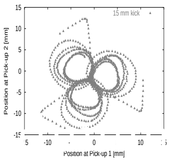
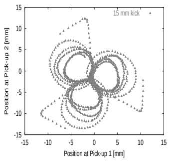
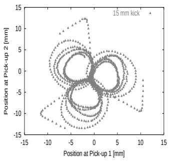


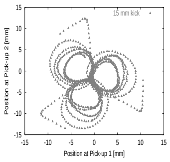


Measurement of Resonance Driving Terms at SPS at 26 GeV in 2001

M. Hayes, F. Schmidt and R. Tomás

This work has been possible thanks to: All the SPS operation crew, G. Arduini, P. Baudrenghien, T. Bhol, H. Burkhardt, A. Faus-Golfe, H. Jacob, L. Jensen, J. Klem, F. Zimmermann.





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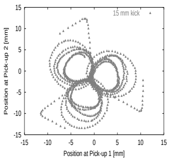
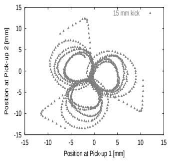
- BPM status recognition.
- Linear Coupling.
- Sextupolar Driving terms.
  - Beta-Beating via Phase advance.





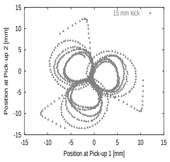
Introduction

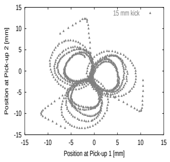
Goal: Develop a tool that allows the measurement of linear and non–linear resonances.

Technique: Transverse beam oscillation excited by a single kick. Complex signal constructed from 2 contiguous pick-ups: $x_1 - ix_2$. FFT of turn–by–turn complex signal.

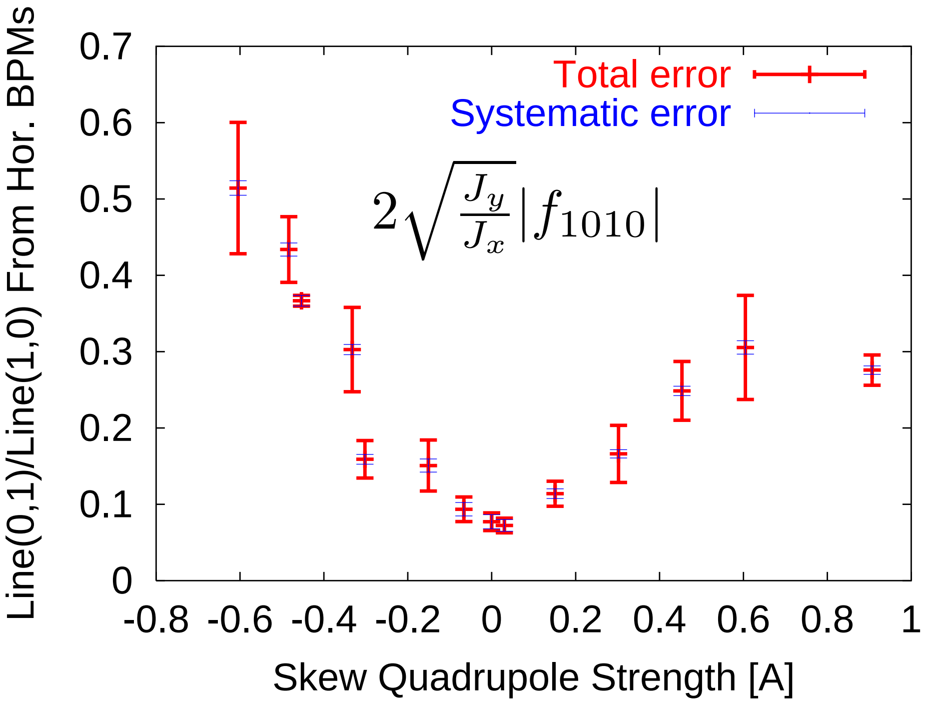
Experiment:

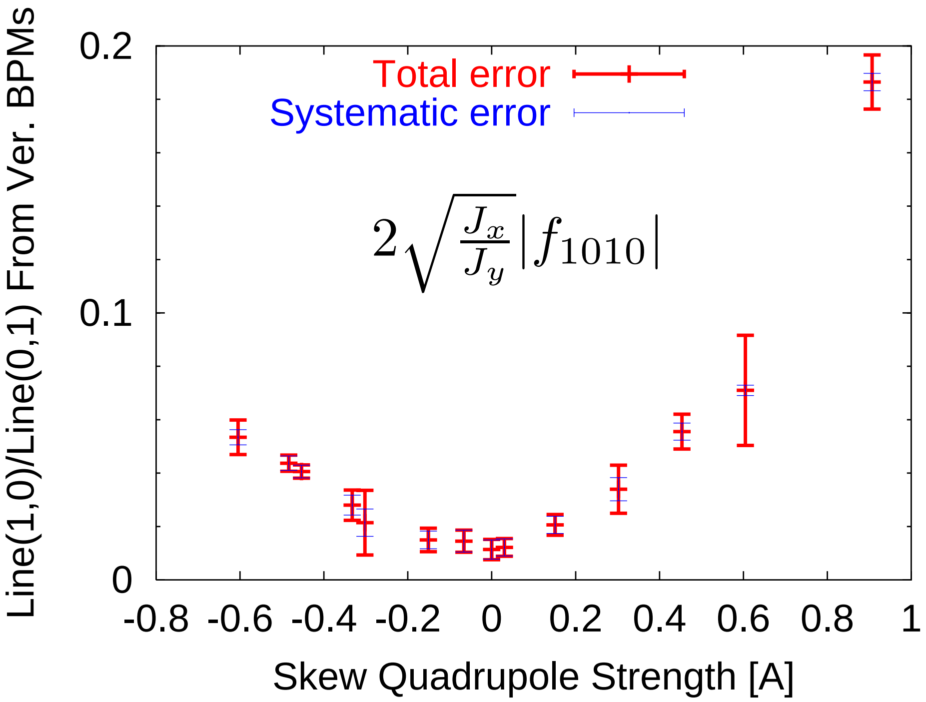
- Energy 26 GeV.
- Single Bunch, 2×10^{10} protons.
- Q-kickers used for transverse kicks.
- Chromaticities set to zero.
- Various tune settings.
- Extraction sextupoles powered to different configurations.

