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CMS-DP-2011/008
ECAL 2010 Performance Results

Performance plots of the CMS Electromagnetic Calorimeter based on the 2010 pp data sample..

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Figure	Caption
pdf version Error: (1) can't find tempstab.png at /CMSPublic.EcalDPGResultsDP2011008	Temperature stability of the ECAL Barrel and Endcap detectors during the period June 2010 - December 2010. The temperature measurements are recorded by 6114 active DCU thermistors in the Barrel (170 per SM) and 569 thermistors in the Endcaps (one per supercrystal). The RMS deviation of the temperature measurements for each thermistor over the specified time period is shown. The temperature stability is well within the required limits (<0.05°C for EB, <0.1°C for EE)
pdf version Error: (1) can't find ccC_Deta_EB.png at /CMSPublic.EcalDPGResultsDP2011008 pdf version Error: (1) can't find ccC_Dphi_EB.png at /CMSPublic.EcalDPGResultsDP2011008 pdf version Error: (1) can't find ccC_Deta_EE.png at /CMSPublic.EcalDPGResultsDP2011008 pdf version Error: (1) can't find ccC_Dphi_EE.png at /CMSPublic.EcalDPGResultsDP2011008	Relative alignment of the ECAL crystals and the CMS tracker measured using electrons from Z ee and (chiefly) W e events. The plot shows the residual difference in and between the position of the ECAL supercluster and the tracker based position, which is the point of closest approach to the supercluster position, extrapolating from the innermost track position measurement. The distributions of Δ and Δ are shown for data before and after the ECAL alignment procedure has been carried out. The distributions for perfectly aligned Monte Carlo events are also shown A relative ECAL-tracker alignment precision of 2x10−3 rad in and 2x10−3 units in has been achieved. This meets the ECAL alignment goals for electron ID and di-photon resonance reconstruction, which are 4x10−3 units in Δ and 20x10−3 rad in .
pdf version Error: (1) can't find esalign_dps.png at /CMSPublic.EcalDPGResultsDP2011008	Relative alignment between the CMS tracker and the four ECAL preshower planes. The plot shows the residuals in the X and Y coordinates between the extrapolated track position and the measured preshower hits for each ES plane for 2010 data, both before and after software alignment. Also shown are the alignment residuals for Monte Carlo. Note: the MC is not normalised to the same number of events as the data, to aid visibility of the plots. Residual mis-alignments of 5-10mm between the preshower planes and the CMS tracker are reduced to less than 0.1mm after the ES-tracker alignment procedure
pdf version Error: (1) can't find laserhistory.png at	Relative response to the laser monitoring light (APD/PN ratio in EB, VPT/PN ratio in EE) for example channels

/CMSPublic.EcalDPGResultsDP2011008	in the ECAL Barrel (left) and the ECAL Endcaps (right) between March and December 2010. The effect of crystal transparency loss due to irradiation, and subsequent recovery, is clearly seen.
pdf version Error: (1) can't find pi0_history.png at /CMSPublic.EcalDPGResultsDP2011008 pdf version Error: (1) can't find eta_history.png at /CMSPublic.EcalDPGResultsDP2011008	pi0(top) and eta(bottom) invariant mass history plots, from the reconstruction of di-photon events in the ECAL Barrel for 2010 data, period Sept 22nd-October 30th (Run2010B). Histories are shown before and after corrections to ECAL crystal energy due to transparency loss are applied. The invariant mass is normalised to unity at the start of the run period considered. Uncorrected invariant mass plots show a 1% drop over this period. After laser corrections applied, invariant mass distributions are flat to better than ±0.2% for the majority of the running period. Over the full range, the maximum excursion of the corrected histories is 0.3%
pdf version Error: (1) can't find eop_barrel.png at /CMSPublic.EcalDPGResultsDP2011008 pdf version Error: (1) can't find eop_endcap.png at /CMSPublic.EcalDPGResultsDP2011008	History plot of the ratio of electron energy E, measured in the ECAL, to electron momentum, measured in the tracker, for 2010 data. The electrons are selected from W e decays. The history plots are shown before (open circles) and after (filled circles) corrections to ECAL crystal energy due to transparency loss are applied. The ratio is normalised to unity at the start of the run period considered. Uncorrected ratios show a drop of 1.5% (EB), 6% (EE) during this period. After laser corrections are applied, the E/p histories are flat to better than ±0.2% (EB), ±1% (EE)
pdf version Error: (1) can't find eb_icprecision.png at /CMSPublic.EcalDPGResultsDP2011008 pdf version Error: (1) can't find ee_icprecision.png at /CMSPublic.EcalDPGResultsDP2011008	Crystal energy inter-calibration precision in the ECAL barrel and endcap detectors, measured from the weighted average of pre-calibration constants (test beam + laboratory LY/gain + cosmic ray measurements), and in-situ phi-symmetry, beam-induced muon data, and di-photon invariant mass plots from pi0 and eta decays. The combined inter-calibration precision is shown as a function of eta in EB and EE The crystal inter-calibration precision at low eta in EB is approximately 0.5%, and is better than 1% in all eta rings. The EE inter-calibration precision is 2% or better in the region of EE covered by the preshower, and is 3 to 4 % elsewhere
pdf version Error: (1) can't find esgamma.png at /CMSPublic.EcalDPGResultsDP2011008	GeV/MIP conversion constant for the ES as a function of the electron energy. The MIP signal in each strip of ES is inter-calibrated in-situ. A clustering algorithm associates energy deposits to a cluster in the ECAL EE crystals. The equivalent energy of the ES deposit is converted using the GeV/MIP calibration constant. The ADC/MIP calibration for ES is stable to within a few per cent in the energy range from 60 GeV to 160 GeV. For a typical electron shower about 5% of the

