Definition of selection cuts for physical variables in the pp process at D0 (Tevatron)

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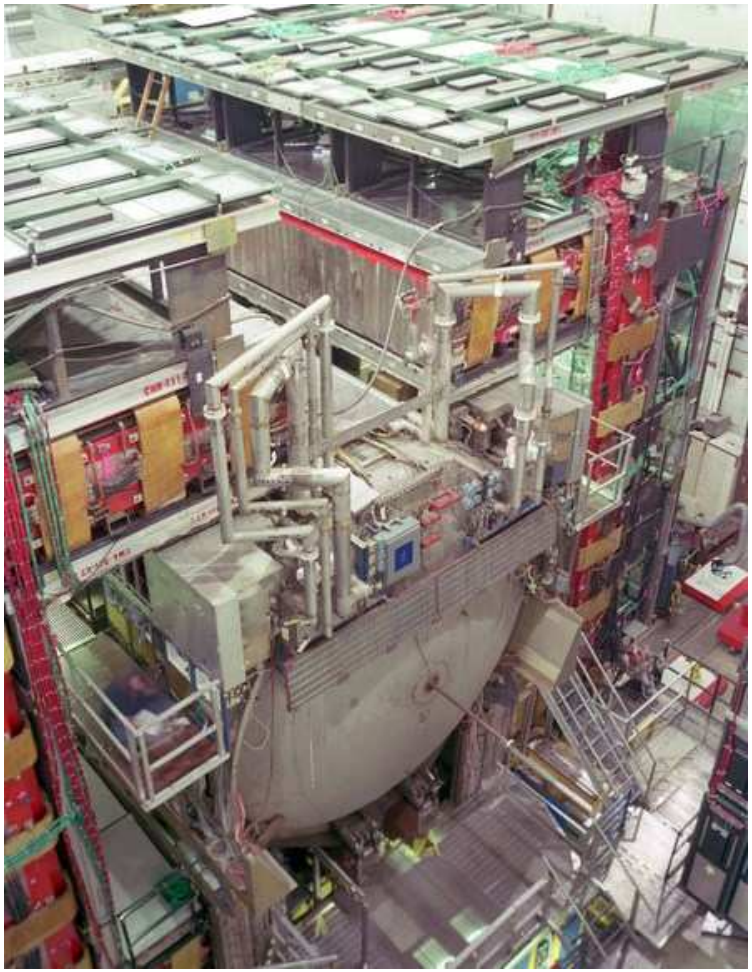
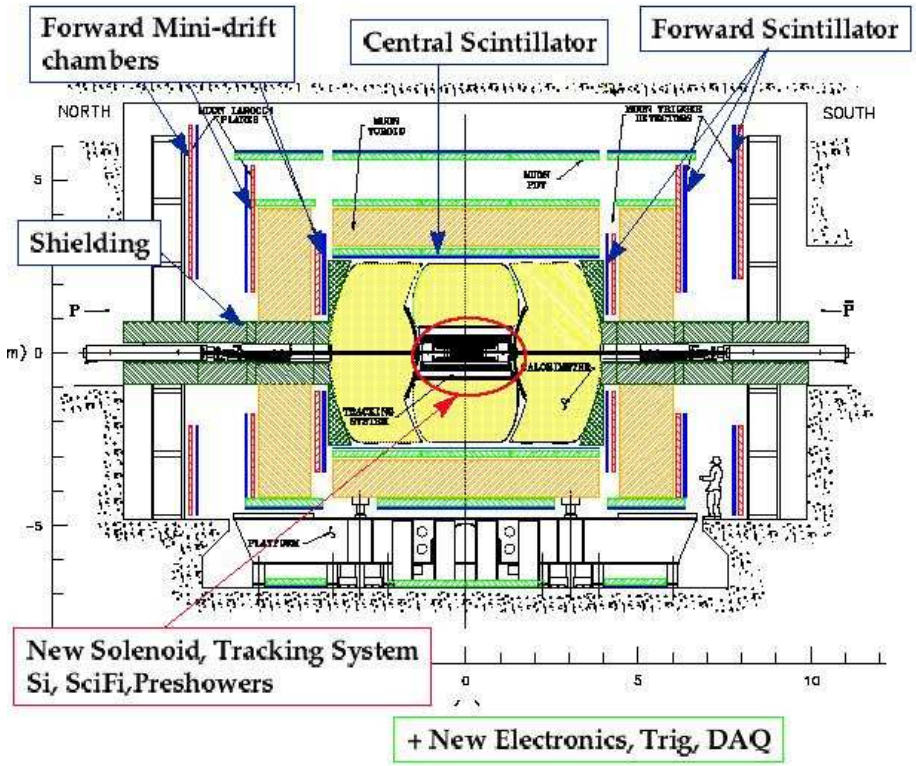
Plan

