ECAL Alignment 2018

MoCa Meeting
20th June 2018

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Outline

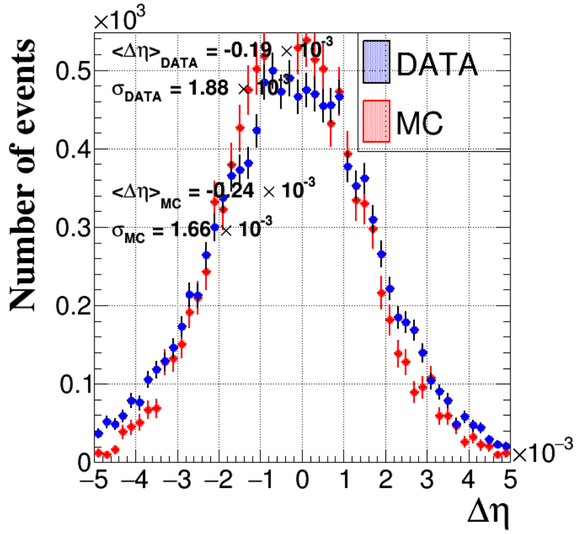
- New tracker alignment was deployed into prompt on 10th May; starting run 316059 and prompt GT 101X_dataRun2_Prompt_v9 was updated w/ new tracker as well as ECAL alignment conditions

- Monitoring Δη and Δφ values to make sure everything is OK with new Tracker-ECAL alignment (starting run 316060)
  - ECAL alignment performing well Link to last presentation
  - Minor shift was seen in ECAL endcap (b/w the **old tracker (before 10th May) + new ECAL alignment** & the **new tracker (after 10th May) + new ECAL alignment** conditions => Discuss the investigations today

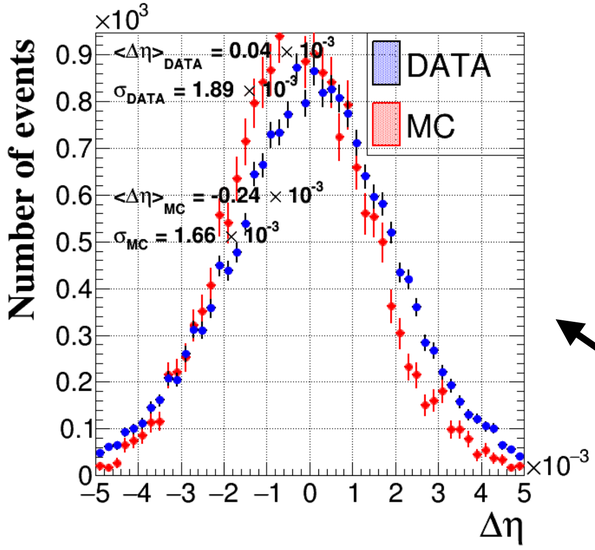
- Conclusion

Δη Distributions : ECAL endcap

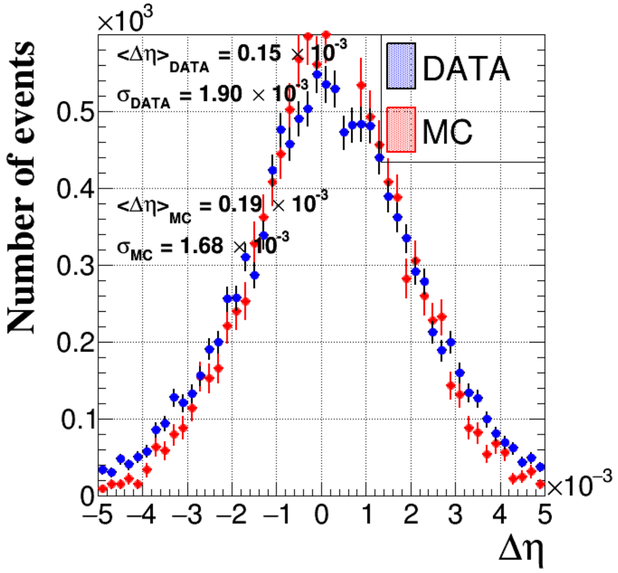
Old tracker (before 10th May)+ new ECAL Alignment



