

# Beam 2 in MAD-X and SixTrack

M. Giovannozzi

Acknowledgements: S. Redaelli, T. Risselada

# Summary of the tests performed

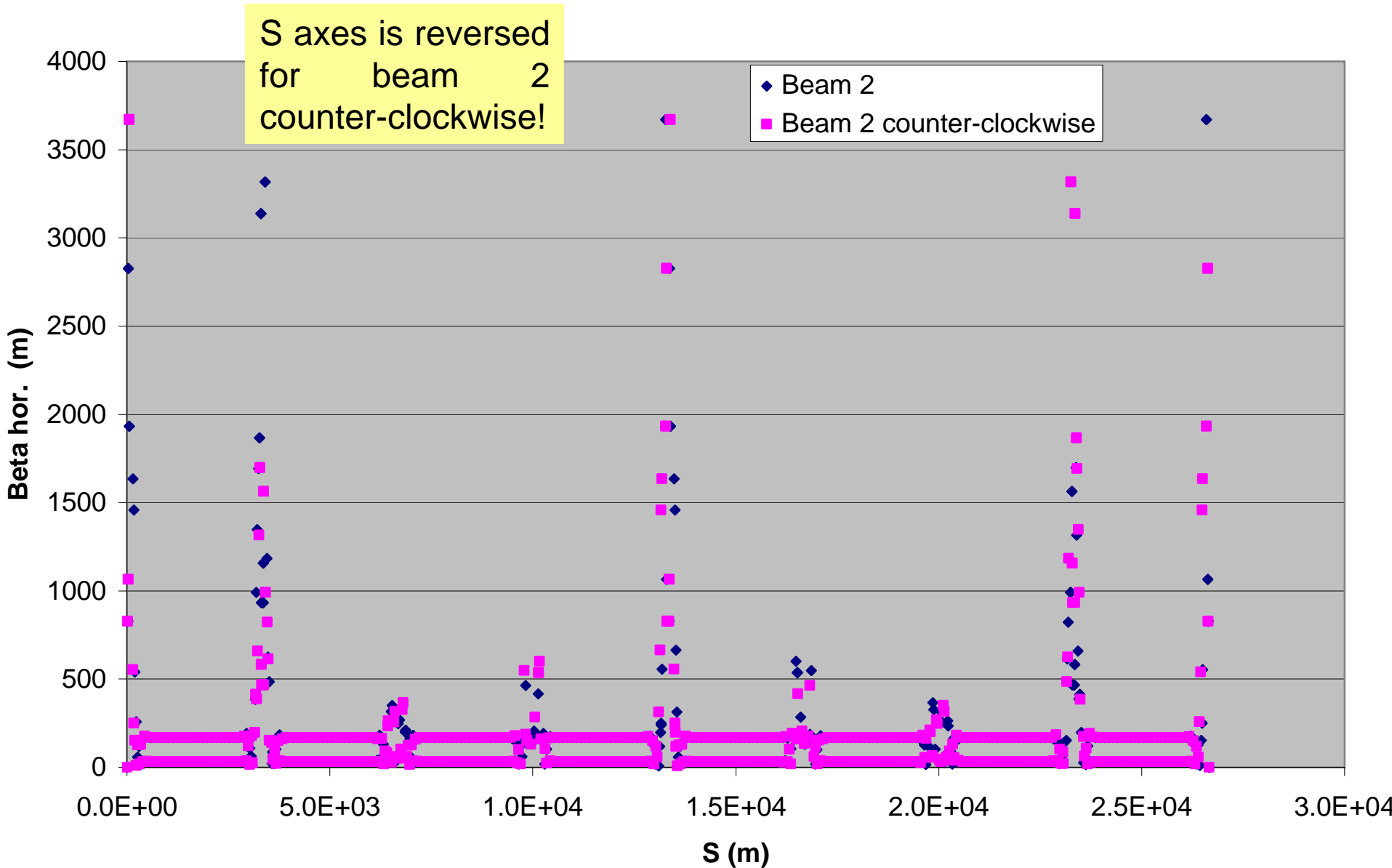
- **Comparison of the optics for beam 2 counter-clockwise and clockwise in MAD-X.**
- **Comparison of the optics for beam 2 counter-clockwise in MAD-X and SixTrack.**
- **Comparison of the optics for beam 2 clockwise in MAD-X and SixTrack.**

