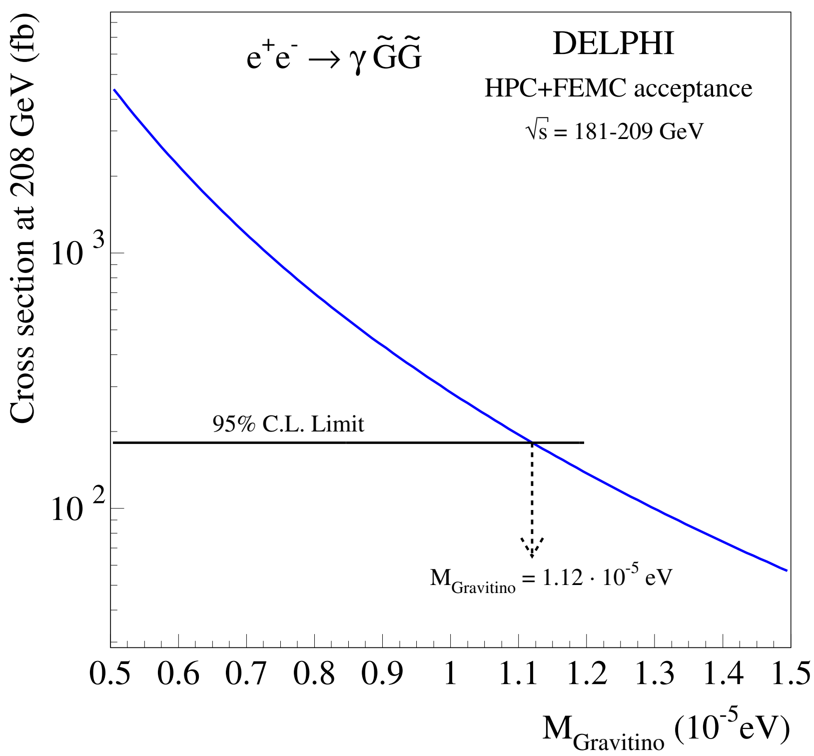
The Single Photon Analysis

- ✔ What has been done
- ✔ Work in progress
- ✘ The problem with Susygen

The Gravitino analysis

$$e^+e^- \rightarrow \tilde{G}\,\tilde{G} + \gamma$$

- ✔ Gravitino LSP
- ✔ All other SUSY-partners to heavy to produce
- ✔ $\mathcal{L}_{\mathcal{R}}$ - method from the $\tilde{\chi}_1^- \tilde{\chi}_1^+$ been used to select the candidates
- ✔ All data $\sqrt{s}$ = 181-209 GeV was combined



Expected limit:

$m_{\tilde{G}} > 1.14 \bullet 10^{-5}$ eV

Obtained limit:

