Status update on $H \to b\bar{b}$ analysis on semileptonic channel

B-tag matrices

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INFN Padova

PD meeting,
PD, 14/10/2011

B-matrices and co.

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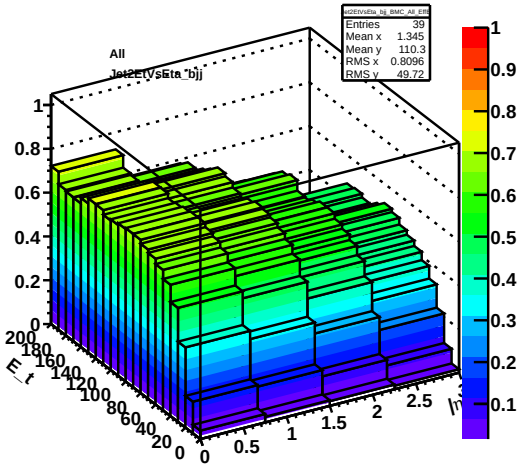
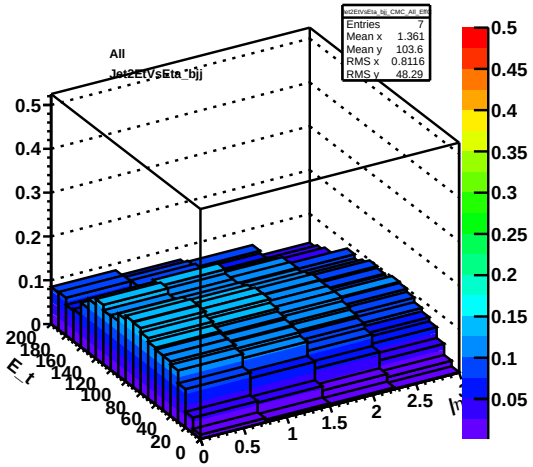
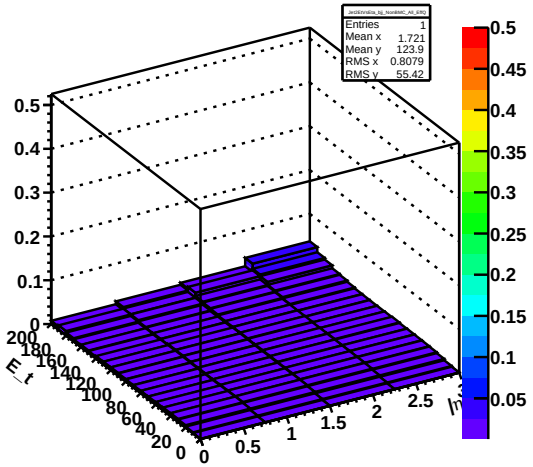
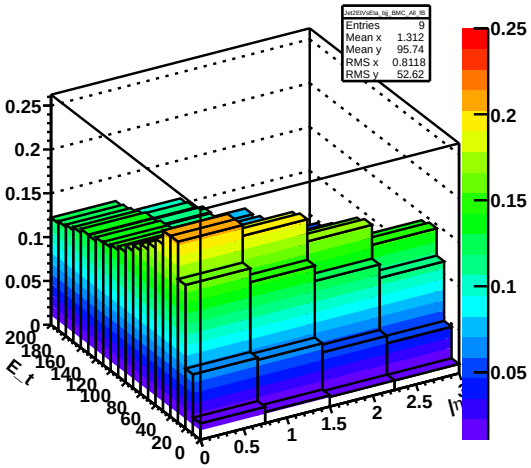
- Get f_b, f_c, ϵ_b, ϵ_c and ϵ_l from MC;
- vs E_t, $|\eta|$;
- vs E_t, ΔR;
- Separately for:
  - *bjj* vs *bbj* (first jet b-tag, look at second one);
  - *bjj* vs *bjb* (first jet b-tag, look at third one);
  - *jbj* vs *bbj* (second jet b-tag, look at first one);
  - *jbj* vs *jbb* (second jet b-tag, look at third one);
  - *bbj* vs *bbb* (first two b-tags, look at third);

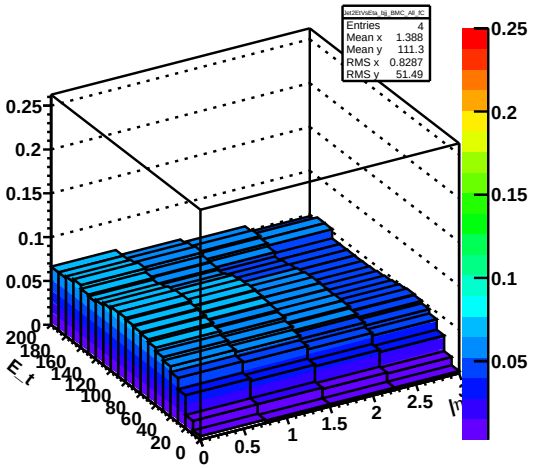
ϵ_b, ϵ_c, ϵ_l, $f_{b,c,l}$ for bjj vs $|\eta|, E_t$

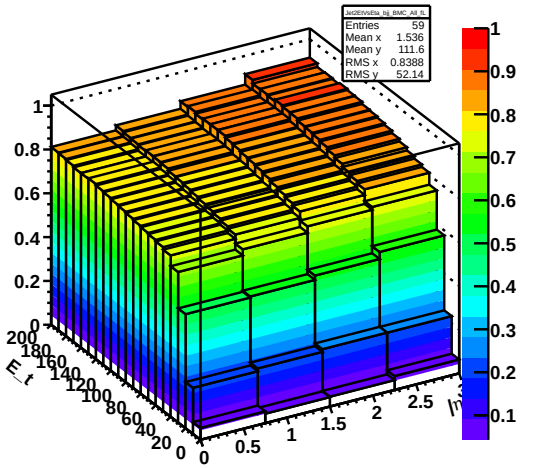




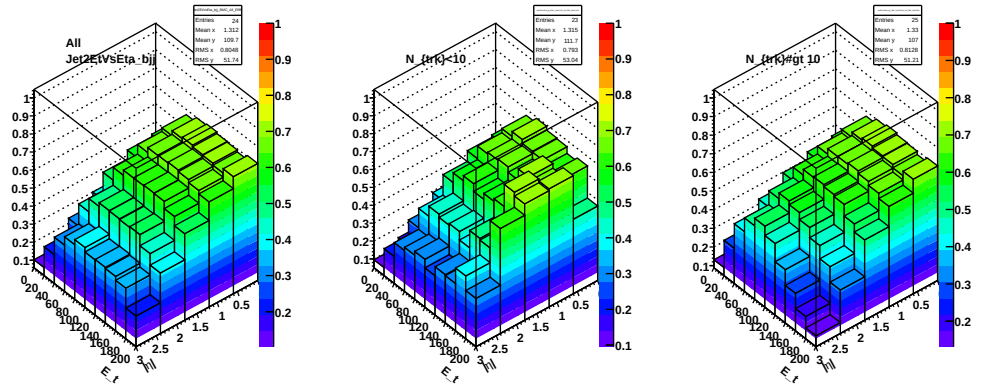






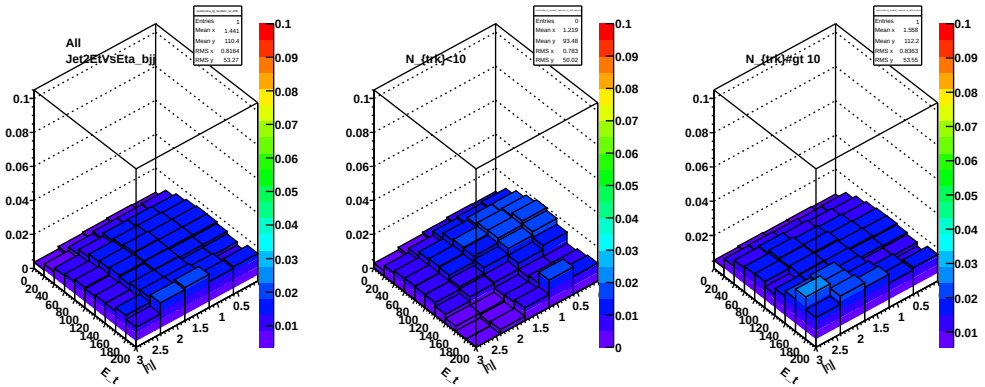


ϵ_b, ϵ_q, f_b for bjj vs $|\eta|$, E_t vs N_{trk}



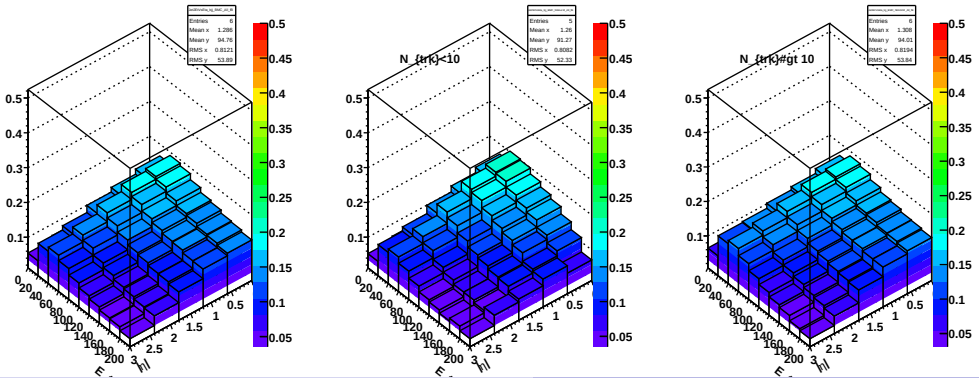
Left to Right:

ϵ_B All, $N_{trk} < 10$, $N_{Trk} \geq 10$



Left to Right:

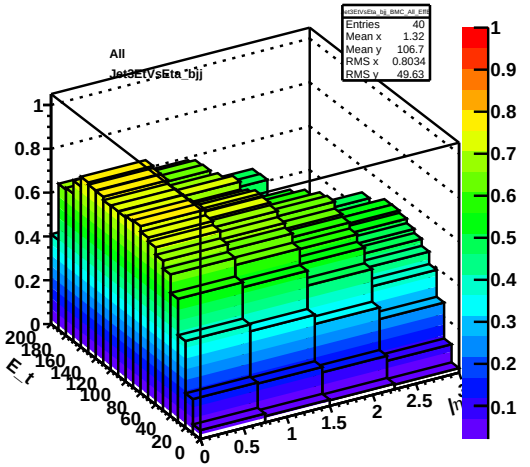
ϵ_Q All, $N_{trk} < 10$, $N_{Trk} \geq 10$

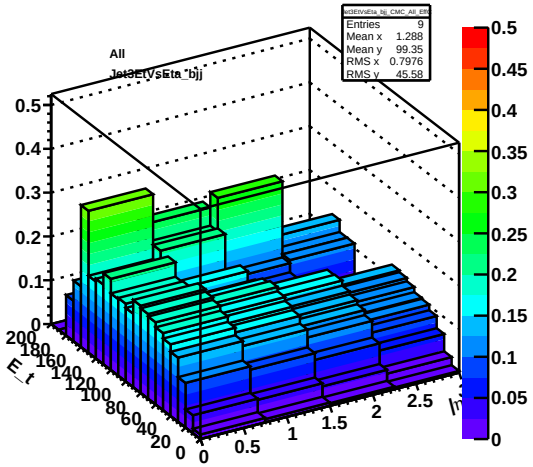


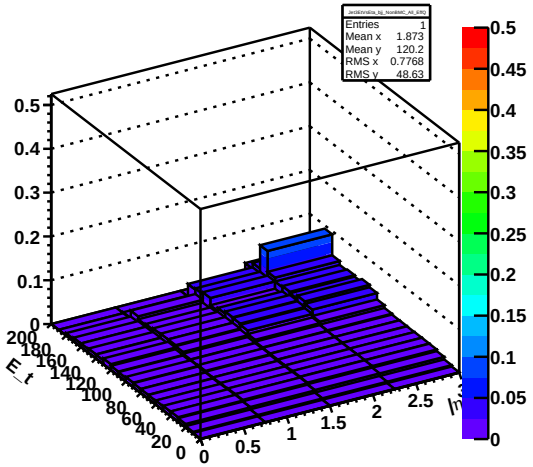
Left to Right:

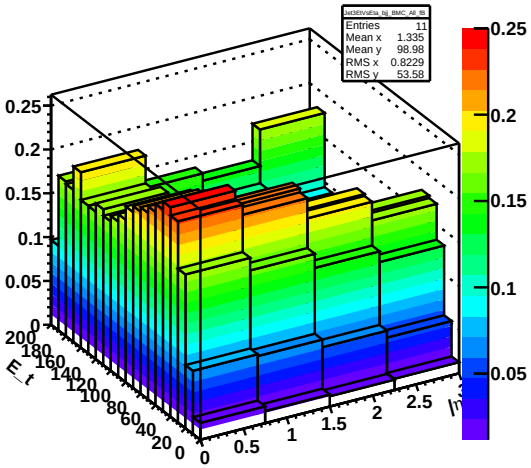
F_B All, $N_{trk} < 10$, $N_{Trk} \geq 10$

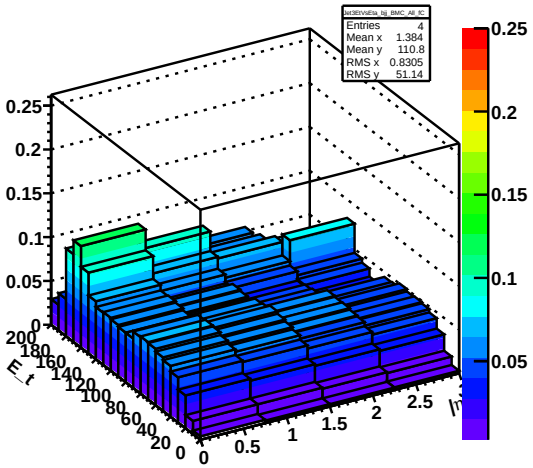
ϵ_b, ϵ_c, ϵ_l, $f_{b,c,l}$ for bjj vs $|\eta|, E_t$

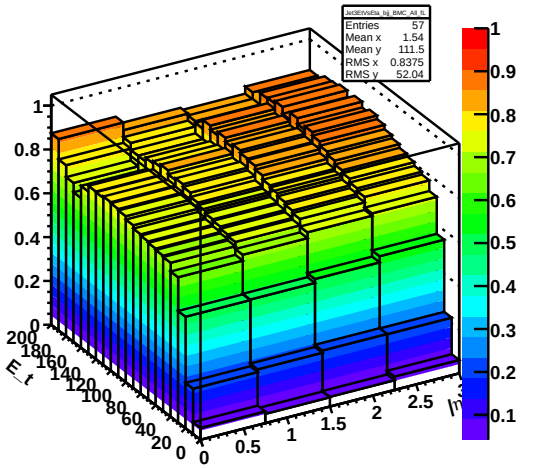




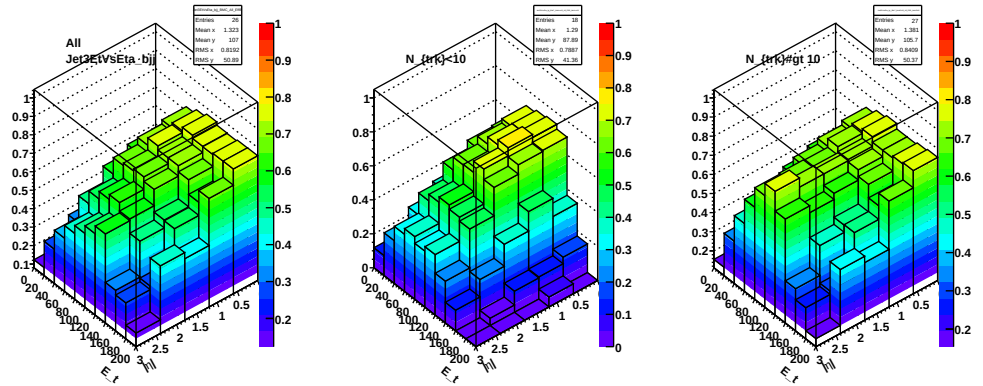






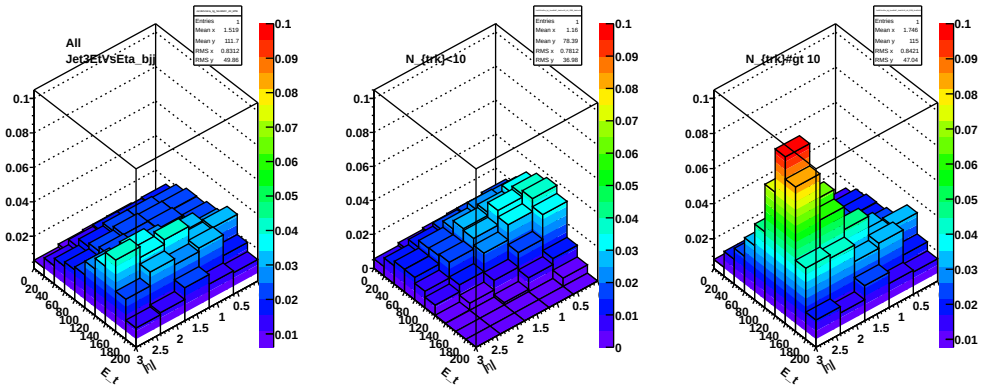


ϵ_b, ϵ_q, f_b for bjj vs $|\eta|$, E_t vs N_{trk}



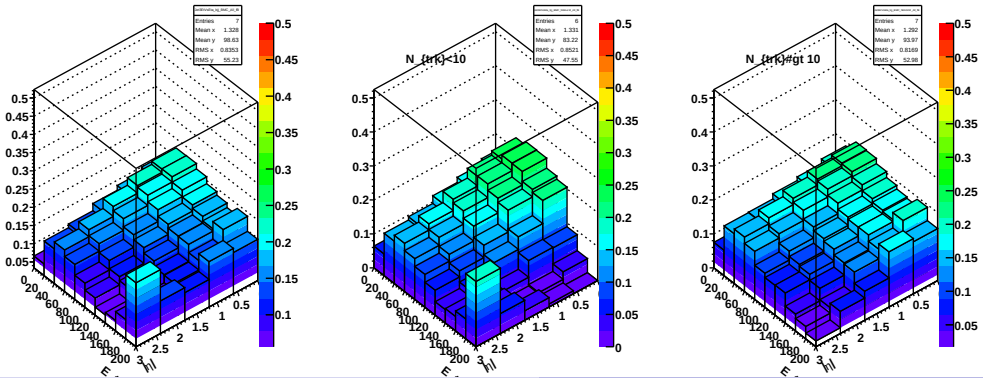
Left to Right:

ϵ_B All, $N_{trk} < 10$, $N_{Trk} \geq 10$



Left to Right:

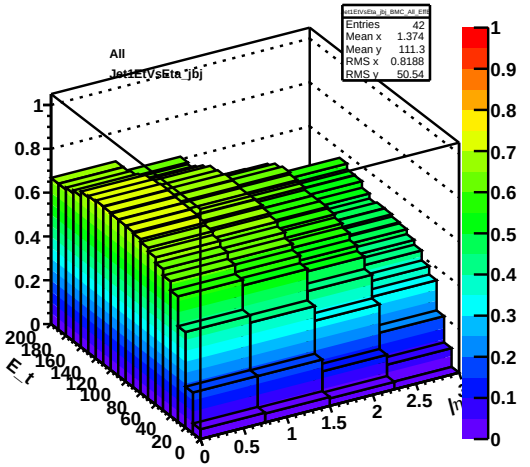
ϵ_Q All, $N_{trk} < 10$, $N_{Trk} \geq 10$

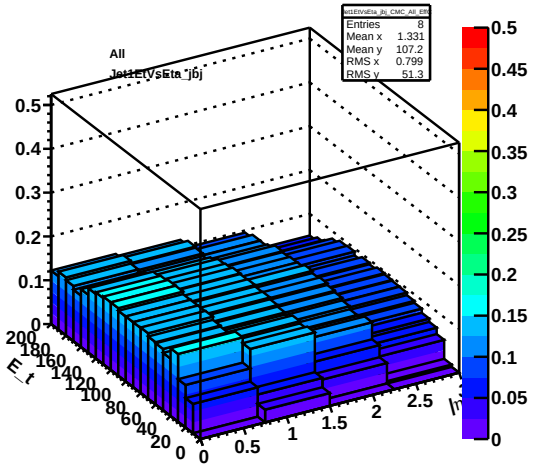


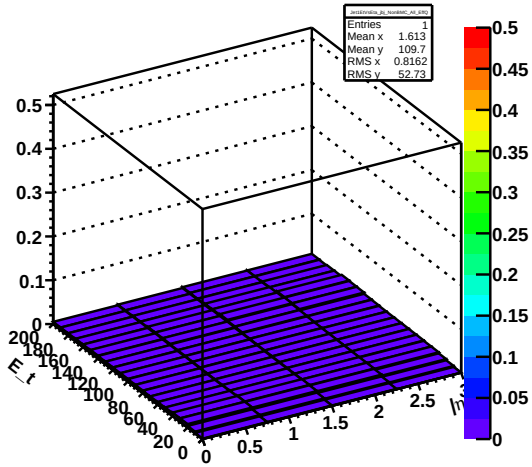
Left to Right:

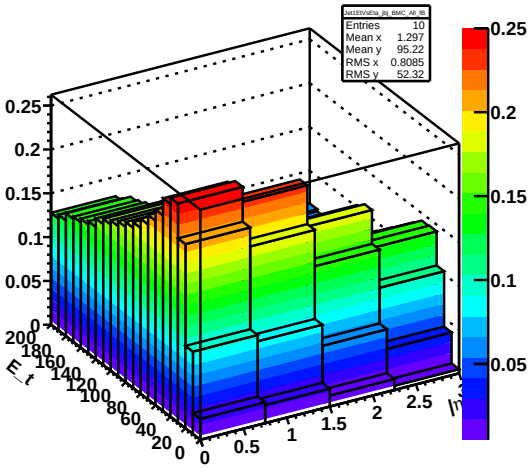
F_B All, $N_{trk} < 10$, $N_{Trk} \geq 10$

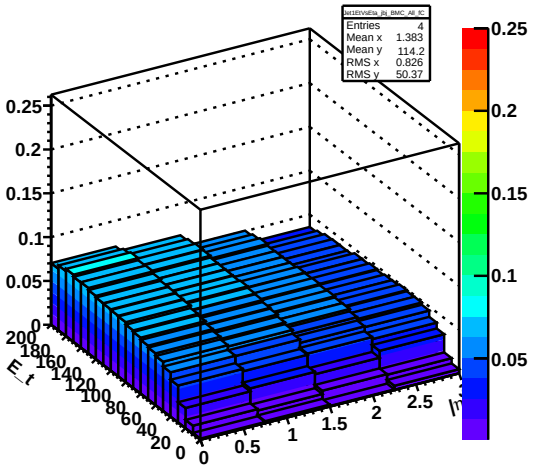
ϵ_b, ϵ_c, ϵ_l, $f_{b,c,l}$ for jbj vs $|\eta|, E_t$

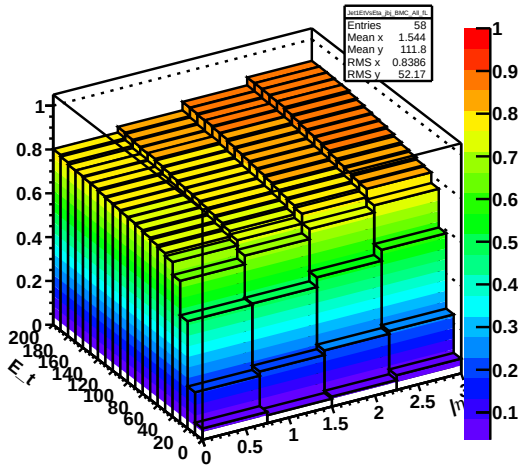




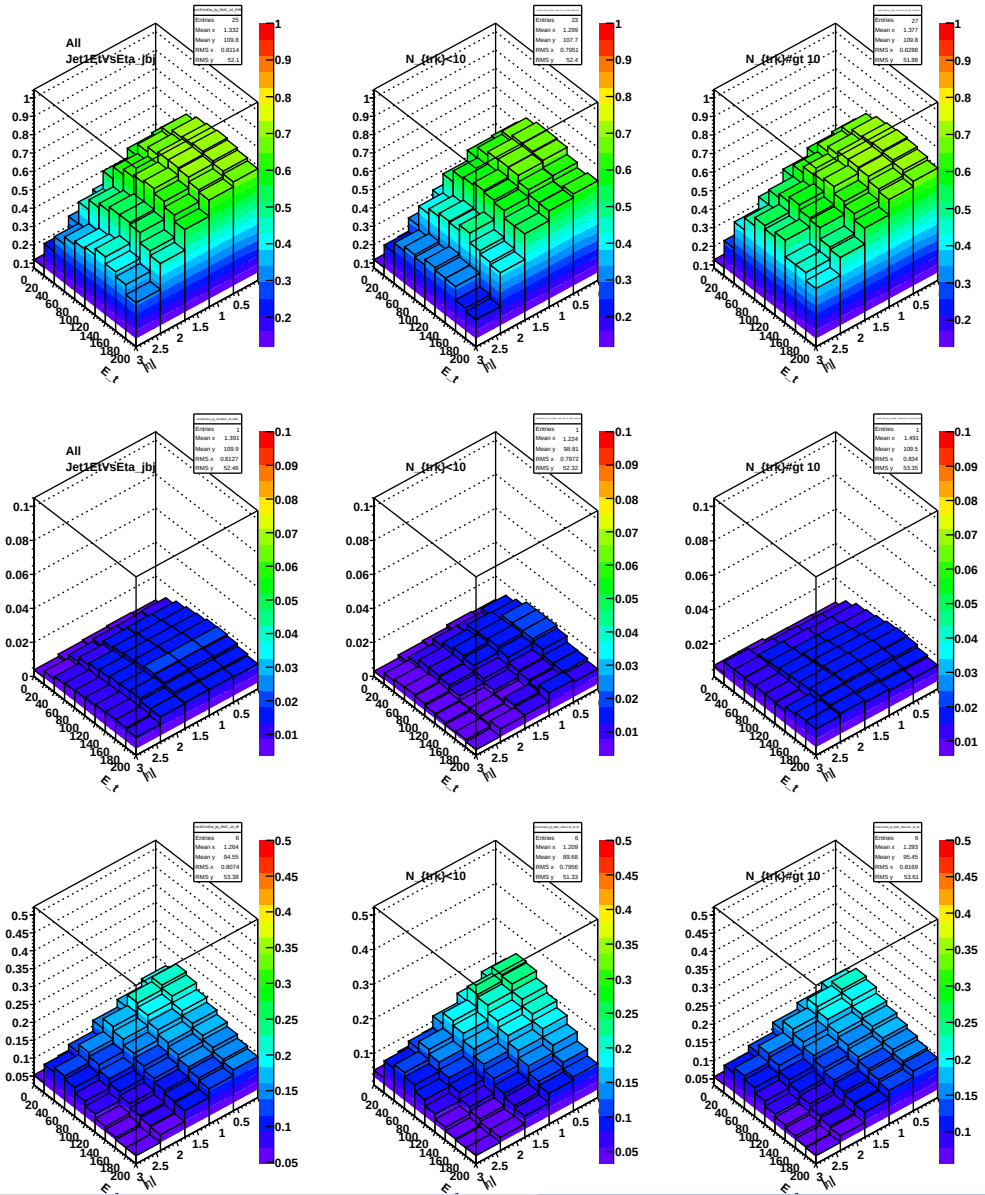








ϵ_b, ϵ_q, f_b for jbj vs $|\eta|$, E_t vs N_{trk}



Left to Right:

ϵ_B All, $N_{trk} < 10$, $N_{Trk} \geq 10$

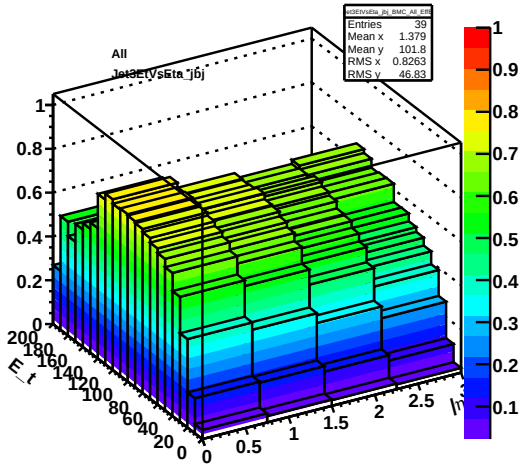
Left to Right:

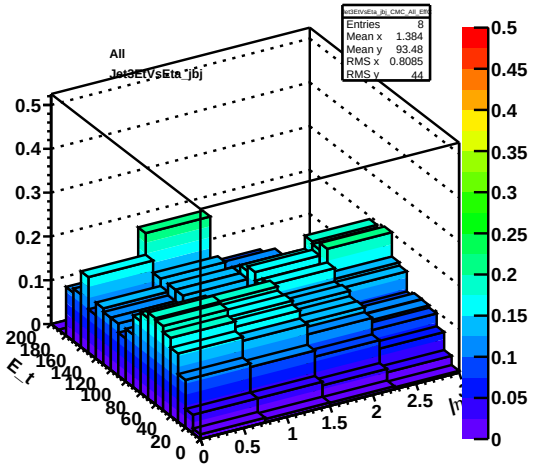
ϵ_Q All, $N_{trk} < 10$, $N_{Trk} \geq 10$

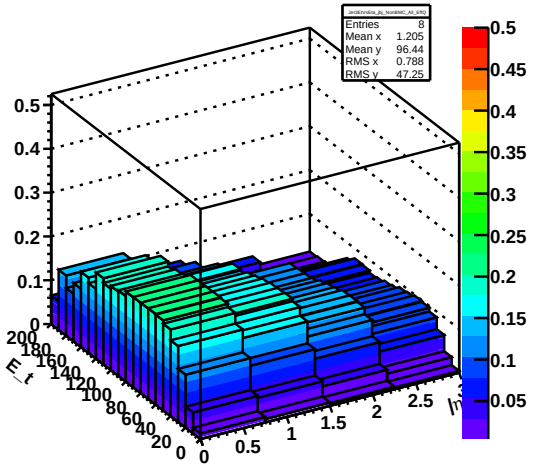
Left to Right:

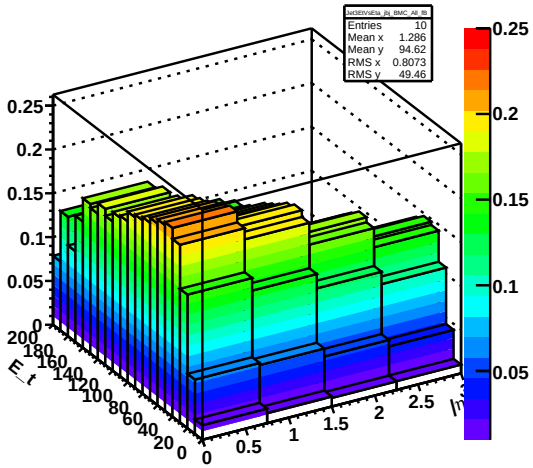
F_B All, $N_{trk} < 10$, $N_{Trk} \geq 10$

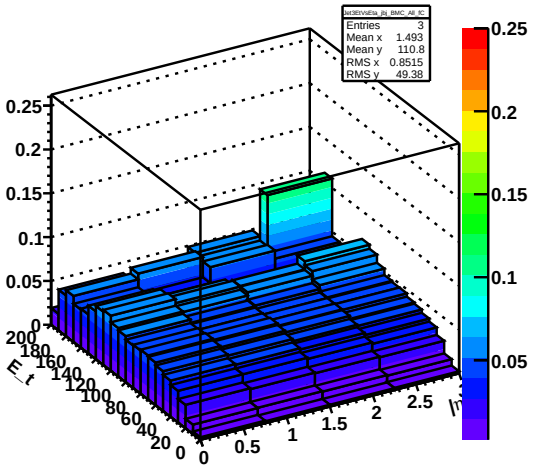
ϵ_b, ϵ_c, ϵ_l, $f_{b,c,l}$ for *jbj* vs $|\eta|$, E_t