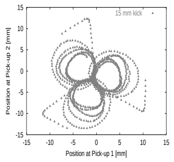


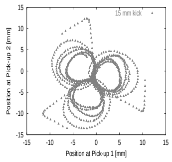


Linear Coupling

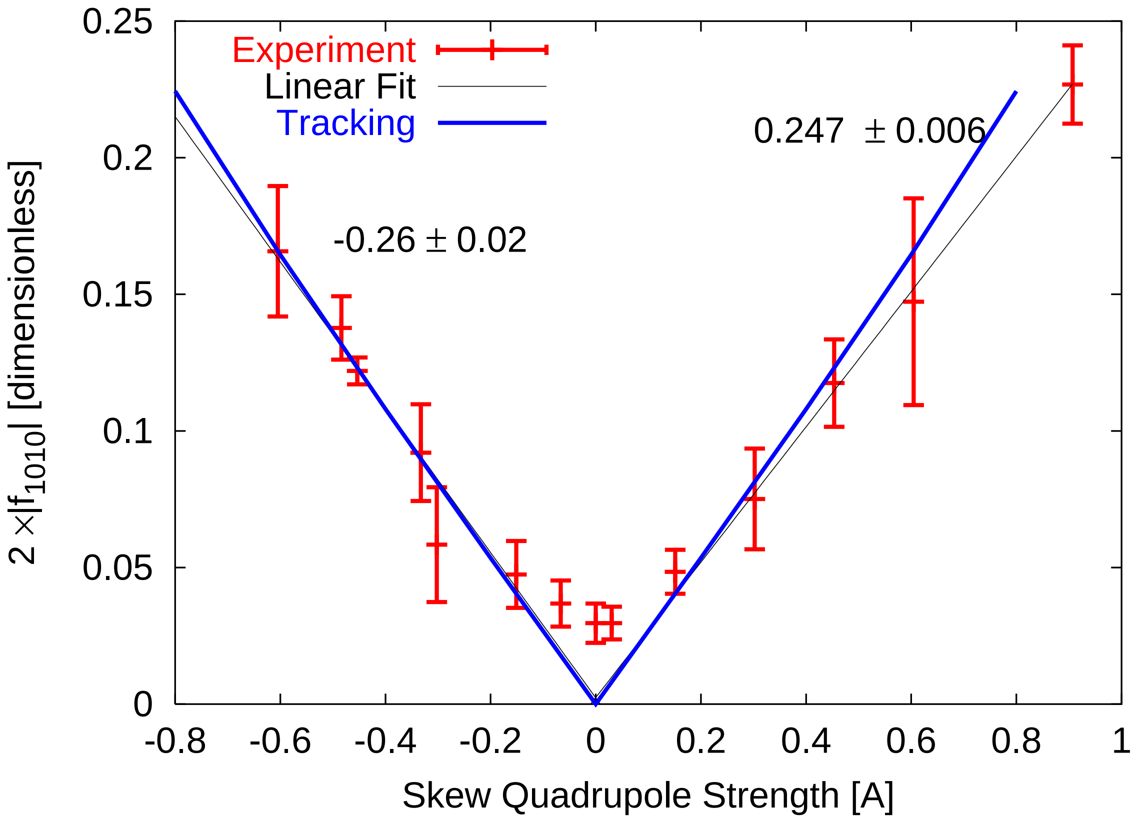




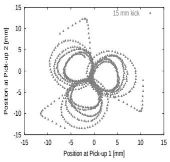


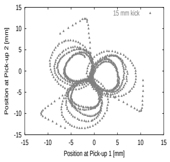


Linear Coupling



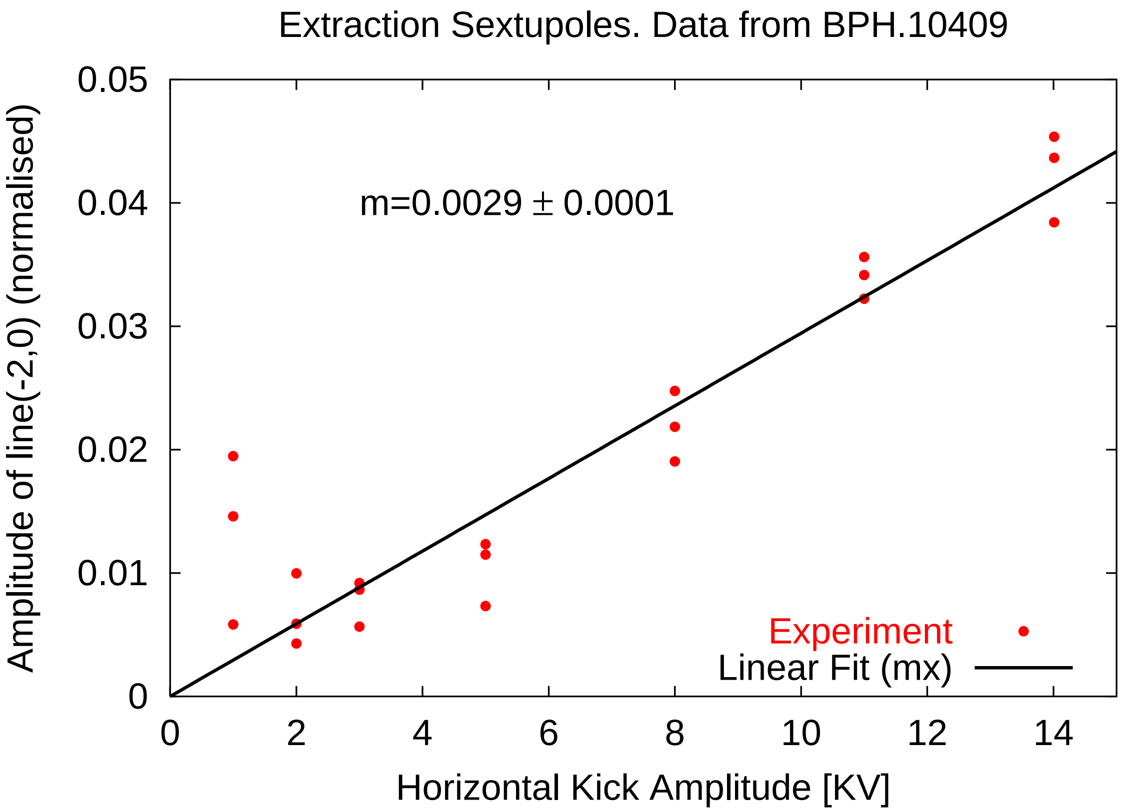
$$2|f_{1010}| = \sqrt{\frac{line(0,1)_H}{line(1,0)_H}\frac{line(1,0)_V}{line(0,1)_V}}$$





