

# Studies of top-quark reconstruction

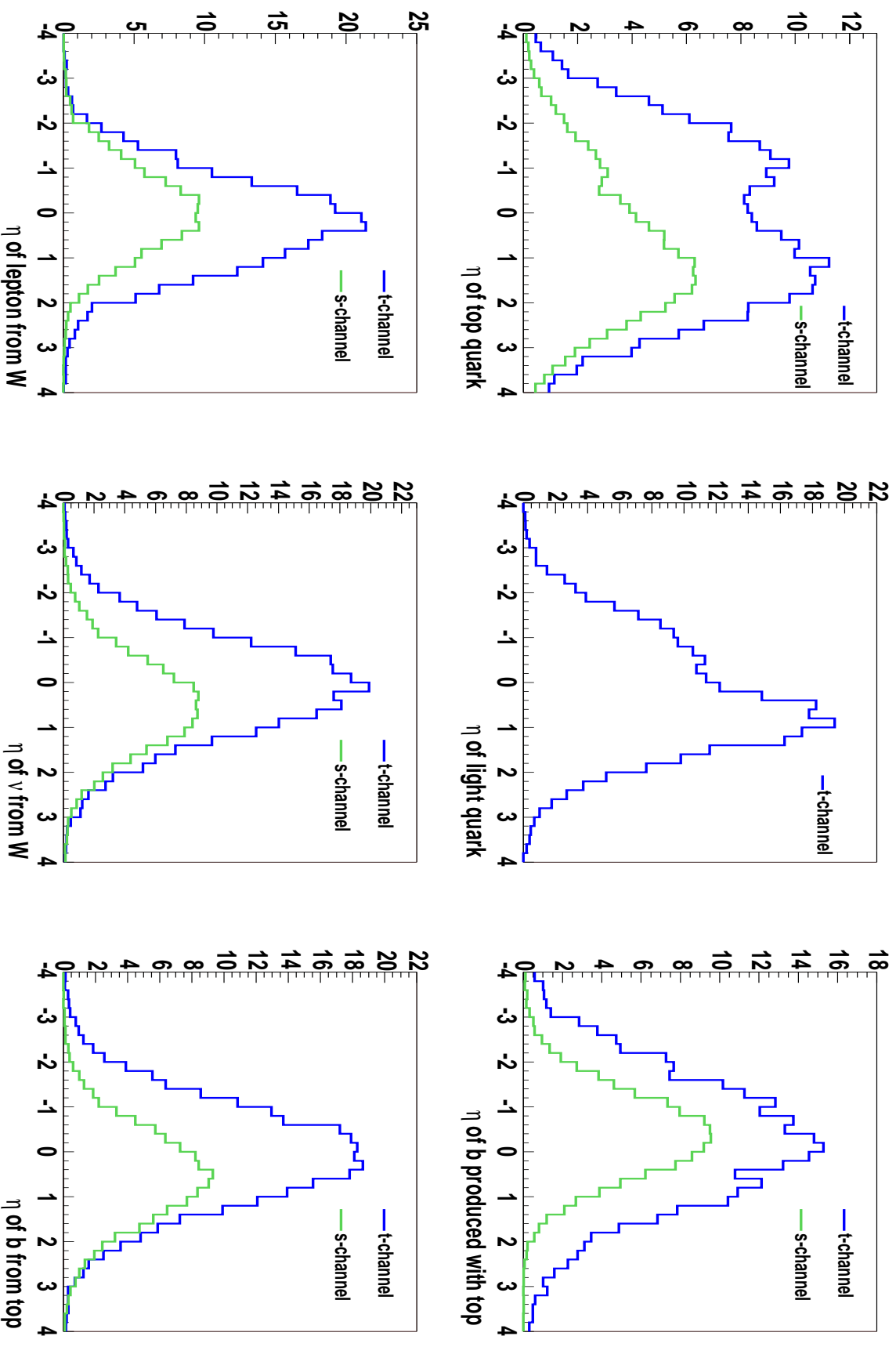
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## Summary

