Search for Z (B-L) prime in the future run at LHC

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MC simulation , Why ?????

-Compare theory to experiment.

-Compare predicted particle properties to measured Properties :

mass mX, charge qX, spin sX, lifetime τX / decay Width ΓX , branching ratios BR(X → ...), production crosssections- σ(X, ...)

-Theory should be predictive and map to physical observables

-Colliders bring their own complications...

-Real detectors do not cover full solid angle .
-Real detectors do not trigger on arbitrarily soft particles.
-Often want to remove backgrounds with typical using kinematic cuts.

-invisible particles “ Neutrinos , Dark matter”.
-multi-particles phase spaces.

Is Standard Model needs extension ?!!!

The fact that neutrinos are massive indicates that the Standard Model (SM) requires extension. B − L extension of the SM, which is based on (SM) requires extension. B − L extension of the SM, which is based on the gauge group the gauge group

SU (3)C × SU (2)L × U (1)Y × U (1)B−L ..

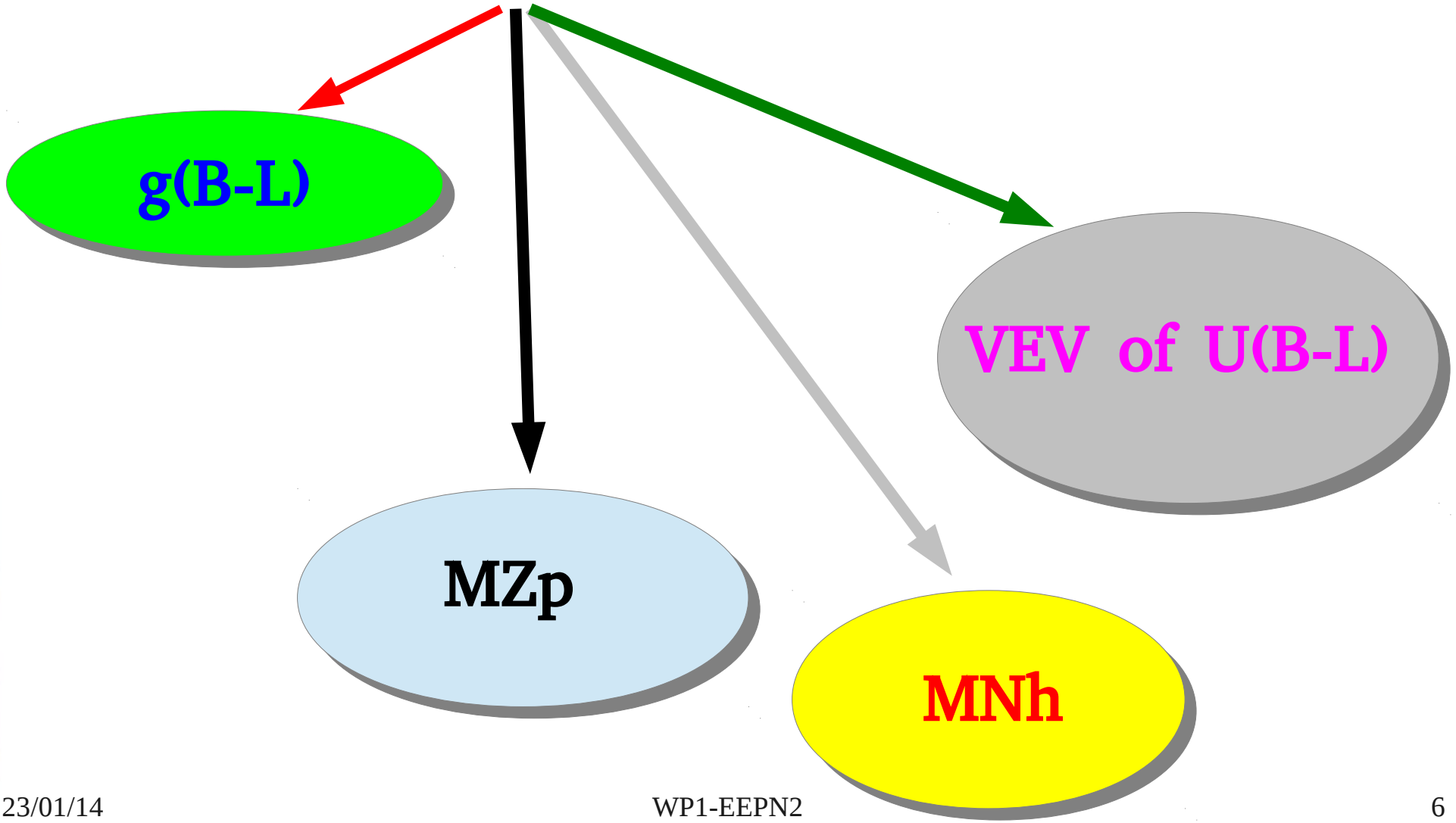
Theory

The theoretical part been discussed in the previous meeting and let us focus to the new results

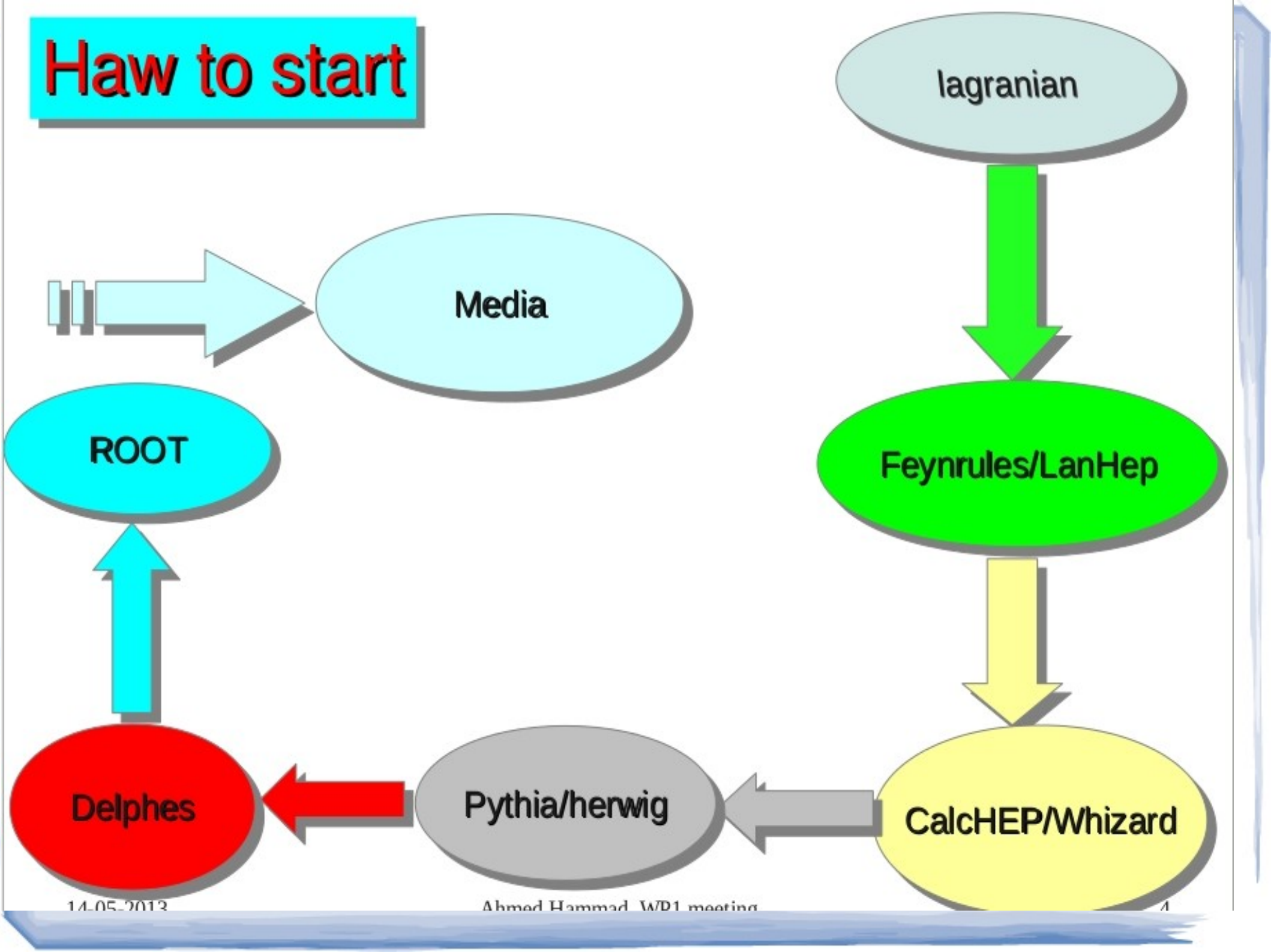
For more deep info a bout the theory and the computational tools used in this work see my talk in the previous meeting

