

FCNC 1L3B

Status on 17/12/2014

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Revision of the baseline selection cuts

- Baseline selection
 - ≥ 1 lepton (iso: CONE04, threshold: 0.2)
 - μ : $P_T > 10$ GeV, $|\eta| < 2.4$
 - e : $P_T > 15$ GeV, $|\eta| < 2.5$
 - ≥ 3 jets
 - cleaned from leptons with $\Delta R < 0.5$, $P_T < 20$ GeV
 - $P_T(\text{jet1}) > 40$ GeV, $P_T(\text{jet2}) > 40$ GeV, $P_T(\text{jet3}) > 35$ GeV
 - $|\eta| < 2.4$
 - $E_{\text{eoverHE}} > 0.3$
 - ≥ 3 CSVM b-tagged jets
 - $M_T(\text{lep}, \text{MET}) \geq 50$ GeV

$S/\sqrt{S+B}$ after full baseline selection: 42.07

Variables fed to an MVA

- MET
- $M(\text{lep}, b^{\text{SM}})$ (b^{SM} : hardest b-jet)
- $P_T(b^{\text{SM}})$
- $M(b_1, b_2)$ ($b_1 \neq b_2 \neq b^{\text{SM}}$)
- $\Delta R(b_1, b_2)$ ($b_1 \neq b_2 \neq b^{\text{SM}}$)
- $M(b_1, b_2, j_{\text{FCNC}})$ ($b_1 \neq b_2 \neq j_{\text{FCNC}}$)
- $P_T(j_{\text{FCNC}})$
- $\Delta\Phi(b^{\text{SM}}, t_{\text{FCNC}})$
- $M_T(\text{lep}, \text{MET})$
- H_T

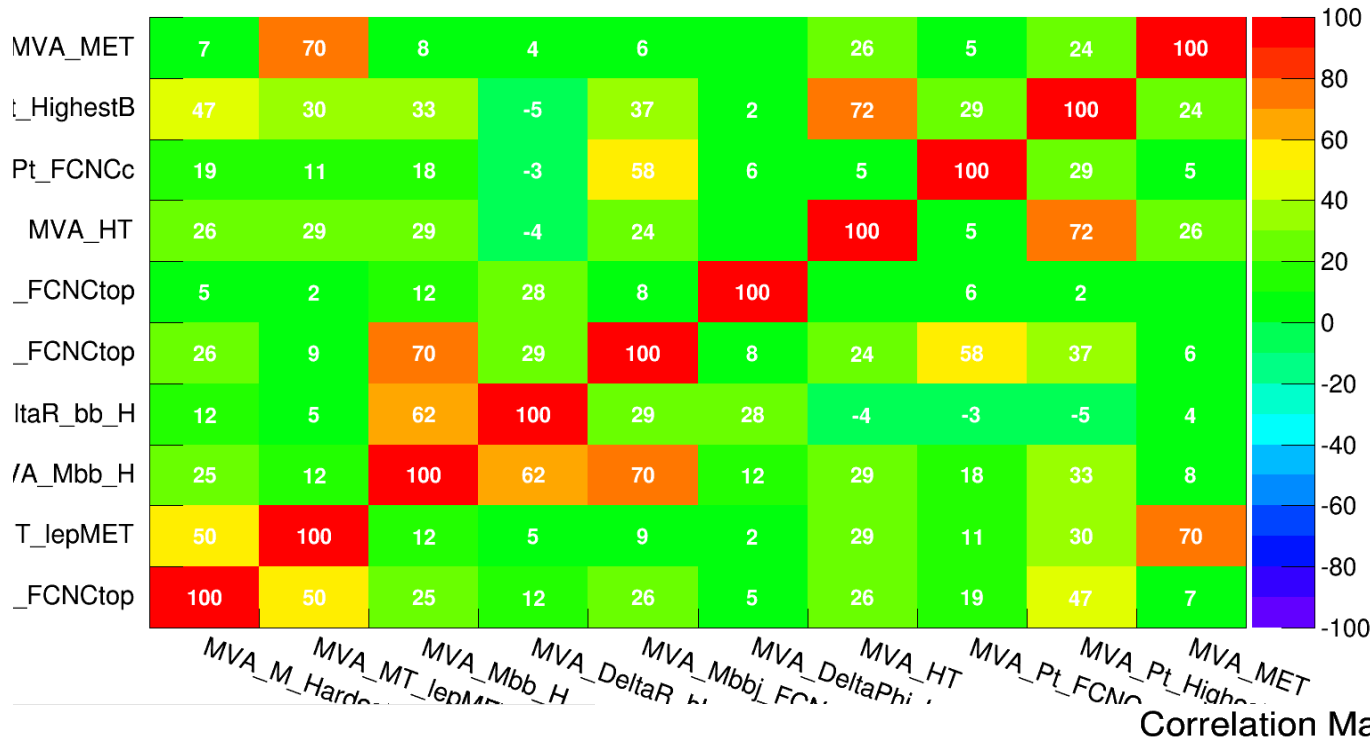
Simultaneous χ^2 -minimization to determine b_1, b_2 & j_{FCNC}