$m_{\tilde{G}} > 1.12 \bullet 10^{-5}$ eV $\longrightarrow$ $\sqrt{F} > 217$ GeV

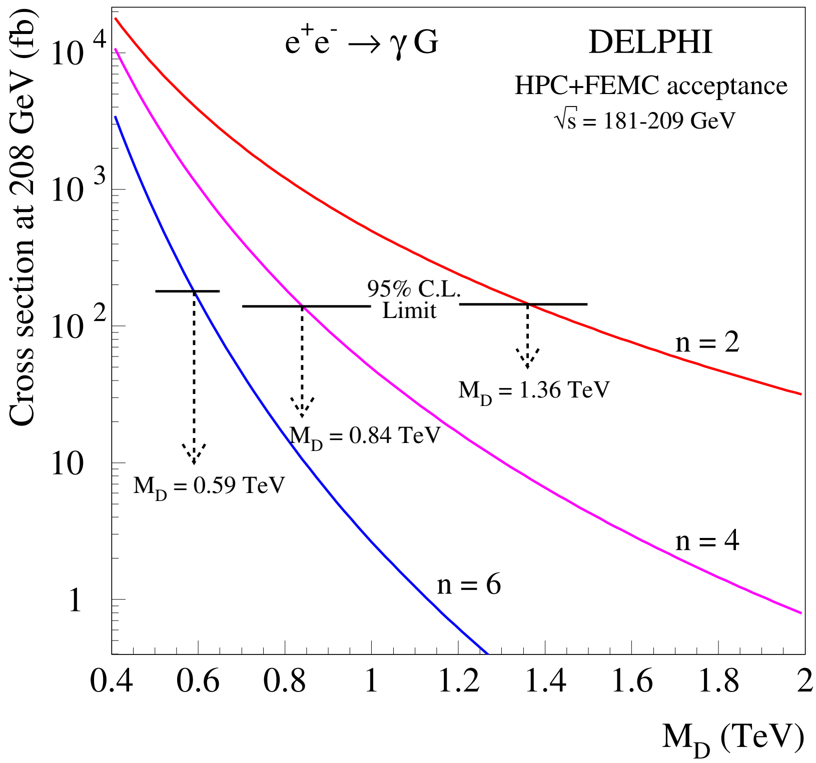
Extra dimsension analysis

$$e^+e^- \rightarrow G + \gamma$$

✔ Gravity propagates in extra dimensions

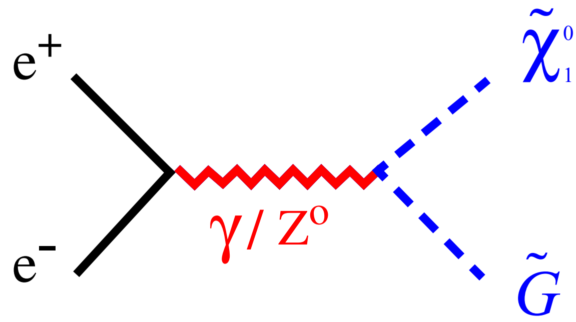
$$G_N^{-1} = 8\pi R^{\delta} M_D^{\delta+2}$$

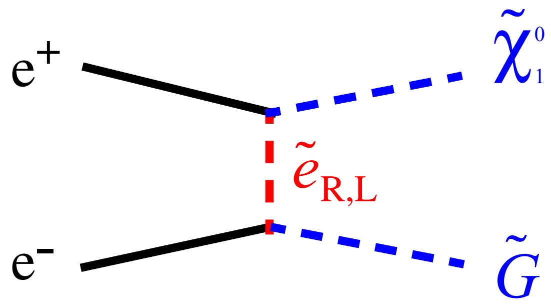
$$M_D^G = 2^{-1/\delta+2} M_D^M$$

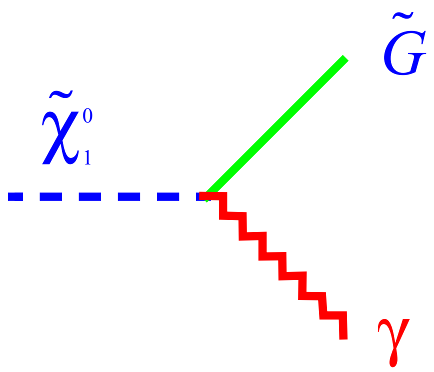


Dimensions	$M_D >$ (Exp.)	$M_D >$	Radius <
2	1.32	1.36 TeV	0.26 mm
3	1.01	1.05 TeV	3.3 nm
4	0.82	0.84 TeV	13 pm
5	0.69	0.69 TeV	0.48 pm
6	0.59	0.59 TeV	0.54 fm

Gravitino-Neutralino analysis







$$\sigma(e^+e^- \rightarrow \tilde{\chi}^0_1 \tilde{G}) = f(m_{\tilde{G}}, m_{\tilde{\chi}^0_1}, m_{\tilde{e}_{R,L}}, N_{11}, N_{12}, \sqrt{s})$$

$$BR(\tilde{\chi}^0_1 \rightarrow \tilde{G}\gamma) \simeq 1$$

- ✔ General scenario (GMSB)
- ✔ LNZ one parameter model

General scenario (GMSB)

Assume the $\tilde{\chi}^0_1$ is gaugino like

+

Signal shape and $\sigma(e^+e^- \rightarrow \tilde{\chi}^0_1 \tilde{G})$
quite unsensitive to gaugino
composition of $\tilde{\chi}^0_1$

