Status of $Z(->\mu^+\mu^-)H(->qq\nu\nu)$ analysis

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What has been done from the last meeting

・ A trial about the (initial) Pt cut to suppress the background for ZZ*-> νν̄qq̄ .

・ Try to see ZZ*->qq̄νν̄ side (so far, ZZ*->νν̄qq̄ is only analyzed)

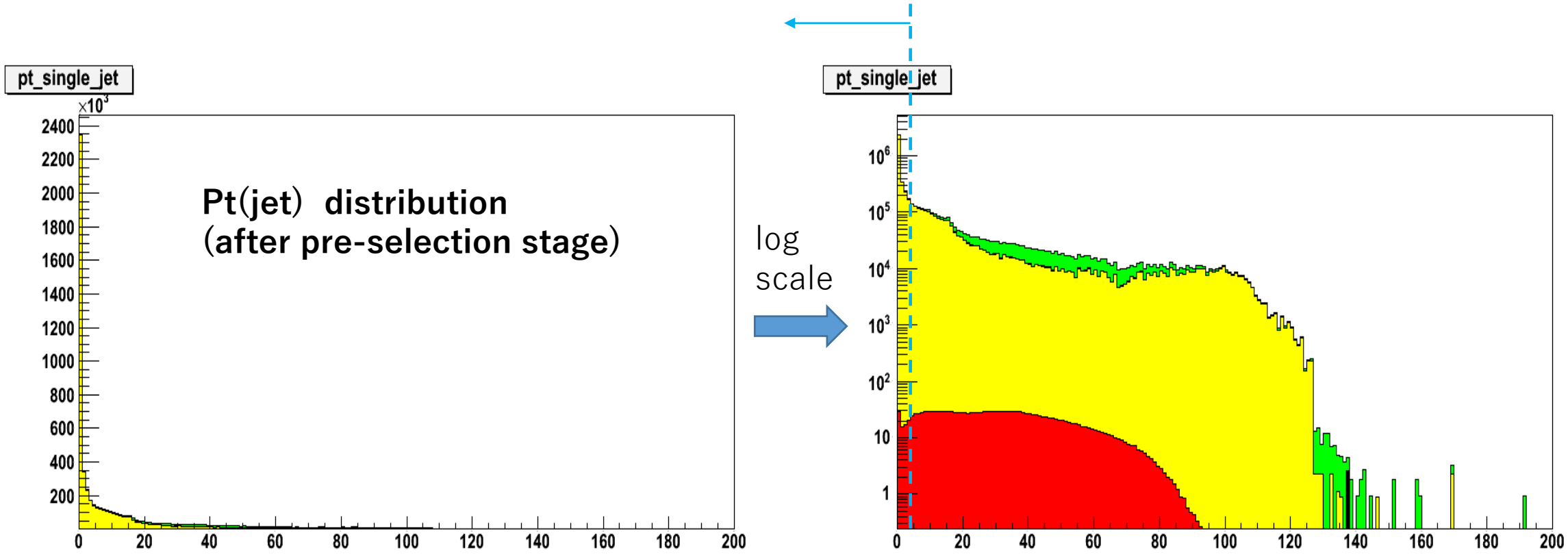
It is also suggested at the last meeting, but , , ,

