

Top mass with d_{Merge} cuts - MVA for background suppression

Top group meeting
13. February 2009

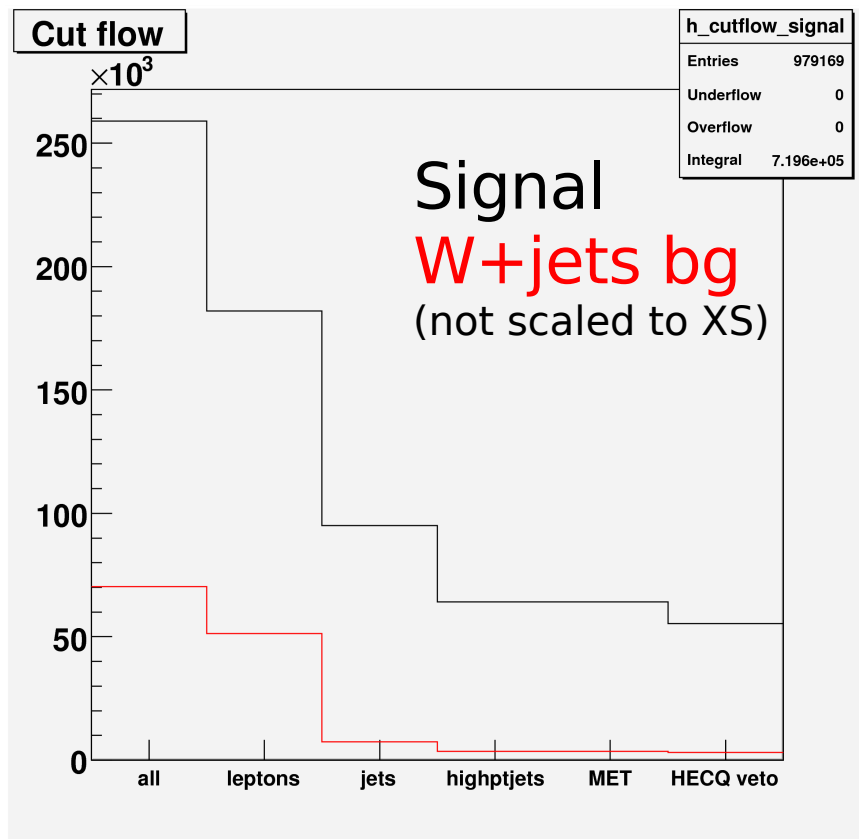


Max-Planck-Institut für Physik
(Werner-Heisenberg-Institut)

Top Selection

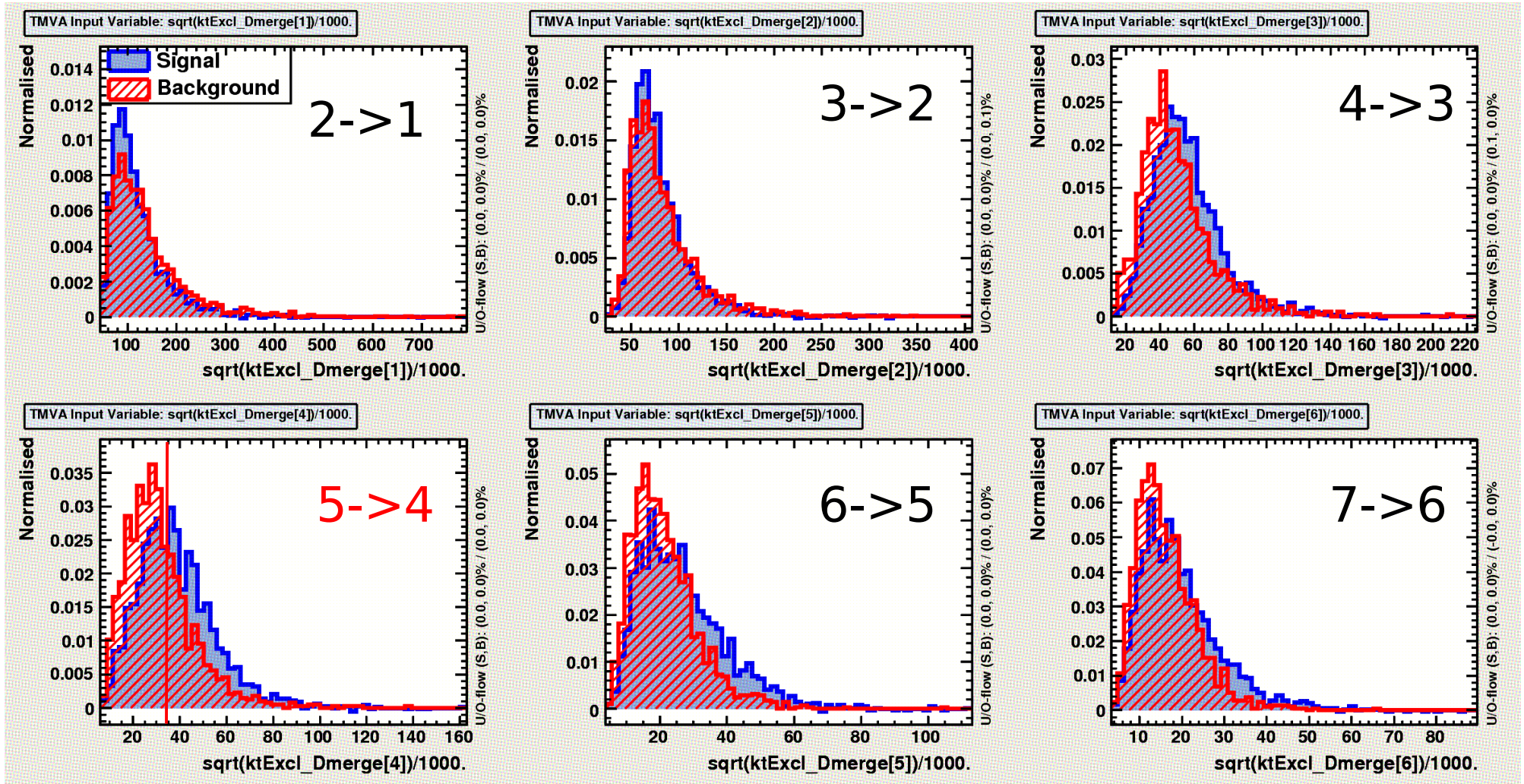
- Using DPDs with **signal** and **W+jets** background (105200 & 108240-108250)
- DPD making introduces a **soft preselection**:
 - ≥ 1 lepton $p_T > 10 \text{ GeV}$, $|\eta| < 3$
 - ≥ 2 jets $> 20 \text{ GeV}$, a third one $> 10 \text{ GeV}$ (Cone4H1Tower)
 - No MET cut (HecQ missing)
- Standard **top reconstruction** selection:
 - ≥ 1 lepton $> 20 \text{ GeV}$, $|\eta| < 2.5$ (Tight electrons, etcone20 $< 6 \text{ GeV}$)
 - ≥ 3 jets $> 40 \text{ GeV}$, a fourth one $> 20 \text{ GeV}$ (Kt4LCTopo)
 - No MET cut
 - HEC veto: no jet $> 10 \text{ GeV}$ in broken quadrant
- Trying to enhance top fraction by **imposing cut on d_{Merge}** scales determined by exclusive k_T algorithm running on TopoClusters

