

Beam Dynamics Simulations of the Wire Pre-Alignment

D. Schulte

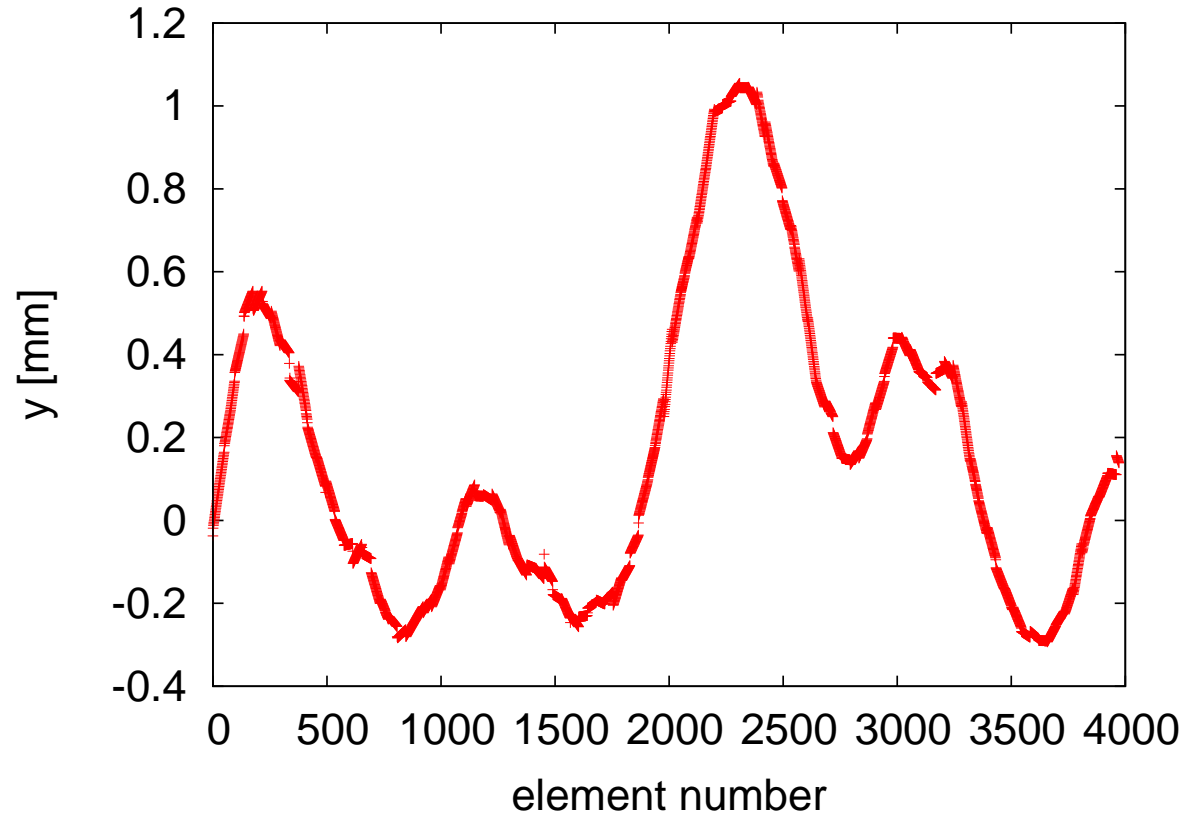
February 25th 2009

Simulation Rational

- Pre-Alignment imperfections can be roughly categorised into short-distance and long-distance errors
 - To first order, the imperfections can be treated as independent
 - as long as a linear main linac model is sufficient
 - The long-distance misalignments are dominated by the wire system
- ⇒ Ignore short-distance misalignments and simulate wire errors only
- More involved studies to come