・Include Higgs background channels (e.g. H->WW*) *-- not yet*

Trial to suppress backgrounds: Pt cut for jet

-- Cut : Pt(jet1) < 5GeV || Pt(jet2) < 5 GeV

-- something tight cut but for a trial

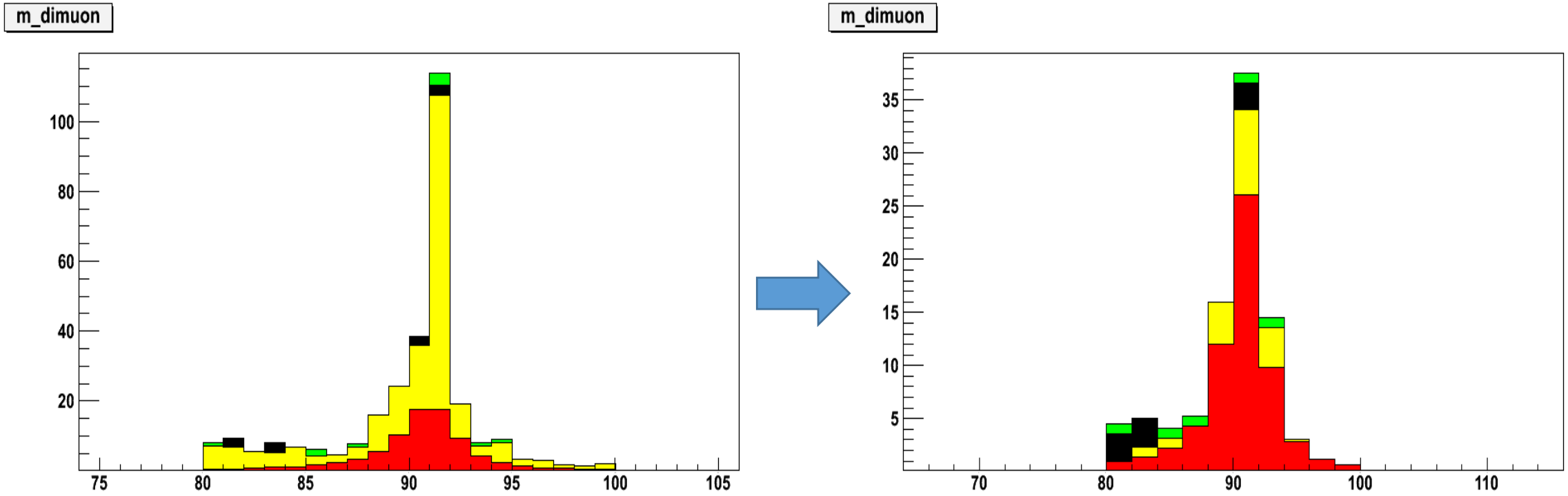


Cut Flow Table

	Signal	SM lep.	SM had.	sznu_sl	sze_sl	ww_sl	zz_sl
Missing mass> M(di-jets)	109	35301	144	5	0	1301	1473
80 < M(dimuon) < 100	92	11139	0	0	0	135	412
120 < RecM(dimuon) < 160	92	3212	0	0	0	91	193
N(pfo) >15	87	159	0	0	0	91	192
Pt(total visible) > 10	81	56	0	0	0	91	43
Min angle > 0.3	76	47	0	0	0	21	39
Missing Mass & M(dijets)	61	18	0	0	0	8	5

Di-muon Invariant Mass (final)

