Measurement of η meson in pp collisions at √s = 7 TeV with the ALICE electromagnetic calorimeter

Olga Driga

for ALICE collaboration

Laboratory SUBATECH, Nantes

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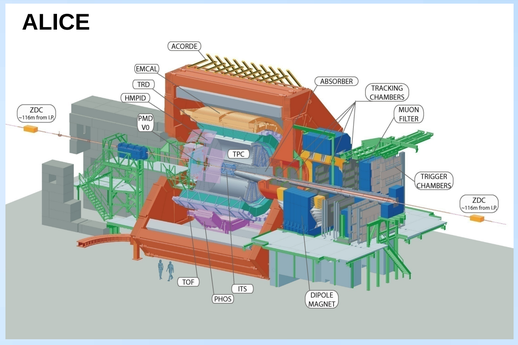
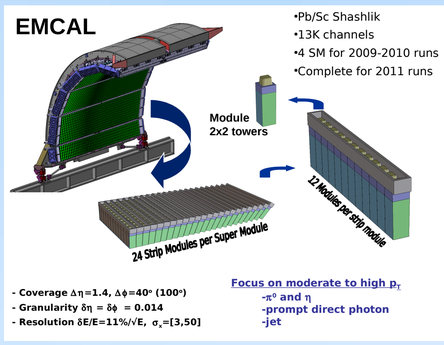
Main physics interests





ALICE is designed to carry out comprehensive measurements of high energy nucleus–nucleus collisions in order to study QCD matter under extreme conditions. One of the first measurement with ALICE electromagnetic calorimeter EMCAL is π^0 and η meson spectra. Light neutral meson detection is a benchmark process necessary to validate the calibration, energy scale, detector performance. The experimental input to the η meson fragmentation function (FF) is not well measured. η to π^0 ratio can give us better precision of η FF.

Details can be found in [1]

EMCAL in pp run 2010

EMCAL is the Pb-Sci electromagnetic calorimeter of a sampling type. In the 2010 run EMCAL consisted of 4 supermodules covering |η|<0.7, Δφ=40°. Each module was assembled from 48x24 towers of a size 6x6cm^2.

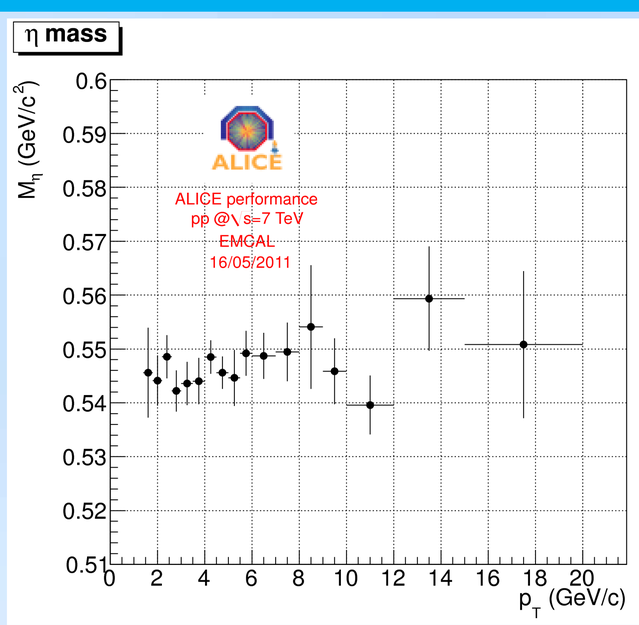
Dataset and event selection

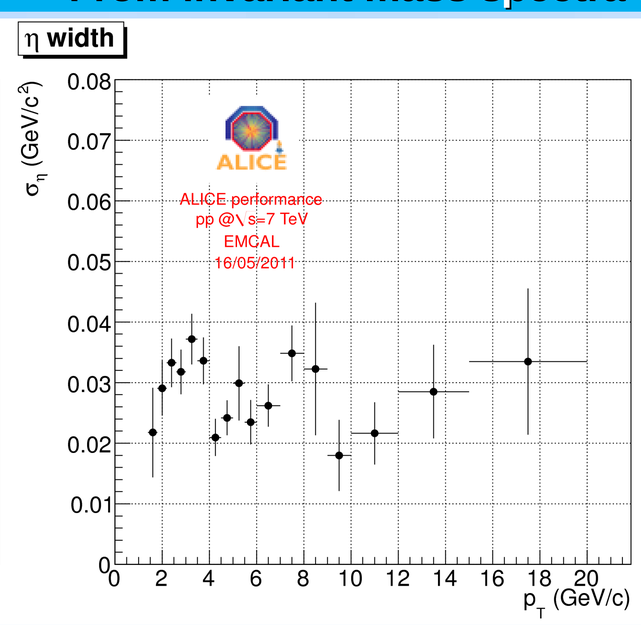
Dataset of 190M minimum bias events with pp collisions at 7 TeV in 2010 were used in the analysis (LT= 3 nb^{-1}). Events were triggered by SPD | V0A | V0C.

