

ZH branching ratio study

ILC physics and software meeting

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H. Ono (NDU)

Current status

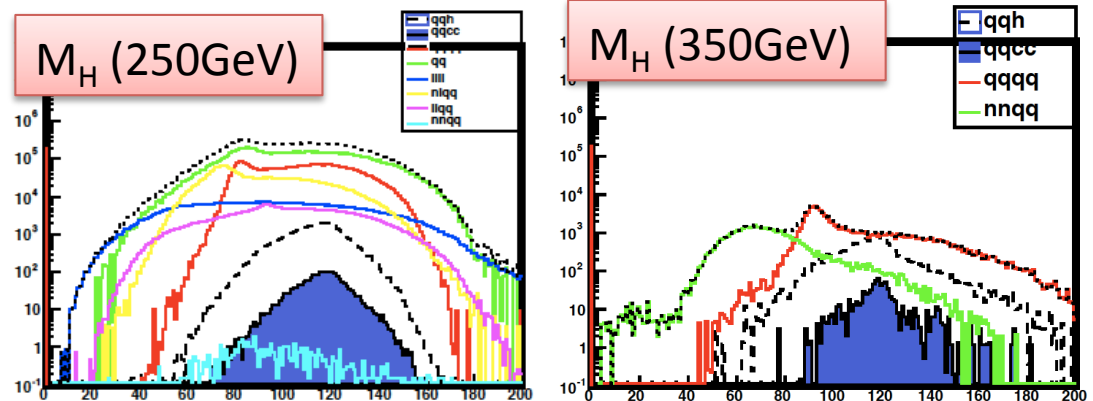
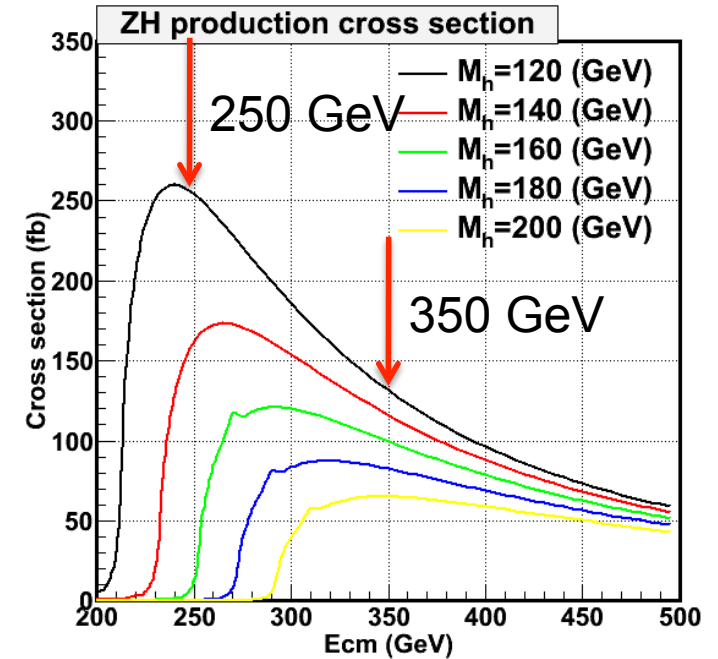
- Start ZH Ecm=350GeV data check
 - ZH Ecm=350 GeV samples are generated by Miyamoto-san
 - Data copy was succeeded from Grid (qqh, vvh, nnqq, qqqq)
 - /data17/jlc/user/ono/grid/reconstructed/ILD_00/CMS_350/
 - Successfully analyze the lcio files with same analysis code
 - Some code modification was required to use new file suffix (Minor problem).
 - Luminosity, polarization weight was applied-> Maybe succeeded
 - <http://wiki.kek.jp/display/~miyamoto/ILC+Common+Generator+Samples> wiki site by Miyamoto-san
- ZH→llH, nnH, qqH Ecm=250 GeV analysis on going

Cross section of $E_{cm}=250$ and 350 GeV

Cross section	$E_{cm}=250$ GeV	$E_{cm}=350$ GeV
$ZH \rightarrow qqH$	210 fb	90 fb
qqqq	16200 fb	400 fb
$\nu\nu qq$	600 fb	600 fb