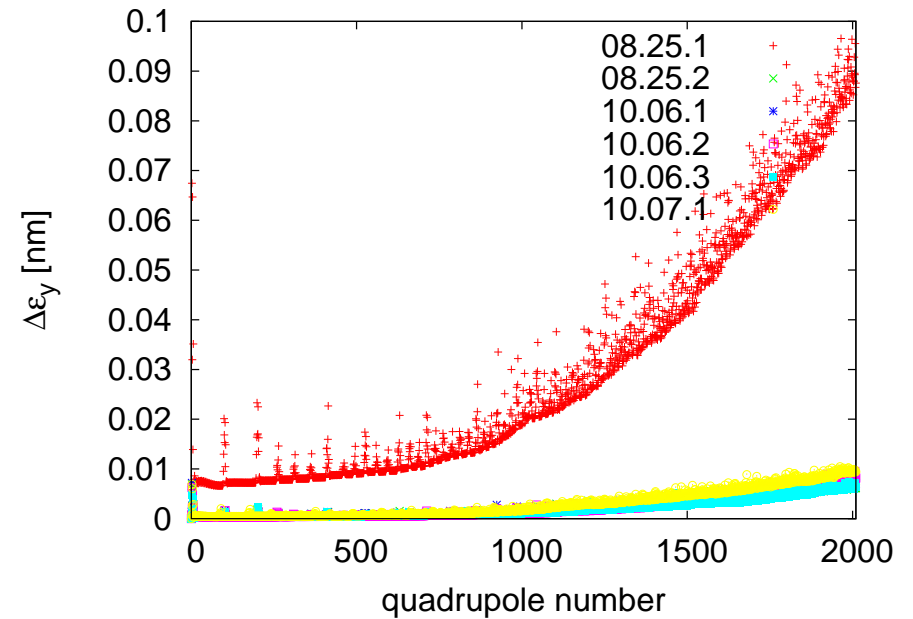
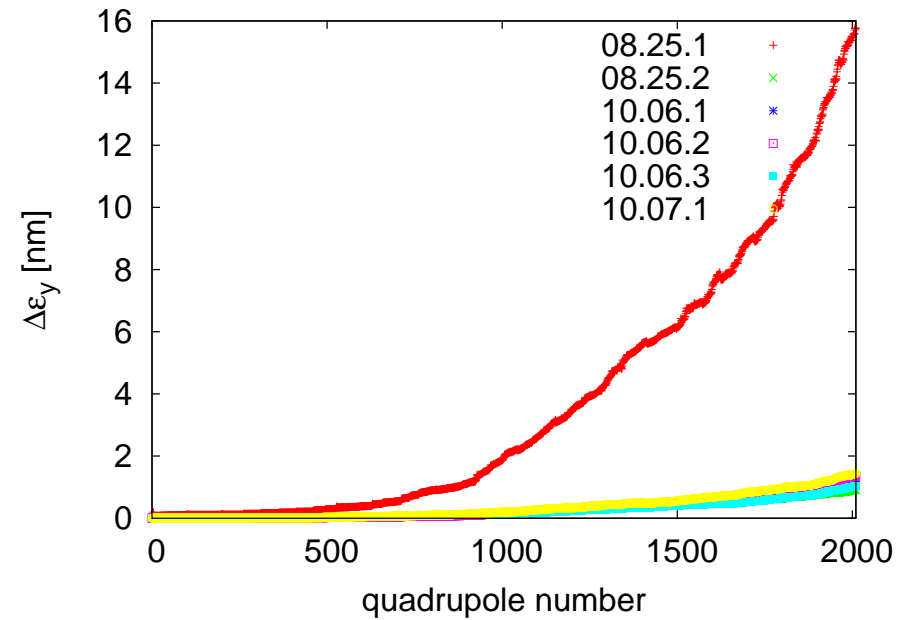
Misalignment Modelling

- Received a number of misalignments from Thomas
- Used 50 seeds for each error set
- Switched from one wire 1 to 2 at end point of 1 and back to 1 at end point of 2
- Used linear interpolation in between wire end-points
 - no sag error
 - no error of geoid

