

Jets identification criteria

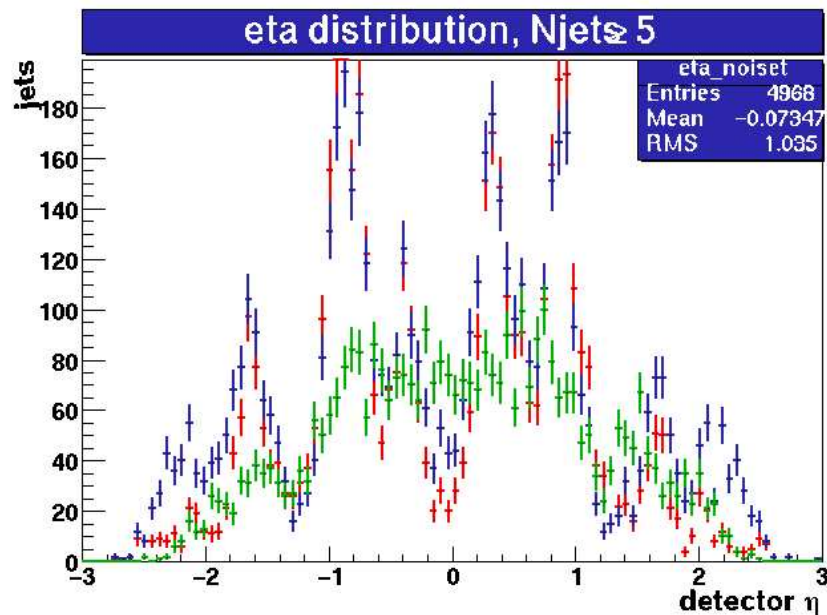
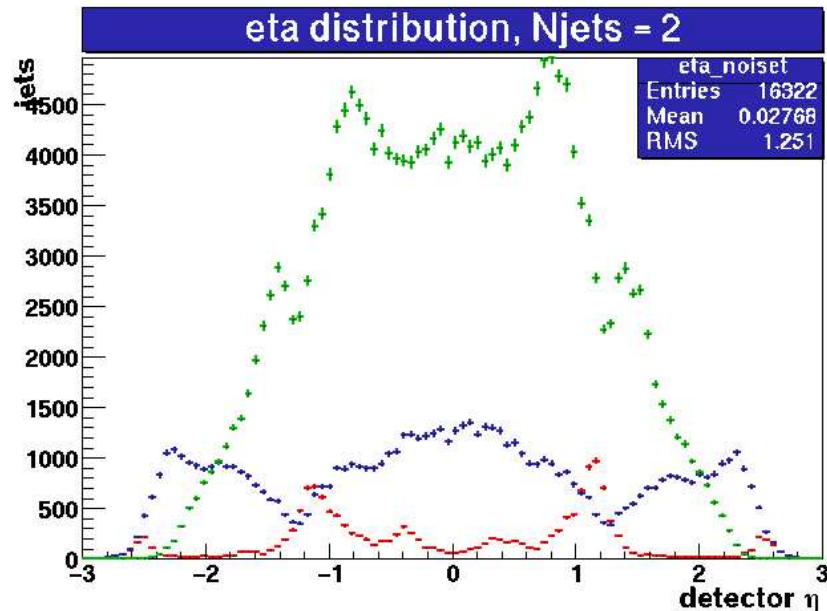
Slava Kulik