**In all the cases the lattice files are the thin version.**

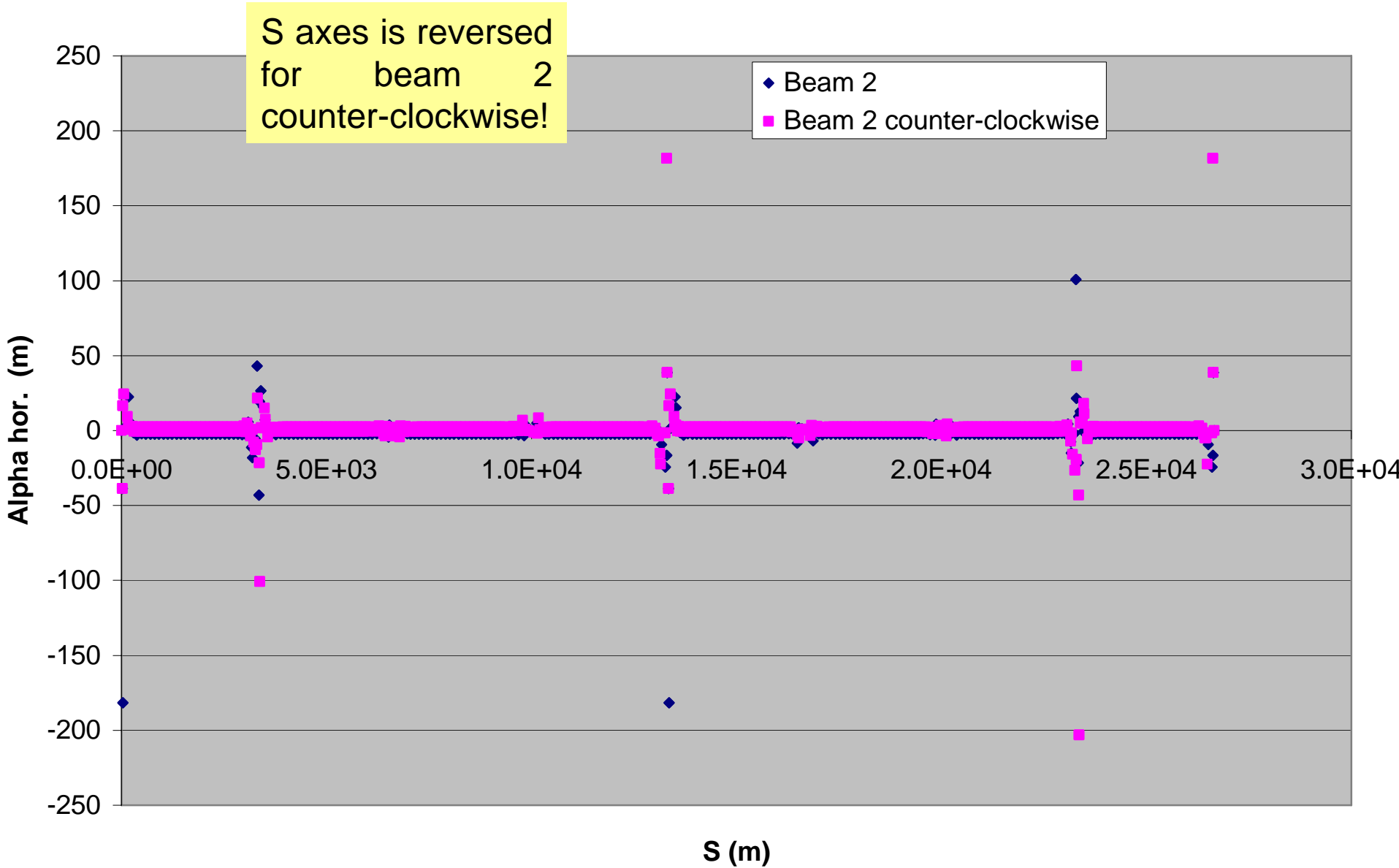
**The optics version is V6.500.**

**Both injection and low-beta configurations were analysed. The results reported here are for the injection version.