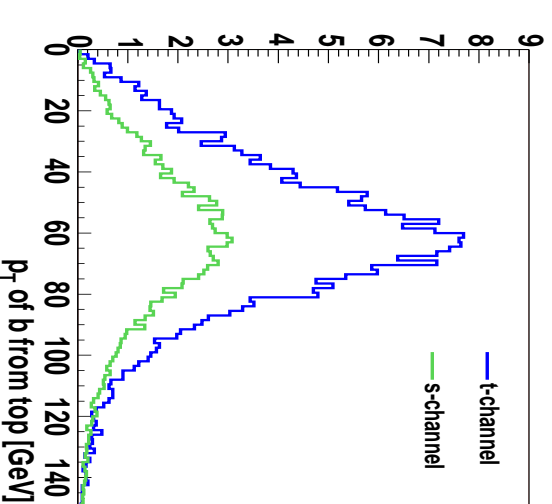
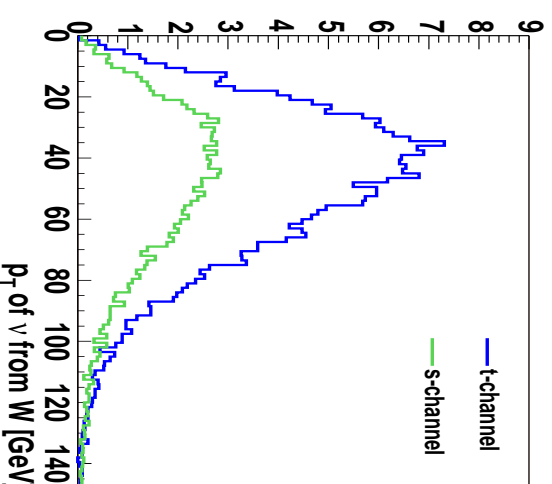
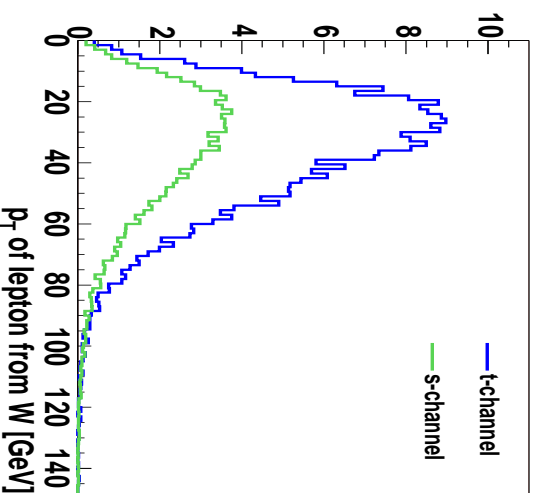
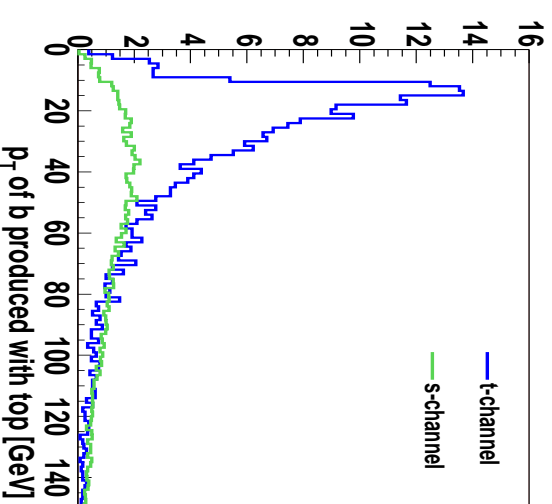
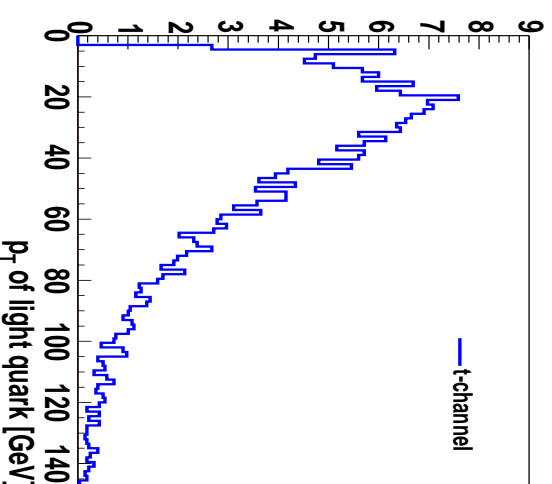
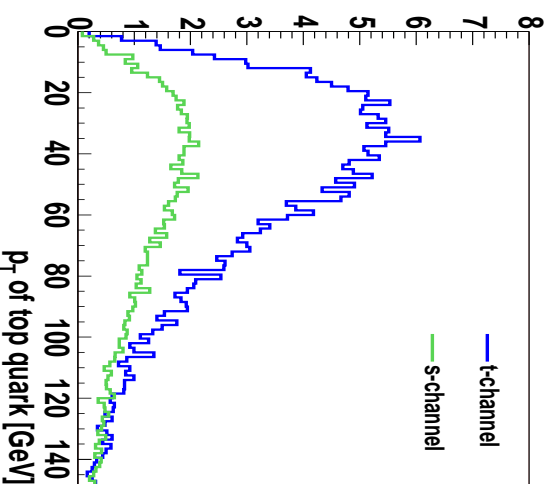
- ◆ Interlude: MC parton distributions from SingleTop
- ◆ Top-quark reconstruction methods used to be compared:
  - ★ Best Jet: top is formed with the jet that gives an  $m_t$  closer to  $175 \text{ GeV}/c^2$
  - ★  $b$ -tagged: top is formed with the leading SVT tagged jet
  - ★ Leading jet: top is formed with the leading jet in the event
- ◆  $b$ -tagged is better for  $t$ -channel, Best Jet is probably better for  $s$ -channel
- ◆  $b$ -tagged reconstructs better the jet kinematics

