ECAL Alignment 2017
Plots for Approval

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ECAL DPG Meeting
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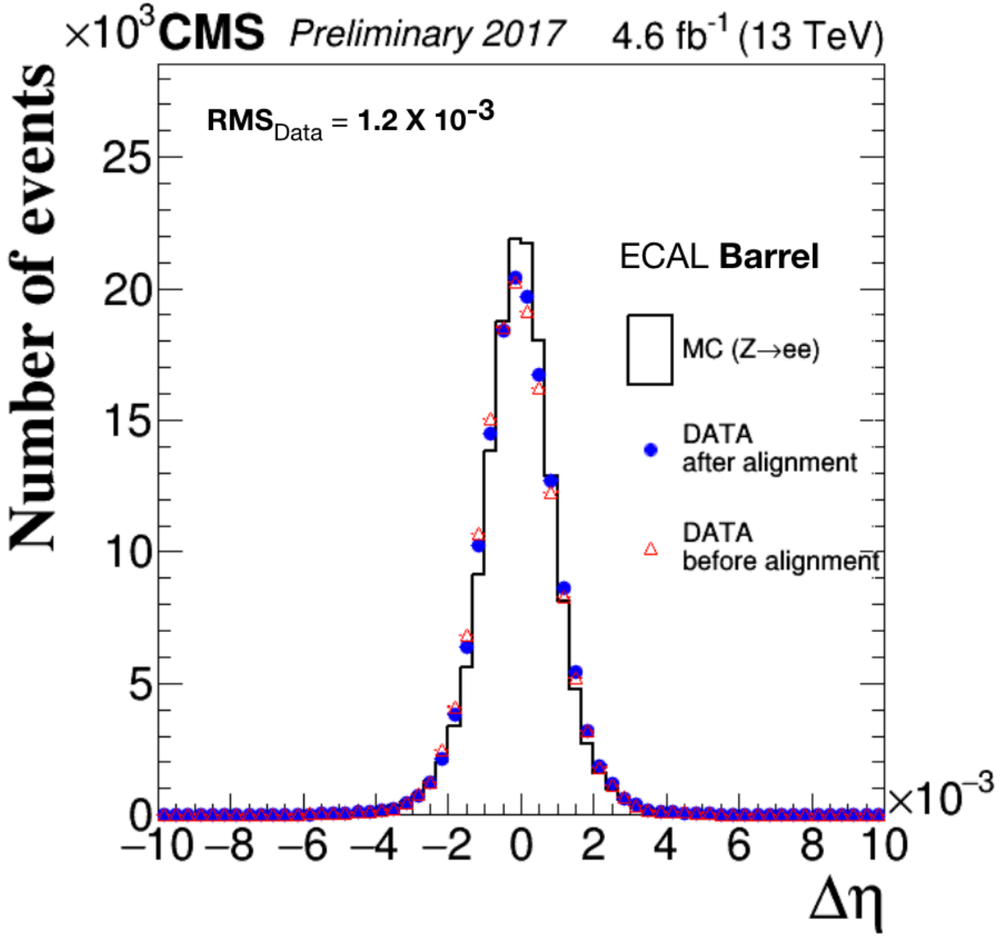
Outline

- Present summary plots for ECAL alignment (2017 data)
- Δη and Δφ distributions for ECAL barrel and endcap
- Full set of plots are here :

http://twamorka.web.cern.ch/twamorka/ECALAlignment/2017_Result_Approval/MC_Data_prepostcompare/images/