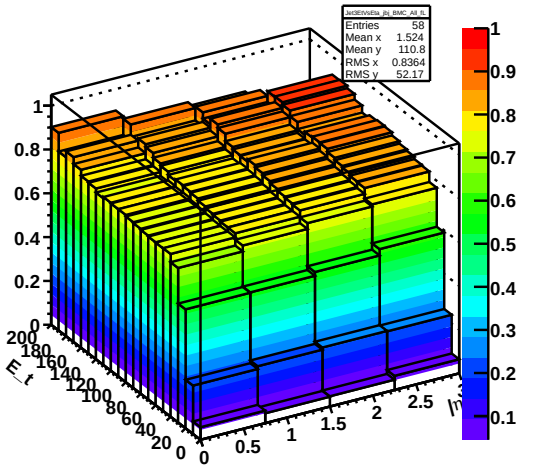




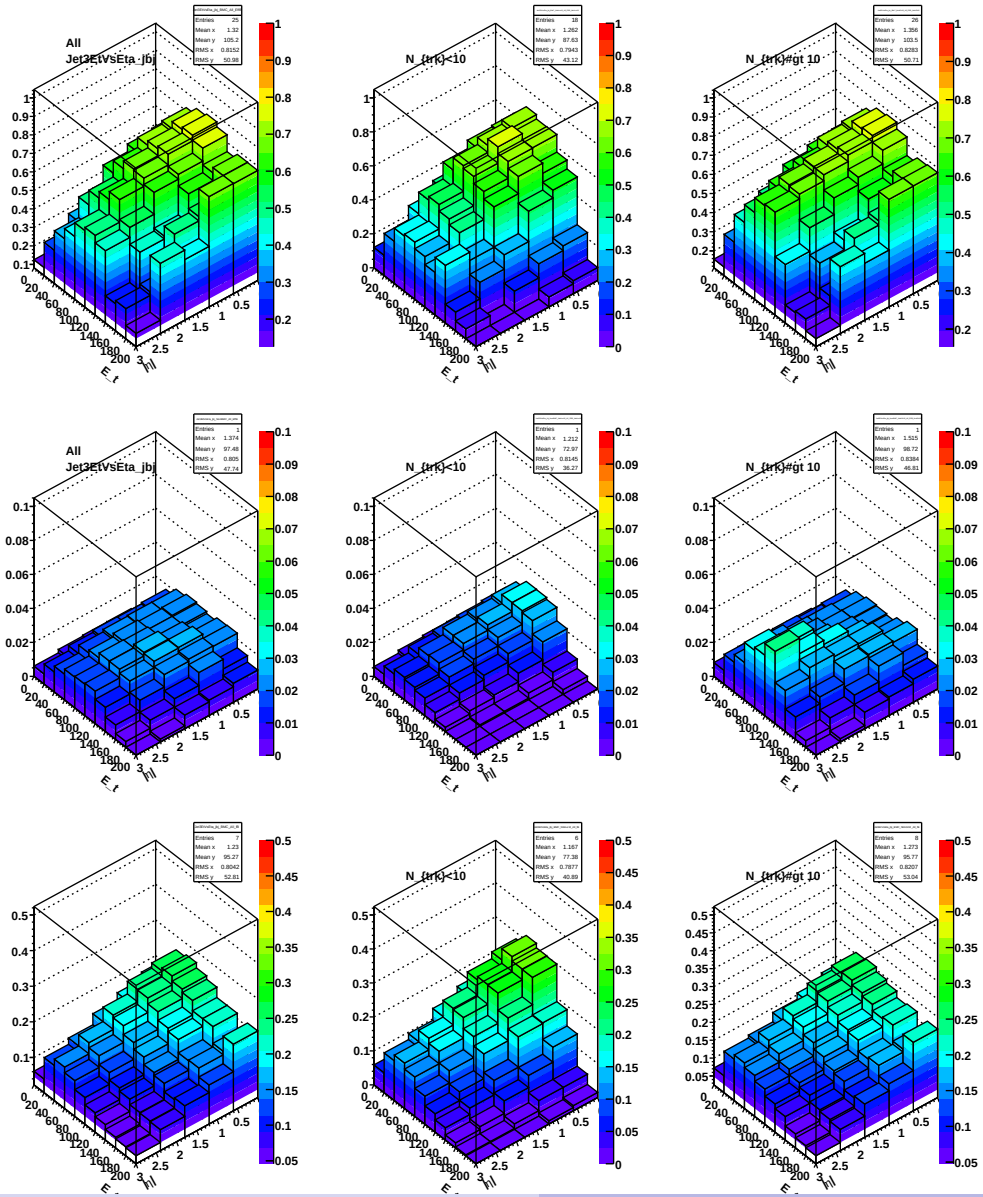








ϵ_b, ϵ_q, f_b for *jbj* vs $|\eta|$, E_t vs N_{trk}



Left to Right:

ϵ_B All, $N_{trk} < 10$, $N_{Trk} \geq 10$

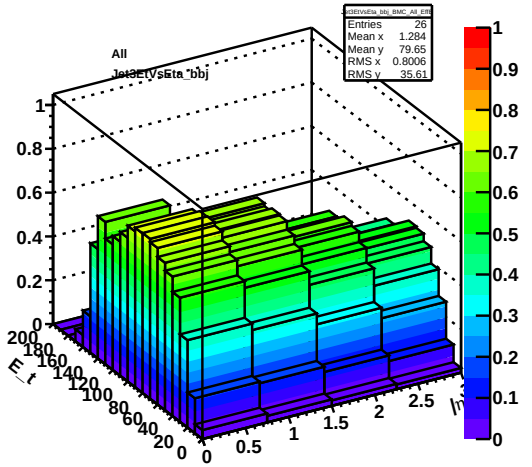
Left to Right:

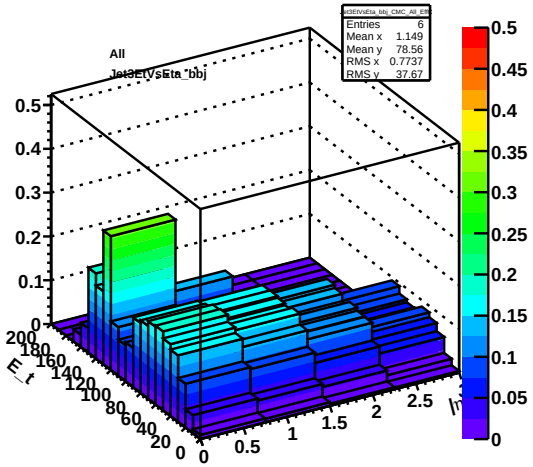
ϵ_Q All, $N_{trk} < 10$, $N_{Trk} \geq 10$

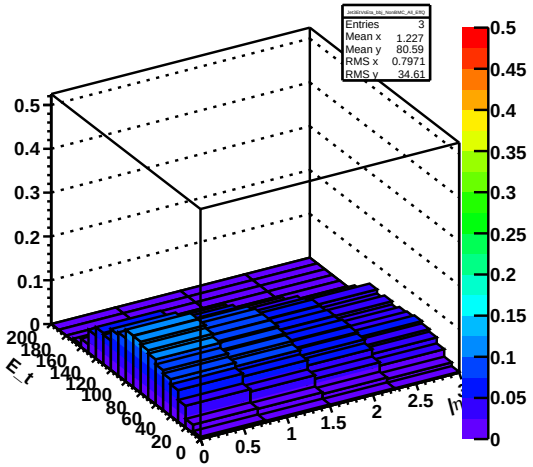
Left to Right:

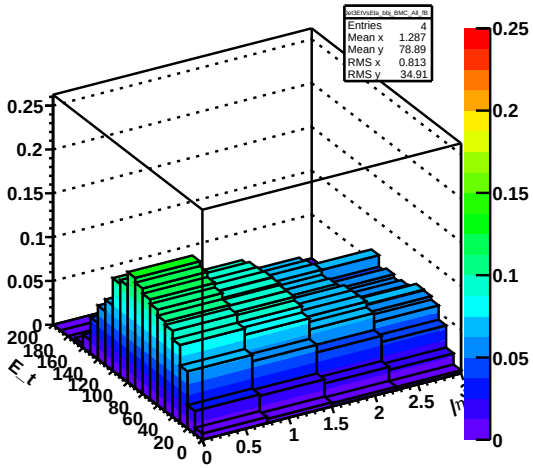
F_B All, $N_{trk} < 10$, $N_{Trk} \geq 10$

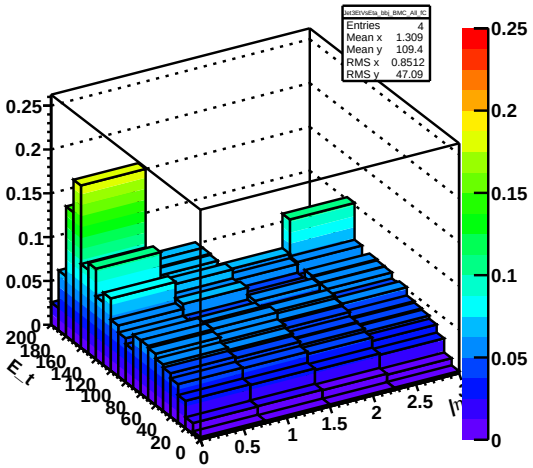
ϵ_b, ϵ_c, ϵ_l, $f_{b,c,l}$ for *bbj* vs $|\eta|$, E_t

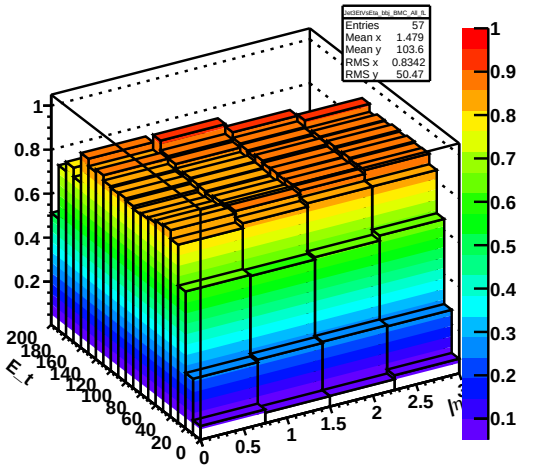




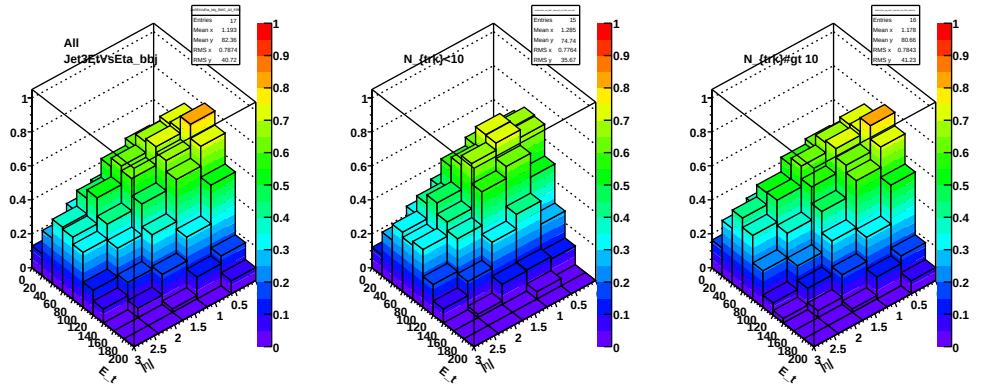






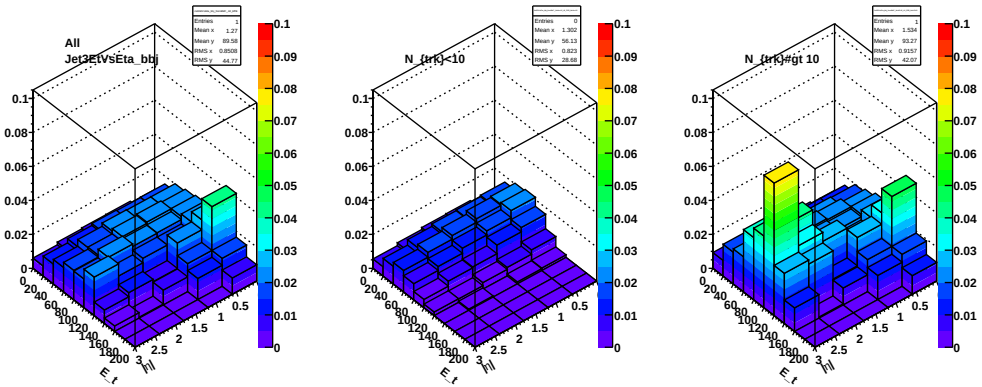


ϵ_b, ϵ_q, f_b for bbj vs $|\eta|$, E_t vs N_{trk}



Left to Right:

ϵ_B All, $N_{trk} < 10$, $N_{Trk} \geq 10$



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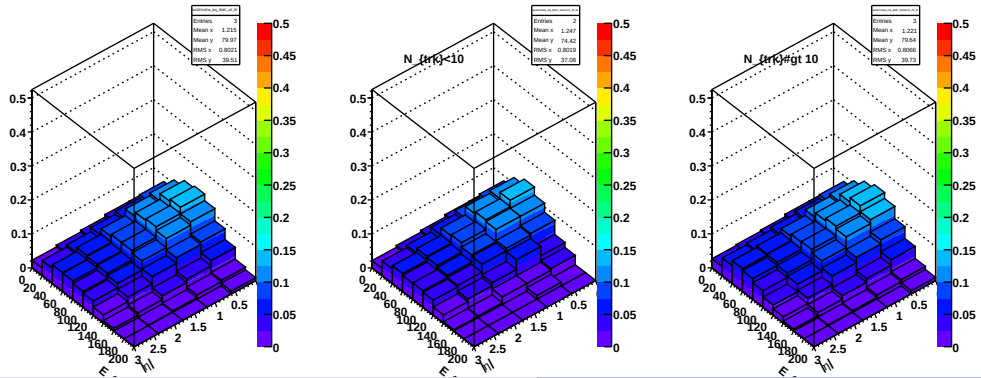
ϵ_Q All, $N_{trk} < 10$, $N_{Trk} \geq 10$



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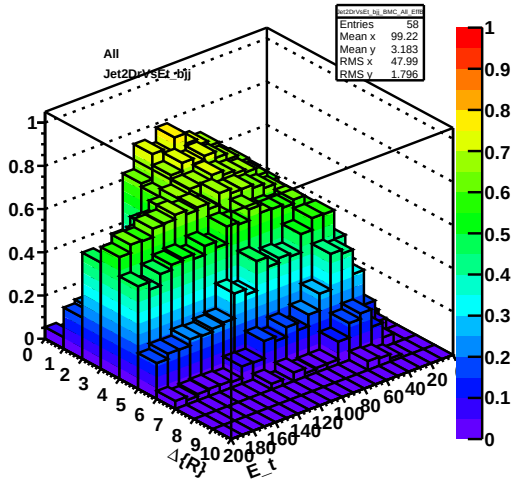
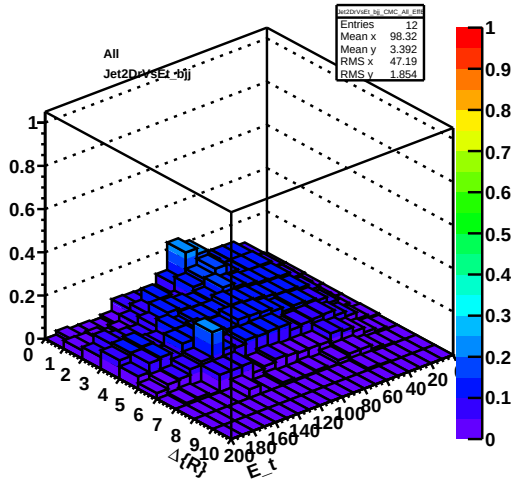
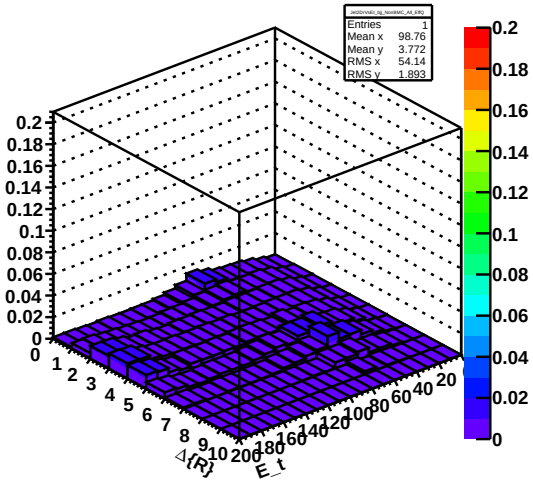
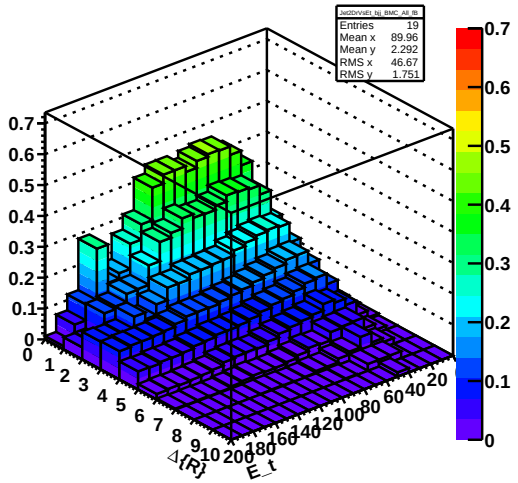
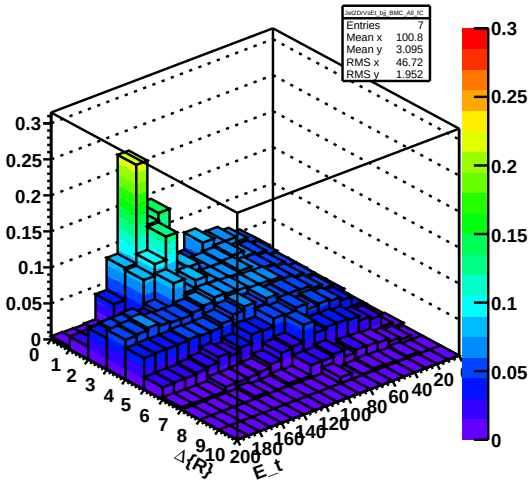
ϵ_b, ϵ_c, ϵ_l, $f_{b,c,l}$ for bjj vs $|\eta|, E_t$

