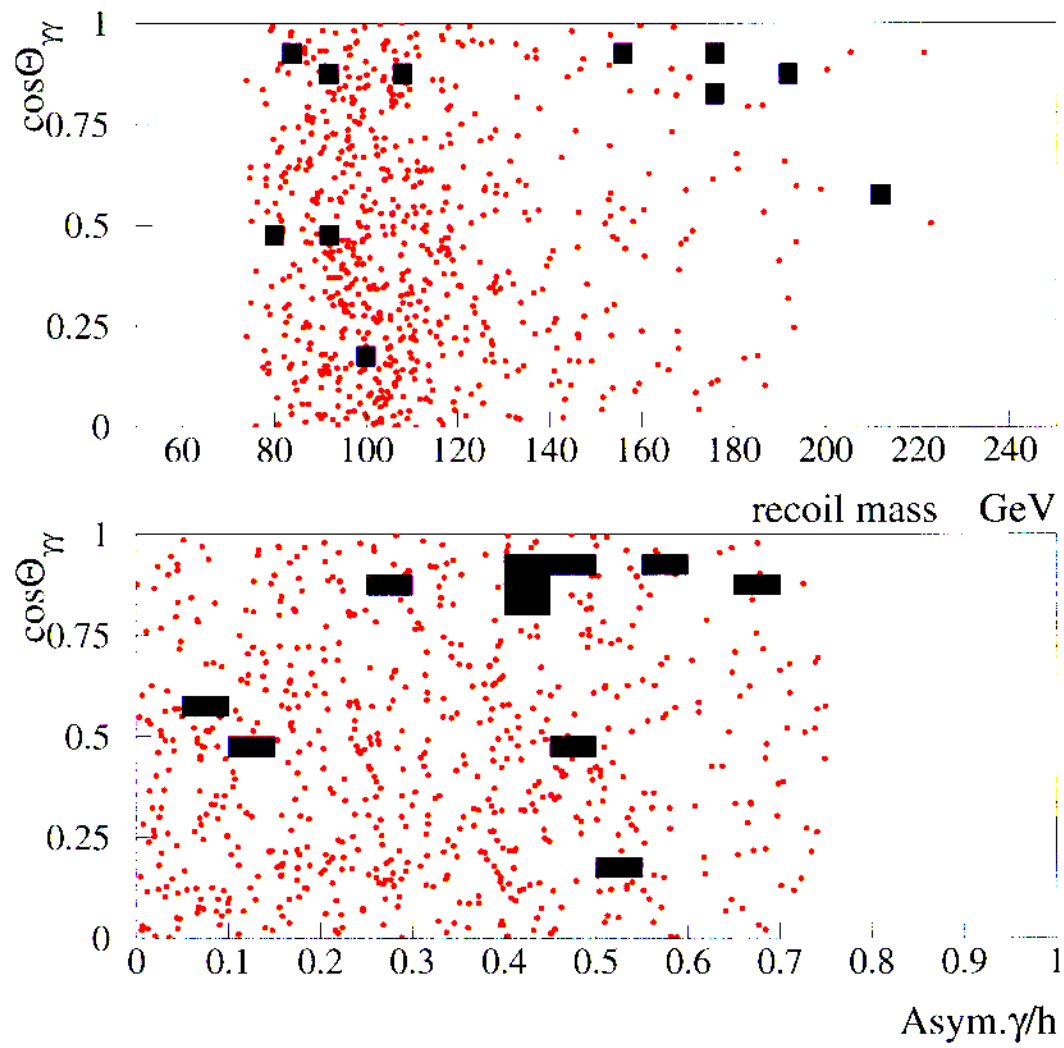
Generated MC

- $5 \cdot 10^6 e^+e^- \rightarrow ZZ, Z\gamma$ and $W^+ W^-$
- 2000 $e^+e^- \rightarrow Z h$ and $h \rightarrow \gamma\gamma$



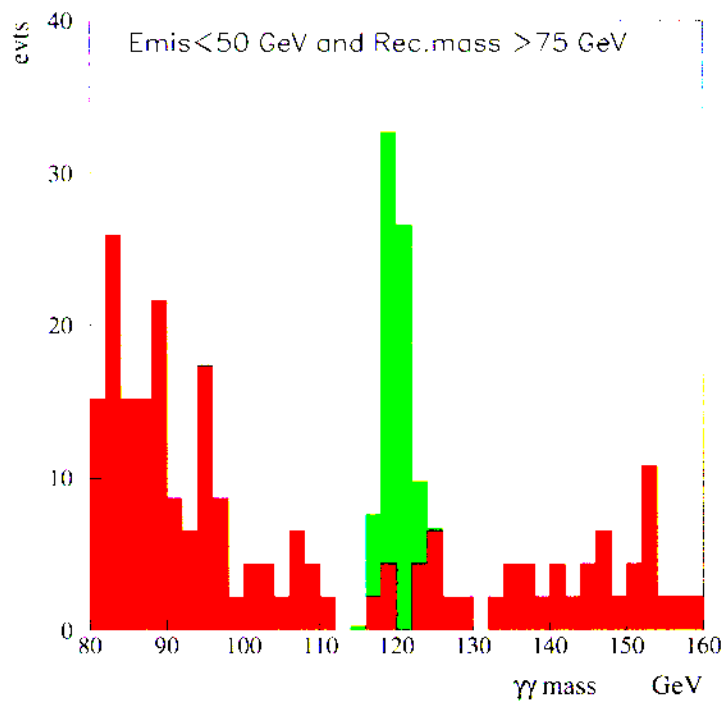
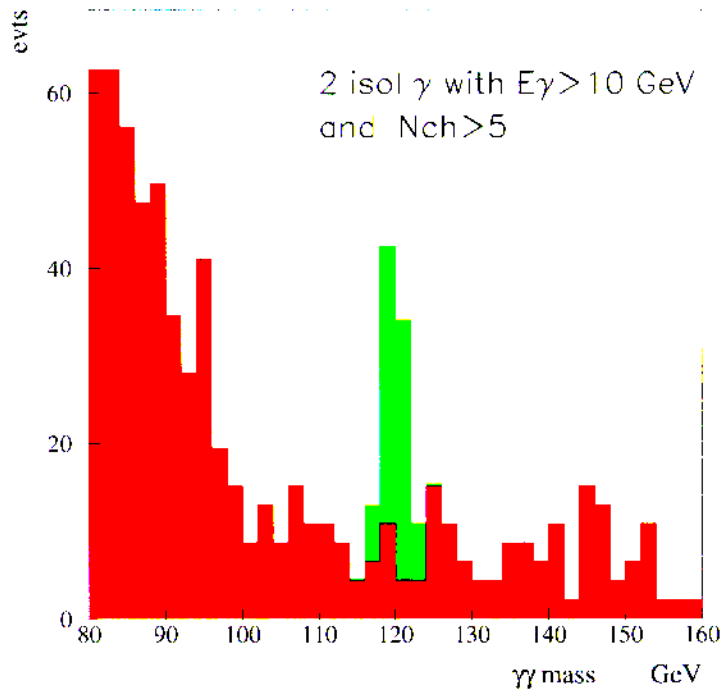






