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On double counting in MET measurement with Jet corrections

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The present way of MET measurement with Jet corrections :

$$\text{MET} = \text{MET}_0 + \sum E_{t \text{ Jet}}^{\text{corr}} - \sum E_{t \text{ Jet}}^{\text{no corr}}, \quad E_{t \text{ Jet}} > 30 \text{ GeV}$$

corrections from MC : $R = E_{t \text{ Jet}}^{\text{MC}} / E_{t \text{ Jet}}^{\text{no corr}}$ for cone 0.5

No improvement in QCD MET is found

- in off-line QCD MET - A. Nikitenko, jetmet talk 22.11.00
- L1 QCD MET - S. Abdullin, S. Eno, CMS IN 2000/60

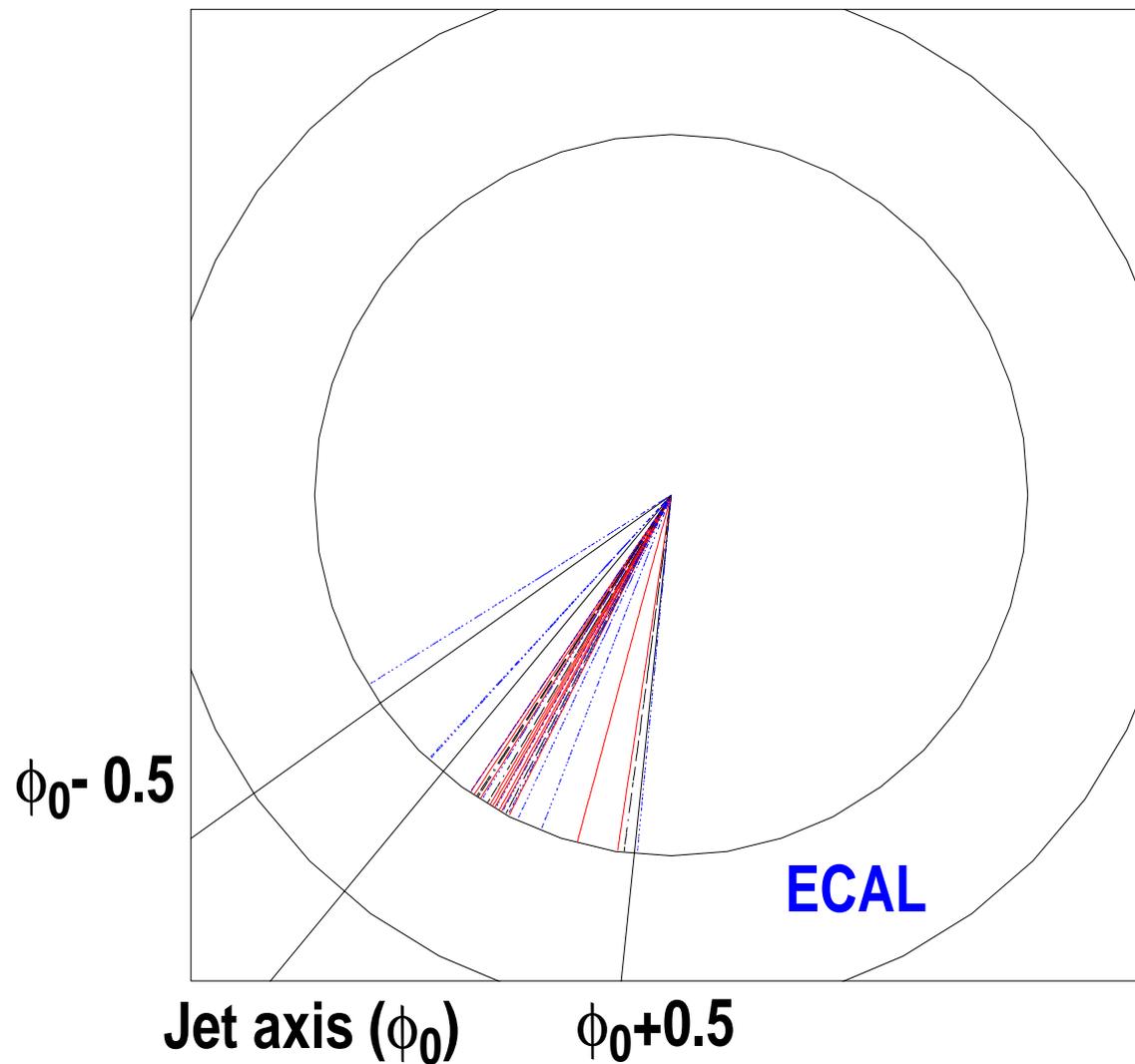
One reason is that in a such way MET counts twice :