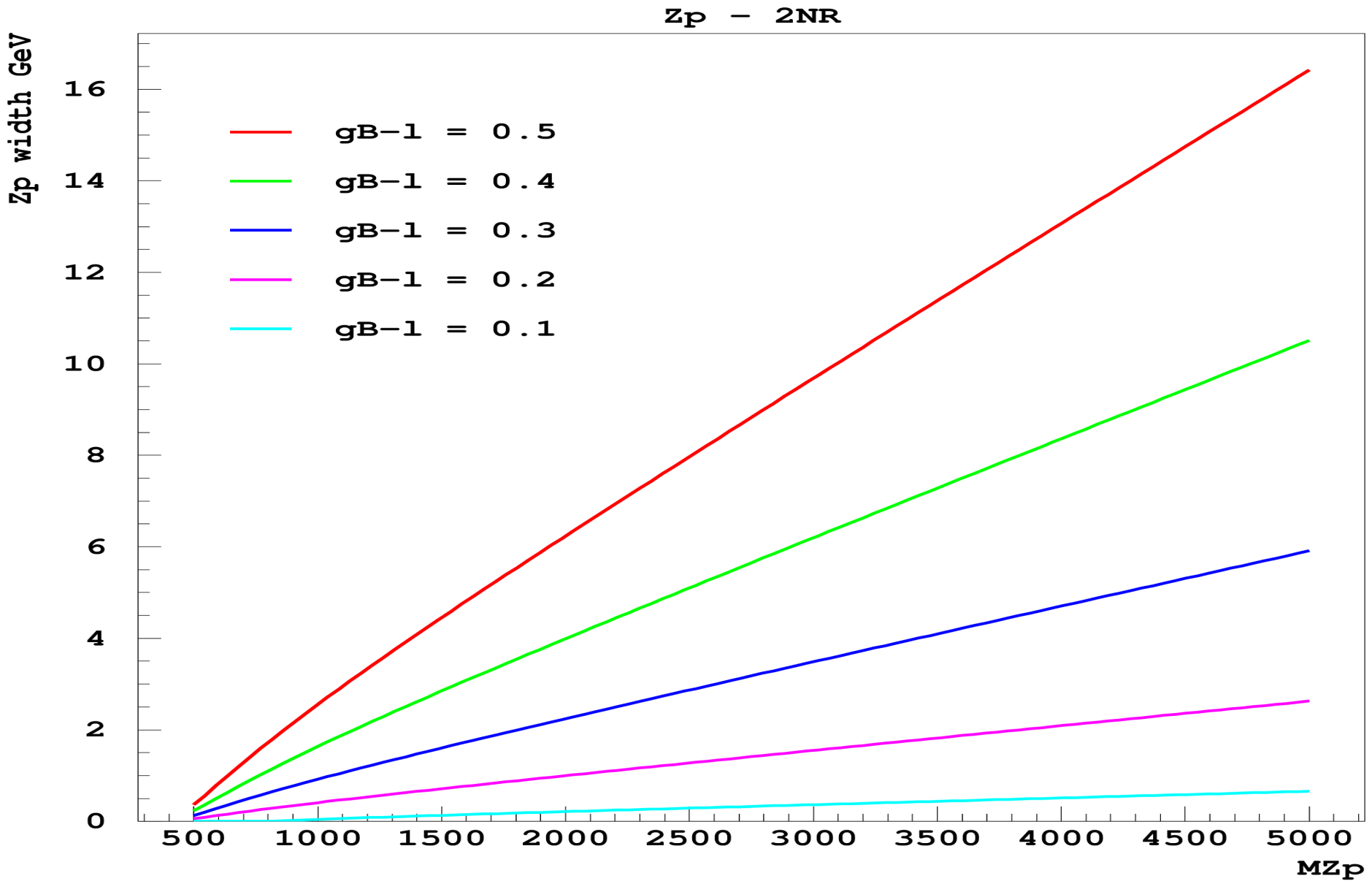
Model Parameter

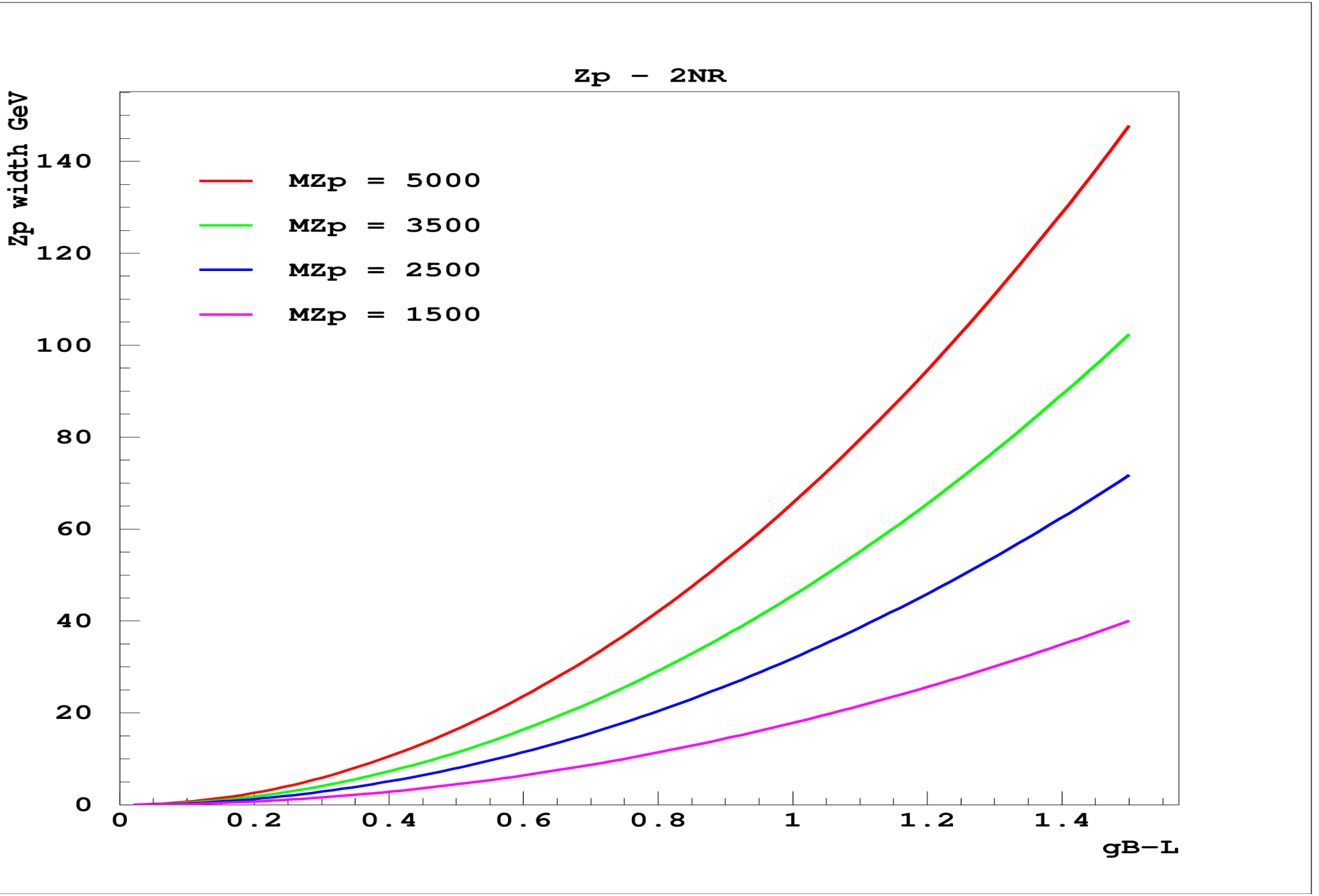
The mode free parameters

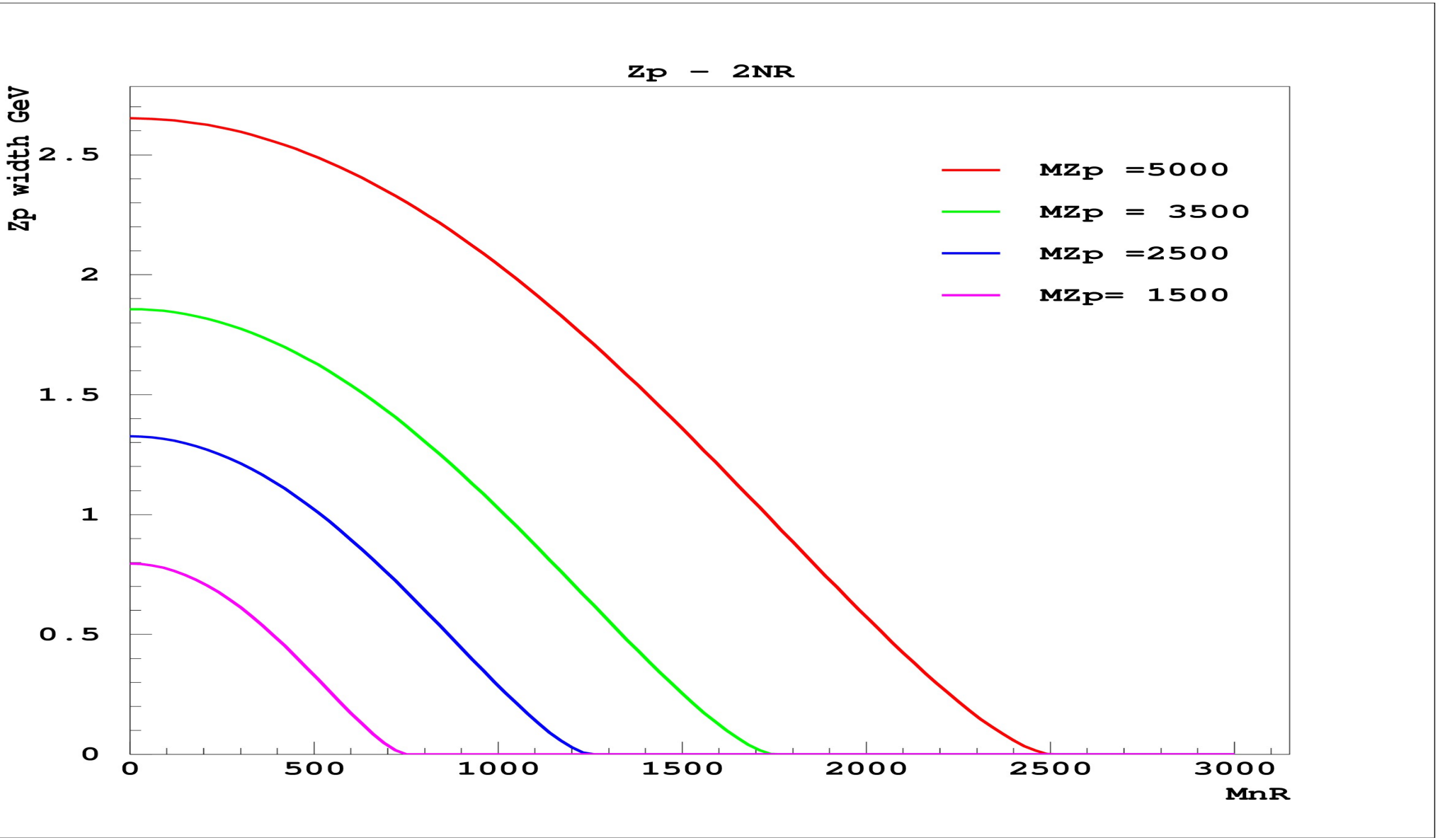


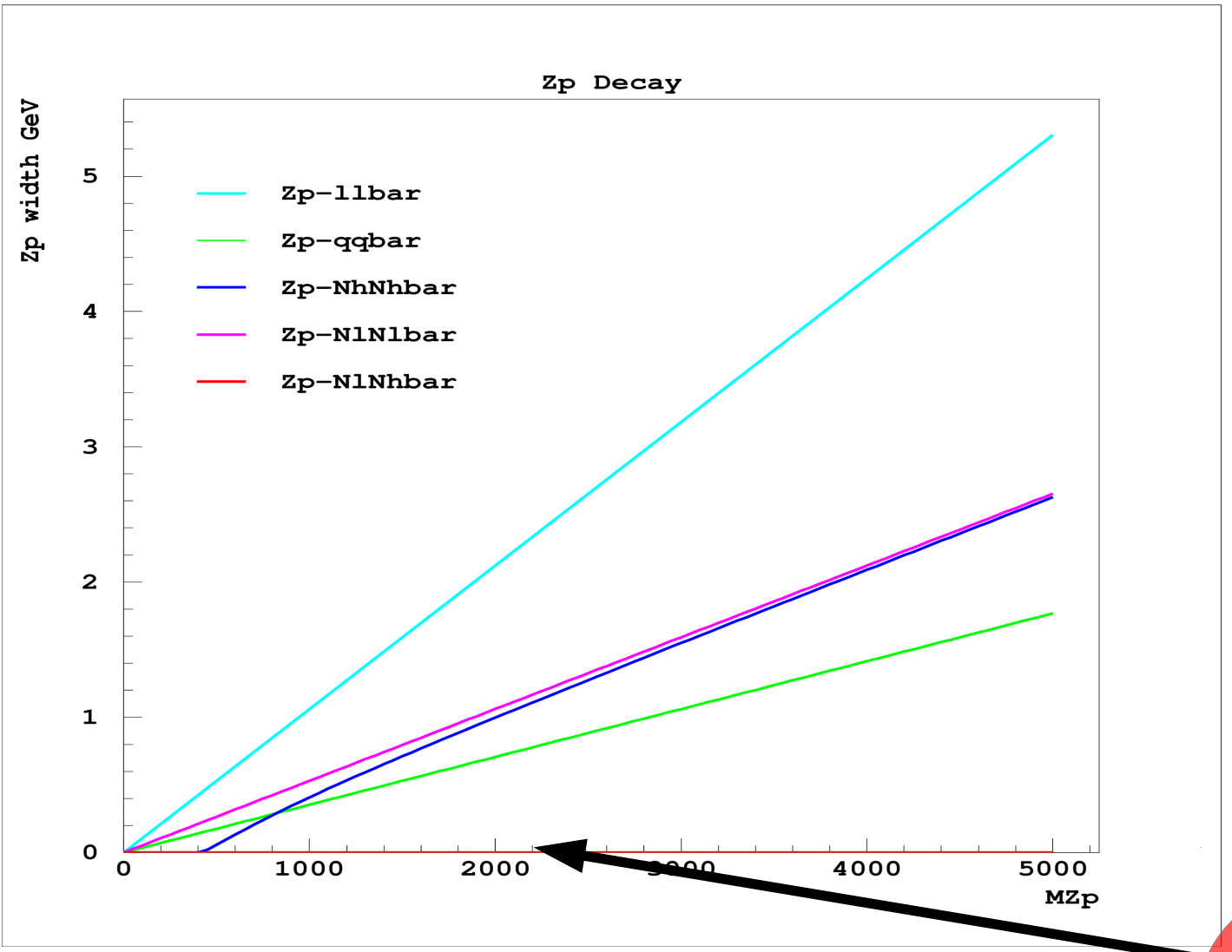
Haw to start


lagranian
Media
ROOT
Feynrules/LanHep
Delphes
Pythia/herwig
CalcHEP/Whizard

