Fit of radiator parameters.

Fit of radiator parameters:

Important 'cause it gives as a comparison independent of setup geometry.

The radiators parameters we consider are

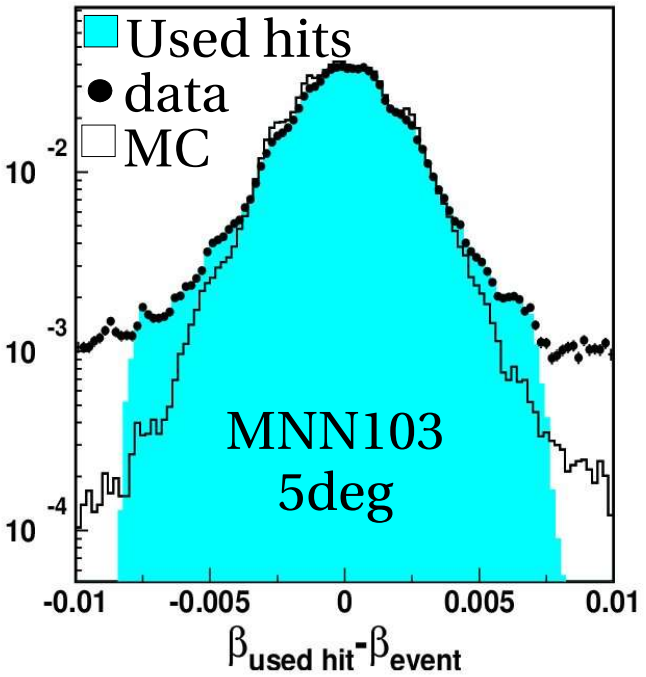
- Refractive index.
  - Fitted assuming correctness of geometrical parameters by adjusting reconstructed β to 1.

    (I am not going to talk about this)

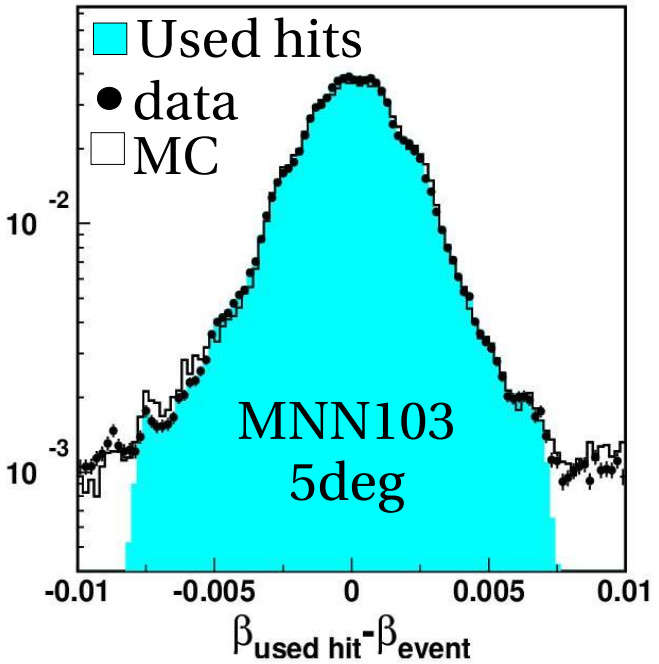
  Clarity.
- Forward scattering probability.
- Forward scattering mean scattered angle.
  - Obtained by fitting the β residue and the reconstructed number of hits in the ring.
  - We do the fit for Z=2.

Fit of radiator parameters:

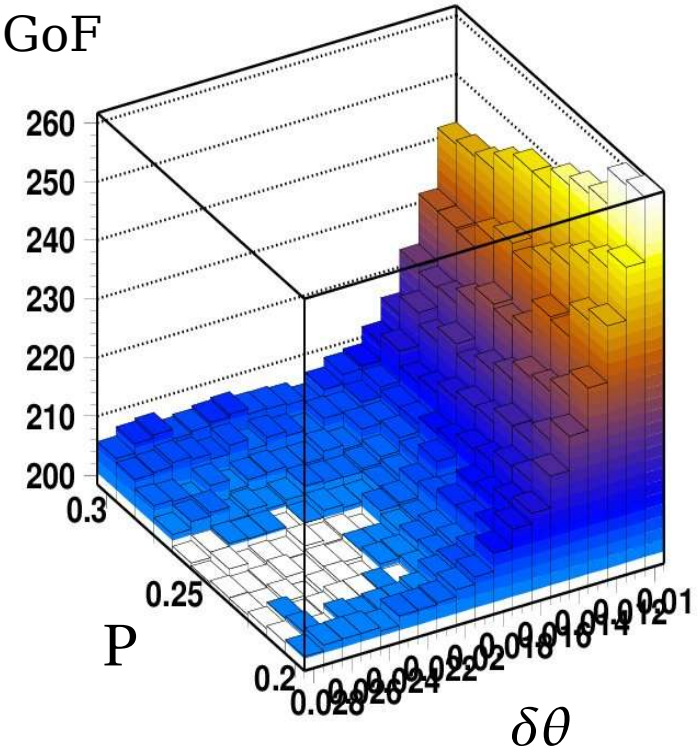
- Forward scattering probability.
- Forward scattering mean scattered angle.



