

vvh 1TeV study for DBD

ILD Analysis meeting

Dec. 12 2012

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Current status

- Found some miss merging on my analysis BG
 - 4f_sw_sl (lvqq, 2nd contribution) is failed due to too many files open.
 - Correct and re-analyze for each process
- $h \rightarrow WW^*$ BG reduction with TMVA
- Preparing LC note

h → bb, cc, gg channel 4f_sw_sl correction

cuts	Gen	All cuts	B-tag
h->all	223,408	71,966	51,506
h->bb	128,662	55,515	50,942
h->cc	5,998	2,966	78
h->gg	19,078	7,494	211
2f	3,890,180	1,560	133
4f	9,168,850	30,855	3,554
6f	121,842	4,218	133
BG all	13,180,900	36,633	3,821

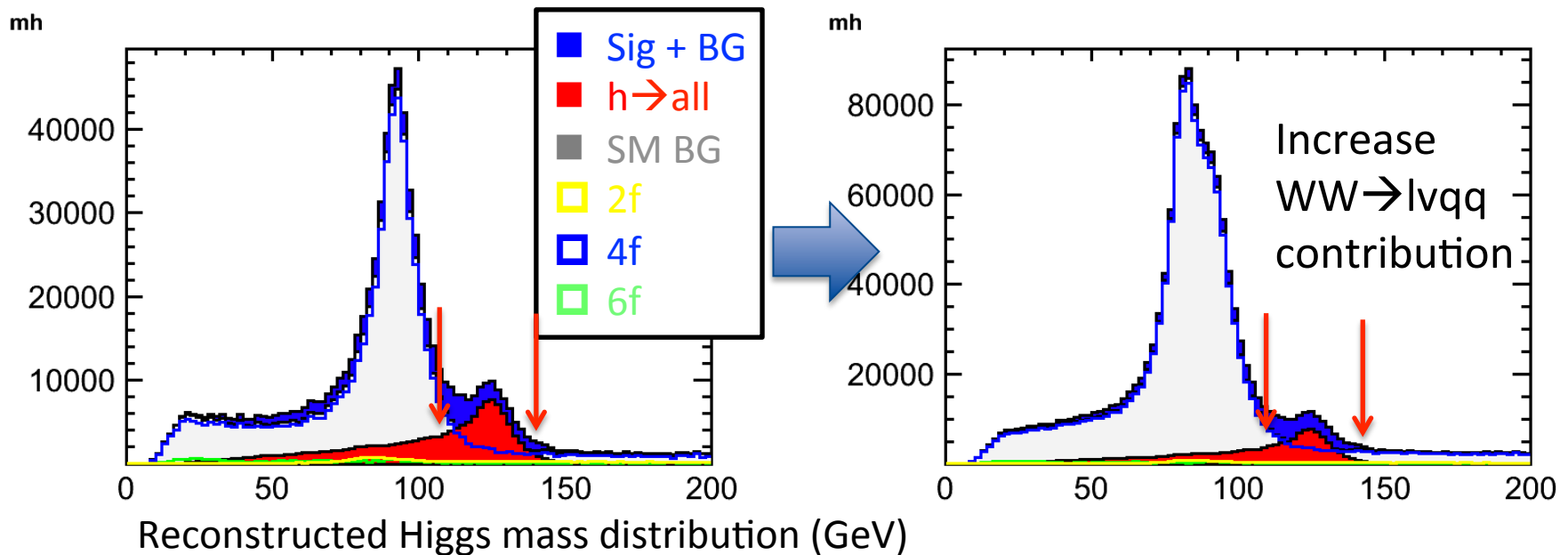


cuts	Gen	All cuts	B-tag
h->all	223,408	71,966	51,506
h->bb	128,662	55,515	50,942
h->cc	5,998	2,966	78
h->gg	19,078	7,494	211
2f	3,890,180	1,560	133
4f	13,386,600	58,660	3,874
6f	121,842	4,218	133
BG all	17,398,700	64,438	4,140

