

# HL-LHC optics MD results

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- Investigation of possible source of phase error

Focus only at a single  $\beta^*$ , to compare before and after the applied corrections

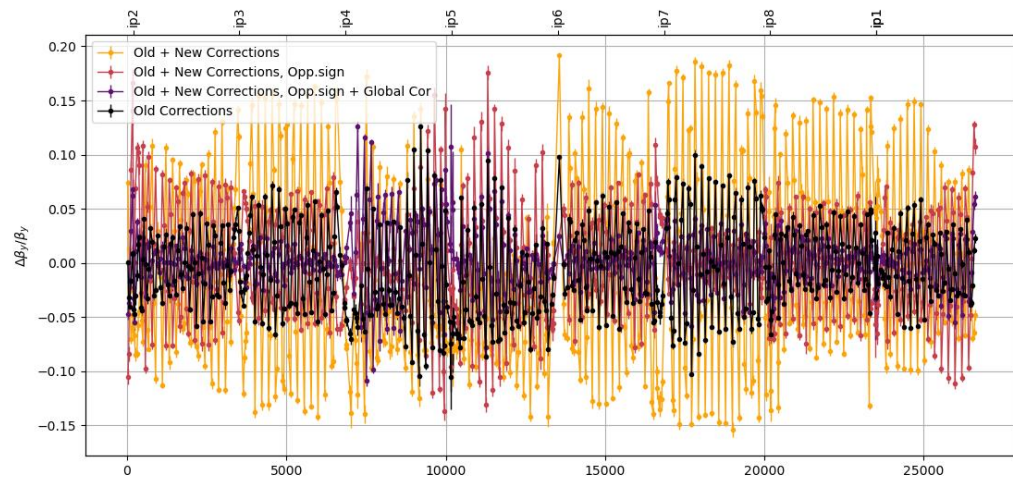
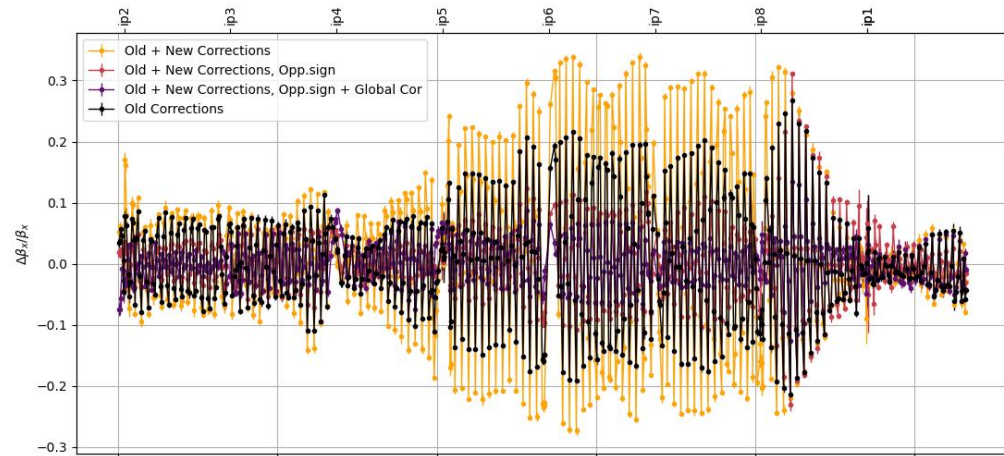
# Arc corrections for Beam1

Analysis for the step: 165/84cm

**Old corrections:** Sextupole Bumps + Q10 + MQT, at Arc45, Arc81

**New Corrections:** Sextupole Bumps +MQT at Arc45, Arc81

Goal: Reduce  $\beta$ -beating by reducing the phase errors in the arcs



# Arc corrections for Beam1

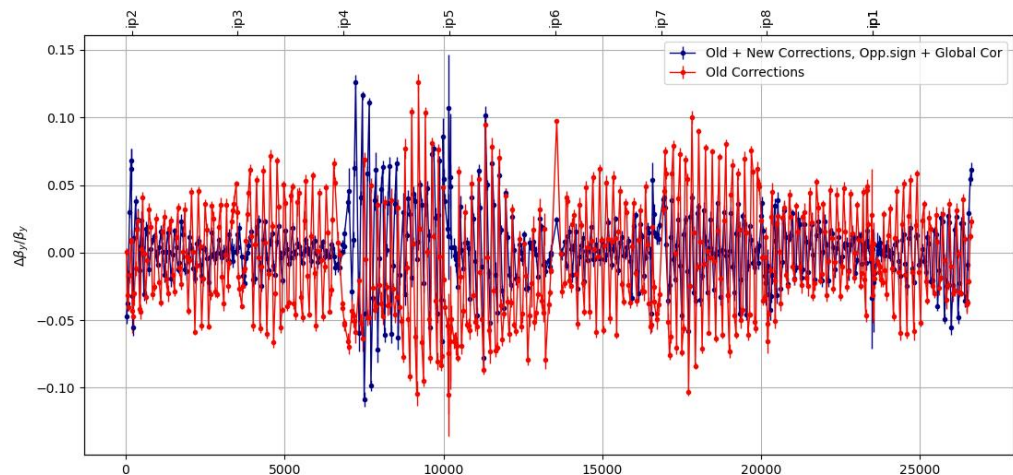
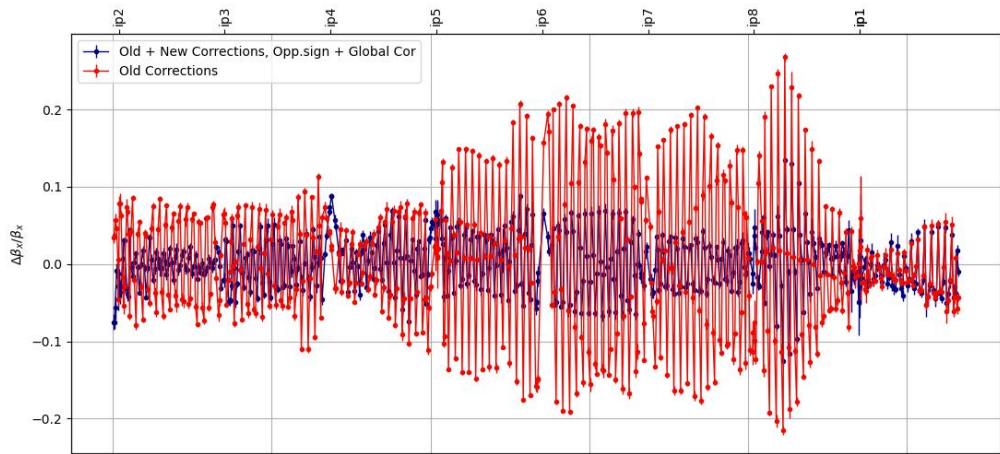
Analysis at the step: 165/84cm