P=20
$\delta\theta$=10 mrad
C=0.0064



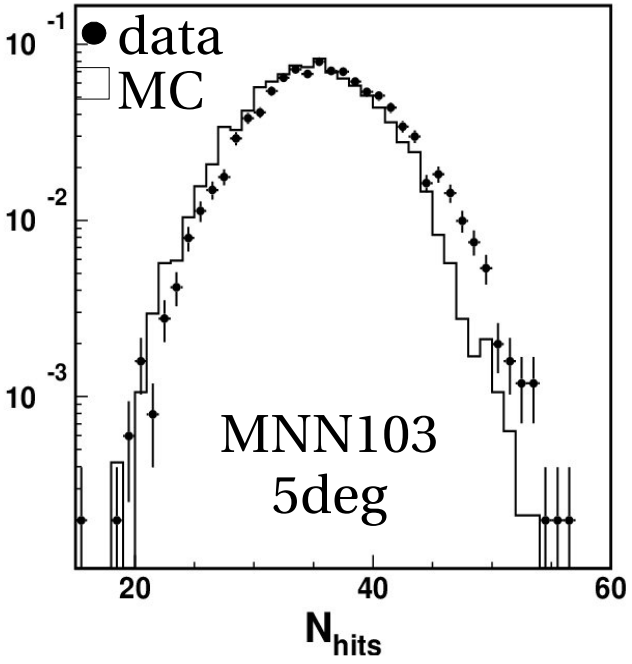
P=23
$\delta\theta$=25 mrad
C=0.0064



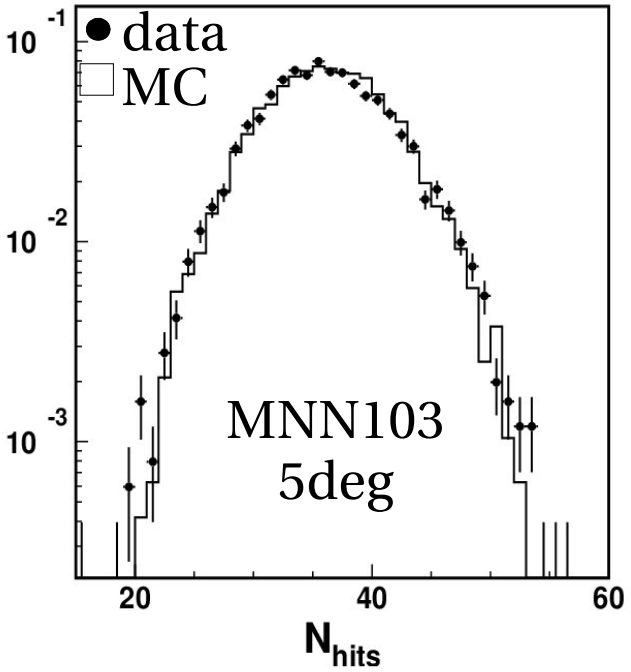
Fit of radiator parameters:

- Clarity.

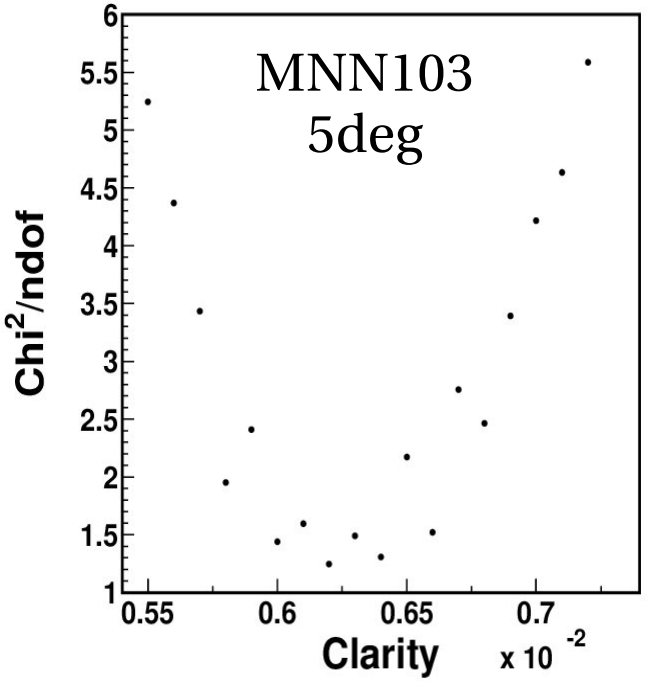
Fixed the forward scattering, the number of hits in the ring is used to fit the clarity.