Δη

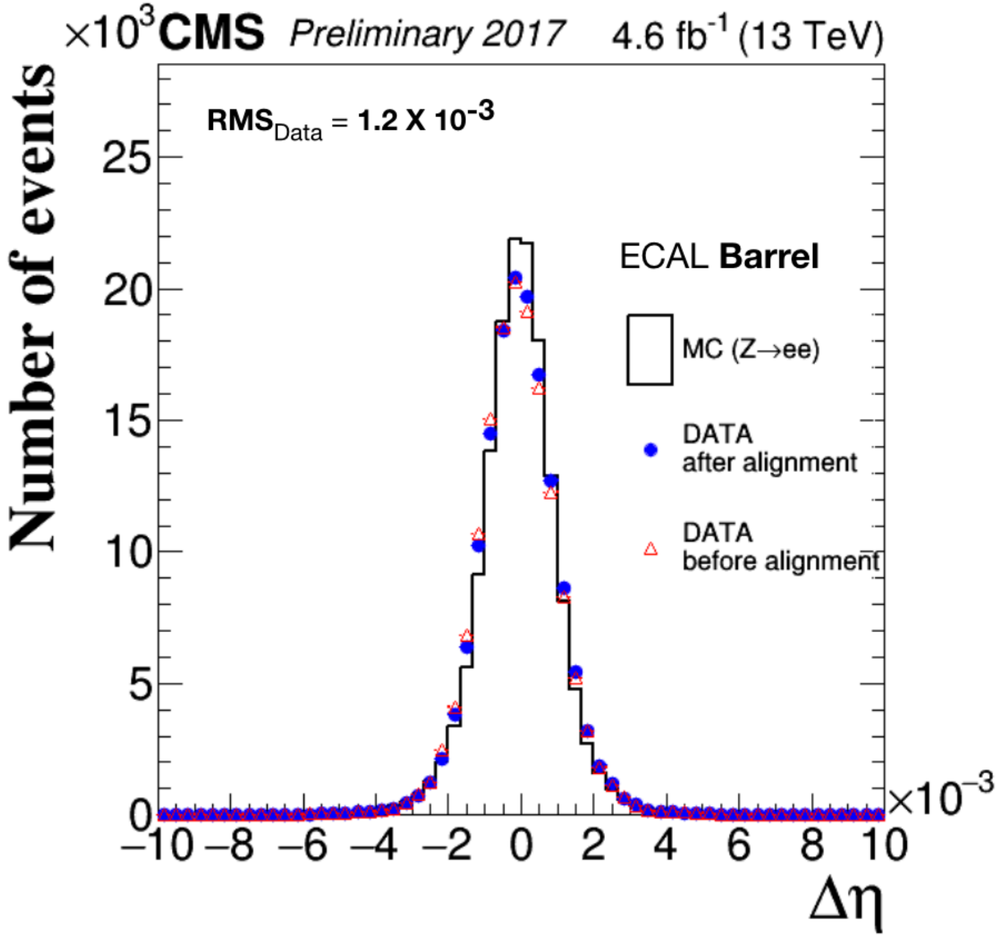


Δη distribution for ECAL barrel

- Distribution of the pseudorapidity difference between the position reconstructed by ECAL Supercluster and the position extrapolated by tracker.

- Black line : MC distribution
- Red triangles : Data, before the alignment procedure is performed
- Blue Dots : Data, after alignment procedure is performed with 2017 Data

Δη



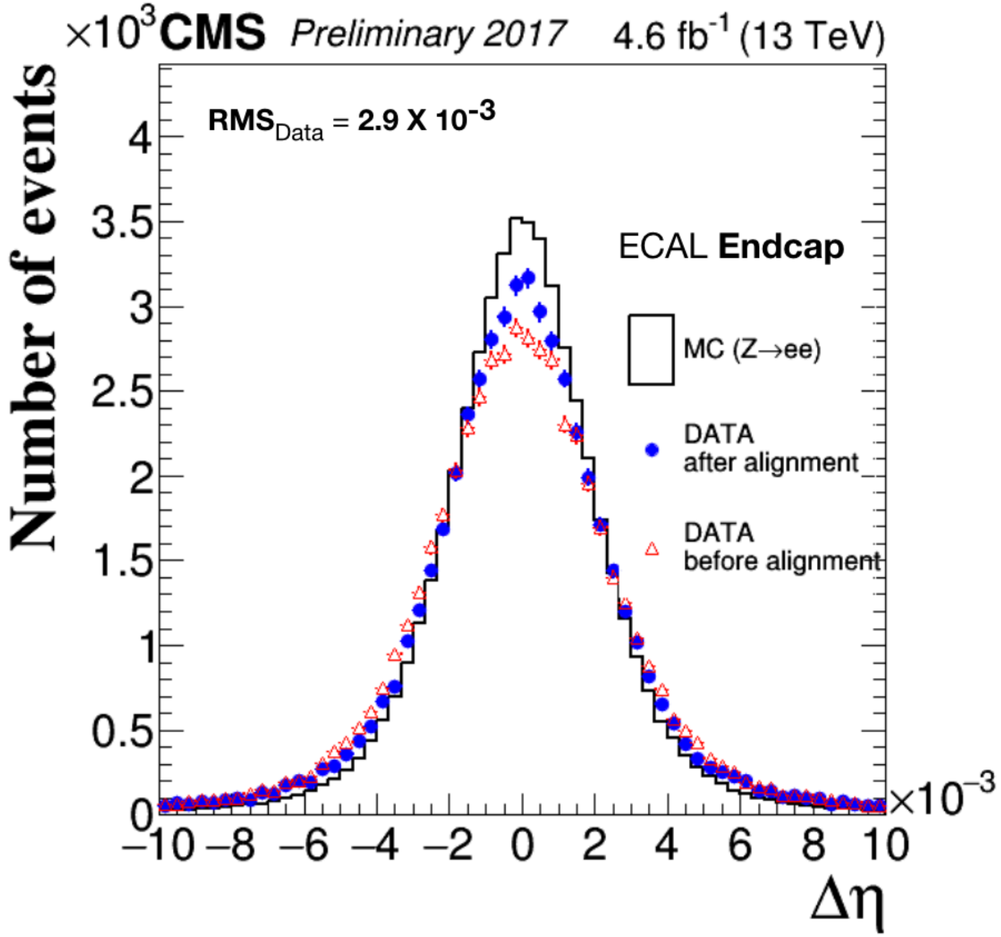
Δη distribution for ECAL barrel

CAPTION

Relative alignment of ECAL Barrel crystals and the CMS Tracker

- The relative alignment is measured using electrons from Z→ee events. This is done by minimizing the distance between position measurements provided by ECAL and the track extrapolated on ECAL with respect to three dimensional translations (x,y,z) (and three Euler angles in Endcap). The figure on the left shows the **Δη distribution for ECAL barrel.**
- At the beginning of data taking, the ECAL Supercluster and Tracker matching for electrons is loosened at the trigger level. This is done to remove any potential bias due to change in alignment measurement.
- Alignment procedure was performed with **2017 Data(4.6 fb^{-1})** and the MC (Z→ee) events are also shown.
- Relative ECAL-tracker precision of **1 X 10^{-3} (in η units)** has been achieved. This meets the ECAL alignment goals of 4 X 10^{-3} in η units and 20 X 10^{-3} rad in **Φ** for electron ID and Di-photon resonance reconstruction.