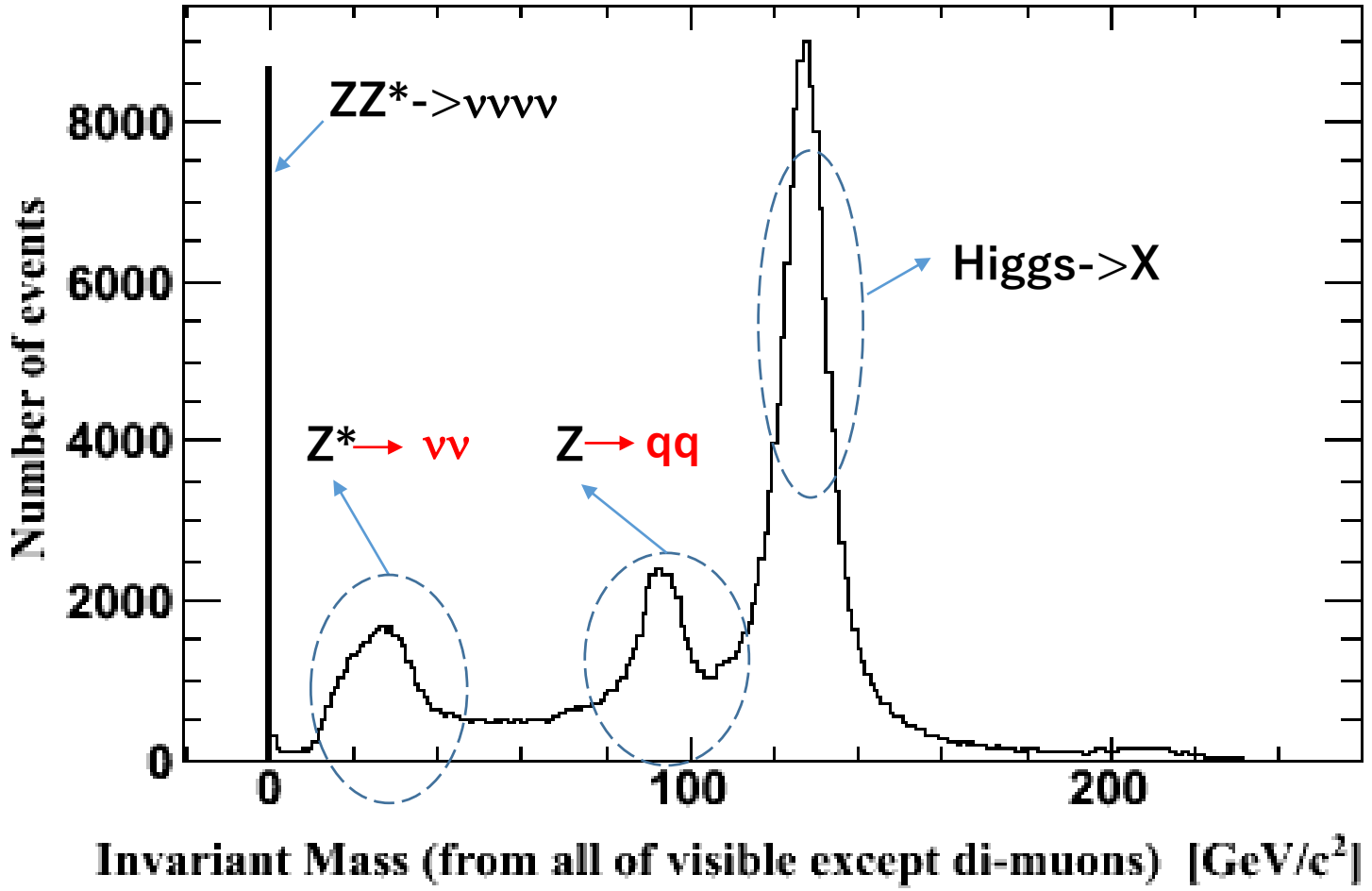
Background events seems to be suppressed at some level…



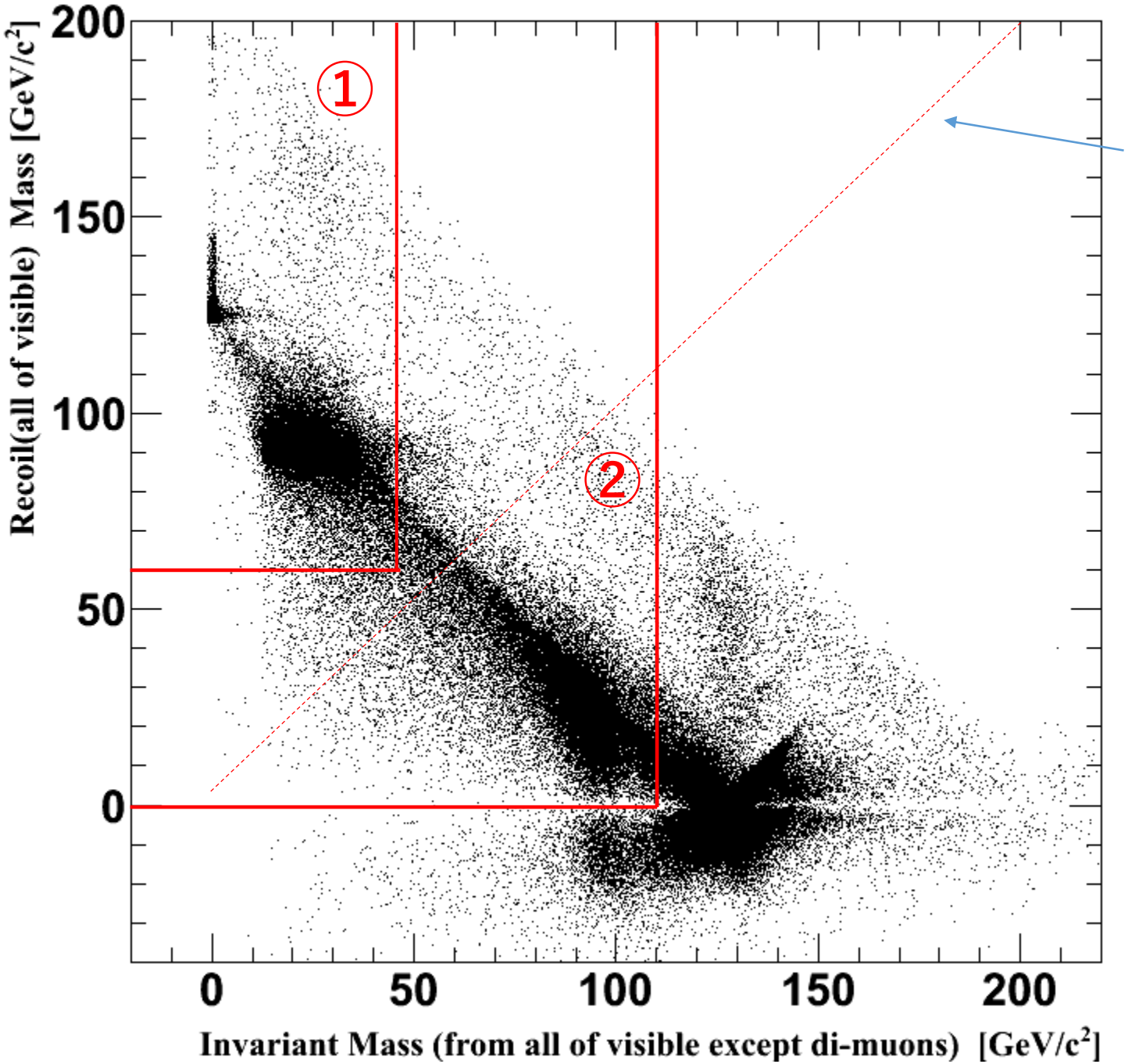
Note : Binning is changed .