# MC partons $\eta$ distributions

Relative areas according to  $\sigma_s$  and  $\sigma_t$



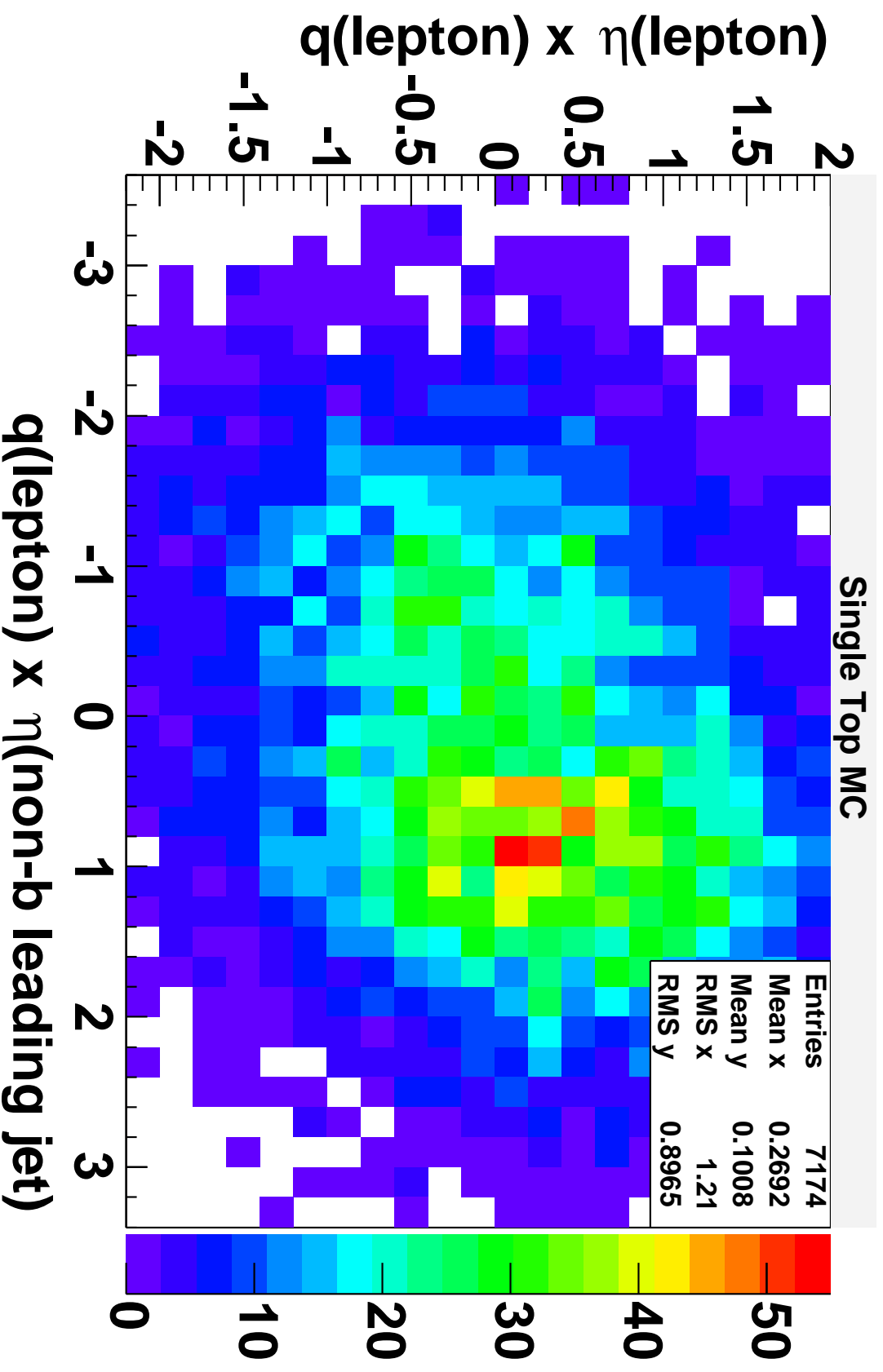
# MC partons $p_T$ distributions



Identifying the light quark is hard! The interaction vertex has all kinds of light quarks  
There is some contamination from these underlying event quarks (even after some cuts)