$$\chi^2 = \frac{(m_{b_1 b_1} - m_H)^2}{\sigma_H^2} + \frac{(m_{b_1 b_1 j} - m_t)^2}{\sigma_t^2}$$

$\swarrow$ $\sim 15 \text{ GeV}$
 $\swarrow$ $\sim 16.21 \text{ GeV}$

Correlation of input variables

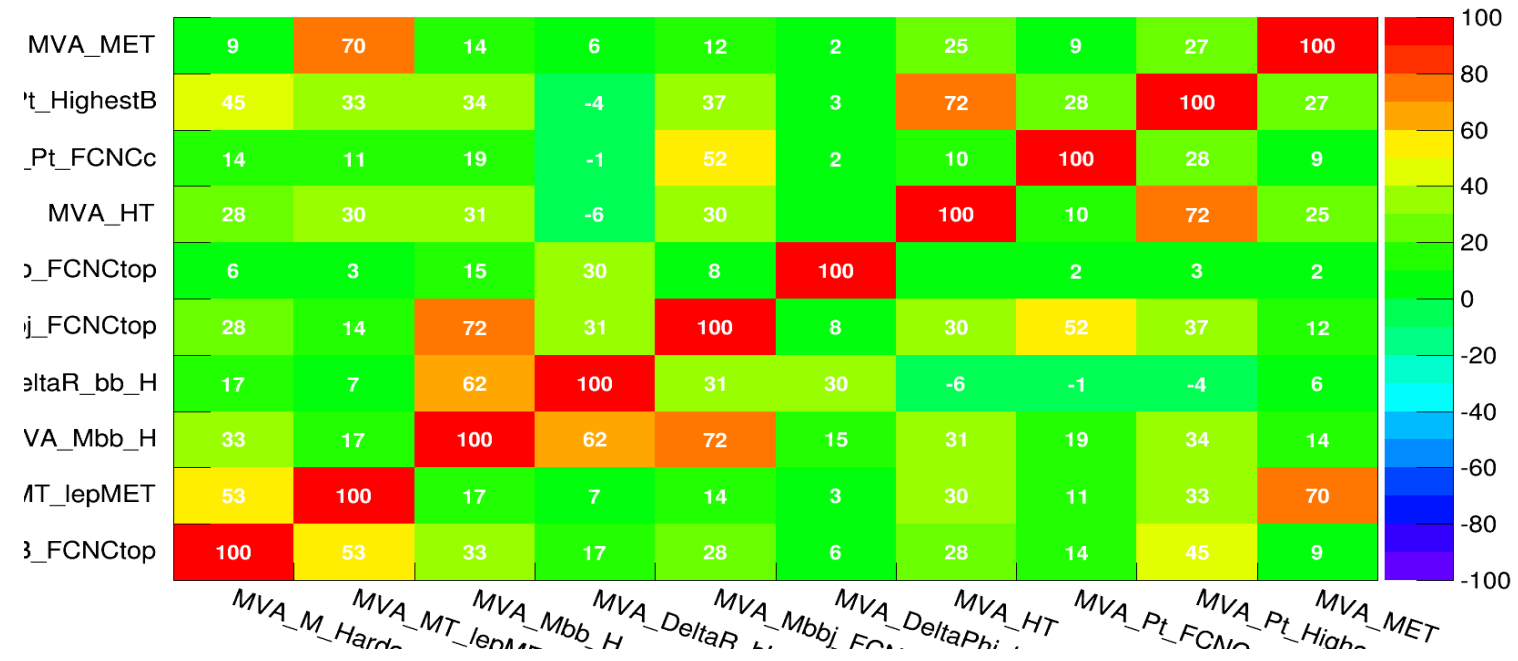
Correlation Matrix (background)