**

# Comparison beam 2 clock/counter-clock in MAD-X

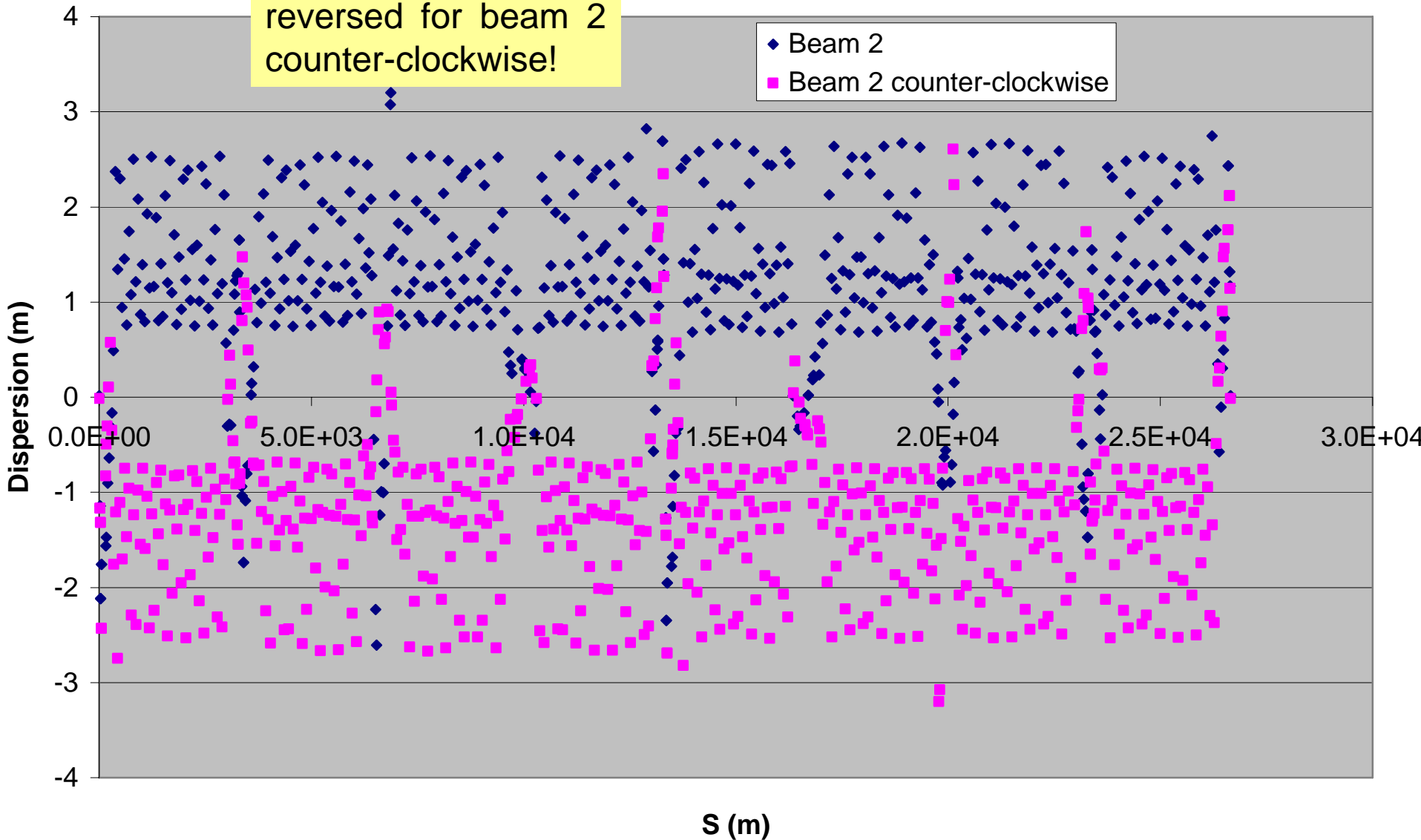


# Comparison beam 2 clock/counter-clock in MAD-X

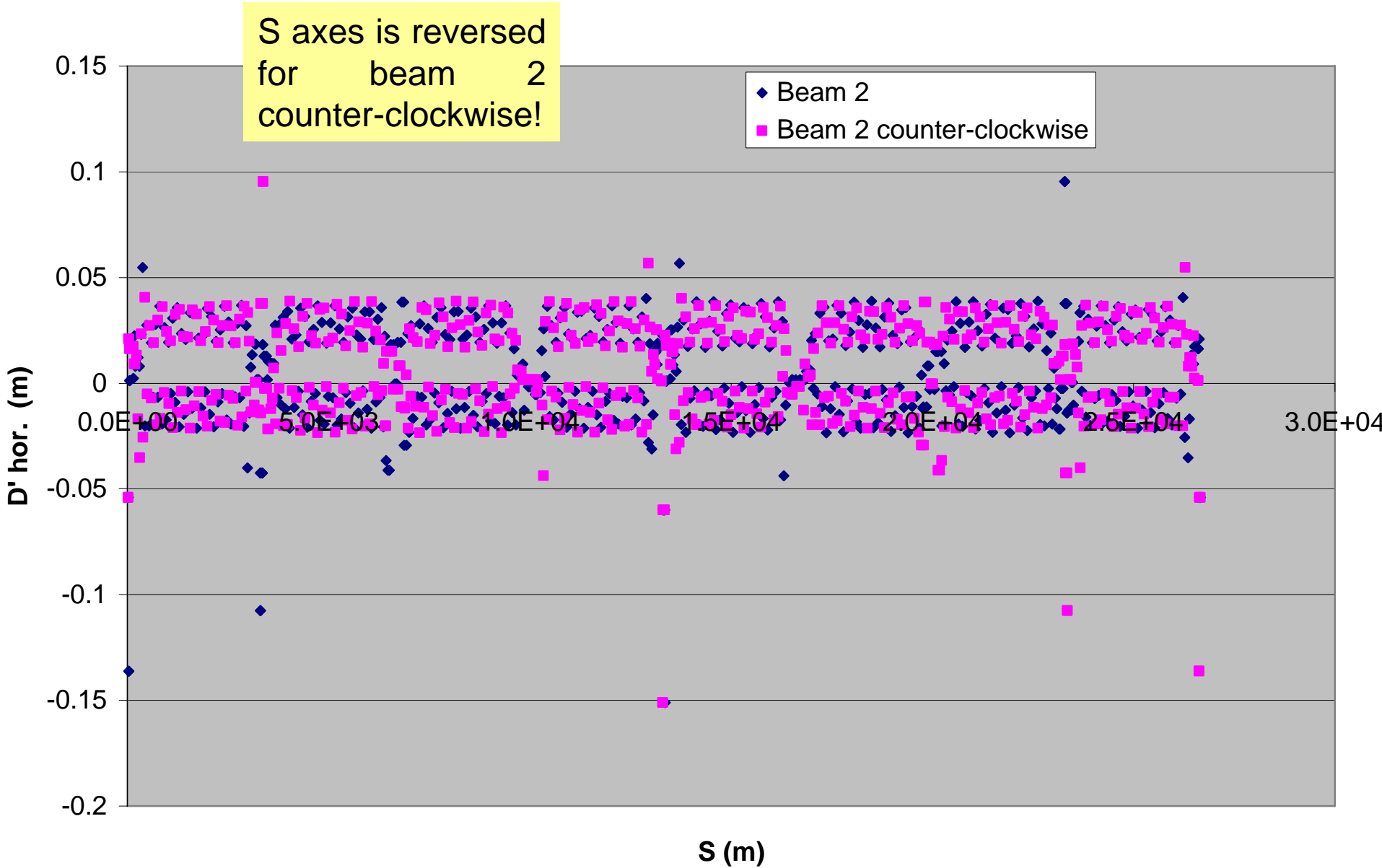


# Comparison beam 2 clock/counter-clock in MAD-X

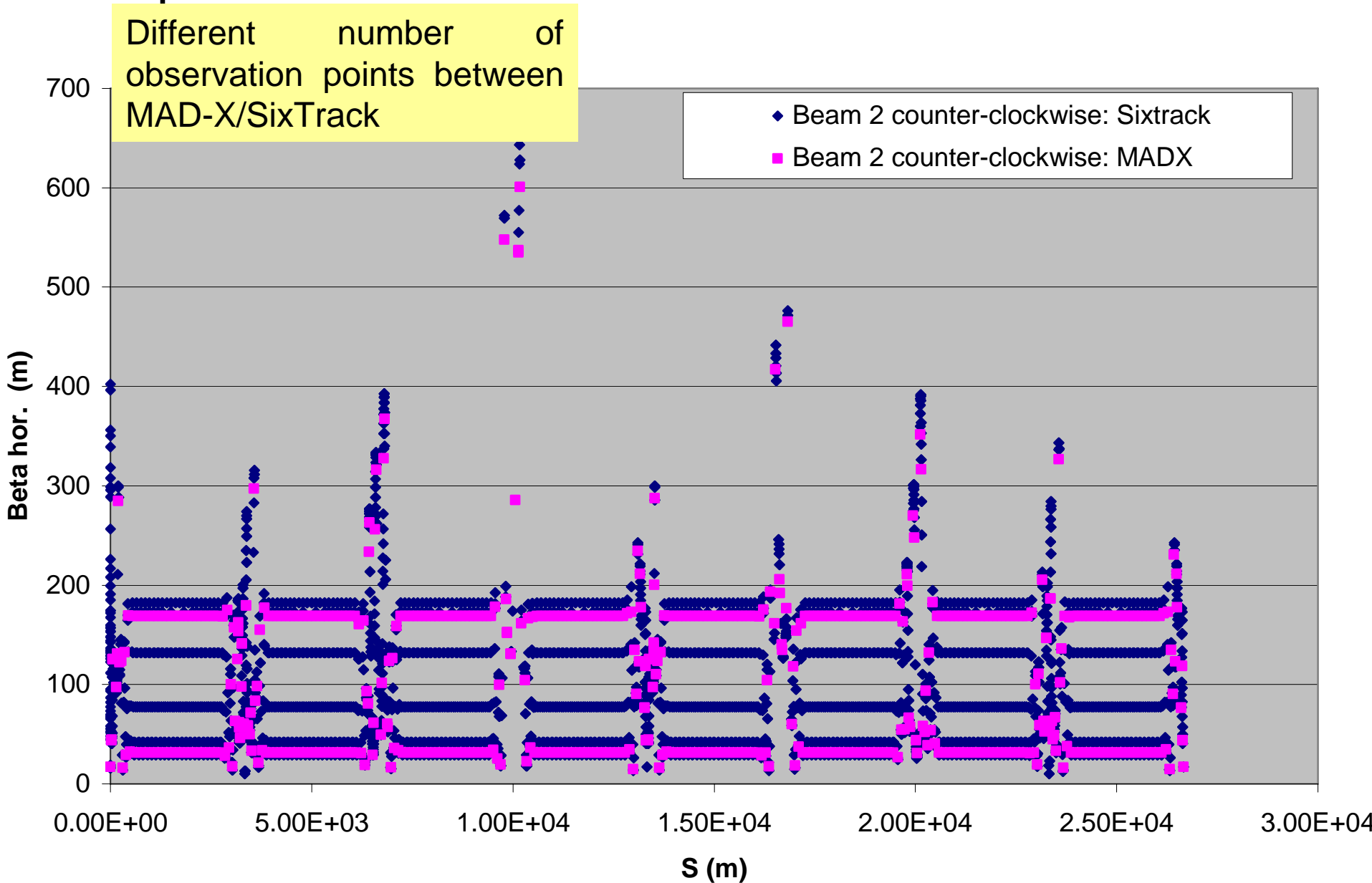
S and X axes are reversed for beam 2 counter-clockwise!