Cutflows



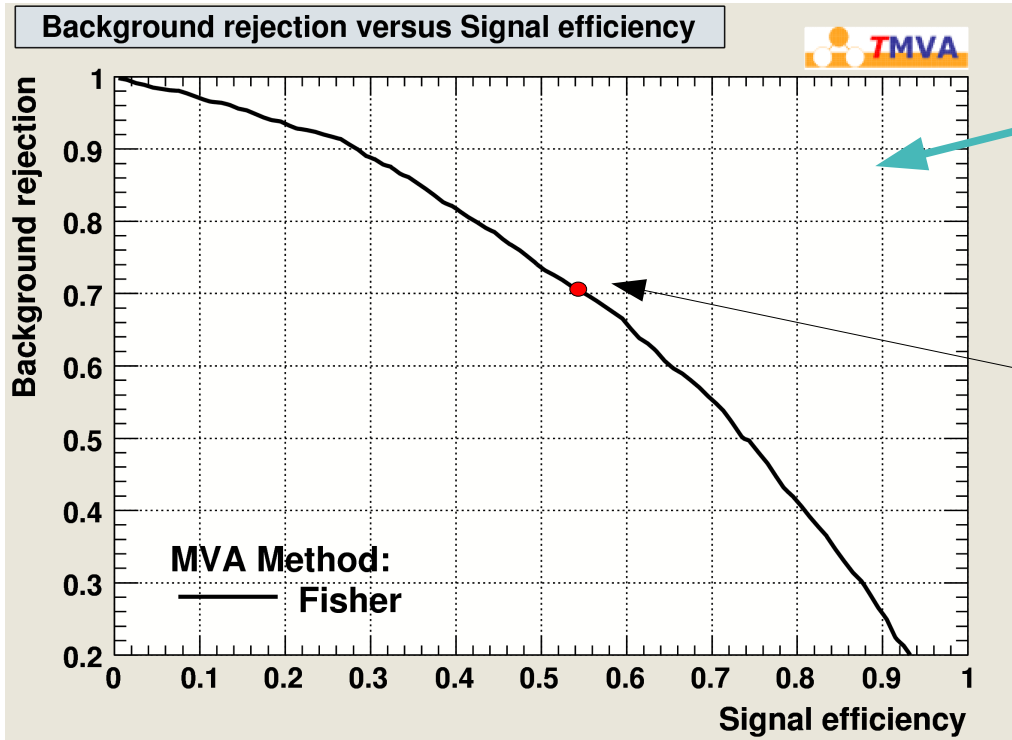
	signal	background
AOD events	359174	131139
DPD events	258935	70242
	72.1%	53.6%
Top selection	55398	3161
	21.4%	4.5%
Dmerge cut	29575	1033
	53.4%	32.7%
Dmerge MVA	30082	916
	54.3%	29.0%
luminosity	1655/pb	~200/pb

d_{Merge} distributions



(Normalized by TMVA)

