

Right-handed neutrino in extra dimension

Model Identification *@* 1TeV

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Right-handed neutrino in extra dimension

(arXiv:0901.4596v1[hep-ph])

Analysis on 1st KK mode @ **1TeV**

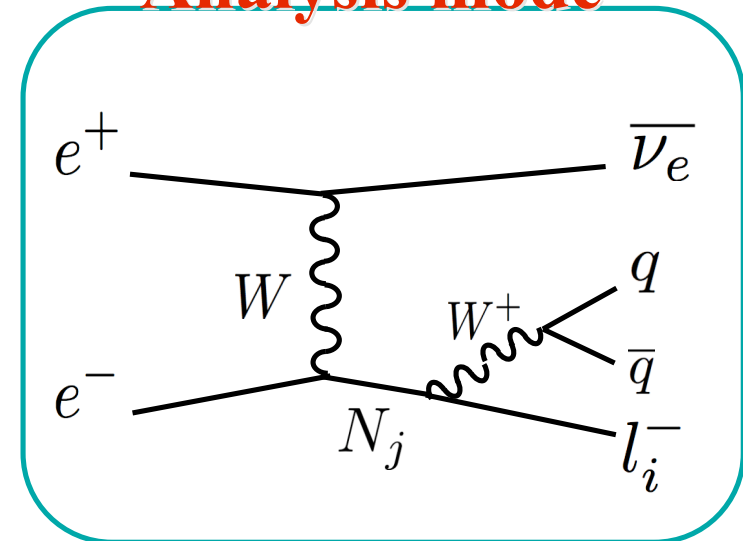
Simulation

Simulation condition

Fast simulator of GLD

c.m. energy	: 1 TeV
Luminosity	: 500 fb ⁻¹
N_1 mass	: 100 GeV
N_2 mass	: 300 GeV
N_3 mass	: 500 GeV
N_4 mass	: 700 GeV

Analysis mode



Neutrino mass hierarchy

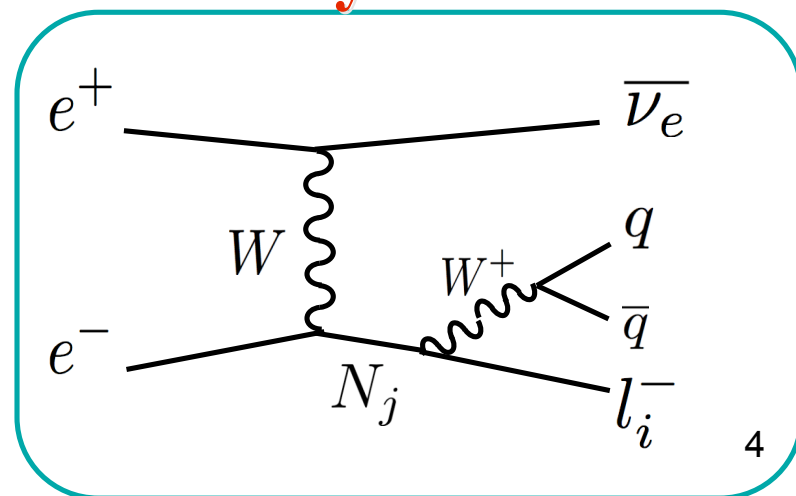
	<i>Normal</i>	<i>Inverted</i>	<i>Degenerated</i>
ν_e (eV)	0	4.1E-02	0.20
ν_μ (eV)	9.0E-03	5.0E-02	0.21
ν_τ (eV)	5.9E-02	0.0E+00	0.26

Cross section

Signal	cross section (fb)		
KK mode	Normal	Inverted	Degenerated
1st KK	10.87	494.06	427.00
2nd KK	0.64	29.25	25.29
3rd KK	0.17	7.80	6.74
4th KK	0.05	2.40	2.08

Background	cross section (fb)
enW	10320
WW	280.3
ZZ	32.79
tt	29.43

Analysis mode



Cut Summary

	Normal	Inverted	Degenerated	evW	WW	ZZ	tt
before cut	5435	247000	213500	5160000	140150	16395	14715
① 10 < Lepton Energy < 100	696	45544	118514	143696	17086	660	6163
② 60 < W mass < 100	348	23049	15062	30282	7782	78	315

Normal

420 < W energy < 680	159	2532	3413	42	0
90 < N mass < 110	139	564	24	24	0
efficiency (%)	2.6%	0.0%	0.0%	0.1%	0.0%