P=23
$\delta\theta$=25 mrad
C=0.0070



P=23
$\delta\theta$=25 mrad
C=0.0062



P=23
$\delta\theta$=25 mrad

Fit of radiator parameters: results (at beam angle 0^0)

- Matsushita 1.03
  - Clarity: 0.0064 μm^4 cm^{-1}
  - Prob. f. scattering: 0.23
  - $\delta\theta$: 0.016 rad
- Novosibirsk 1.03
  - Clarity: 0.0057 μm^4 cm^{-1}
  - Prob. f. scattering: 0.22
  - $\delta\theta$: 0.016 rad
- Novosibirsk 1.05
  - Clarity: 0.0051 μm^4 cm^{-1}
  - Prob. f. scattering: 0.25
  - $\delta\theta$: 0.017 rad

So from the point of view of these parameters the three radiators are very similar.

Fit of radiator parameters: warnings

- This work because f. scattering parameters are almost independent of clarity.

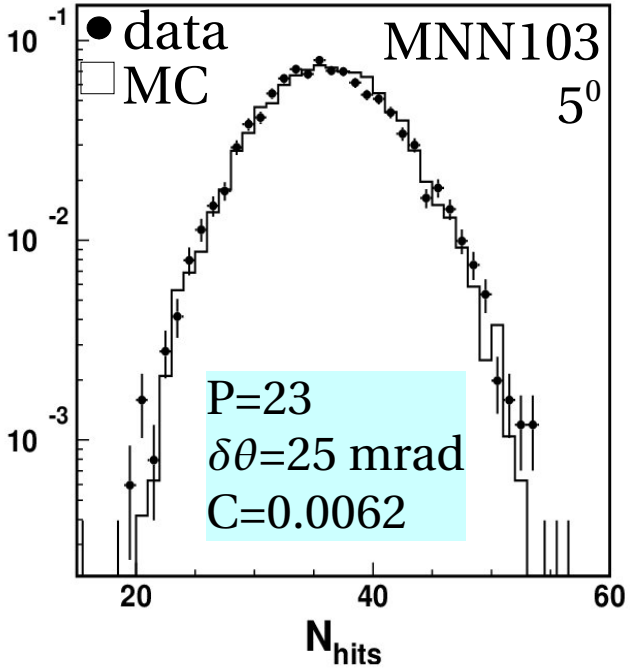
- However it must be done carefully:

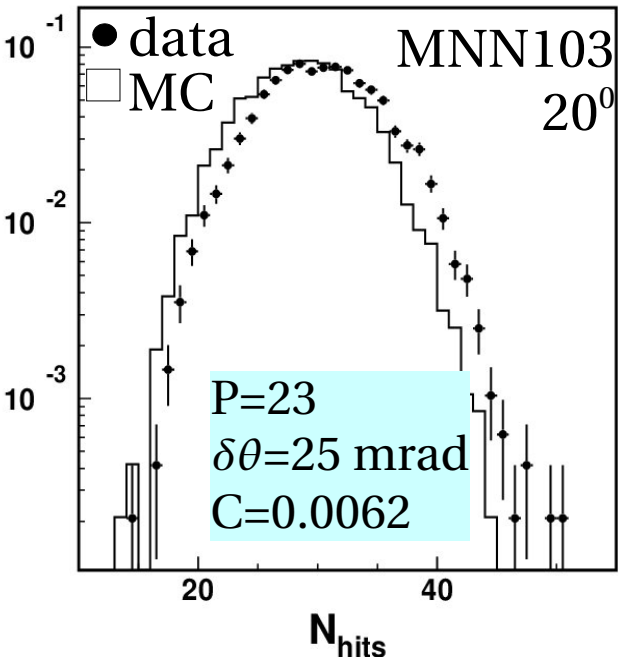
  - F. scattering parameters can be reconstruction dependent: check that data and MC agree within all the reconstruction window.