Δη



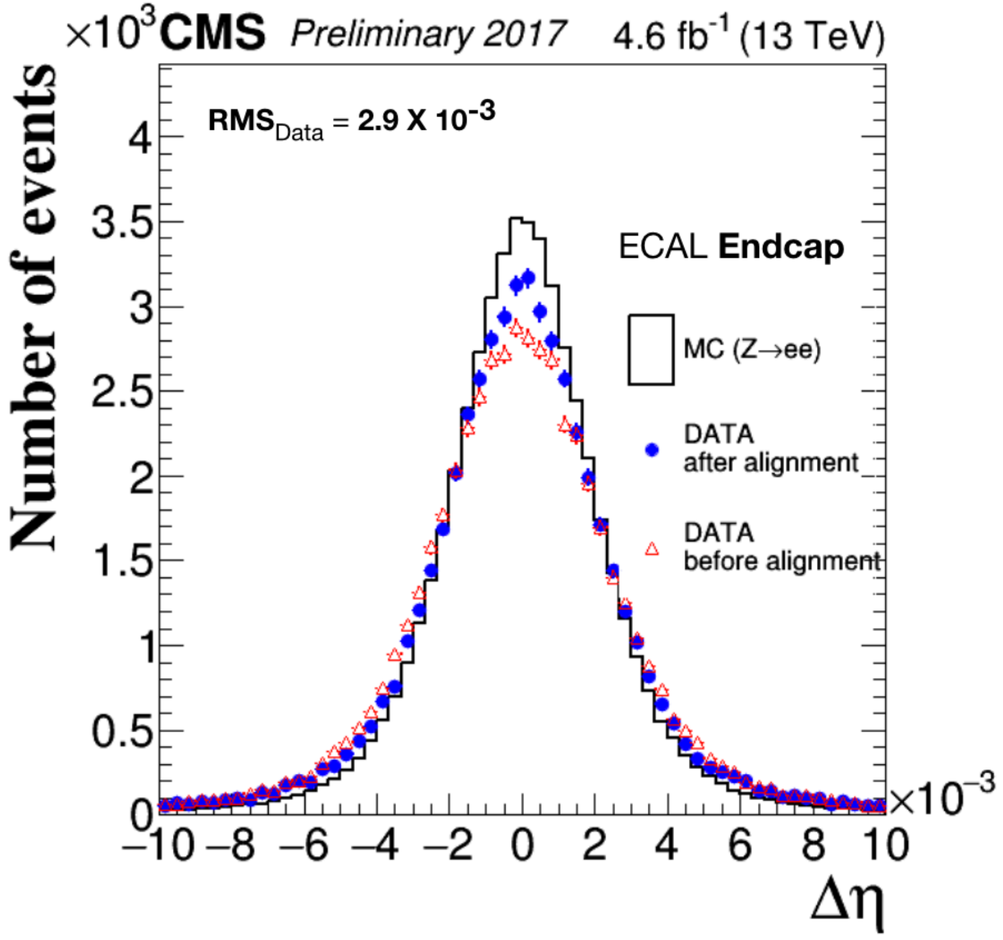
Δη distribution for ECAL endcap

- Distribution of the pseudorapidity difference between the position reconstructed by ECAL Supercluster and the position extrapolated by tracker.

- During the winter shutdown of 2016, the ECAL endcaps were opened and closed as a result of which a small misalignment was measured in the endcaps with respect to 2016. The alignment procedure improves the Data-MC agreement.

- Black line : MC distribution
- Red triangles : Data, before the alignment procedure is performed
- Blue Dots : Data, after alignment procedure is performed with 2017 Data