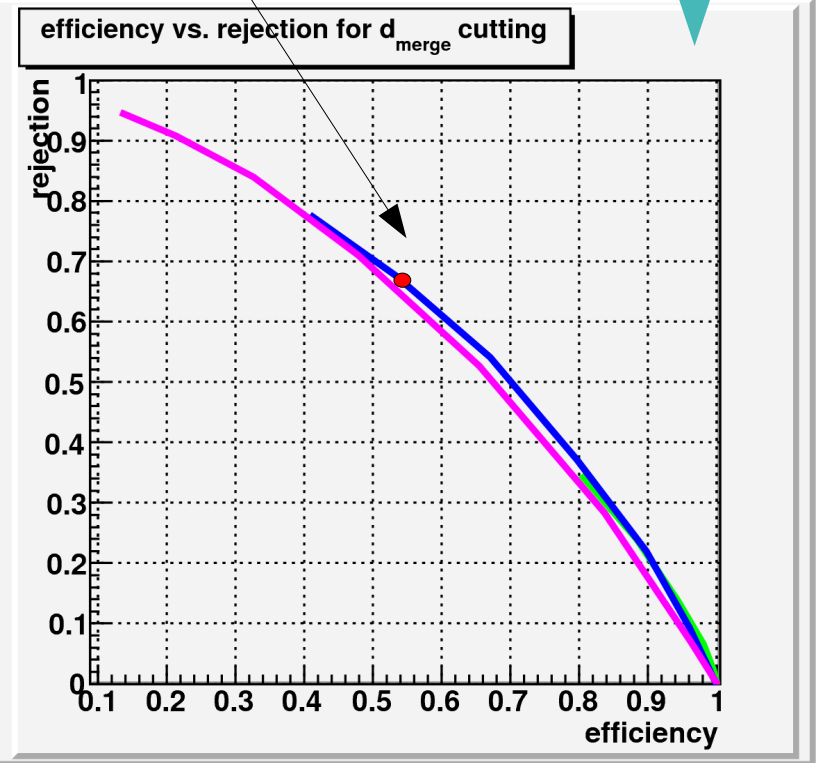
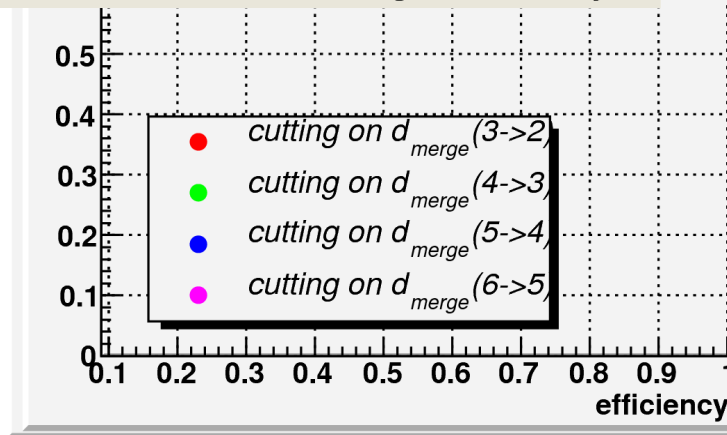
Fisher discriminant vs. Single cut



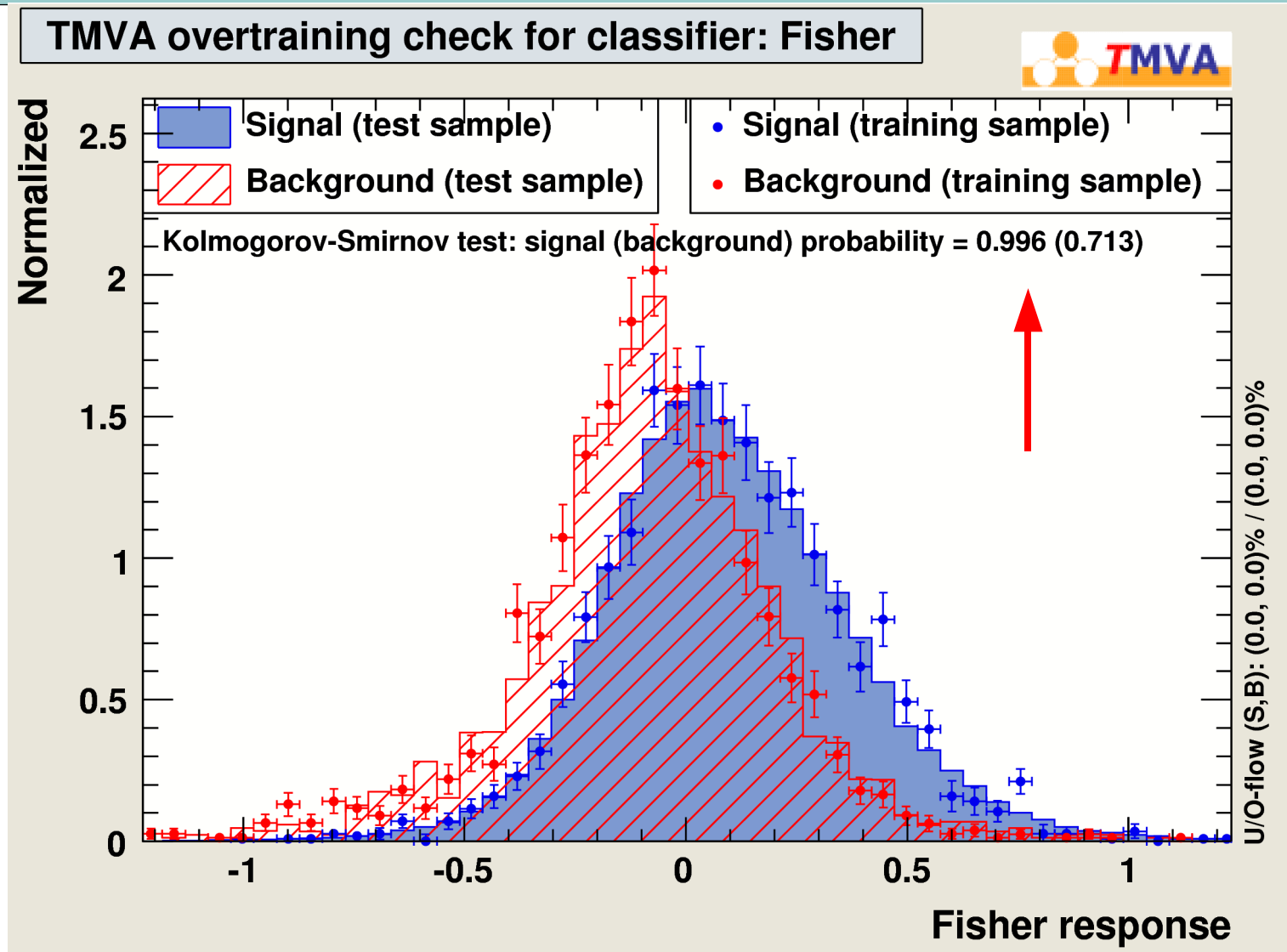
Fisher discriminant trained on 3000 signal and 1500 bg events (top selected) and first 10 $\sqrt{d_{\text{Merge}}}$ vars