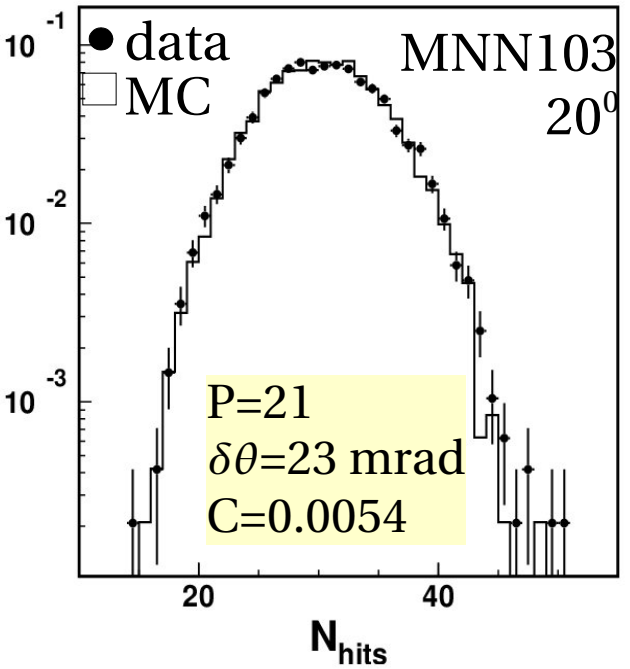
  - Dependence of parameters with beam angle found.
    So MC/data agreement at 0^0 does not hold for other angles.

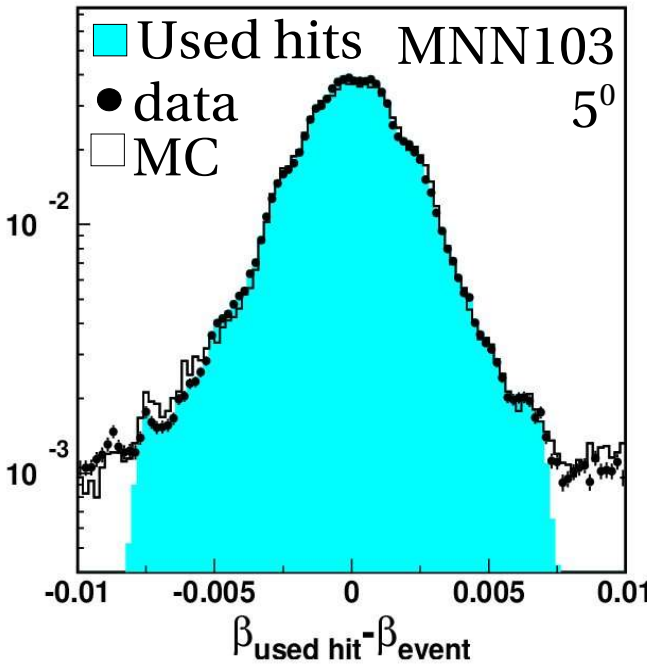
  - The model does not reproduce the high number of hits far from the ring in the data, so again care must be taken with windows/noise-parameterization for the reconstruction.

