ECAL Alignment 2018

MoCa Meeting
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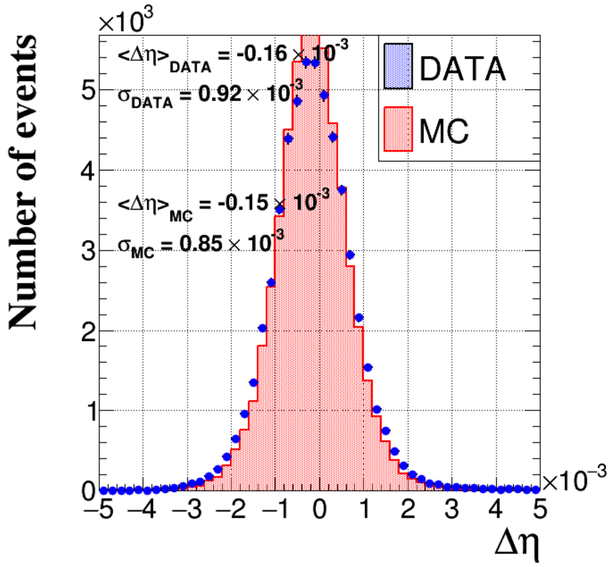
Outline

- ECAL alignment was performed for 2018 and first results were discussed on 9th May'18 Link
- New tracker alignment was deployed into prompt; starting run 316059 and prompt GT 101X_dataRun2_Prompt_v9 was updated w/ new tracker as well as ECAL alignment
- Monitoring Δη and Δφ values to make sure everything is OK with new Tracker-ECAL alignment (starting run 316060)
- Conclusion

Δη Distributions : ECAL barrel

Old tracker + new ECAL Alignment



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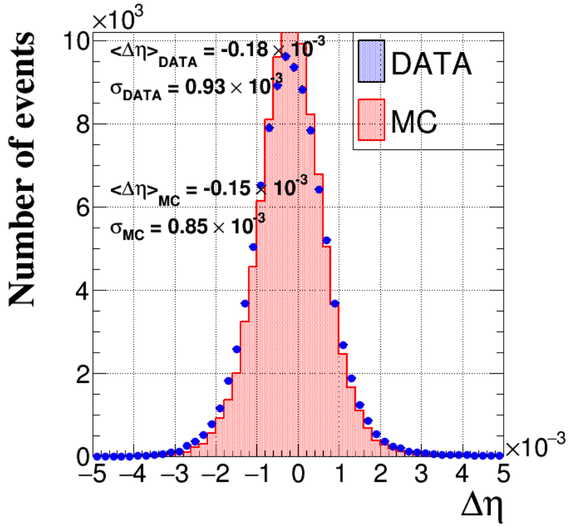
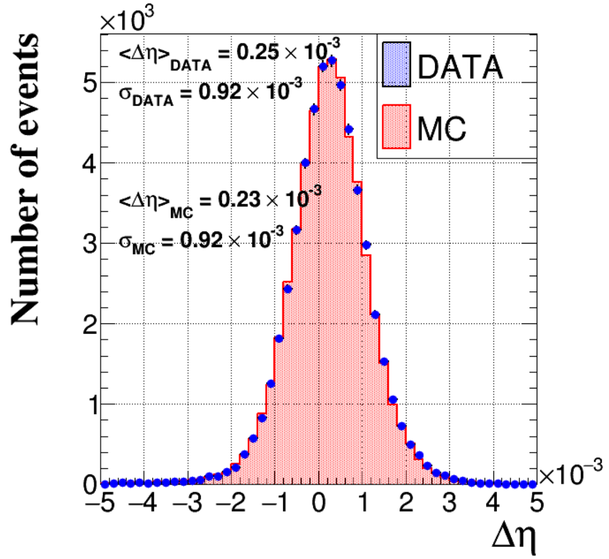