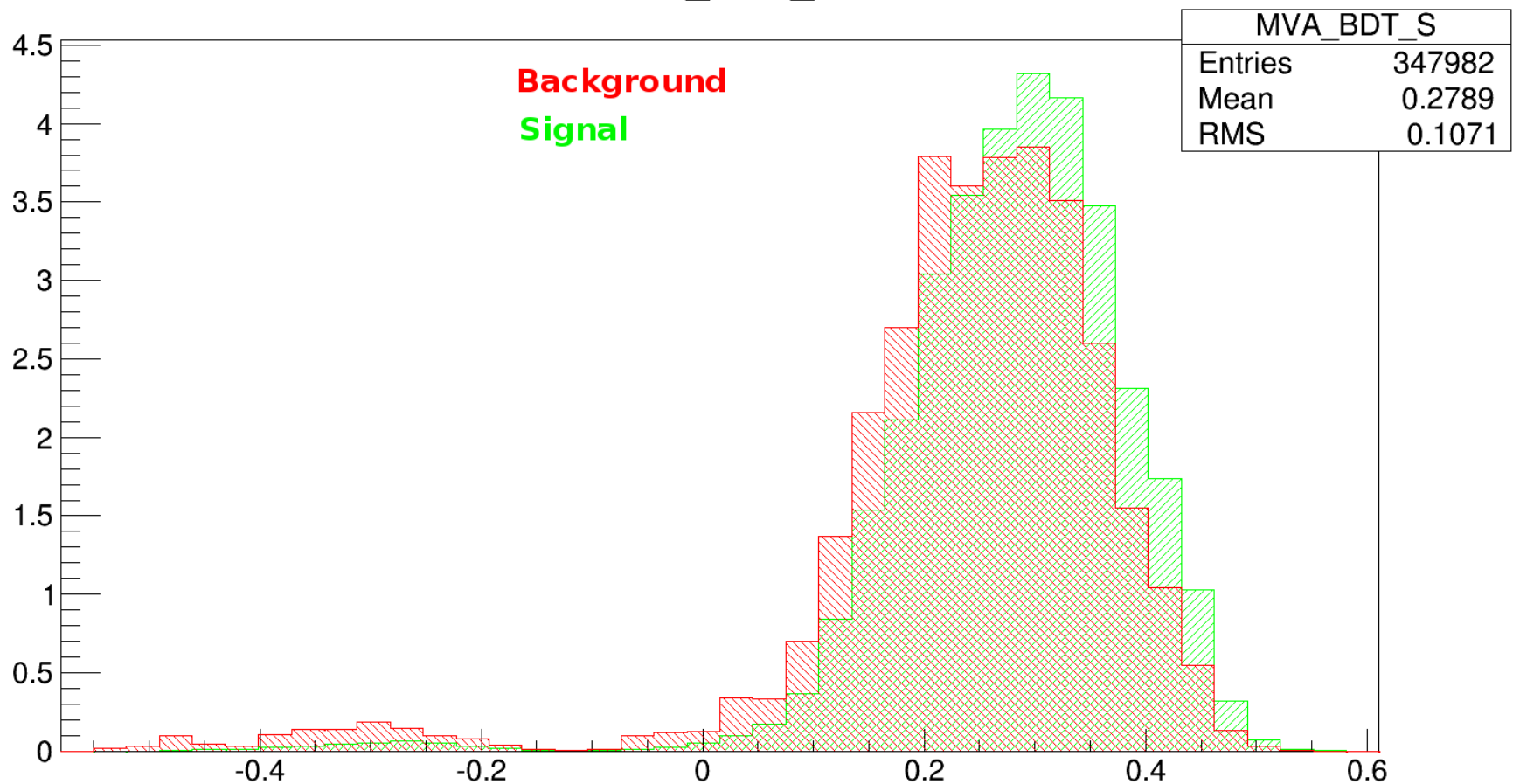
Ranking Variables

Rank : Variable		: Separation
1	MVA_Pt_FCNCc	: 1.095e-02
2	MVA_Mbbj_FCNCtop	: 8.083e-03
3	MVA_Mbb_H	: 6.751e-03
4	MVA_HT	: 3.640e-03
5	MVA_DeltaR_bb_H	: 3.185e-03
6	MVA_M_HardestB_FCNCtop	: 2.104e-03
7	MVA_Pt_HighestB	: 1.822e-03
8	MVA_DeltaPhi_b_FCNCtop	: 1.784e-03
9	MVA_M_T_lepMET	: 1.238e-03
10	MVA_MET	: 9.167e-04