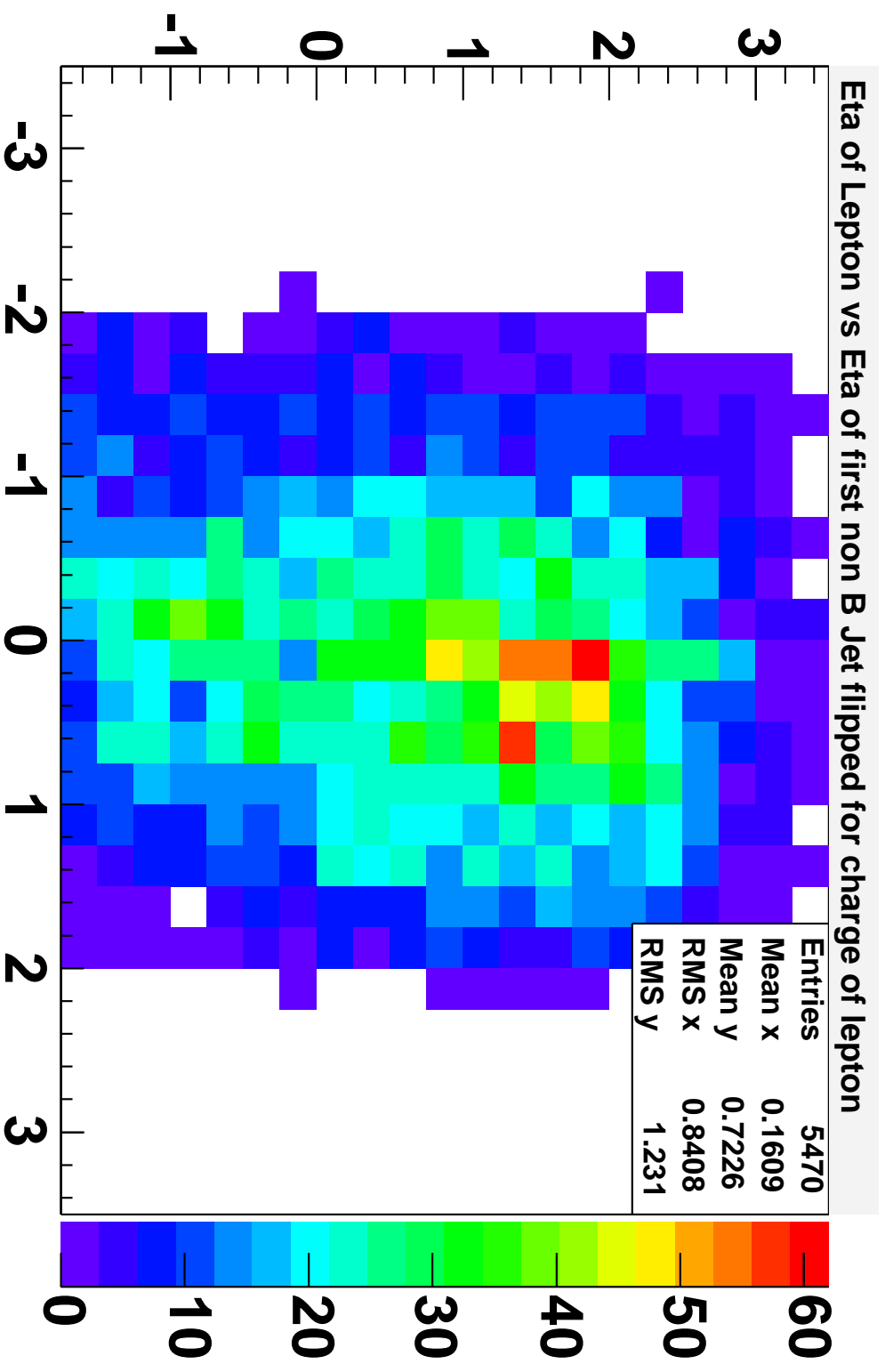
# Asymmetry for $t$ -channel at parton level

