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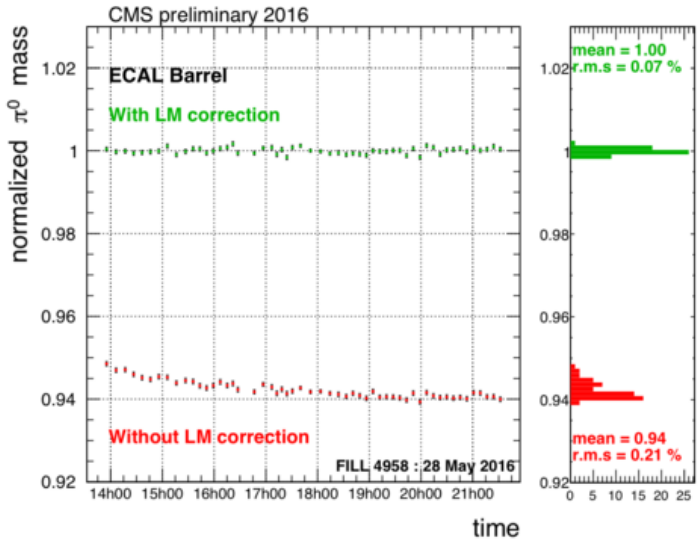
CMS-DP-2016/031

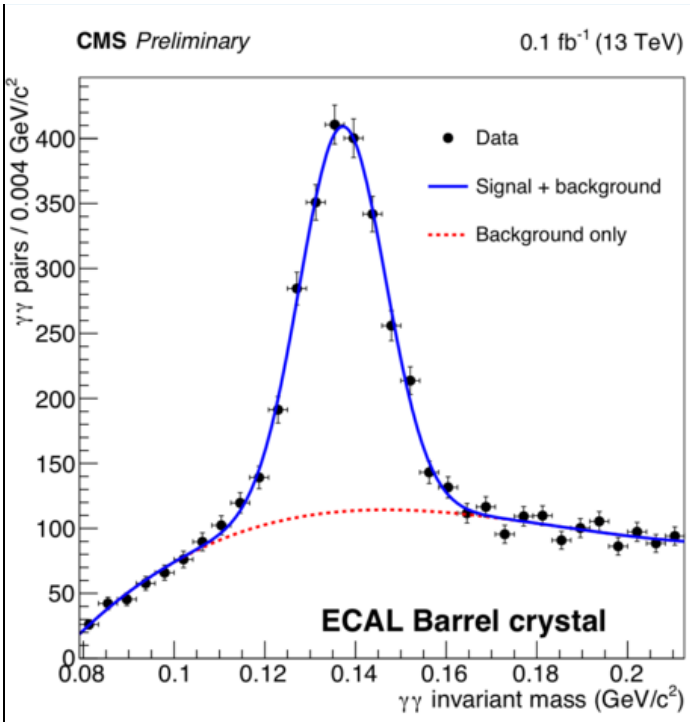
CMS ECAL first results with 2016 data

Abstract: ECAL performance plots with the early 2016 collisions data.