**Old corrections:** Sextupole Bumps + Q10 + MQT

**New Corrections:** Sextupole Bumps +MQT

**'Similarly'** for both arcs

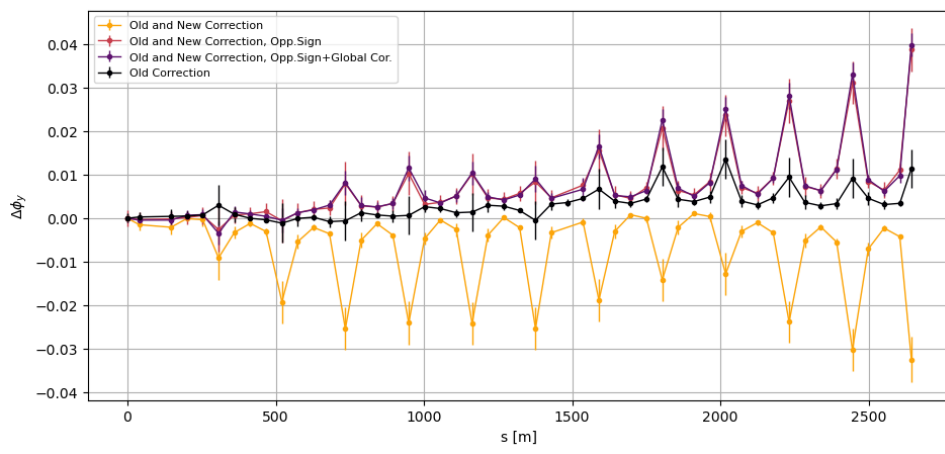
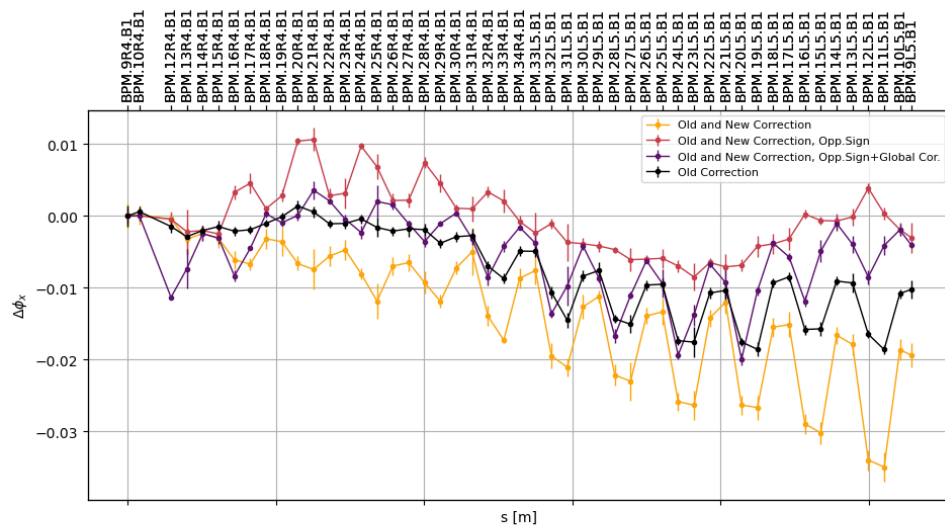
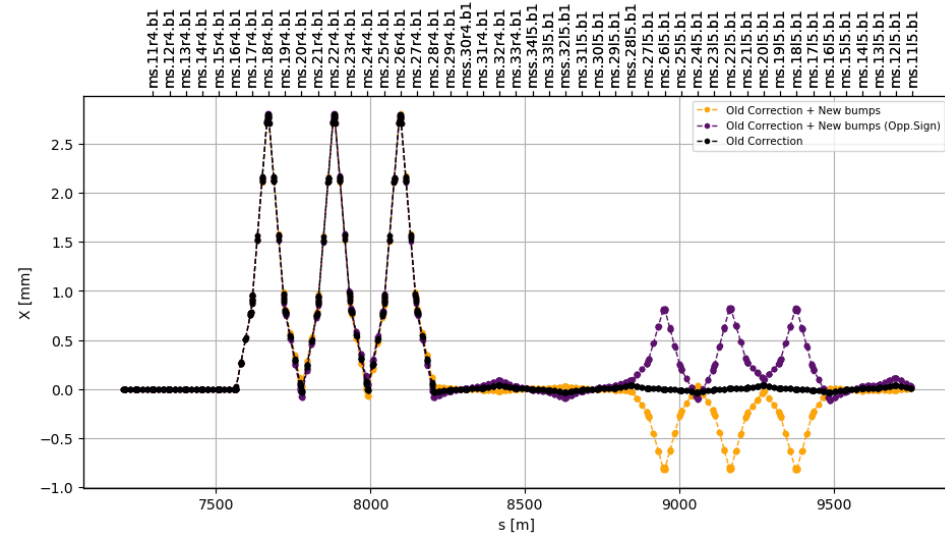
Goal: Reduce  $\beta$ -beating by reducing the phase errors in the arcs