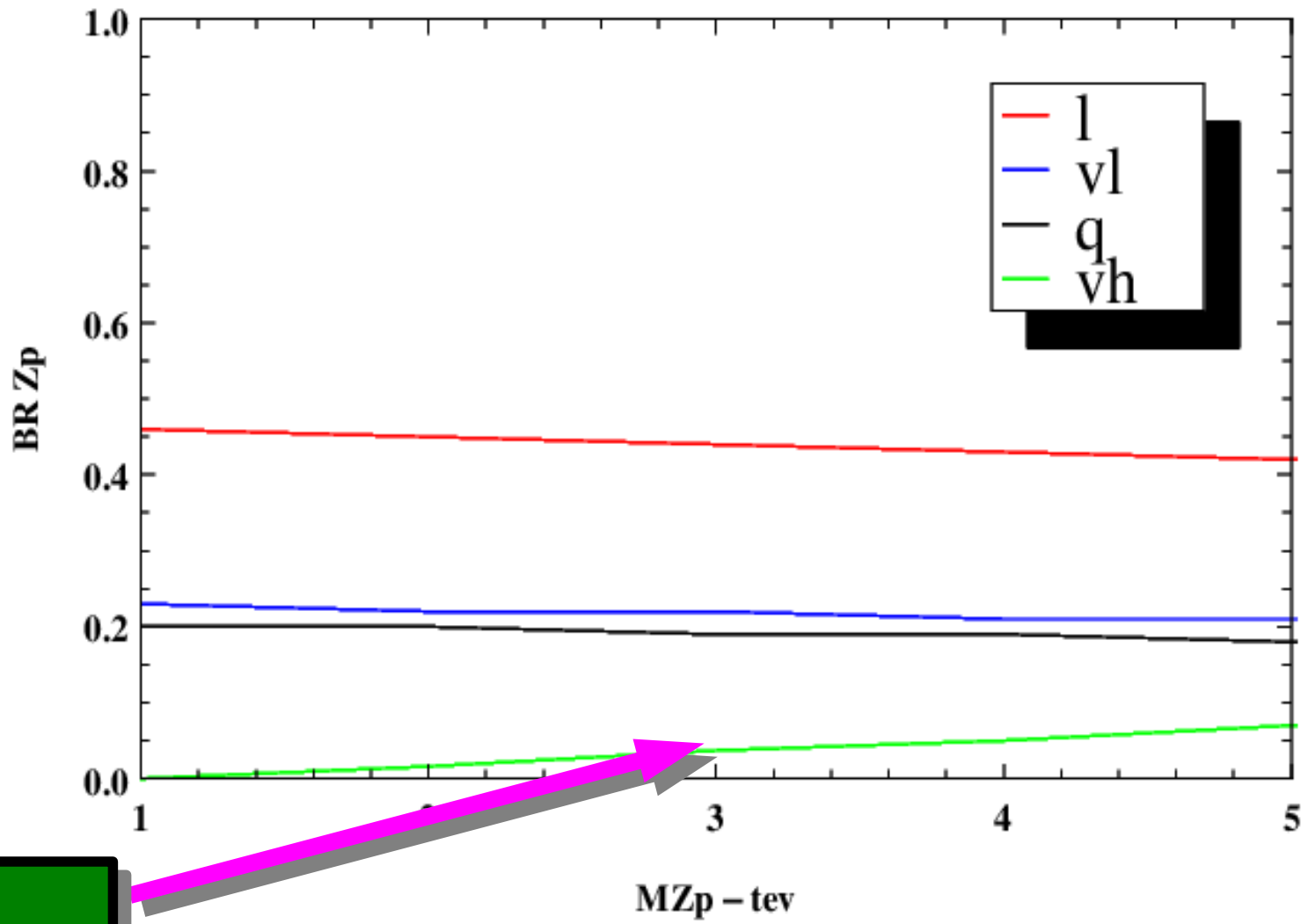

Zp – 2NR
Zp width GeV
gB–1 = 0.5
gB–1 = 0.4
gB–1 = 0.3
gB–1 = 0.2
gB–1 = 0.1
0
2
4
6
8
10
12
14
16
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
MZp


Zp – 2NR
Zp width GeV
0
20
40
60
80
100
120
140
0
0.2
0.4
0.6
0.8
1
1.2
1.4
gB–L
MZp = 5000
MZp = 3500
MZp = 2500
MZp = 1500