Δη



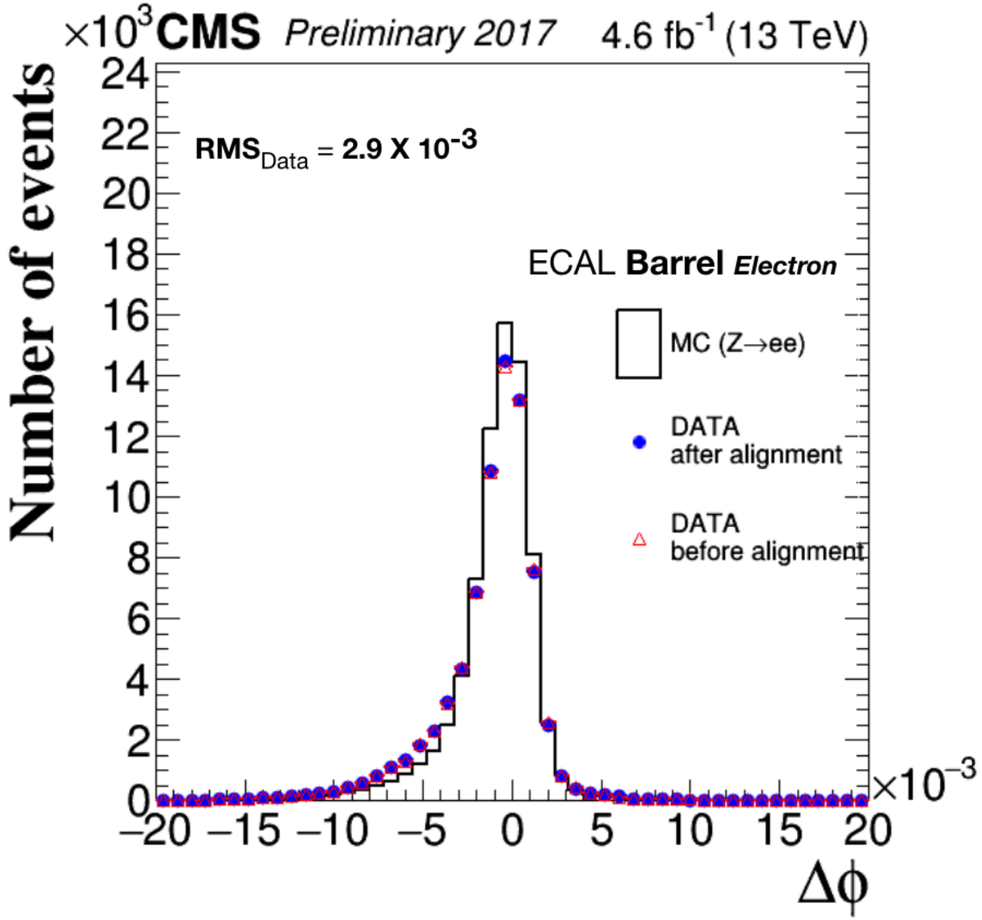
Δη distribution for ECAL endcap

CAPTION

Relative alignment of ECAL Endcap crystals and the CMS Tracker

- The relative alignment is measured using electrons from Z→ee events. This is done by minimizing the distance between position measurements provided by ECAL and the track extrapolated on ECAL with respect to three dimensional translations (x,y,z) (and three Euler angles in Endcap). The figure on the left shows the **Δη distribution for ECAL Endcap .**
- At the beginning of data taking, the ECAL Supercluster and Tracker matching for electrons is loosened at the trigger level. This is done to remove any potential bias due to change in alignment measurement.
- Alignment procedure was performed with **2017 Data(4.6 fb^{-1})** and the MC (Z→ee) events are also shown.
- Relative ECAL-tracker precision of **3 X 10^{-3} (in η units)** has been achieved. This meets the ECAL alignment goals of 4 X 10^{-3} in η units and 20 X 10^{-3} rad in **Φ** for electron ID and Di-photon resonance reconstruction.

Δφ : Electrons



- Distribution of the azimuthal angle difference between the position reconstructed by ECAL Supercluster and the position extrapolated by tracker **for electrons**.

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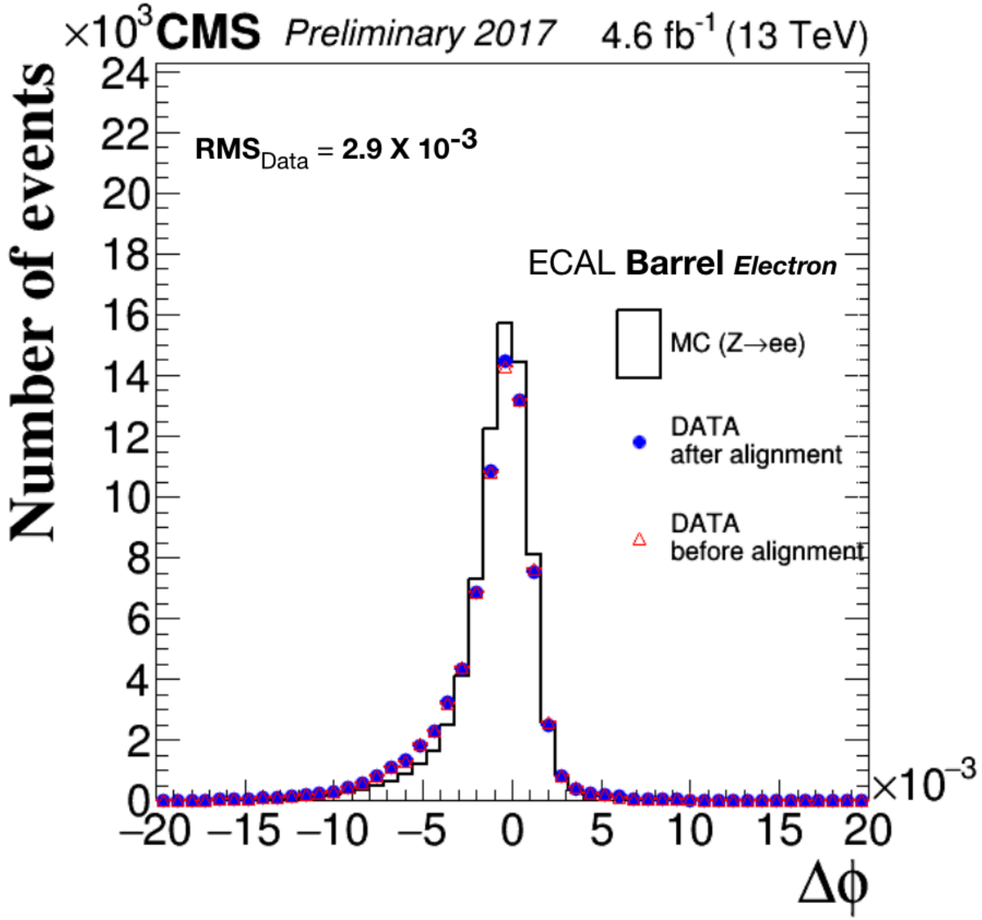
Δφ distribution for ECAL barrel