# Arc45 corrections for Beam1

Old corrections: Left side of the arc

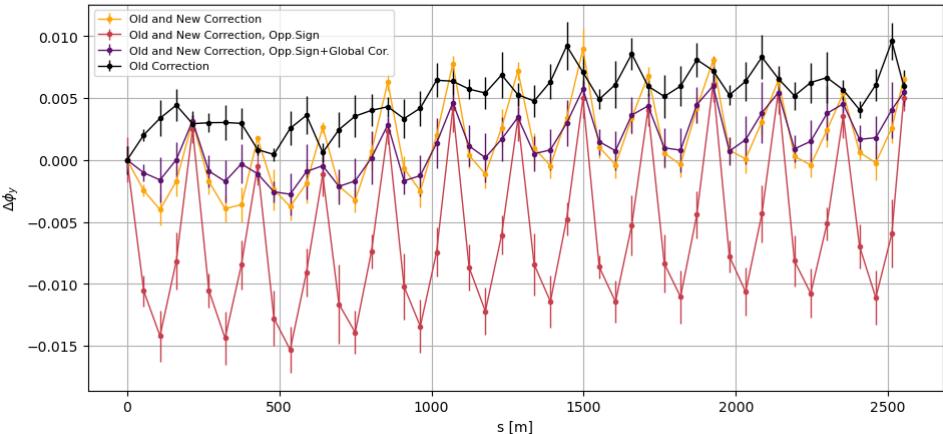
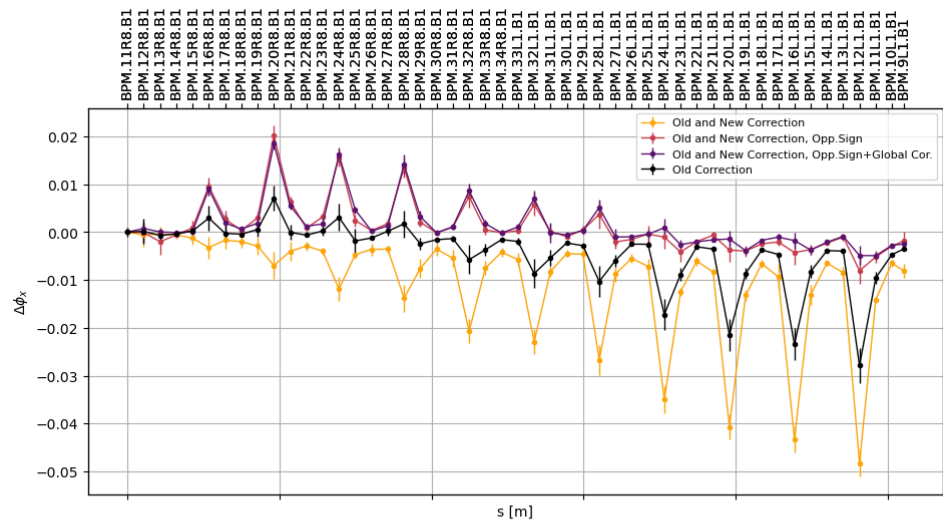
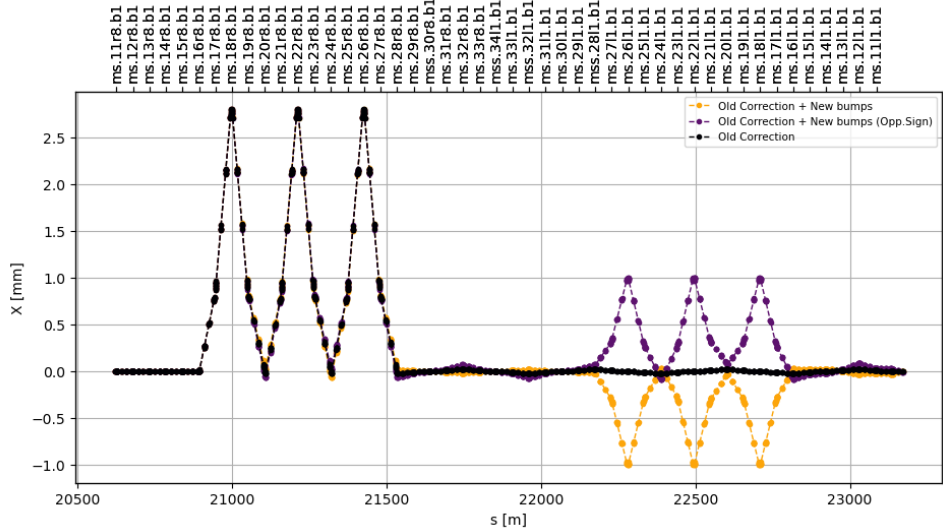
New Corrections: Right side of the arc