Cross section was calculated from the reconstructed entries
 Some files are lacking, check grid sites again

Apply the same selection criteria for $E_{cm}=350$ GeV samples



Selection criteria (as same as 250 GeV)

0. Classification ($E_{\text{vis}} > 170$ GeV + No high P leptons(>15 GeV))
→ Select the $ZH \rightarrow qqH$ events from pre-mixed samples

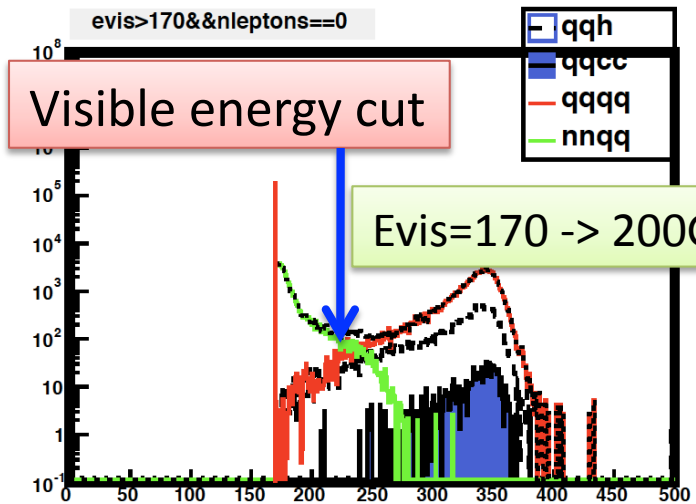
1. # of charged track in each jet > 4
2. $-\log_{10}(Y_{34}) < 2.7$
3 → 4 Jet combination threshold Y value
3. thrust < 0.95
4. $|\cos\theta_{\text{thrust}}| < 0.96$
5. $105 < \theta_{\text{Hjets}} < 165$ (Angles between H jets)
6. $70 < \theta_{\text{Zjets}} < 160$ (Angles between Z jets)
7. $110 < M_{\text{Hfit}} < 140$ GeV
8. $80 < M_{\text{Zfit}} < 110$ GeV
9. $E_{\gamma} < 20$ GeV in each jet (Highest photon E cut)

Reduction power comparison

250GeV	No cut	E_{vis}	# chdtrk	Log (Y34)	thrust	cos (thrust)	H jets angle	Z jets angle	MH	MZ	Eg
qqcc	1915.6	1644.5	1236.3	1216.6	1215.4	1155.9	1078.5	1027.1	981.5	981.5	894.6
qqbb	34962.7	28326.7	22171.0	21837.1	21826.3	20801.3	19366.6	18465.9	17644.0	17643.5	16270.6
Higgs All	52506.9	38956.4	29100.4	28720.1	28707.4	27357.8	25362.1	24175.3	23016.4	23014.3	21212.5
qqqq	4048390.0	3477480.0	2077300.0	2009000.0	2008530.0	1766300.0	1468630.0	1405720.0	984853.0	983532.0	844920.0
nnqq	149979.0	43.2	4.7	2.6	2.6	2.4	2.2	1.6	1.3	1.3	1.1
SM Bkg	4198360.0	3477530.0	2077300.0	2009010.0	2008540.0	1766300.0	1468630.0	1405720.0	984854.0	983534.0	844921.0
350GeV	No cut	E_{vis}	# chdtrk	Log (Y34)	thrust	cos (thrust)	H jets angle	Z jets angle	MH	MZ	Eg
qqcc	842.6	629.0	438.3	409.1	409.1	381.8	85.0	48.6	27.9	24.8	22.0
qqbb	14738.7	10563.9	7725.3	7377.4	7377.4	7104.5	1780.5	1238.8	557.9	518.0	356.3
Higgs All	22251.0	15027.3	10267.0	9861.8	9861.8	9483.6	2320.5	1586.7	693.9	634.6	436.3
qqqq	100015.0	75699.3	46062.5	42131.6	42097.8	33243.9	9778.8	7423.9	3655.3	3417.0	2178.3
nnqq	145474.0	40912.1	2927.1	1025.3	1018.7	880.1	339.5	197.2	28.5	10.9	8.4
SM Bkg	245489.0	115611.0	48989.0	42157.0	42116.5	34124.0	10118.0	7621.1	3683.8	3427.9	2186.7