This is the asymmetry variable postulated by the Seattle phenomenologists



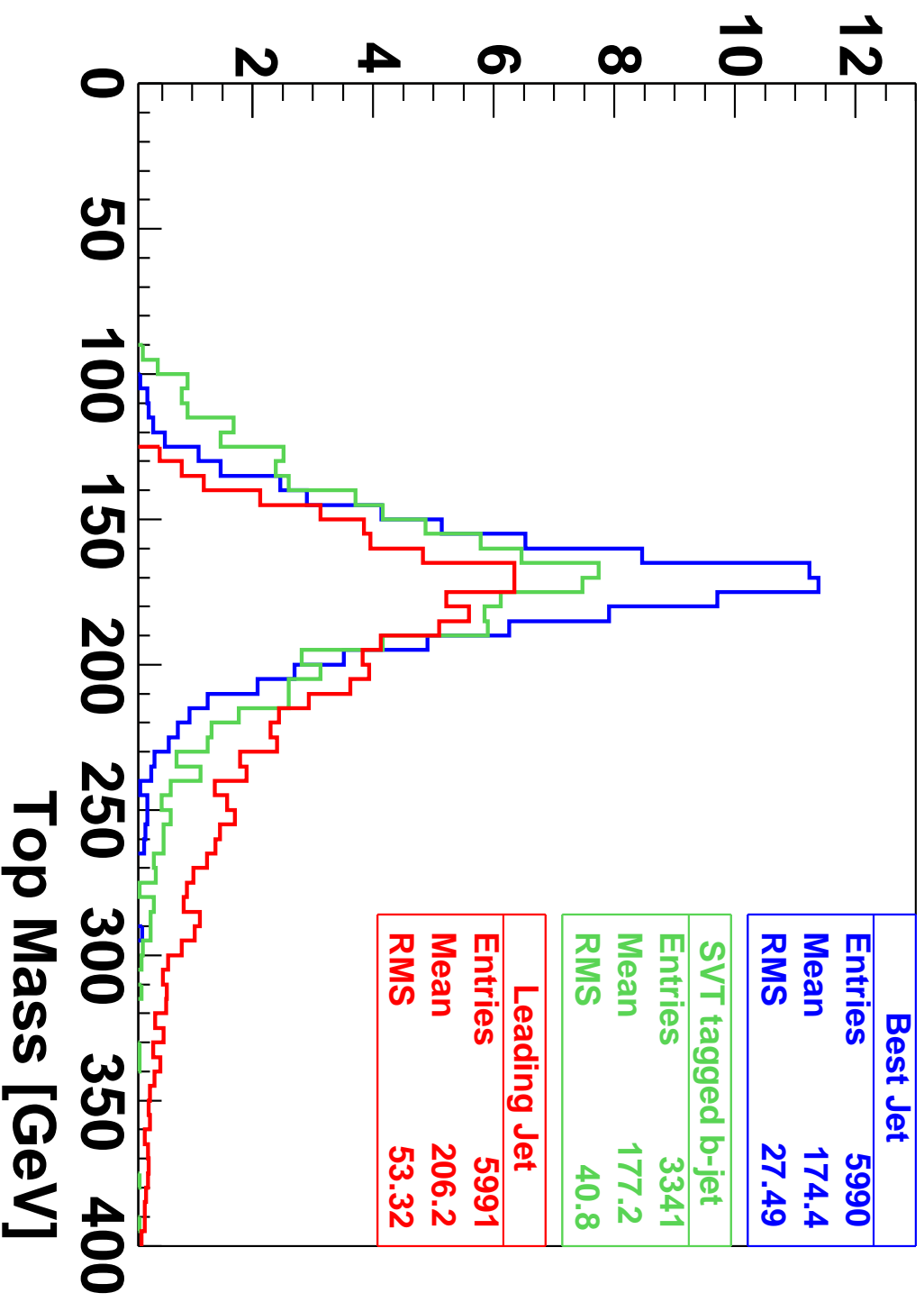
It seems hard at parton level!

# Asymmetry for $t$ -channel after all cuts



The asymmetry at parton level is  $q \times \eta(\text{jet}) \sim 0.10$  and  $q \times \eta(\ell) \sim 0.27$   
It gets better after reconstruction and final cuts?