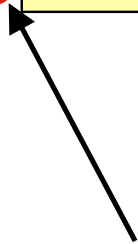
Inverted

100 < W energy < 600	21822	21624	7512	75	293
90 < N mass < 110	17101	3564	161	38	26
efficiency (%)	6.9%	0.1%	0.1%	0.2%	0.2%

Degenerated

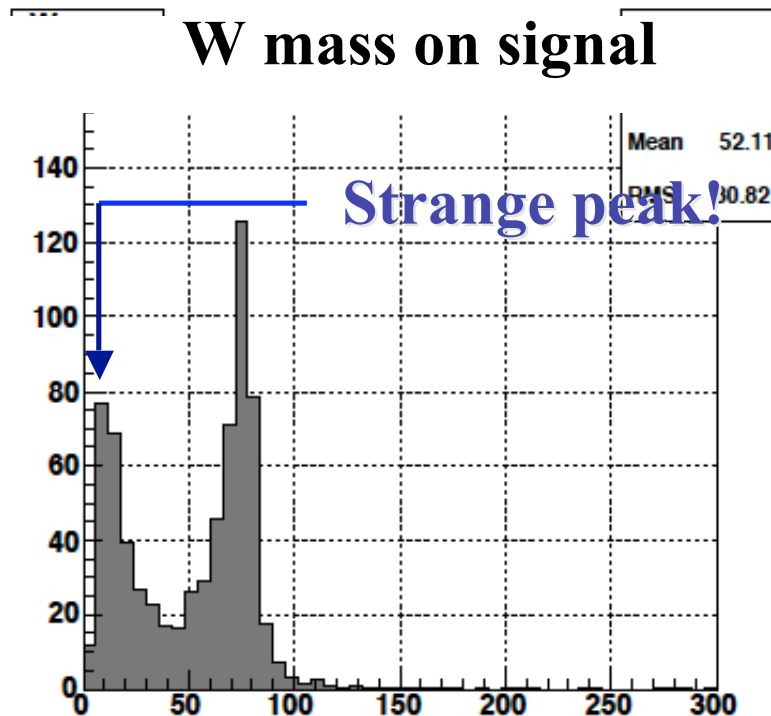
100 < W energy < 700	14379	21643	7558	75	293
90 < N mass < 110	11201	3564	161	38	26
efficiency (%)	5.2%	0.1%	0.1%	0.2%	0.2%

Question!



Question

- ① Signal event number is made 2/3 by the JetAnalysis.
- ② W mass distribution about the signal has a strange peak.