Re-analyze template fitting

Mass and template fitting result

Reconstructed Higgs mass before mass cut and w/o B-tagging

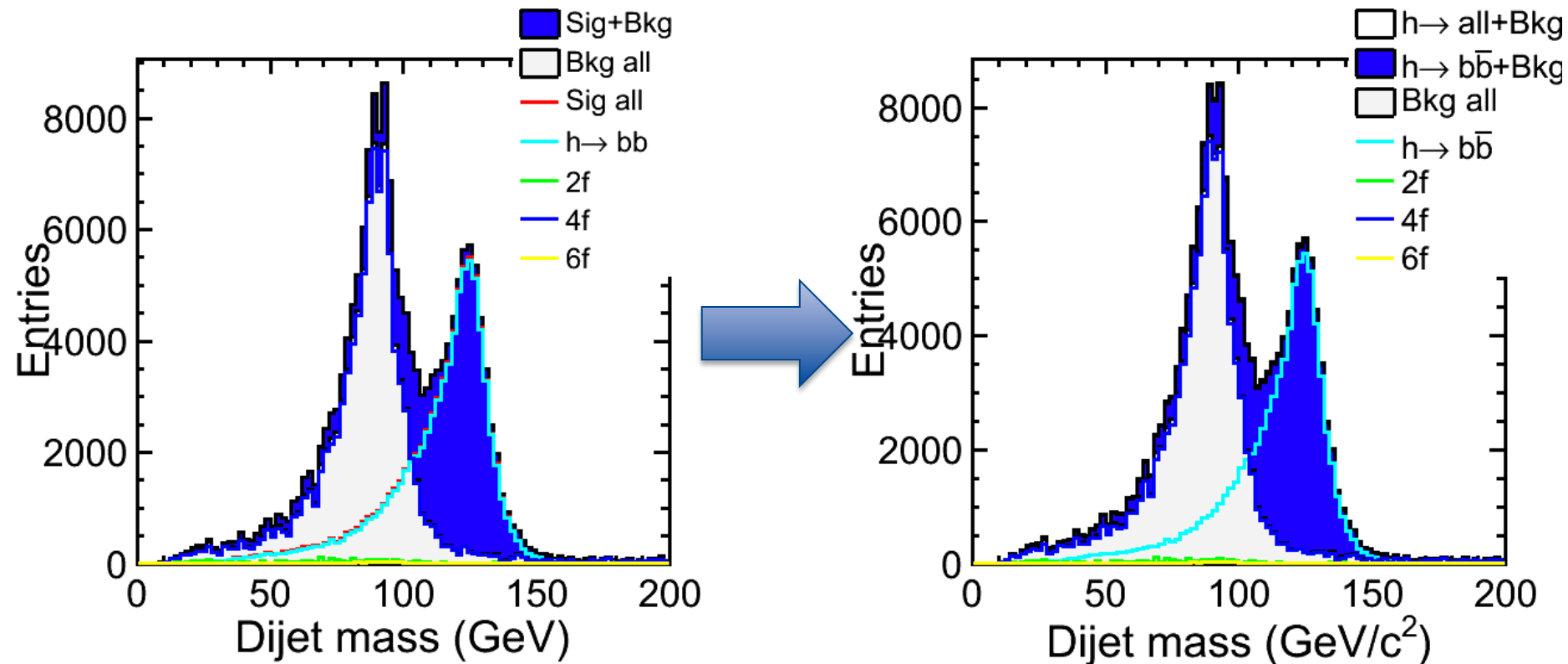


$L=500 \text{ fb}^{-1}$

$(e^-, e^+) = (-0.8, +0.2)$

Template fitting	Before	Corrected
$\Delta\sigma\text{BR}/\sigma\text{BR}(bb)$	0.44%	0.46
$\Delta\sigma\text{BR}/\sigma\text{BR}(cc)$	3.8%	4.3%
$\Delta\sigma\text{BR}/\sigma\text{BR}(gg)$	2.6%	3.2%