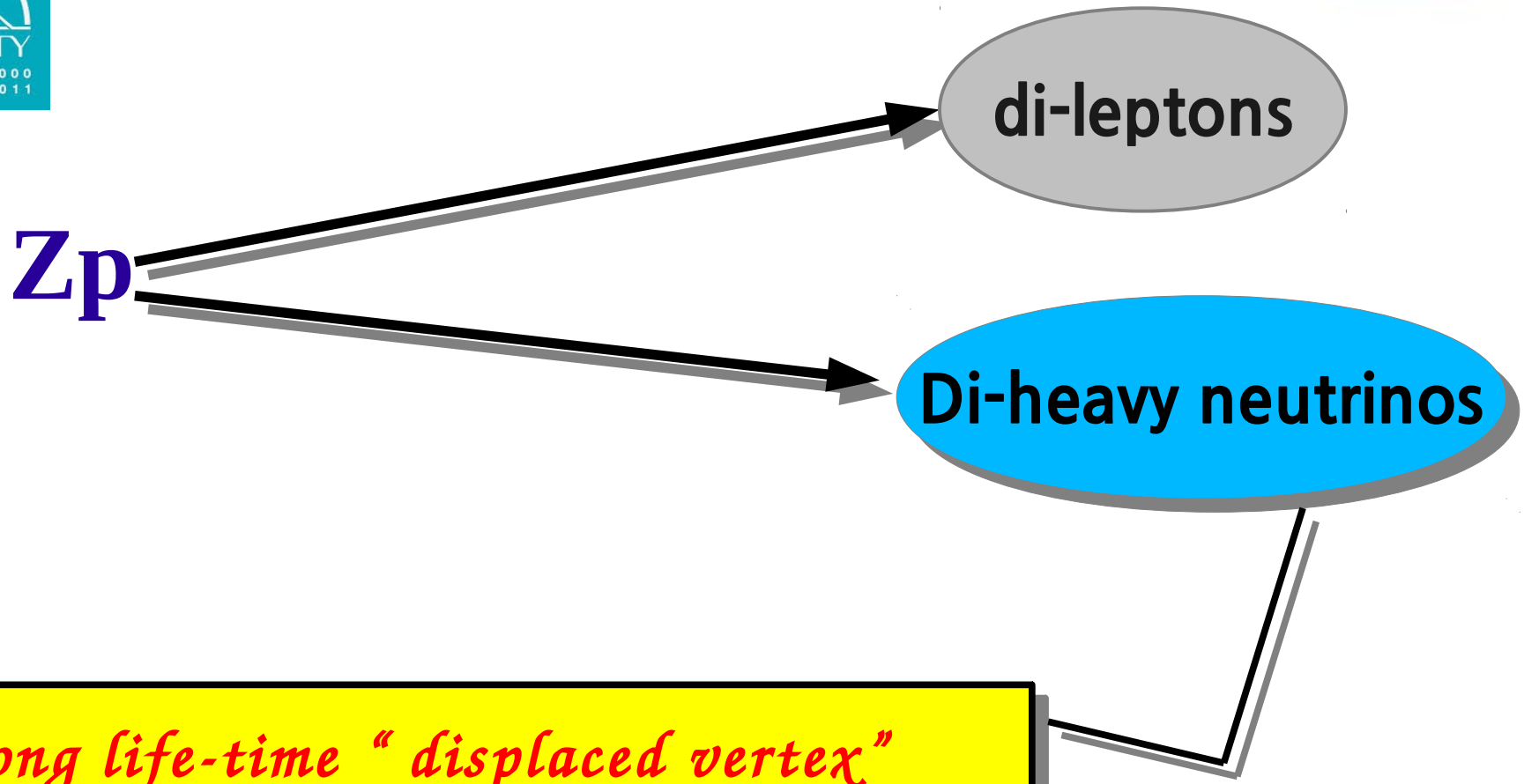

Zp – 2NR
Zp width GeV
2.5
2
1.5
1
0.5
0
0
500
1000
1500
2000
2500
3000
MnR
MZp =5000
MZp = 3500
MZp =2500
MZp= 1500


Zp Decay
Zp width GeV
Zp-llbar
Zp-qqbar
Zp-NhNhbar
Zp-NlNlbar
Zp-NlNhbar
0
1
2
3
4
5
0
1000
2000
4000
5000
MZp