Δφ : Electrons



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- The opposite sign of lepton charge is responsible for opposite **Φ** bending in the magnetic field for electrons and positrons.
- The figure on the left shows the **ΔΦ distribution for ECAL Barrel (for electrons).**
- At the beginning of data taking, the ECAL Supercluster and Tracker matching for electrons is loosened at the trigger level. This is done to remove any potential bias due to change in alignment measurement.
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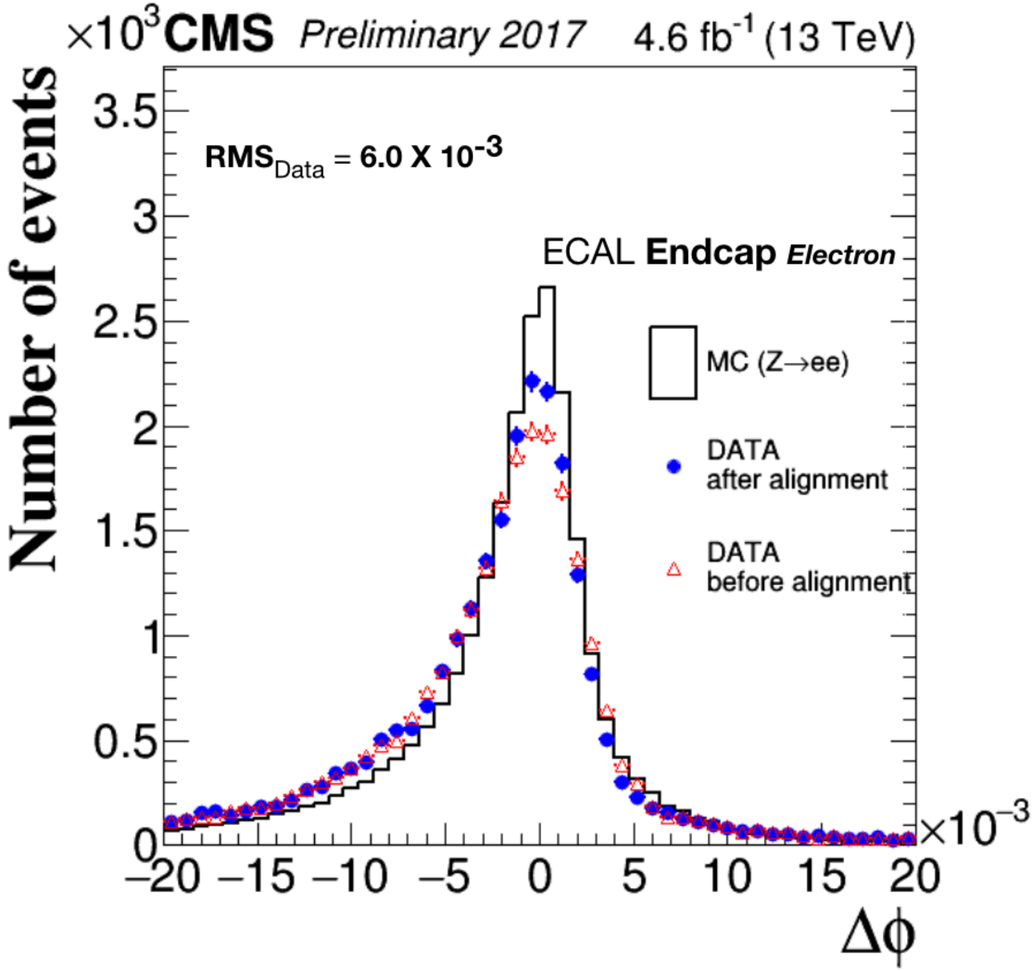

Δφ distribution for ECAL endcap

- Distribution of the azimuthal angle difference between the position reconstructed by ECAL Supercluster and the position extrapolated by tracker **for electrons**.

- During the winter shutdown of 2016, the ECAL endcaps were opened and closed as a result of which a small misalignment was measured in the endcaps with respect to 2016. The alignment procedure improves the Data-MC agreement.