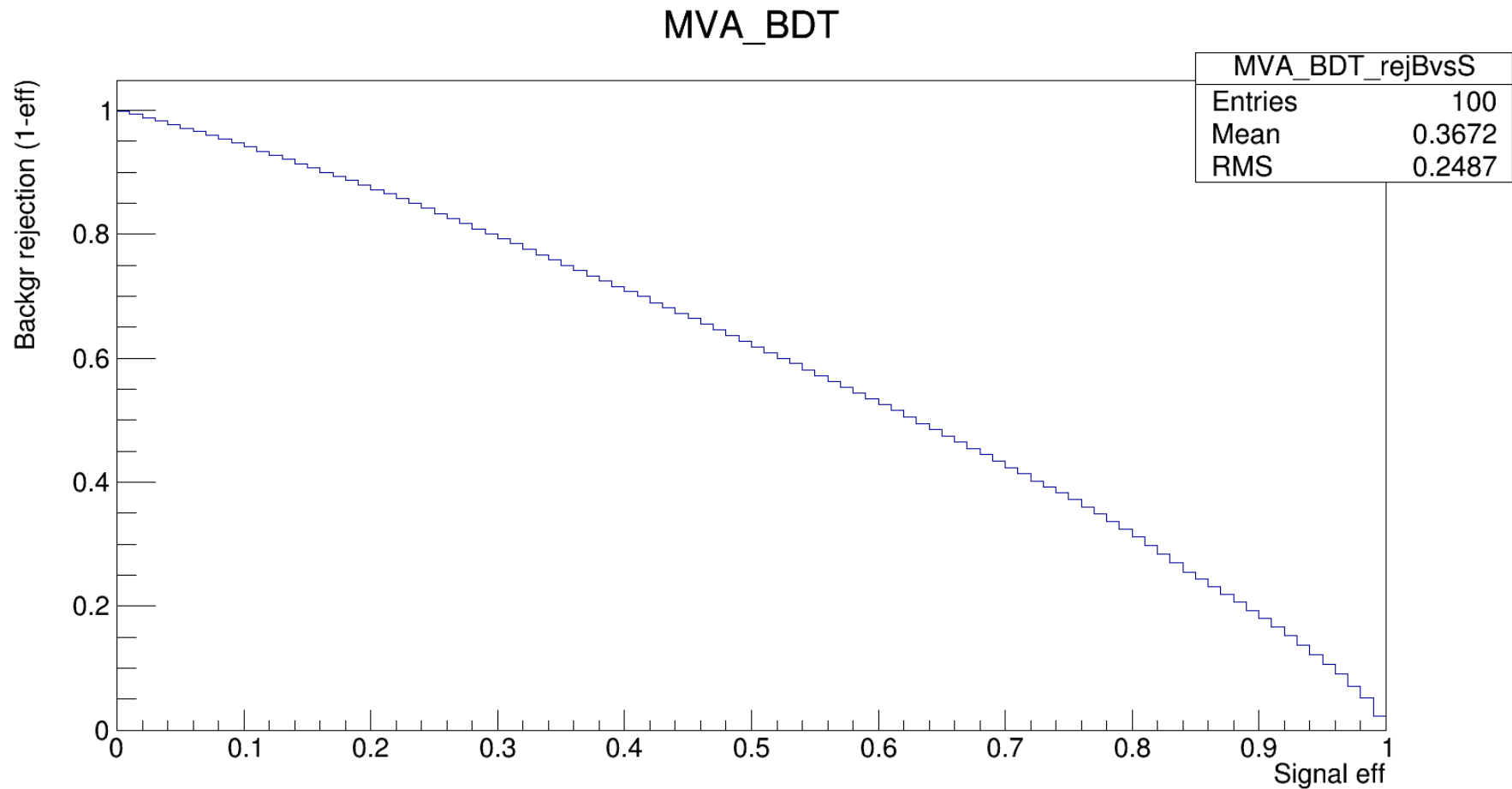
Correlation Matrix (signal)