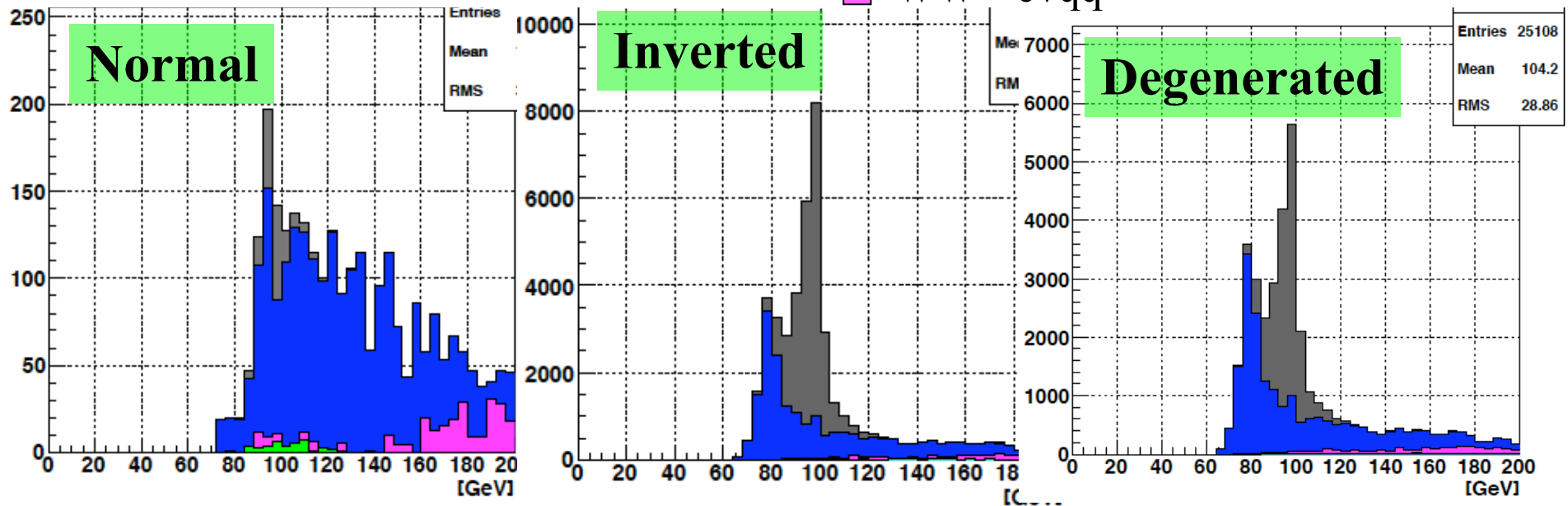


Signal event number is made small
by these effects

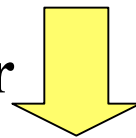
Right-handed neutrino mass

Reconstructed NR mass

- signal
- $\nu W \rightarrow \nu qq$
- $ZZ \rightarrow \nu\nu qq + ll qq$
- $WW \rightarrow \nu\nu qq$
- tt



Error



19.7%

0.8%

1.1%

7

Model Identification *@* 1TeV

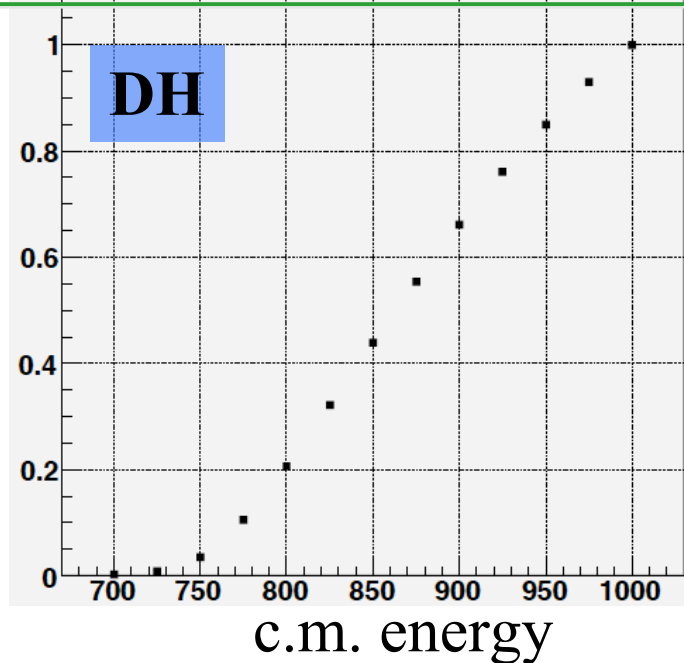
Progress

- ▶ The threshold scans are investigated, changing the cross section.
 - Points are fluctuated
 - Fit region : 740 ~ 825 GeV
 - Luminosity on one point : 40 fb⁻¹

Threshold scan

The cross section rising is checked through the threshold scan.

The normalized cross section



Fit function : $N (s - m_C^2)^\alpha$

N : the normalized factor

s : the square of \sqrt{s}

m_C : the mass of charged particle

α : 1/2 , 3/2, 5/2, ...