-- Will check the Pt distribution (& maybe energy) of jet at the final stage to investigate more.

ZZ* -> qqνν channel



Suggestion is to change : Z*->νν , Z->qq



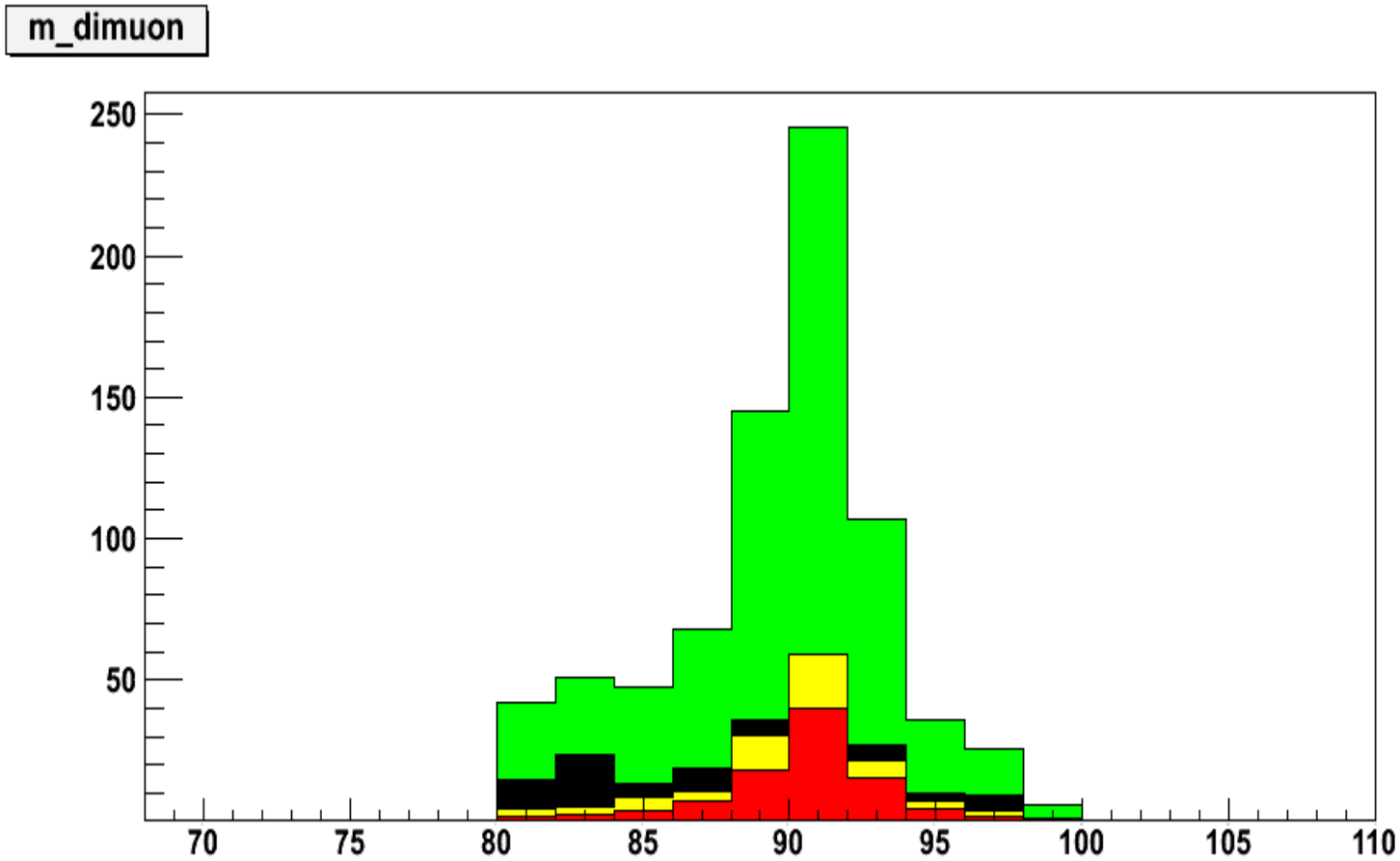
Missing Mass (Z->νν) = Dijet Mass (Z->qq)