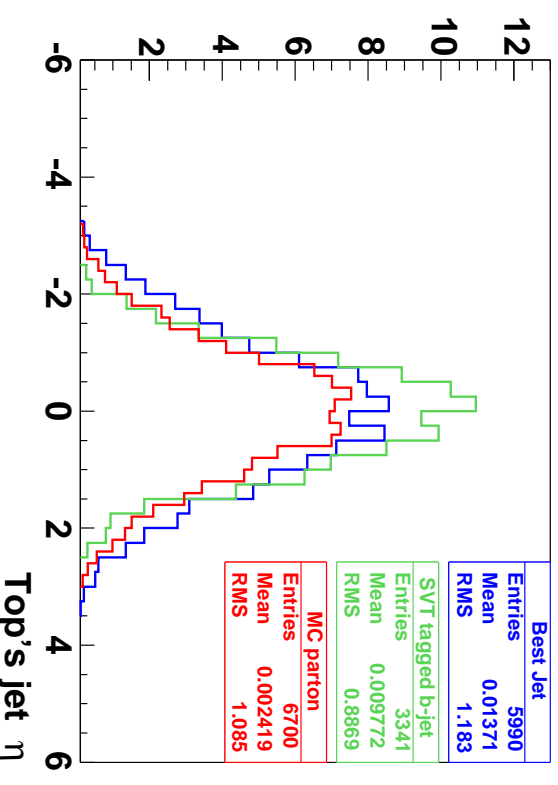
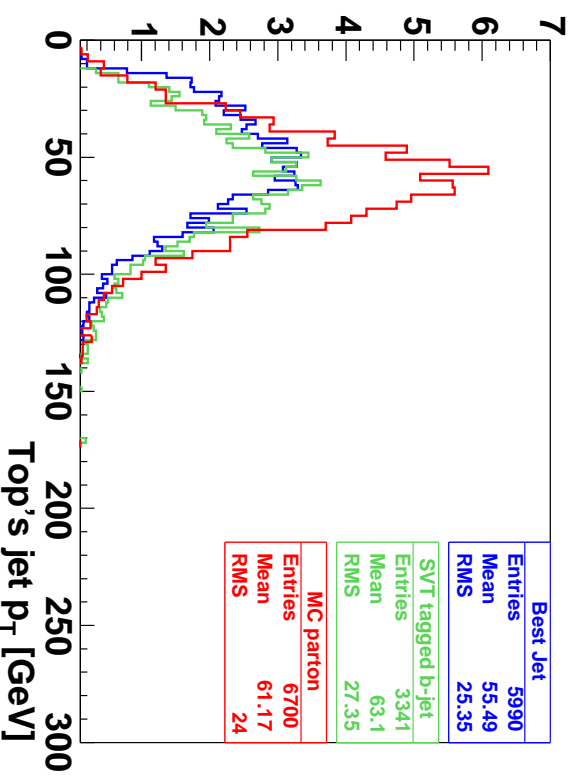
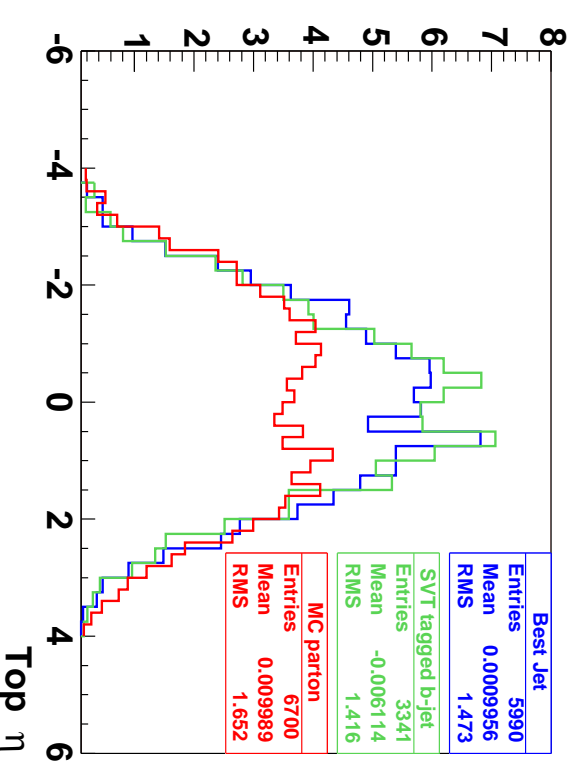
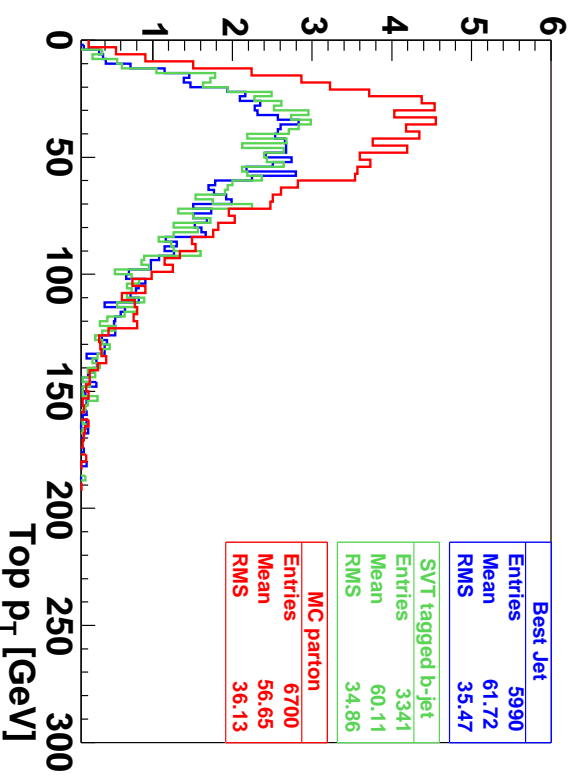
# *t*-channel Top mass after final cuts