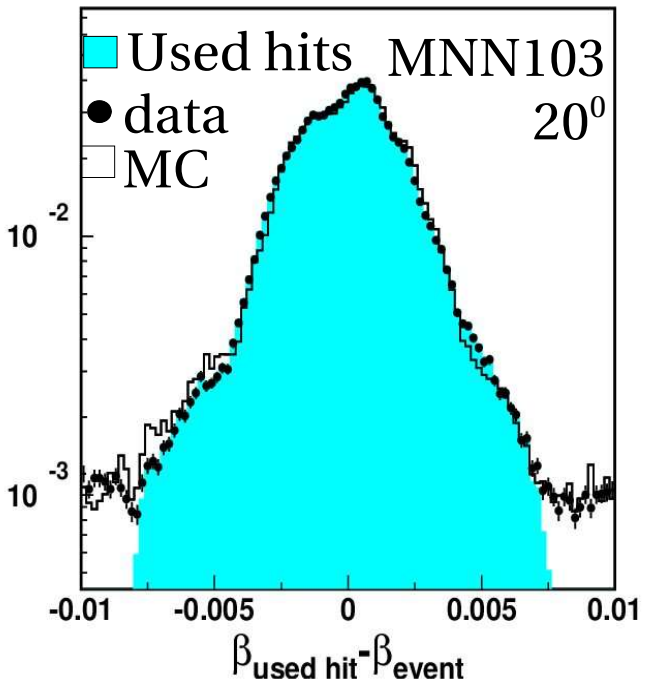
Fit of radiator parameters: warnings

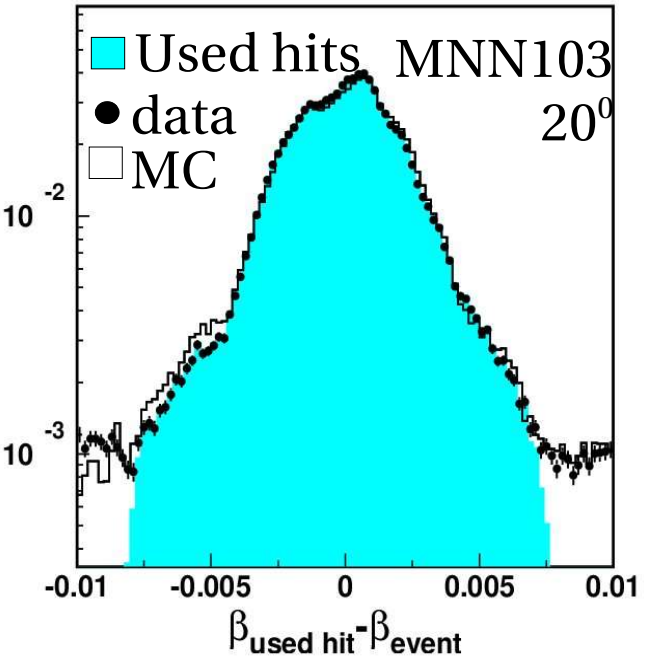




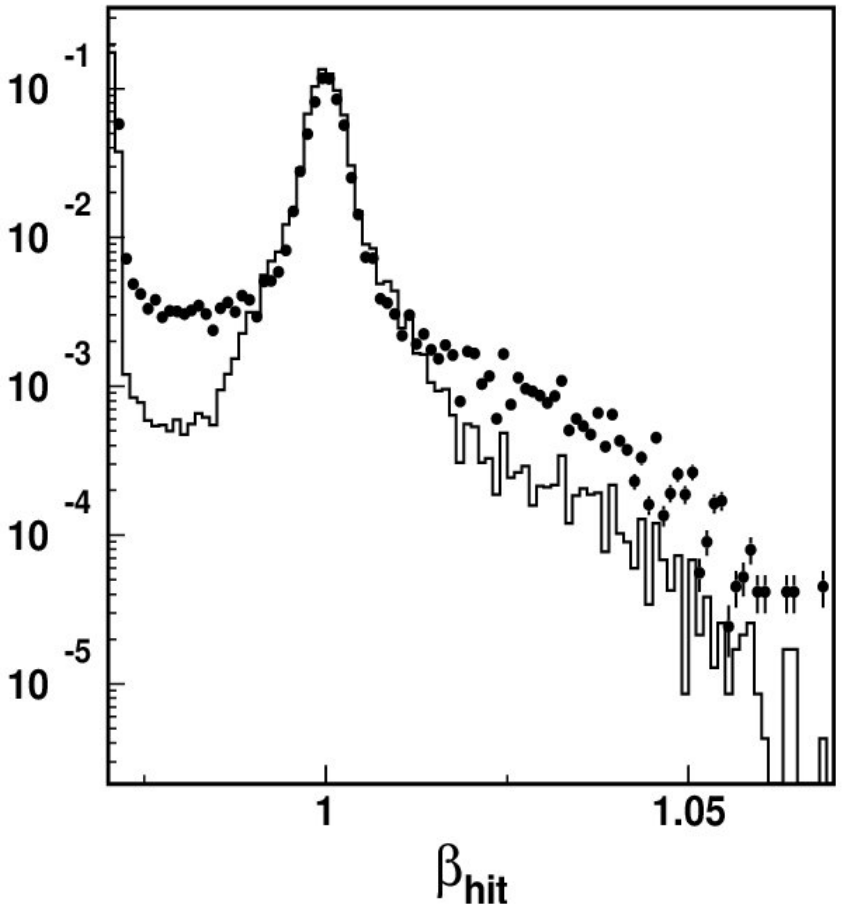








Fit of radiator parameters: warnings



This is not so unexpected because MC does not include the reflection in the chamber, secondaries...

Fit of radiator parameters: conclusions

- MNN103, N103 y N105 radiators have been found to be very similar in optical quality at 0^0 beam angle.

- We have found that the forward scattering and clarity parameters fitted depend on the angle:
  - The f. scattering seems to scatter out too many photons for large angle, so clarity must be decreased to reproduce the data.