We set $\tilde{\chi}^0_1$ to pure Bino

GMSB: $|\mu| >> M_2$

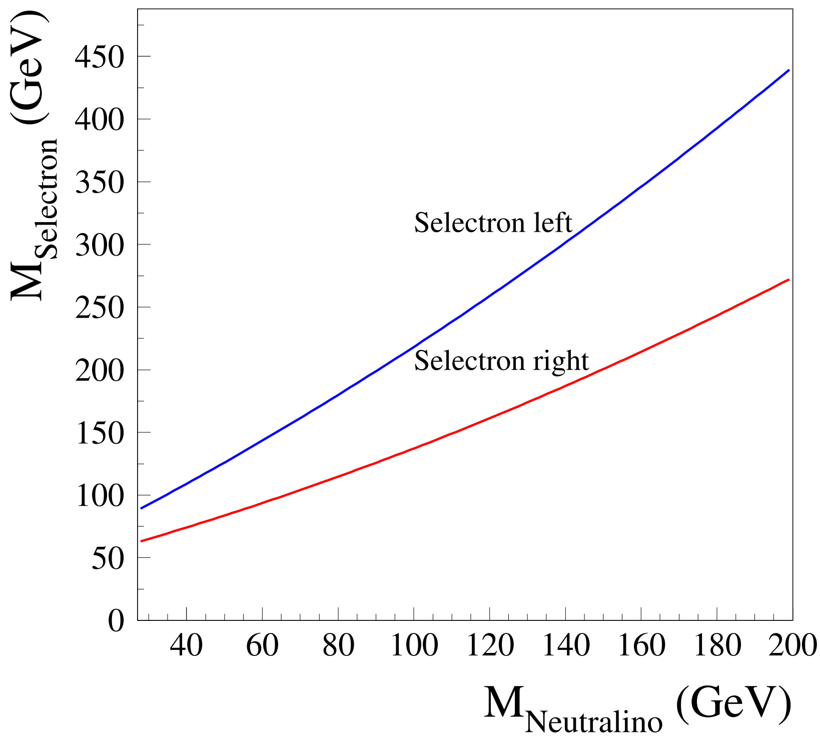
Independent of $\tan(\beta)$

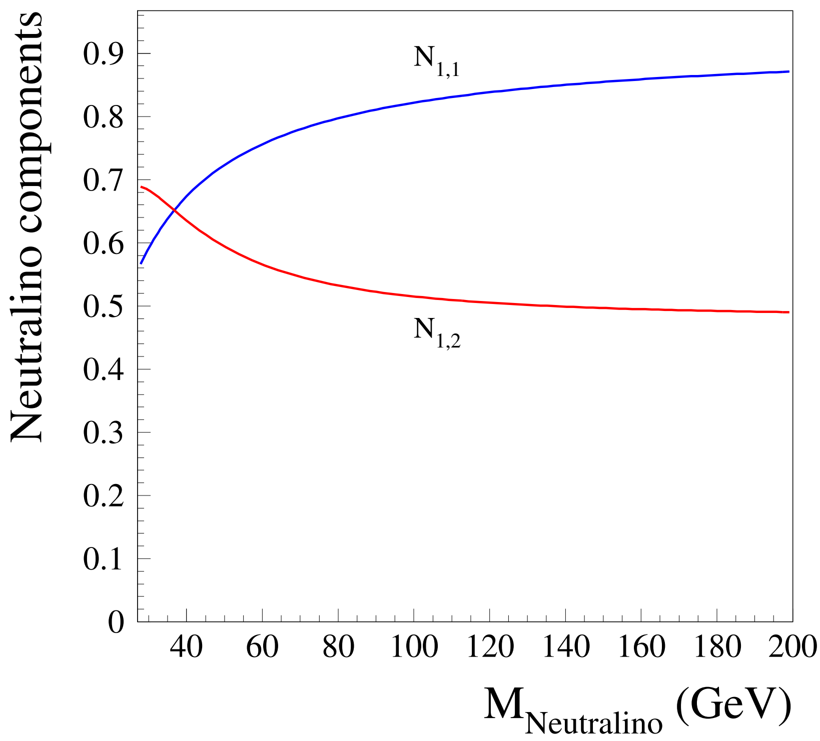
The LNZ model

(J.L. Lopez, D.V. Nanopoulos, A. Zichichi)

- ✔ One parameter ($m_{1/2}$) supergravity model
- ✔ Gravitino LSP
- ✔ Gaugino like neutralino

LNZ parameters





The Susygen problem

J.L. Lopez et al., Phys. Rev. D55 (1997) 5813

Figures 6, 9 and 10, from the paper.