Di jet mass distribution w/ B-tagging

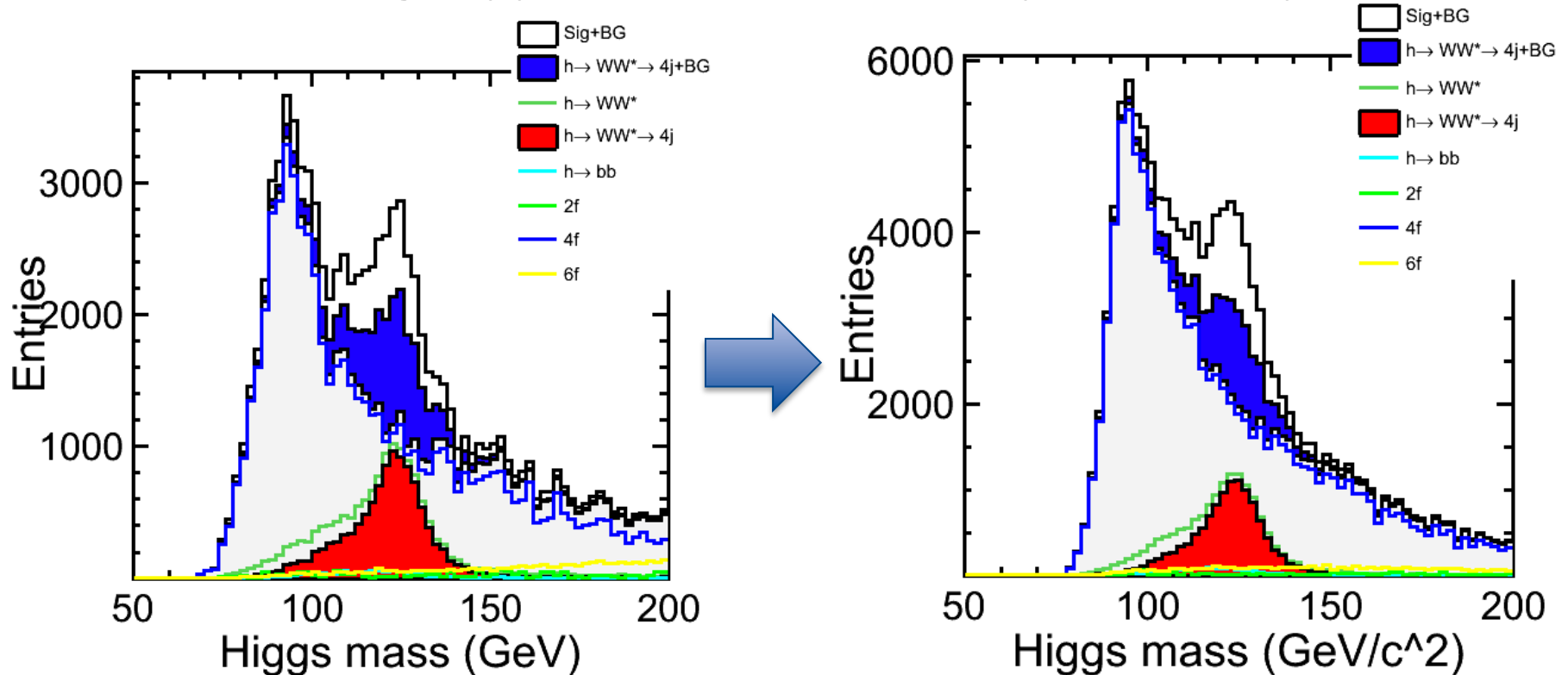


B-tagging is working well and well suppress BGs

$H \rightarrow ww^*$ analysis

$h \rightarrow WW^* \rightarrow 4j$ analysis

Correct lacking $lvqq$ contribution and re-optimize cut parameters



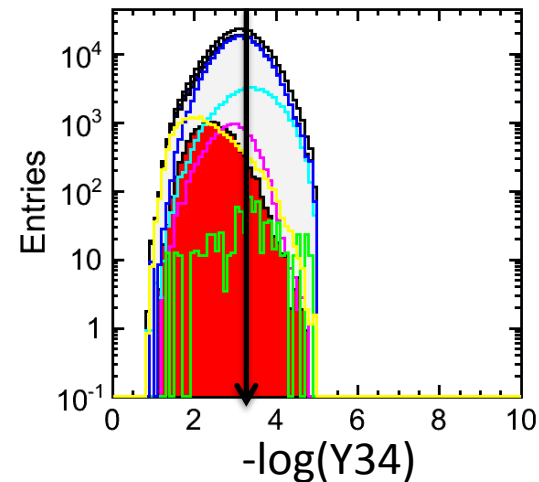
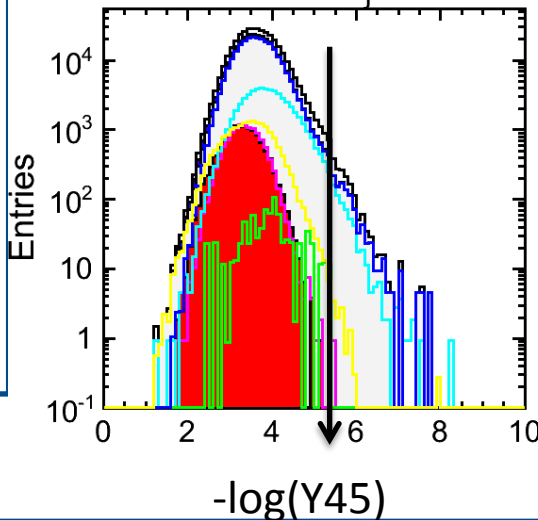
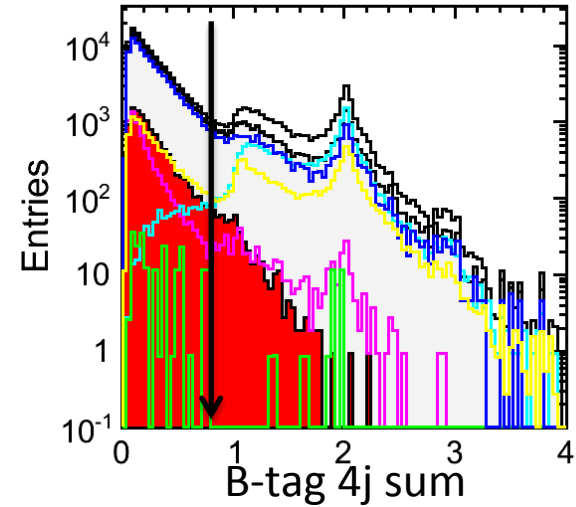
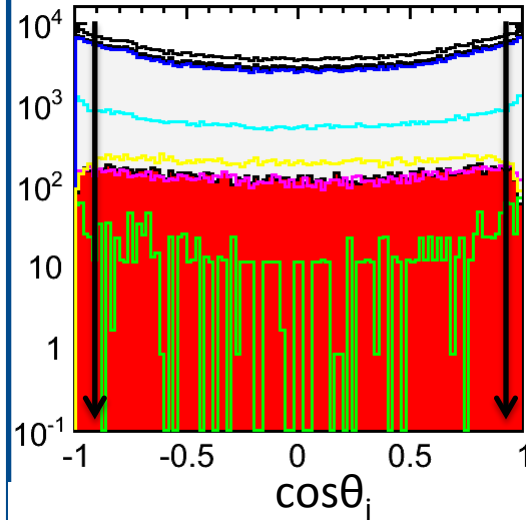
BG contribution increase and cut optimization is applied to suppress