- Before comparing data/MC for angle>0^0, a new f. scattering model, or a parameterization of the change of parameters with angle is necessary.
  - Currently I am working in the second option, although I keep thinking in refined models.

Runs with angle.

- Set of runs:
  - 511-515 for MNN103
  - 516-519 for N103
  - 521-523 for N105

- Particularities:
  - MNN103: everything works fine

  - N103: in order to get the right β the expansion length has to be decreased by 2.7mm for $5^{0.}$ We use this new value for the other angles, but we get a bias too high for them.

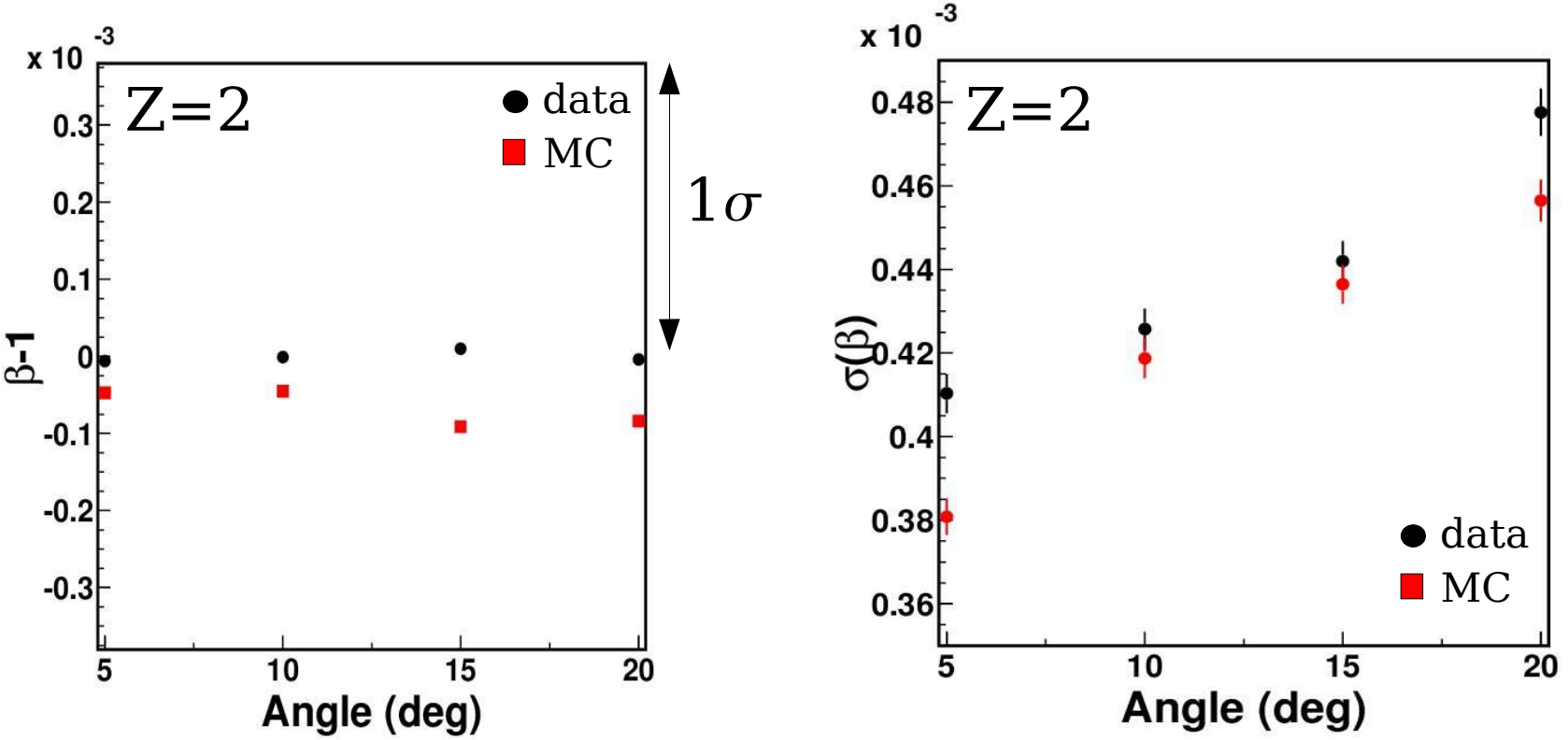
    (Remember that a change 3mm was also needed to correct the large bias found for this radiator in the scanning for 3 runs)

  - N105: a consistent bias is found for all the runs respect the 0^0 run.