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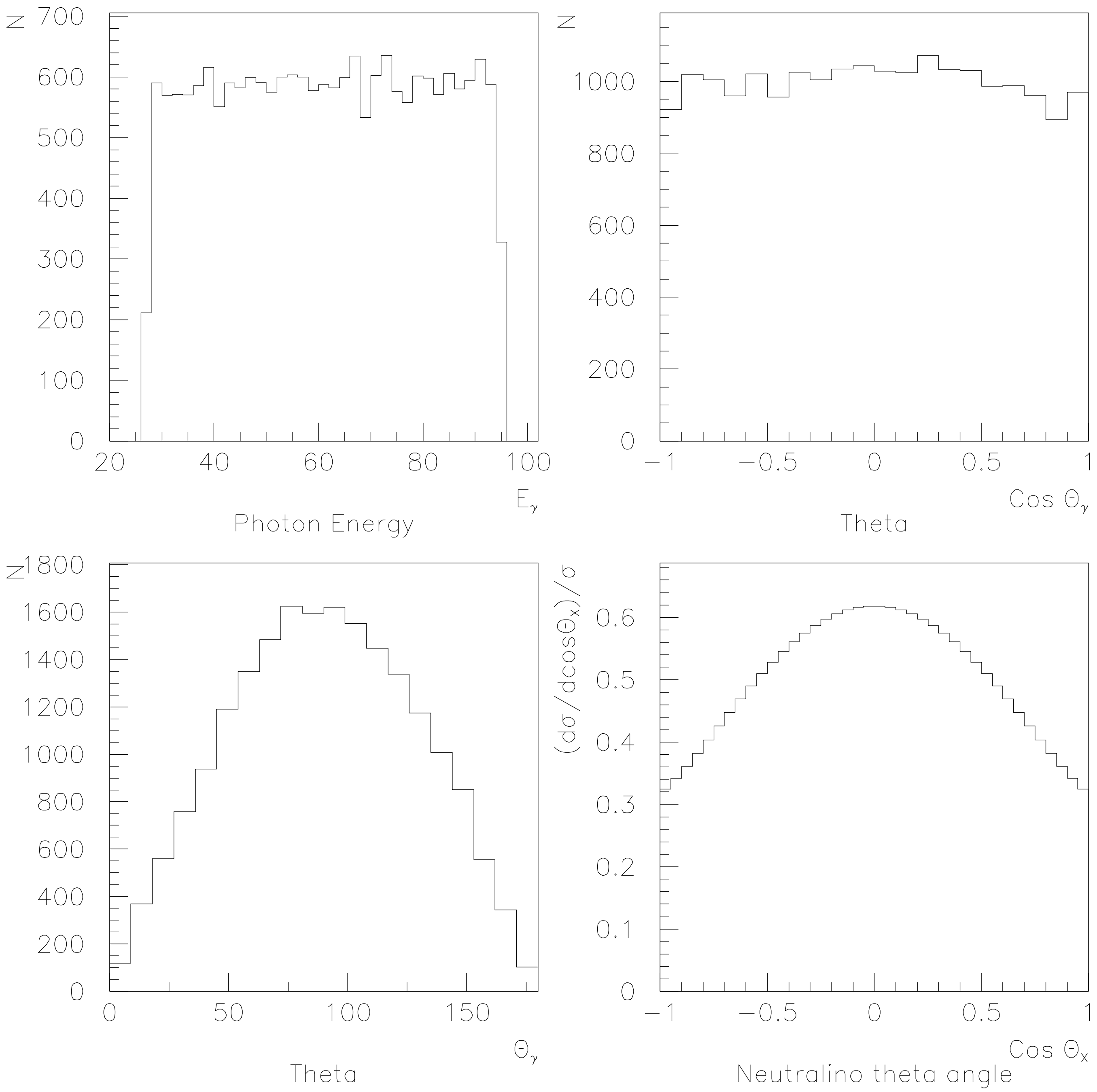