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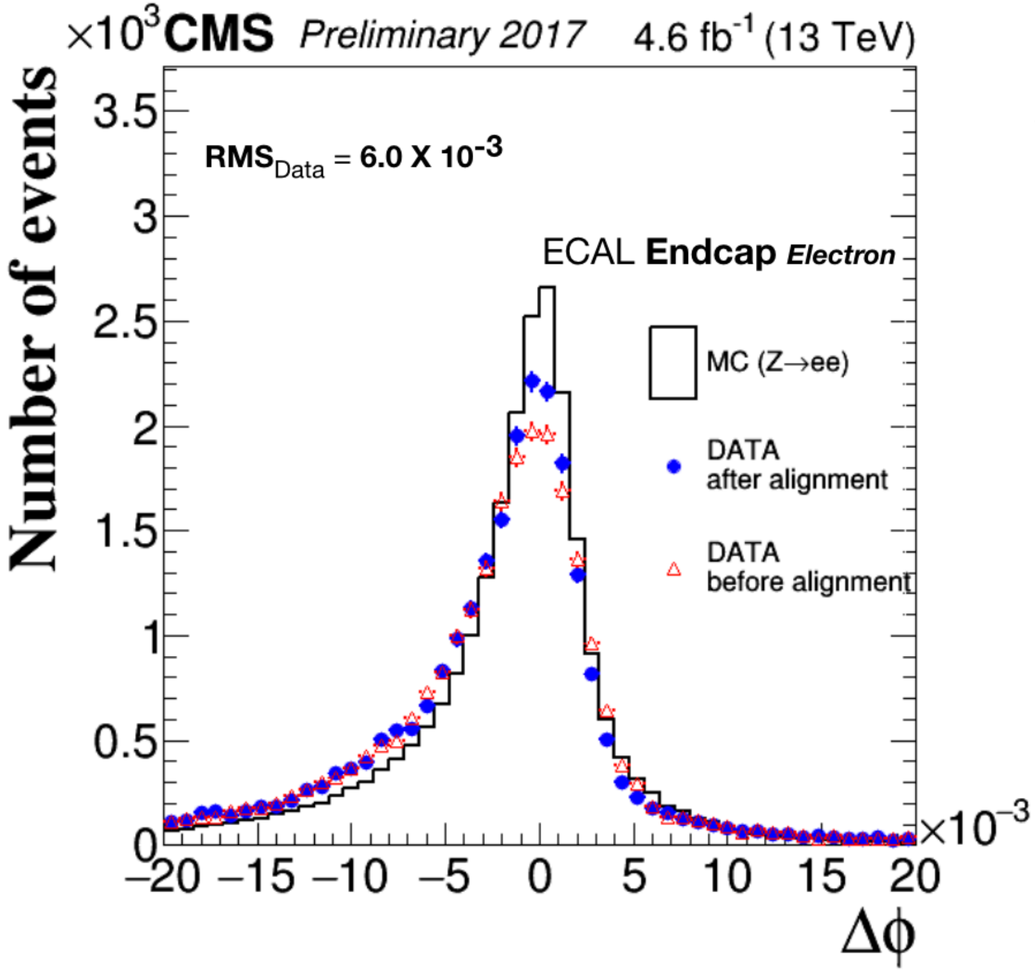
Δφ : Electrons



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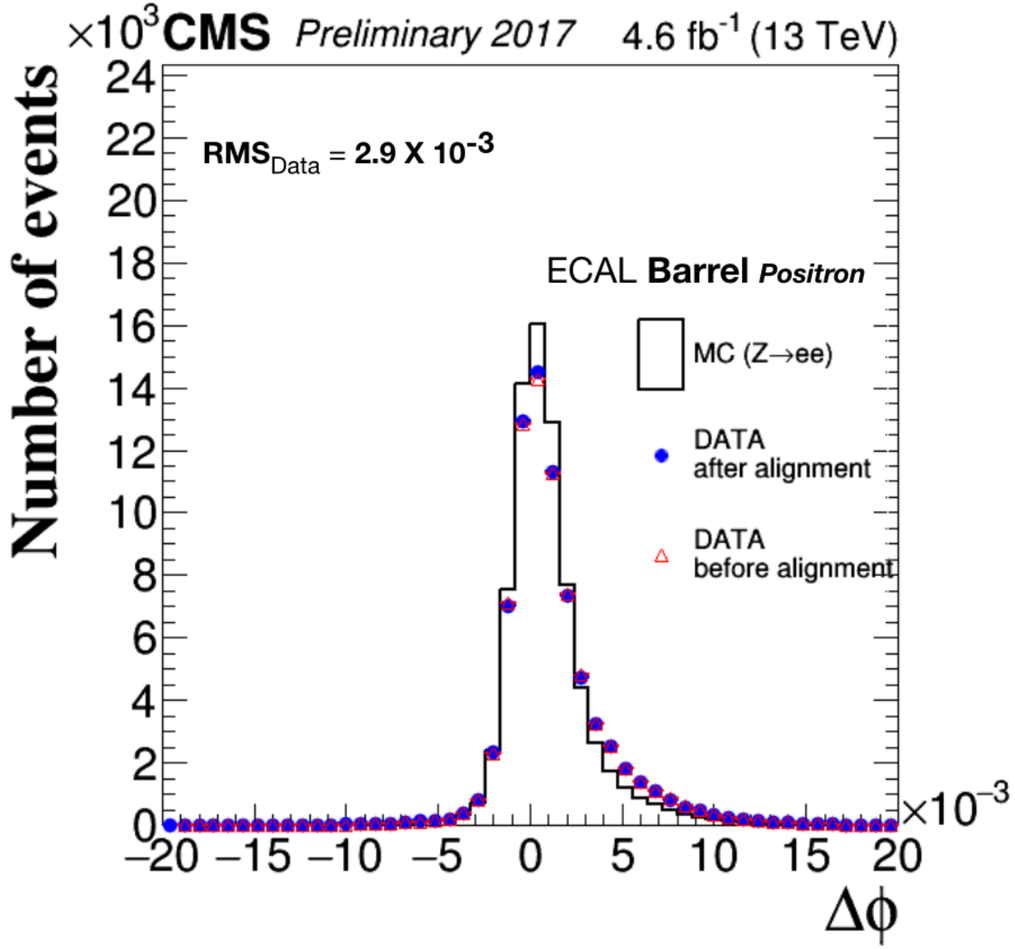
Δφ : Positrons