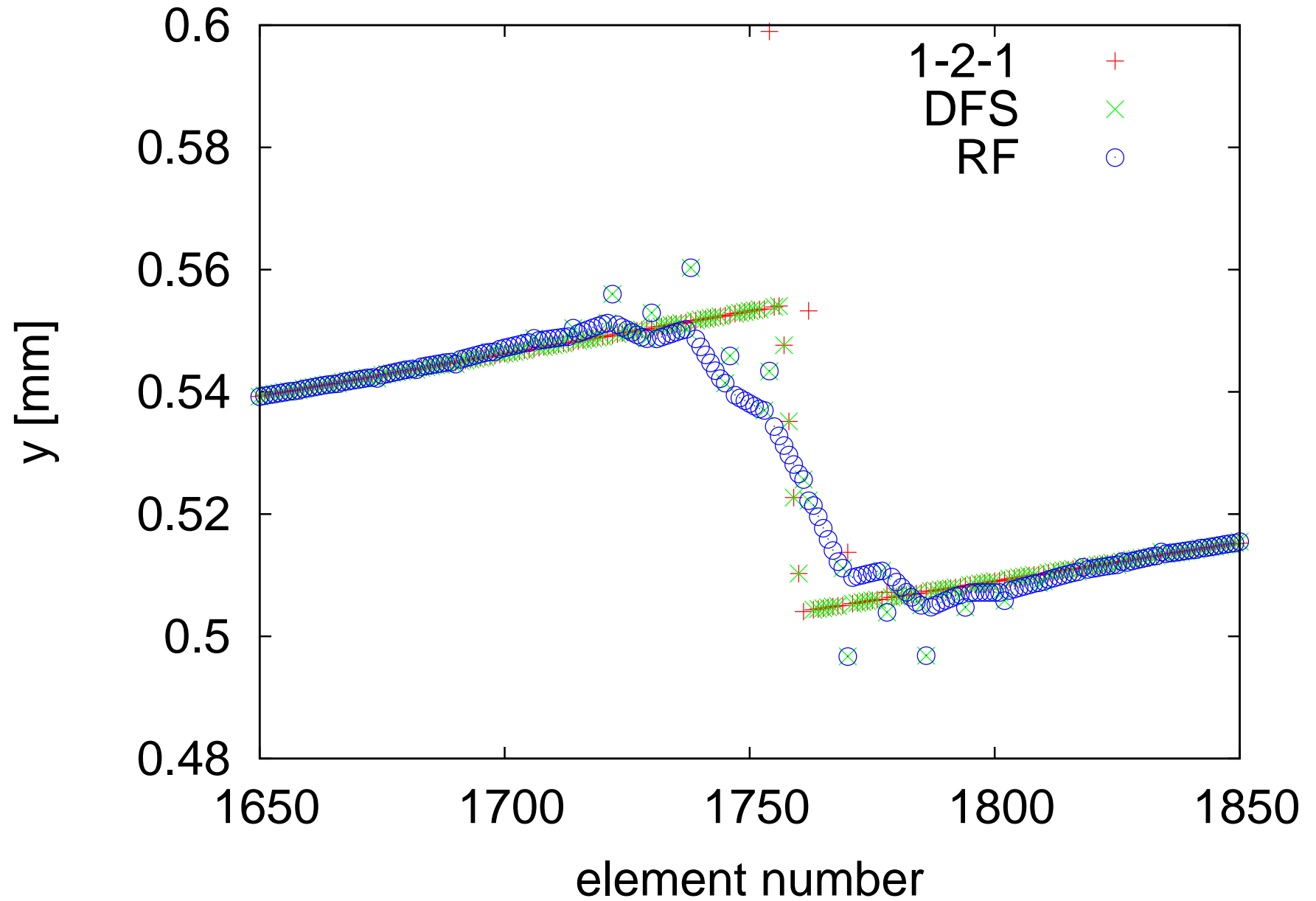


Beam-Based Alignment

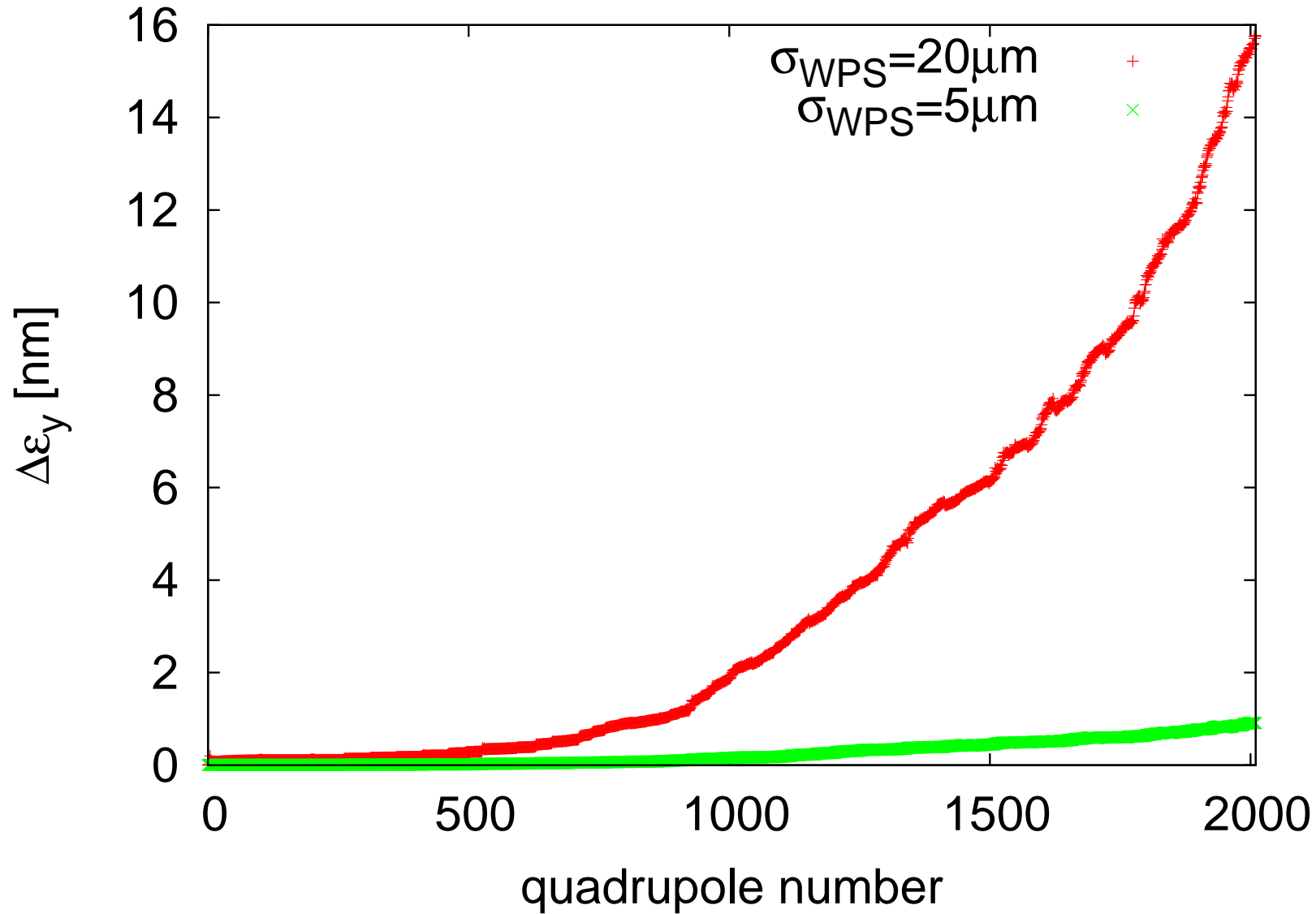
- Flat steering used first
 - Dispersion free steering using settings from baseline algorithm
 - RF structure alignment
 - Different cases marked by date
- ⇒ RF Alignment is very important