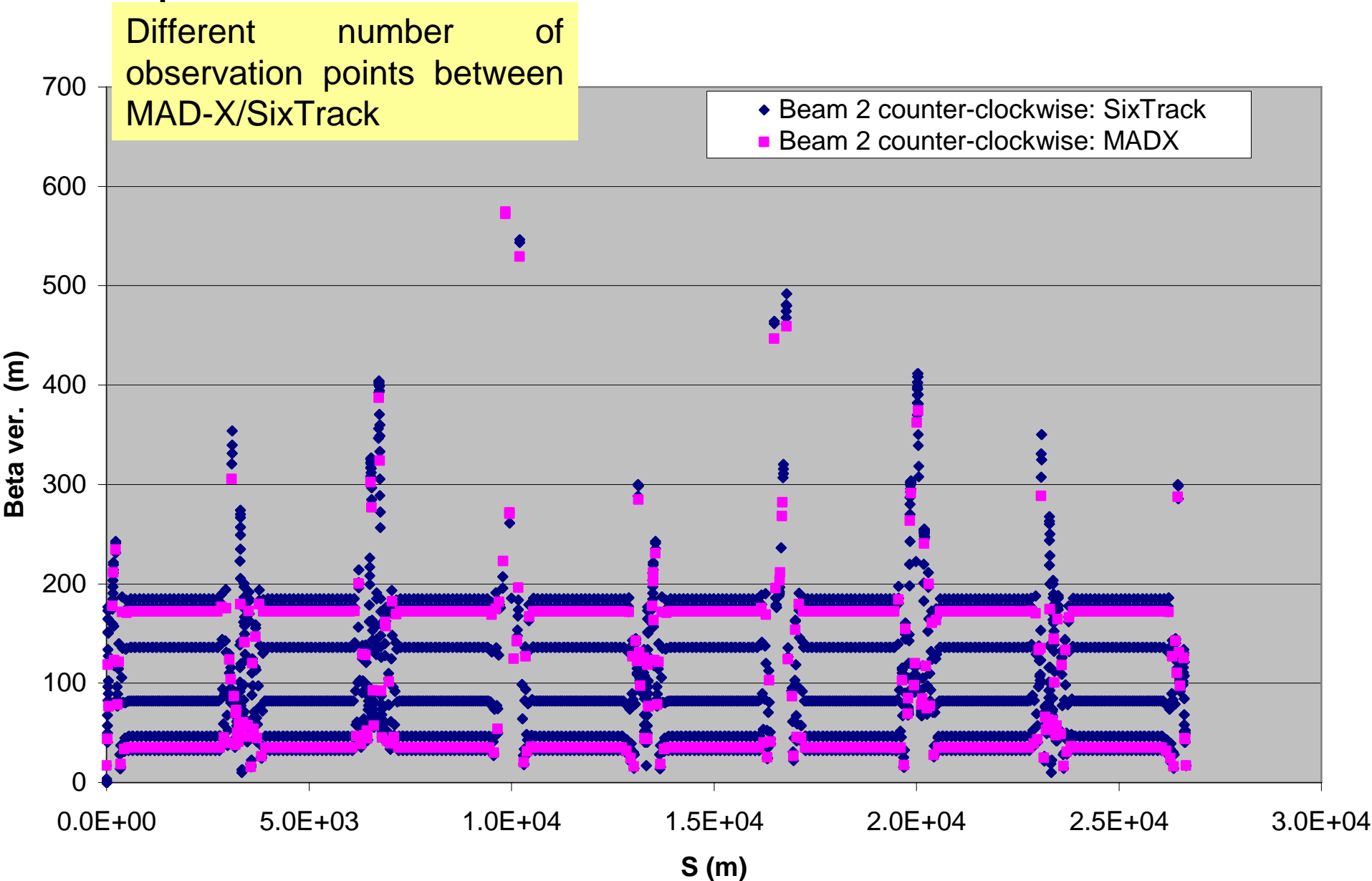
# Comparison beam 2 clock/counter-clock in MAD-X



# Comparison beam 2 counter-clock in MAD-X/SixTrack



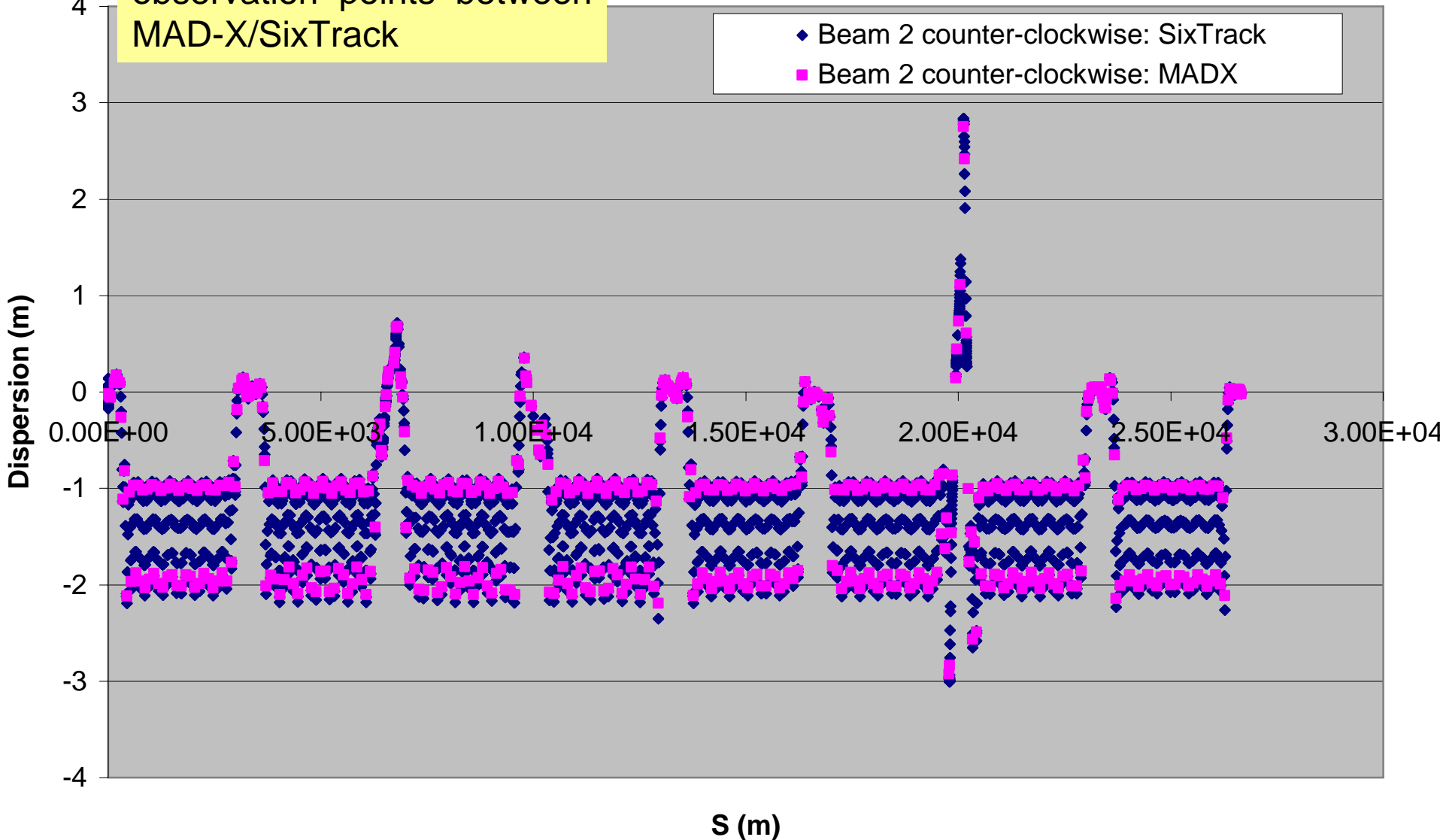
# Comparison beam 2 counter-clock in MAD-X/SixTrack