New tracker + new ECAL Alignment



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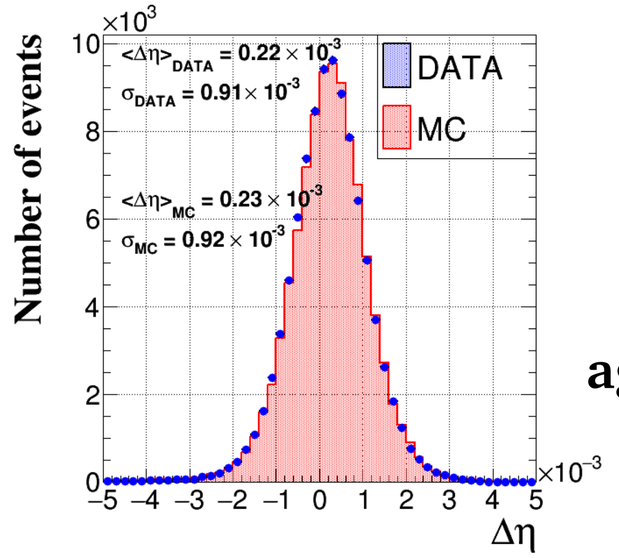
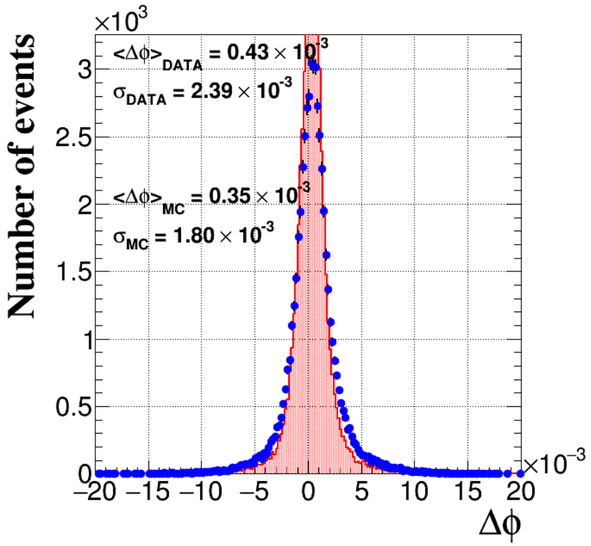


Consistently good agreement b/w Data and MC (as expected)

Δφ Distributions: ECAL barrel

Old tracker + new ECAL Alignment



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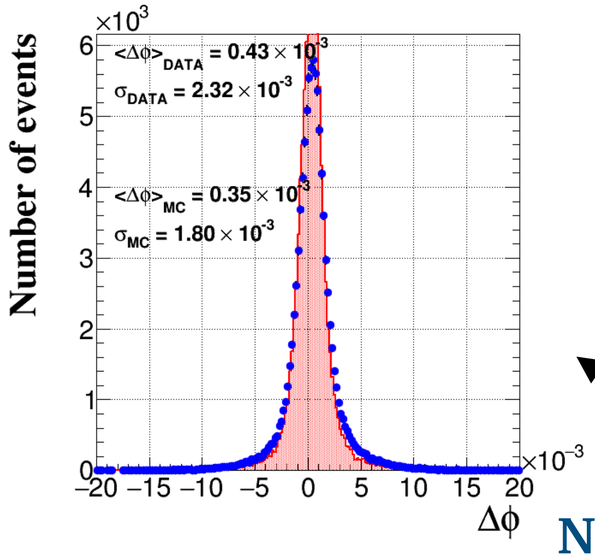
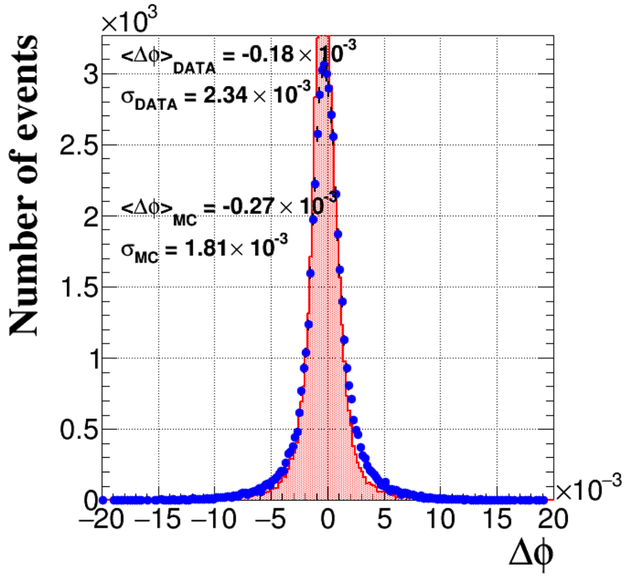