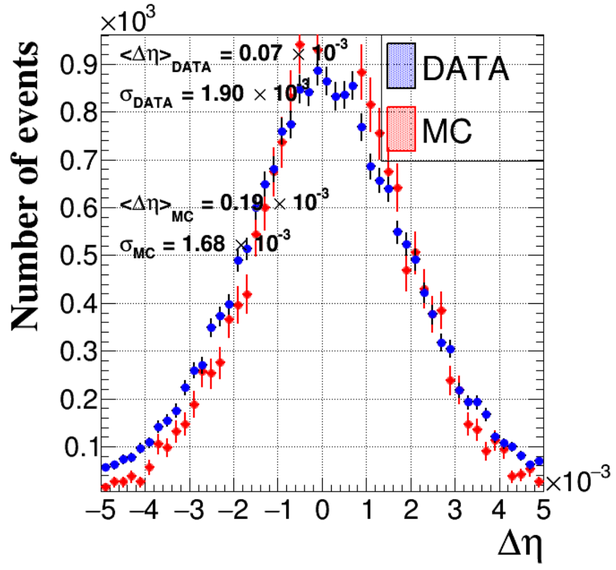
EE +



New tracker (after 10th May)+ new ECAL Alignment



EE -



Minor shift observed in mean value of Δη for Data

Selections applied to choose Z→ee events

Old selections

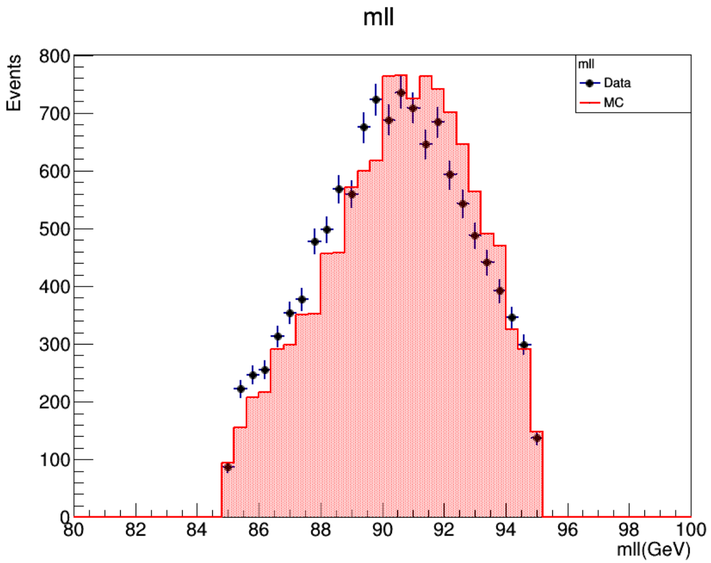
- Golden electrons (supercluster associated to the electron is composed of only one basic cluster)
- **ET_{SC} > 30 GeV**
- For |η| < 1.5
  - (eleTrkIso+eleEcalIso+eleHcalIsoD1+eleHcalIsoD2)/pT<0.07 && abs(SigmaIEtaIEta)<0.01
- For |η| > 1.5
  - (eleTrkIso+eleEcalIso+eleHcalIsoD1+eleHcalIsoD2)/pT<0.06 && abs(SigmaIEtaIEta)<0.03
- 85 GeV < Di-lepton mass < 95 GeV

Revised selections

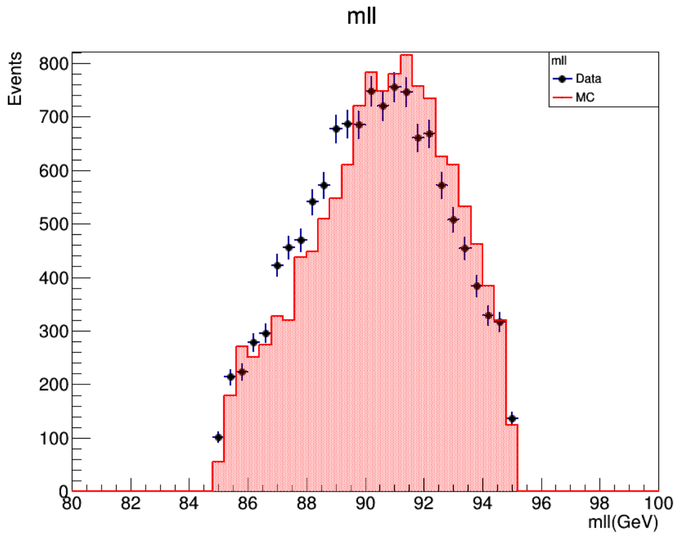
- Golden electrons
- **ET_{SC} > 40 GeV**
- For |η| < 1.5
  - (eleTrkIso+eleEcalIso+eleHcalIsoD1+eleHcalIsoD2)/pT<0.07 && abs(SigmaIEtaIEta)<0.01
- For |η| > 1.5
  - (eleTrkIso+eleEcalIso+eleHcalIsoD1+eleHcalIsoD2)/pT<0.06 && abs(SigmaIEtaIEta)<0.03
- **HoE < 0.3 && (abs(DeltaEtaIn)<(25e-3))&& (abs(DeltaPhiIn)<(10e-3))**
- **Restrict $|\eta_{SC}| < 2.1$**
- 85 GeV < Di-lepton mass < 95 GeV

Di-lepton mass (after revised selections)