# Arc81 corrections for Beam1

Old corrections: Left side of the arc

New Corrections: Right side of the arc



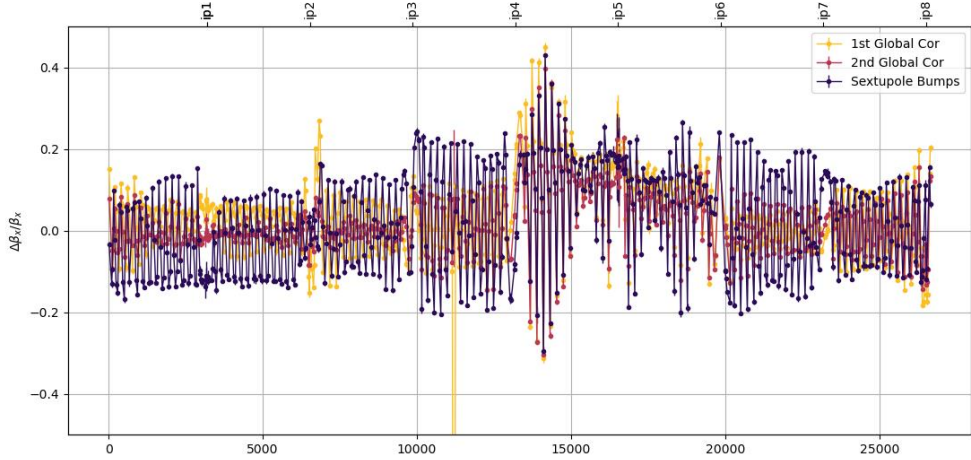
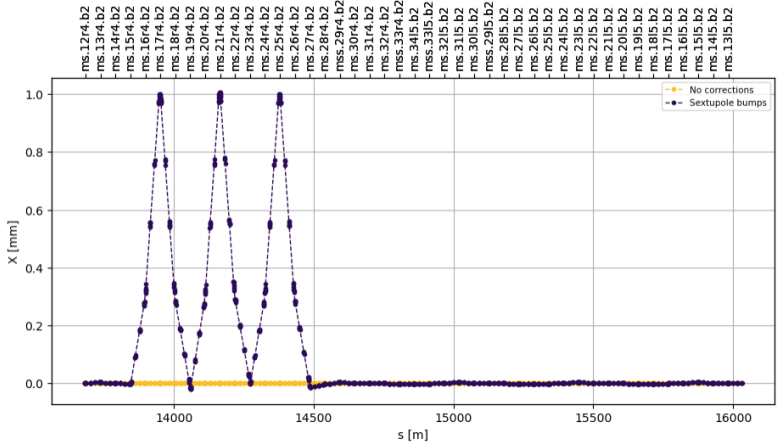
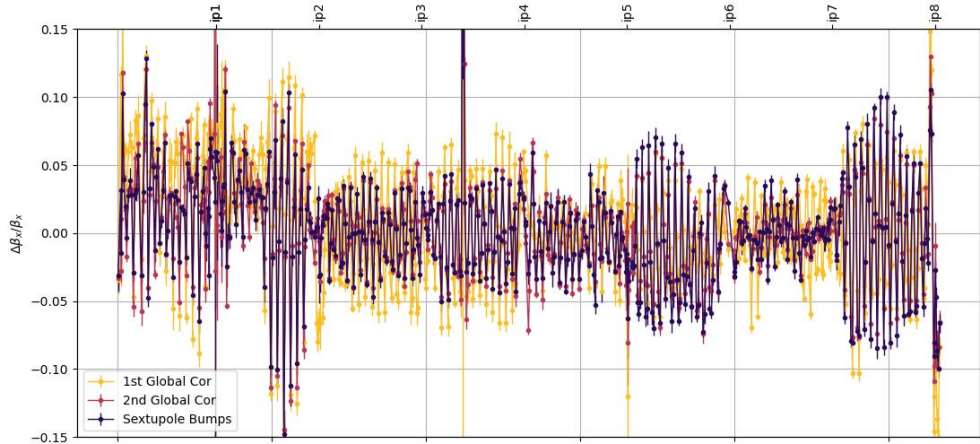
# Arc45 corrections for Beam2

110/43cm

**Sextupole bumps:** Applied with the 1st iteration of Global corrections

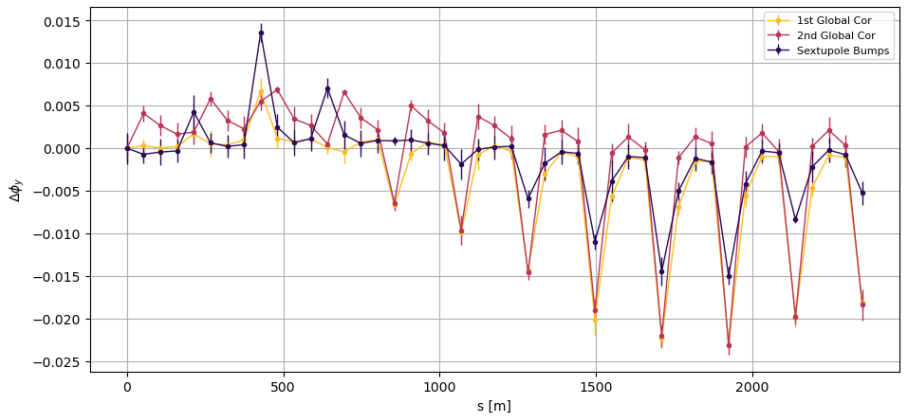
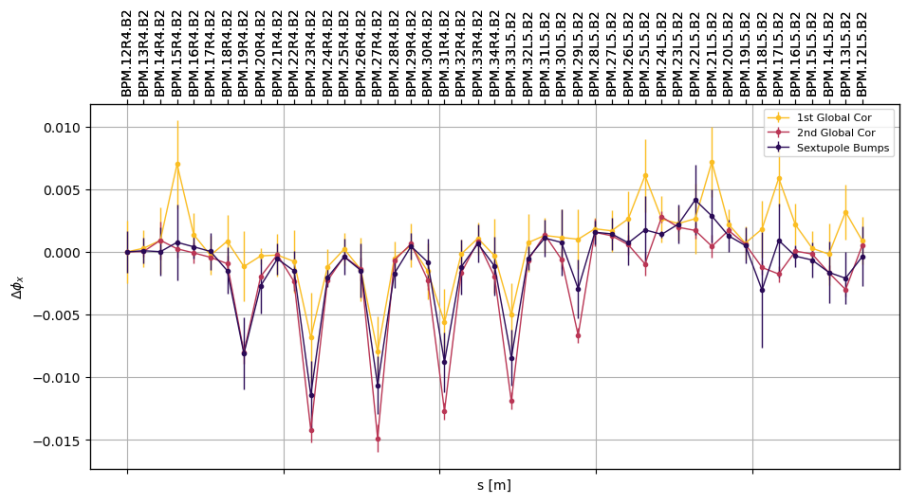
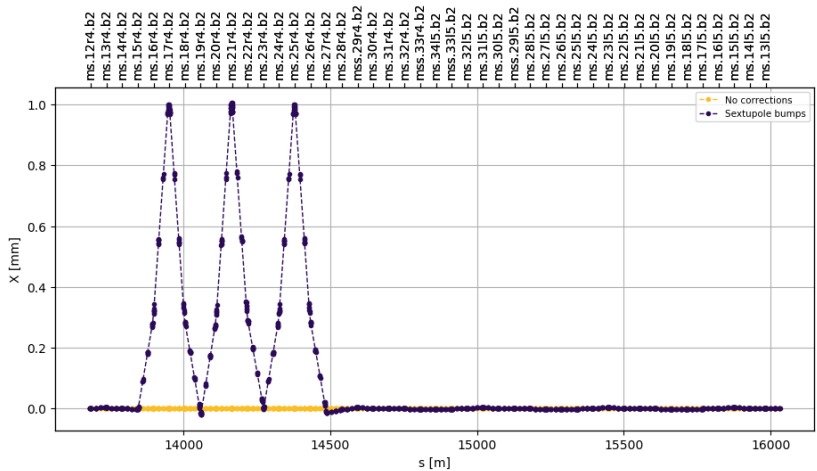
2nd iteration did not improve arc45 beating