Plain cut on one d_{Merge} variable

Chosen working point (~54%eff)



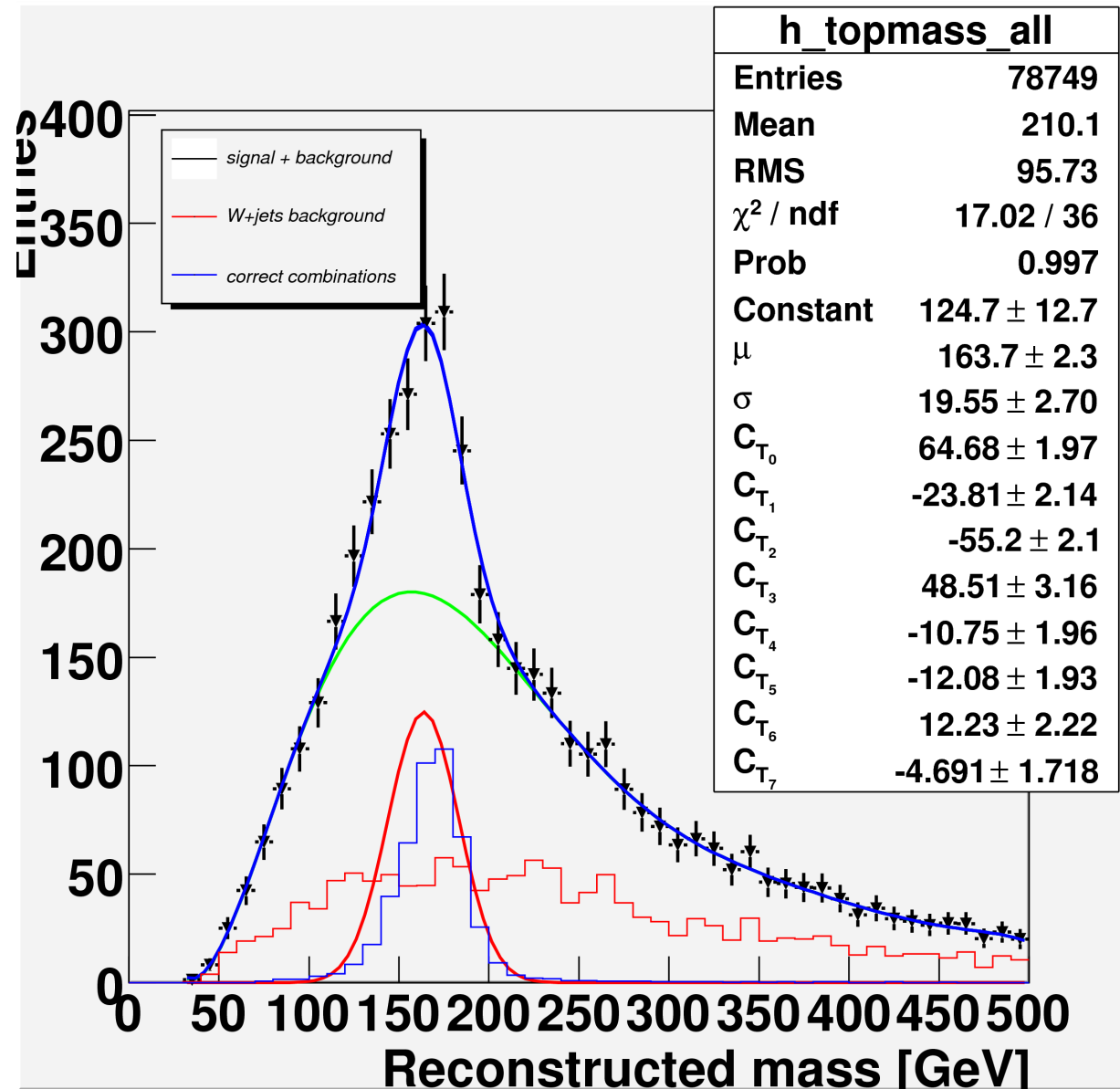
Fisher classifier output



Fisher discriminant passes the overtraining check :)