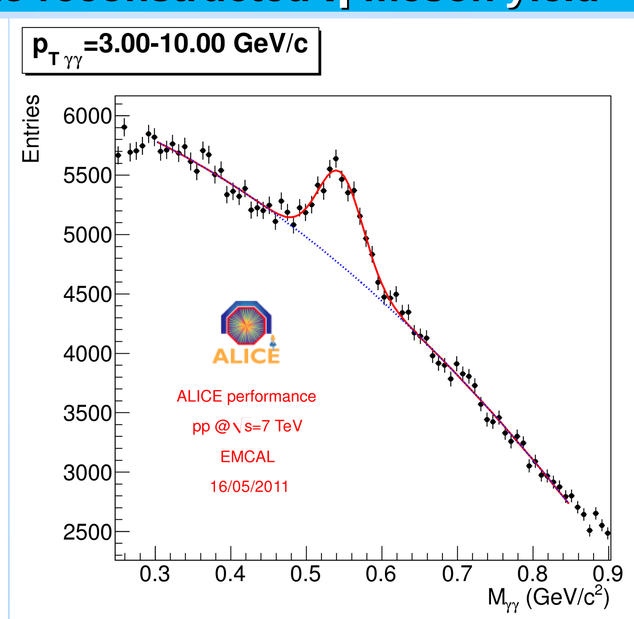
η meson analysis

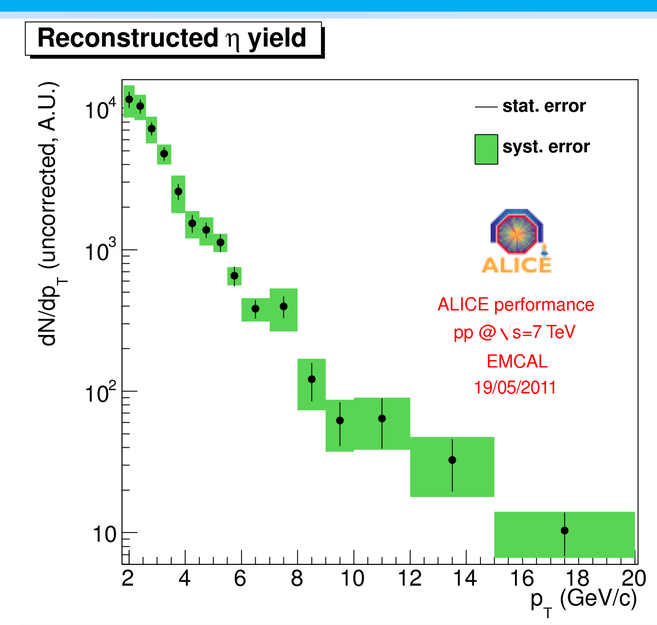
η meson is reconstructed via its two-photon decay from invariant mass analysis. To minimize the impact of photon identification on the spectra, all pairs of clusters with energy>0.5 GeV entered the invariant mass spectrum. Combinatorial background was evaluated by event mixing technique and subtracted from the invariant mass spectra.

From invariant mass spectra to reconstructed η meson yield



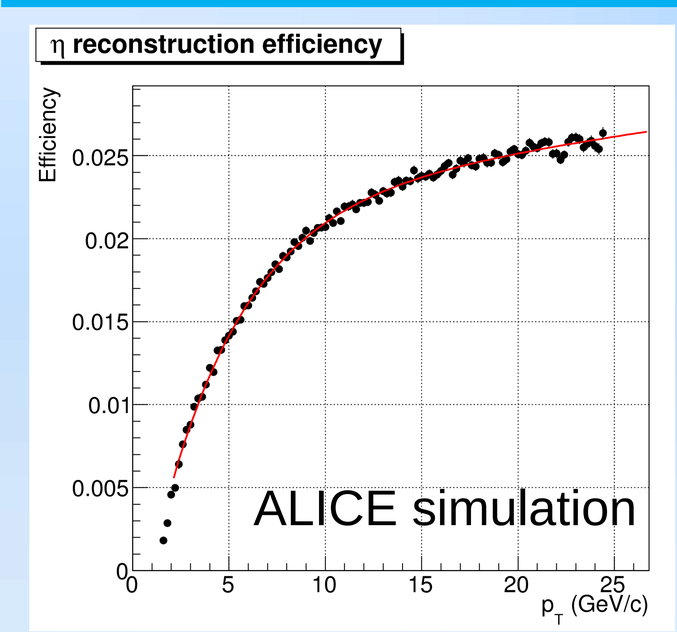






η meson mass corresponds to its PDG value, which is an indication of good linearity of calorimeter energy response.

