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Jet resolution and energy scale uncertainty in ATLAS

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About one year after the first proton proton collisions at a centre of mass energy of sqrt(s)= 7 TeV the ATLAS experiment has achieved an accuracy of the jet energy measurement between 2-4% for jet transverse momenta from 20 GeV to 2 TeV in the pseudo-rapidity region up to eta=4.5. The jet energy scale uncertainty is derived from in-situ single hadron response measurement a long with systematic variations in the Monte Carlo simulation. In addition, the transverse momentum balance between a central and a forward jet in events with only two jets at high transverse momentum is exploited. The obtained uncertainty is confirmed by direct in-situ measurements exploiting the transverse momentum balance between a jet and a well measured reference like the photon transverse in photon-jet events or the total transverse track momentum. Jets in the TeV-energy regime can be also tested using a system of well calibrated jets at low transverse momenta against a high-pt jet.

The jet energy resolution can be determined in in-situ from the measurement of the transverse momentum balance of a system of two jets (transverse momentum asymmetry). The measurement is based on the direct transverse momentum balance and a decomposition of the transverse jet momentum along the bi-sector of the two jets. Good agreement between data and Monte Carlo simulations is found. Sophisticated jet calibration schemes based on cell energy weighting or exploiting the internal jet structure are also presented. Such calibration schemes improve the jet resolution by 20-30% and in addition reduce the flavour dependence of the jet response.

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