- Detector D0(Tevatron)
- Main goals
- Key points of calibration process
- Problems in measurement of Jet energy and gluon distribution
- Definition of selection cuts for physical variables
- Histograms
- Summary

Detector D0




Forward Mini-drift chambers
Central Scintillator
Forward Scintillator
NORTH
SOUTH
Shielding
New Solenoid, Tracking System
Si, SciFi,Preshowers
+ New Electronics, Trig, DAQ

The main goals

- To introduce new application criteria for the improvement of calibration accuracy of jet energy with the process "$p\bar{p} \to \gamma + jet + X$" at Tevatron
- To estimate the results

Key points of calibration process

- ✓ To know the transverse momentum of the jet and direct photon
- ✓ To know selection cuts for physical variables and systematic uncertainties,including muons and neutrino contribution.
- ✓ To estimate not detected part of jet momentum (P_t^{Jet})

Problems in measurement of Jet energy

- Different elements of the detector and certain properties of its work can influence the result
- Additional events recorded in the process of gathering information on the trigger signal
- Size of the shower in the calorimeter, problems with jet separation
- Shower outlets outside the calorimeter

As a result, the value of transverse momentum of jet observed (reconstructed) inside the calorimeter can be noticeably different from the value of energy that the jet has after parton-hadron fragmentation, i.e. before registration in the detector

Definition of selection cuts for physical variables

- We select the events with one jet and one photon with

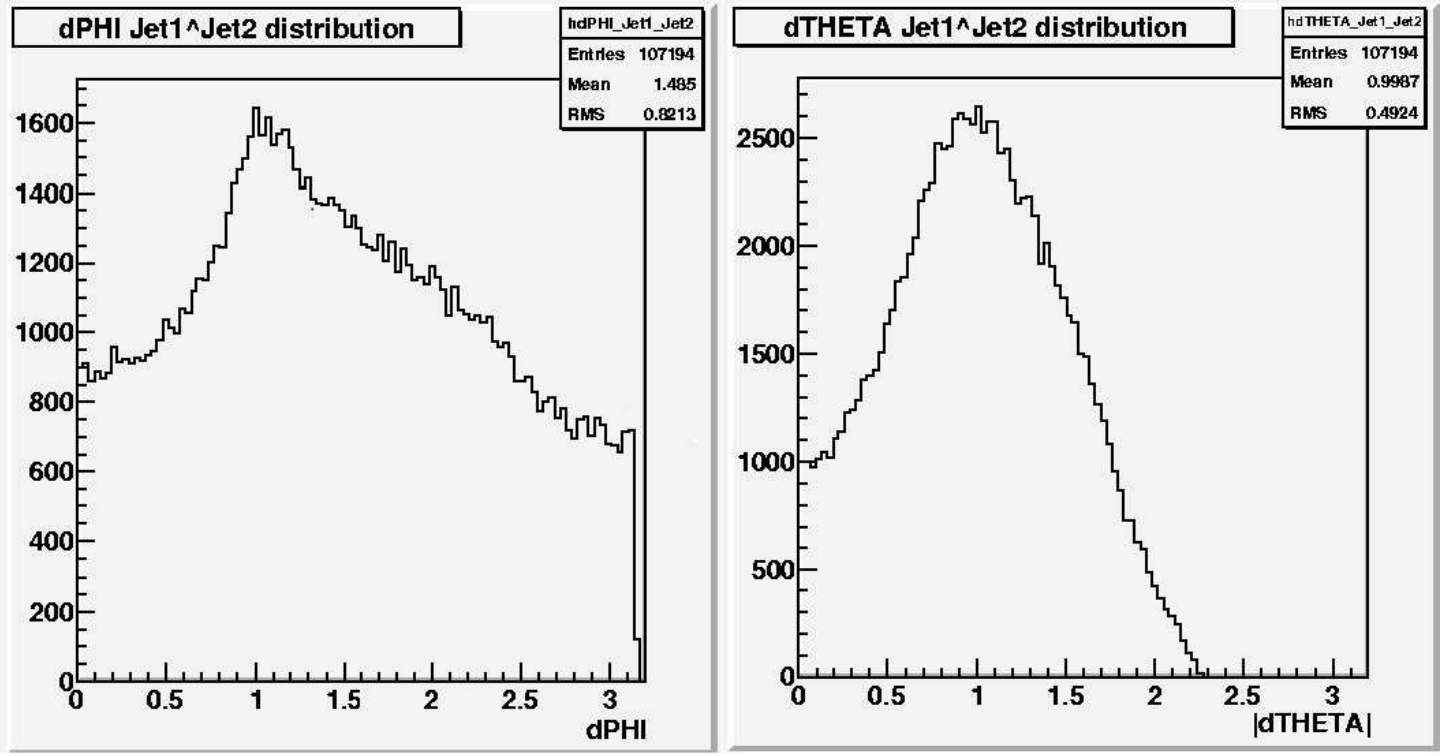
$$P_t^{\gamma} \geq 40\ GeV/c\ ; \qquad P_t^{Jet} \geq 30\ GeV/c$$