- 1) energy of jet particles in MC cone 0.5 deflected by magnetic field out of calorimeter jet reconstruction cone 0.5
- 2) energy of jet particles entering calo cone 0.5, but deposited part of the energy out of calo cone 0.5

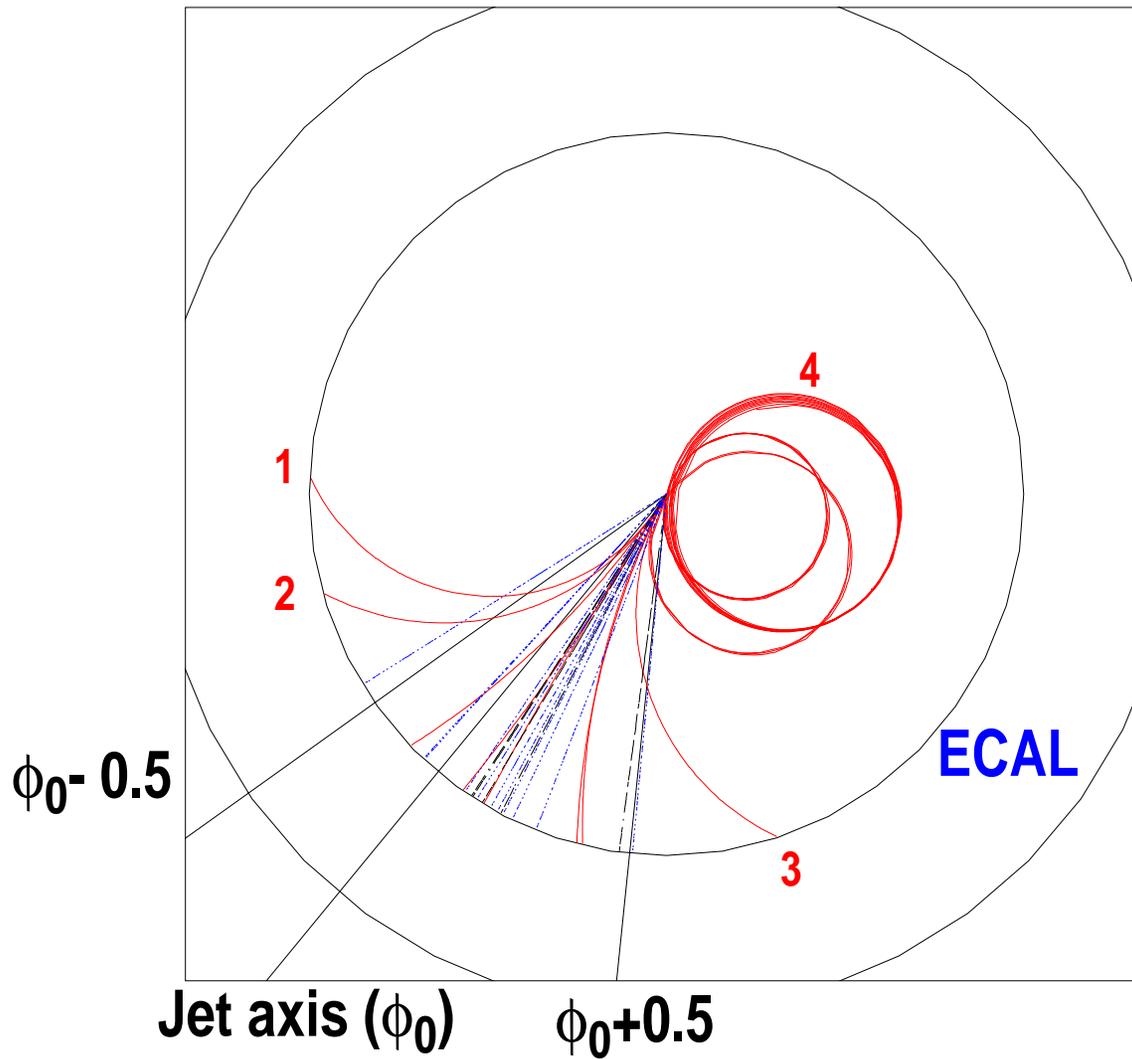
here I will talk about 1). Next 3 plots illustrate the problem