Δφ distribution for ECAL barrel

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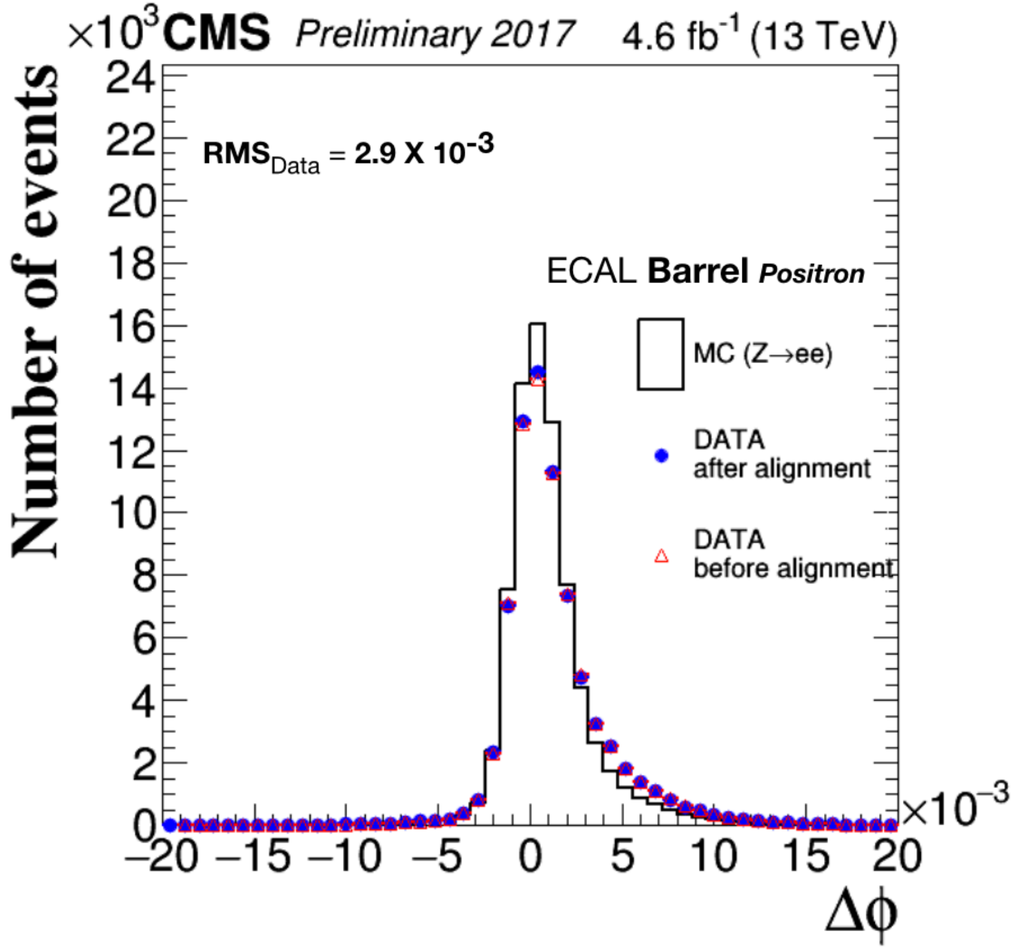