BDT: no clear distinction



ROC-curve



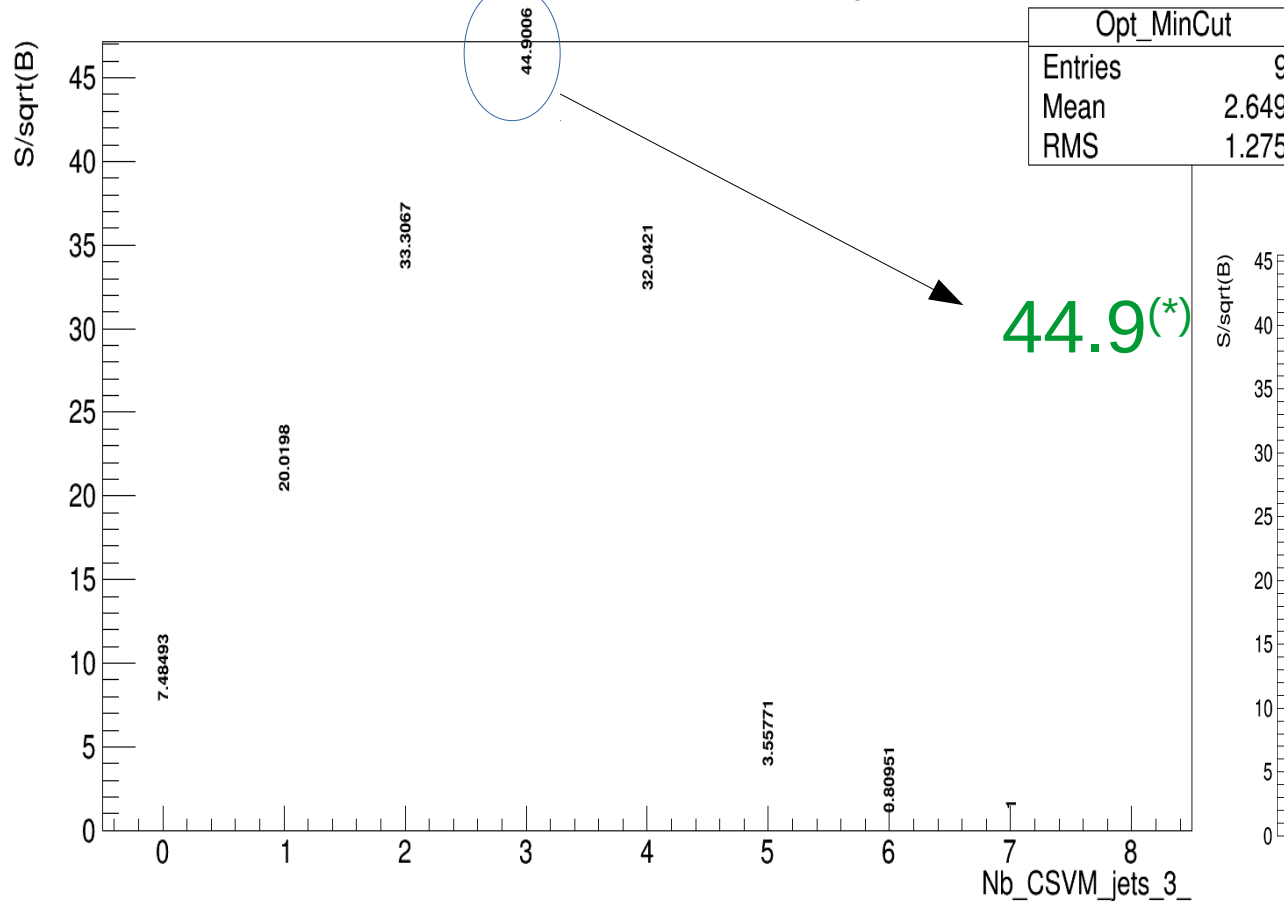
BACKUP

Significance of baseline selection

- Assuming current best limit on $\text{BR}(\text{tcH}) = 0.0083$

$$\rightarrow \sigma(\text{tt} \rightarrow \text{bW cH} \rightarrow \text{bW cbb})_{13\text{TeV}} \approx 6.45 \text{ pb}$$