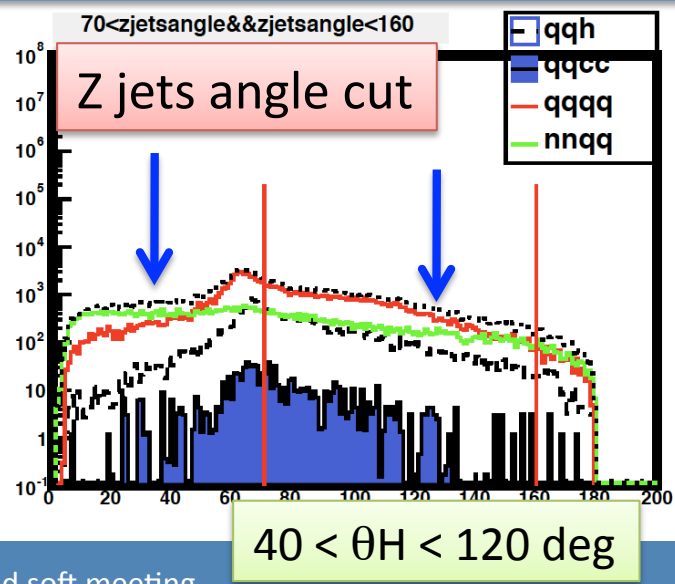
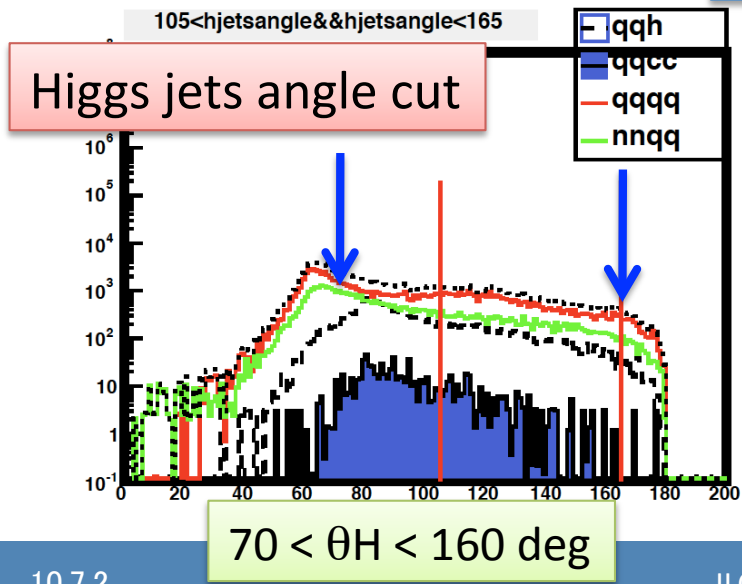
Some files are still lacking, check grid site again

Optimization for Higher energy



Evis cut should be tuned

Angle between jets becomes narrower compare to the 250 GeV due to the Z, H boost at 350 GeV



Optimized selection criteria

350GeV	No cut	E_{vis}	# chdtrk	Log (Y34)	thrust	cos (thrust)	H jets angle	Z jets angle	MH	MZ	Eg
qqcc	842.58	629.036	438.319	409.118	409.118	381.801	362.283	332.953	305.659	302.412	238.032
qqbb	14738.7	10551.8	7717.73	7369.8	7369.8	7096.91	6635.61	6209.52	5420.93	5346.83	3800.21
Higgs All	22251	14904	10258.9	9853.76	9853.76	9475.63	8669.53	8068.26	6969.85	6865.54	4897.65
qqqq	100015	75480.3	46006	42089.7	42055.8	33213.6	21676.3	18653.5	12314.3	11955.3	7513.2
nnqq	145474	4618.15	423.013	201.707	195.097	184.081	178.014	125.602	28.2721	22.1995	11.0054
SM Bkg	245489	80098.4	46429	42291.4	42250.9	33397.7	21854.3	18779.1	12342.5	11977.5	7524.2

Some files are still lacking, check grid site again

Next step

- Check qqqq data samples on Grid site
- Compare reduction power between 250 and 350 GeV
- 250 GeV should be summarized