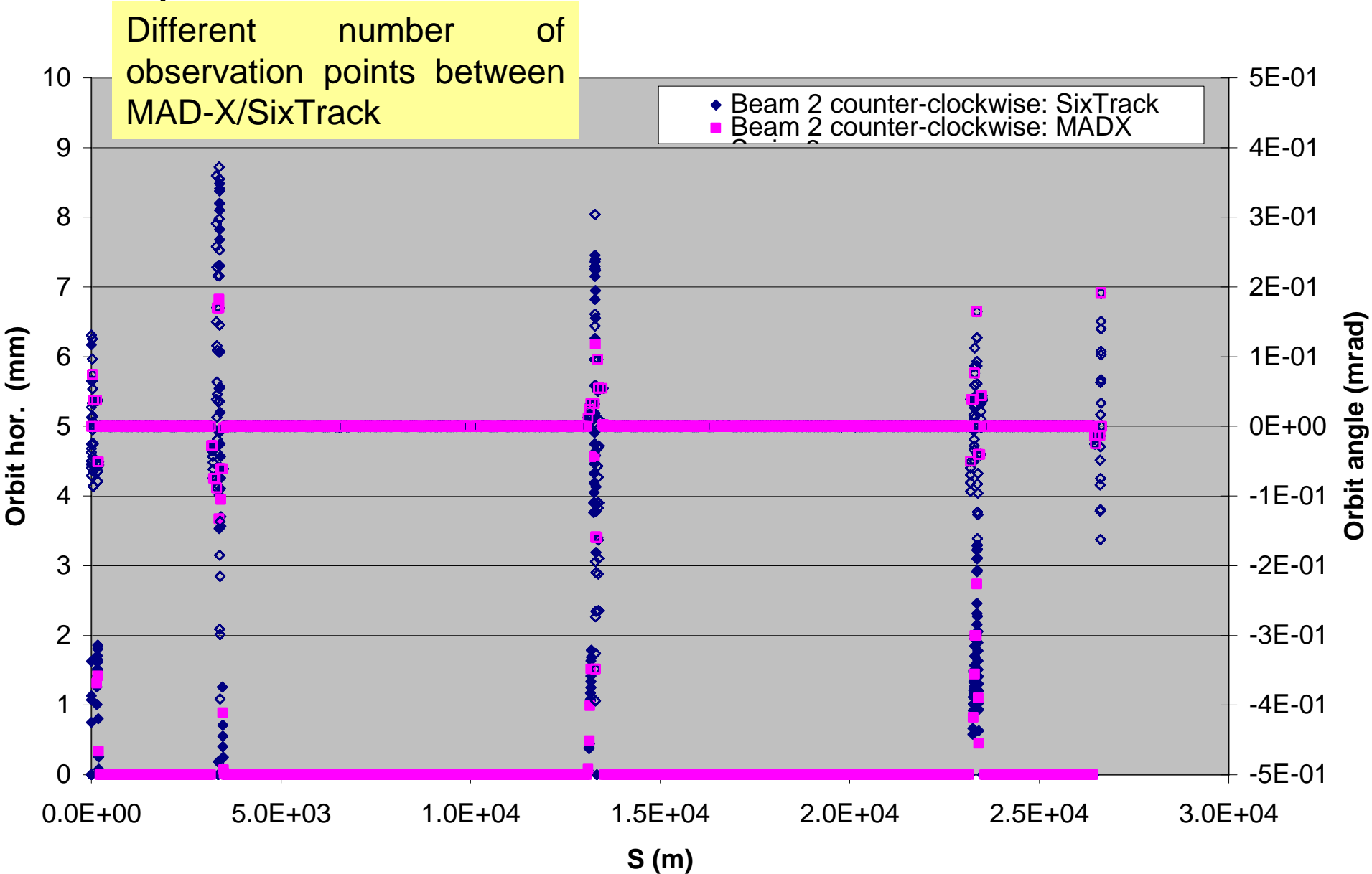


# Comparison beam 2 counter-clock in MAD-X/SixTrack

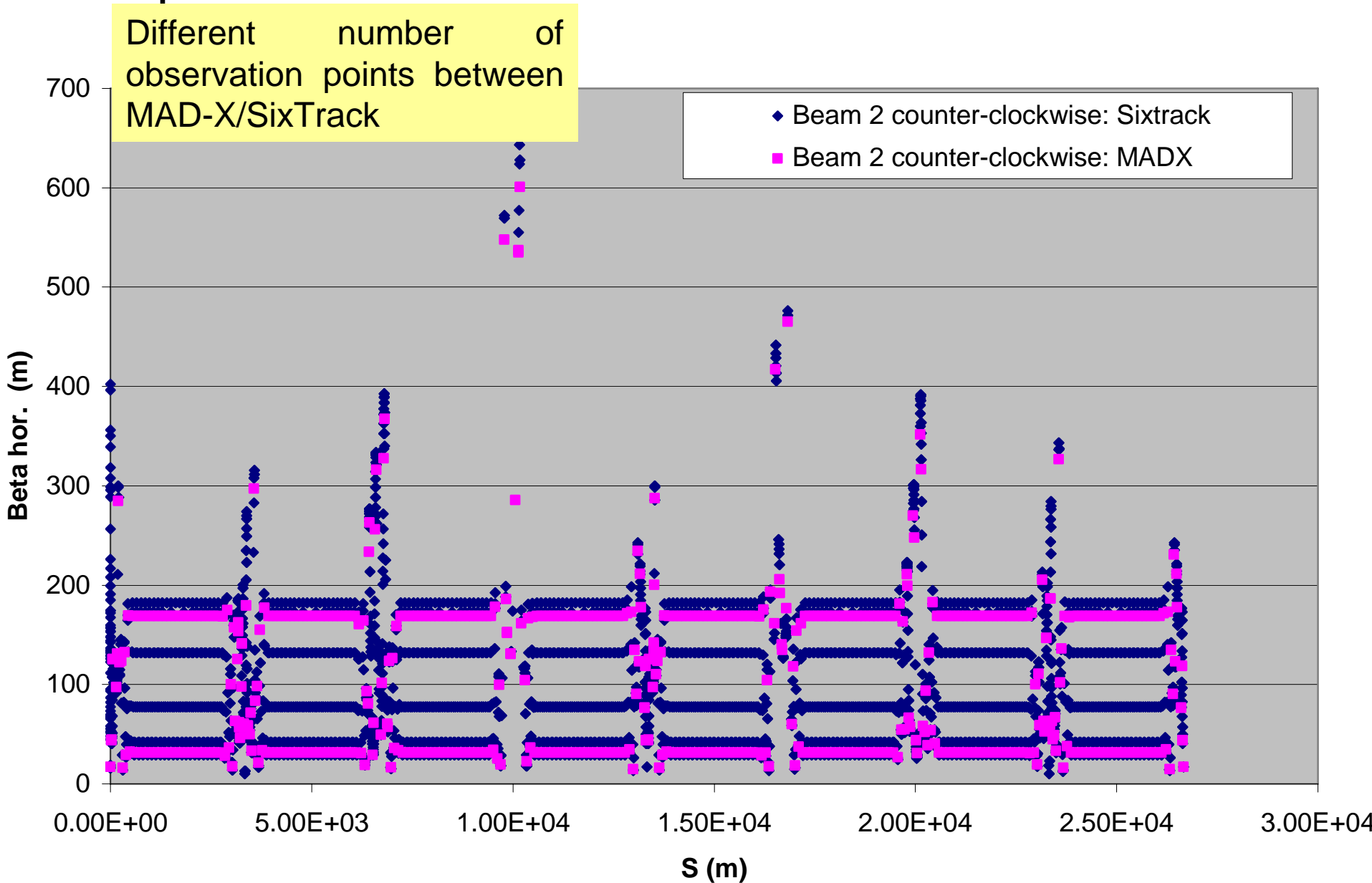
Different number of observation points between MAD-X/SixTrack