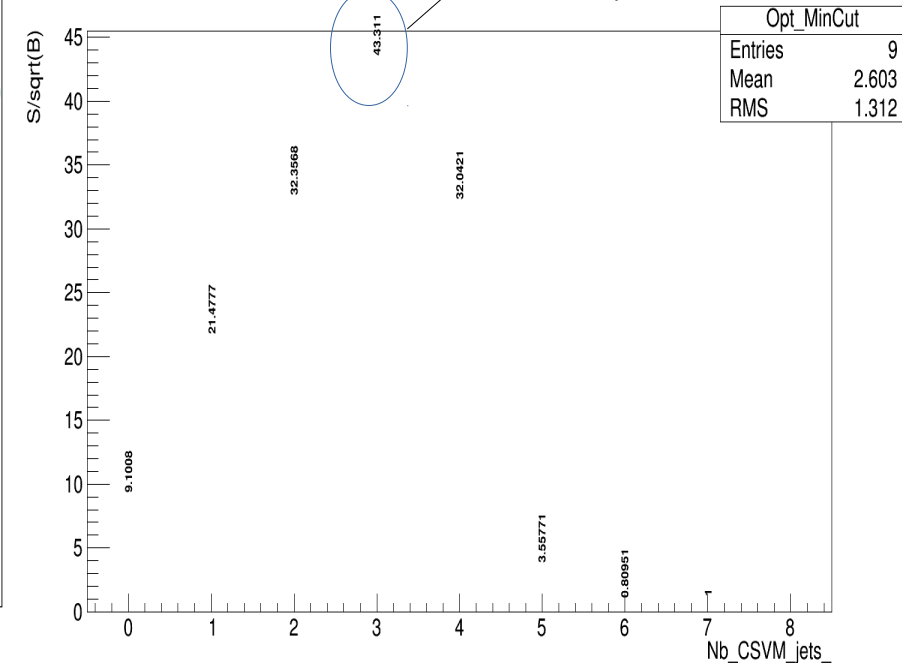
Lower bound scan for Nb_CSVM_jets_3_



Cfr 4J3B

43.3(*)