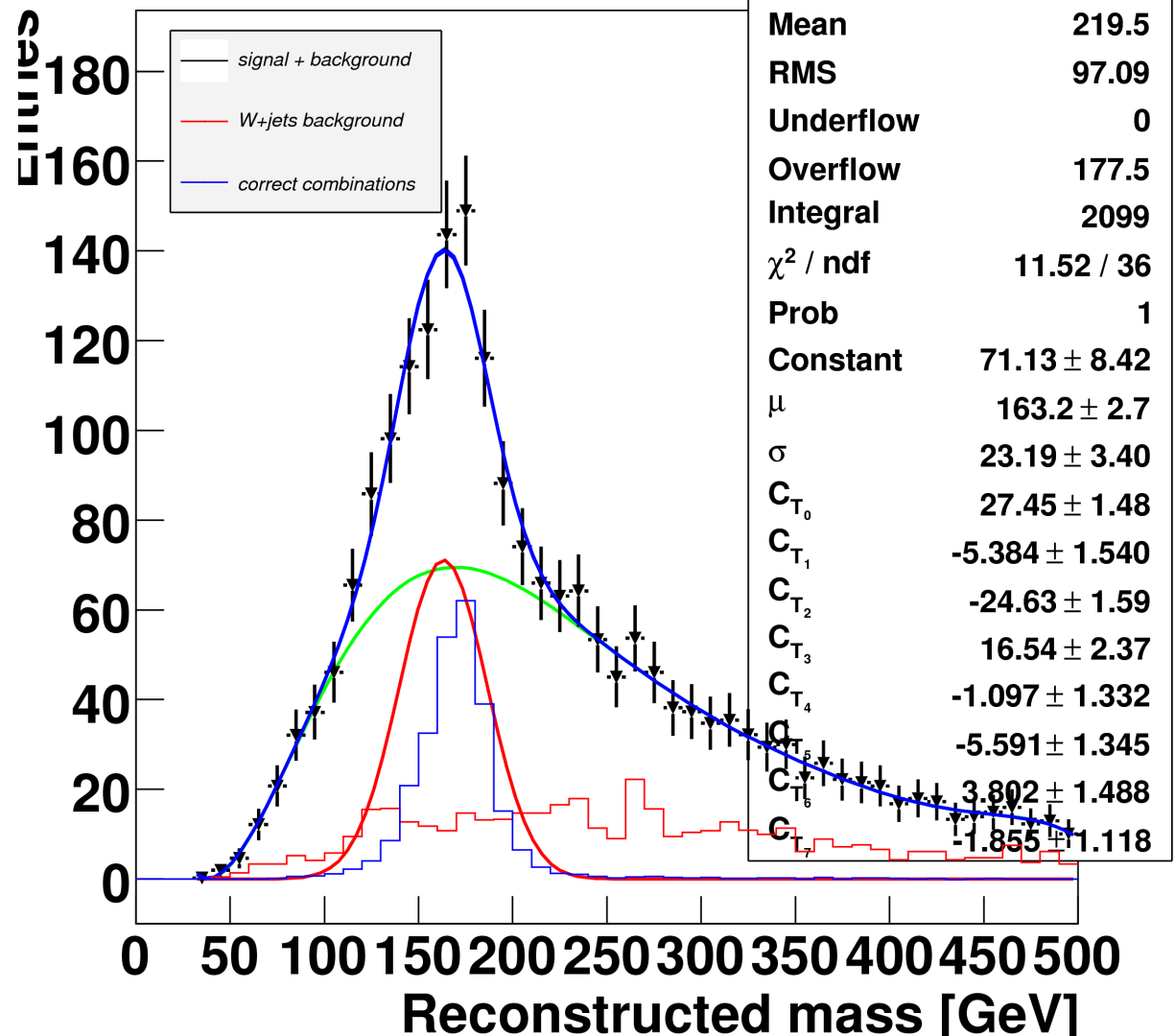
Top mass plot

- Standard selection
- Fit a Chebychev 7th degree + Gaussian
- Gauss mean: 163.7 GeV
- Gauss width: 19.6 GeV