*b*-tagged jet gives an ok mean (without bias) but worse spread

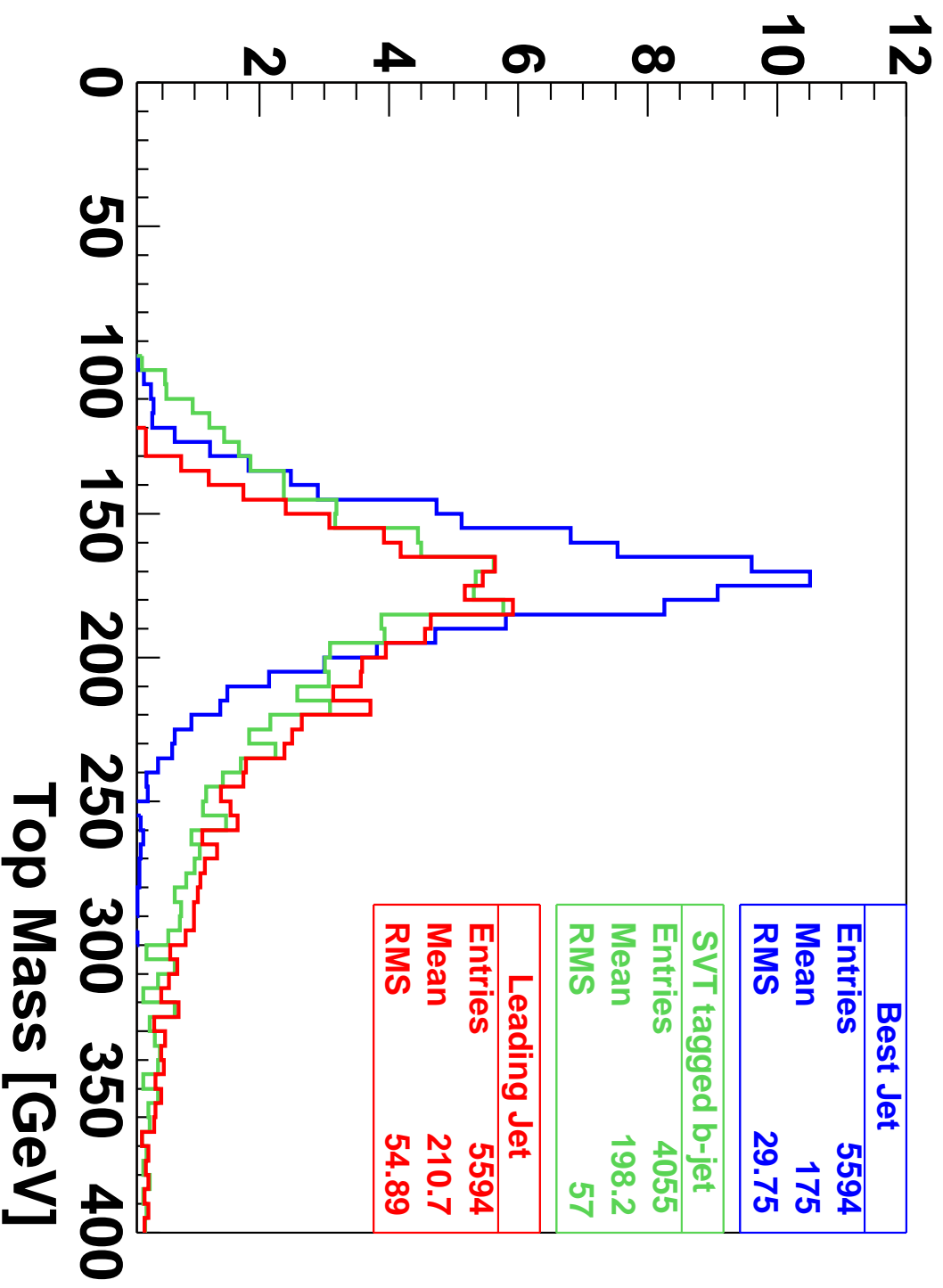
Leading Jet is very spread out

# *t*-channel after final cuts

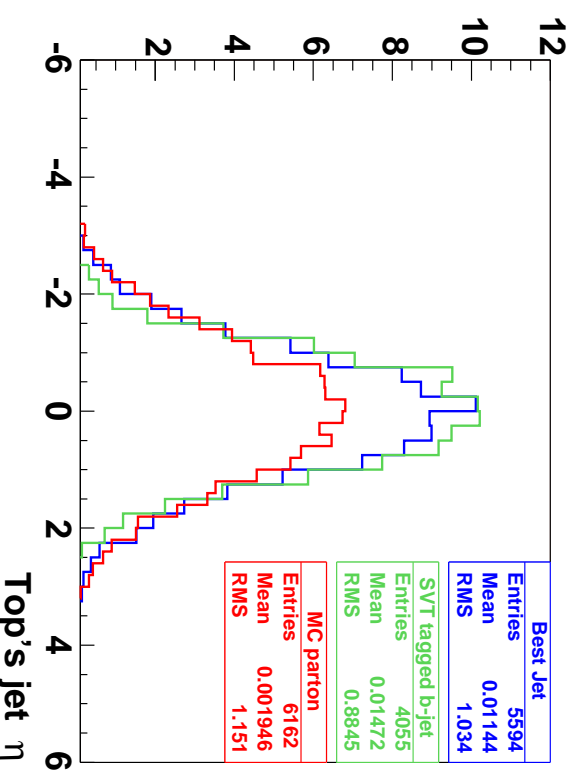
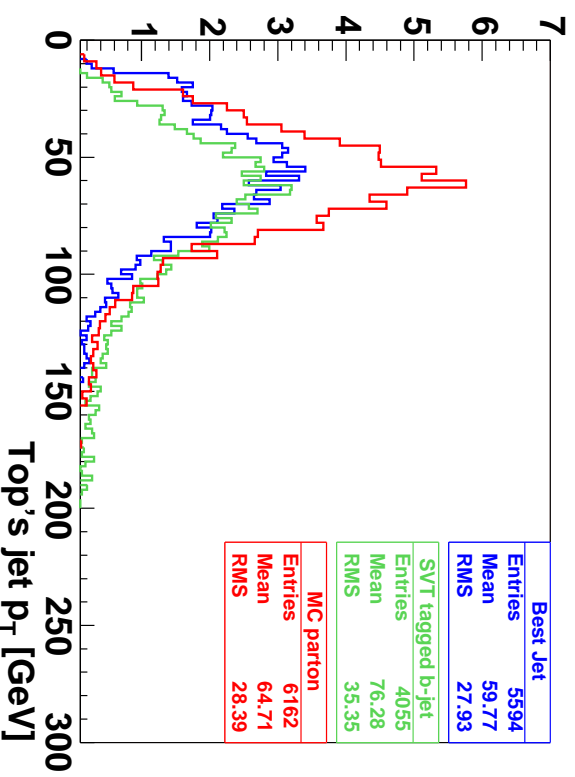
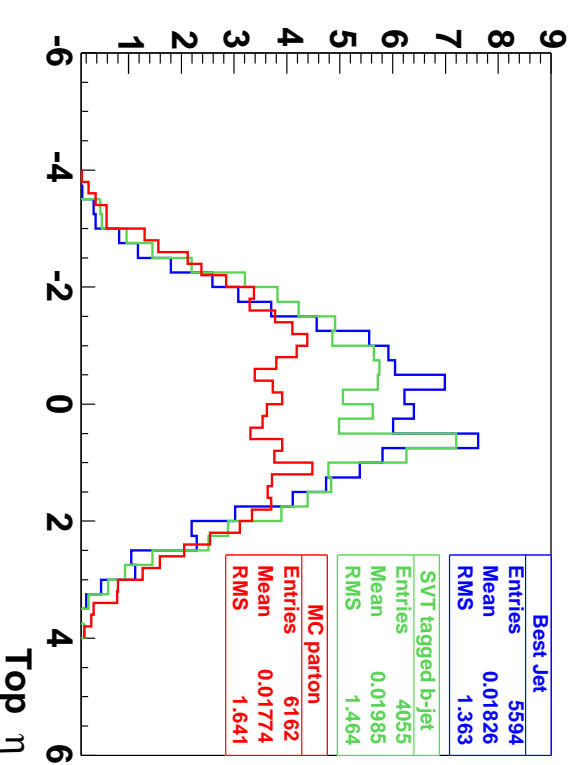
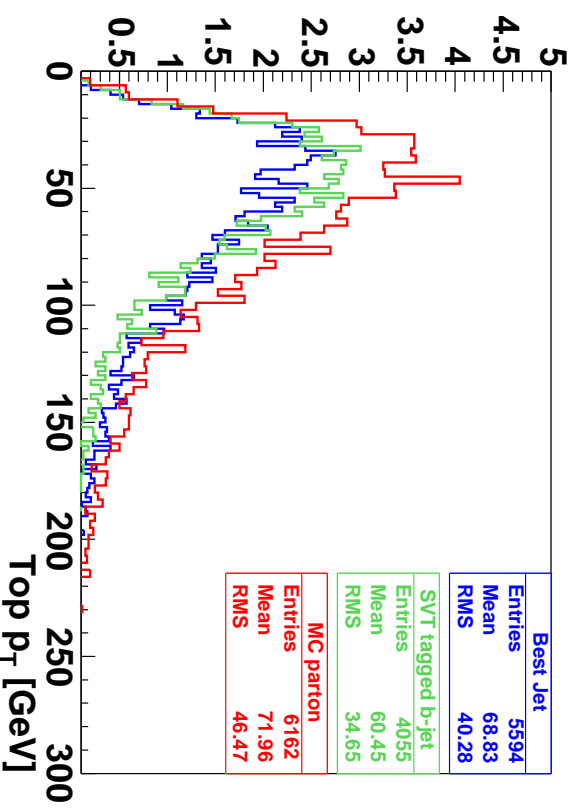


*b*-tagged jets tend to be harder and more central than Best Jets

# *s*-channel Top mass after final cuts



In the *s*-channel both *b*'s are hard, in the *t*-channel the accompanying *b* may not be so hard



Best Jet and  $b$ -tagged jet give very similar distributions

# Conclusions

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Overlap between reconstruction methods:

	$s$ -channel	$t$ -channel
How many times the best jet is the leading jet	48%	48%
How many times the best jet is tagged	45%	33%
How many times the b-jet is the leading jet	73%	58%

Efficiency of actually reconstructing a top quark with a  $b$ -quark inside:

	$s$ -channel	$t$ -channel
<b>Best Jet</b> efficiency in being a $b$ -quark parton	<b>44%</b>	32%
<b><math>b</math>-tagged jet</b> efficiency in being a $b$ -quark parton	<b>49%</b>	<b>47%</b>
<b>Leading Jet</b> efficiency in being a $b$ -quark parton	<b>49%</b>	30%

- ▶ The **Best Jet** reconstruction gives a **narrower  $m_t$  distribution**
- ▶ The  **$b$ -tagged jet** reconstruction gives a nice centered distribution (with no bias, but **somewhat broader specially in the  $s$ -channel**)
- ▶ Both describe very well the **top kinematics**
- ▶ The **Leading Jet** reconstruction gives similar results to the  $b$ -tagged in the  $s$ -channel (but is worse in general)