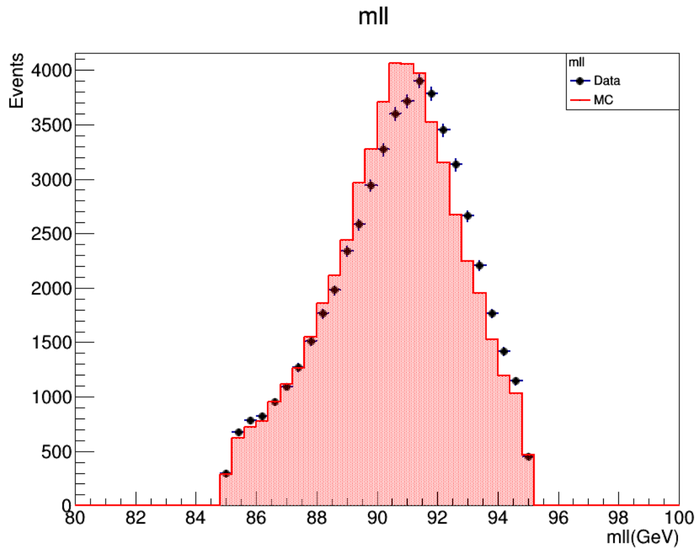
EE+



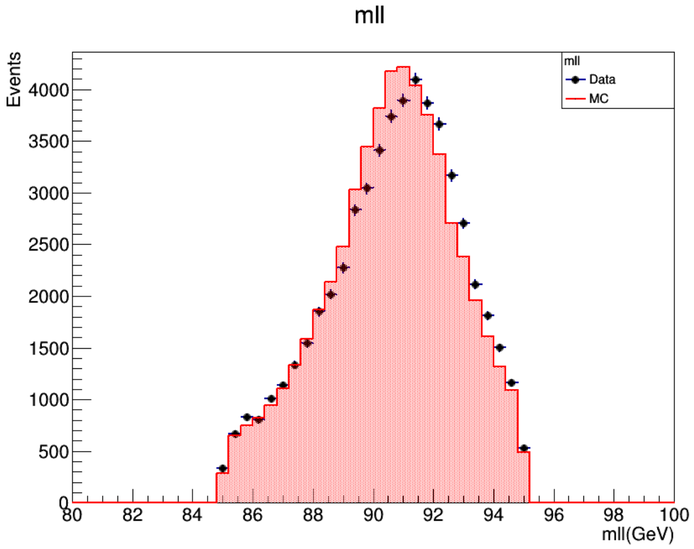
EE -



EB -



EB+



- Di-lepton mass distribution is a good handle to check the performance of selections
- Reasonable agreement b/w data and MC

Revised bias values

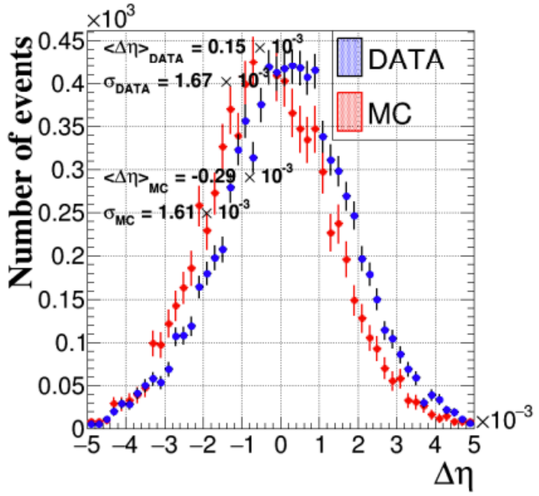
- Change in selections leads to a small change in bias values
- New values (old values)
- The change in bias values is more pronounced in the endcaps (expected, since there is a shift observed in the η distribution)

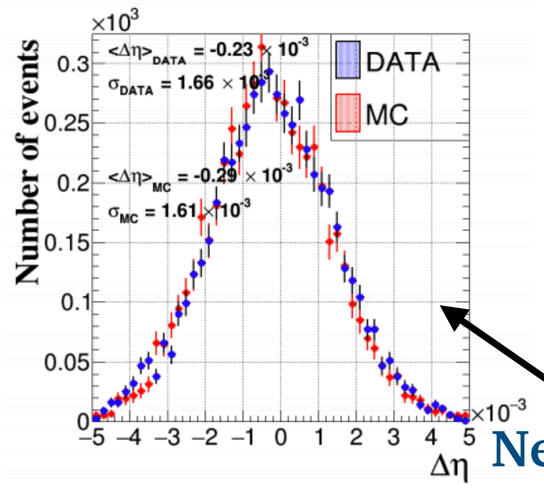
	Δη	Δφ (Electron)	Δφ (Positron)
EE +	-0.29 (-0.24)	-0.20 (-0.11)	0.08 (0.09)
EB +	-0.16 (-0.15)	-0.04 (-0.06)	0.75 (0.77)
EB -	0.24 (0.23)	-0.66 (-0.67)	0.10 (0.13)
EE -	0.22 (0.19)	-0.13 (-0.07)	0.25 (0.15)

- With these revised bias values, a re-alignment was performed
- Validation plot with these revised bias values for the endcap is on the next slide

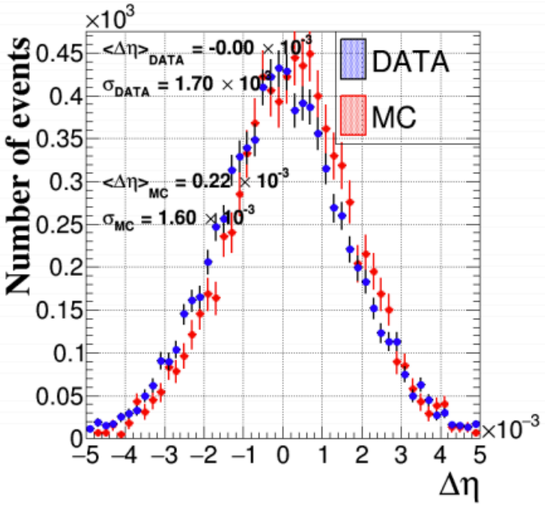
Δη Distributions : ECAL endcap (Revised bias values)

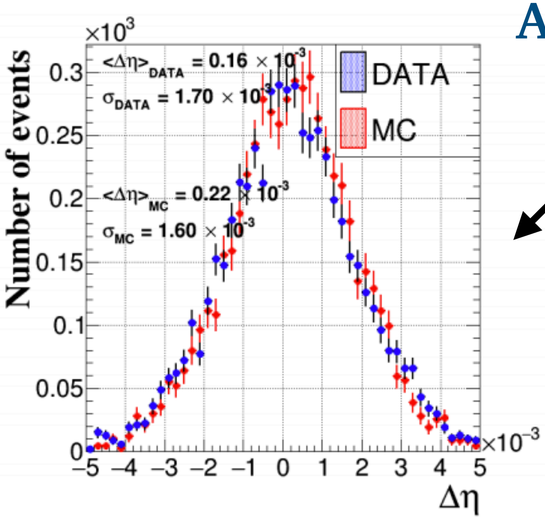
New tracker (after 10th May)+ new ECAL Alignment (old 2018 conditions)