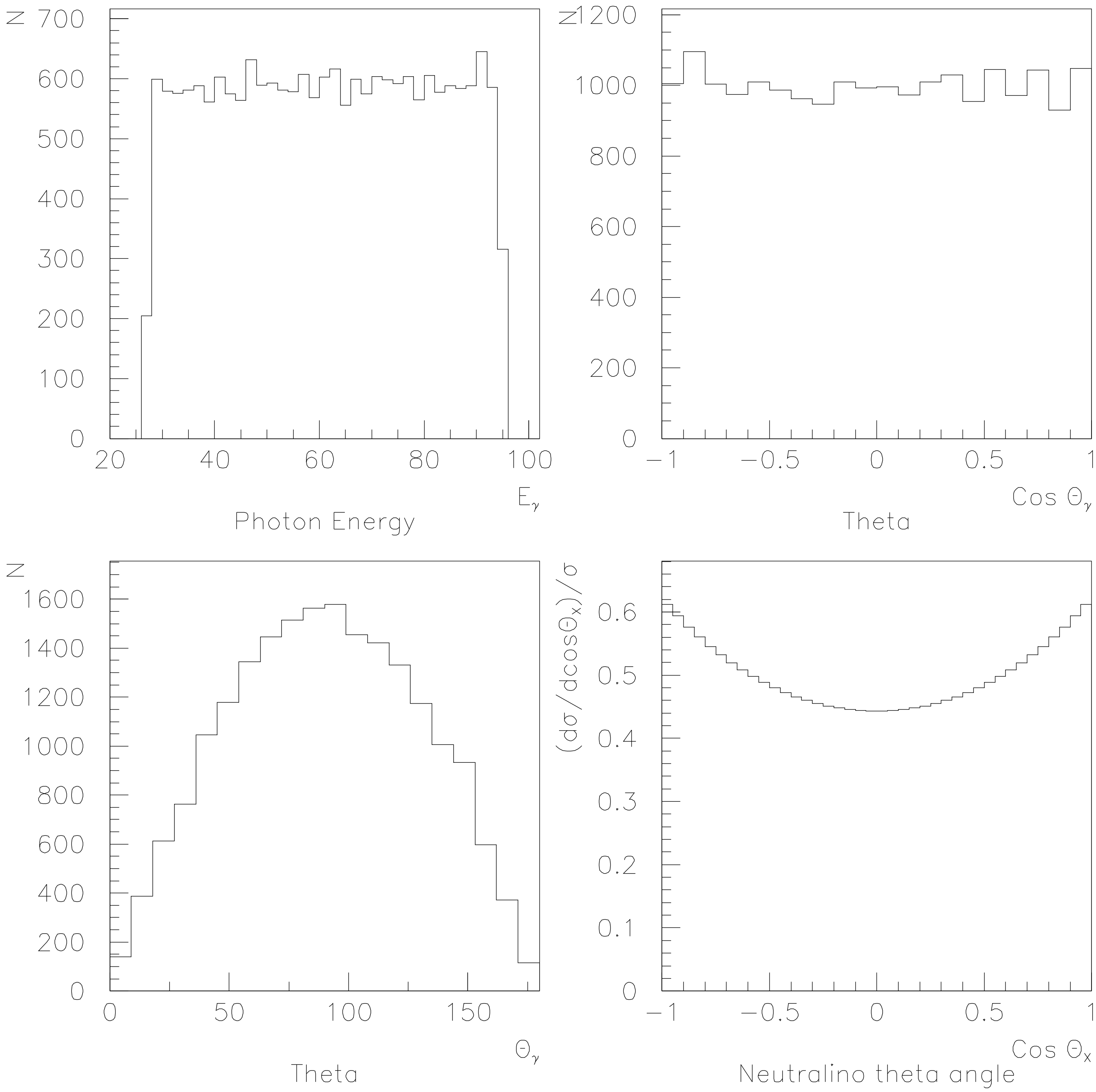