New tracker + new ECAL Alignment



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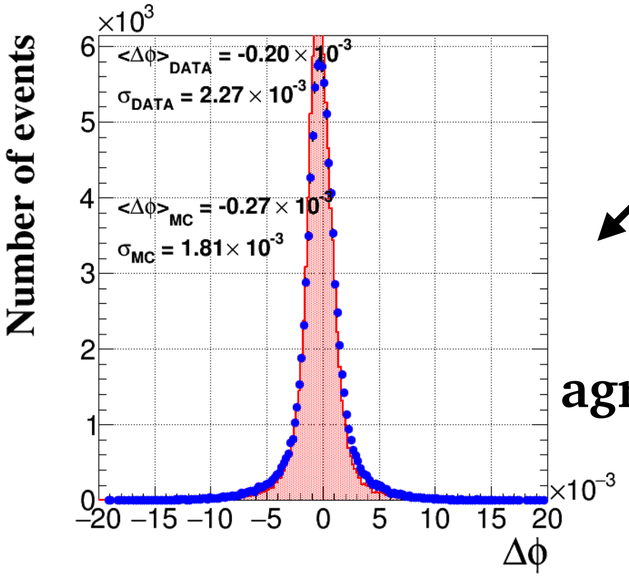
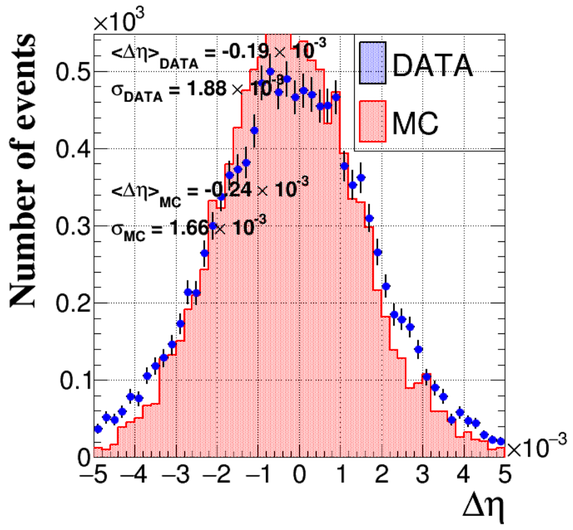


Consistently good agreement b/w Data and MC

Δη Distributions : ECAL endcap

Old tracker + new ECAL Alignment



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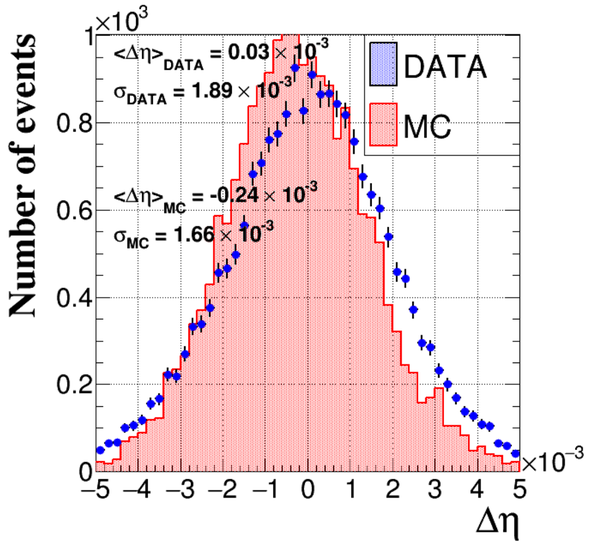