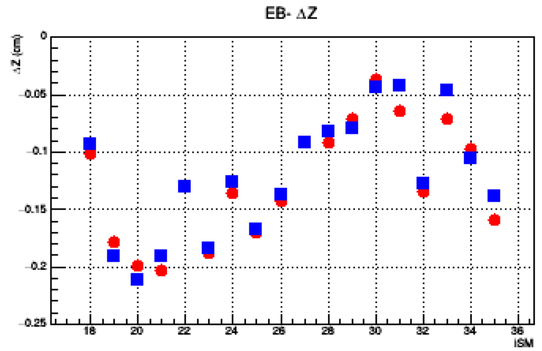


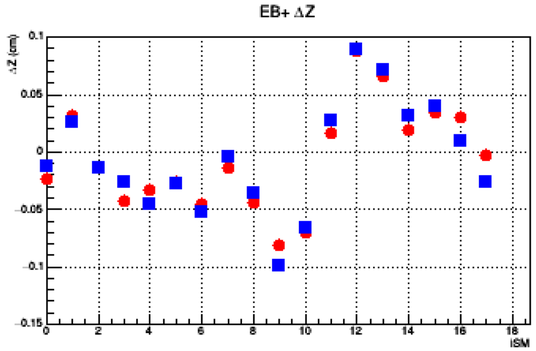
New tracker (after 10th May)+ new ECAL Alignment (new 2018 conditions

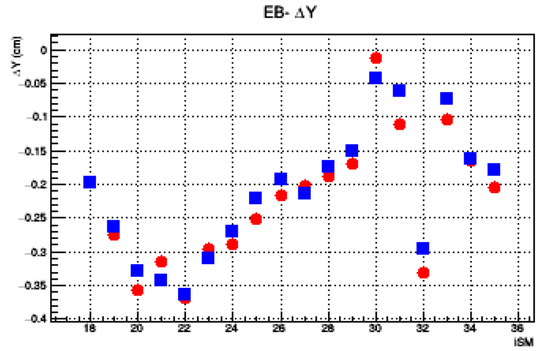


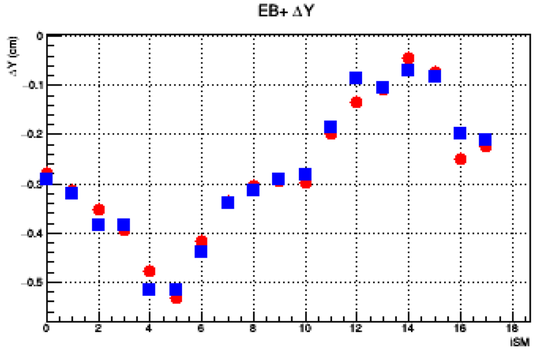


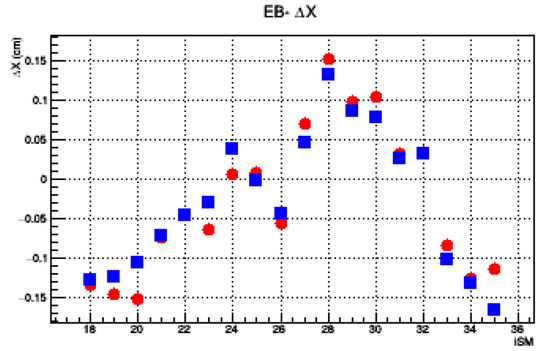
(Revised) Alignment values : ECAL barrel

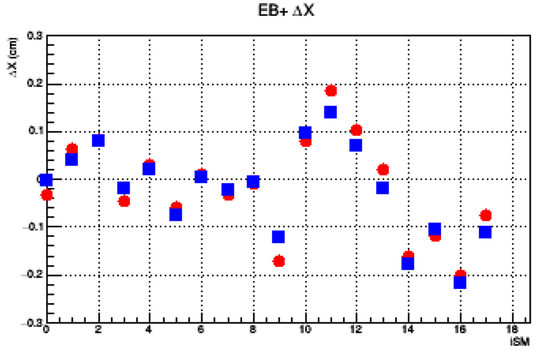












- Δx, Δy, Δz values for EB + and EB -
- On y axis: Supermodule number

- Red circles : Tracker (after 10th May) + ECAL (old 2018 alignment) conditions

- Blue squares : Tracker (after 10th May) + ECAL (new 2018 alignment) conditions

- No significant change

(Revised) Alignment values : ECAL endcap

		ΔΦ	Δϕ	ΔΨ	Δx	Δy	Δz
EE -	Dee 0	0.00039112	0	0.00039112	-0.093372	-0.62537	-0.66182
	Dee 1	0.00046148	0	0.00046148	-0.087034	-0.76022	-0.46897
EE +	Dee 2	-0.00026845	0	-0.00026845	0.07638	-0.79304	0.46977
	Dee 3	-0.00045037	0	-0.00045037	0.12154	-0.8734	0.43970

Tracker (after 10th May) + ECAL (old 2018 alignment) conditions

EE -	Dee 0	0.00039112	0	0.00039112	-0.091489	-0.63508	-0.56091
	Dee 1	0.00046148	0	0.00046148	-0.026053	-0.75269	-0.54505
EE +	Dee 2	-0.00026845	0	-0.00026845	0.024858	-0.77397	0.39712
	Dee 3	-0.00045037	0	-0.00045037	0.14884	-0.86985	0.38928