**Correction:** Sextupole bumps on the left side of the arc + KQTD.A45B2



# Arc45 corrections for Beam2

**Correction:** Sextupole bumps on the left side of the arc + KQTD.A45B2



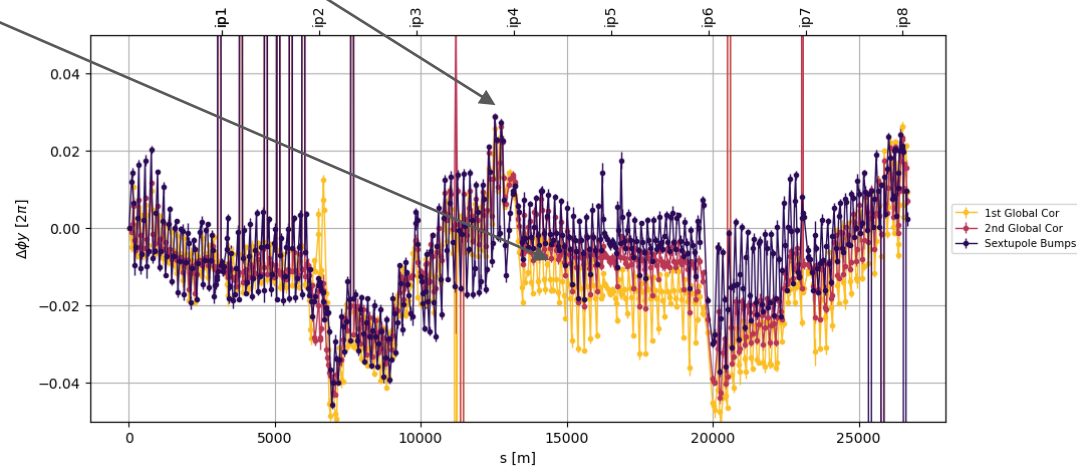
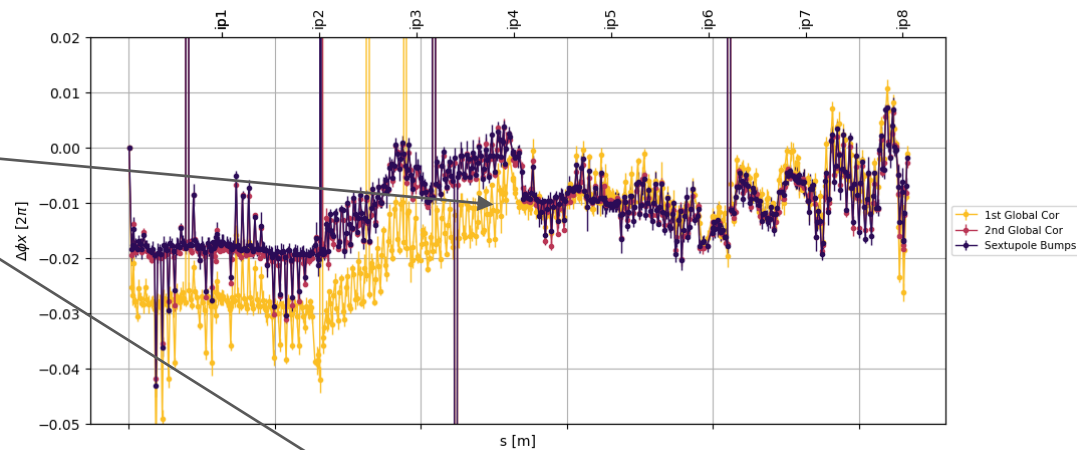


# Arc45 Beam2

Investigating the source of the phase error: **Focusing around IP4**

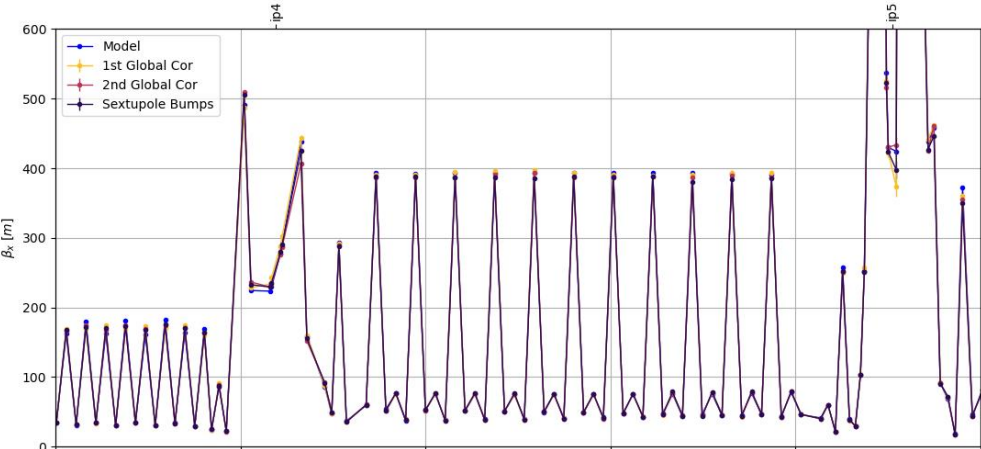
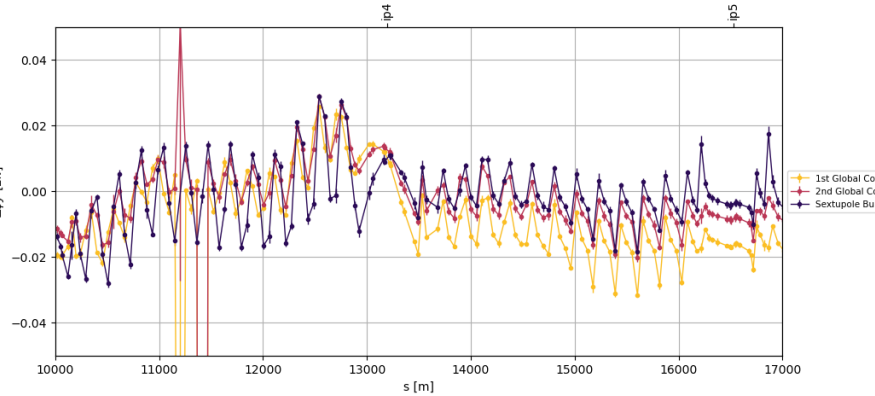
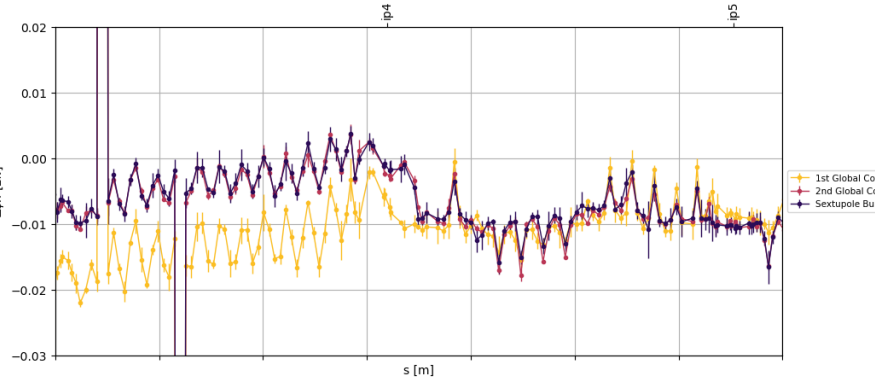
Phase error 'drift' in Arc45