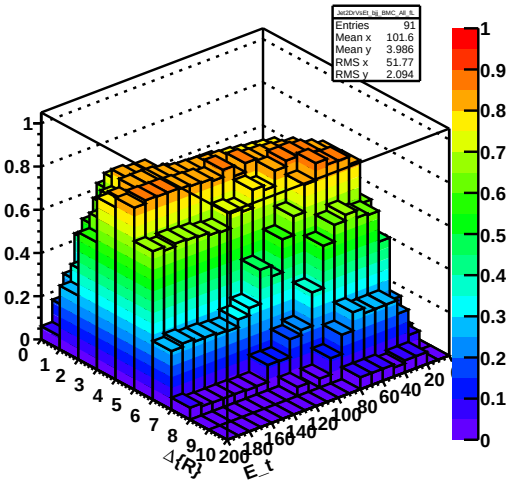




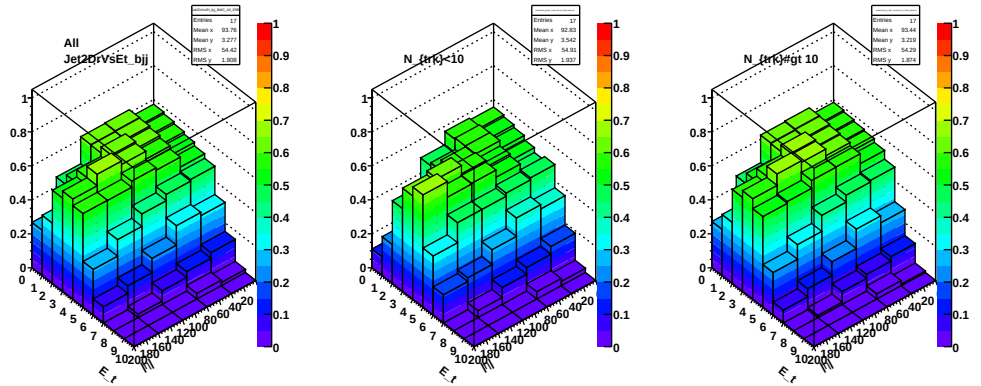








ϵ_b, ϵ_q, f_b for bjj vs $E_t, \Delta R$



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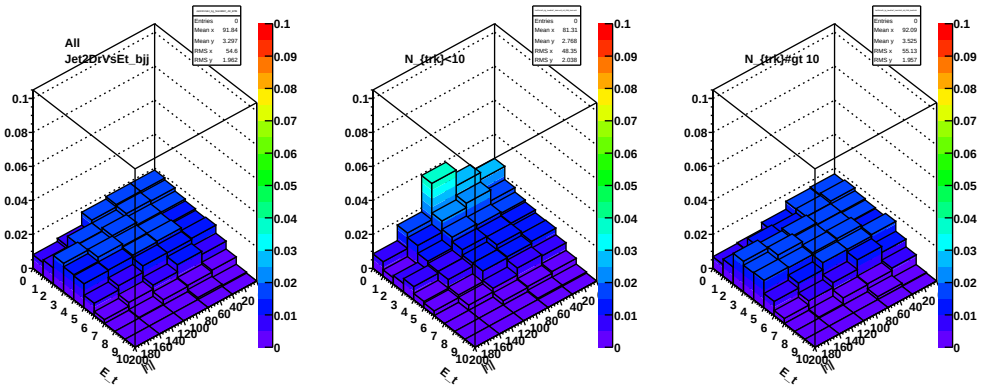

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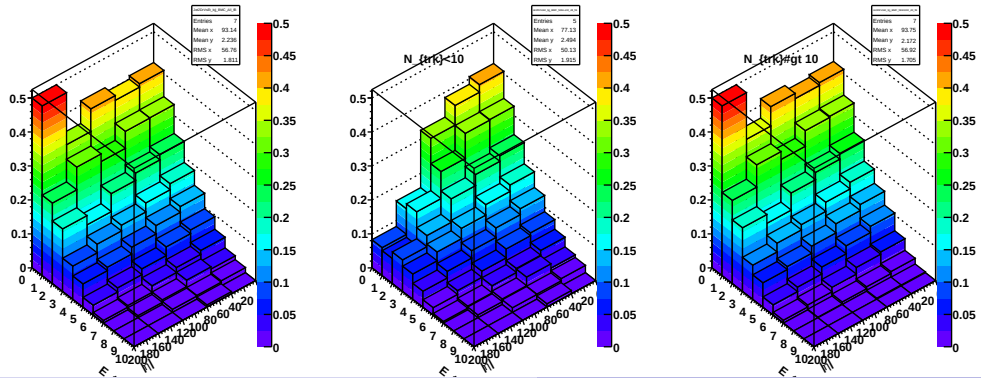
ϵ_Q All, $N_{trk} < 10$, $N_{Trk} \geq 10$



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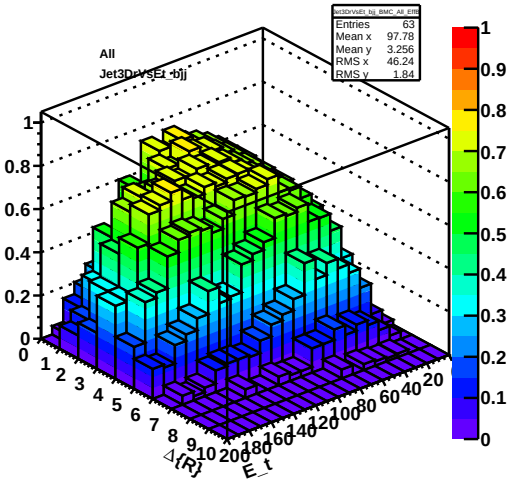
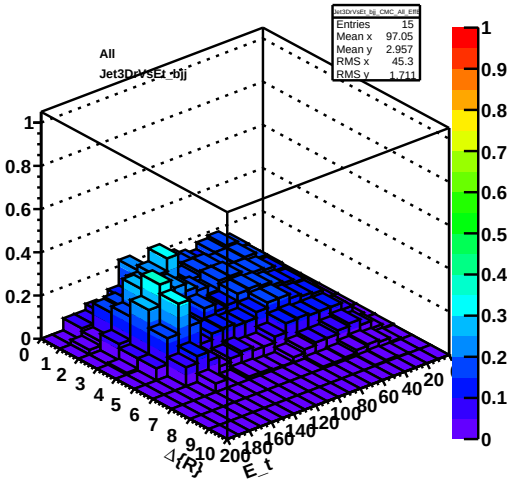
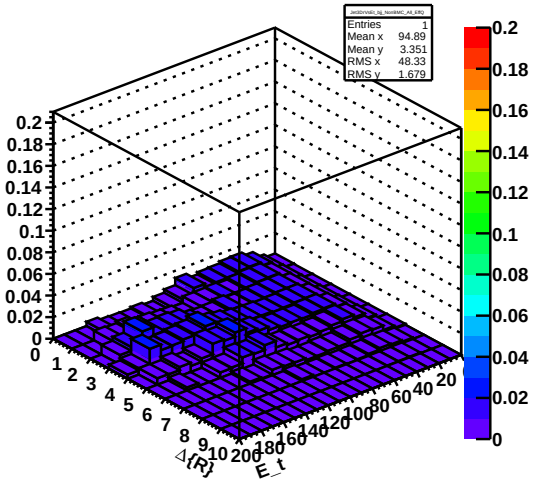
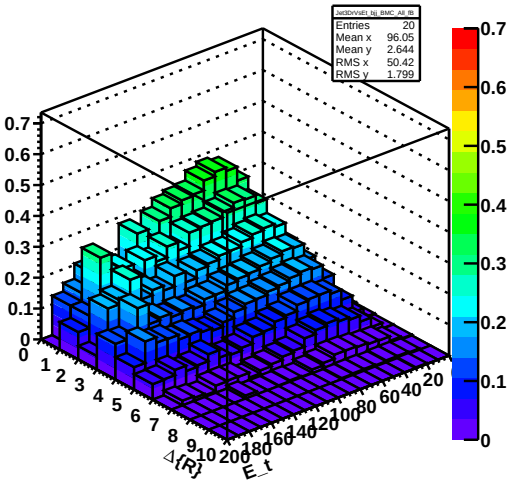
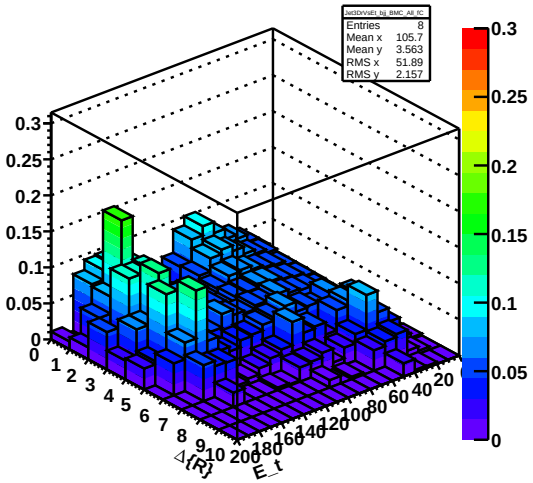
ϵ_b, ϵ_c, ϵ_l, $f_{b,c,l}$ for bjj vs $|\eta|, E_t$

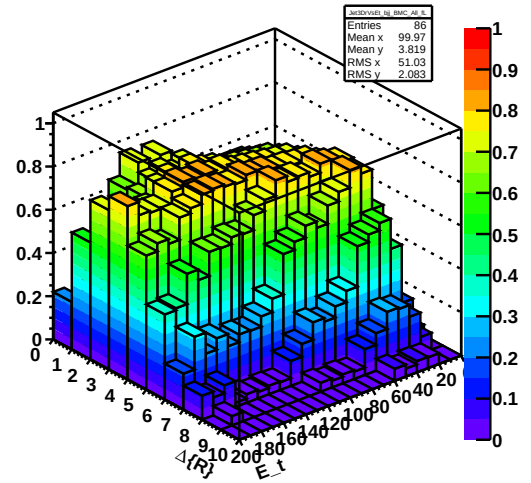




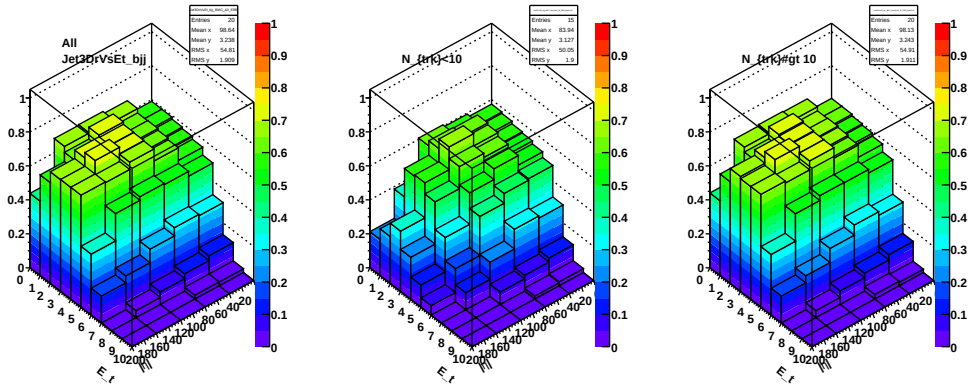






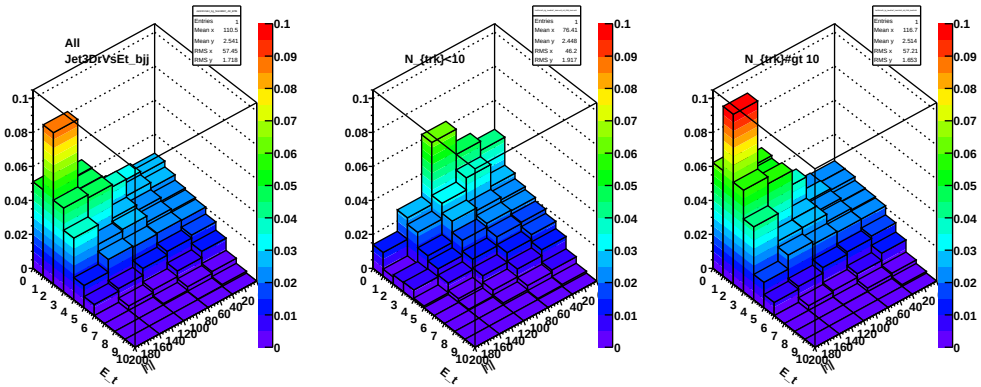


ϵ_b, ϵ_q, f_b for bjj vs $E_t, \Delta R$



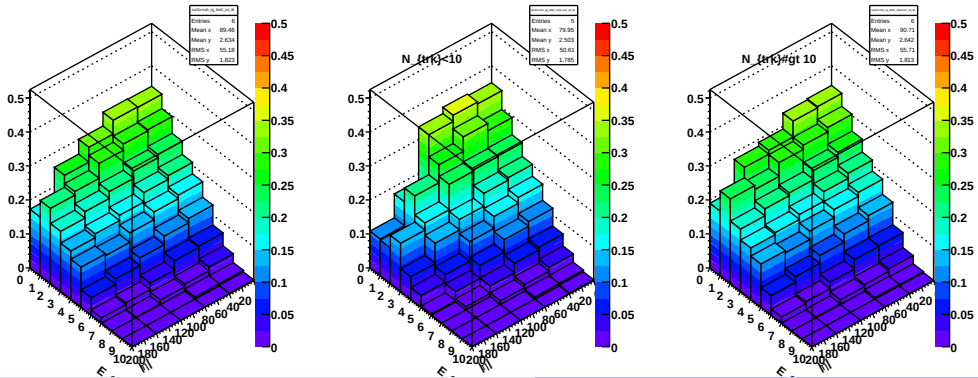
Left to Right:

ϵ_B All, $N_{trk} < 10$, $N_{Trk} \geq 10$



Left to Right:

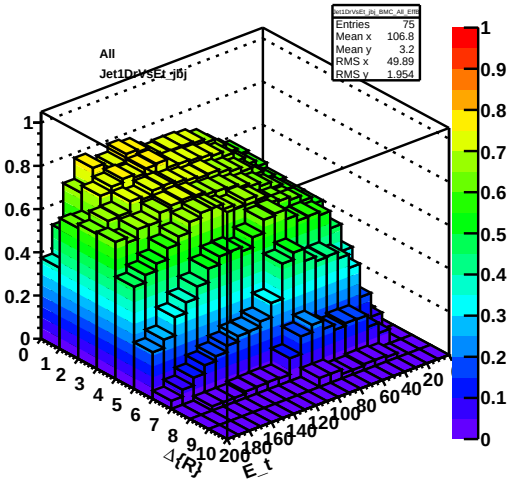
ϵ_Q All, $N_{trk} < 10$, $N_{Trk} \geq 10$

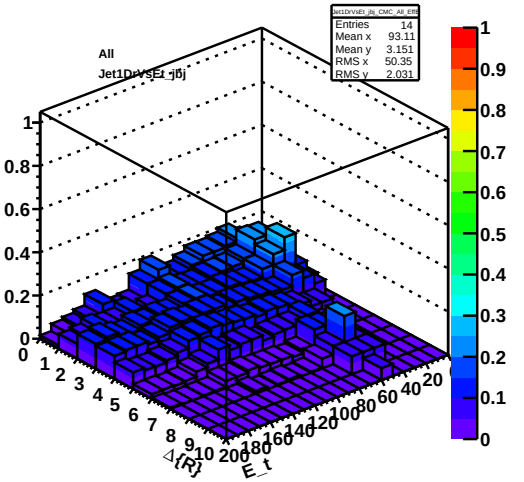


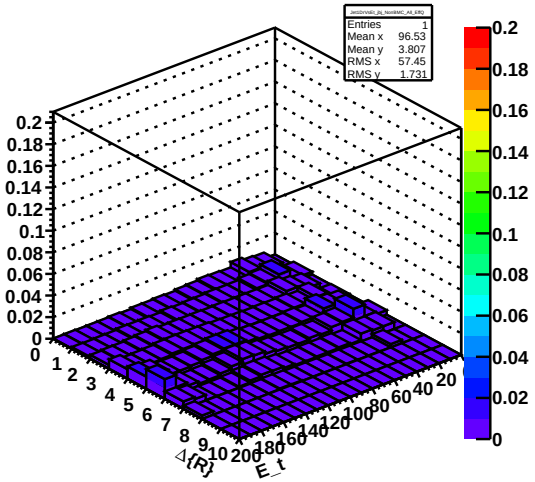
Left to Right:

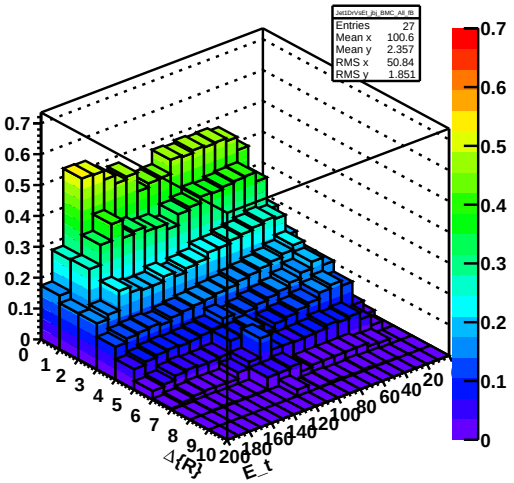
F_B All, $N_{trk} < 10$, $N_{Trk} \geq 10$

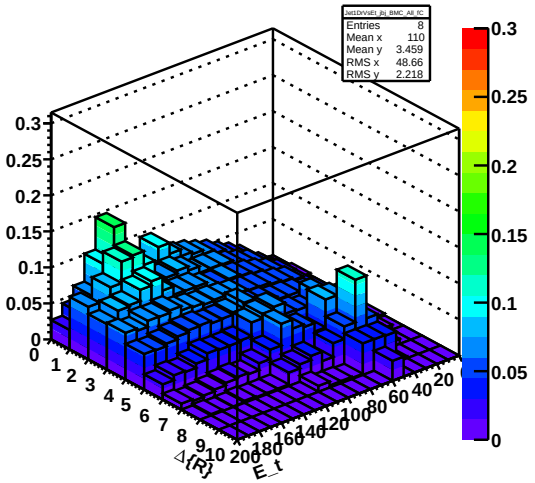
ϵ_b, ϵ_c, ϵ_l, $f_{b,c,l}$ for jbj vs $|\eta|, E_t$

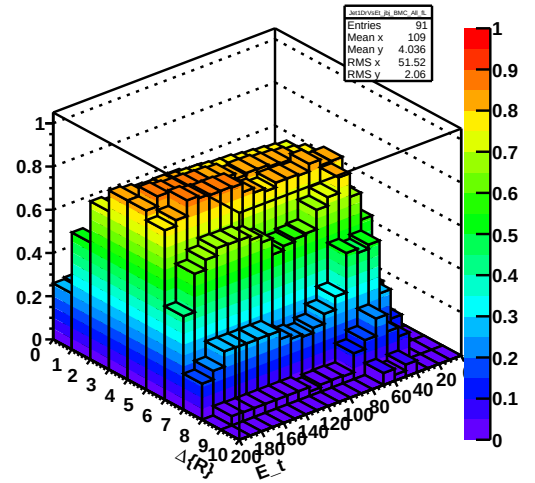




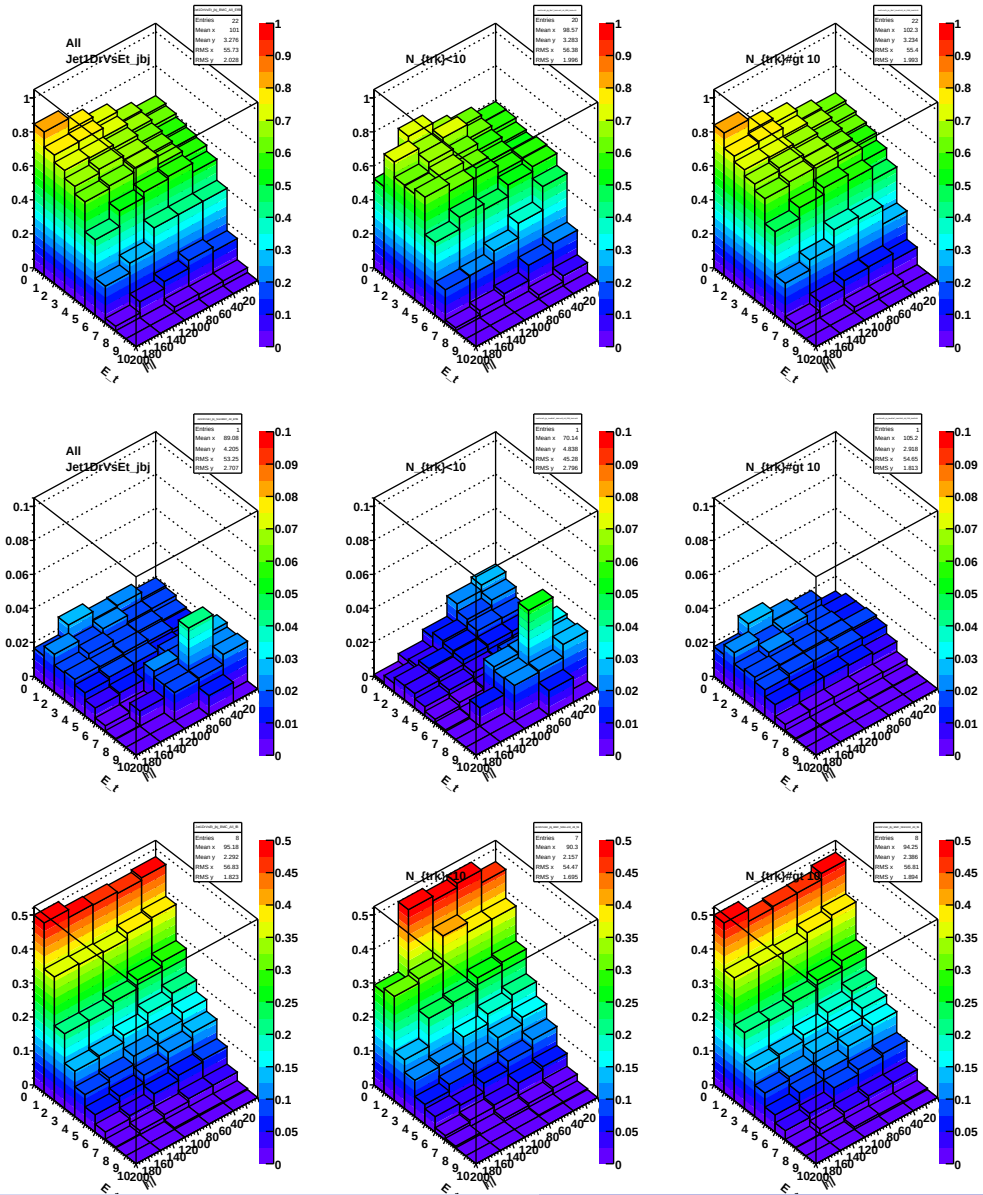








ϵ_b, ϵ_q, f_b for jbj vs $E_t, \Delta R$



Left to Right:

ϵ_B All, $N_{trk} < 10$, $N_{Trk} \geq 10$

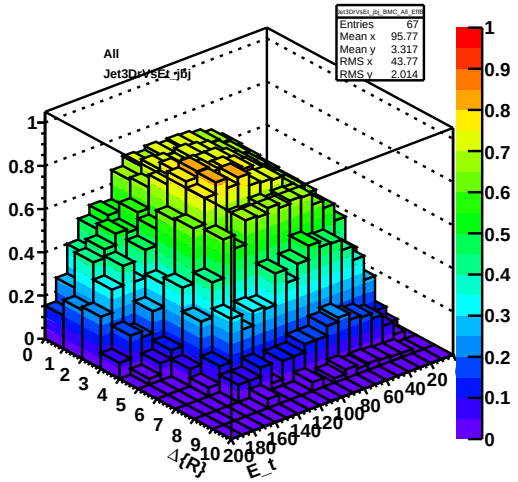
Left to Right:

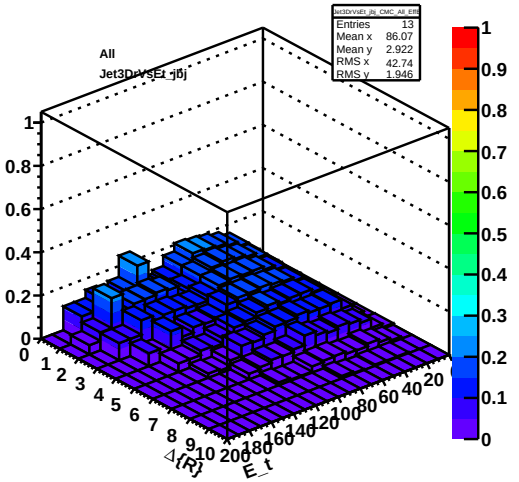
ϵ_Q All, $N_{trk} < 10$, $N_{Trk} \geq 10$

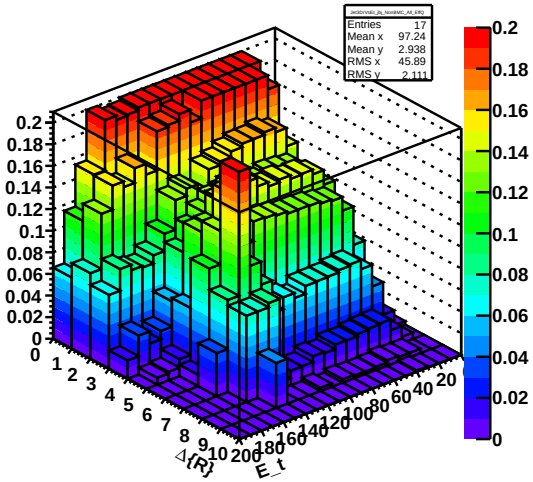
Left to Right:

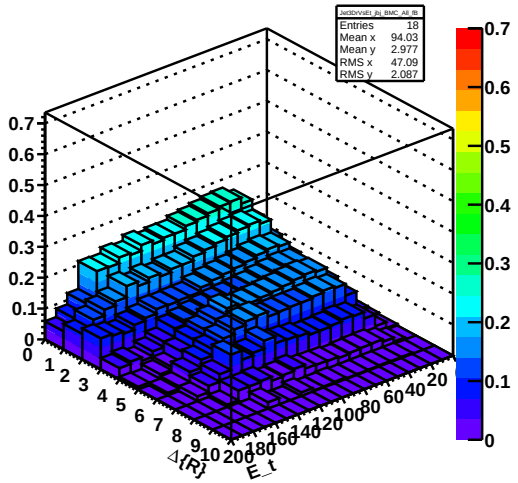
F_B All, $N_{trk} < 10$, $N_{Trk} \geq 10$

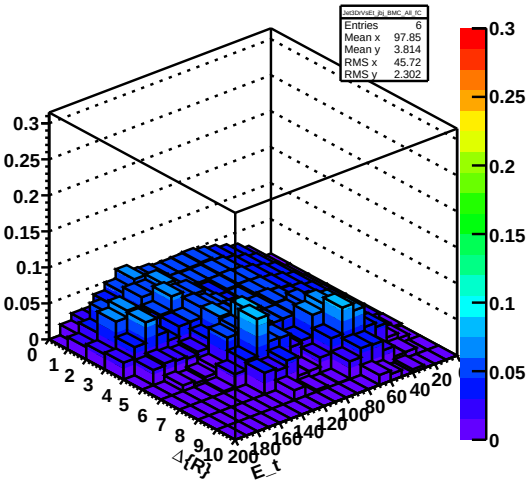
ϵ_b, ϵ_c, ϵ_l, $f_{b,c,l}$ for *jbj* vs $|\eta|$, E_t

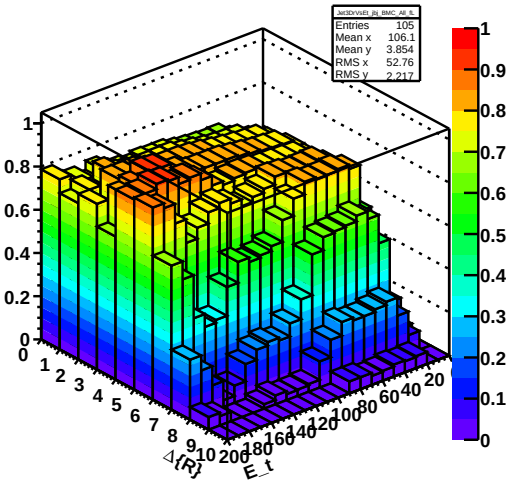




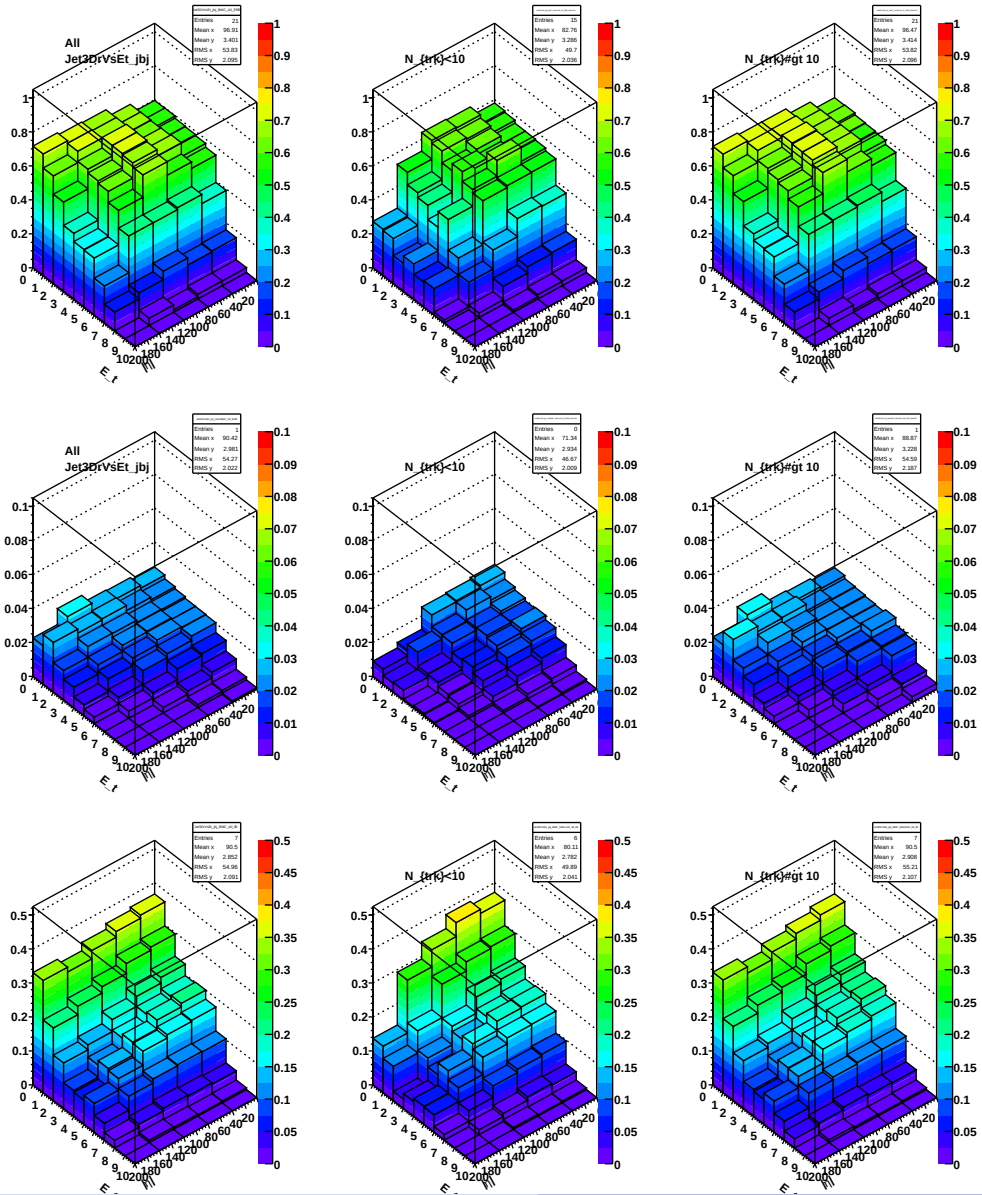








ϵ_b, ϵ_q, f_b for *jbj* vs $E_t, \Delta R$



Left to Right:

ϵ_B All, $N_{trk} < 10$, $N_{Trk} \geq 10$

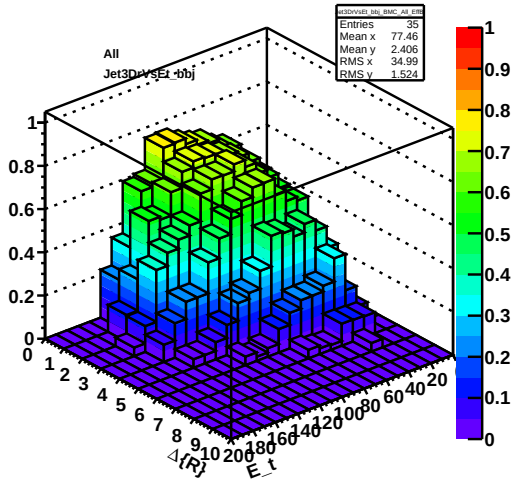
Left to Right:

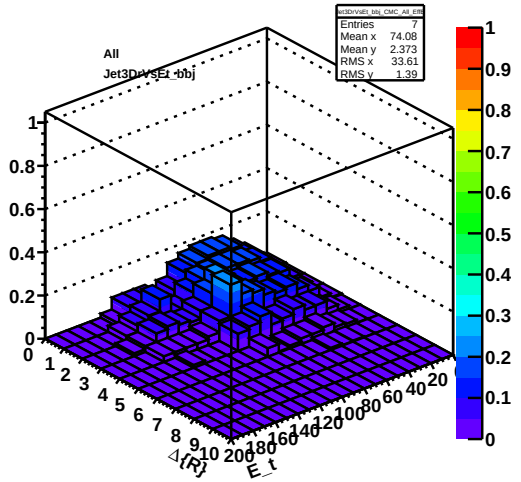
ϵ_Q All, $N_{trk} < 10$, $N_{Trk} \geq 10$

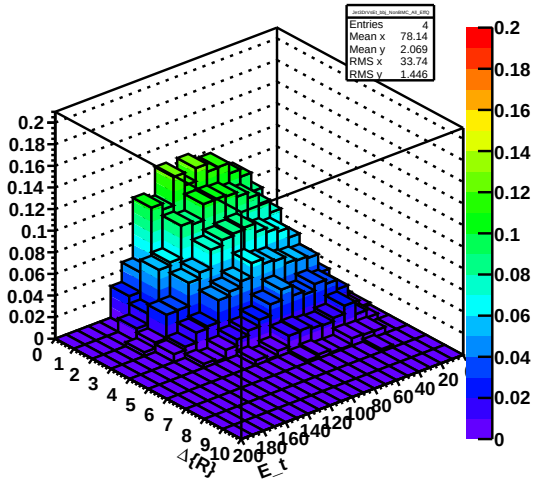
Left to Right:

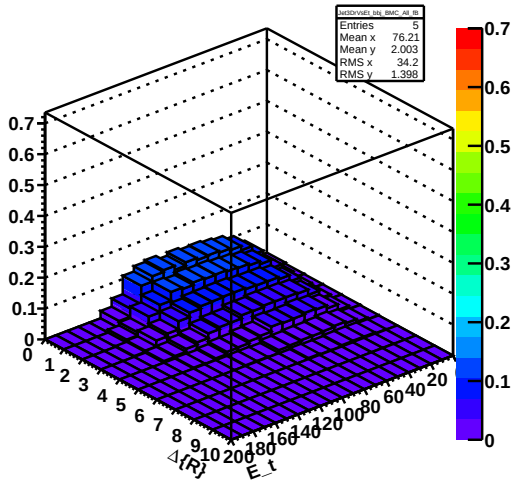
F_B All, $N_{trk} < 10$, $N_{Trk} \geq 10$

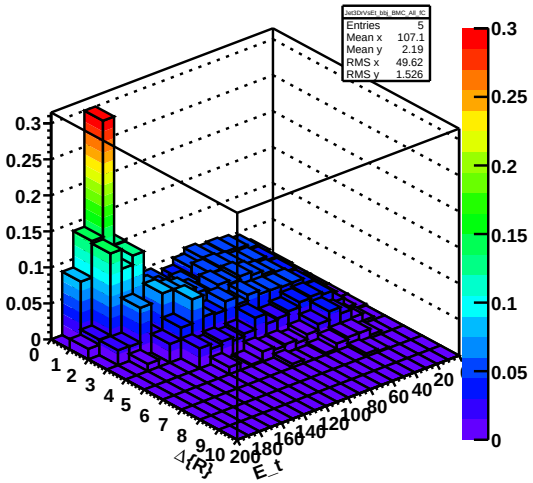
ϵ_b, ϵ_c, ϵ_l, $f_{b,c,l}$ for *bbj* vs $|\eta|$, E_t

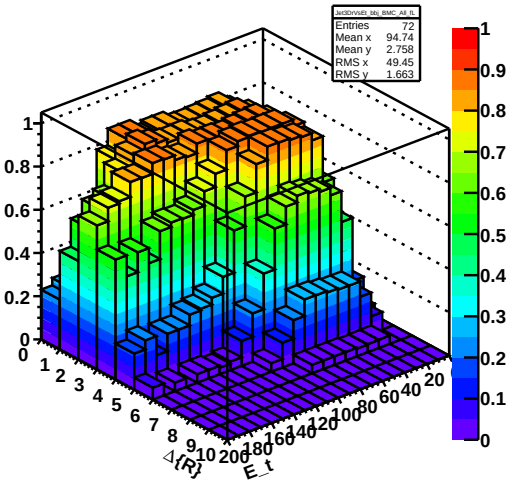




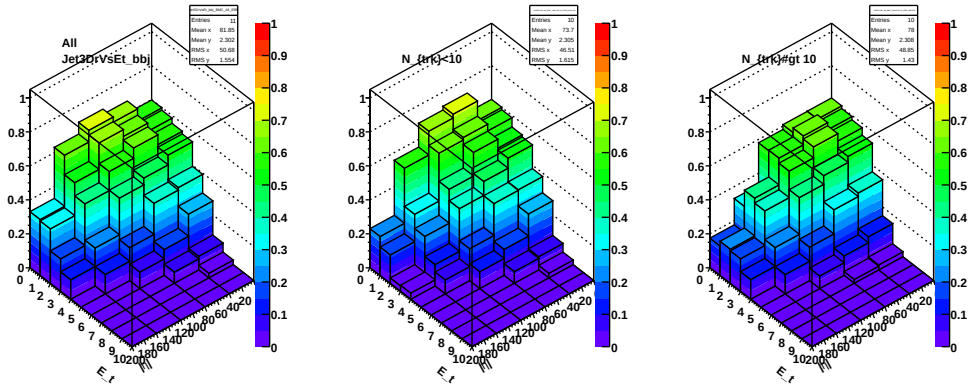






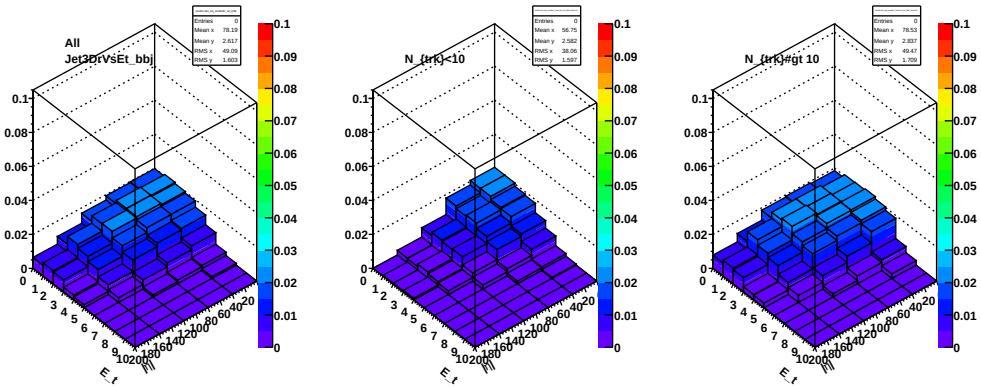


ϵ_b, ϵ_q, f_b for *bbj* vs $E_t, \Delta R$



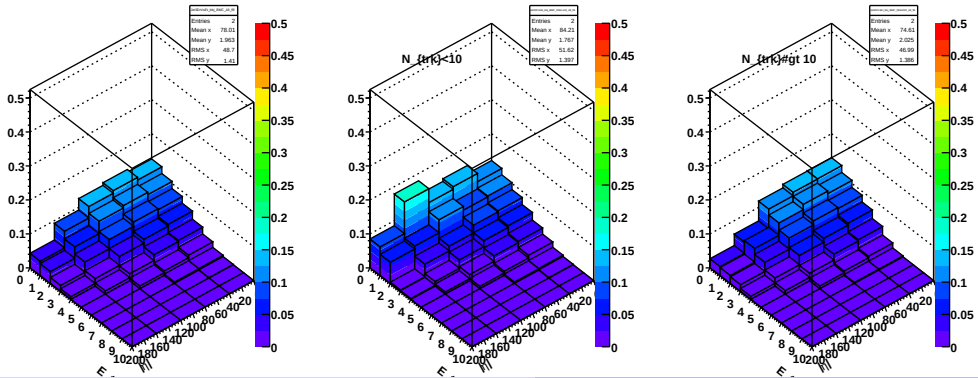
Left to Right:

ϵ_B All, $N_{trk} < 10$, $N_{Trk} \geq 10$



Left to Right:

ϵ_Q All, $N_{trk} < 10$, $N_{Trk} \geq 10$



Left to Right:

F_B All, $N_{trk} < 10$, $N_{Trk} \geq 10$

Check on Top

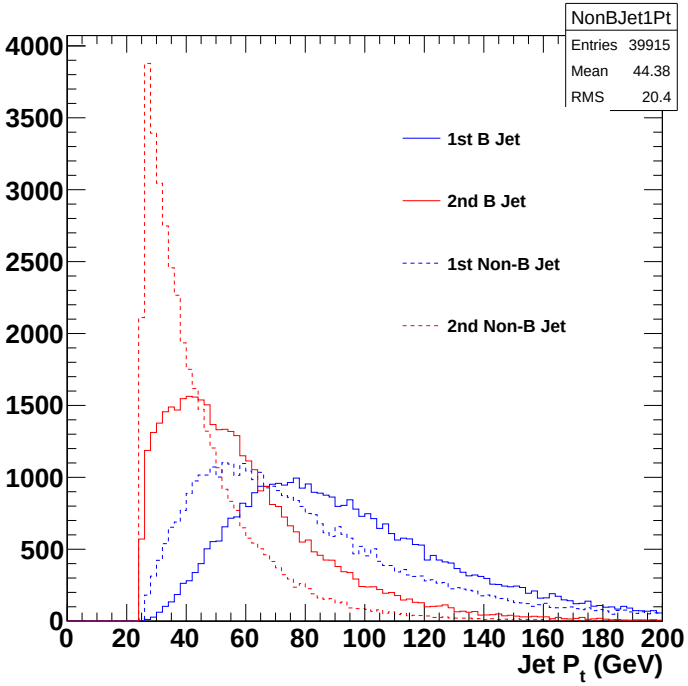
Top Selection

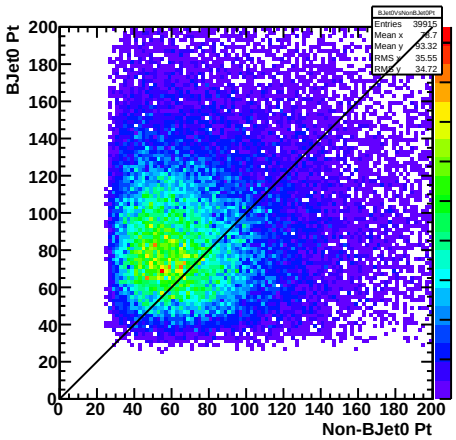
- Good, isolated muon $p_t > 25$ GeV Combined relative Isolation $((\Sigma p_t^{trk} + \Sigma E_t^{em} + \Sigma E_t^{had})/p_t^{\mu} < 0.1)$
- exactly 4 jets $E_t > 25$ and $|\eta| < 2.6$ JetID loose, of which exactly 2 B-jets ($CSV > 0.8$).
  - $W \to jj$ from the two non-b jets
  - $t \to bW \to bjj$ from $W \to jj + b$ (combinatorics not resolved, $\times 2$ candidates)
  - $t \to bW \to b\mu\nu$ from μ and MET.

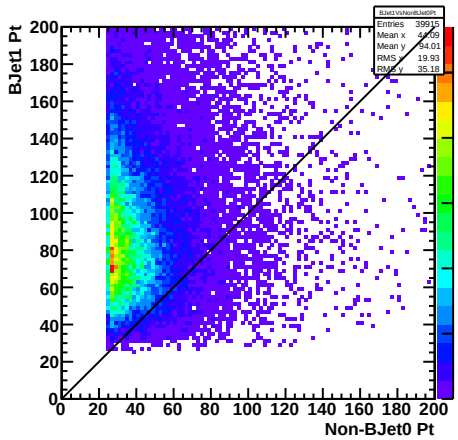
Check on Top

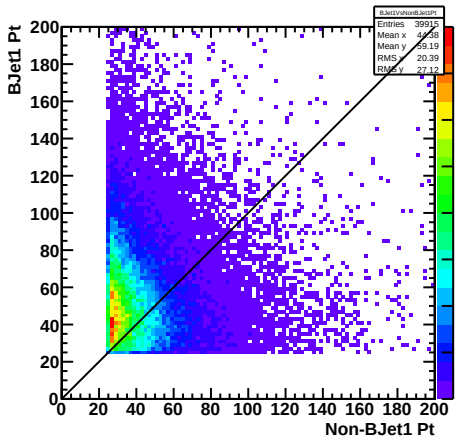
- On $t\bar{t}$ sample (MC), check ϵ_q and ϵ_b on $t \to bW$ candidates:
  - Ask for $2b$ and 2 other jets, build M_{jj} and compare M_{jj} when one j is b-tagged with $M_{jj} \otimes \epsilon_q$: Separately for either jet (and for both).
  - Ask for $1b$, and 3 other jets. If $|M_{jj} - M_W| < 10.$ GeV (for a jj pair) and $|M_{Wj} - M_t| < 20.$ GeV look at other jet (j) p_t, η and $M_{W(jj)j}$ as before (b-tag vs reweight).

P_t of first/second B-jet/Non-B-jet

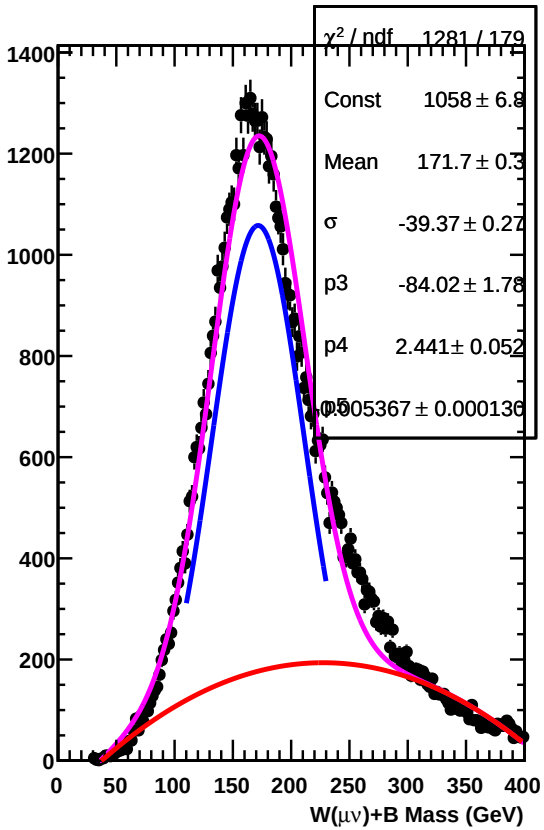


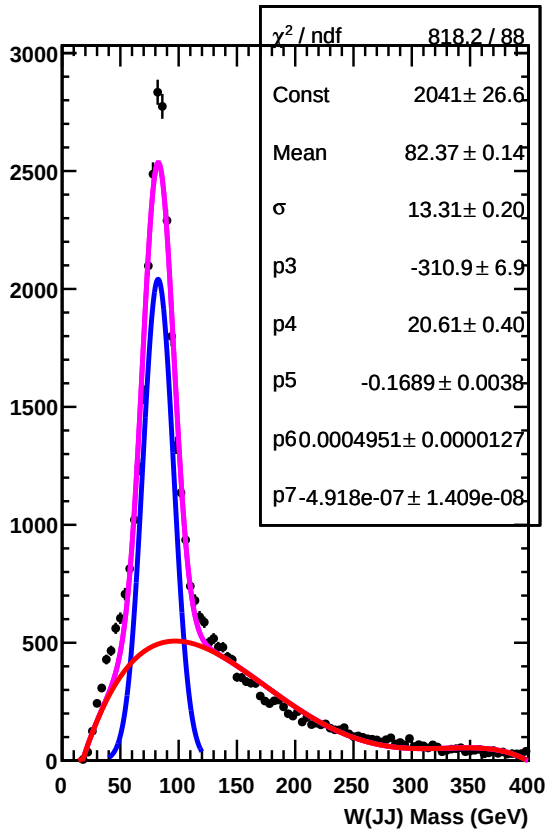


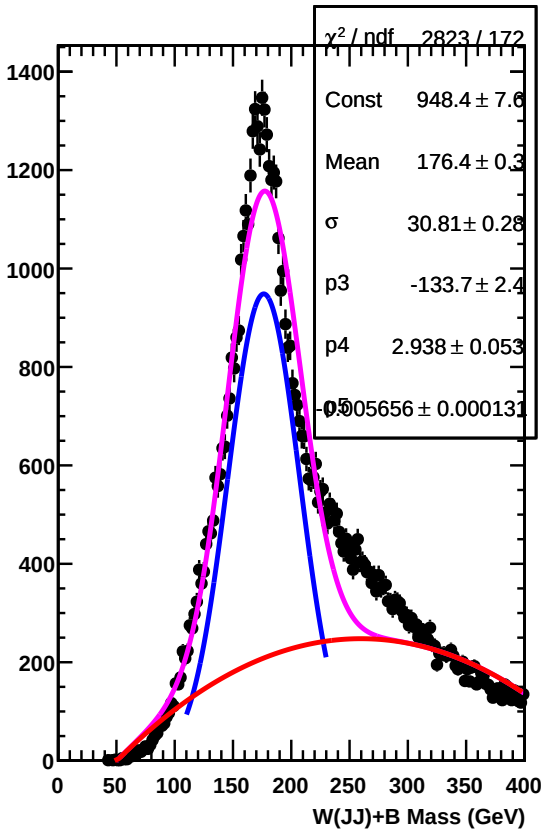




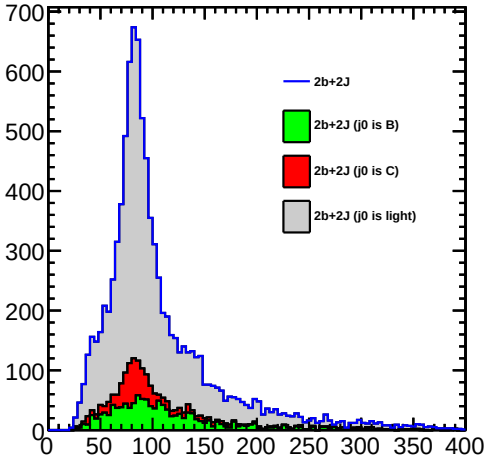
Mass of: $t \to b\mu\nu$, $W \to jj$, $t \to bjj$

