Residual Vertical Dispersions and Corrections

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XIth FCC-ee Energy Calibration and Polarization WG meeting
30 November 2017
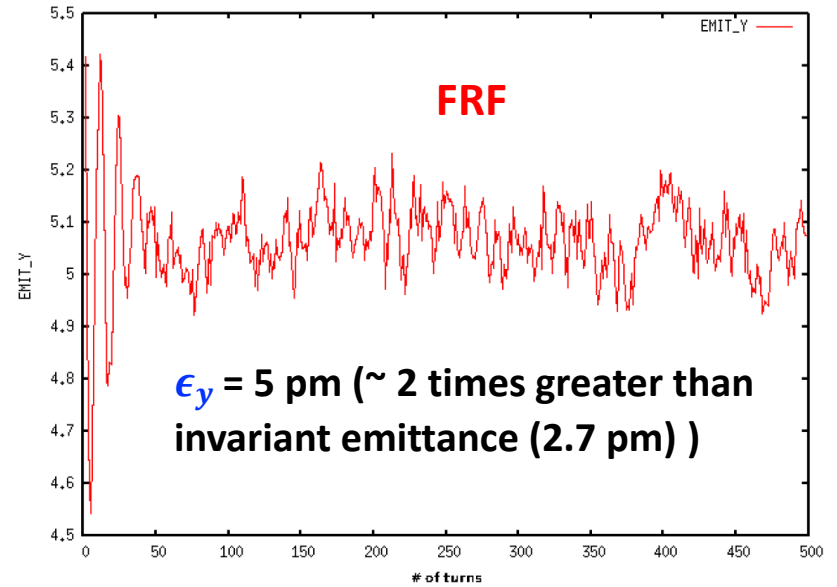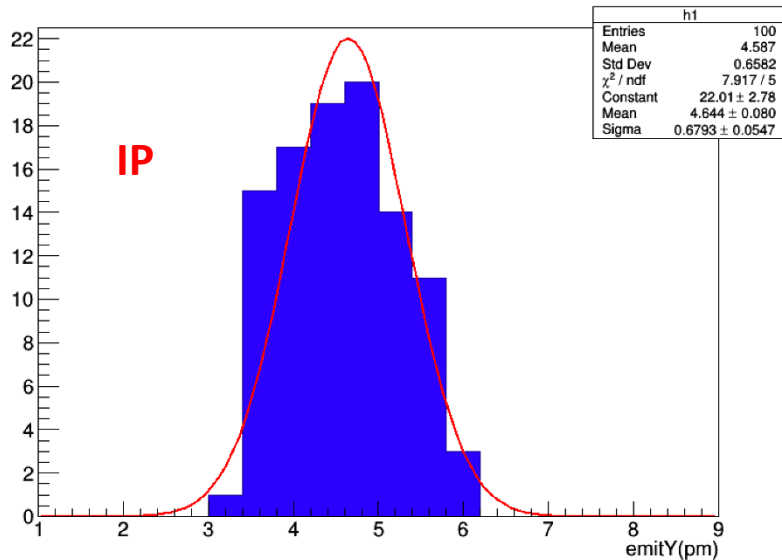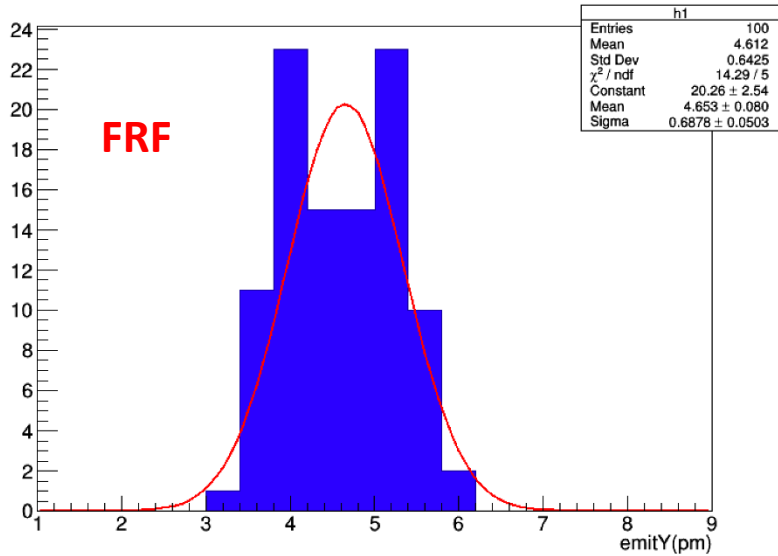
OUTLINE