**Correction did not improve globally the vertical plane**

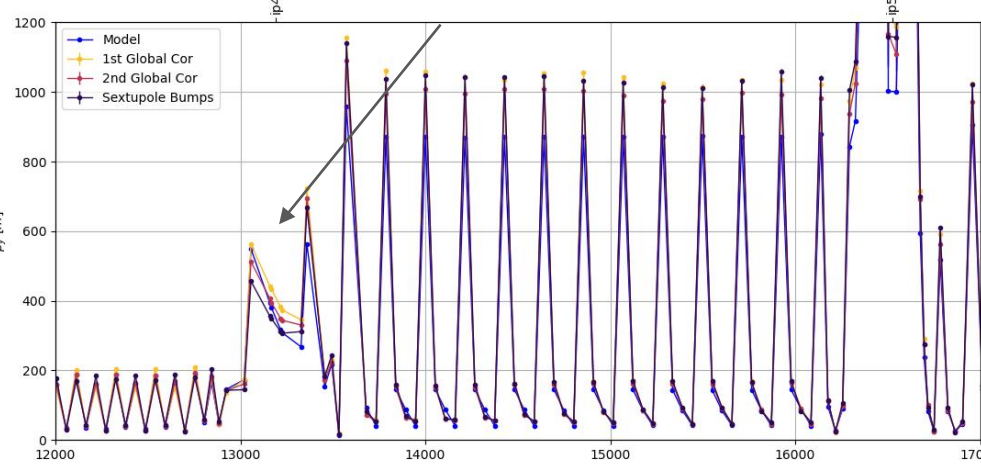


# Arc45 Beam2

Investigating the source of the phase error: **Focusing around IP4**