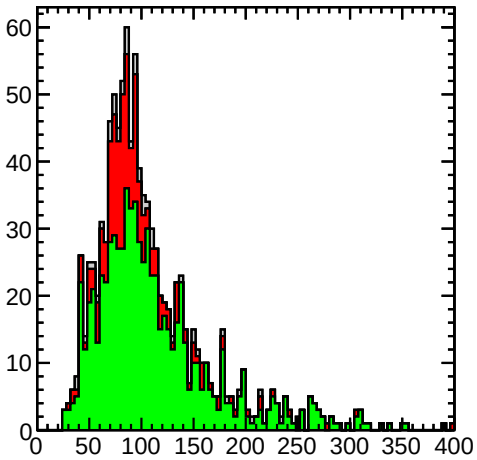


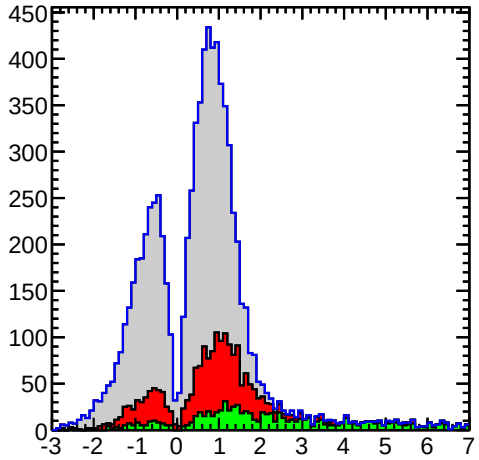


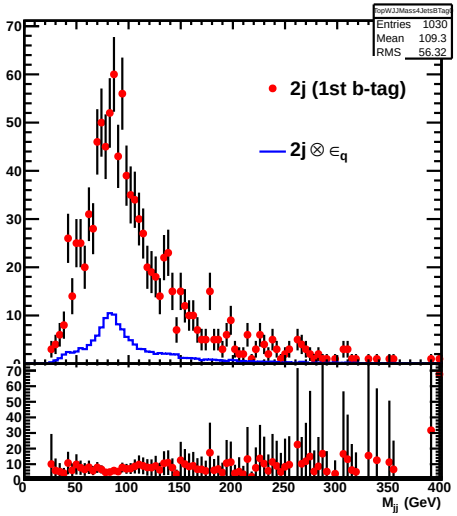


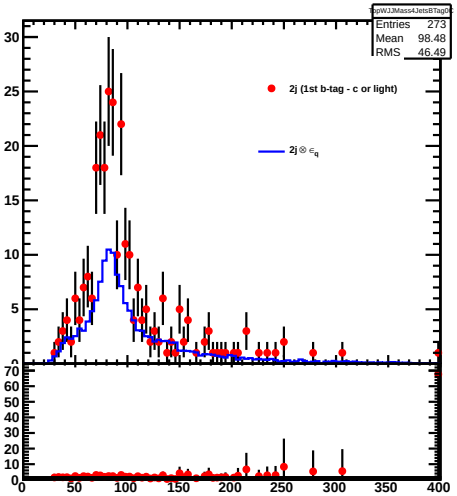
Test of ϵ_q on W first jet

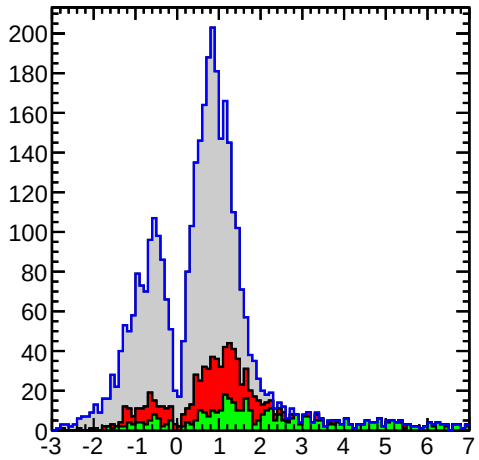




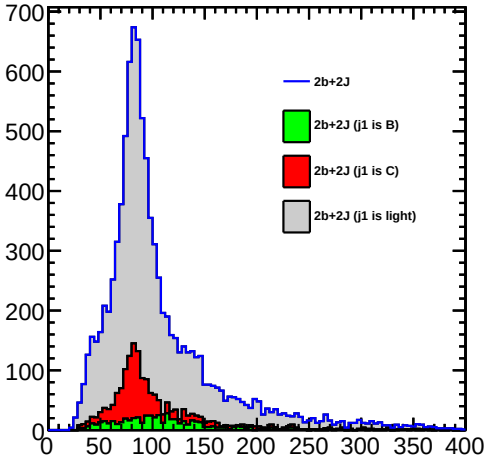


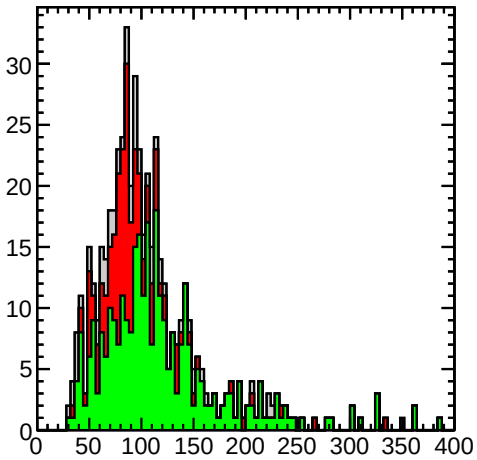


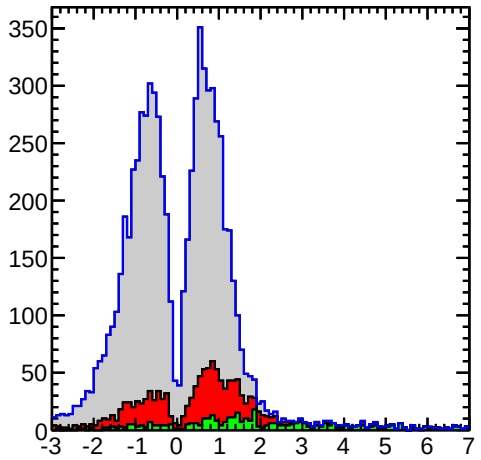


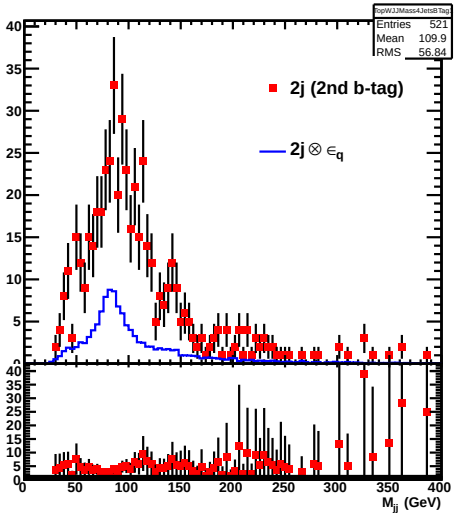


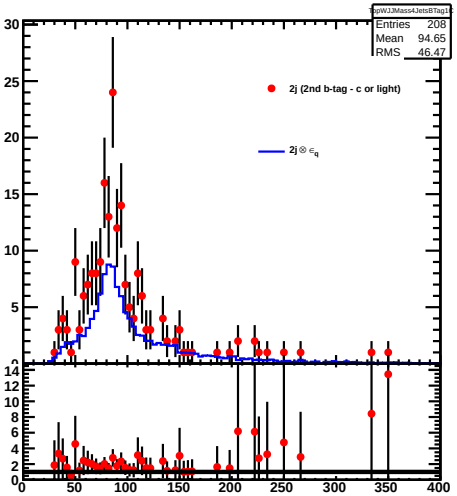
Test of ϵ_q on W second jet

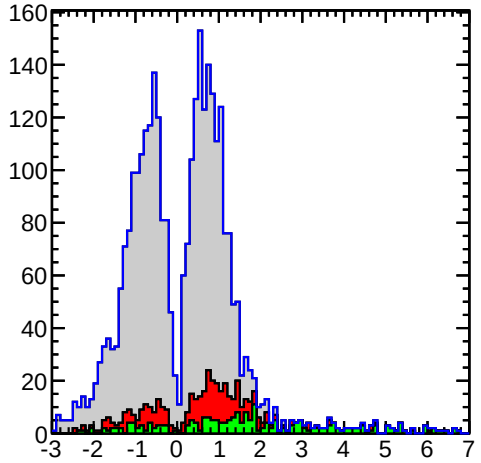




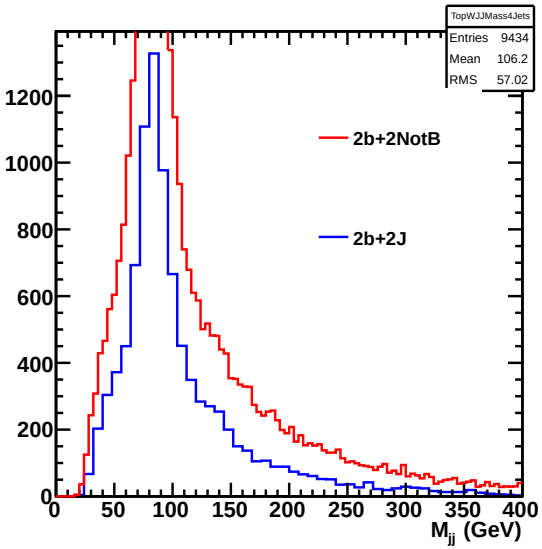


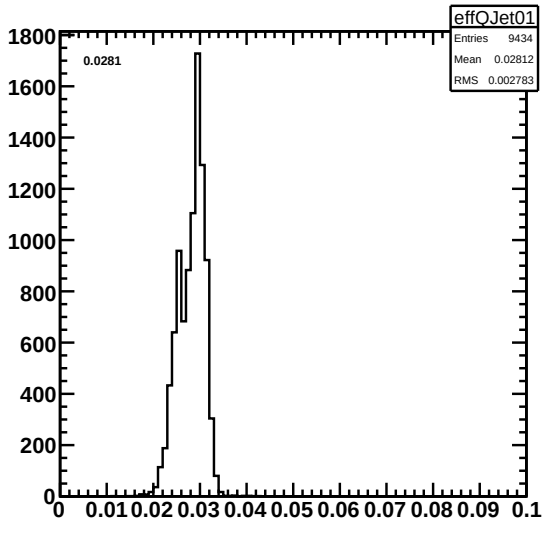


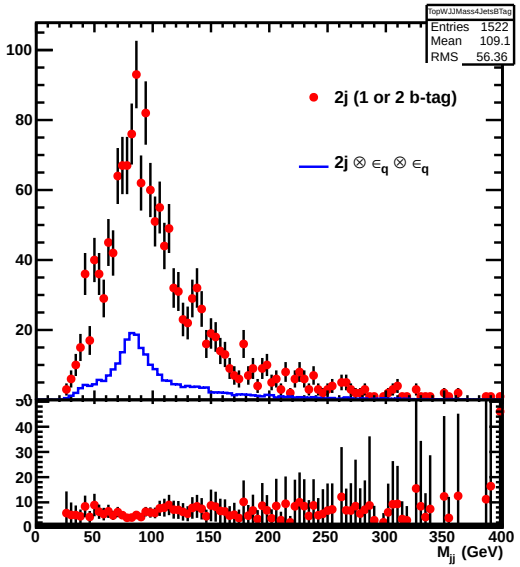




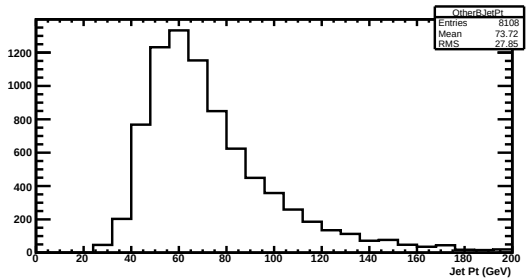
Test of ϵ_q on W first or second jet

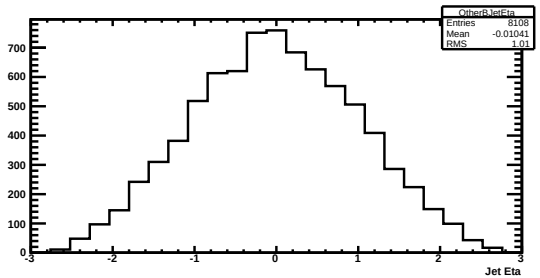


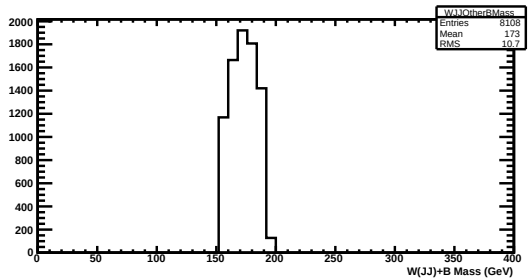


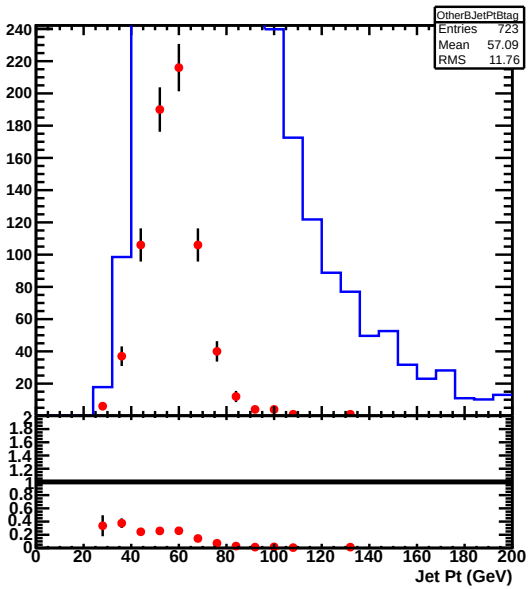


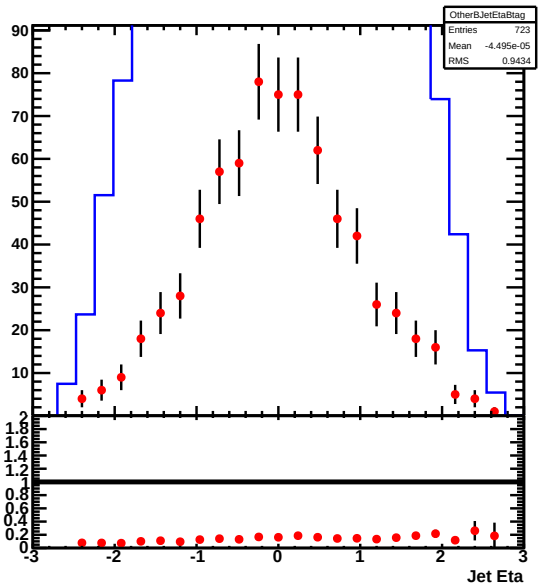
Test of ϵ_b on $t \to bjj$: Jet p_t, η and M_{bjj}