Jet of $E=100$ GeV, $\eta = 0.1$

No magnetic field (as in the past D0), no tracker interactions

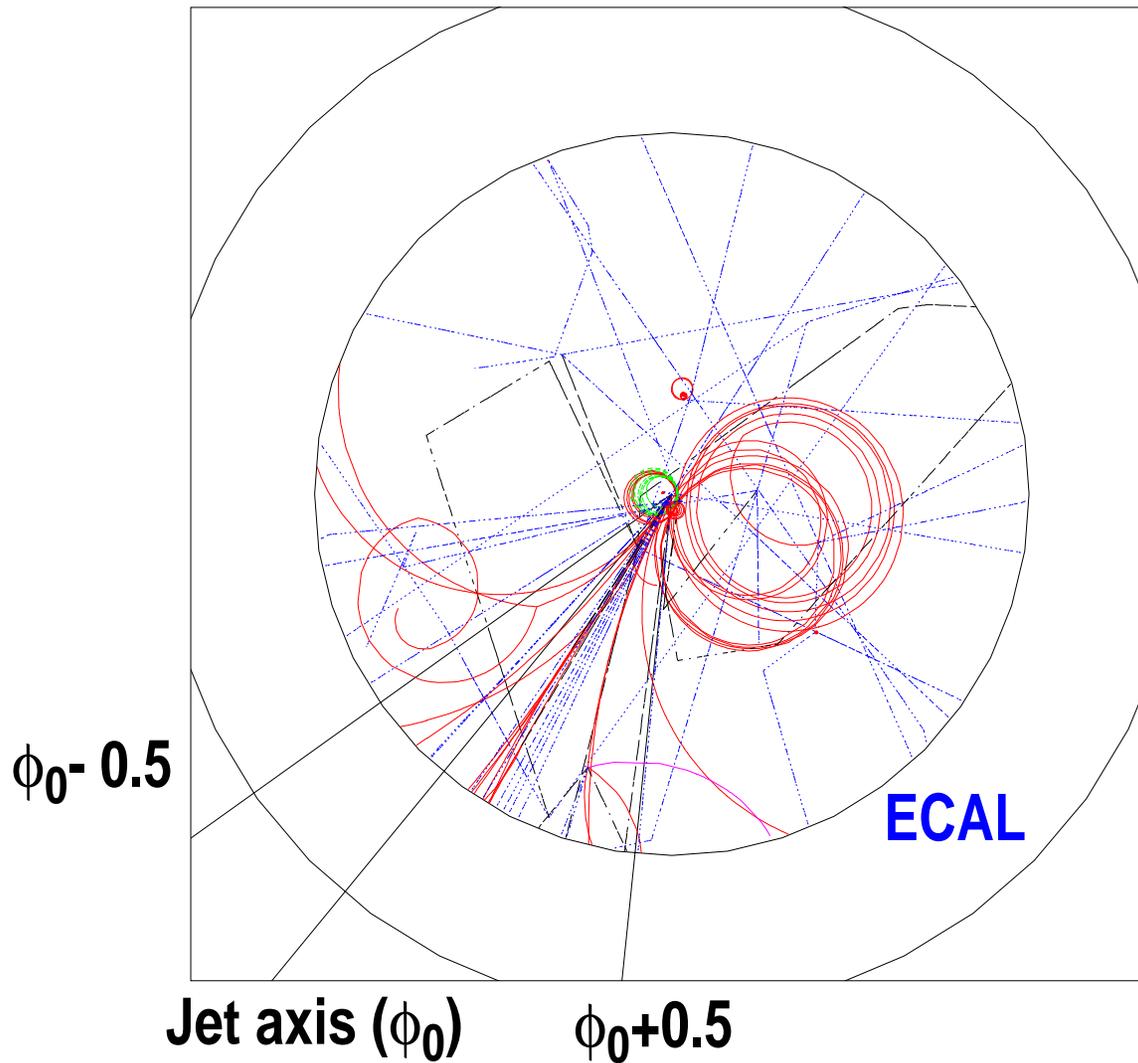


the same Jet of $E=100$ GeV, $\eta = 0.1$, field ON, no tracker interaction