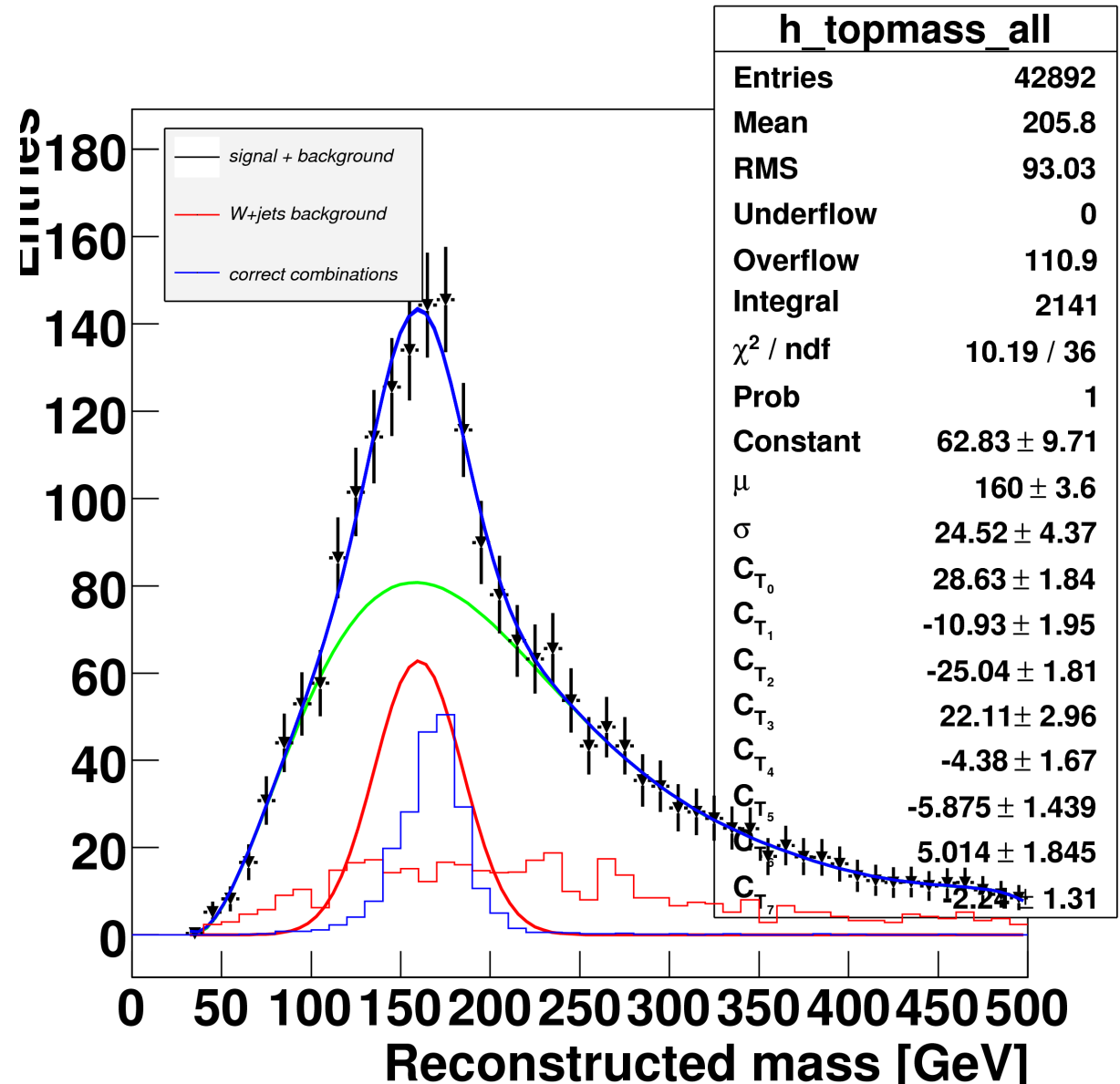
Top mass with d_{Merge} cut

- Standard selection + cut on d_{Merge} (5->4)
- Fit a Chebychev 7th degree + Gaussian
- Efficiencies:
signal 53.4%
backgd 32.7%
- Gauss mean:
163.7 GeV
163.2 GeV with cut
- Gauss width:
19.6 GeV
23.2 GeV with cut



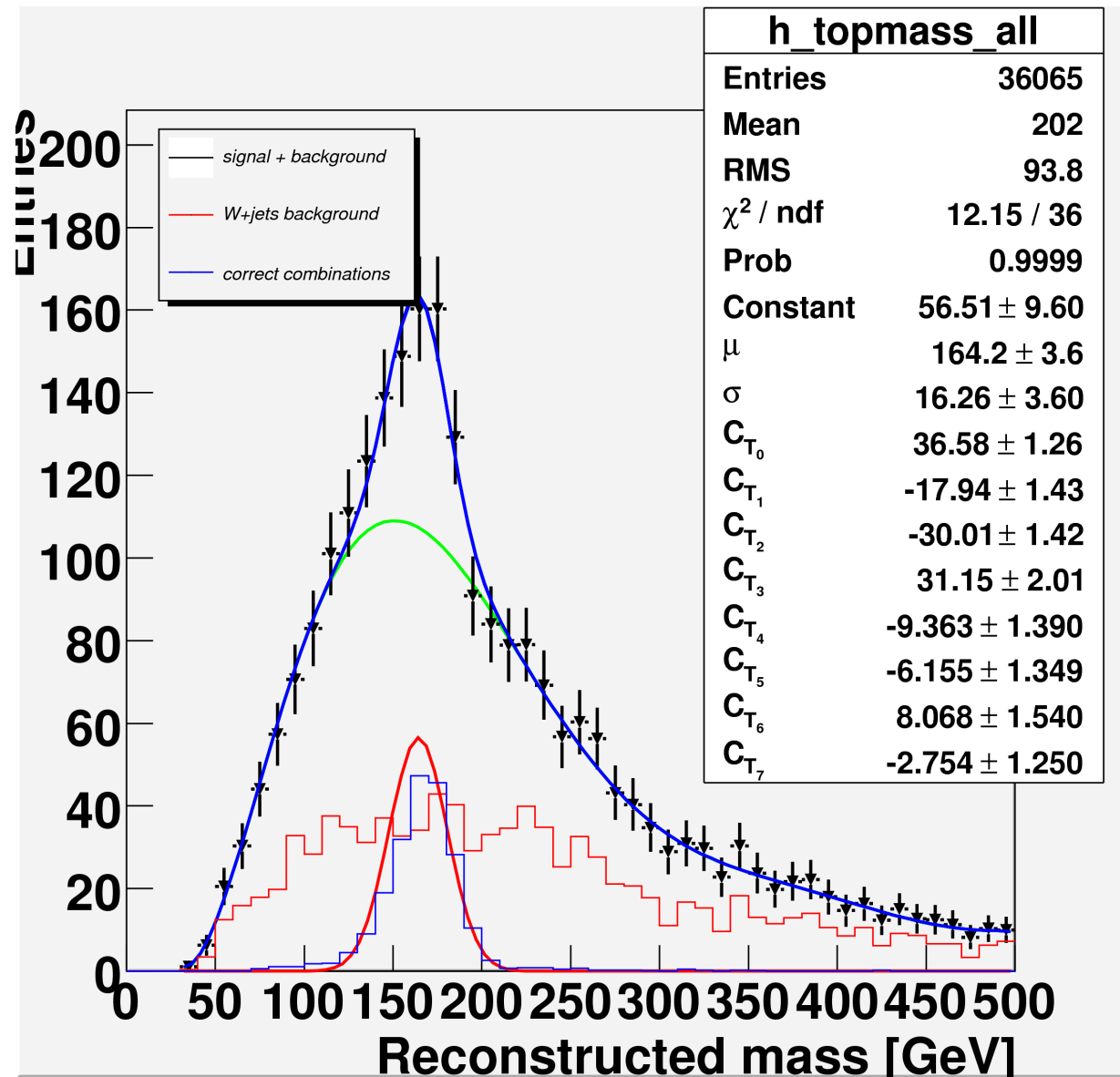
Top mass with Fisher classifier

- Standard selection + Fisher classifier on $10 \sqrt{d_{\text{Merge}}}$ vars
- Fit a Chebychev 7th degree + Gaussian
- Efficiencies:
signal: 54.3%
backgd 29.0%
- Gauss mean:
163.7 GeV
163.2 GeV with cut
160.0 GeV with Fisher
- Gauss width:
19.6 GeV
23.2 GeV with cut
24.5 GeV with Fisher