1. H->ZZ*->ννqq
   - -- Missing M > Dijet Invariant M
   - -- Missing M > 60 GeV
   - -- Dijet Invariant M < 45 GeV
2. H->ZZ*->qqνν
   - -- Missing M < Dijet Invariant M
   - -- Missing M > 0 GeV
   - -- Dijet Invariant M < 110 GeV

Cut Flow Table : Z->qq, Z*->νν

	Signal	SM lep.	SM had.	sznu_sl	sze_sl	ww_sl	zz_sl
Missing mass < M(di-jets)	650	286190	654	0	11	5995	310579
80 < M(dimuon) < 100	557	115826	1	0	0	666	201551
120 < RecM(dimuon) < 160	554	22056	1	0	0	277	17331
N(pfo) >15	550	1126	1	0	0	277	17331
Pt(total visible) > 10	136	109	0	0	0	271	1298
Min angle > 0.3	129	88	0	0	0	141	1220
Missing Mass & M(dijets)	95	56	0	0	0	60	561

Di-muon Invariant Mass



"zz_sl" component is dominant one. Especially, e^+e^- -> ZZ(->μμ+uu/dd) background, since the final states/kinematics are similar.

Short Summary

・ Need further to suppress the background components for e+e- -> ZH->Z(->μμ)H(->ZZ*->qqνν)

・ For e+e- -> ZH->Z(->μμ)H(->ZZ*->ννqq) , I just have a look. This is also need careful background evaluation and/or arrangement of cut flows.

・ Need include Higgs backgrounds very quickly.

LCFIplus and/or FastJet

- The execution time using the FastJet is much faster than LCFIplus

- Except the flavor tag information, what kinds of merits it has ? (for example, better momentum resolution after vertexing ?)

[Example of execution time]

```
[ MESSAGE "Marlin"] VertexFinder       |          1.145900e+02 s in        500 events  ==> 2.291800e-01 [ s/evt.]
[ MESSAGE "Marlin"] JetClusteringAndFlavorTag     3.622000e+01 s in        500 events  ==> 7.244000e-02 [ s/evt.]
[ MESSAGE "Marlin"] MyIsolatedLeptonFinderProcesso  1.000000e-01 s in      500 events  ==> 2.000000e-04 [ s/evt.]
[ MESSAGE "Marlin"] MyFastJetClustering           1.000000e-01 s in        500 events  ==> 2.000000e-04 [ s/evt.]
[ MESSAGE "Marlin"] MyHiggs2zz                    6.000000e-02 s in        500 events  ==> 1.200000e-04 [ s/evt.]
[ MESSAGE "Marlin"]             Total:            1.510700e+02 s in        500 events  ==> 3.021400e-01 [ s/evt.]
[ MESSAGE "Marlin"]  ------------------------------------------------------------
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