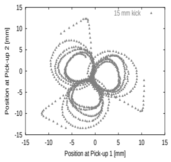
Sextupolar Driving terms

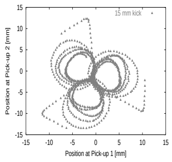
The method



$$|f_{3000}| = \frac{1}{6}\frac{m}{0.094^{\dagger}}\ [mm^{-1/2}]$$

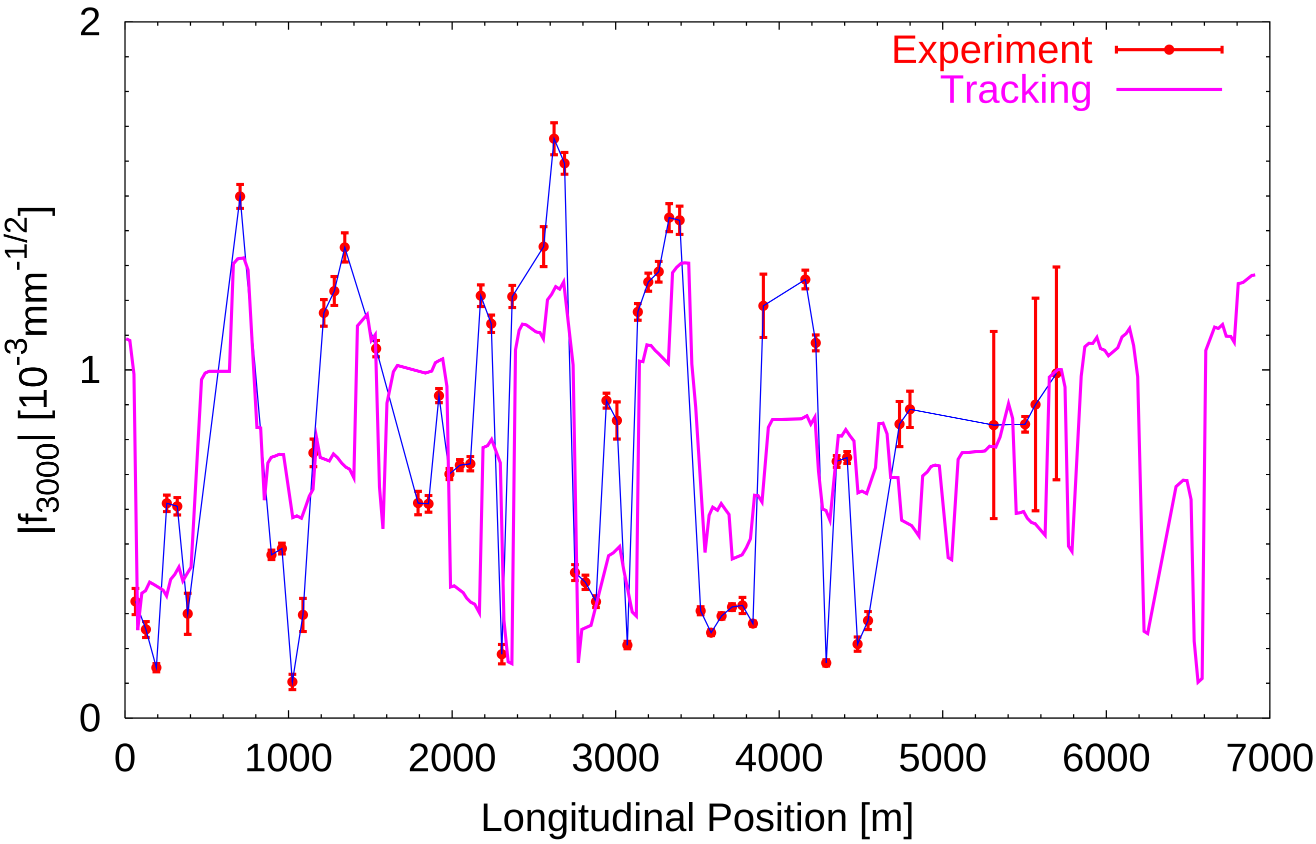
† Horizontal kicker calibration.