Fit region : 740 ~ 825 GeV

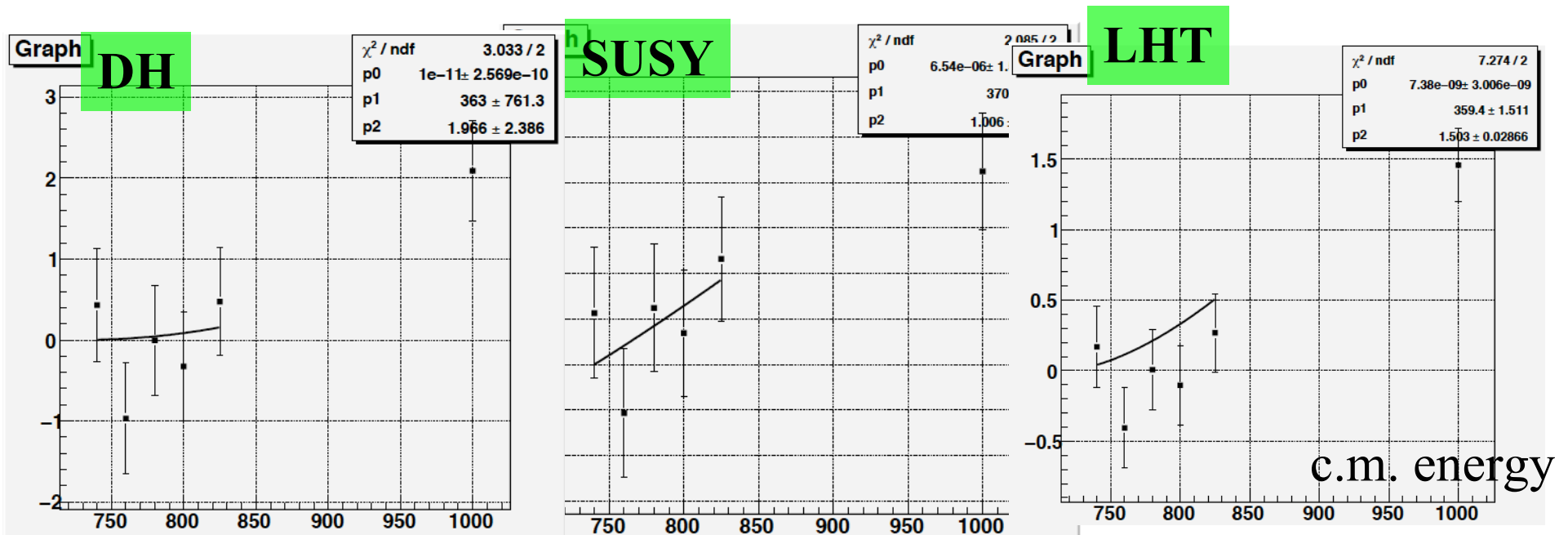
Luminosity on one point : 40 fb⁻¹

The difference on α is investigated by the fit results, changing the model's cross section, 3, 100, 308 fb.

Fit results (cross section=3fb)

The threshold scan are performed. (All model = 3fb)

The normalized cross section



Result

$$\alpha = 1.966 \pm 2.386$$

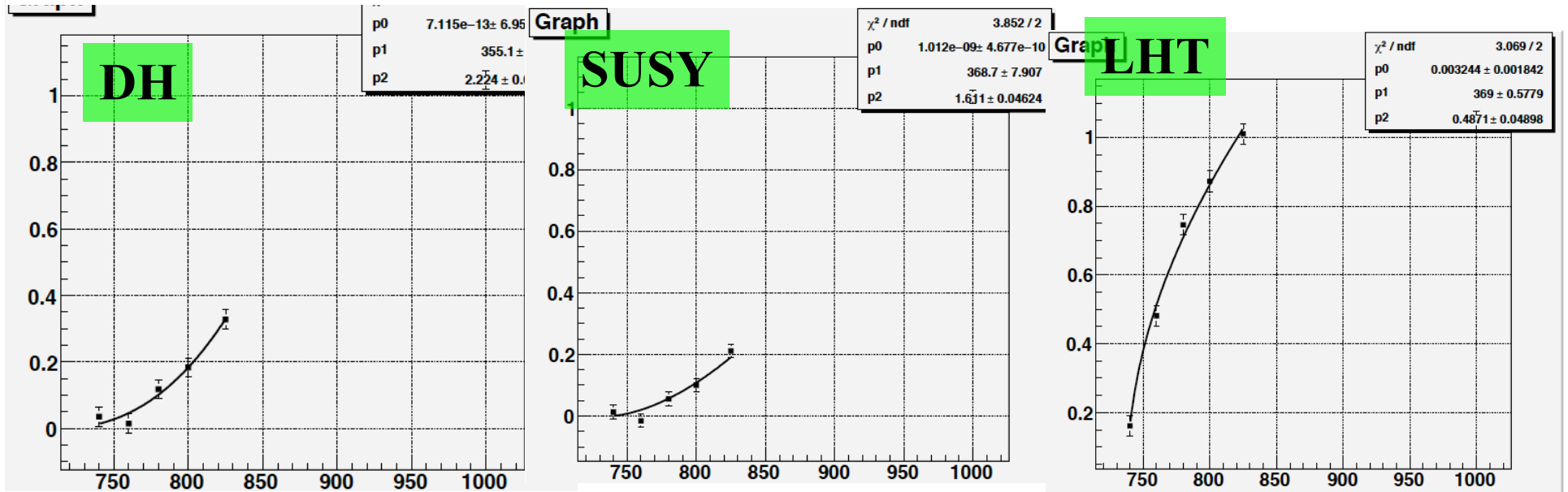
$$\alpha = 1.006 \pm 0.2321$$

$$\alpha = 1.503 \pm 0.02866$$

Fit results (cross section=100fb)