Impact on Element Positions

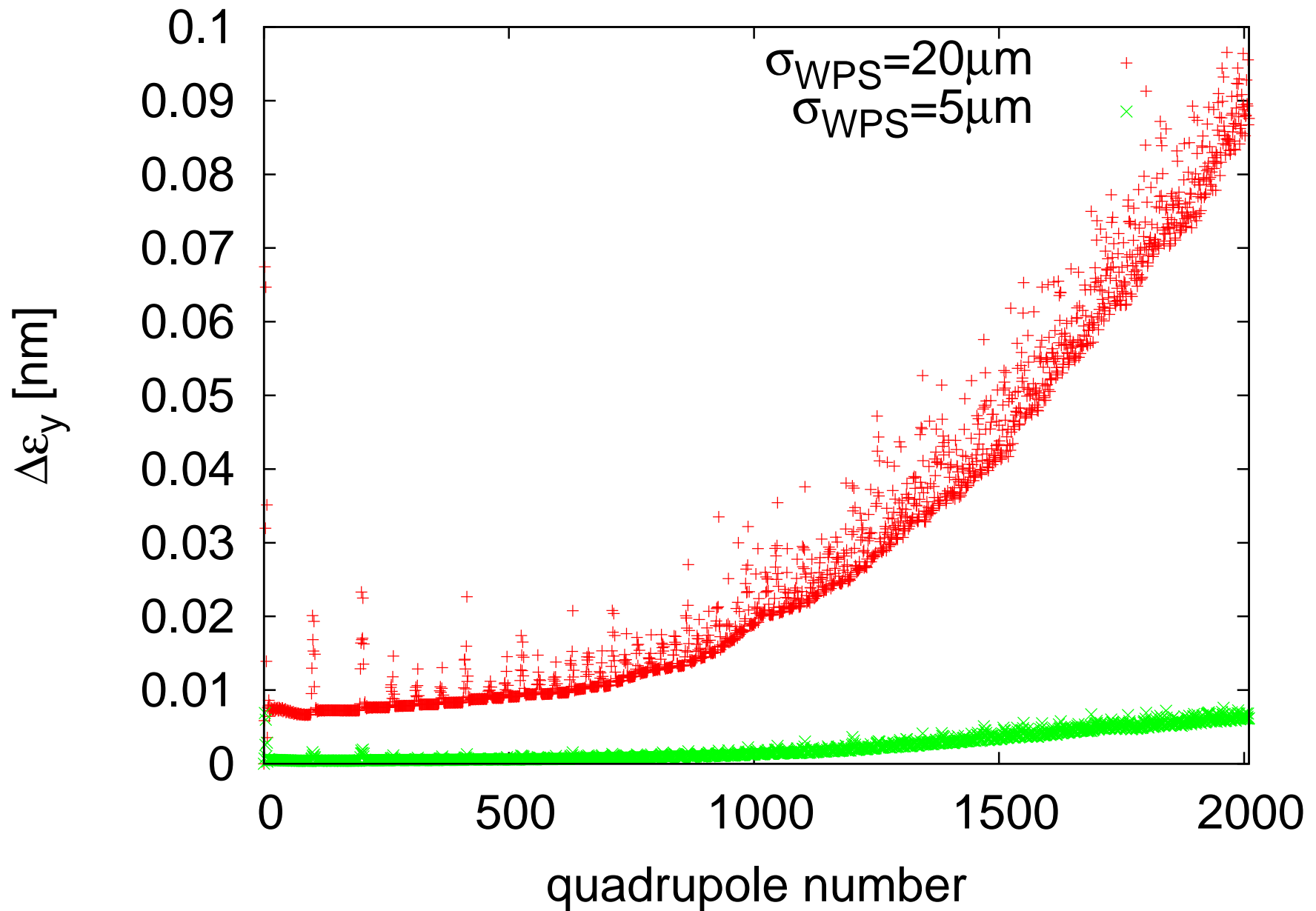


Accuracy of Wire Position Sensors (DFS Only)