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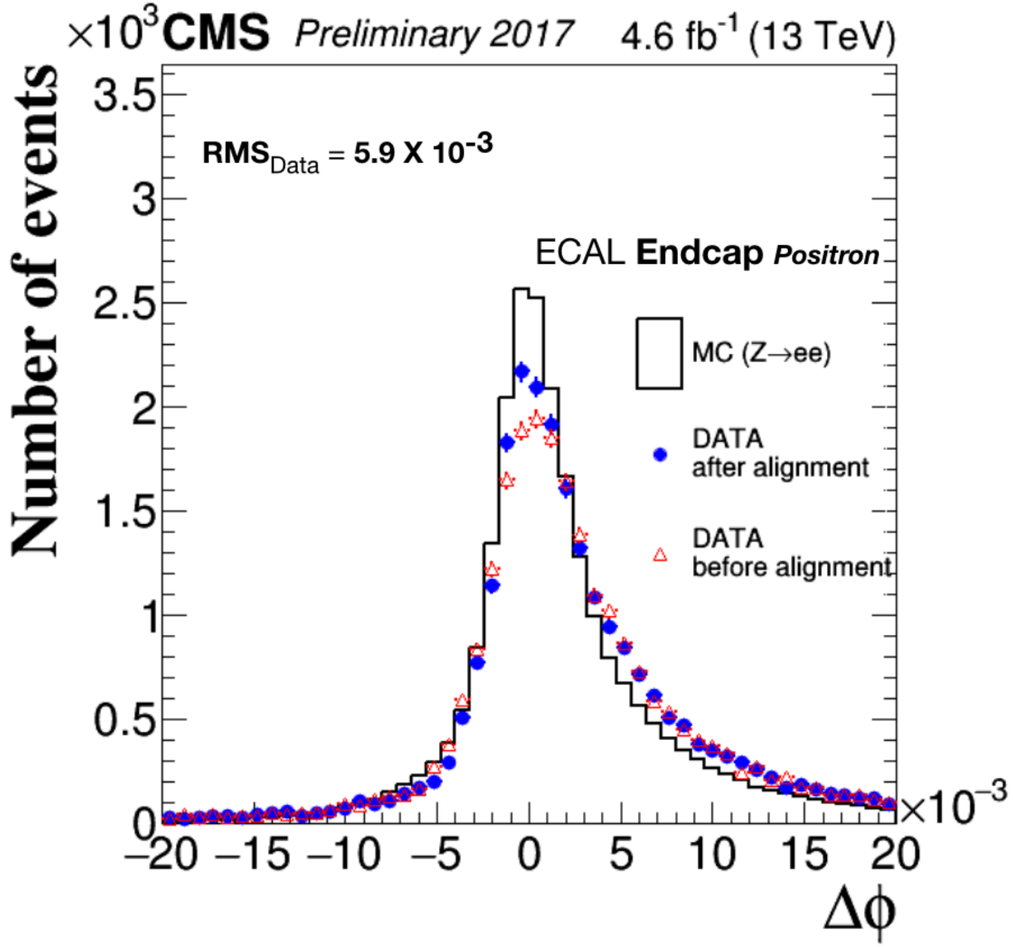

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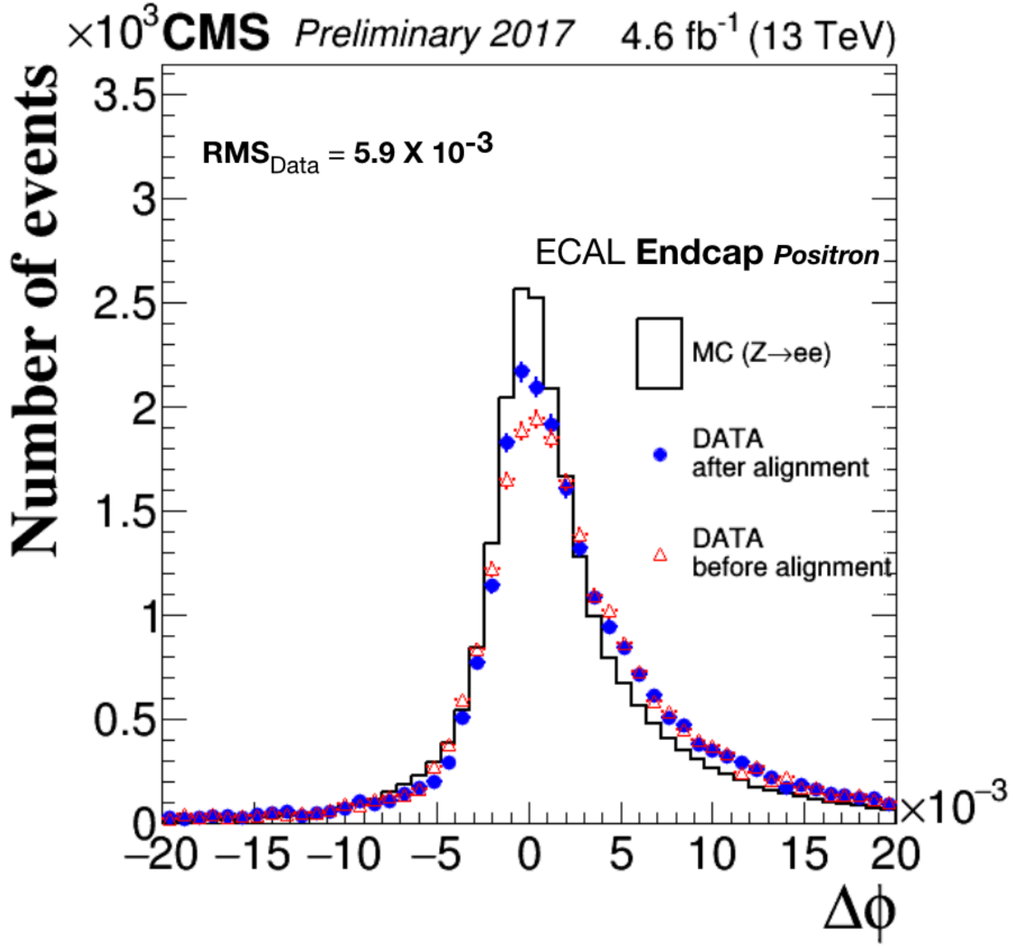

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