Fermilab

Jan 5-6, 2004

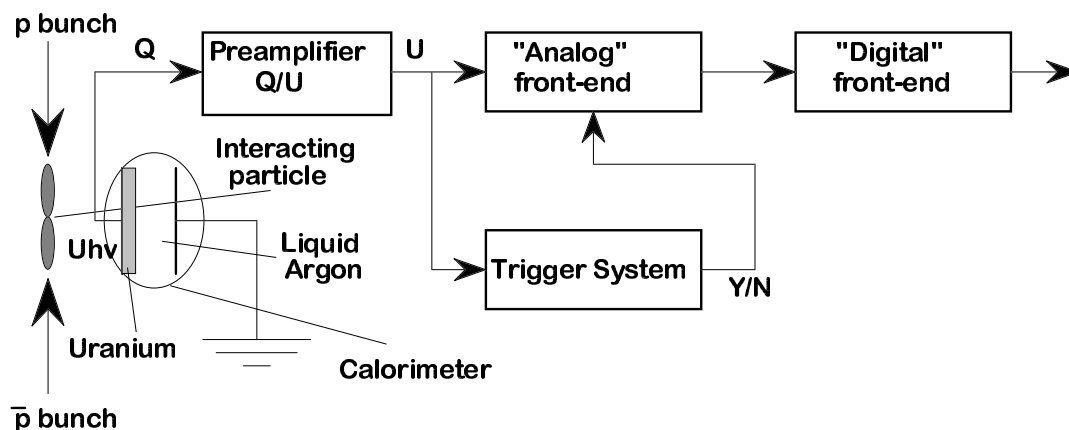
Manchester HEP group meeting

Noise in the calorimeter



After the upgrade, the noise in the calorimeter readout has increased significantly. It causes reconstruction of “fake” jet objects especially in high jet multiplicity events. For instance, the signal to background ratio in $t\bar{t} \rightarrow l + \text{jets}$ events ($l+ \geq 4$ events) is 1:6 in comparison to 1:1 or 1:2 in Run I data.

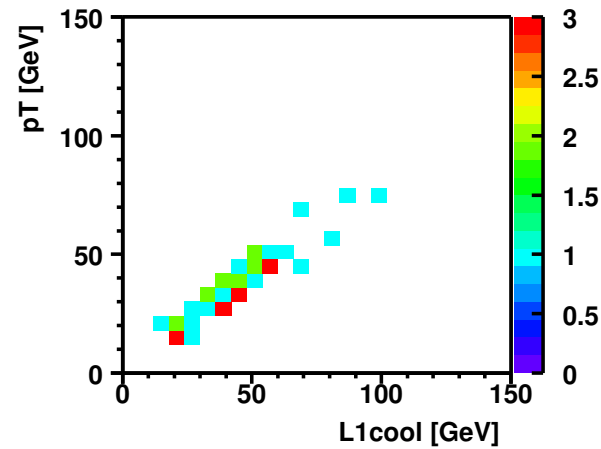
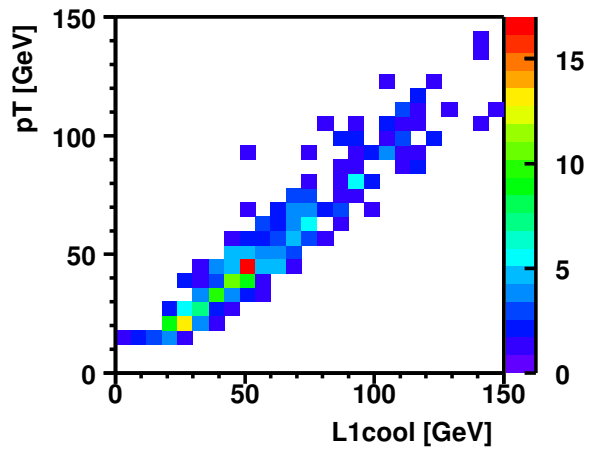
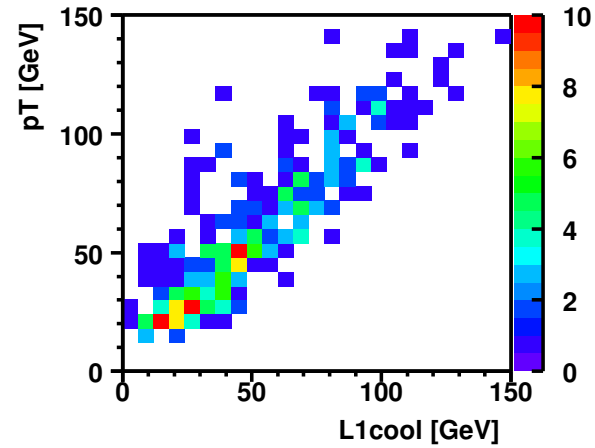
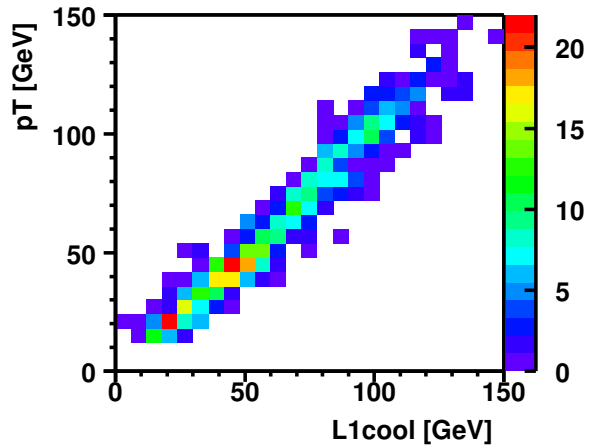
L1 vs precision readout