→ Projected emittance @ 175 GeV

→ Residual dispersions after sextupole misalignments @ 45.6 GeV

→ Corrections:

1) How to correct
2) Results after correction

Projected emittance @ 175 GeV

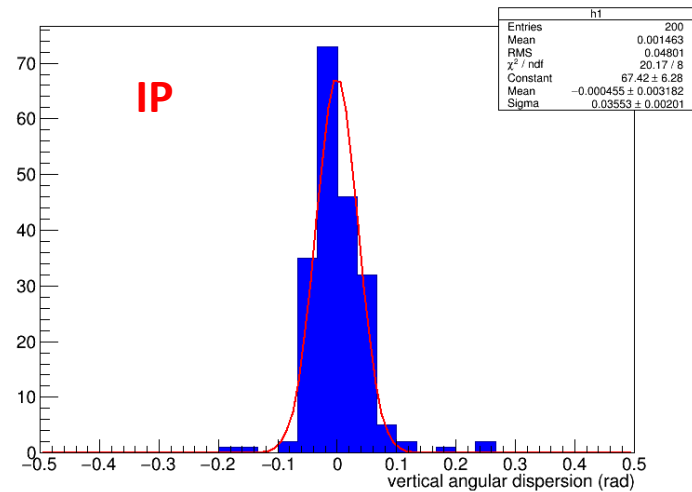ϵ_y = 5 pm (~ 2 times greater than invariant emittance (2.7 pm))

→ The vertical misalignments of the sextupoles give the needed x-y coupling

→ These misalignments result in residual vertical dispersions overall the ring which result in the increase of the projected emittance

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Residual dispersions @ 45 GeV

Sextupole vertical offsets

IP

h1	
Entries	832
Mean	1.57e−06
RMS	3.553e−05

DY (m)

IP

h1	
Entries	100
Mean	−5.254
Std Dev	20.48

EY (um)
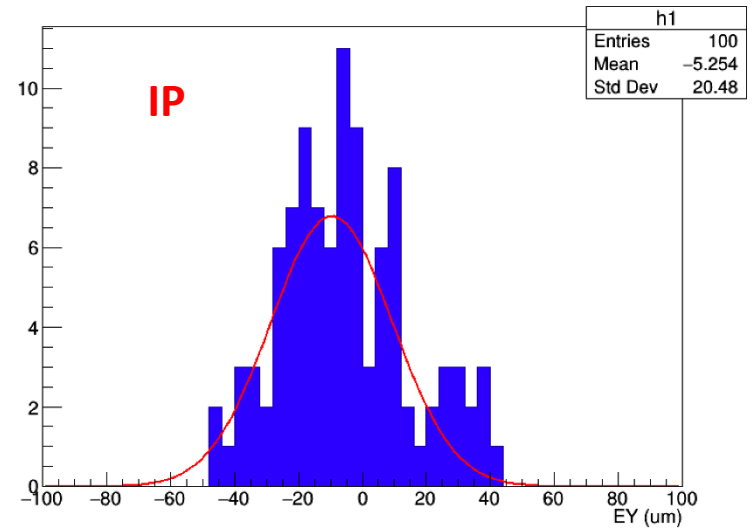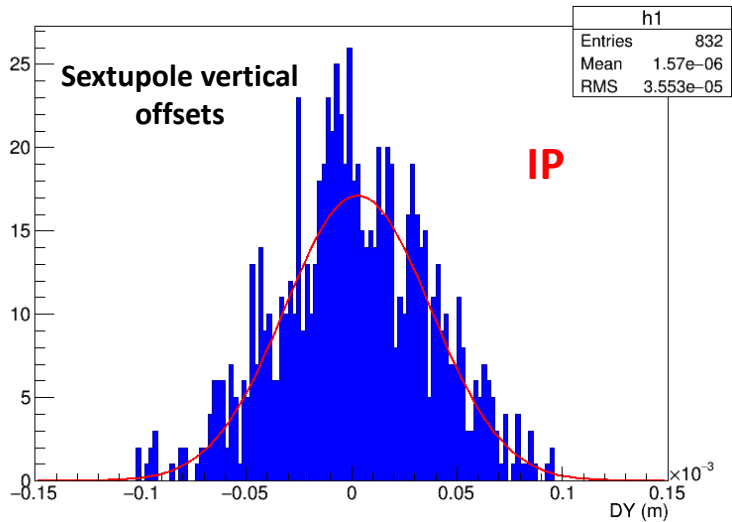
→ The x-y coupling at Z is of 0.37%