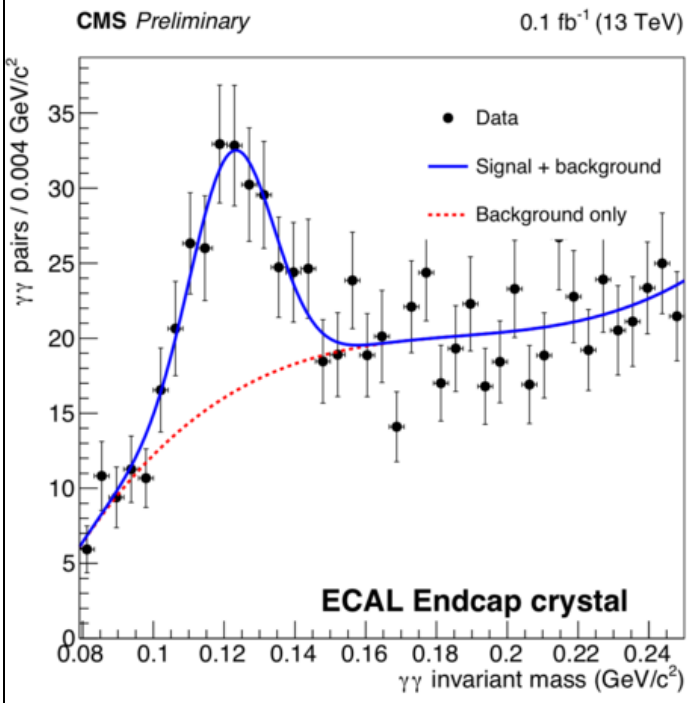
CDS entry

iCMS entry

Figure	Caption
pdf version 	***^{0} invariant mass history*** The plot shows, for a typical LHC fill in 2016, the stability of the relative energy scale measured from the invariant mass distribution of ^{0} decays in the ECAL barrel. The energy scale is measured by fitting the invariant mass distribution of approximately 200,000 photon pairs in the mass range of the ^{0} meson. Each point is obtained from a fit to approximately 8 minutes of data taking. The error bars represent the statistical errors on the fitted peak position. The energy scale is plotted as a function of time, over a period of 8 hours during an LHC fill, for data recorded on 28th May 2016 during LHC fill 4958. The plot shows the data with (green points) and without (red points) light monitoring (LM) corrections applied. The right-hand panel shows the projected relative energy scales.
pdf version	***^{0} mass peak in Barrel*** Invariant mass of photon pairs reconstructed in one crystal of the ECAL Barrel and Endcaps, in the mass range of the ^{0}, during the run 273730 taken in May 2016, corresponding to an integrated luminosity of approximately 100 pb-1. These events are collected by CMS with a dedicated trigger at a rate of 8 (2.5) kHz in the Barrel (Endcap), allowing to save only the minimal information of the events, in particular energy deposits in the ECAL crystals surrounding a possible ^{0} candidate. These events are used as prompt feedback to monitor the effectiveness of the laser monitoring calibration and to inter-calibrate the energy of ECAL crystals.



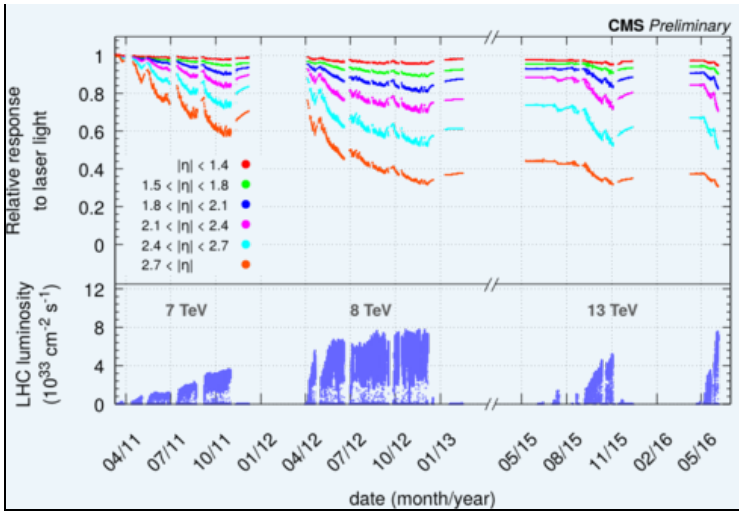
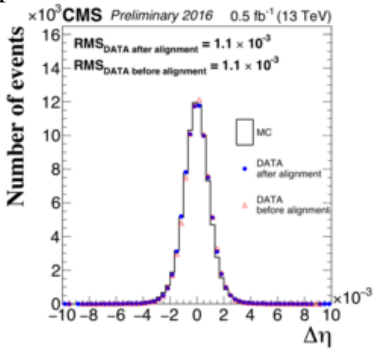
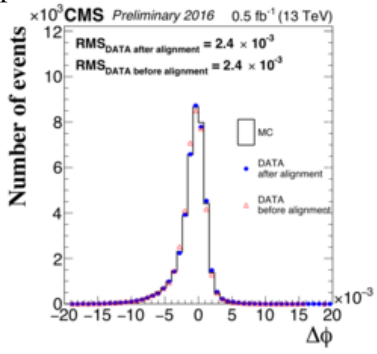
pdf version

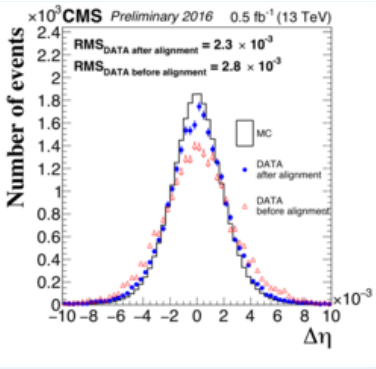
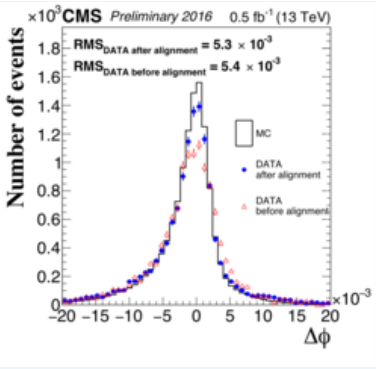
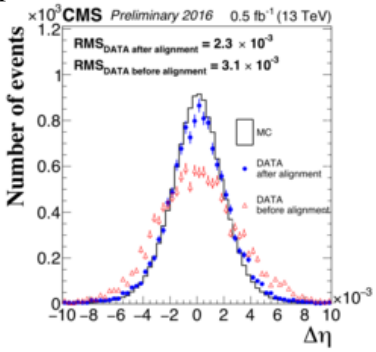
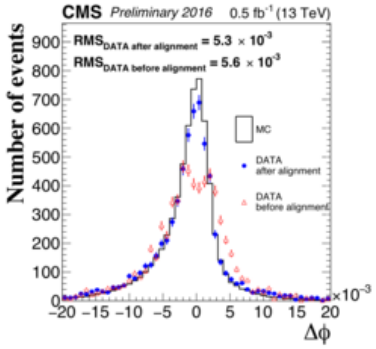