Tracker (after 10th May) + ECAL (new 2018 alignment) conditions

Units are cm

Conclusion

- ECAL - tracker relative alignment performing well since the new tracker alignment conditions were deployed on 10th May

- Next steps:
  - Short term: New IOV was added to the tracker alignment on 4th June — work under progress to re-run the alignment with this data also included
  - Next month: Perform realignment of ECAL on top of the final tracker alignment conditions to deliver re-reco conditions for 2018 data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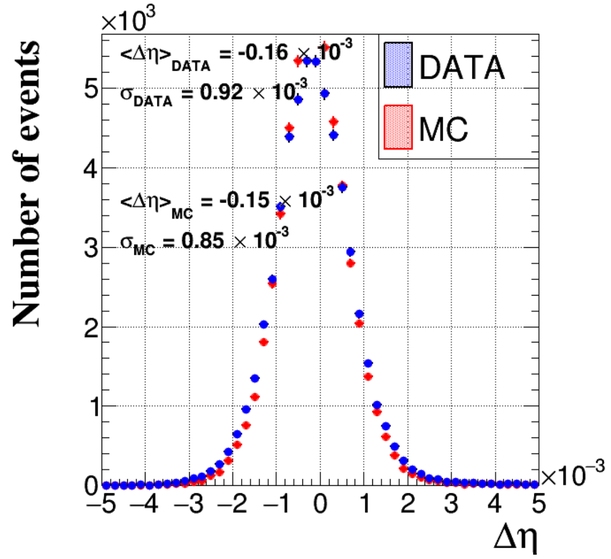
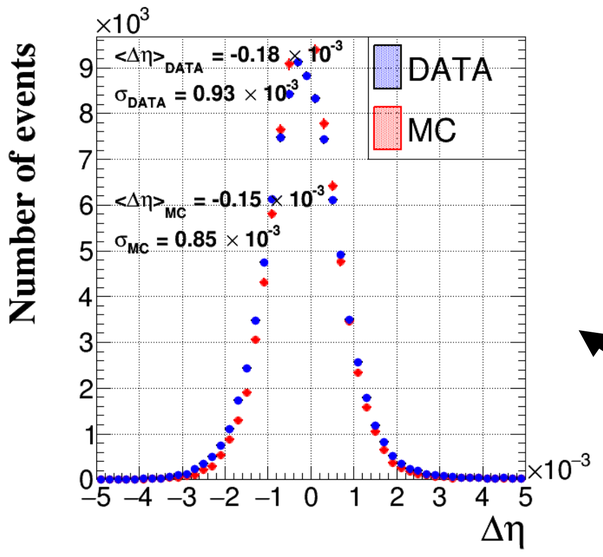
Backup

Δη Distributions : ECAL barrel

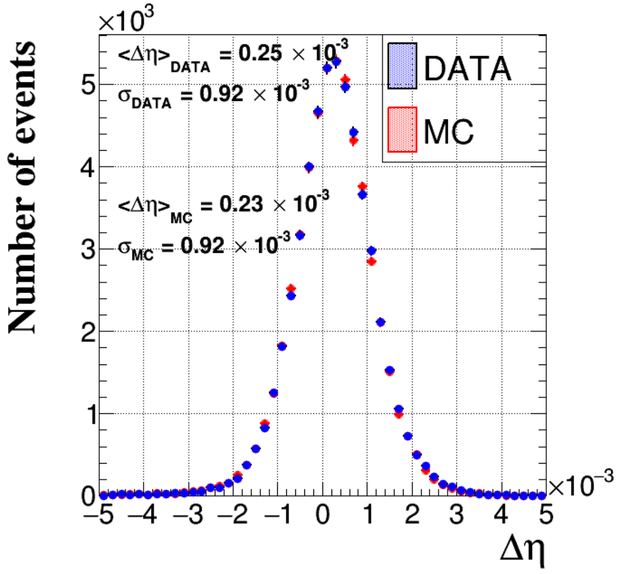
Old tracker (before 10th May)+ new ECAL Alignment