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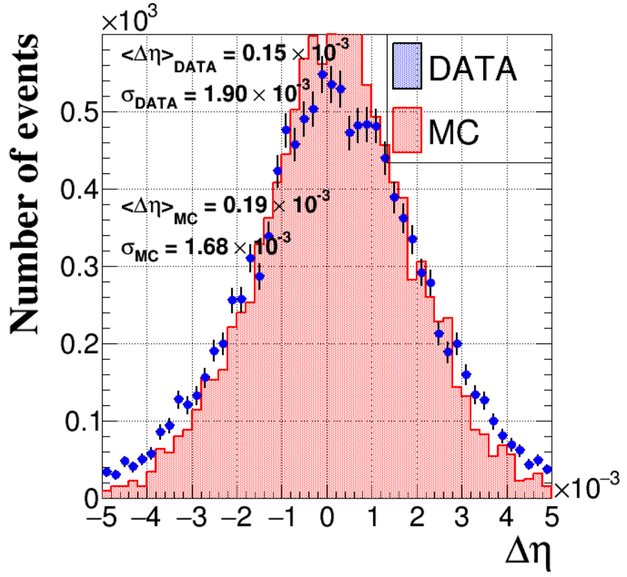

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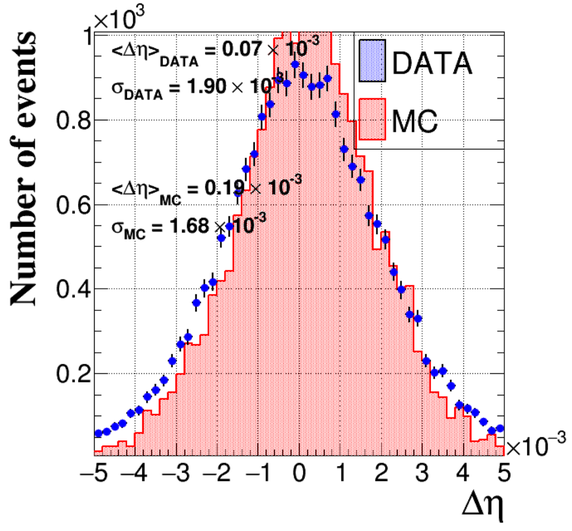
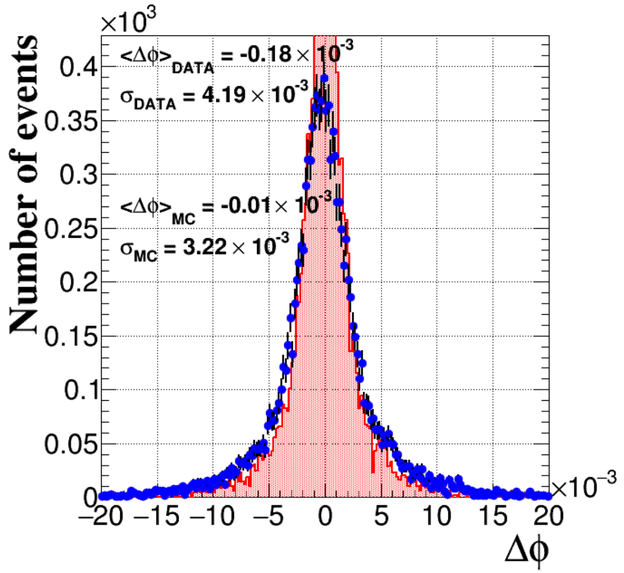