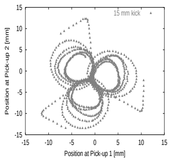




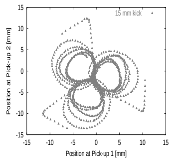
Sextupolar Driving terms

Baseline, Qx=26.62 (No decoherence).





Sextupolar Driving terms

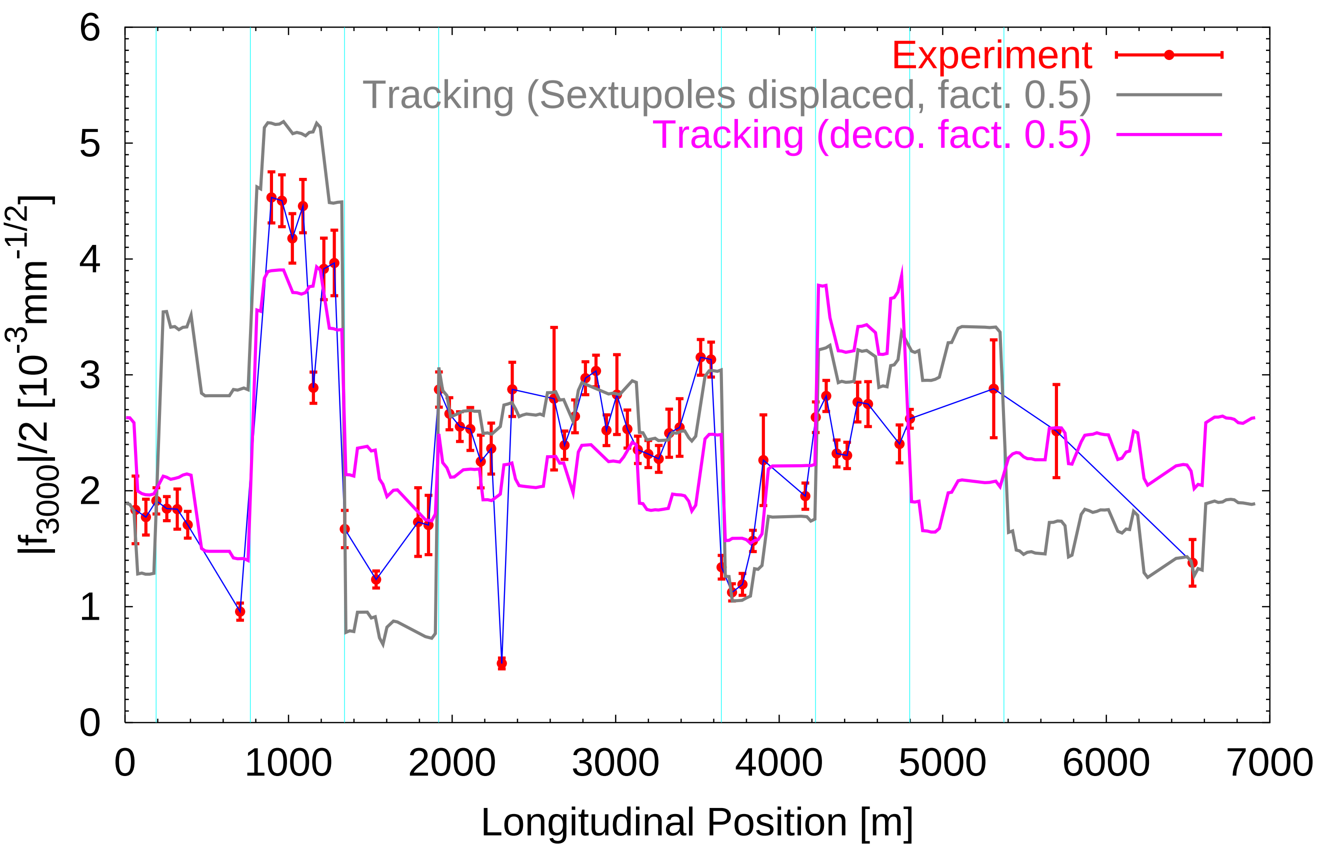


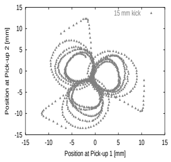
Extraction Sextupoles powered to $++++----30$ A.

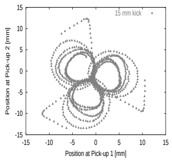
Horizontal displacements of sextupoles read form horizontal BPMs.