Cut optimization

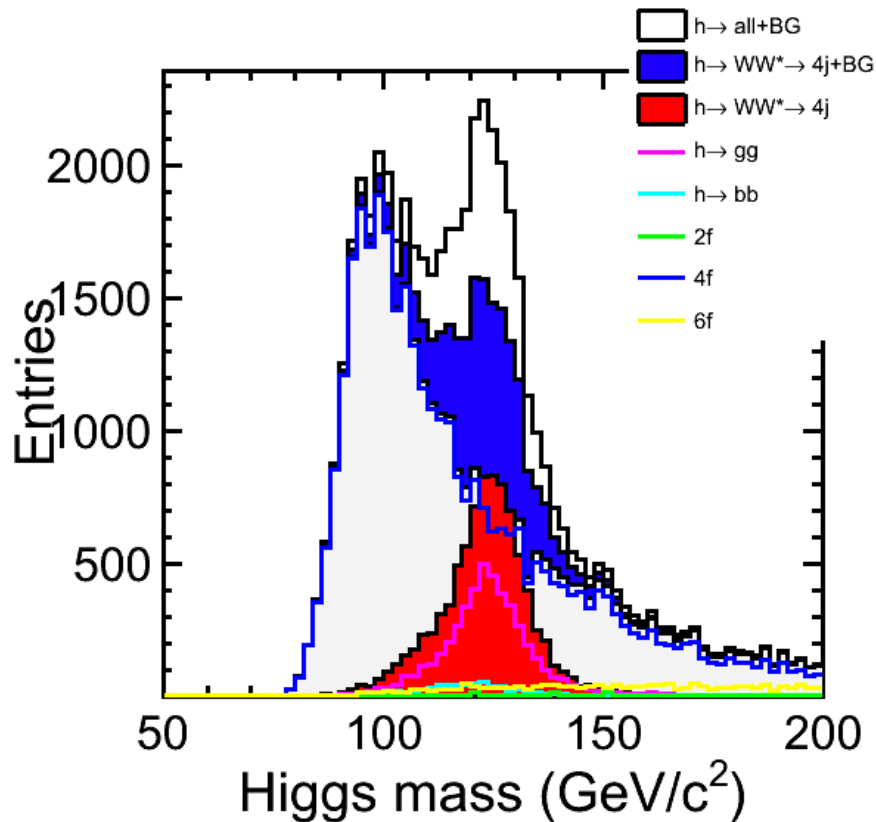
1. $110 < E_{\text{vis}} < 400$ GeV
2. $P_t > 35$ GeV
3. $|P_I| < 350$ GeV
4. $50 < N_{\text{pfos}}$
5. $|\cos\theta_j| < 0.98$
6. $-\text{Log}_{10}(Y_{45}) < 5.0$
7. $-\text{Log}_{10}(Y_{34}) < 3.1$
8. $-\text{Log}_{10}(Y_{23}) < 2.5$
9. $(W_{1\text{btag}} + W_{2\text{btag}}) < 0.8$
10. $60 < M_{W_1} < 95$ GeV
11. $15 < M_{W_2} < 60$ GeV
12. $105 < M_h < 140$ GeV