particles 1, . . . 4 deposit energy (part energy) out of calo cone 0.5

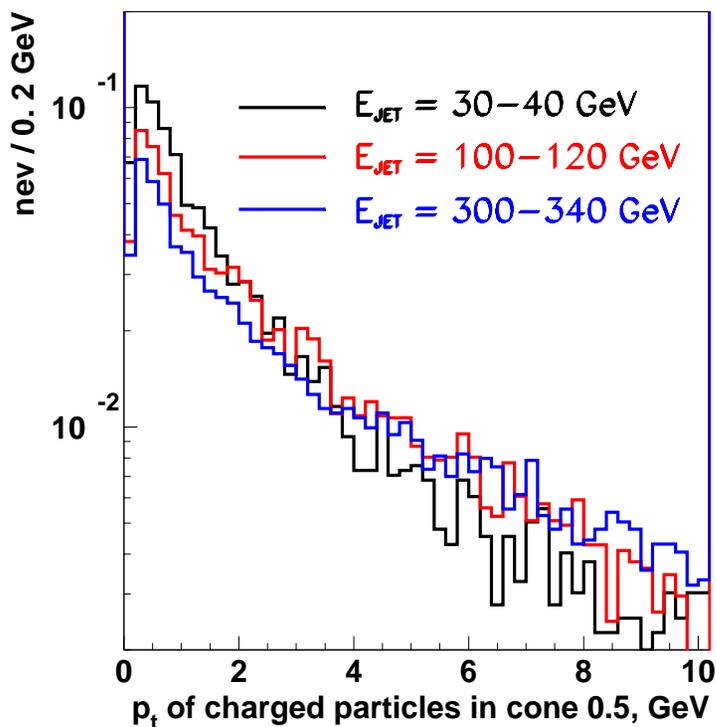
the same Jet of $E=100$ GeV, $\eta = 0.1$, field ON, trk interaction ON



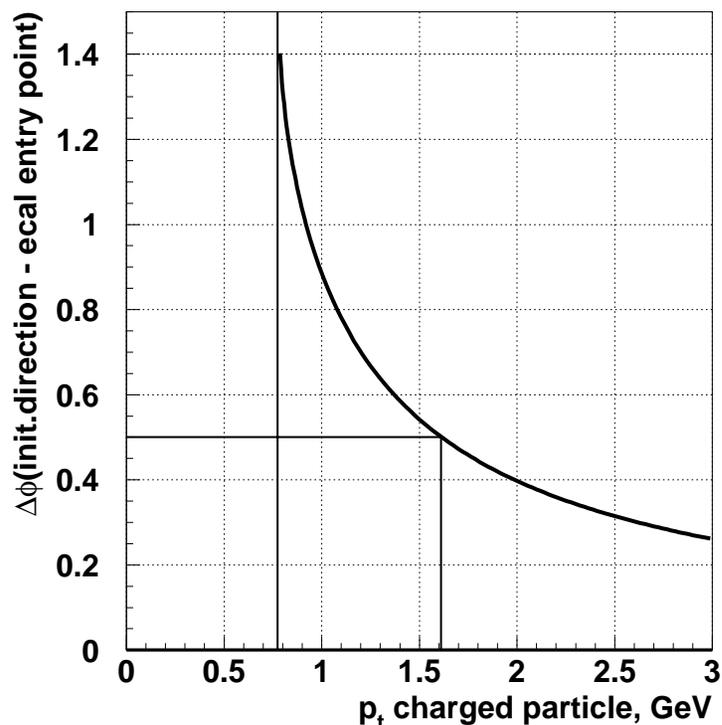
more MC Jet energy deposited out of calo cone 0.5. how much ?