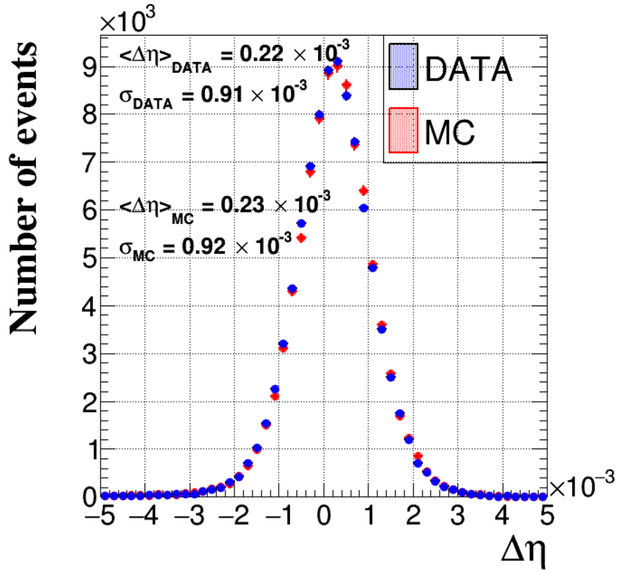
EB +



New tracker (after 10th May)+ new ECAL Alignment



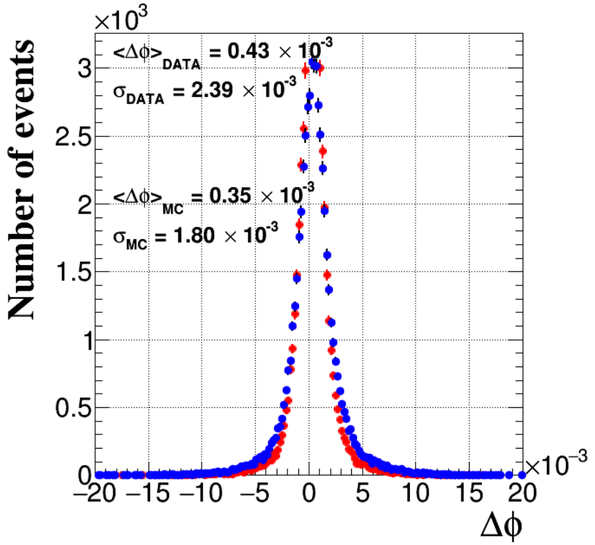
EB -



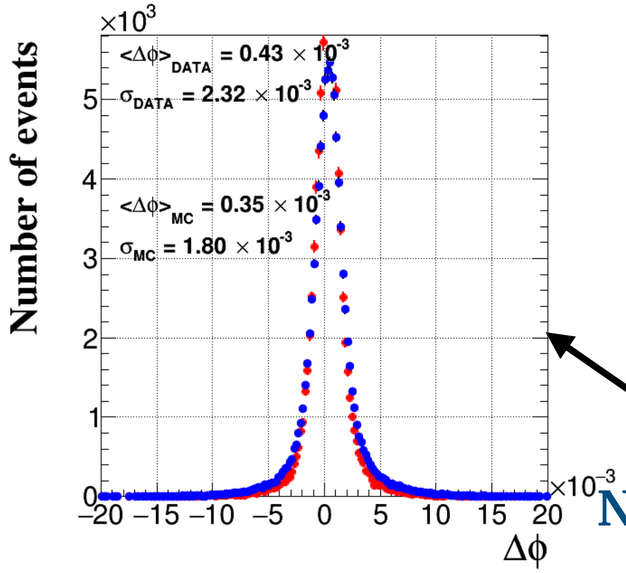
Minor shift observed in mean value of Δη for Data

Δφ Distributions : ECAL barrel

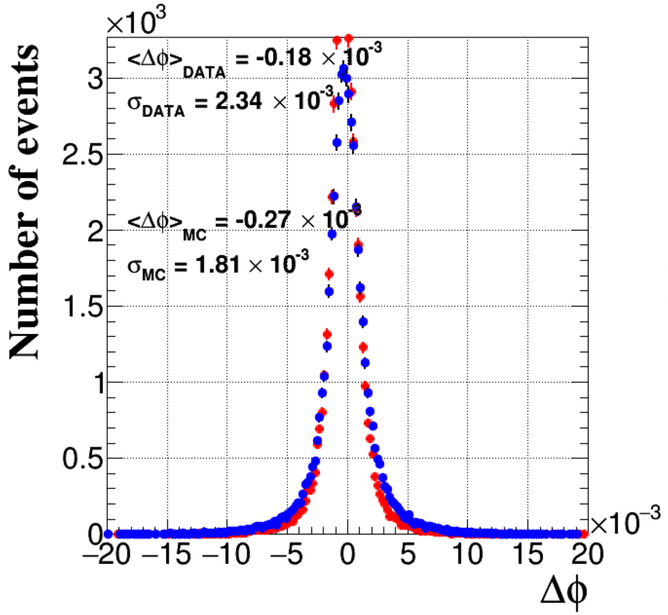
Old tracker (before 10th May)+ new ECAL Alignment