# Comparison beam 2 counter-clock in MAD-X/SixTrack



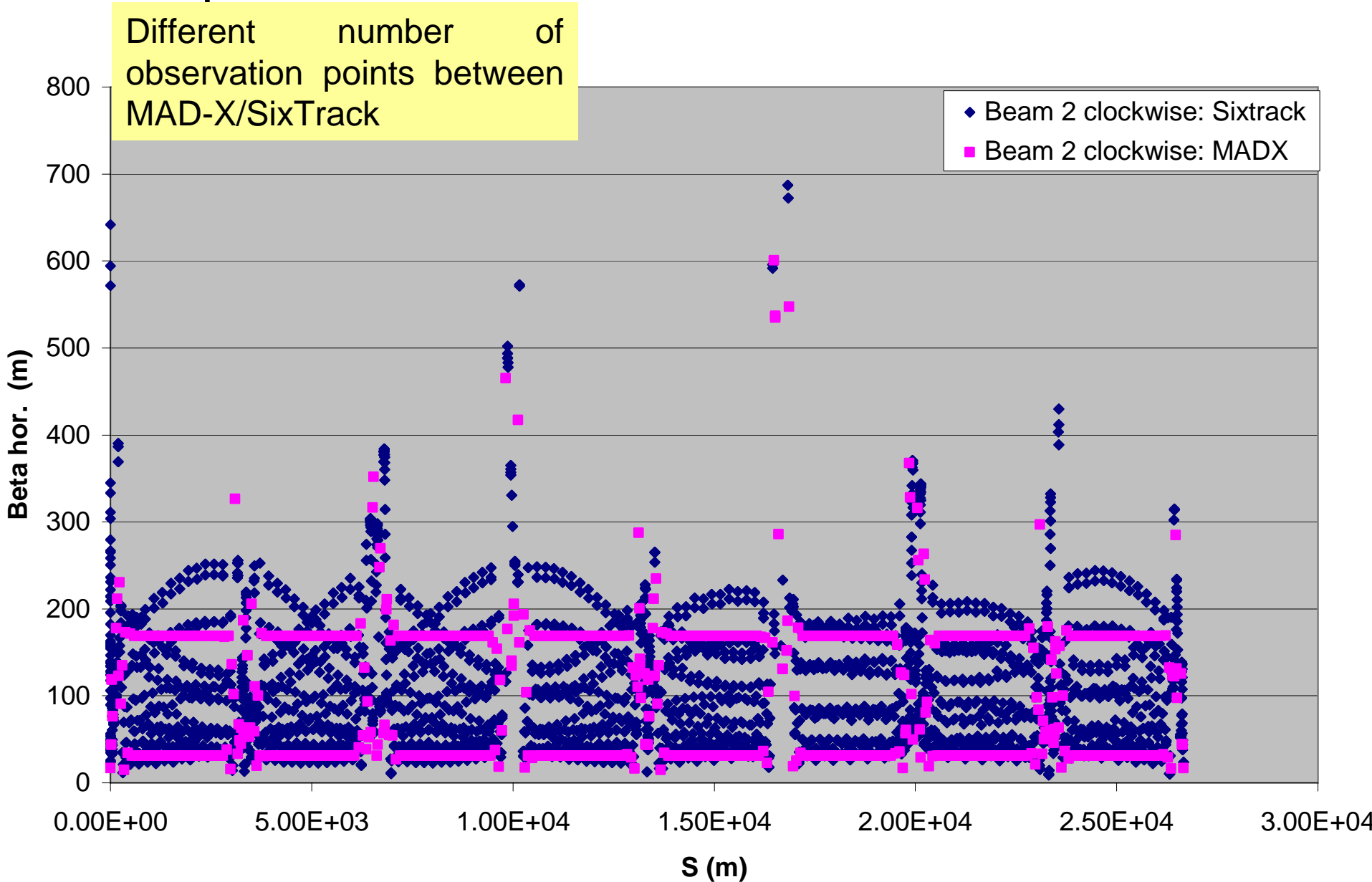
# Comparison beam 2 counter-clock in MAD-X/SixTrack



# Intermediate summary

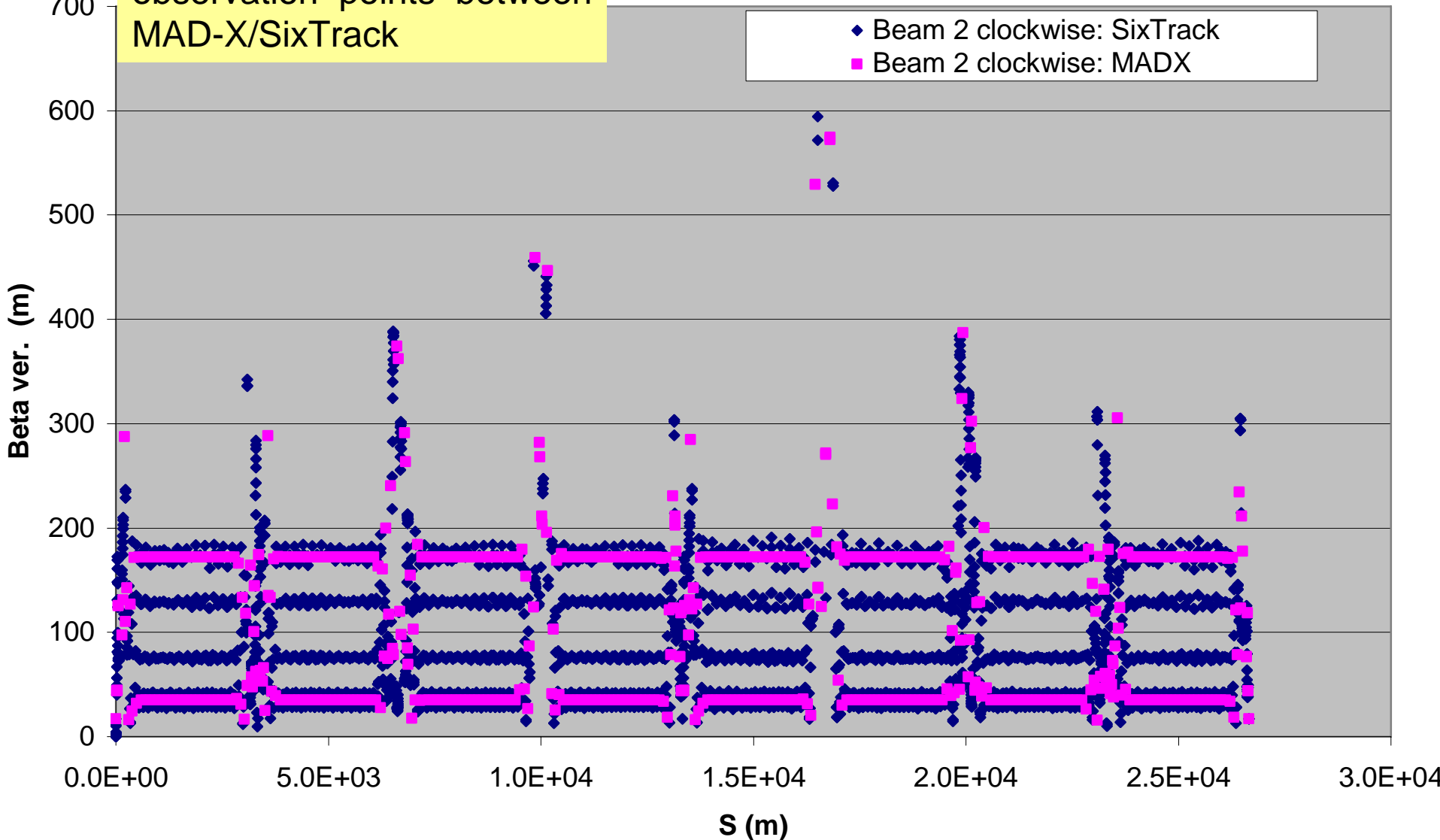
- Discrepancy between beam 2 clock/counter-clock in MAD-X less than few parts in  $10^{-7}$ !
- Excellent agreement between MAD-X and SixTrack for optics of the beam 2 counter-clockwise.
- Further checks with SixTrack:
  - Track few particles for 1 turn with beam 2 counter-clockwise.
  - Track particles back for 1 turn with beam clockwise.
  - Initial and final coordinates should agree.