→ The rms of the sextupole vertical misalignments is around 36 μm

→ The rms of the residual horizontal dispersion is in the range of 20 μm (20 μm * 0.132% = 26 nm)

→ The rms of the horizontal angular dispersion is in the order of 36 mrad (36 mrad *0.132% = 48 μradians)

IP

h1	
Entries	200
Mean	0.001463
RMS	0.04801
χ^2 / ndf	20.17 / 8
Constant	67.42 ± 6.28
Mean	−0.000455 ± 0.003182
Sigma	0.03553 ± 0.00201

vertical angular dispersion (rad)

Corrections @ 175 GeV

→ Local corrections were considered so far
→ Residual dispersions and x-y coupling were removed from FRF and IP
→ Put on the skew quadrupole components of ±8 sextupoles upstream and downstream of the location to be corrected
→ Corrections give a 22% lower projected vertical emittance
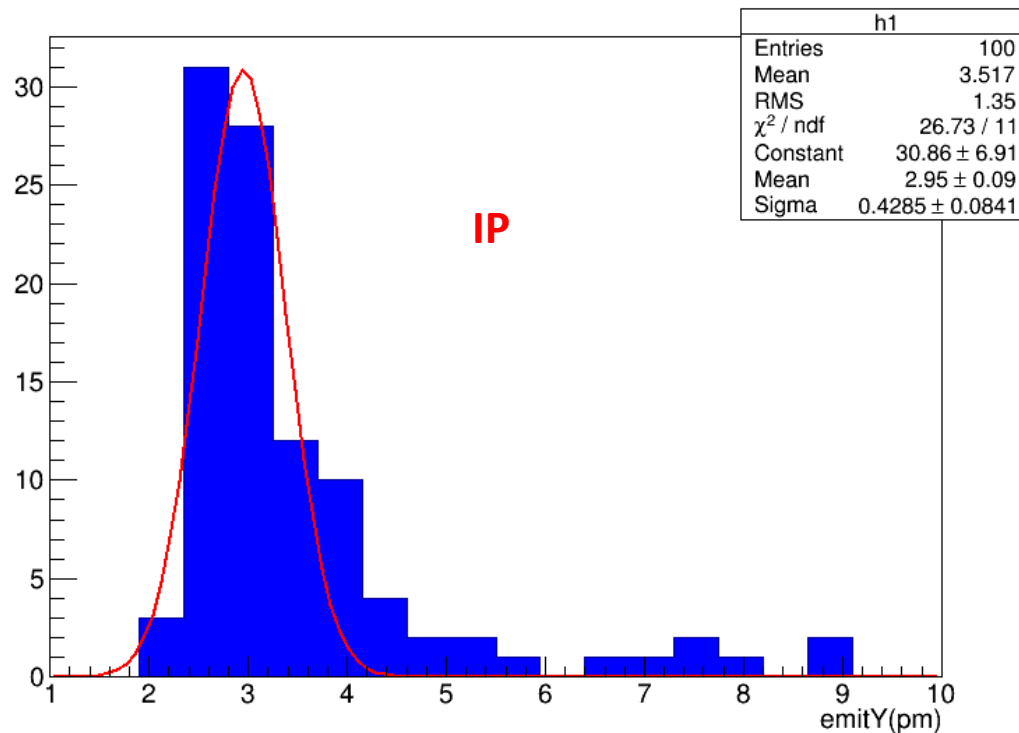
Conclusions

→ Vertical misalignments result in residual dispersions leading to larger projected emittance

→ The residual dispersions were corrected locally by varying the skew quadrupole components of the sextupoles

→ Corrections should be considered in all lattices @ all energies

→ Tracking with the corrected dispersions is ongoing and results will be reported later