Jets with MC energy 30-40, 100-120, 300-340 GeV in cone 0.5 , $\eta = 0.1$

spectra of jet charged particles



$\Delta\phi$ deviation due to 4T field

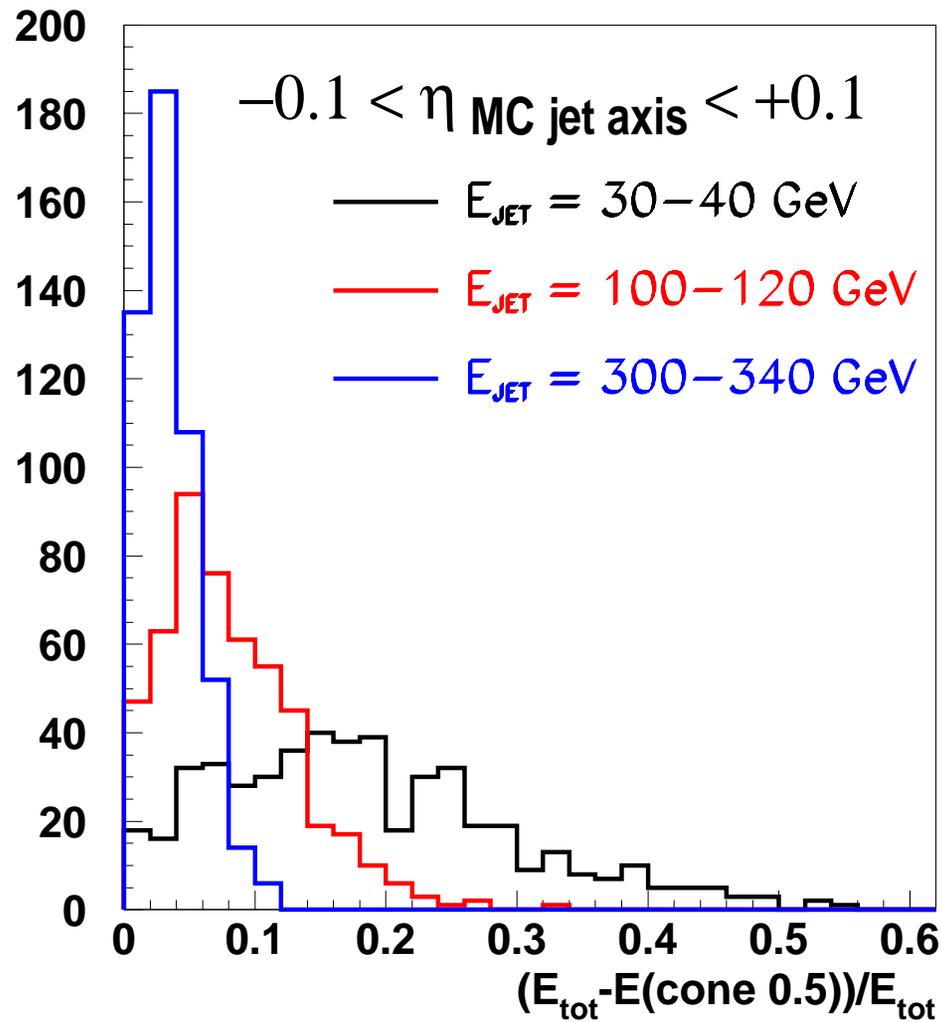


$E_J=30 - 40$ GeV - $\langle p_t^{ch} \rangle = 2.4$ GeV, $\langle n^{ch} \rangle = 8.4$

$E_J=100 - 120$ GeV - $\langle p_t^{ch} \rangle = 5.1$ GeV, $\langle n^{ch} \rangle = 12.7$

$E_J=300 - 340$ GeV - $\langle p_t^{ch} \rangle = 9.6$ GeV, $\langle n^{ch} \rangle = 17.0$

how much MC energy enters ecal out of cone 0.5 due to magn.field and interactions in the tracker ? => next slide



In the plot : E_{tot} - MC energy entering all calo surface

$E(\text{cone } 0.5)$ - MC energy entering calo inside cone 0.5 around MC jet axis

**Average fraction of MC jet energy entering calorimeter
outside
jet reconstruction cone v.s. cone size**

Energy, GeV	cone 0.5	cone 0.6	cone 0.7
30-40	18.5 %	15.8%	13.5
100-120	8.0%	6.5%	5.5
300-340	3.6 %	2.9%	2.4

Conclusion :

**□ double counting of ~ 20 % energy of soft jets due to field effect
in the present MET reconstruction with Jet corrections**

next : how large double counting due to showering out of cone

Alternative way may be : MET with response corrections (D0's R)