# Comparison beam 2 clockwise in MAD-X/SixTrack



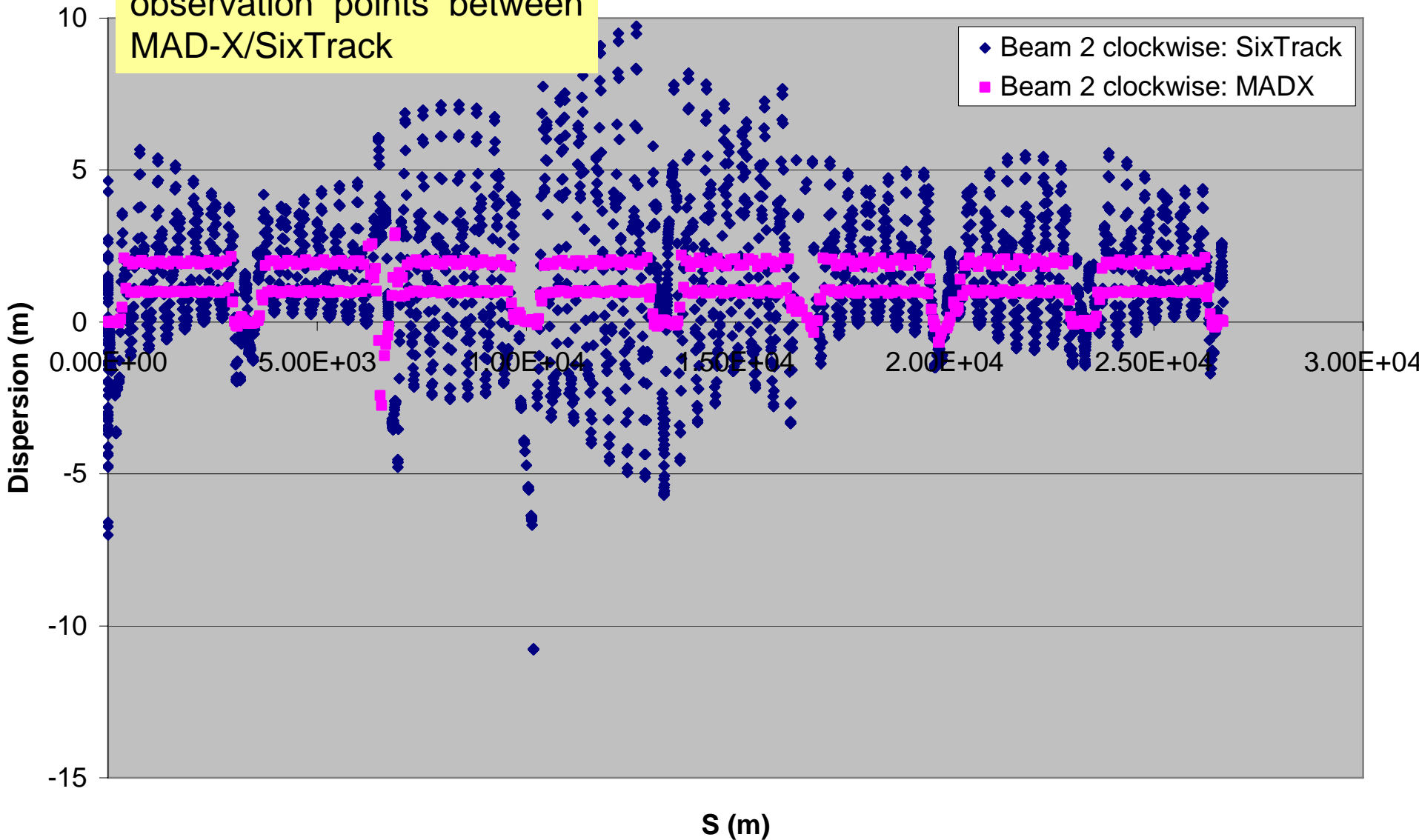
# Comparison beam 2 clockwise in MAD-X/SixTrack