Selection efficiency: 35.5%

Optimize at maximum significance



After the cut optimization



After the mass selection
 $105 < M_h < 140 \text{ GeV}$

Signal significance = 46

Try to analyze with TMVA

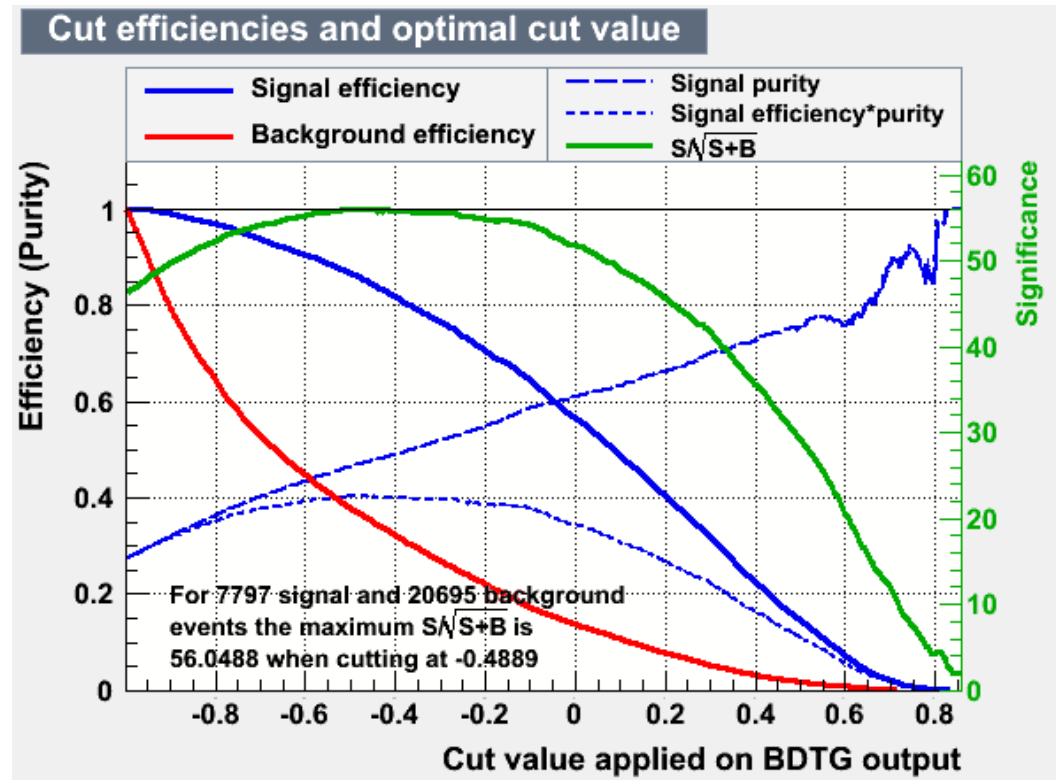
TMVA analysis to BG suppression

Apply TMVA analysis to suppress $h \rightarrow gg$ and SM BG (2, 4, 6f)

Input variables

- Evis
- Pt
- Pl
- Npfos
- $\cos\theta_j$
- $-\text{Log}_{10}(Y_{12})$
- $-\text{Log}_{10}(Y_{23})$
- $-\text{Log}_{10}(Y_{34})$
- $-\text{Log}_{10}(Y_{45})$
- Mw1, 2
- Mh