^{0} mass peak in Endcap Invariant mass of photon pairs reconstructed in one crystal of the ECAL Barrel and Endcaps, in the mass range of the ^{0}, during the run 273730 taken in May 2016, corresponding to an integrated luminosity of approximately 100 pb-1. These events are collected by CMS with a dedicated trigger at a rate of 8 (2.5) kHz in the Barrel (Endcap), allowing to save only the minimal information of the events, in particular energy deposits in the ECAL crystals surrounding a possible ^{0} candidate. For the candidates in the Endcaps in the region covered by the Preshower (ES, 1.7<abs( )<2.55), the position of the ES is used. These events are used as prompt feedback to monitor the effectiveness of the laser monitoring calibration and to inter-calibrate the energy of ECAL crystals.

pdf version

History of ECAL response with laser data during 2011-2016 Relative response to laser light (440 nm in 2011 and 447 nm from 2012 onwards) injected in the ECAL crystals, measured by the ECAL laser monitoring system, averaged over all crystals in bins of pseudorapidity, for the 2011, 2012, 2015 and 2016 data taking periods, with magnetic field at 3.8 T. The response change observed in the ECAL channels is up to 6% in the barrel and it reaches up to 30% at ~ 2.5, the limit of the tracker acceptance. The response

	change is up to 70% in the region closest to the beam pipe. The recovery of the crystal response during the Long-Shutdown-1 period is visible, where the response was not fully recovered, particularly in the region closest to the beam pipe. These measurements are used to correct the physics data. This is an update of the plots appearing in CMS-DP-2012/007, CMS-DP2012/015, CMS DPS 2015-016, and CMS-DP-2015-063 and includes measurements taken up to June 2016. The bottom plot shows the instantaneous LHC luminosity delivered during this time period.
pdf version 	pdf version 	***ECAL Alignment: Barrel*** Relative alignment of the ECAL **barrel** crystals and the CMS tracker measured using electrons from Z ee events. The plot shows the residual difference in (left) and in (right) 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 using the 2015 ECAL alignment and aier the ECAL alignment procedure has been carried out with 2016 data. The distributions for perfectly aligned Monte Carlo events are also shown. The Δ distribution for electrons and positrons is asymmetric and specular against lepton charge. In the previous plots electrons are shown. Plots are shown for the inclusive barrel. **Technical details**: Uses electrons from Z ee (about 0.5/fb). Uses "Golden" (low bremsstrahlung) electron selection. Alignment procedure involves translational offsets (x,y,z), and also rotations in EE. **Conclusion:** Relative ECAL-tracker alignment precision of 2x10^{-3} rad in and 1x10^{-3} units in in the barrel has been achieved. This meets the ECAL alignment goals for electron ID and di-photon resonance reco, which are 4x10^{-3} units in and 20x10^{-3} rad in .
pdf version	pdf version	***ECAL Alignment: Endcap*** Relative alignment of the ECAL **endcap** crystals and the CMS tracker measured using electrons from Z ee events. The plot shows the residual difference in (left) and in (right) 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 using the 2015 ECAL alignment and aier the ECAL alignment procedure has been carried out with 2016 data. The distributions for perfectly aligned Monte Carlo events are also shown. The Δ distribution for electrons and positrons is asymmetric and specular against lepton charge. In the previous plots electrons are shown. Plots are shown for the inclusive endcap. **Technical details**: Uses electrons from Z ee (about 0.5/fb). Uses "Golden" (low bremsstrahlung) electron selection. Alignment procedure involves translational offsets (x,y,z), and also rotations in EE. **Conclusion:** Relative ECAL-tracker alignment precision of 5×10^{-3} rad in and 2×10^{-3} units in in the endcap has been achieved. This meets the ECAL alignment goals for electron ID and di-photon resonance reco, which are 4×10^{-3} units in and 20×10^{-3} rad in .
pdf version 	pdf version 	***ECAL Alignment: Endcap, <0 side*** Relative alignment of the ECAL **endcap minus** crystals, where the initial misalignment was larger, and the CMS tracker measured using electrons from Z ee events. The plot shows the residual difference in (left) and in (right) 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 using the 2015 ECAL alignment and aier the ECAL alignment procedure has been carried out with 2016 data. The distributions for perfectly aligned Monte Carlo events are also shown. The Δ distribution for electrons and positrons is asymmetric and specular against lepton charge. In the previous plots electrons are shown. Plots are shown for the inclusive endcap. **Technical details**: Uses electrons from Z ee (about 0.5/fb). Uses "Golden" (low bremsstrahlung) electron selection. Alignment procedure involves translational offsets (x,y,z), and also rotations in EE. **Conclusion:** Relative ECAL-tracker alignment precision of 5×10^{-3} rad in and 2×10^{-3} units in in the endcap has been achieved. This meets the ECAL alignment goals for electron ID and

		di-photon resonance reco, which are $4x10^{-3}$ units in and $20x10^{-3}$ rad in .

-- EmanueleDiMarco - 2016-06-22

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