Different number of observation points between MAD-X/SixTrack



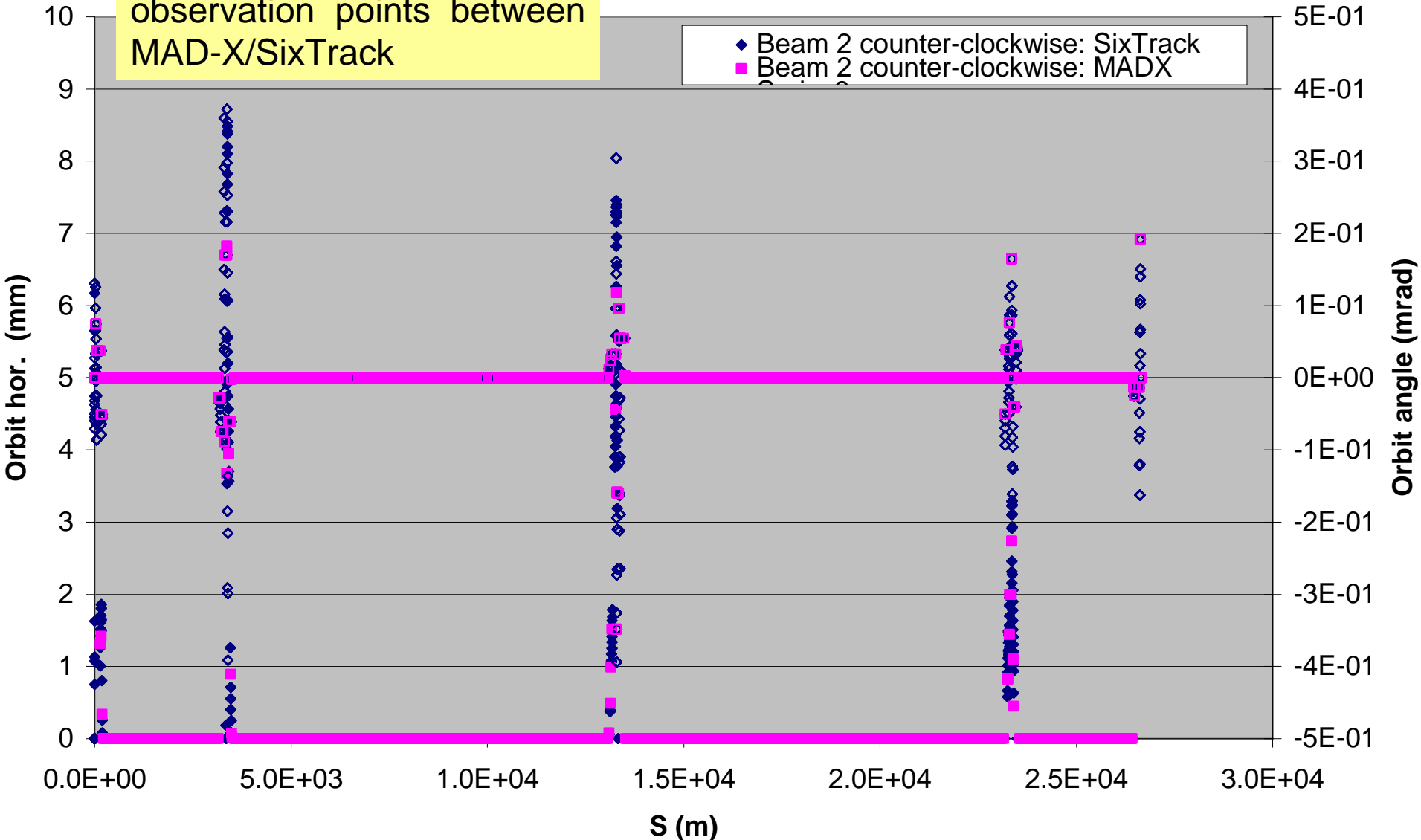
# Comparison beam 2 clockwise in MAD-X/SixTrack

Different number of observation points between MAD-X/SixTrack



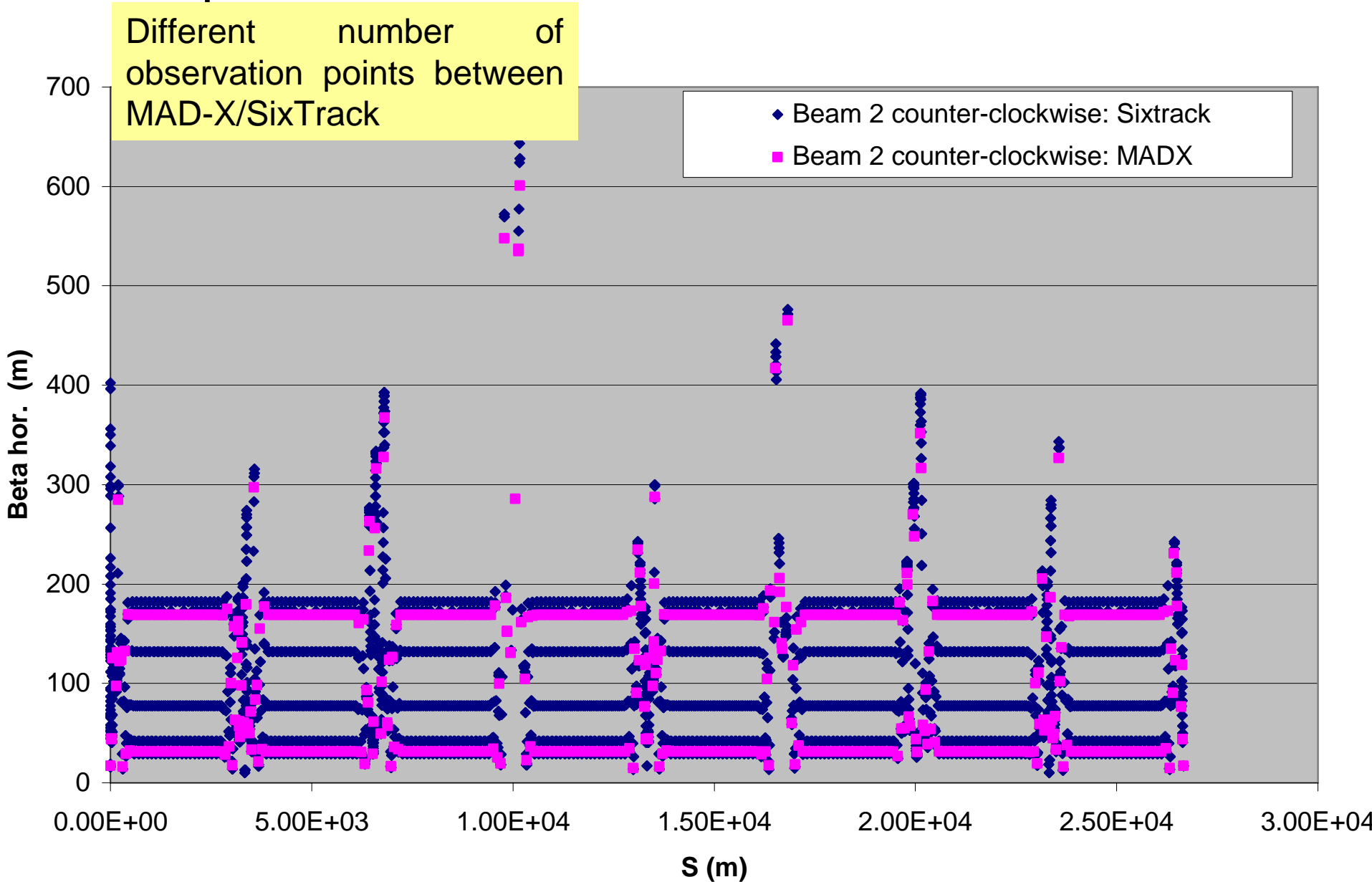
# Comparison beam 2 clockwise in MAD-X/SixTrack

Different number of observation points between MAD-X/SixTrack





# Comparison beam 2 clockwise in MAD-X/SixTrack



# Preliminary conclusions

- Discrepancy between beam 2 clock/counter-clock in MAD-X less than few parts in  $10^{-7}$ !
- Excellent agreement between MAD-X and SixTrack for optics of the beam 2 counter-clockwise.
- Total disagreement between MAD-X and SixTrack for optics of the beam 2 clockwise.
- Could it be to the bv flag (NB: beam 2 counter-clockwise has  $bv=+1$ )? MAD/SixTrack converter might need further verifications for  $bv=-1$ .
- How to test tracking with counter-clockwise beams?  $bv=-1$  should be avoided.
- A possibility would be generating a beam 1 counter-clockwise!