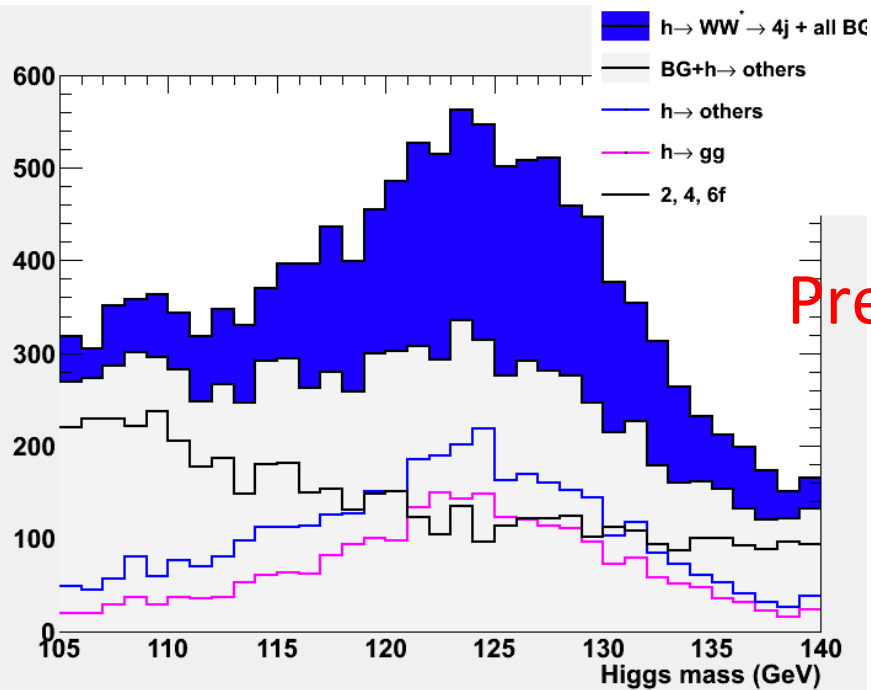
TMVA with BDTG



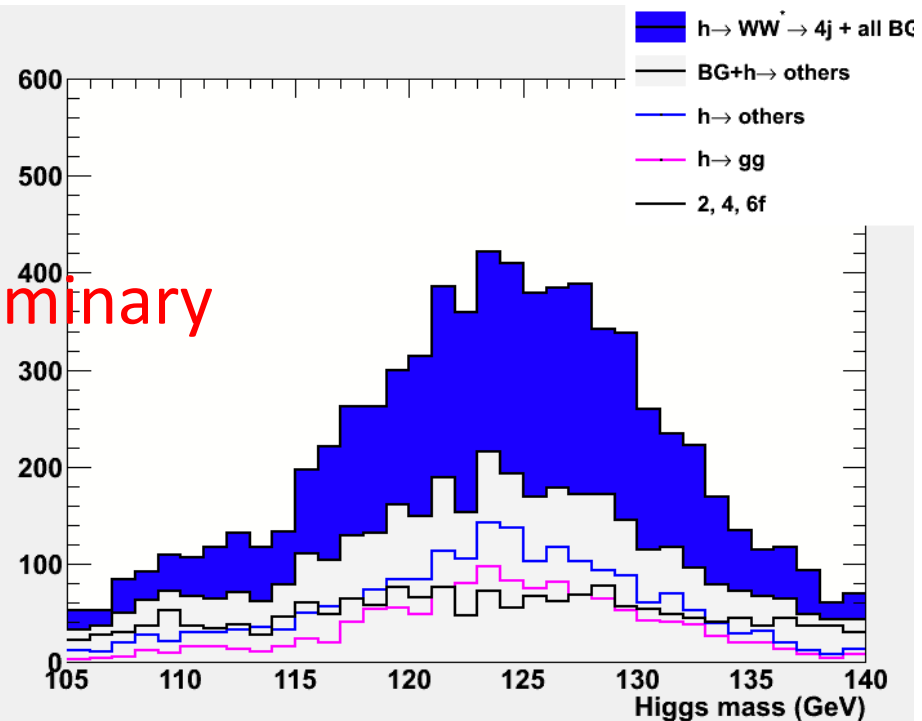
Now optimizing input parameters

Cut before and after BDTG cut

Before cut Higgs mass (GeV) After cut with BDTG



Preliminary

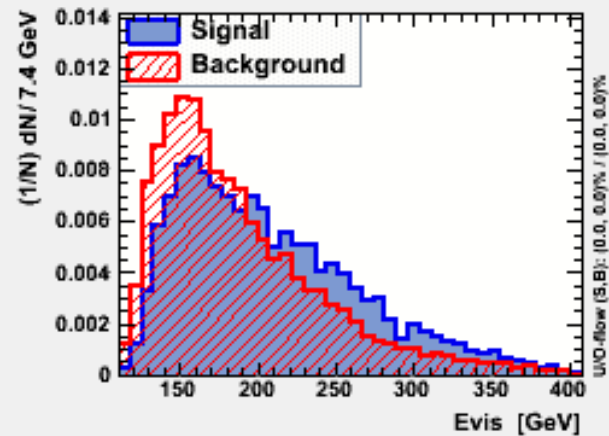


What to do next

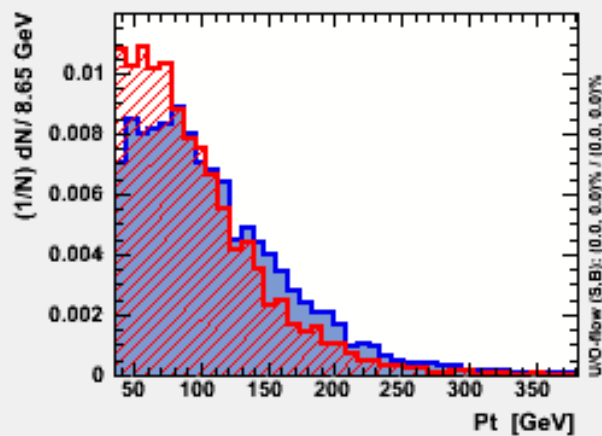
- Re-analyze with lacking process
- $h \rightarrow WW^*$ results are updating
 - TMVA optimization
- Right handed polarization results
- Finalize analysis note

