Analysis of inclusive jet yield in EMCal triggered pp events at √s=2.76 TeV in ALICE

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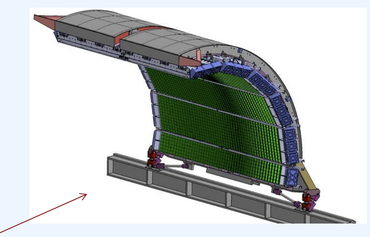
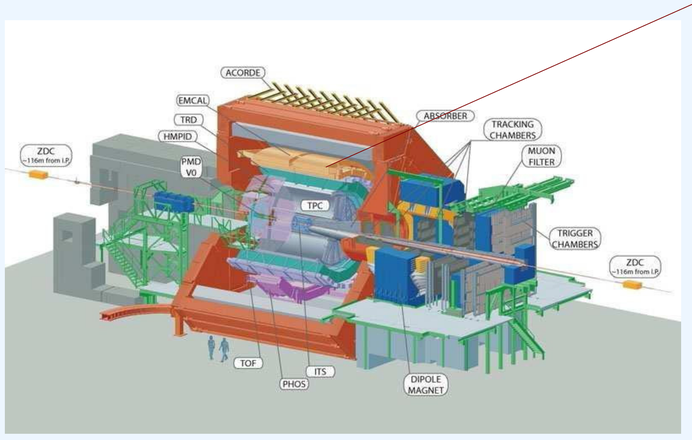
ALICE Experiment

➢ALICE is built to exploit the unique physics potential of heavy-ion collisions at LHC and measure properties of hot, dense and strongly interacting matter - quark-gluon plasma





➢Electromagnetic Calorimeter (EMCal) enhances ALICE's capabilities for jet measurements

➢EMCal is a Pb-scintillator sampling calorimeter with 11520 6cmx6cm towers covering:

- ***-0.7 < η< 0.7***
- ***1.4 < ϕ < 3.14***

Why measure jets in HI collisions?

Jet quenching

➢QCD predicts that highly energetic partons lose energy in quark-gluon plasma

Full jet reconstruction

➢Enables a ***direct study of jet quenching*** – jet-medium interaction

➢Allows for detailed studies of ***modification to the energy flow*** from fragmenting partons as opposed to hadronic observables which suffer from well known biases.

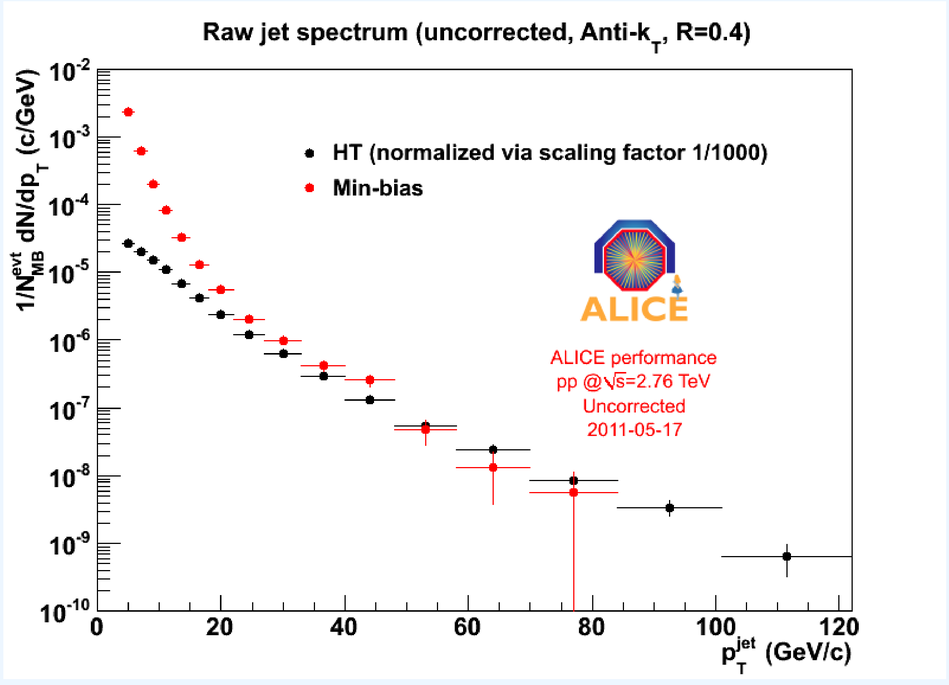
Jets measurement at ALICE

➢The pp measurement at 2.76 TeV is an ***essential reference*** for jet measurements in HI collisions at the same $\sqrt{s_{NN}}$

➢Charged particles are measured in the tracking system, and neutral particles are measured in EMCal

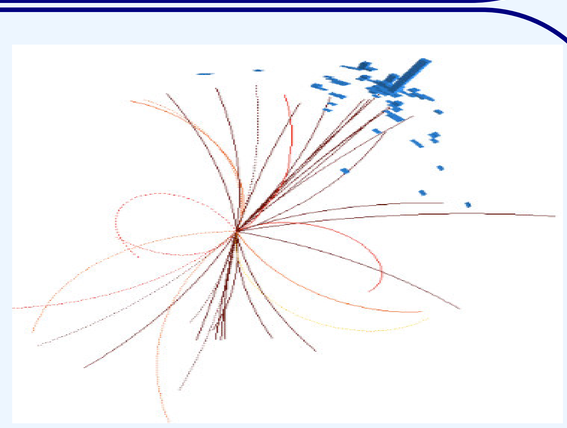
➢Detailed jet structure measurement is down to very low p_T