MNN103

Variance due to pixel size

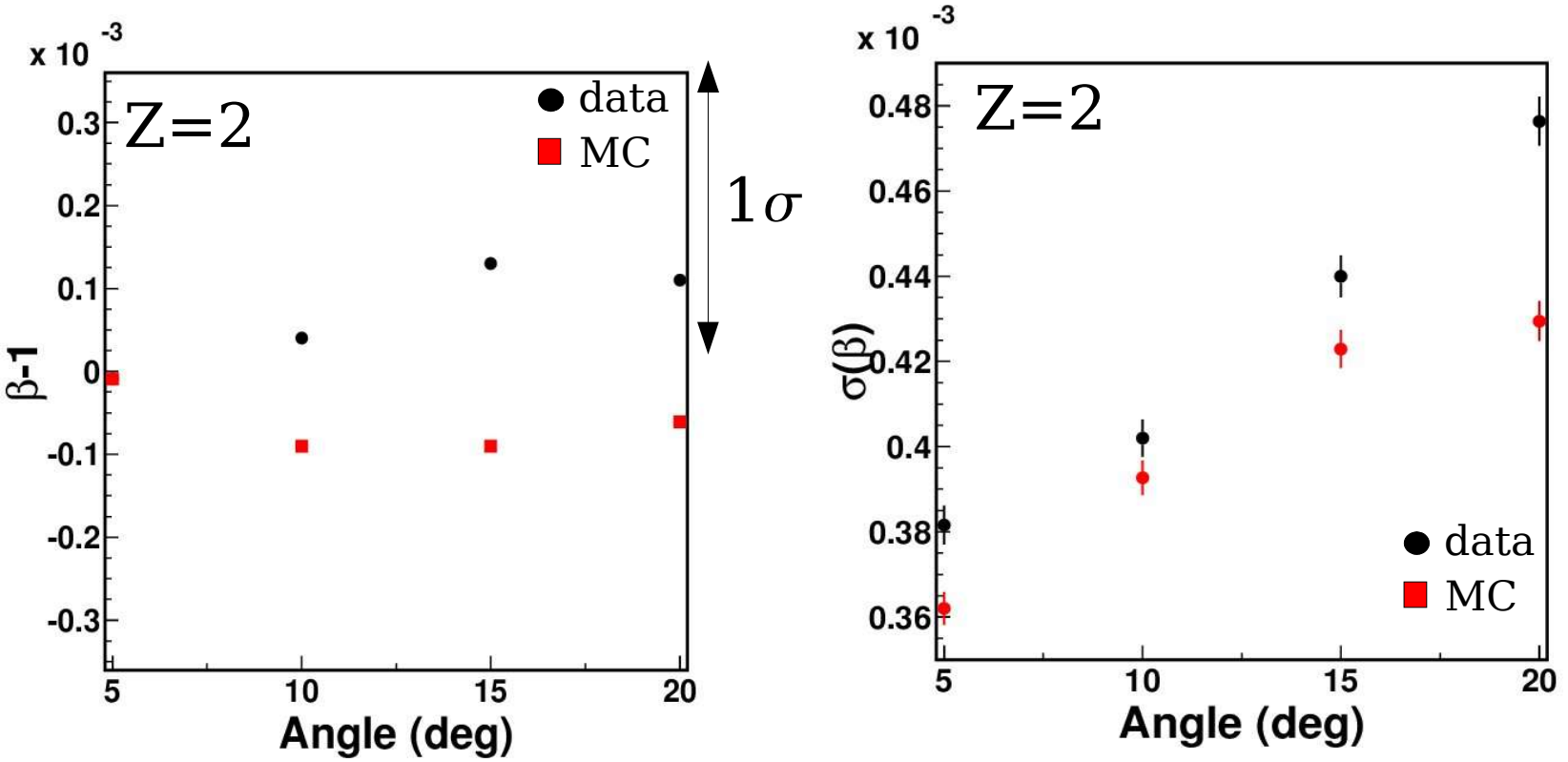
Radiator parameters taken from 0^0



- Data/MC disagreement from radiator parameters and geometry (rotation axis uncertainty,beam width...).
- MC bias under investigation, but likely due to 0 width of simulated beam (expected variance due to pixel size ~0.1e-3) .