Qx=26.62.

Data fully decohered $\Rightarrow$ Line reduced by a factor 2.







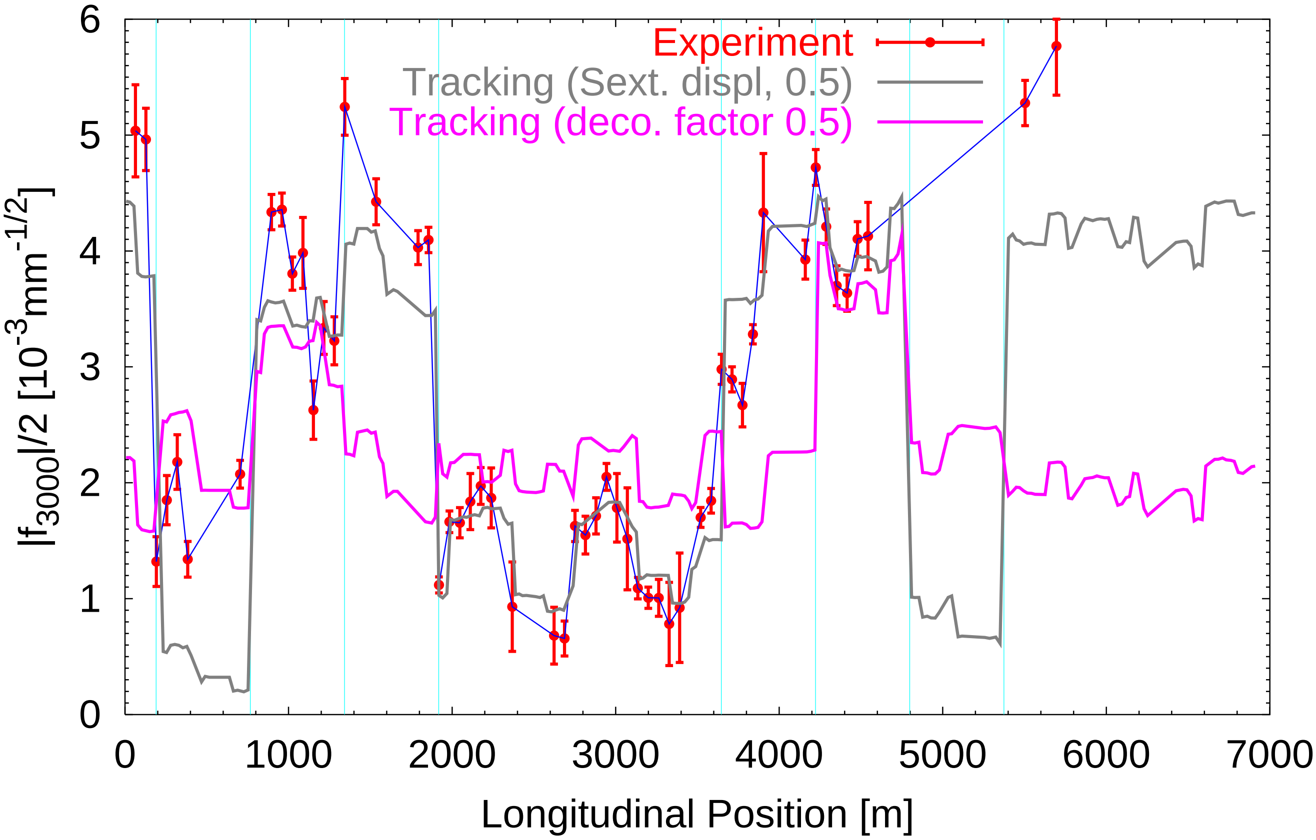
Sextupolar Driving terms

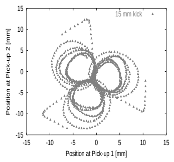
Extraction Sextupoles powered to $++++----$30 A.

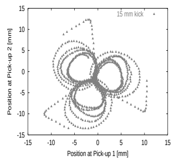
Horizontal displacements of sextupoles read form horizontal BPMs.

Qx=26.69.

Data fully decohered $\Rightarrow$ Line reduced by a factor 2.