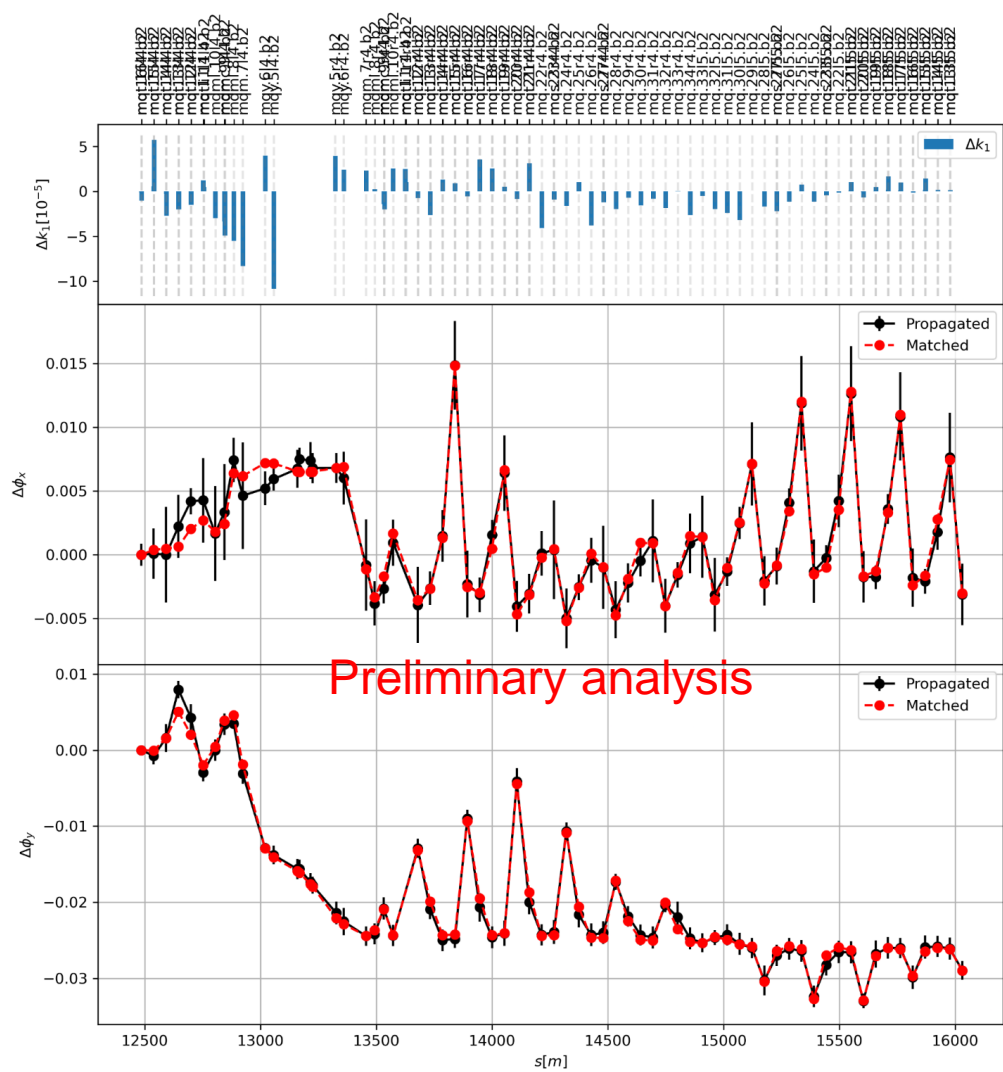
**Visible difference in  $\beta$**



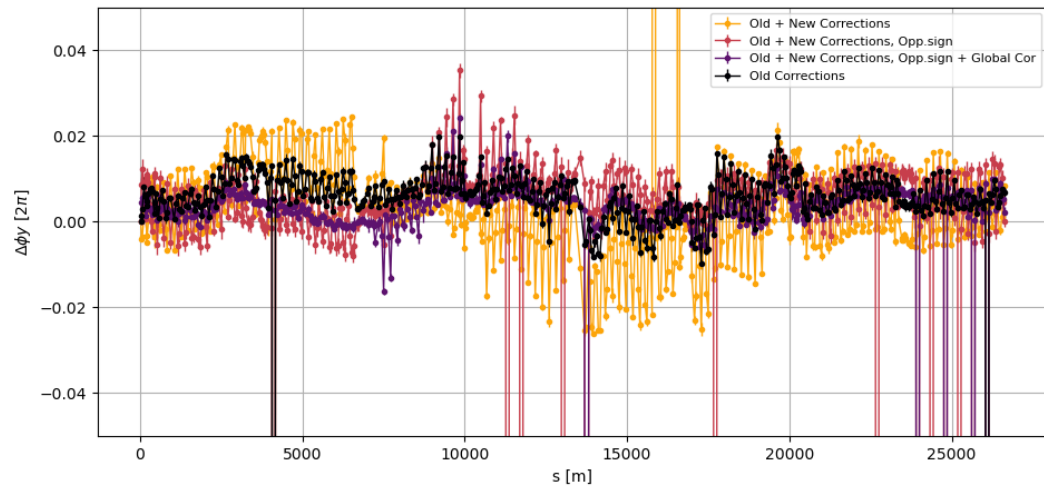
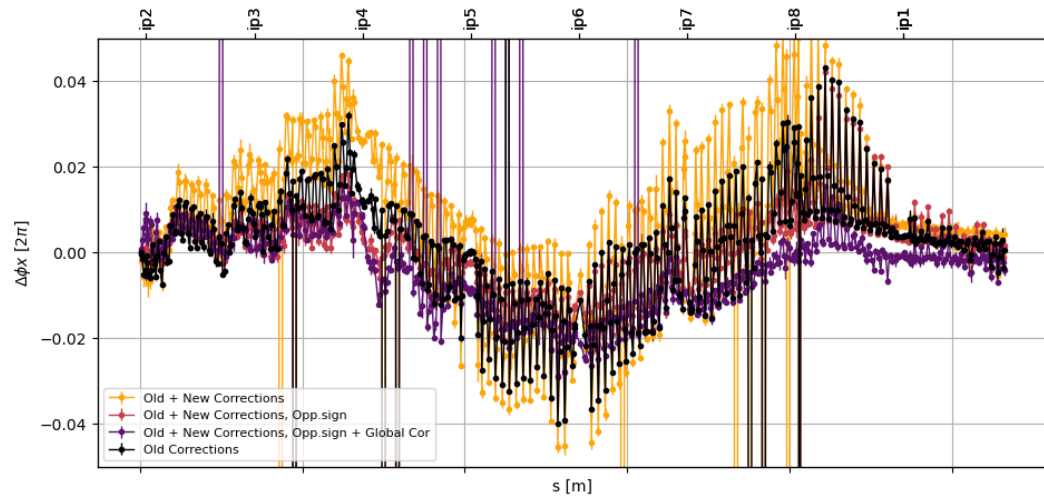
# Arc45 Beam2