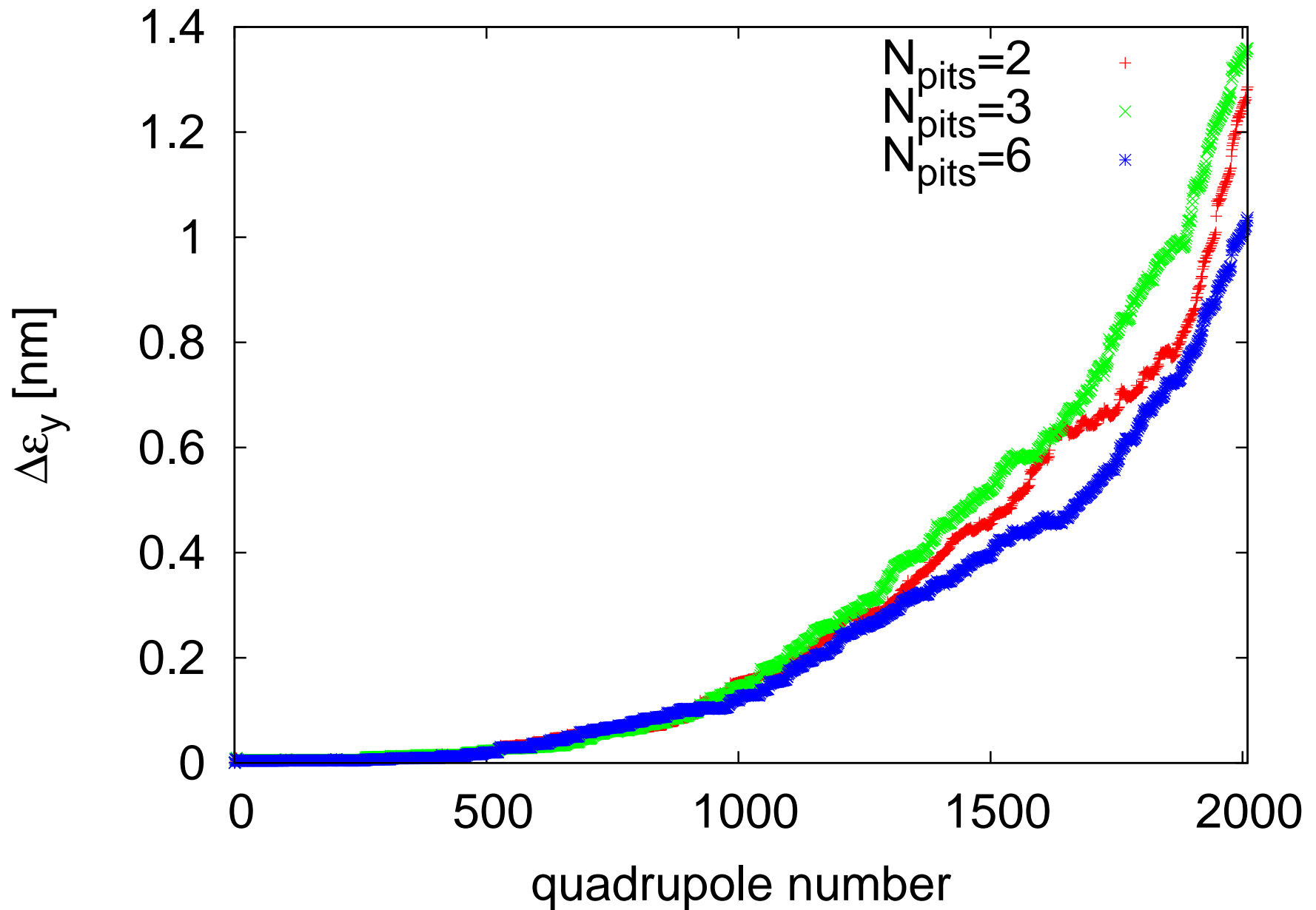
⇒ Significant impact of wire position sensor accuracy

Accuracy of Wire Position Sensors (RF Alignment)