supressed

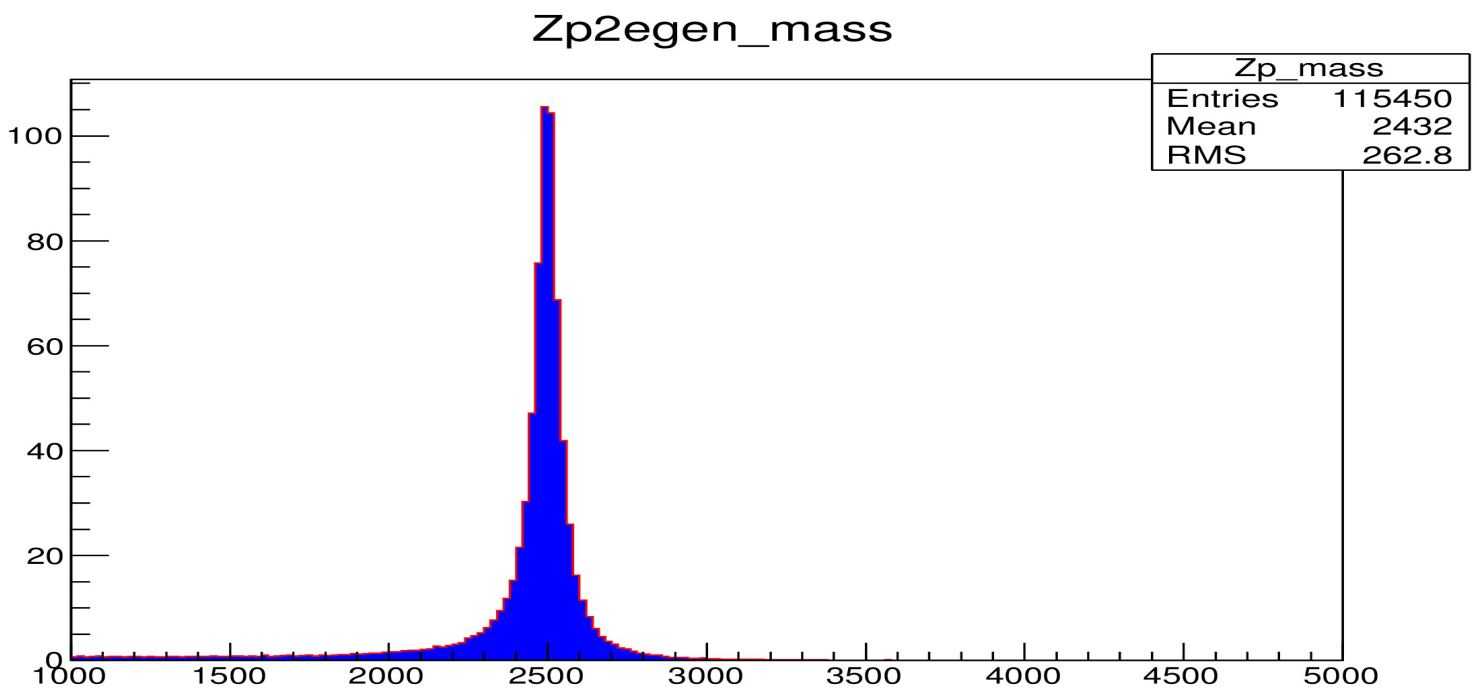


BR Vh ~ 18%

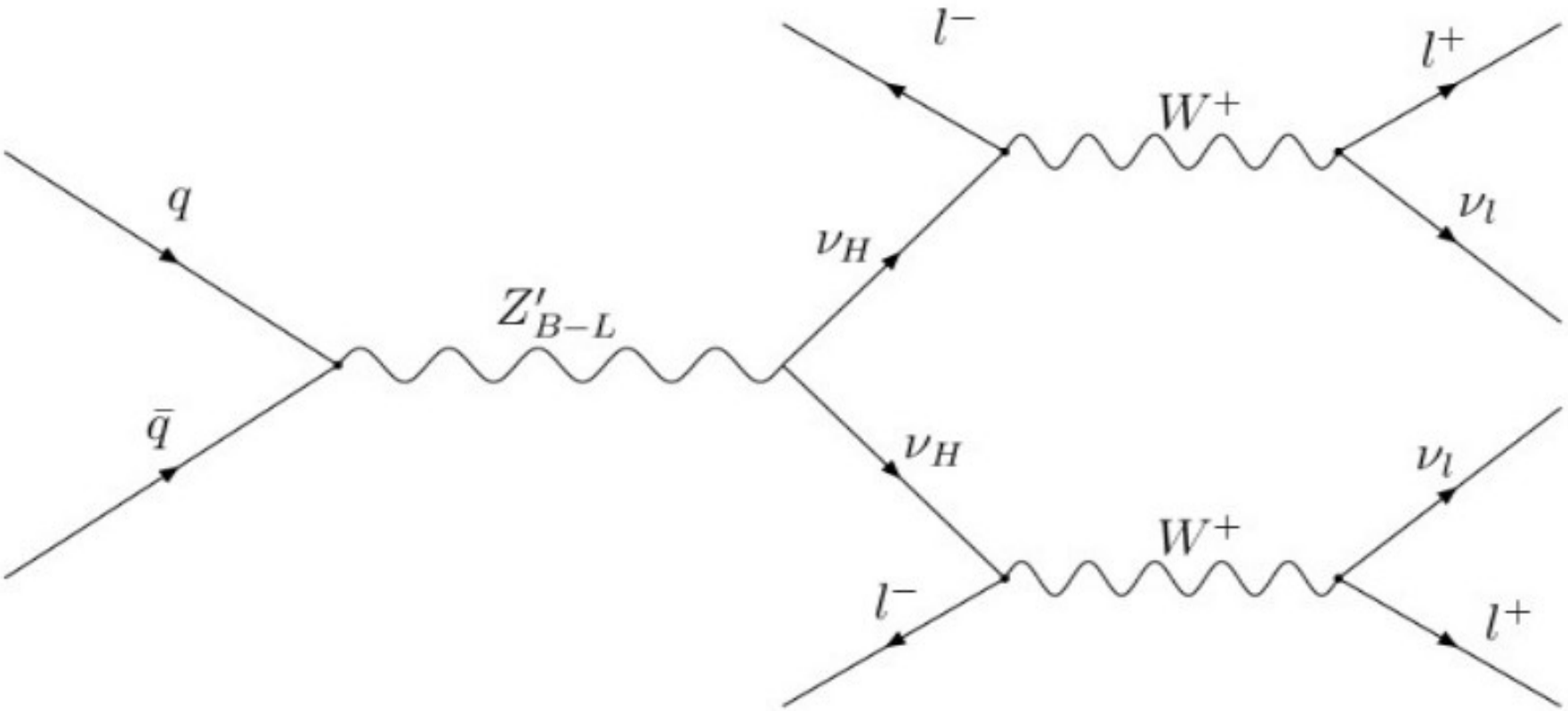


-Long life-time " displaced vertex" make it easy to be discovered

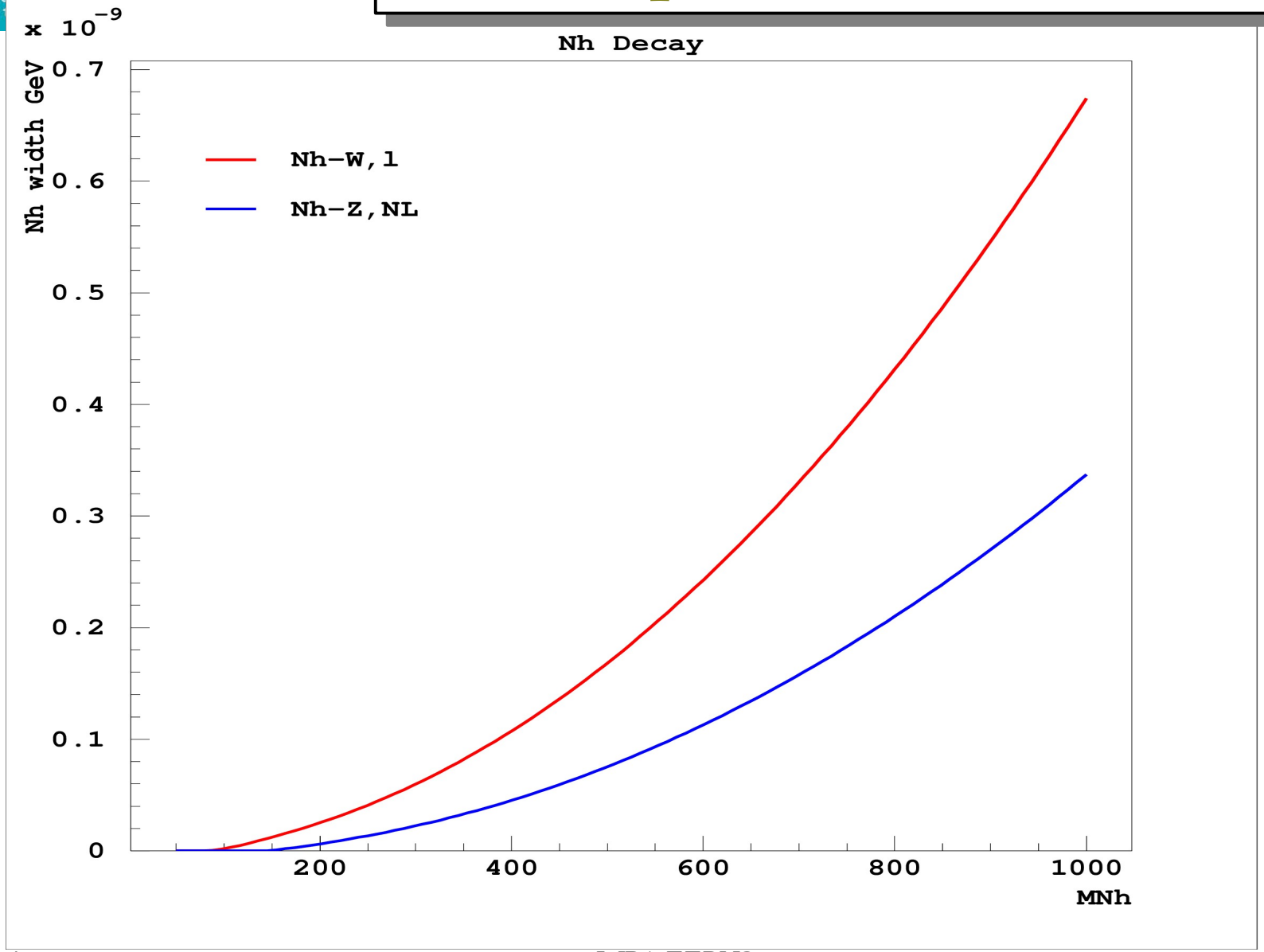
-Multi-lepton final state is back-ground free