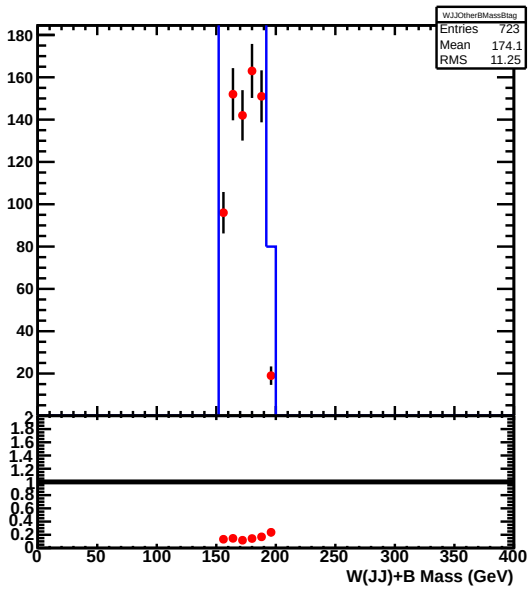










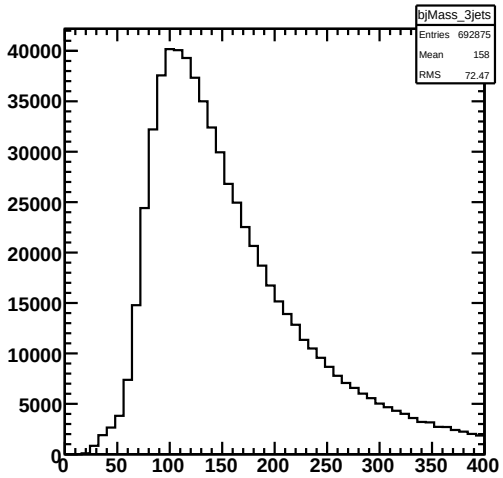


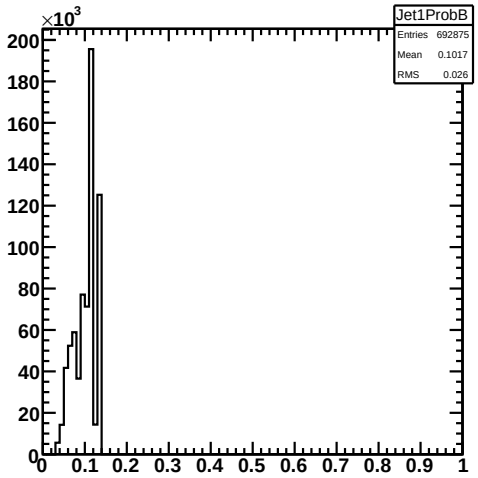
Check on QCD (MC)

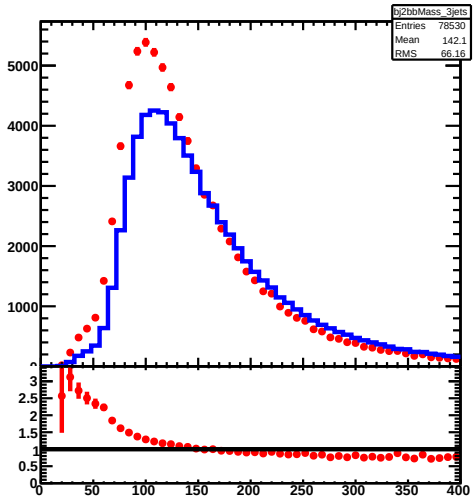
Check on multi-b sample (QCD MC)

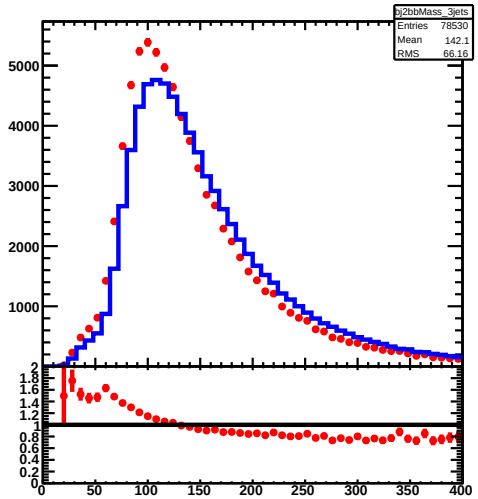
- On *QCD* sample (MC), check $P_b(j) = f_b\epsilon_b + (1. - f_b) \cdot \epsilon_q$ on *bjj* samples;
- compare M_{jj} distribution (two highest j) in sample *bbj* vs $bjj \otimes P_b(j^{2nd})$;
- likewise for *bbj* vs $jbj \otimes P_b(j^{1st})$;
- try also *bbb* vs $bjj \otimes P_b(j^{2nd}) \otimes P_b(j^{3rd})$.
  - Not supposed to work, f_b for 3^{rd} jet is different if other two b-jets in the event or just one;
  - and *bbb* vs $jbj \otimes P_b(j^{1st}) \otimes P_b(j^{3rd})$;
- *bbb* vs $bbj \otimes P_b(j^{3rd})$;

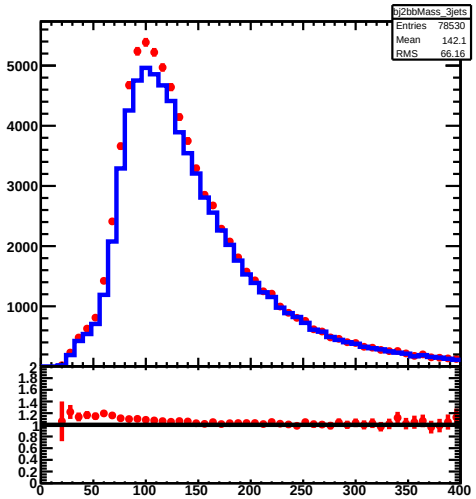
Test of $P_q(j)$ on *bjj* to *bbj*



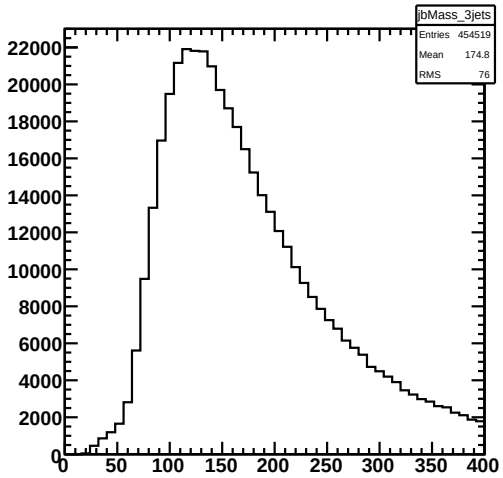


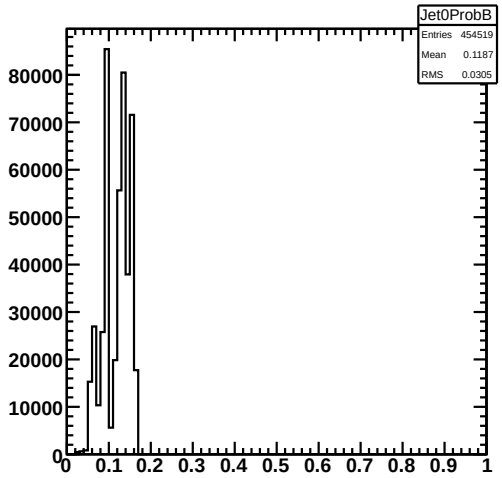


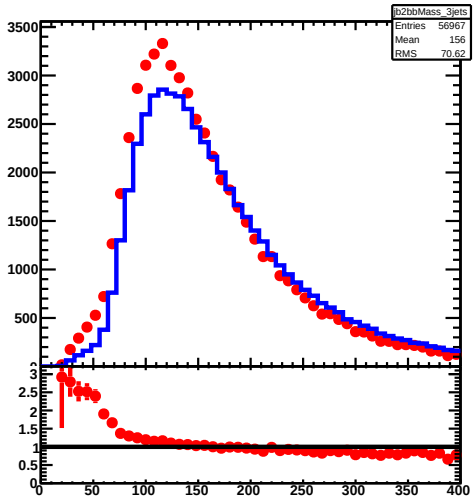


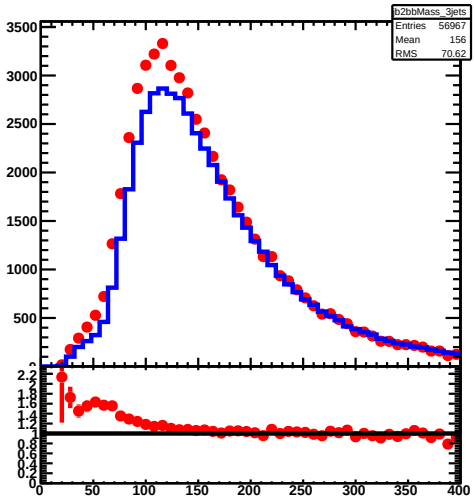


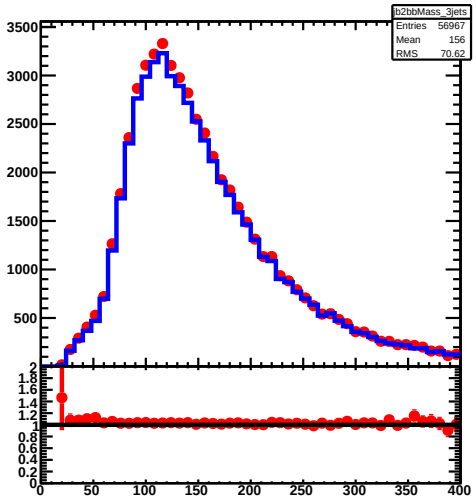
Test of $P_q(j)$ on *jbj* to *bbj*



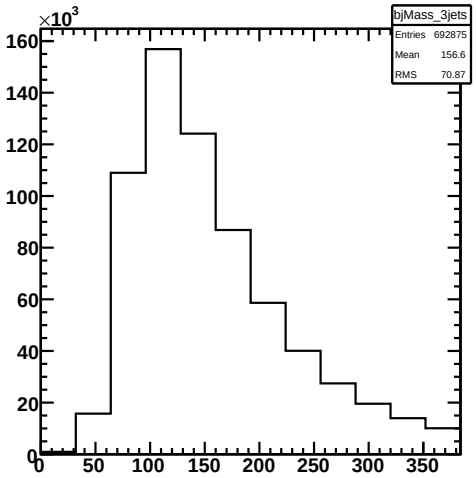


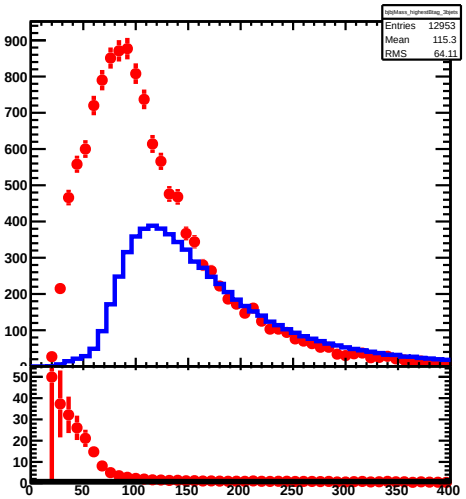


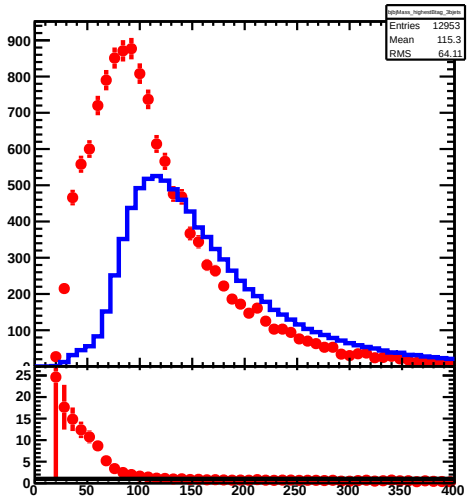


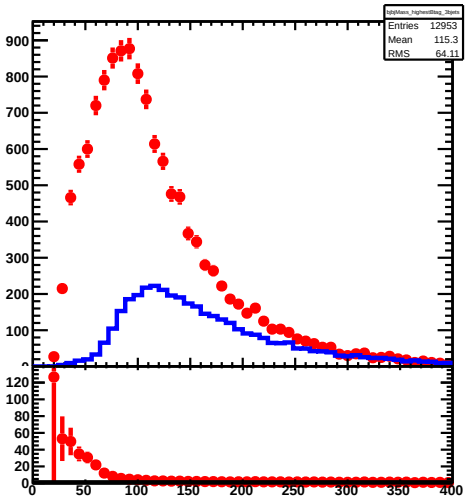


Test of $P_q(j) \otimes P_q(j)$ on *bjj* to *bbb*

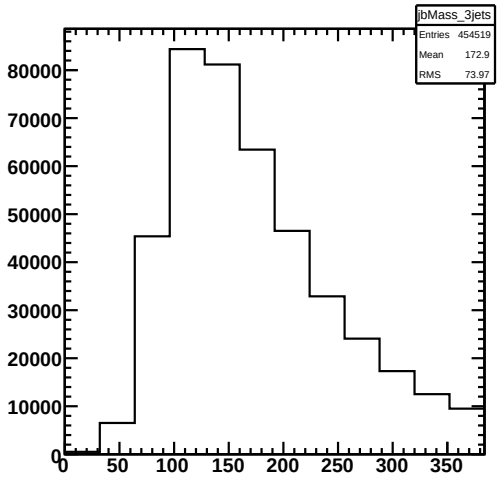


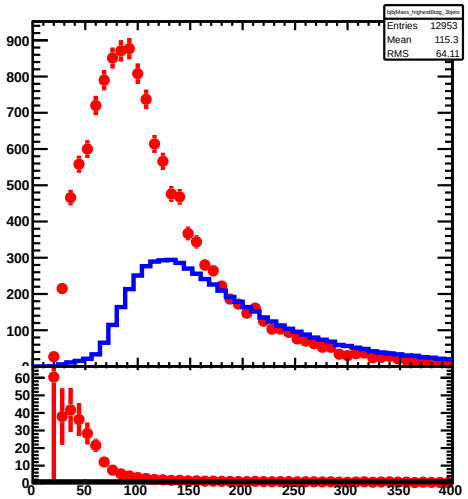


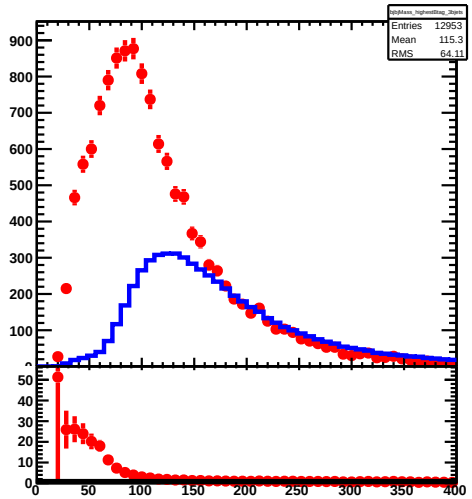


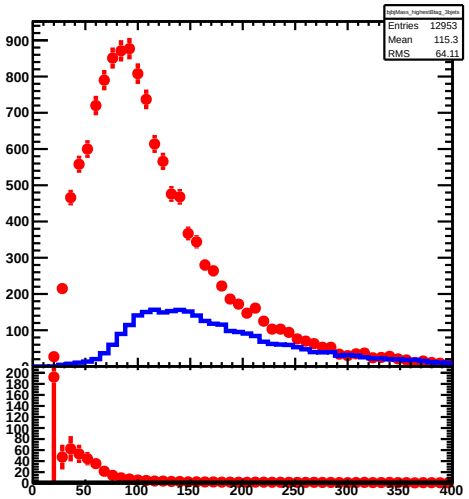


Test of $P_q(j) \otimes P_q(j)$ on *jbj* to *bbb*









Test of $P_q(j)$ on *bbj* to *bbb*