DØ Calorimeter is divided into 0.1×0.1 towers in η - ϕ space. The three level trigger system receives not as precise 0.2×0.2 towers through separate data path.

The indications are that precision read out is noisier than level 1 (L1) trigger data path and L1 towers could help reducing fake jet rate.

Correlation L1 vs Jet p_T



Strategy

The goal is to work out criteria that separate good jets from fake jets with high good jet efficiency.

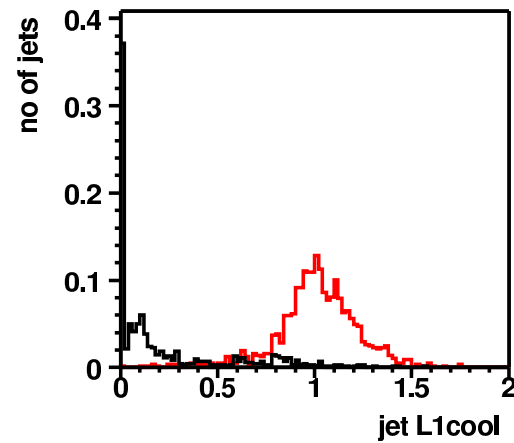
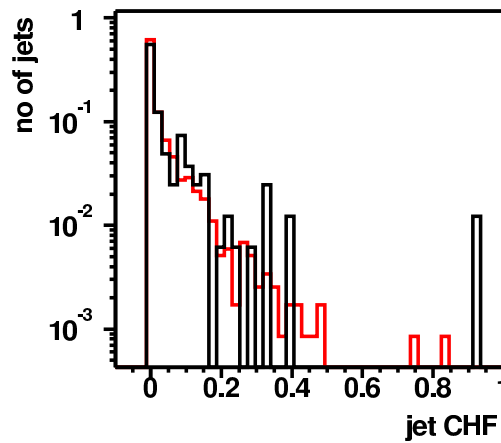
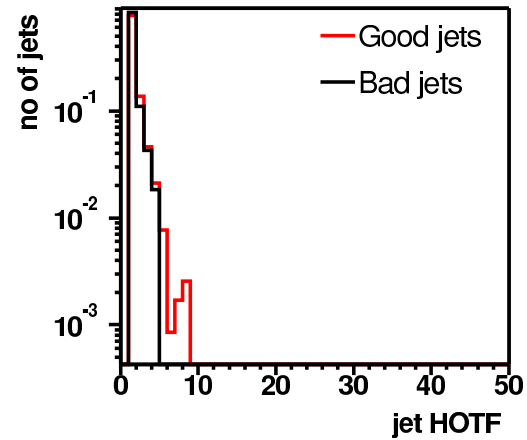
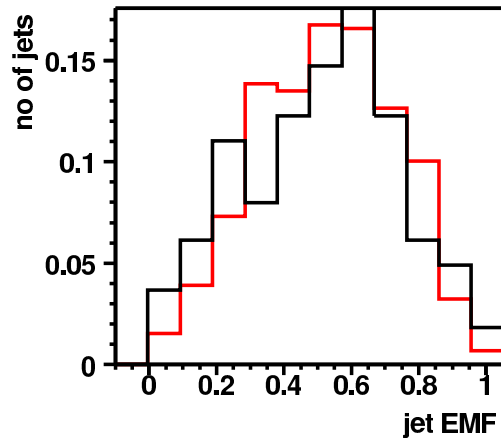
Good jet sample:

- dijet events with back to back jets.
- Low transverse missing energy (\cancel{E}_T)
- one jet passes all good jet criteria (including L1 confirmation)
- the other jet is assumed to be a good jet
- So far, relatively high momentum jets: $P_T > 15$ GeV

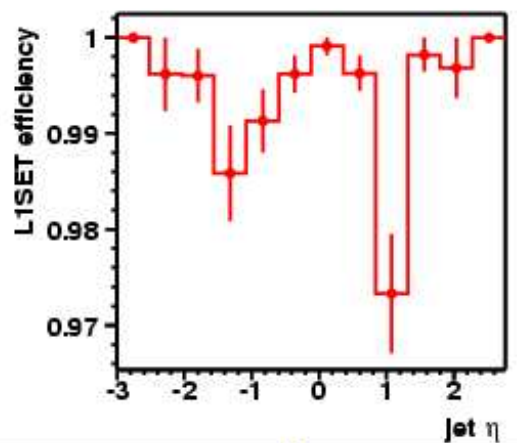
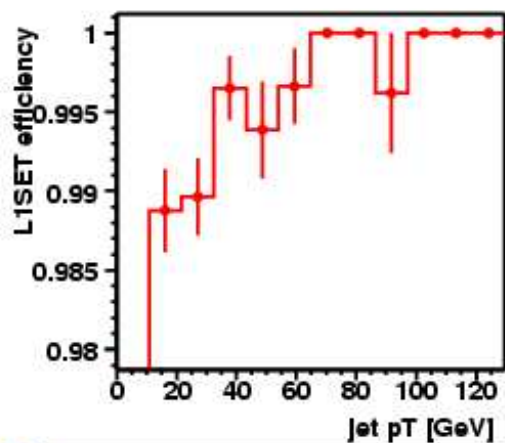
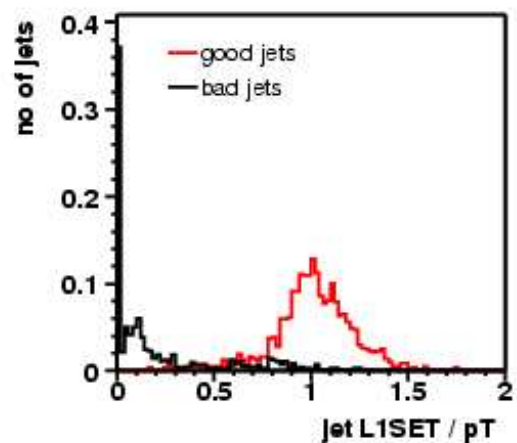
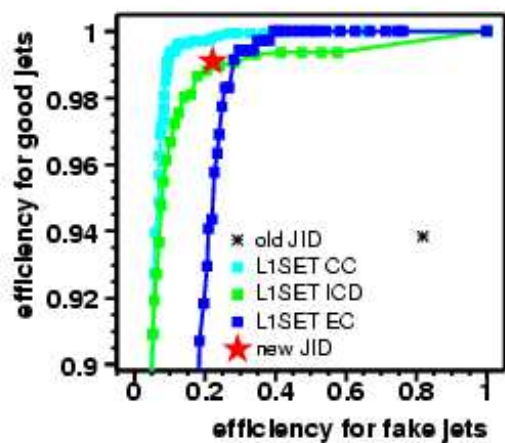
Fake jet sample:

- events with more than 4 jets
- fake jet passes L1 confirmation but has no tracks matched to it.

“Good” and “Bad” jets



L1 confirmation efficiency



Tobias Golling



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Conclusions

- L1 confirmation efficiency is about 99% (98% in the ICD).
- Total JetID efficiency is $97.4 \pm 0.5\%$
- Rejection rate is 70-80%.

Suggested ID criteria :

$$0.05 < \text{EMF} < 0.95$$

$$\text{HTOF} < 10.$$

$$\text{CHF} < 0.4$$

$$n_{90} > 1$$

$$\text{L1/jet } p_T \cdot (1 - \text{chf}) > 0.4 \text{ (CC,EC) } > 0.2 \text{ ICD}$$