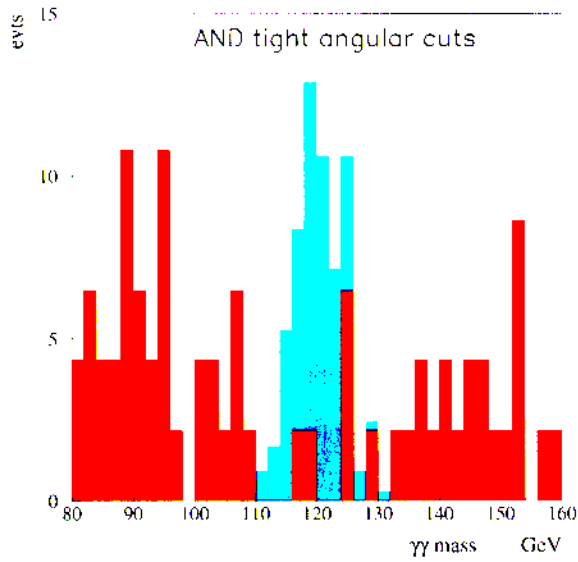
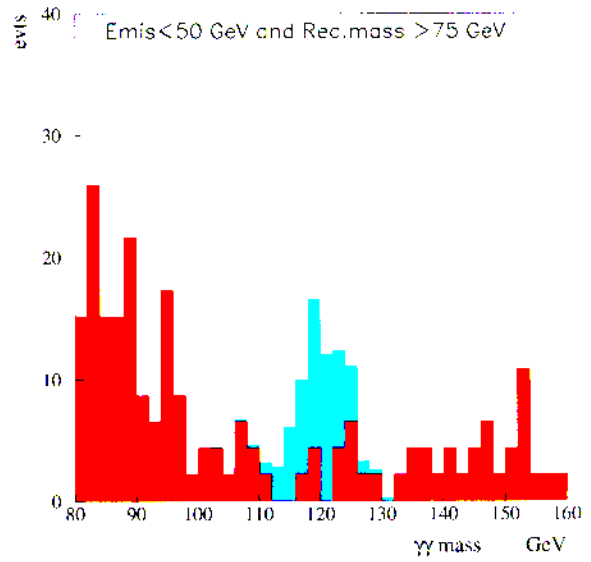
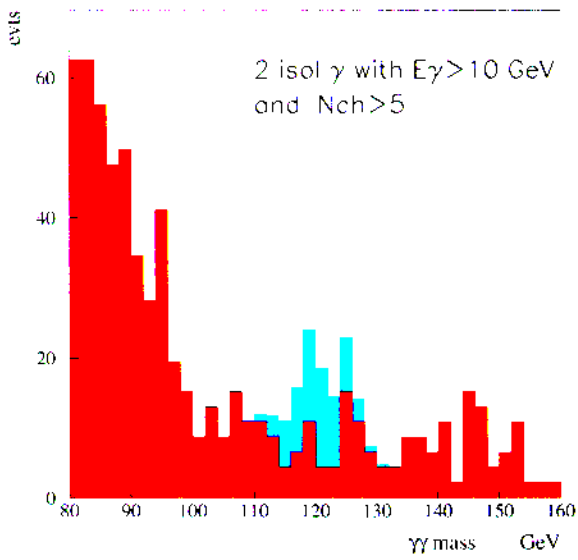
Change ECAL resolution

$$\frac{\Delta E}{E} = \frac{0.06}{\sqrt{E}} \oplus 0.01$$



Change ECAL resolution

$$\frac{\Delta E}{E} = \frac{0.15}{\sqrt{E}} \oplus 0.03$$



Conclusion

1 The extraction of $h \rightarrow \gamma\gamma$ process seems possible **EVEN** with $15\%/\sqrt{E}$ and 3% of constant term !!!

2 ratio S/B and precision $\frac{\Delta B}{B}$ depend on the ECAL detector
 $\frac{\Delta E}{E} = \mathbf{a} / \sqrt{E} \oplus \mathbf{b}$

for 500 fb^{-1}

(a,b)	S/\sqrt{B}	$\frac{\Delta B}{B}$
0.15 0.01	14.4	0.144
0.06 0.01	16.0	0.138
0.15 0.03	11.7	0.159