Lower bound scan for Nb_CSVM_jets_

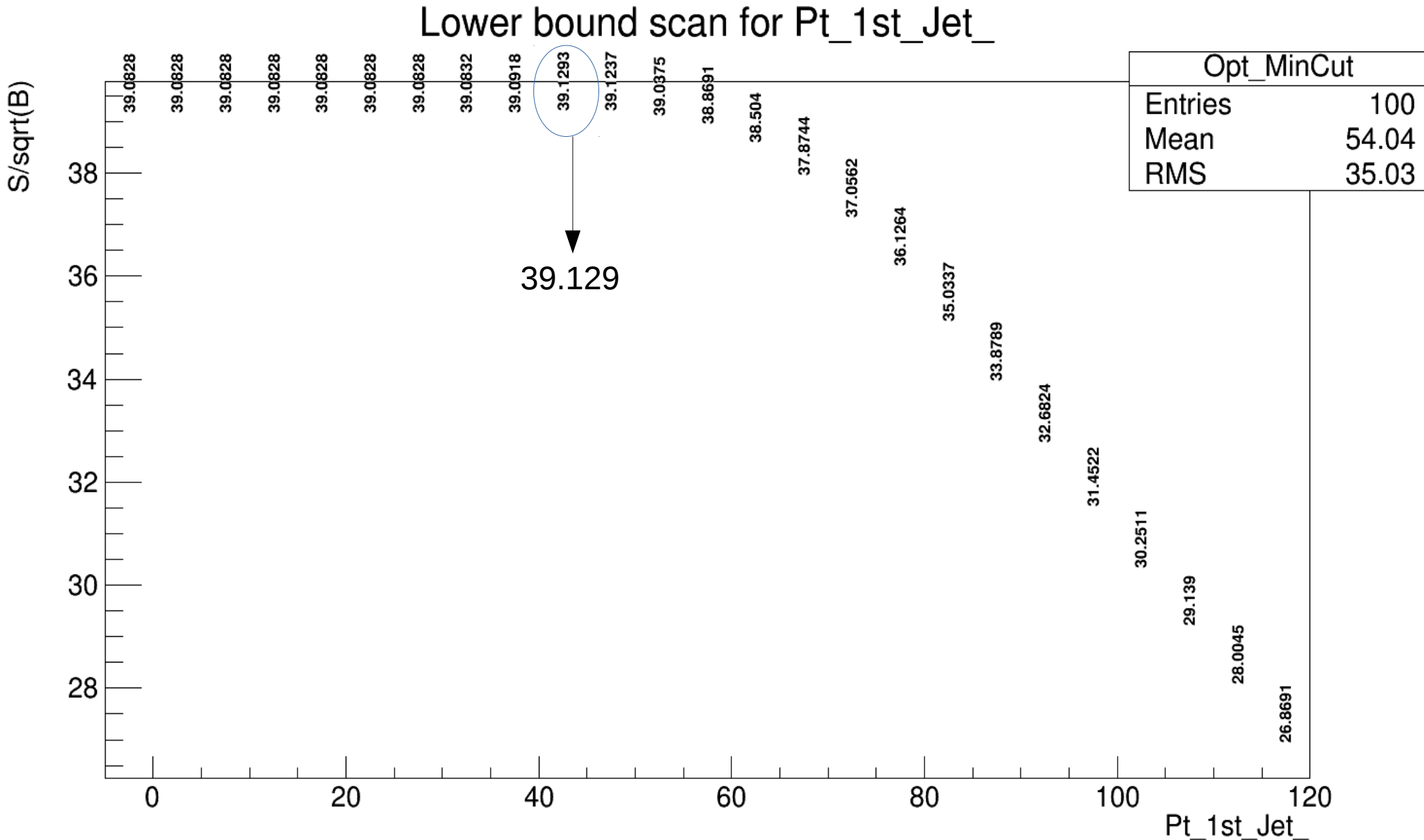


(*): no $M_T/P_T(\text{jet})$ cuts

$S/\sqrt{B}$ after full baseline selection: 43.69

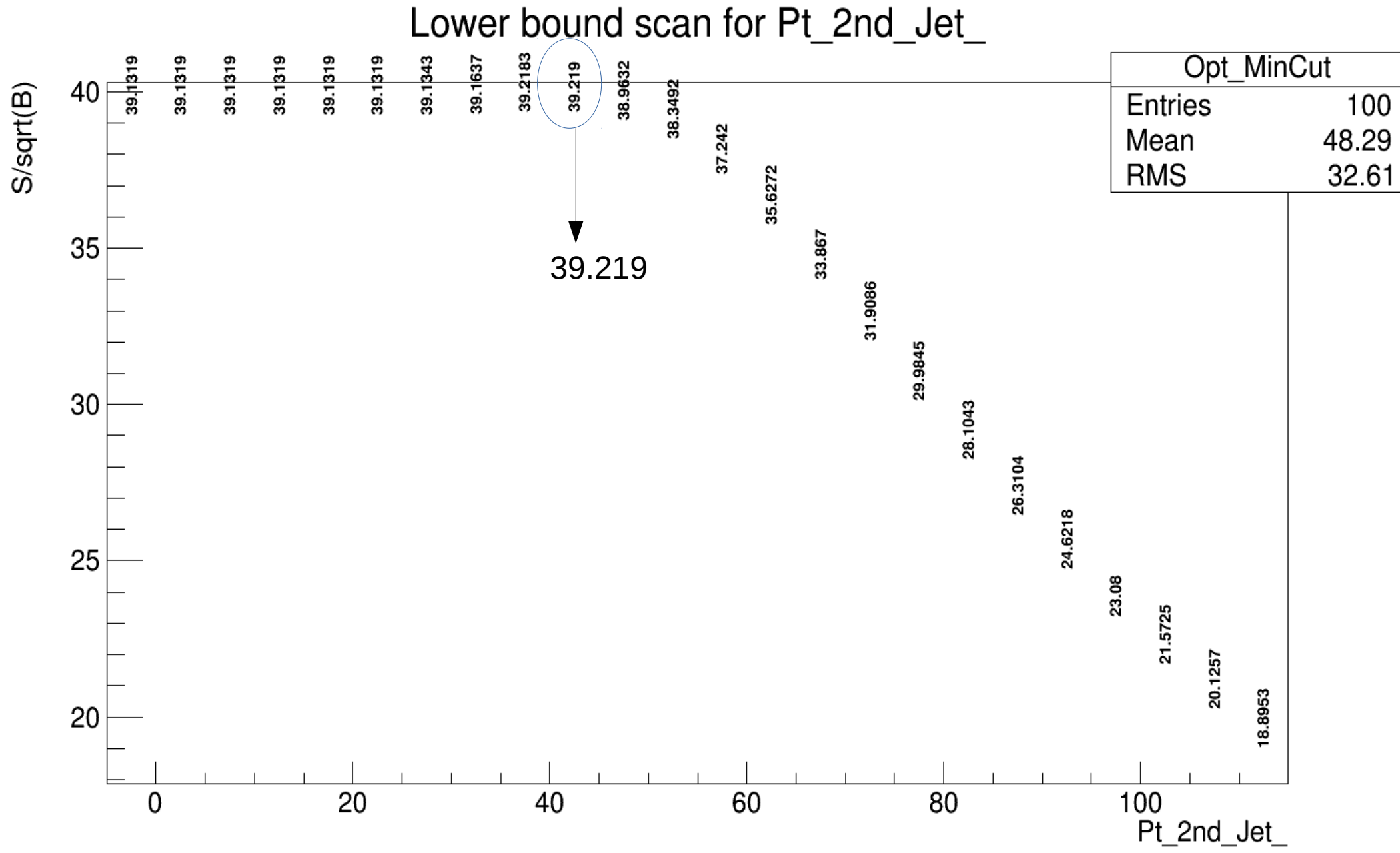
Additional jet cuts (1st jet)