	energy is deposited in the ES. The contribution of the ES ADC/MIP calibration to the EE energy uncertainty is negligible.
pdf version Error: (1) can't find zee_scale_eb.png at /CMSPublic.EcalDPGResultsDP2011008 pdf version Error: (1) can't find zee_scale_ee.png at /CMSPublic.EcalDPGResultsDP2011008	Z ee invariant mass plot, from the reconstruction of di-electron events in the ECAL Barrel and Endcaps for 2010 data. The full 2010 running period (36pb-1) is used. Both data and Monte Carlo distributions are shown, and data is corrected for transparency loss in EB and EE. The top plot requires both electrons to be in the barrel region, and the bottom plot requires both electrons to be in the endcap regions. The ECAL scale has been calibrated as described in CMS-PAS-EGM-003. No further scale adjustment has been applied to EB. The energy scale in EE has been adjusted such that the peak value of the Z mass distribution match in data and MC.
pdf version Error: (1) can't find scaleerror.png at /CMSPublic.EcalDPGResultsDP2011008	Table of systematic error contributions to the ECAL energy scale, evaluated from 2010 data. The leading contributions are: ***Laser corrections:*** Flatness of the pi0,eta and E/p history plots ***Cluster corrections/ES scale:*** Compute the Z invariant mass in data and MC before and after cluster corrections are applied and ES energy is added. Take the difference (data-MC)corrrected - (data-MC)RAW as an estimate of the systematic error ***Linearity:*** Flatness of the Z invariant mass versus electron energy ***Scale extraction method:*** variation of the extracted Z invariant mass due to the choice of fit function, fit range, event selection
pdf version Error: (1) can't find zmumugamma_eb_data.png at /CMSPublic.EcalDPGResultsDP2011008 pdf versionError: (1) can't find zmumugamma_eb_mc.png at /CMSPublic.EcalDPGResultsDP2011008 pdf versionError: (1) can't find zmumugamma_ee_data.png at /CMSPublic.EcalDPGResultsDP2011008 pdf versionError: (1) can't find zmumugamma_ee_mc.png at /CMSPublic.EcalDPGResultsDP2011008	Estimation of photon energy scale from Z μμ events. The ratio plotted, s, is: Ereco/Ekin -1 (Ekin: predicted energy from the difference between the true Z invariant mass and the invariant mass of the μμ system; Ereco: measured energy of the photon) Data and MC distributions of selected photons from 36pb-1 are shown, for EB and EE respectively. The s-factor is extracted from the mean of a Gaussian fit for data. A Crystal ball fit is used for MC. The photon scale agrees with expectations at the 1% level in EB and at the 3% level in EE
pdf versionError: (1) can't find zee_resolution.png at /CMSPublic.EcalDPGResultsDP2011008	Invariant mass distribution of Z ee events for (left) the full sample of Z ee events in EB, (right) the sub-sample of non-showering electrons (low bremstrahlung). Both data and Monte Carlo distributions are shown. Parameters listed are Δm(CB) - the difference (in GeV) between the Crystal Ball mean and the true Z mass, (CB) - the width of the Crystal Ball function. Note: the energy scale of the data distributions have been scaled to match the means of the MC distributions.

-- RiccardoParamatti - 01-Jun-2012

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