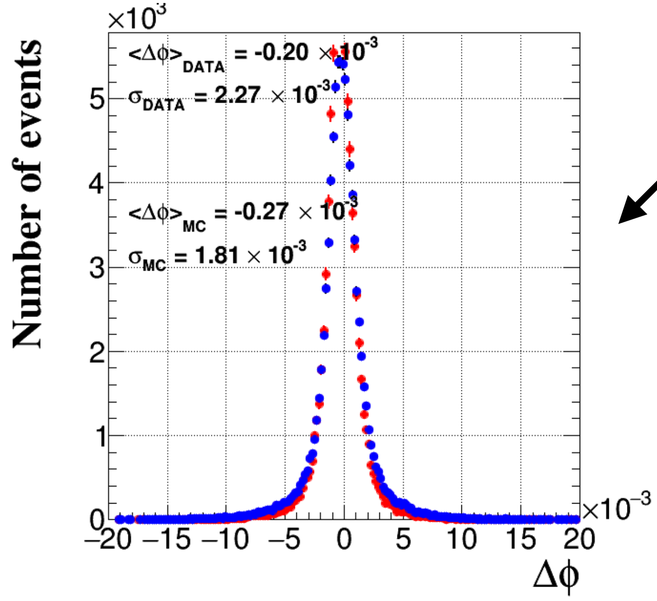
EB +



New tracker (after 10th May)+ new ECAL Alignment



EB -



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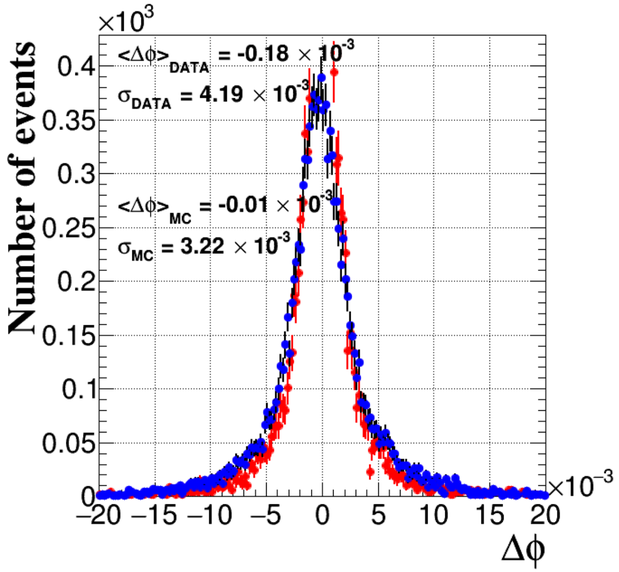
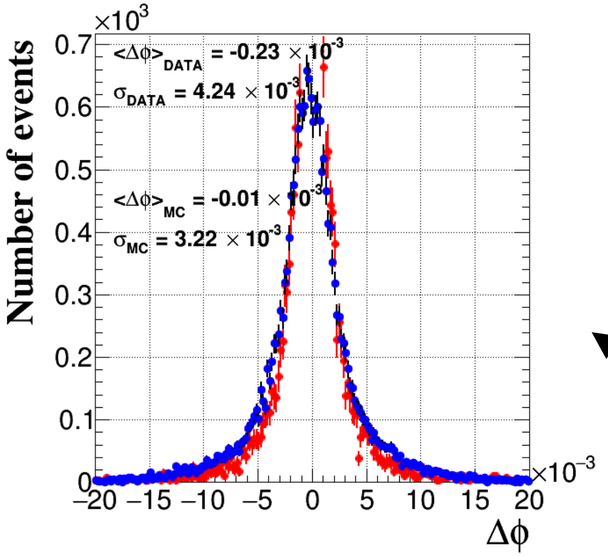
Δφ Distributions : ECAL endcap

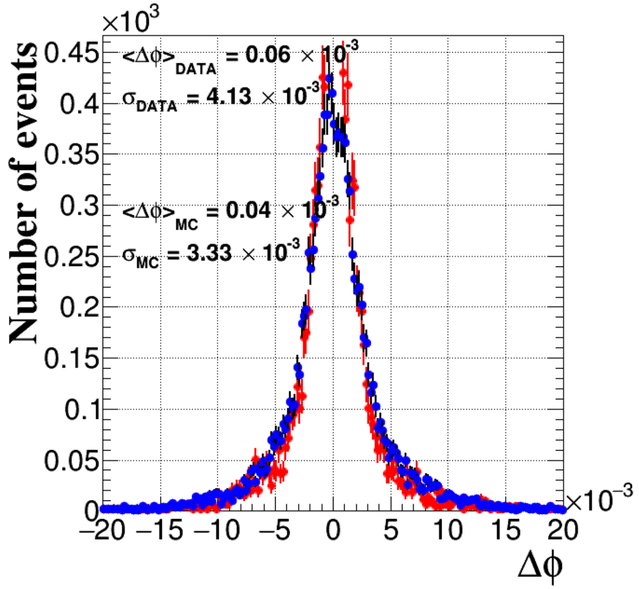
Old tracker (before 10th May)+ new ECAL Alignment