Minor shift observed in mean value of Δη for Data

Δφ Distributions: ECAL endcap

Old tracker + new ECAL Alignment



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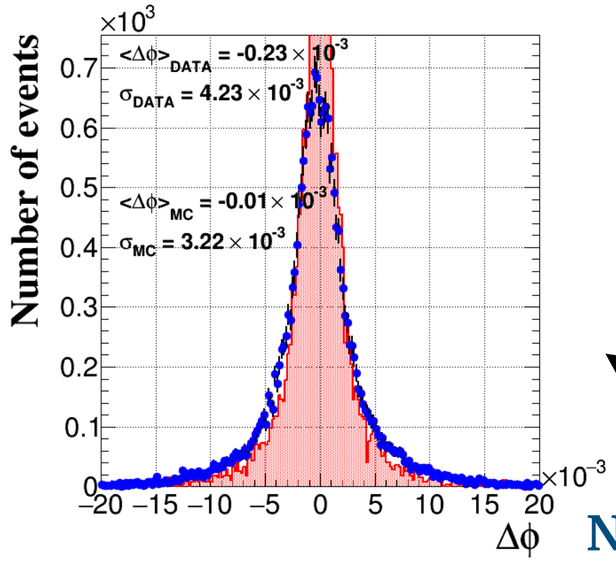
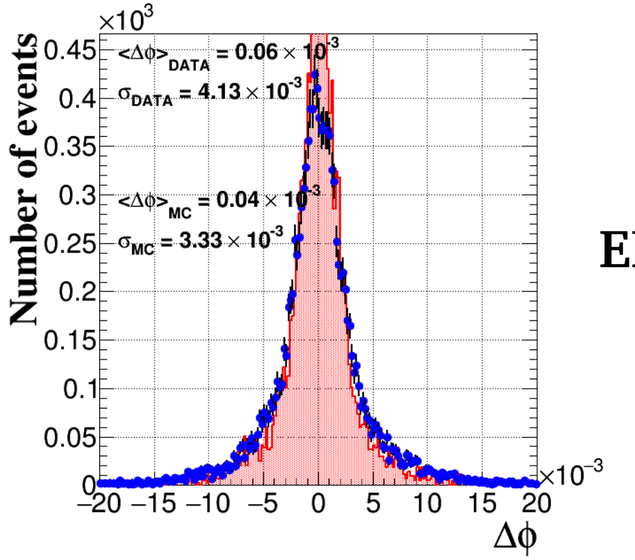


New tracker + new ECAL Alignment



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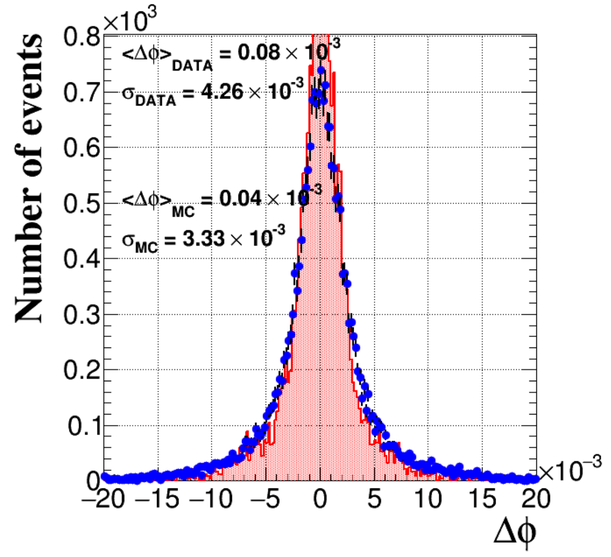

Conclusion

- New Tracker-ECAL alignment performing well
- The minor shift in ECAL endcap is being investigated

Backup

ECAL Alignment : Quick Review

- Alignment of ECAL barrel and endcap with respect to tracking system.
- Measured using electrons from Z→ee events.
- The alignment procedure is based on a minimization of χ^2 (sum of χ_+^2 for positrons and χ_-^2 for electrons). $\chi^2 = \chi_+^2 + \chi_-^2$
- The is based on Δη and Δφ and it minimizes the differences b/w MC and Data for these variables. Under the assumption that in a perfectly aligned system MC and data should agree in these variables, by means of minimization we are effectively aligning ECAL.

$$\chi_{\pm}^2 = \sum_{lepton} \frac{(\Delta\varphi - \langle \Delta\varphi_{\pm}^{MC} \rangle)^2}{\varepsilon_{\varphi}^2} + \frac{(\Delta\eta - \langle \Delta\eta^{MC} \rangle)^2}{\varepsilon_{\eta}^2}$$

- More details on the alignment procedure can be found here:
  - CMS AN-2013/328 - CMS ECAL alignment in the LHC RUN1
  - CMS DN-2015/026 - CMS ECAL alignment in the LHC RUN II