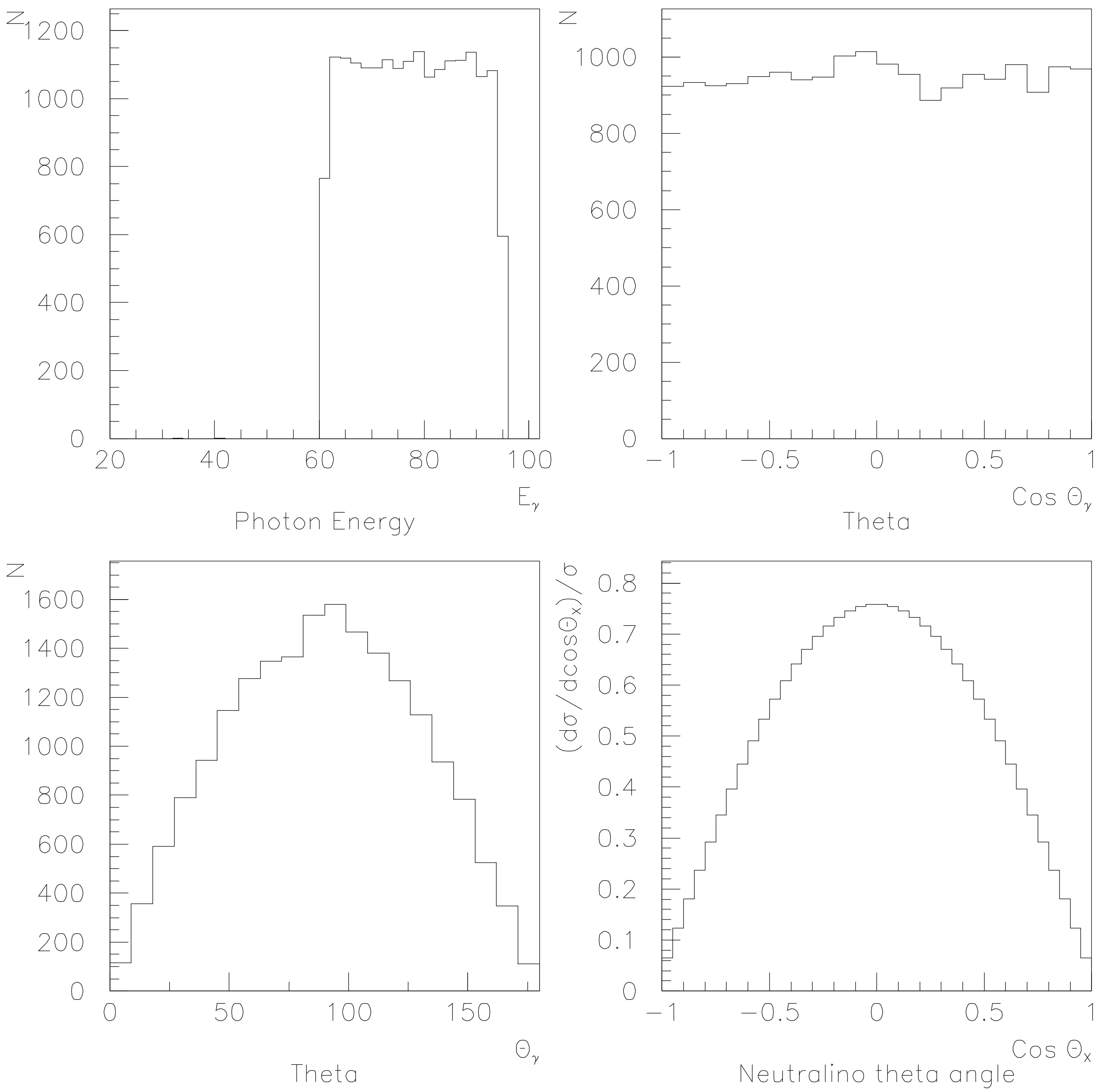
$M_{Neutralino} = 100,\ M_{Selectron} = 150$