Input variables

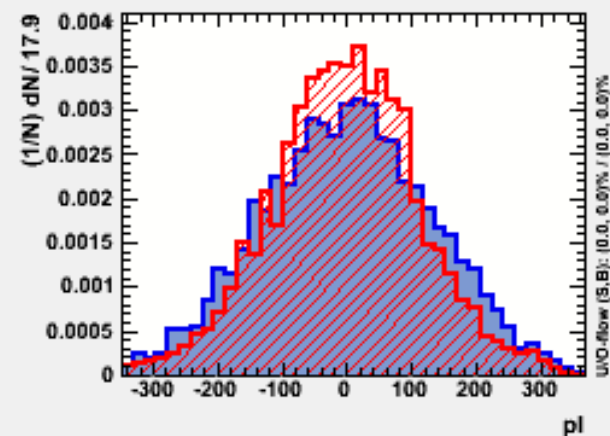
Input variable: Evis



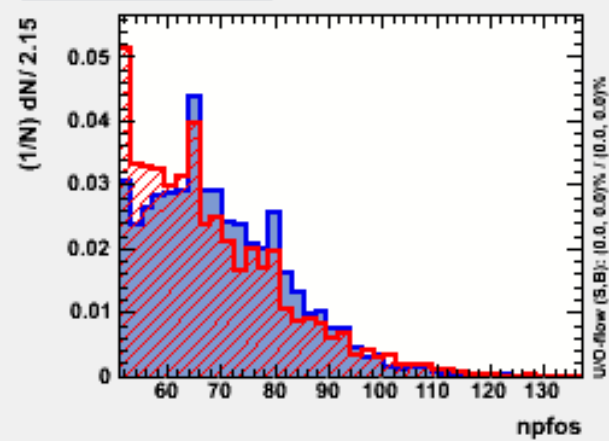
Input variable: Pt



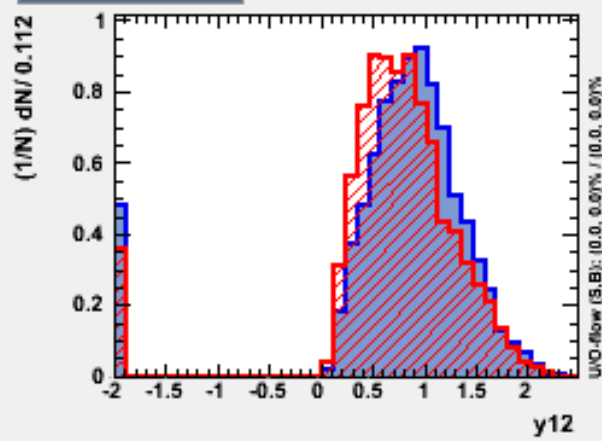
Input variable: pl



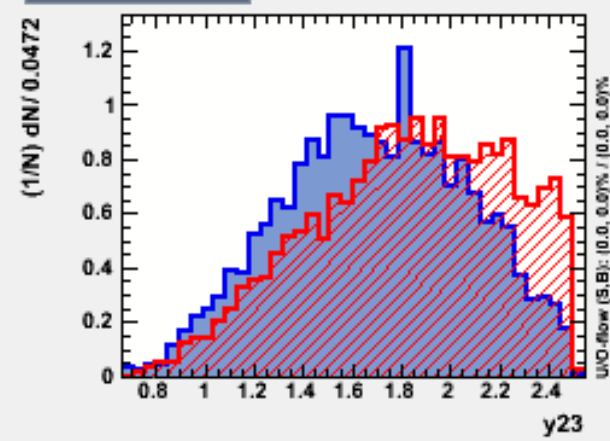