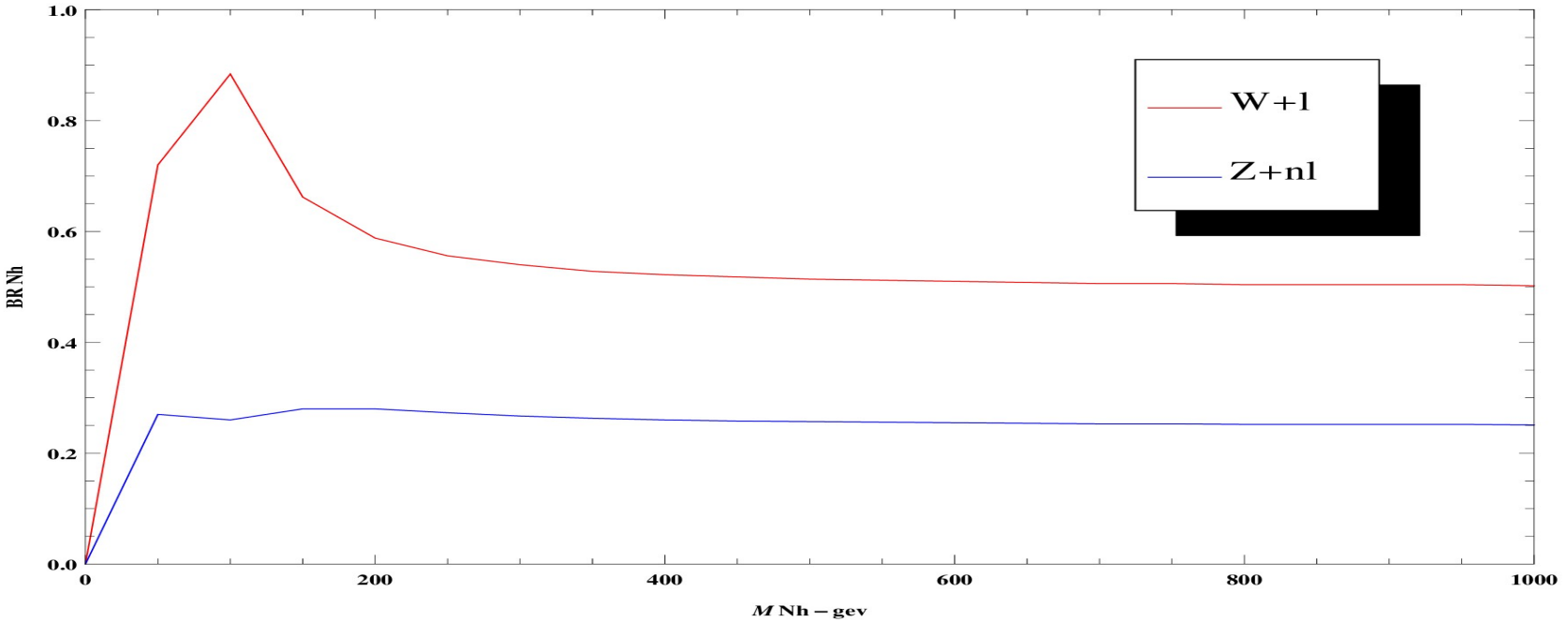


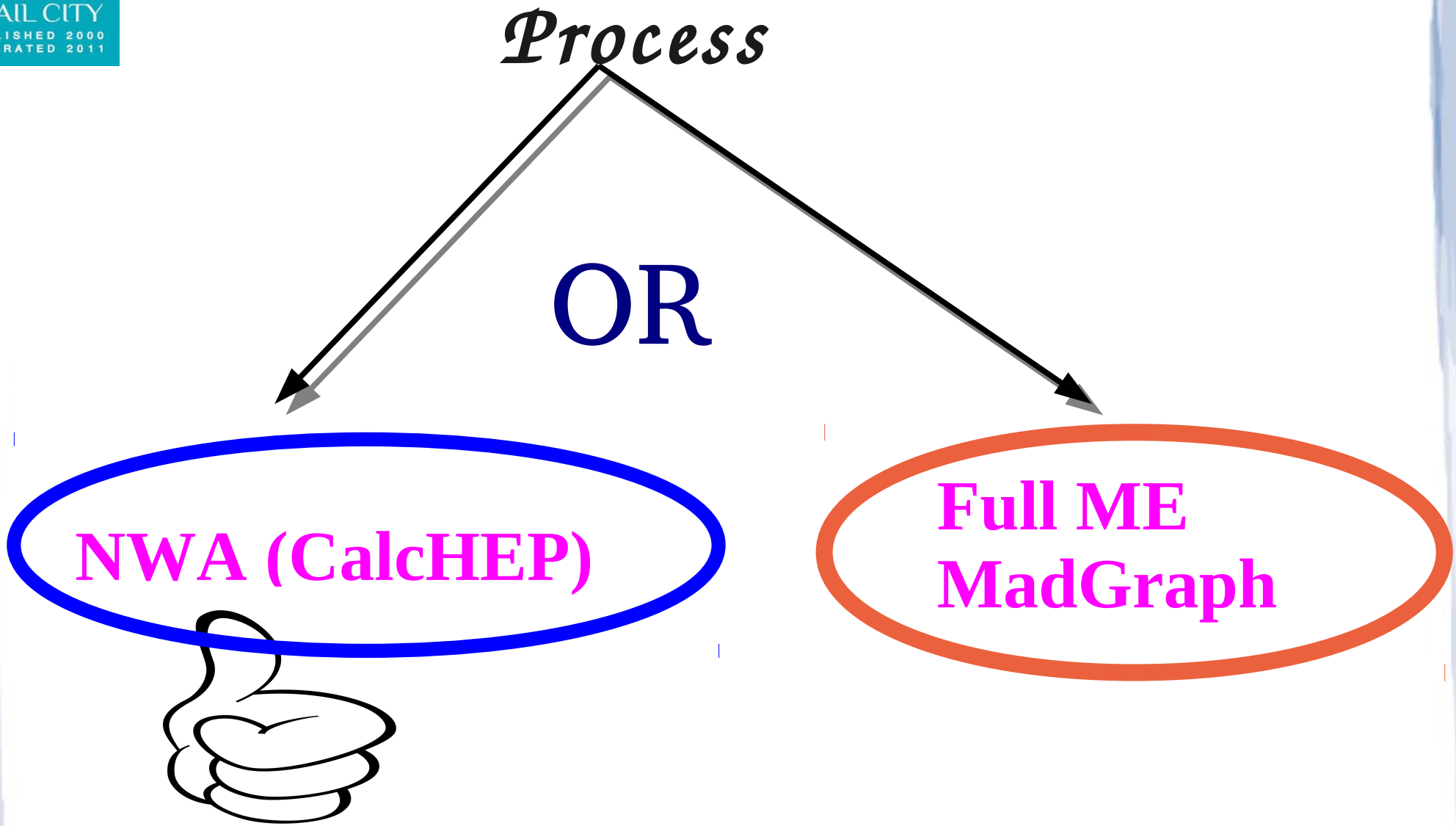
Direct decay to di-leptons


l^-
l^+
W^+
q
ν_H
ν_l
Z'_{B-L}
$\bar{q}$
ν_H
ν_l
W^+
l^-
l^+

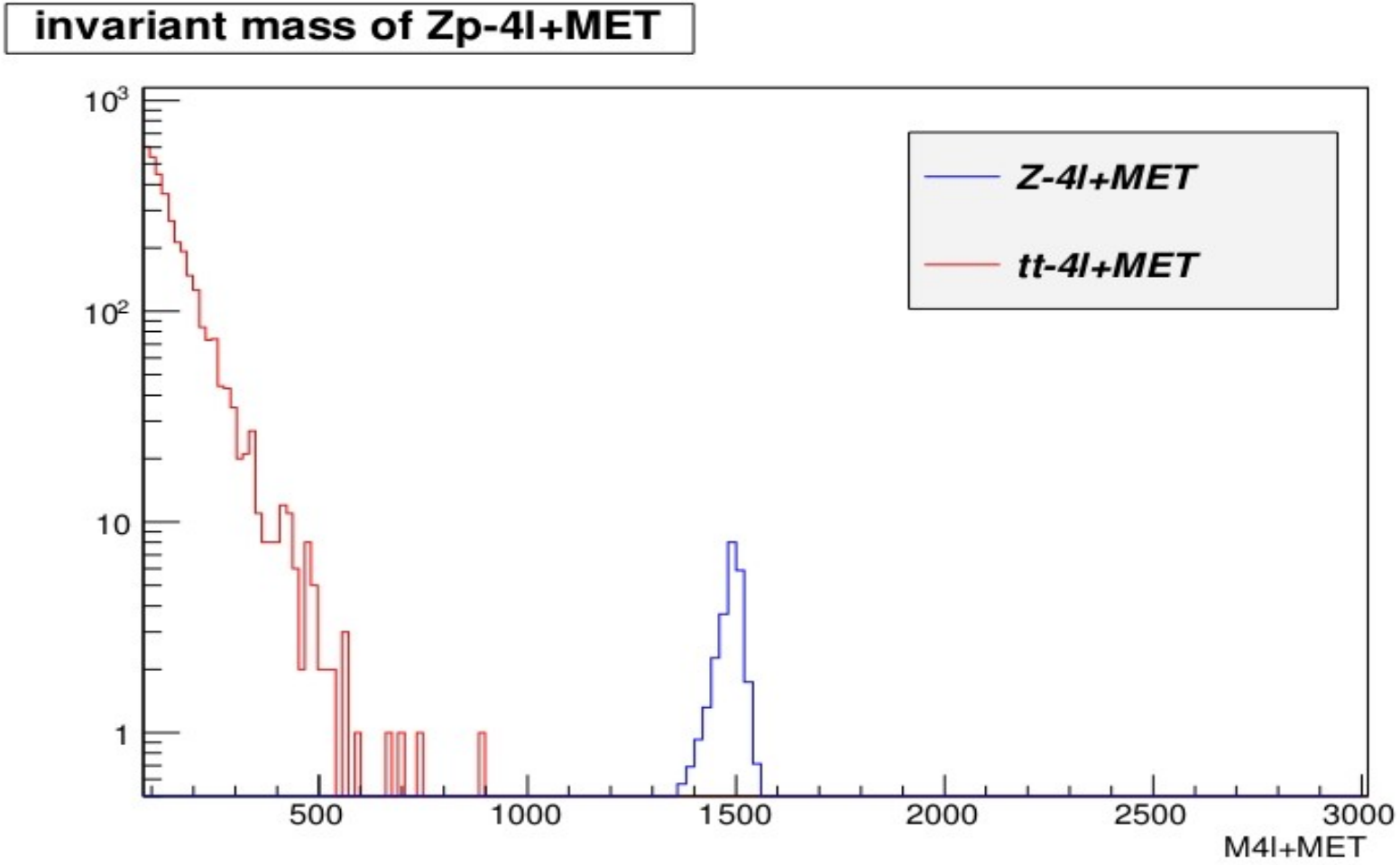
Multi-leptons finla state analysis



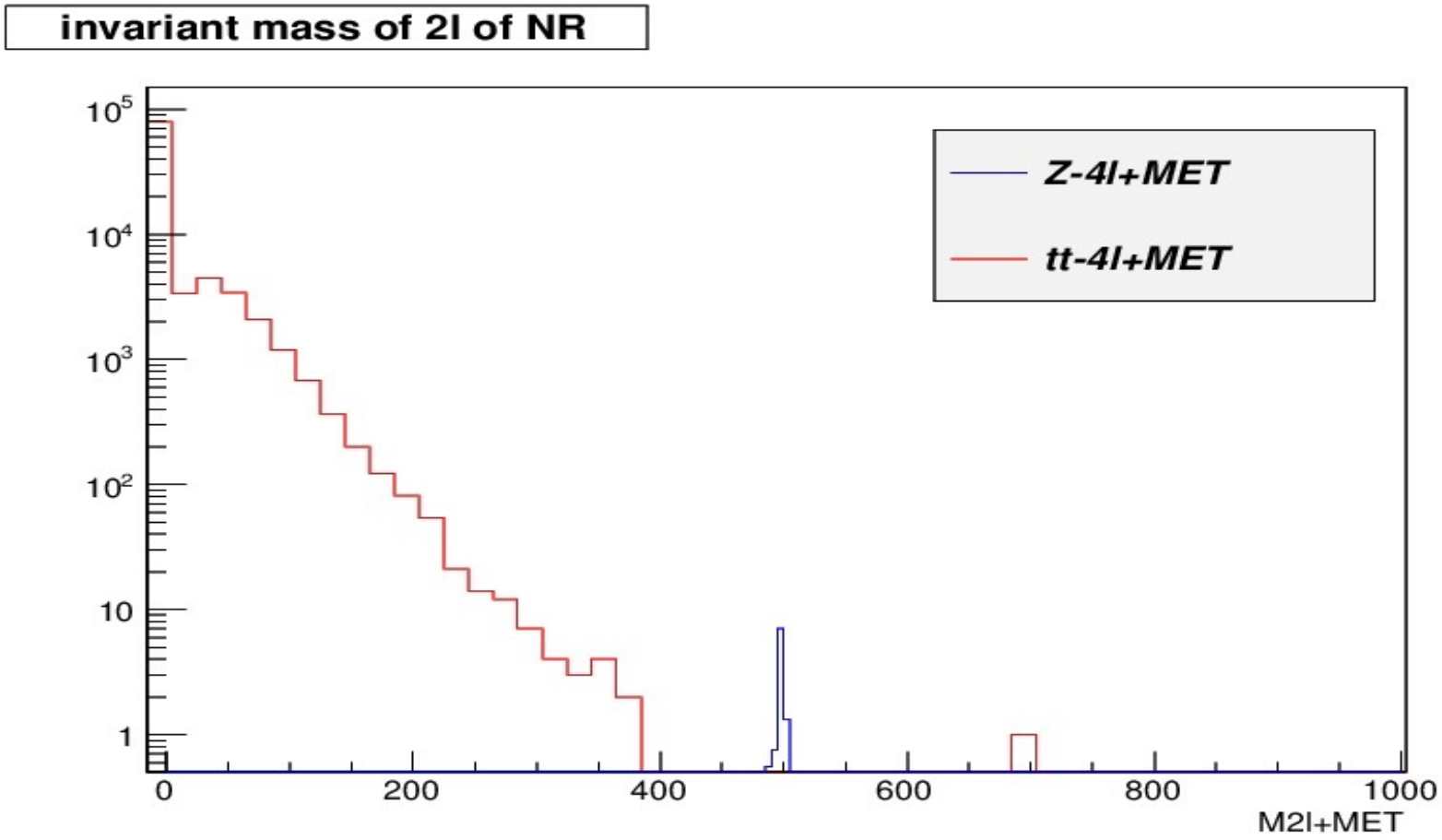

1.0
0.8
0.6
0.4
0.2
0.0
BR Nh
0