Uncorrected raw jet spectrum



➢Kinematic cuts
- ➢Tracks: $0.15 < p_T < 40$ GeV/c
- ➢Clusters: $0.15 < E_T < 50$ GeV
- ➢The effect of the upper cut is less than 3% on jet spectrum below 80 GeV/c

➢***Jet definition: anti-kT, R=0.4, E-recombination scheme*** [1]
- ➢$|\eta| < 0.3$
- ➢$1.8 < \varphi < 2.7$
- ➢0.05 < neutral energy fraction < 0.95



Jets at ALICE

➢HT trigger ***greatly extends the kinematic reach of jets***

➢HT trigger however induces bias on jet population. In order to reconstruct the inclusive jet cross-section, we compare to minimum-bias jet sample and ***extract the necessary correction*** from the region where the trigger is expected to be highly efficient (p_T > 25 GeV/c)

Minimum bias vs high-tower trigger

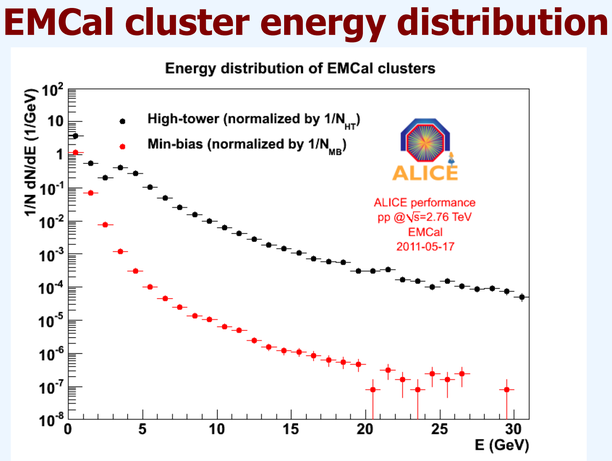
High-tower trigger

➢Trigger patch: sliding window over 4x4 towers

➢Threshold: summed energy in the sliding window > 3 GeV

➢For details: refer to poster "The Level-0 trigger of the ALICE Electromagnetic Calorimeter" by Jiri Kral (board #: 108)

EMCal cluster energy distribution



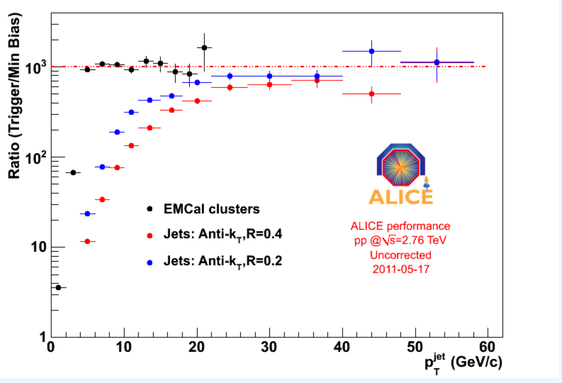
➢The high-tower trigger significantly extends the kinematic reach in cluster energy

➢Recorded HT data sampled $L_{int}=18nb^{-1}$

Assess trigger bias

➢The ratio curve indicates the region for ***trigger bias determination***

➢The same jet is reconstructed with lower p_T for smaller cone radius, and reaches a plateau in ratio earlier for R=0.2 case.

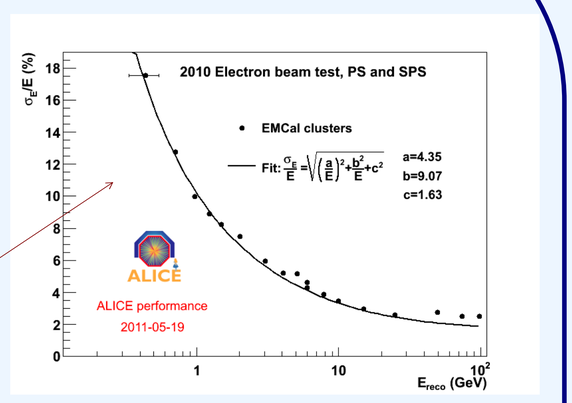


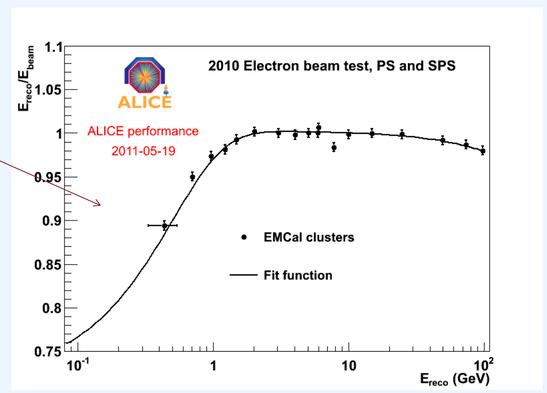
Discussion & Outlook

Jet energy resolution & energy scale

➢Jet energy resolution will be investigated in MC and data
- ➢Tracking resolution: K^0_S, Lambda decays, high-p_T electrons (E/p)
- ➢EMCal energy resolution

➢Jet energy scale
- ➢MC study
- ➢Data: Z+jet, γ+ jet, beam test measurement





Energy double counting

➢Correction for charged particle shower energy

Outlook

➢The EMCal trigger worked very successfully and will be used to select rare events.

➢This analysis will lead to a measurement of the ***inclusive differential cross-section for pp collisions at √s=2.76 TeV***

[1]M. Cacciari, G.P.Salam and G.Sovez, FastJet package.