Input variable: npfos



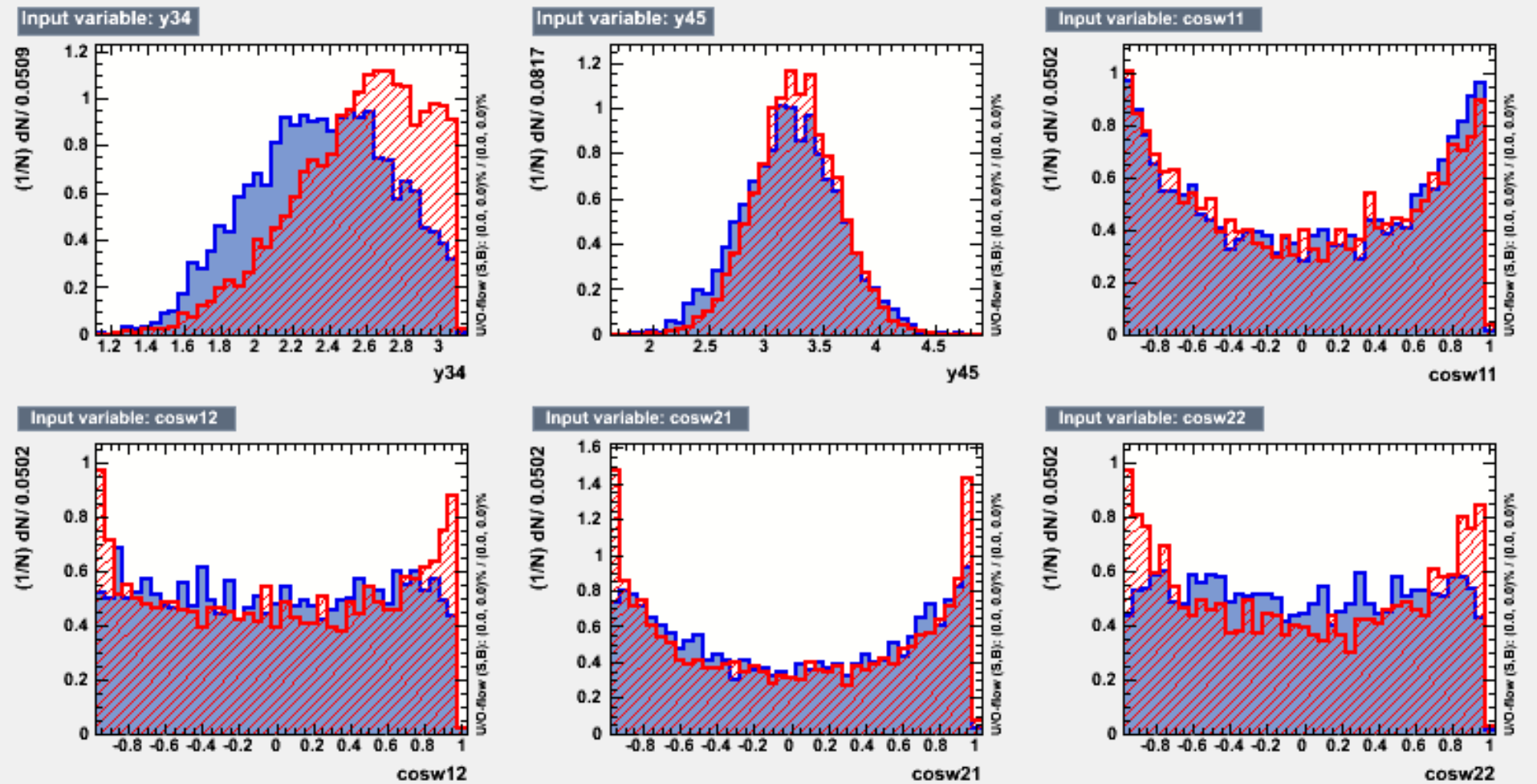
Input variable: y12



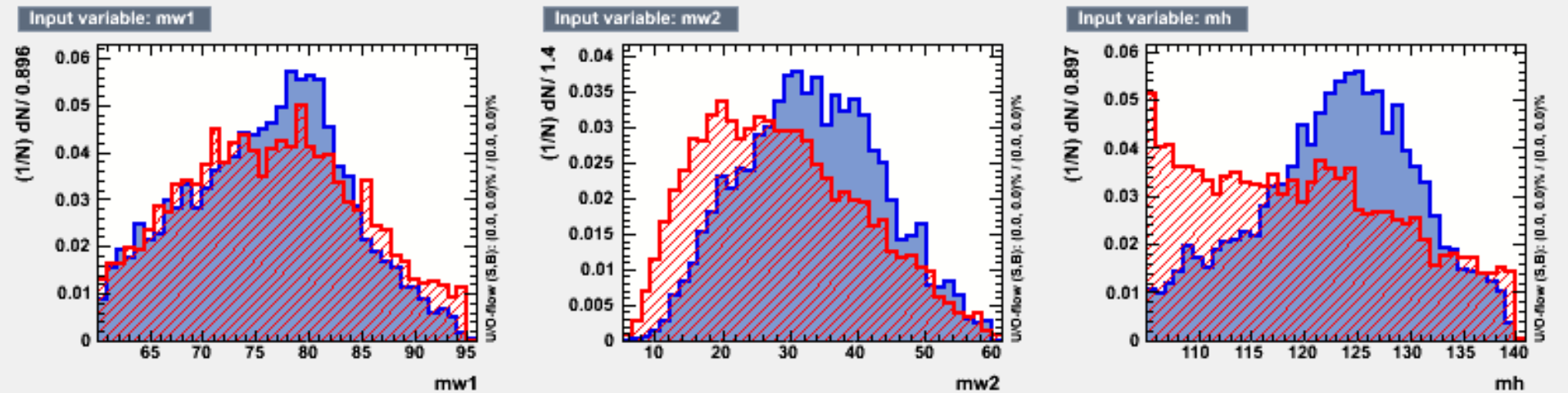
Input variable: y23



Input variables



Input variables



Now optimizing TMVA input parameters