200
400
600
800
1000
M Nh – gev
W+l
Z+nl

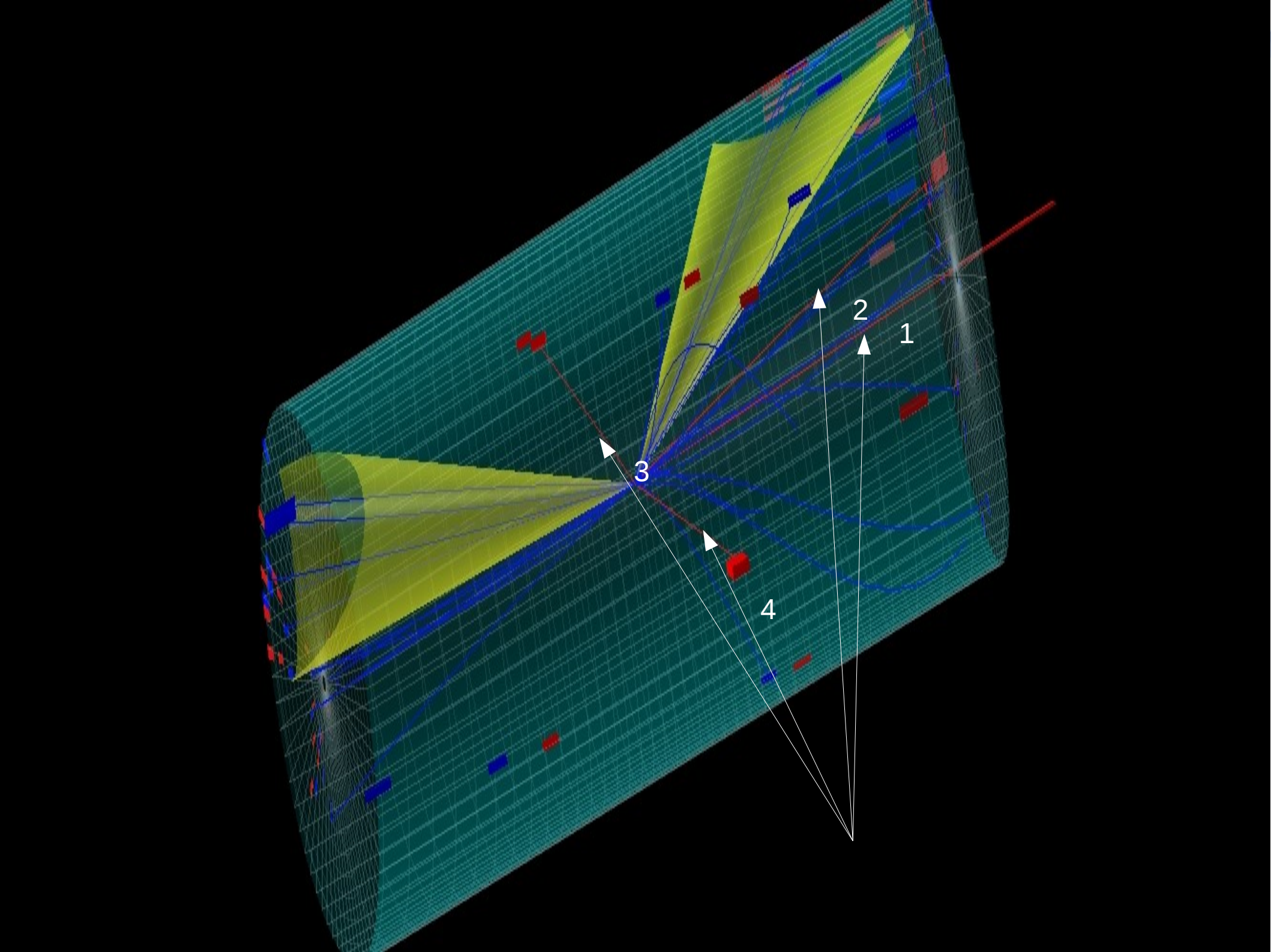

Process
OR
NWA (CalcHEP)
Full ME
MadGraph

Signature in LHC



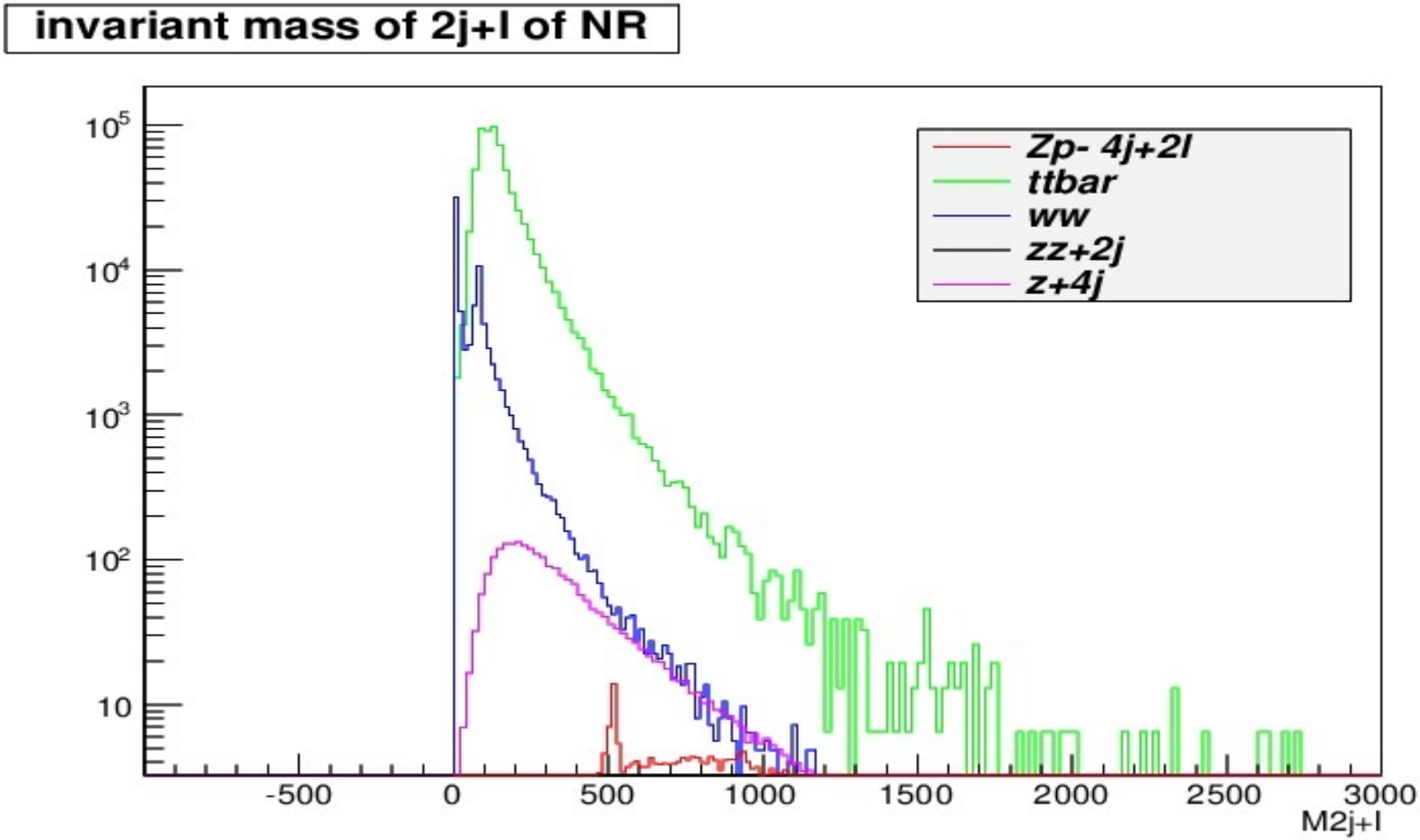
Not only Zp with mass in tev but also heavy neutrinos in few hundred gevs



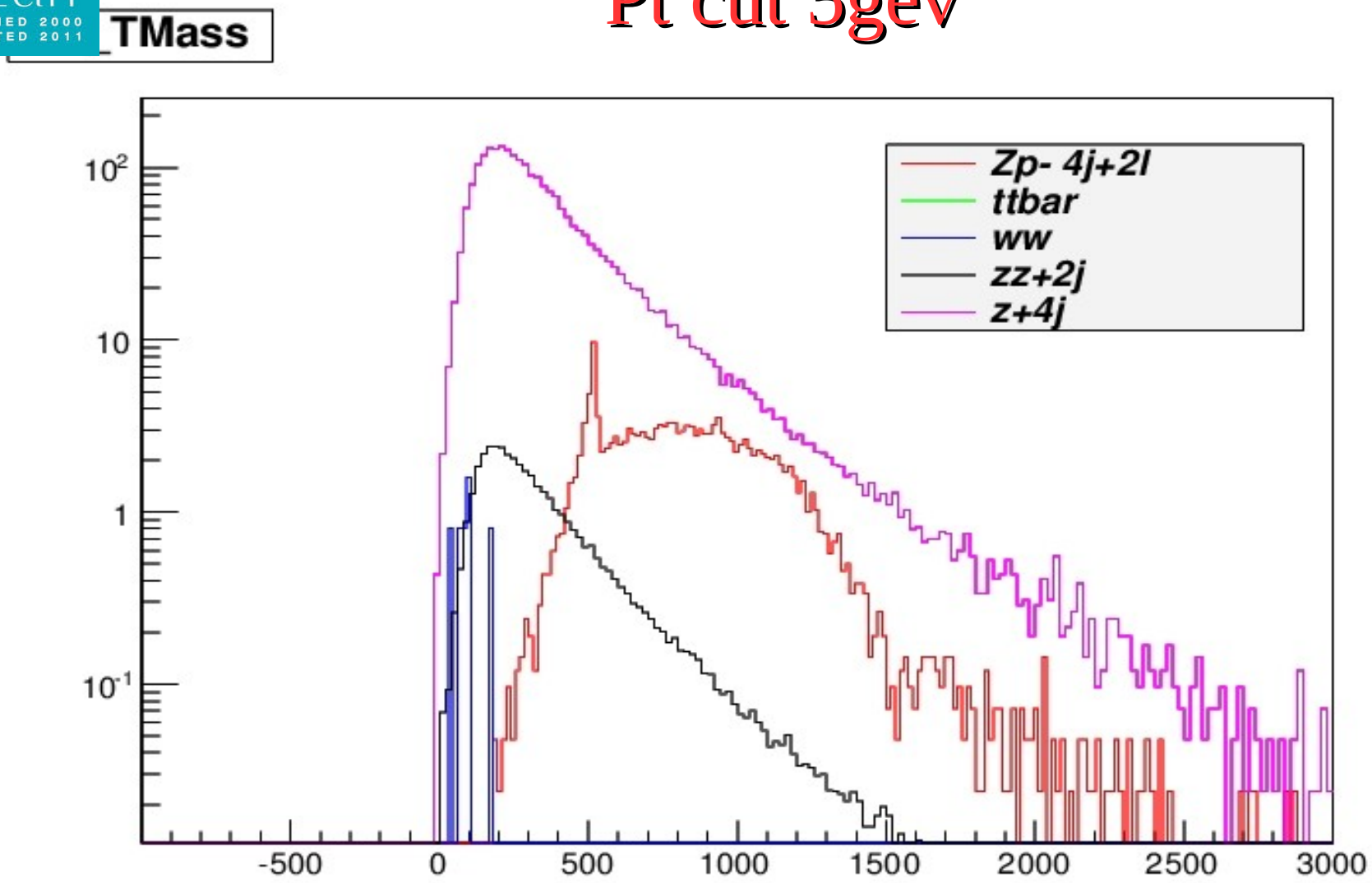

2
1
3
4


Thank
You!