The threshold scan are performed. (All model = 100fb)

The normalized cross section



Result

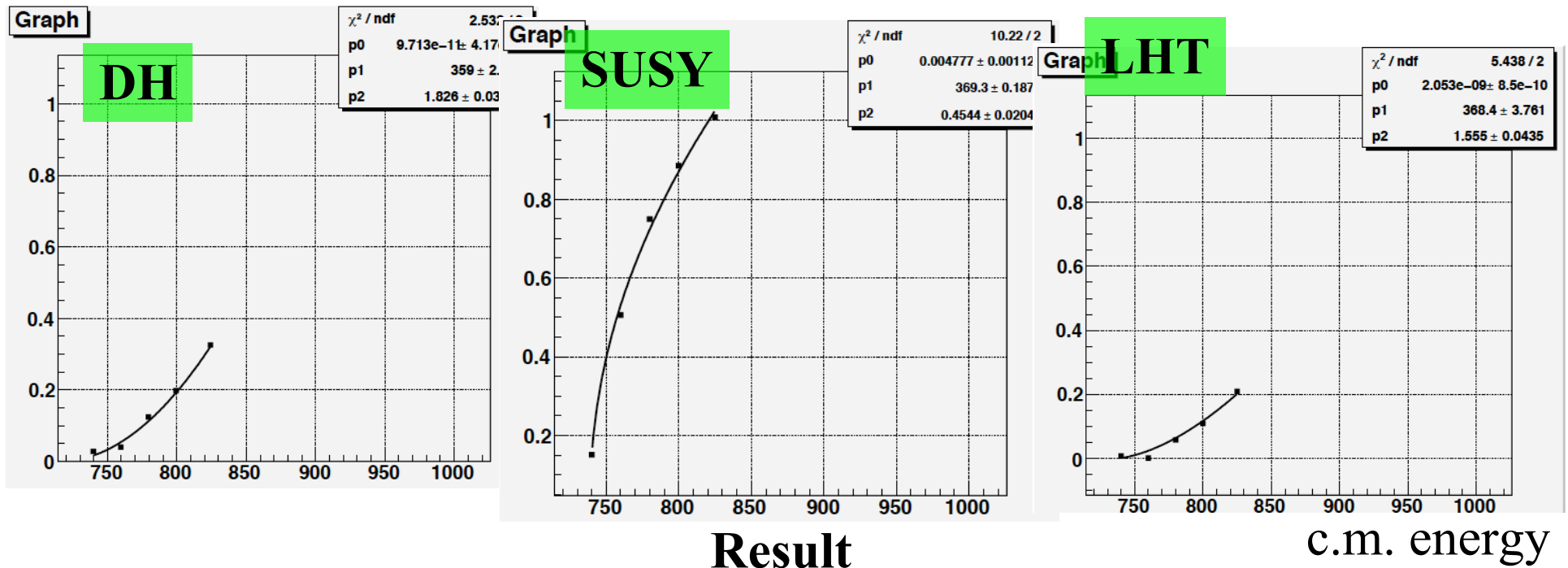
c.m. energy

$\alpha = 2.224 \pm 0.07708$ $\alpha = 0.4871 \pm 0.04898$ $\alpha = 1.611 \pm 0.04624$

Fit results (cross section=308fb)

The threshold scan are performed. (All model = 308fb)

The normalized cross section



$\alpha = 1.826 \pm 0.03416$ $\alpha = 0.4544 \pm 0.02043$ $\alpha = 1.555 \pm 0.0435$

Summary

We performed the threshold scan and obtained the fit parameter α .

The values of α

	<i>DH</i>	<i>SUSY</i>	<i>LHT</i>
<i>3 fb</i>	1.97 ± 2.39	1.006 ± 0.232	1.50 ± 0.029
<i>100 fb</i>	2.224 ± 0.077	0.487 ± 0.049	1.61 ± 0.046
<i>308 fb</i>	1.83 ± 0.034	0.454 ± 0.020	1.56 ± 0.044

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Analysis @ 1TeV was started.