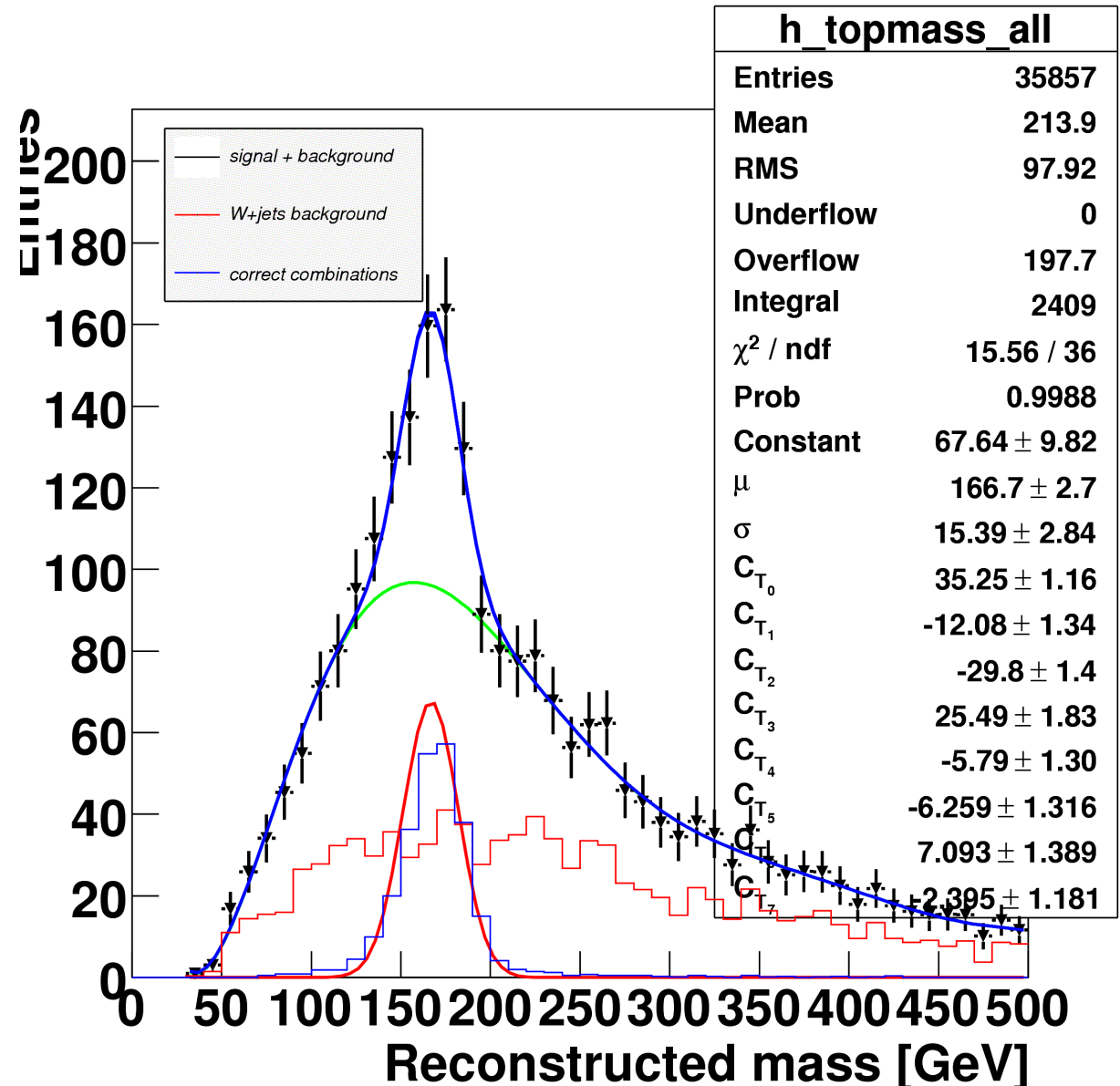
Backup

Top mass with dMerge cut, rejected events



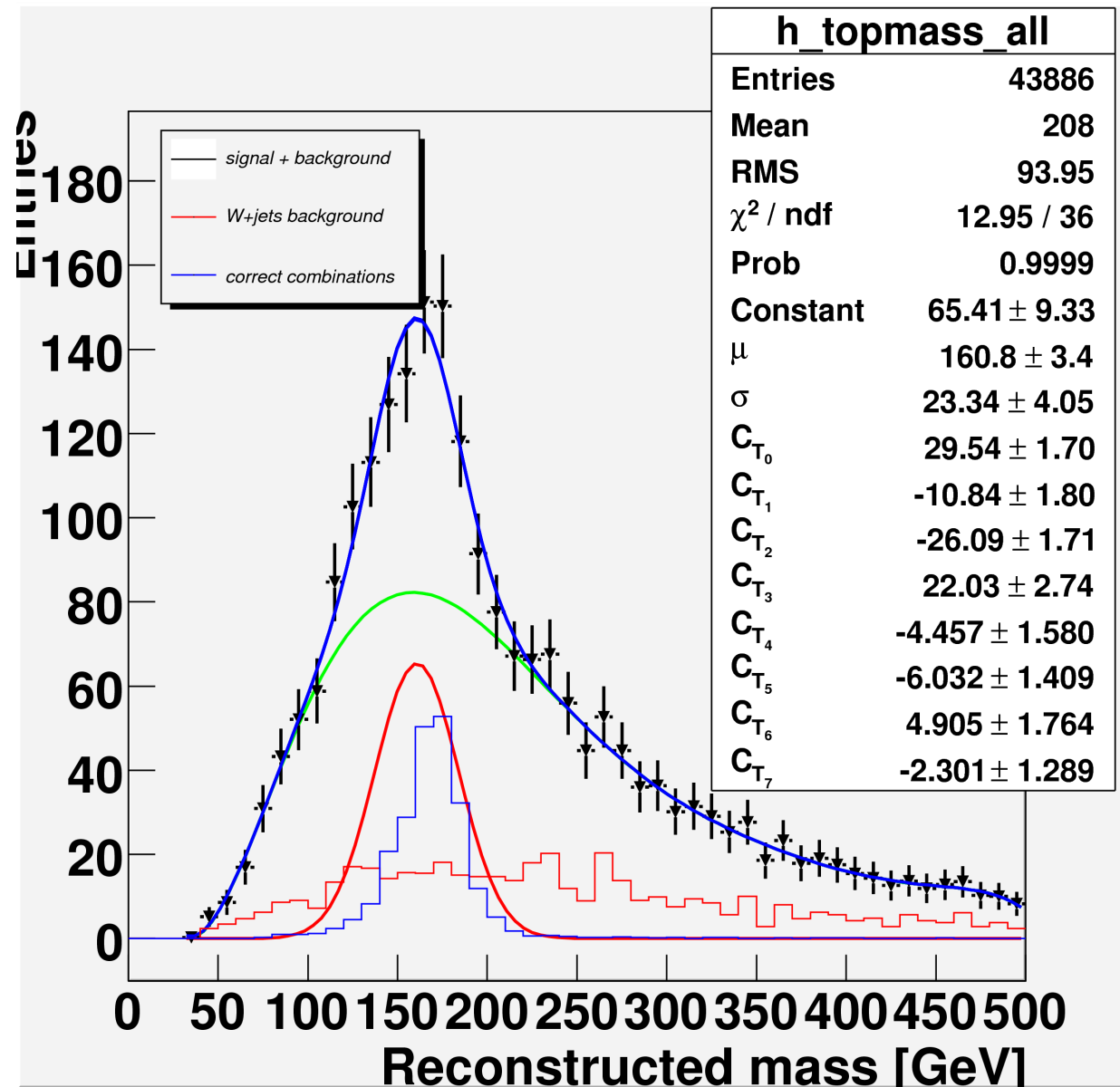
Top mass with Fisher classifier, rejected events