- Restrictions of pseudo-rapidity: for jet $|\eta < 5|$ and for photon $|\eta < 2.61|$

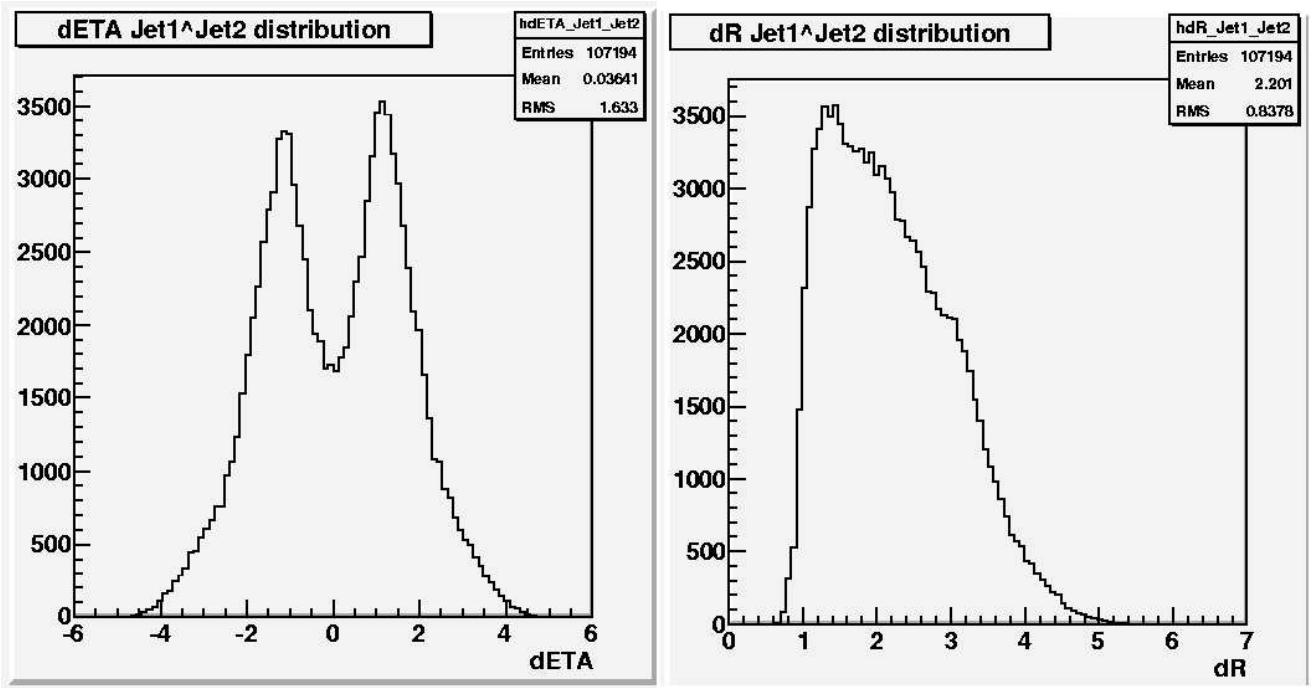
$$\eta = -ln(tg\Theta/2)$$

- Restrictions of pseudo-rapidity for muons $|\eta| < 2.4$ and including of not detected muons $|\eta| > 2.4$
- $dR = ((\Delta\eta)^2 + (\Delta\phi)^2)^{1/2} \geq 0.7$

The angle distributions between Jet1 и Jet2



The distribution of events by the angular difference of the azimuthal ϕ_{jet}(the left graph) and polar Θ_{jet}(the right graph) angles.



Pseudo-rapidity distribution η and jet selection criteria
$R = \sqrt{(\Delta\eta)^2 + (\Delta\phi)^2} >= 0.7$

$$\Delta\phi = \phi_i - \phi_c$$

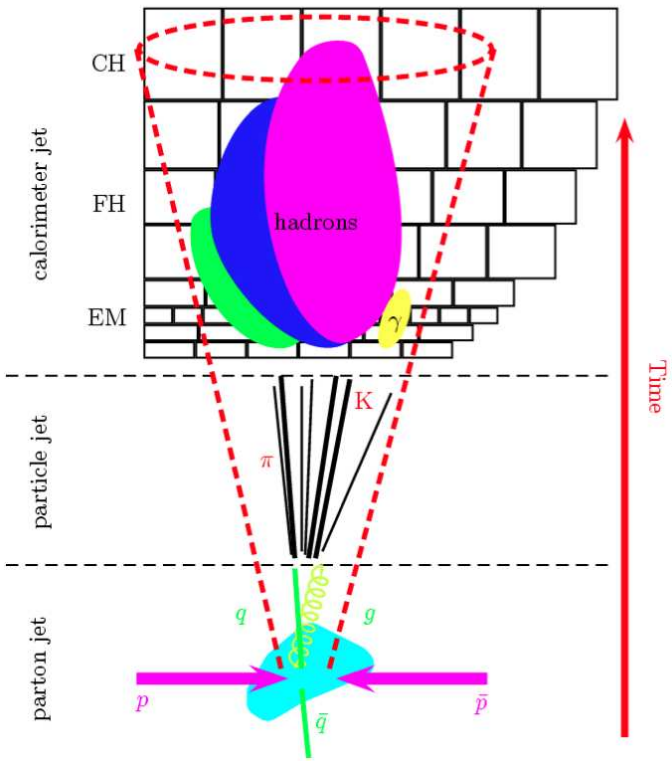
, where ϕ_c, ϕ_i - angles between jet's centre and calorimeter cell (and other elements of detector) with number i.

Summary

1. Calibration accuracy improvement criteria were considered
2. Reducing background events by more than 90 %
3. Number of criteria were criteria were used in the D0 experiment at Fermilab
4. New criteria are planned to be used in the CMS experiment at the LHC.

Thank you!

Адронные струи



Адронная струя – образуется в результате жесткого соударения партонов(кварки, антикаварки и глюоны) входящих в состав протонов и антипротонов. Она состоит из адронов,лептонов и фотонов. Существует несколько подходов для описания струй.Мною рассматривались конусообразная модель струй(так же существует модель струй построенная из кластеров,например, k_T и анти-k_T).

Новые шаги по измерению событий с прямыми фотонами: $\gamma + N - jets$ (N = 1,2,3 ...)

Были использованы события,полученные из генерации с помощью ПИФИЯ(3,5 млн событий). После применения данных критериев отбора, было получены следующие количества событий:

γ + 1 jet = 346 748 событий
γ + 2 jets = 267 328 событий
γ + 3 jets = 176 327 событий
γ + 4 jets = 107 942 событий
γ + 5 jets = 67 852 событий