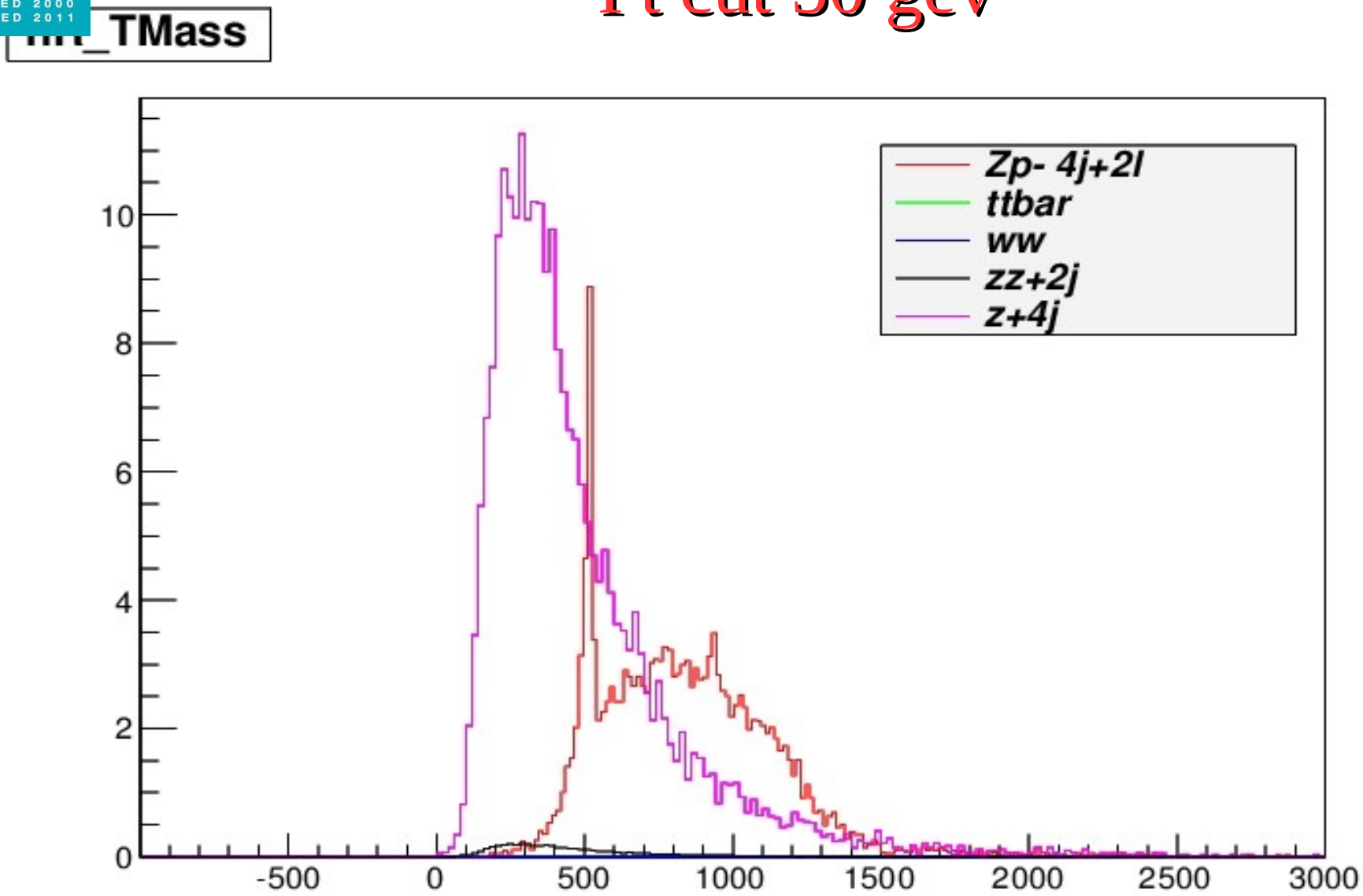
Multi jets final state



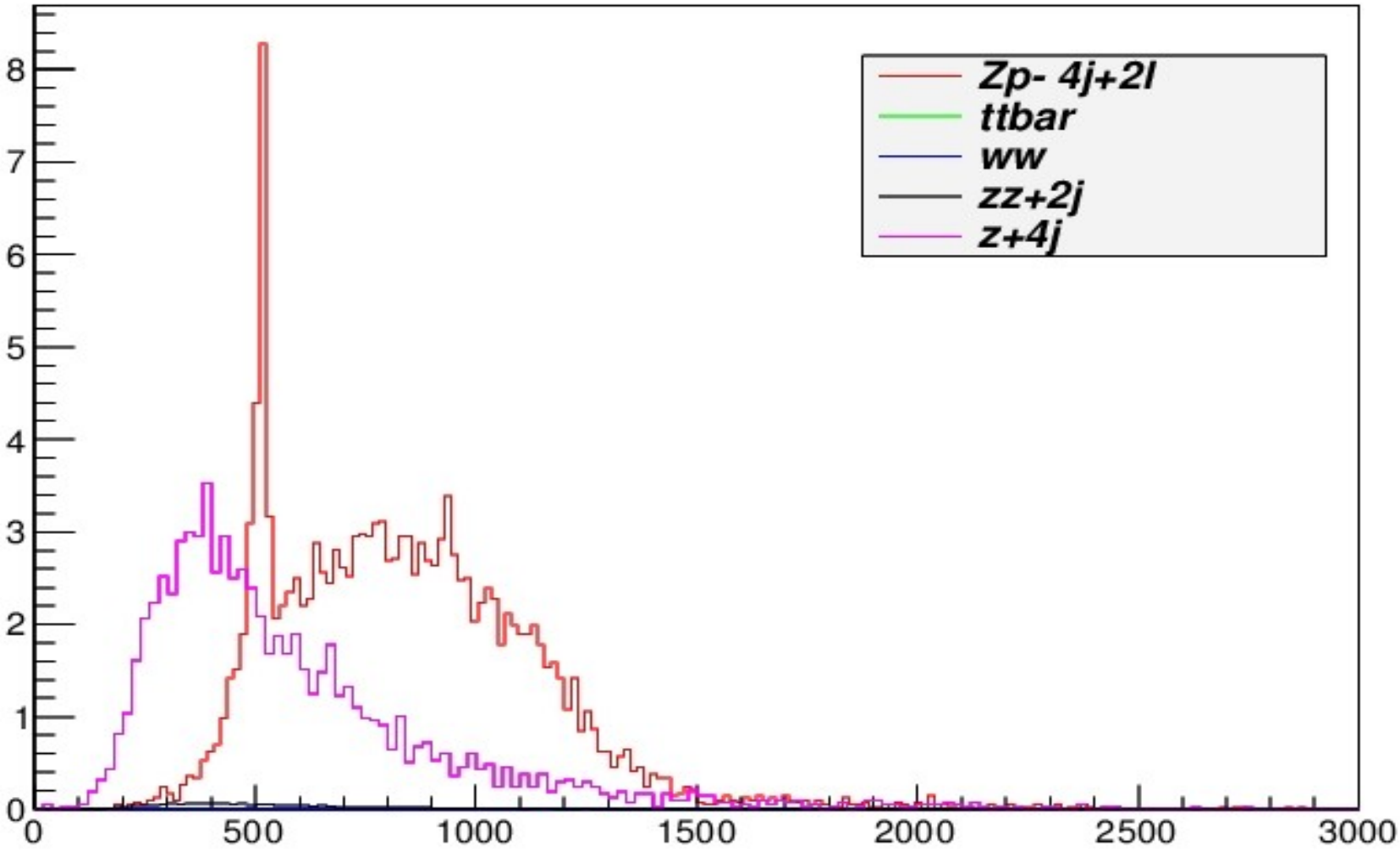
Pt cut 5gev


TMass
Zp- 4j+2l
ttbar
ww
zz+2j
z+4j
10^2
10
1
10^{-1}
-500
0
500
1000
1500
2000
2500
3000

Pt cut 50 gev

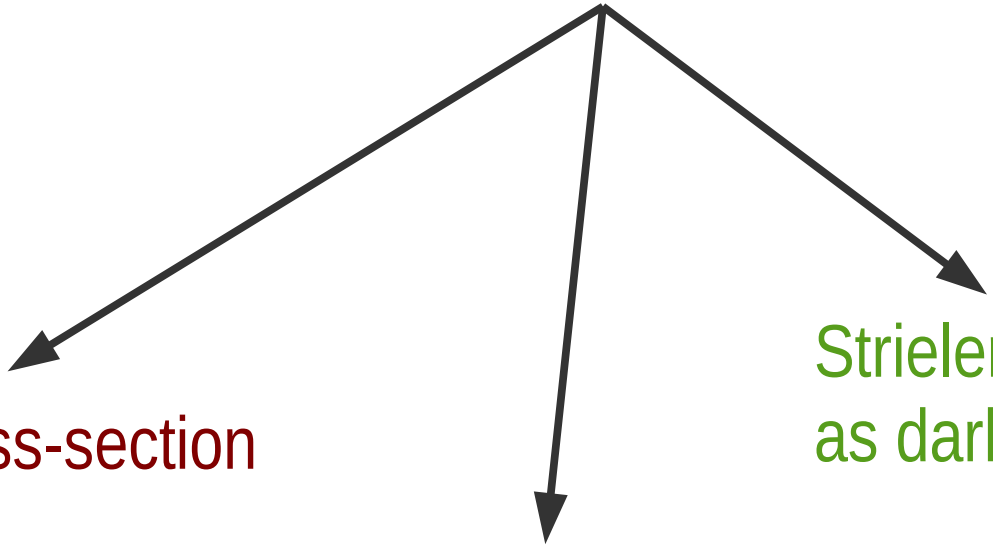

TMass
Zp- 4j+2l
ttbar
ww
zz+2j
z+4j
0
2
4
6
8
10
-500
0
500
1000
1500
2000
2500
3000

Pt cut 70 gev


_TMass
Zp- 4j+2l
ttbar
ww
zz+2j
z+4j
0
1
2
3
4
5
6
7
8
0
500
1000
1500
2000
2500
3000

Conclusion

Inverse see-saw



Higher cross-section

Strieler neutrino can be probed as dark matter candidate

Heavy neutrinos in tev

Inverse seesaw is almost finished