$M_{Neutralino} = 100,\ M_{Selectron} = 300$



$M_{Neutralino} = 150, M_{Selectron} = 150$



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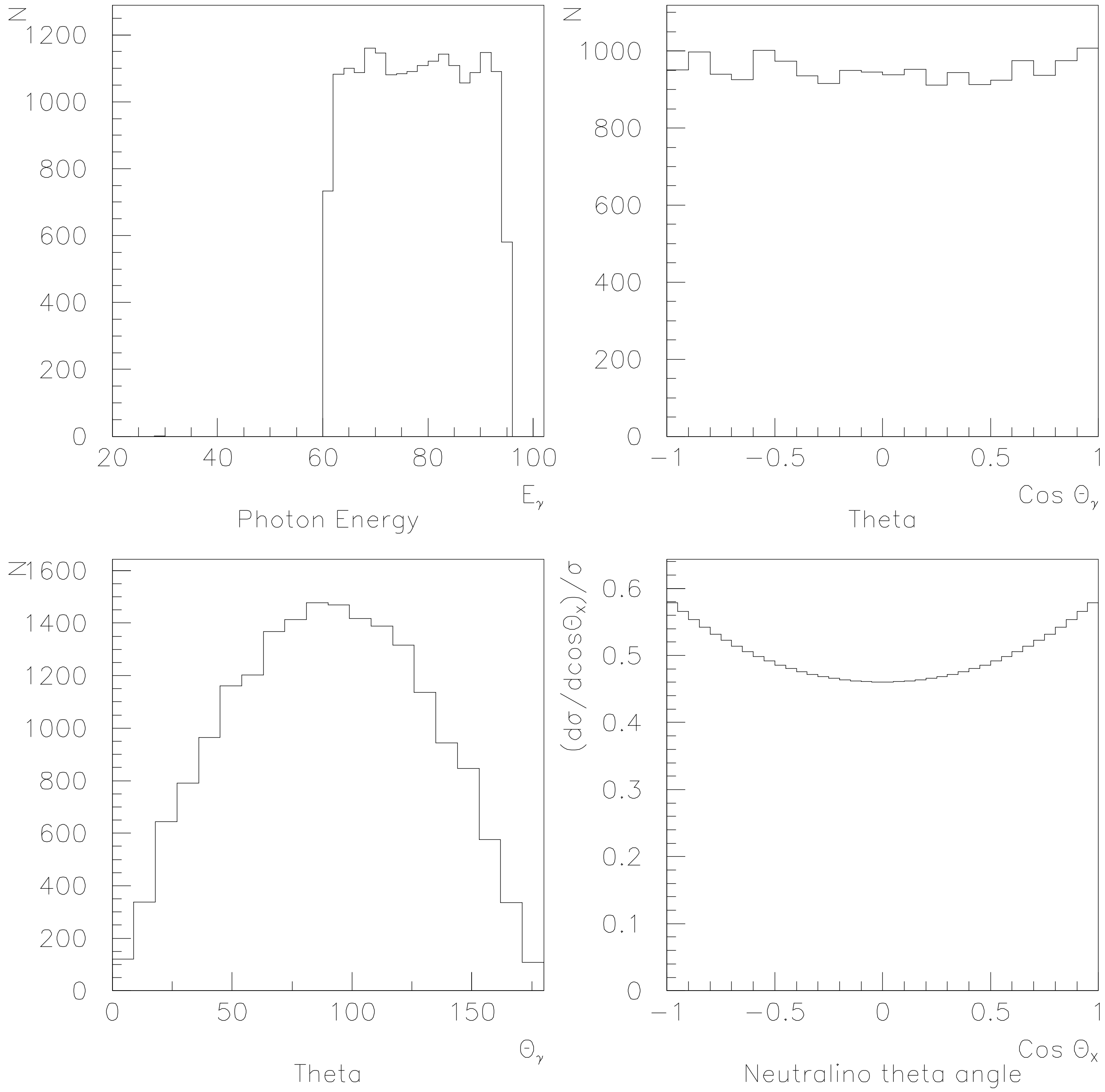
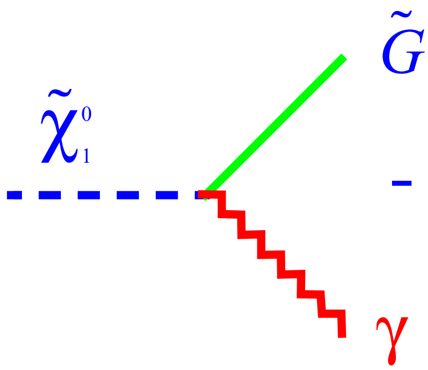


Conclusion

Susygen3 (2.2) :

$$\frac{d\sigma}{d\mathrm{Cos}(\theta)}(e^+e^- \rightarrow \tilde{\chi}^0_1 \tilde{G}) \qquad \text{Ok}$$



- event generation   Not Ok

Susygen-people working on this since two months