N103

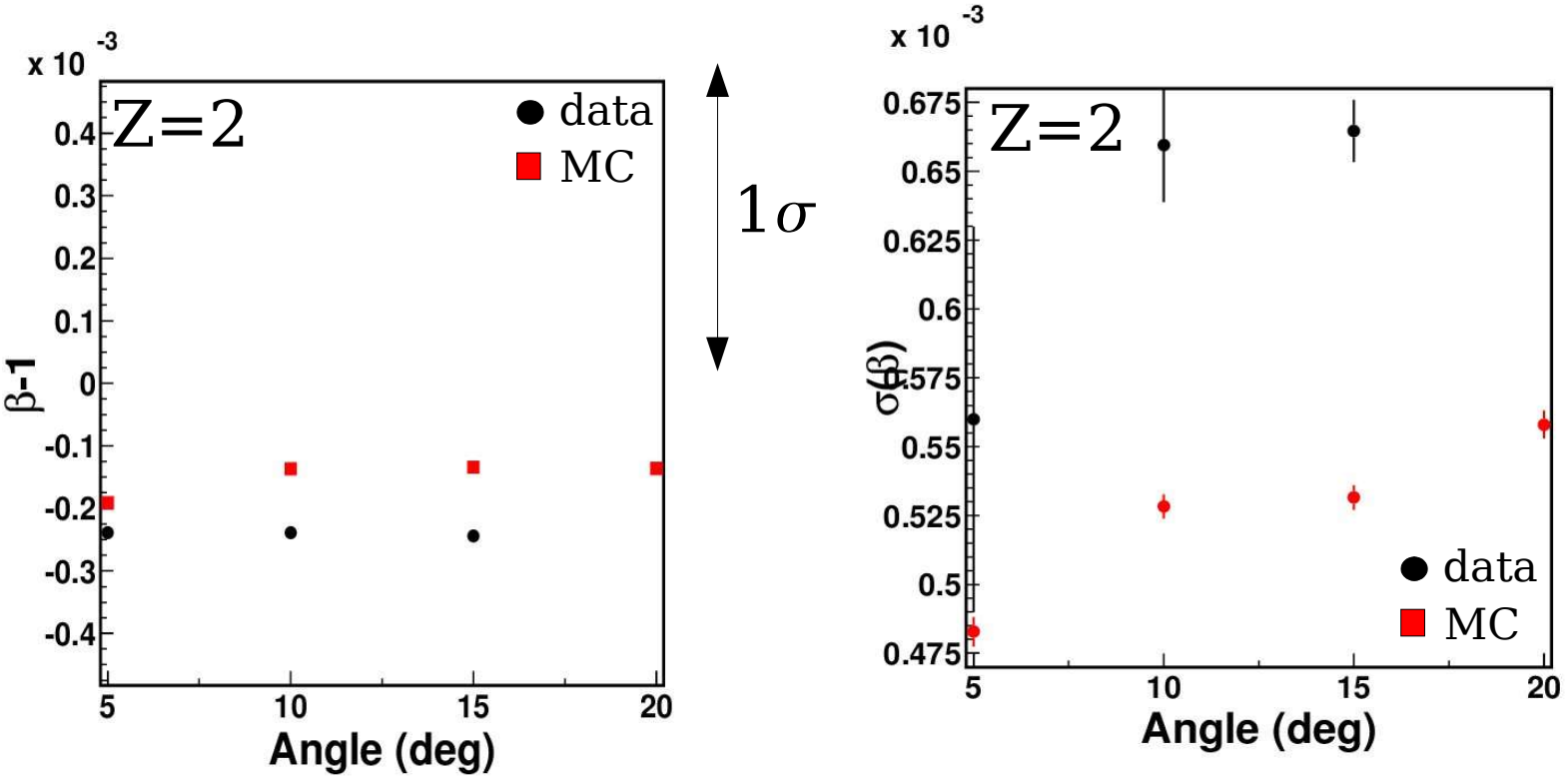
Radiator parameters taken from 0^0



- Worse agreement between data/MC than for MNN103, but MC parameters not so well tuned.
- Larger bias than MNN103, but likely due to systematics.

N105

Radiator parameters taken from 0^0



- Resolution disagreement specially high: I have to check if is it is real or a systematic.
- Bias disagreement again within variance due to pixel size.
- Bad resolution due to small expansion height.

Conclusions:

- Still work to do: MC have to be tuned for these runs (see previous talk)

- We observe a systematic bias in data and MC, but it is compatible with the expected variance from run to run due to the pixel size and the small beam width.

- Resolution behavior is the expected: is is worse for larger angles, and the relative change in data is close to the relative change in MC.

- Absolute values of resolution are also close for n=1.03 radiators. For N105 we observe a larger disagreement, but still has to be confirmed: we have to check it with a better MC, and we have to confirm that it is not a unexpected systematic.