Investigating the source of the phase error

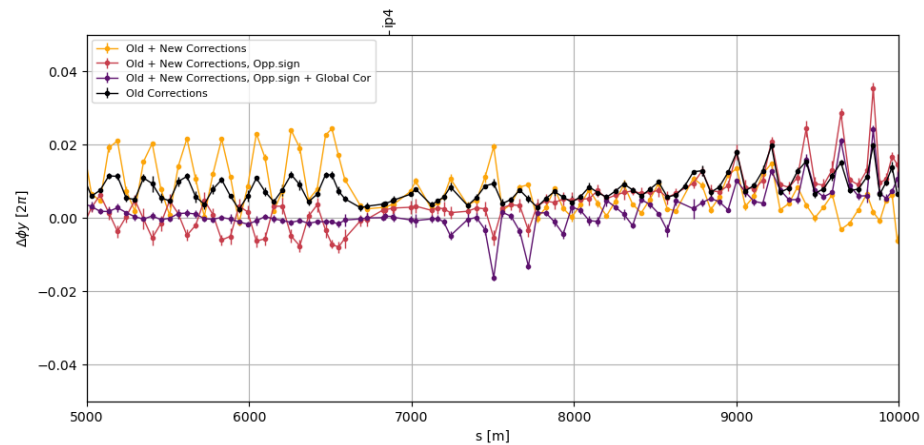
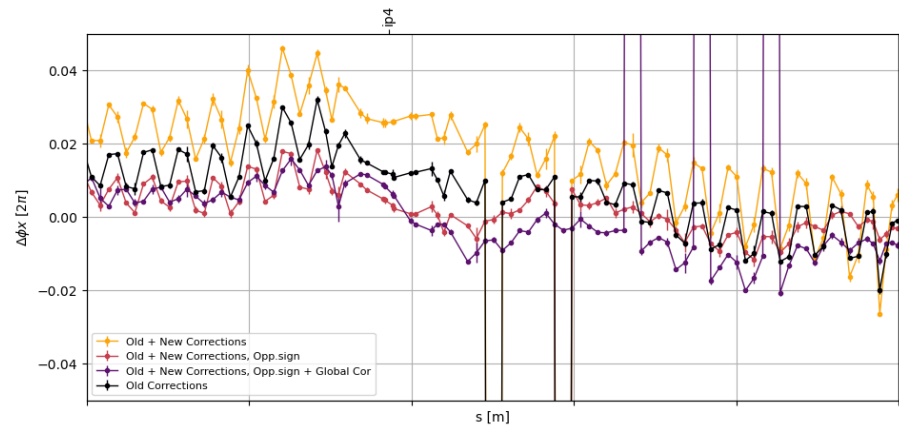
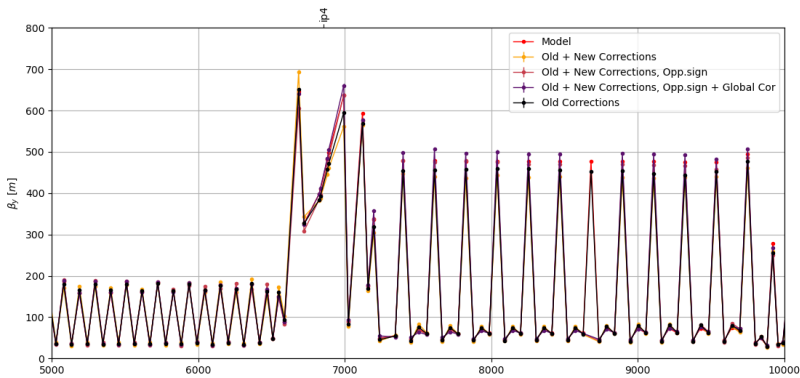
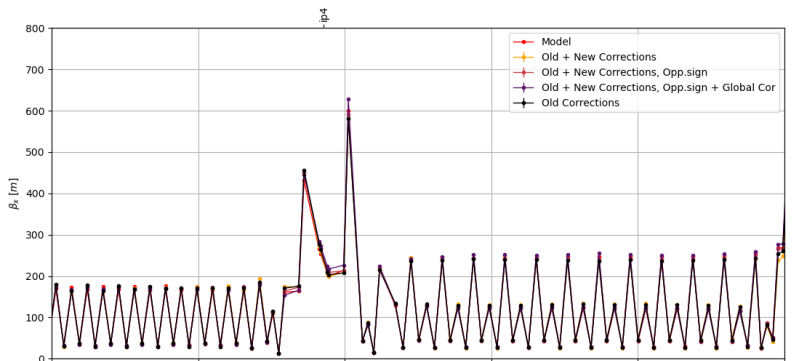
- Selection of quadrupoles in the segment
- Response matrix for the phase error



# Arc45 Beam1



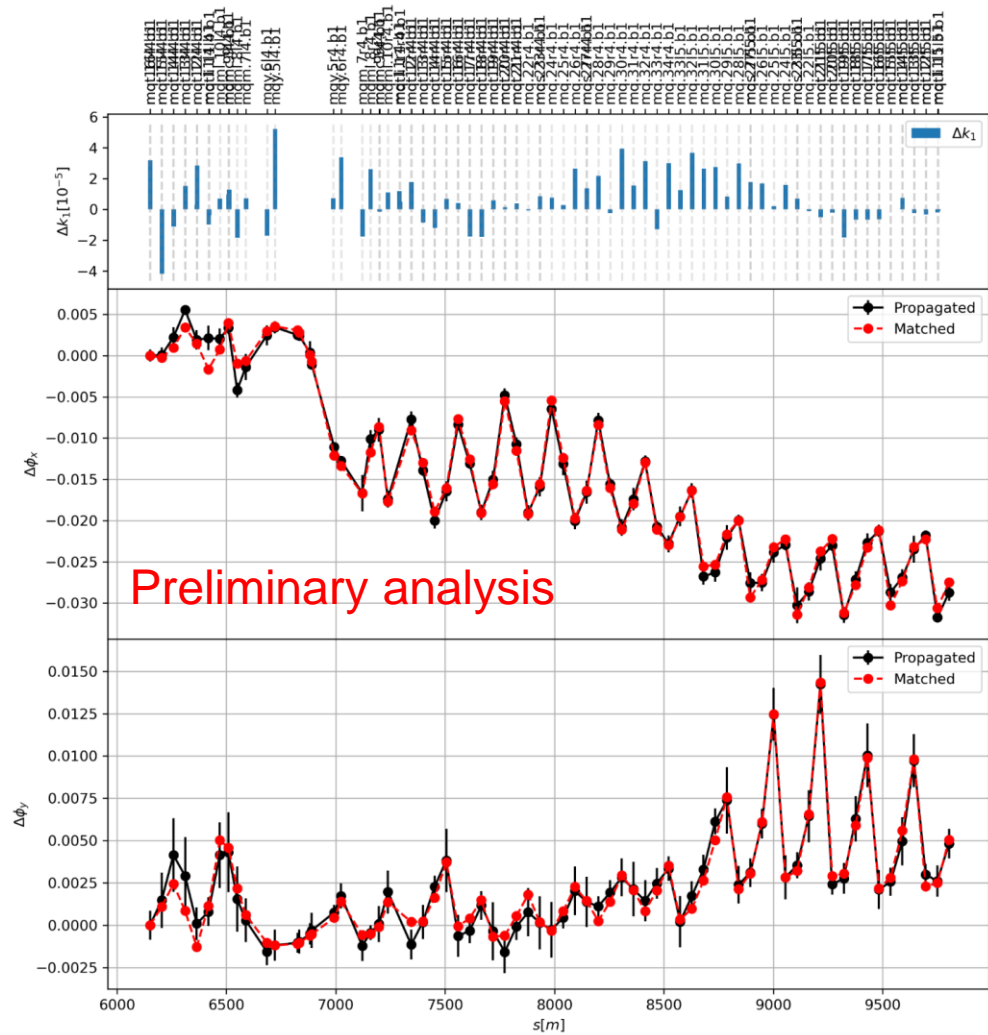
# Arc45 Beam1



# Arc45 Beam1

Investigating the source of the phase error

- Selection of quadrupoles in the segment
- Response matrix for the phase error



# Conclusions

- Local arc corrections in the arc improve optics control Beam1
- Beam2 arc correction not enough
- Plan to either modify the Beam2 correction or apply extra global corrections (postponed since MD5 part was cancelled)
- Possible source of Q5.L4