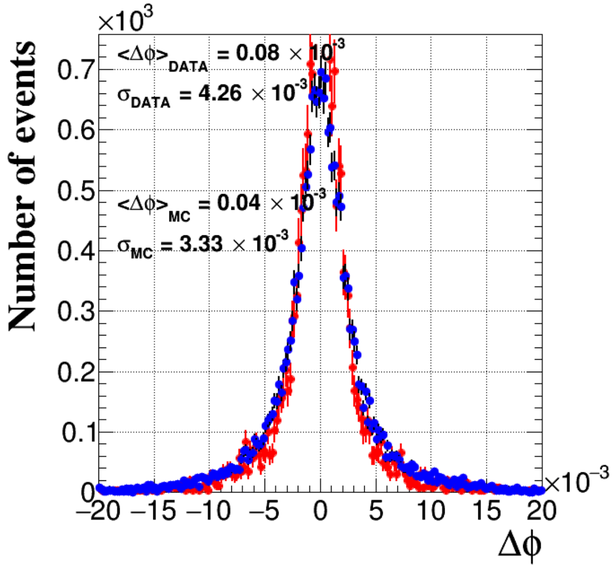
EE +



New tracker (after 10th May)+ new ECAL Alignment



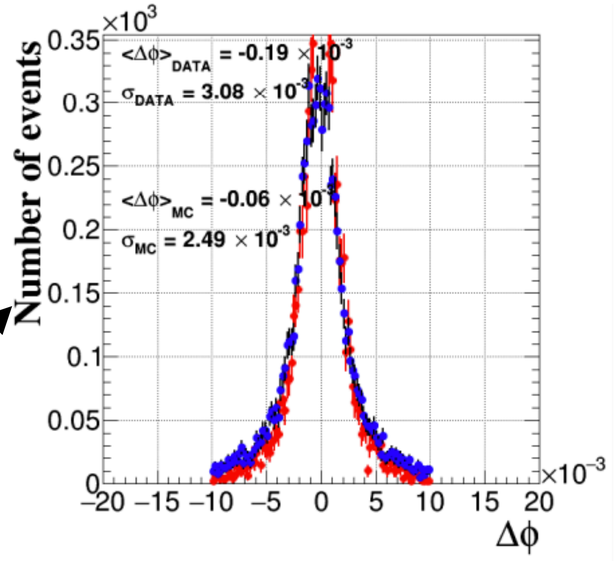
EE -

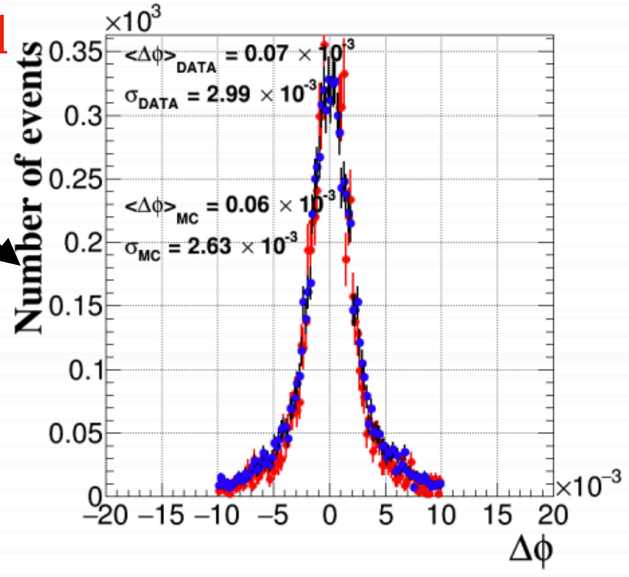


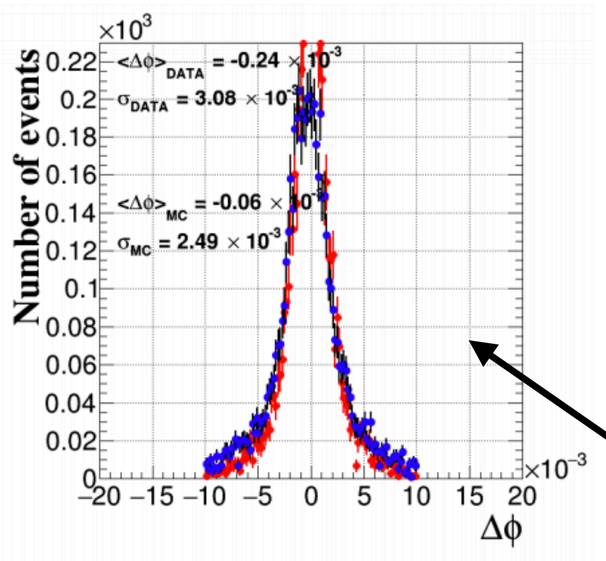
Minor shift observed in mean value of Δη for Data

Δφ Distributions : ECAL endcap (Revised bias values)

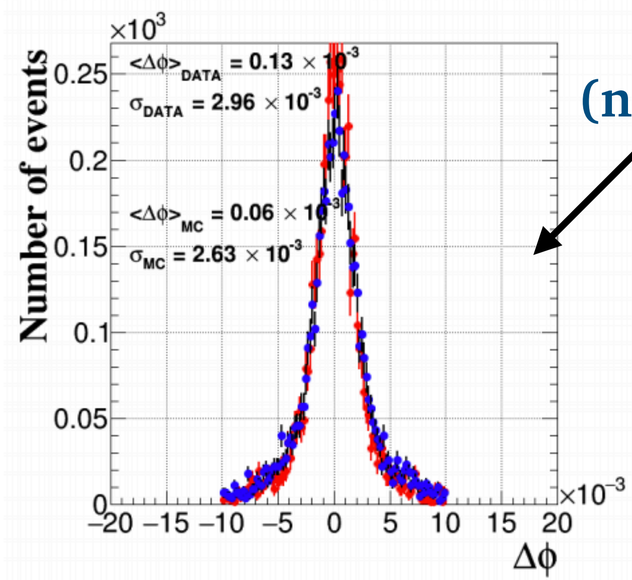
New tracker (after 10th May)+ new ECAL Alignment (old 2018 conditions)







New tracker (after 10th May)+ new ECAL Alignment (new 2018 conditions



Alignment values : ECAL endcap

		ΔΦ	Δϕ	ΔΨ	Δx	Δy	Δz
EE -	Dee 0	0.00039112	0	0.00039112	-0.065725	-0.53779	-0.63415
	Dee 1	0.00046148	0	0.00046148	-0.03533	-0.64747	-0.46271
EE +	Dee 2	-0.00026845	0	-0.00026845	0.26558	-0.74857	0.43904
	Dee 3	-0.00045037	0	-0.00045037	0.32866	-0.84081	0.41354

2017 values

EE -	Dee 0	0.00039112	0	0.00039112	-0.093372	-0.62537	-0.66182
	Dee 1	0.00046148	0	0.00046148	-0.087034	-0.76022	-0.46897
EE +	Dee 2	-0.00026845	0	-0.00026845	0.07638	-0.79304	0.46977
	Dee 3	-0.00045037	0	-0.00045037	0.12154	-0.8734	0.4397

2018 values

Units are cm

Biggest shift is seen in **y-direction in EE- ~1 mm**
x-direction in EE+ ~2mm

From 9th May MoCa presentation

- Alignment values are stored here:

/afs/cern.ch/user/t/twamorka/public/ECALalignment_2018/myEEAlignment_2018_combined_v0.txt