- Fisher, rejected



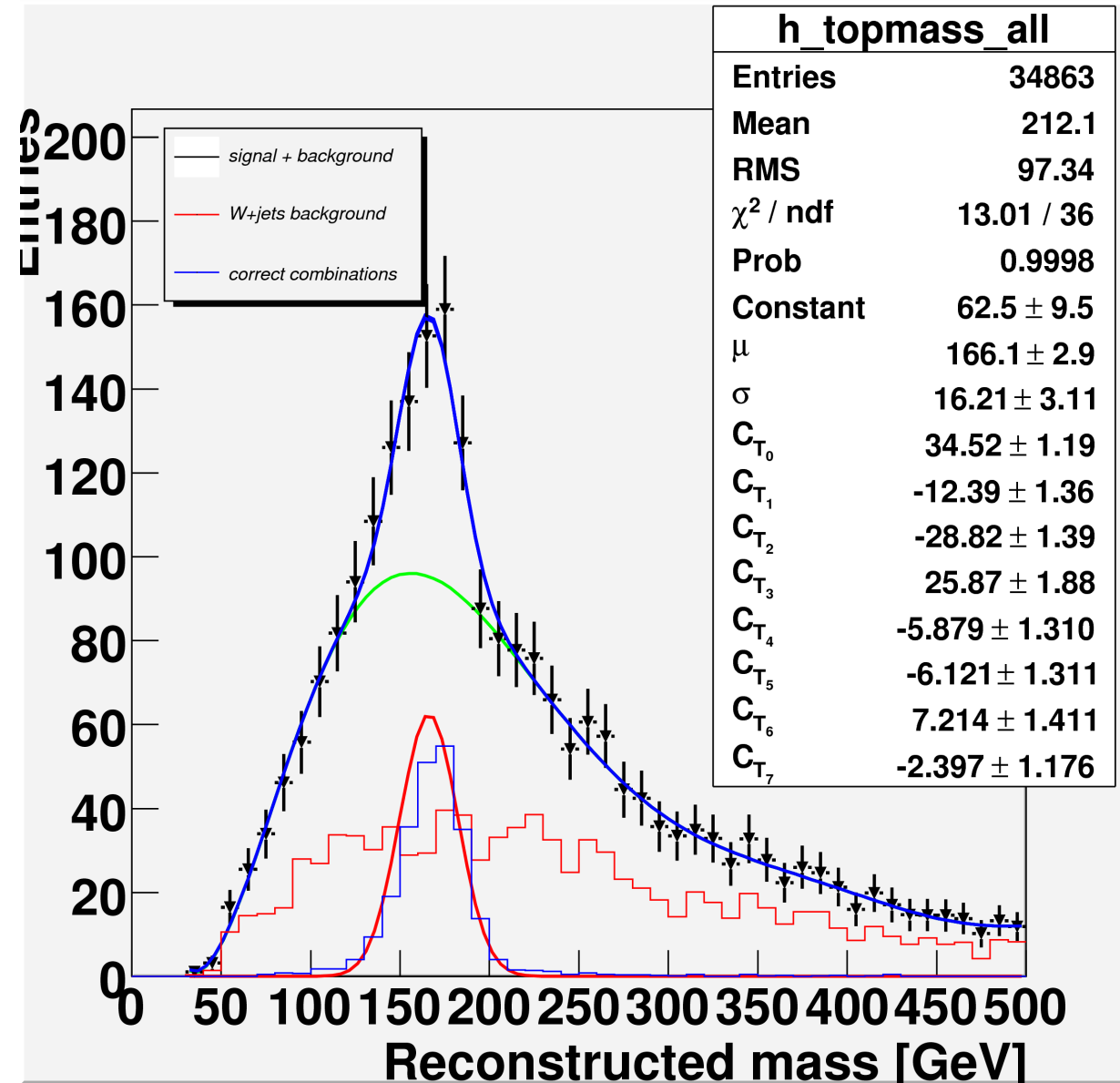
Top mass with Fisher classifier

- Fisher trained with 10 d_{Merge} vars (no sqrt)



Top mass with Fisher classifier, rejected events

- Fisher, trained with 10 d_{Merge} vars (no sqrt), rejected events



Fisher efficiencies & purities