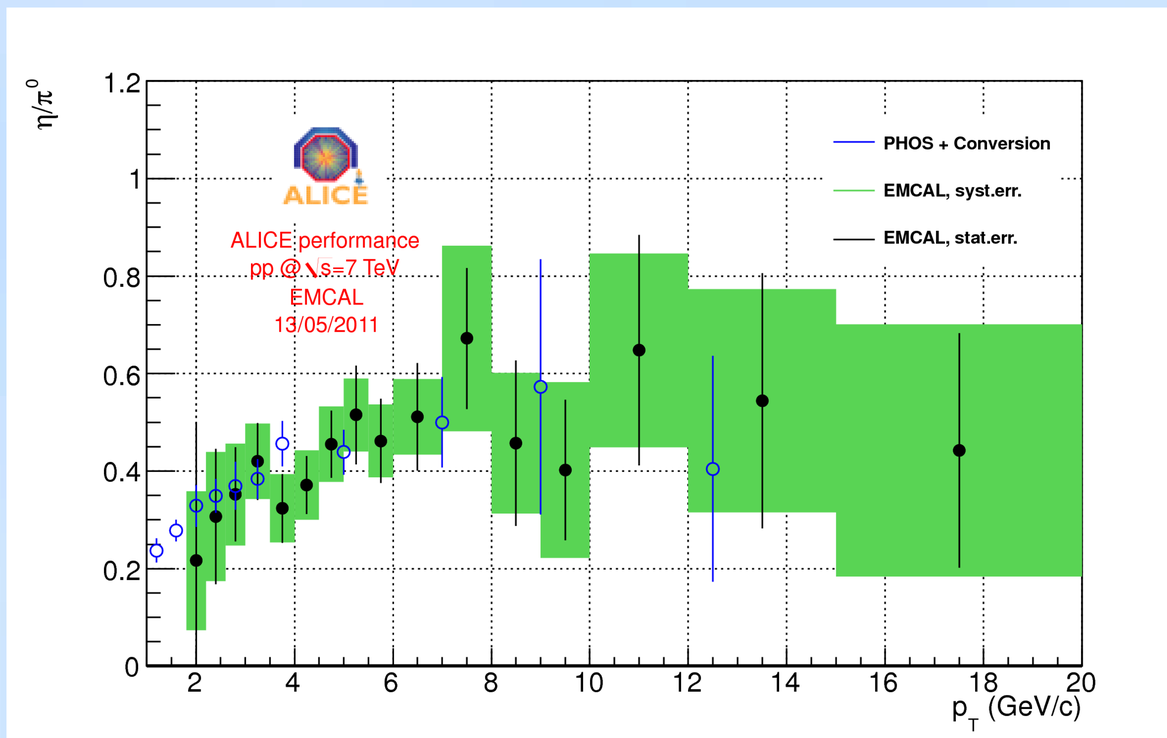
π^0 and η reconstruction efficiency normalized for acceptance



Reconstruction efficiency was calculated in simulations with a single π^0 or η meson generated with a realistic p_T distribution. EMCAL response was corrected for calibration and non-linearity to reproduce the η meson peak position and width. **Reconstruction efficiency was normalized to Δy=1, Δφ=2π.**

See [2] for π^0 details.

η to π^0 ratio



Systematic uncertainties

1. Uncertainty of reconstructed yield extraction
2. Uncertainty of acceptance and reconstruction efficiency
3. Uncertainty due to the finite energy resolution
4. Uncertainty due to the energy scale
5. Uncertainty due to photon loss in the ALICE medium in conversion

The systematic uncertainties (1) and (2) contribute to the η to π^0 ratio.

References:

[1] EMCAL technical proposal. CERN-LHCC-2006-014

[2] Paraskevi Ganoti, "Measurement of pi0 production in p+p collisions at √s = 7 TeV with the ALICE EMCal"