- P_T 1st jet > 40 GeV



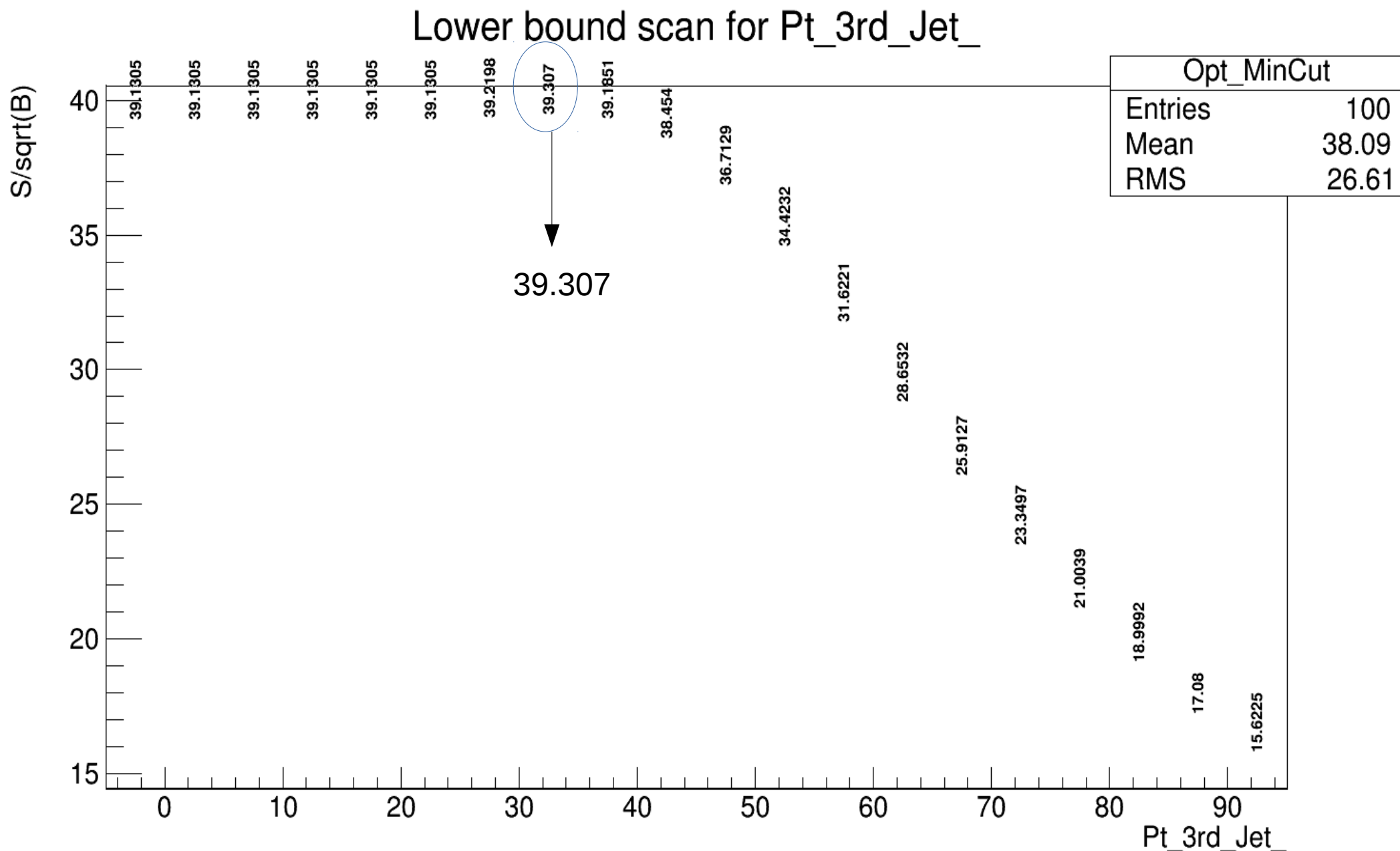
Additional jet cuts (2nd jet)

- P_T 2nd jet > 40 GeV



Additional jet cuts (3^d jet)

- P_T 3rd jet > 35 GeV



Gen information

cutFlow_TT_Kappa_Hct_Htobb