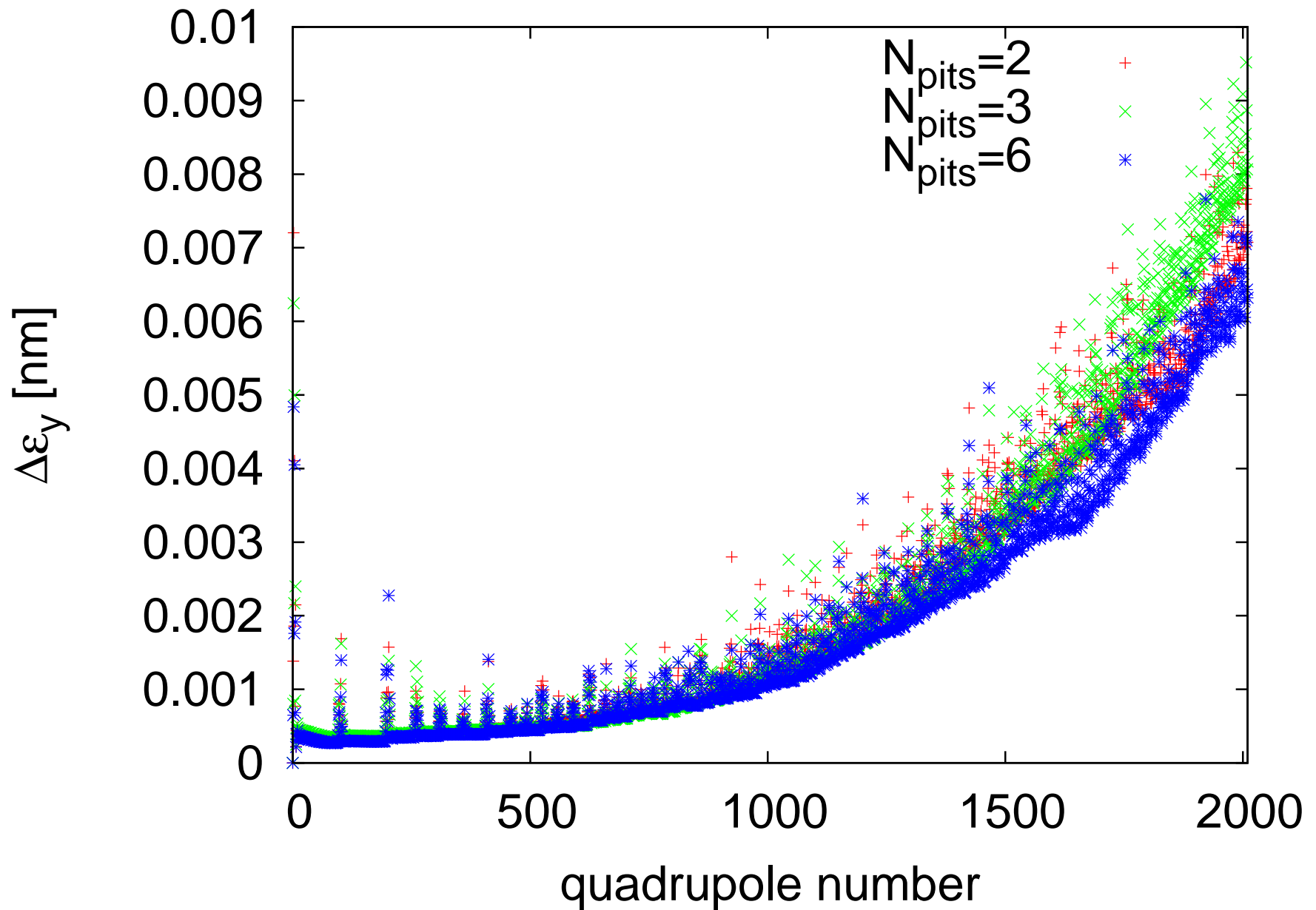
⇒ Significant impact of wire position sensor accuracy

Number of Pits (DFS Only)



⇒ Small impact of number of pits

Number of Pits (RF ALignment)



⇒ Small impact of number of pits

Conclusion

- The first results look very promising
 - wire sensor accuracy is important
 - pit number seems to be less important
 - wire length to be checked, may also impact pit number sensitivity
- More complete beam dynamics studies to follow
 - dispersive effects
 - machine protection
- More complete model of misalignments
 - wire length
 - geoid
 - wire sag
- Extend studies to beam delivery system and RTML
 - if possible cross detector region for consistent errors on both sides