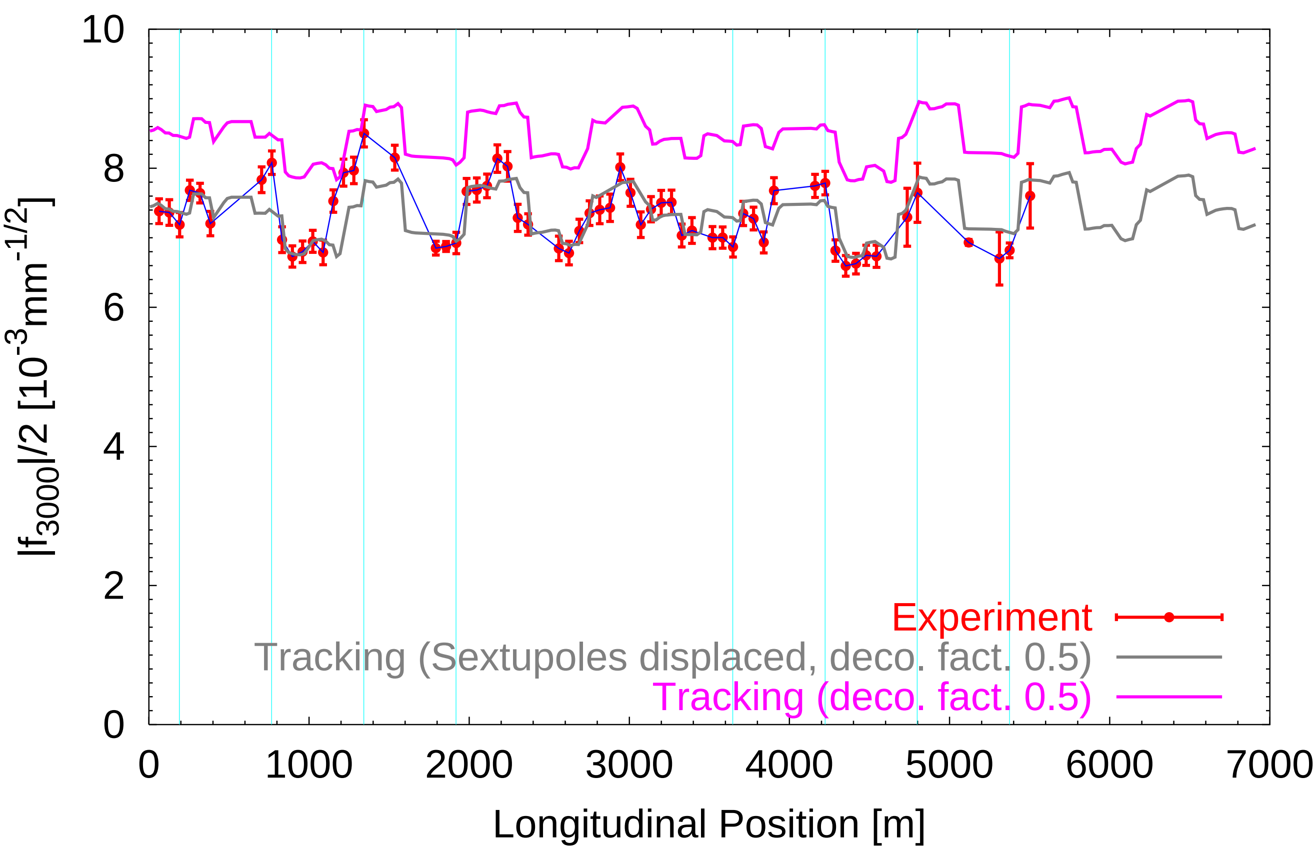
Sextupolar Driving terms

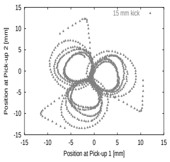
Extraction Sextupoles powered to + + + + + + + ++3 A.

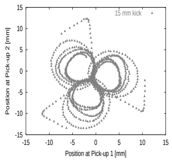
Horizontal displacements of sextupoles read form horizontal BPMs.

Qx=26.662.

Data fully decohered ⇒ Line reduced by a factor 2.







Conclusions

- Faulty pick-ups are identified by looking at the spectrum. Missing all pick-ups from particular sextants strongly limits the method.
- The measurement of Linear Coupling is fully understood.
- For the first time sextupolar resonance terms have been measured at SPS at 26 GeV:
  - The overall agreement between model (with displaced sextupoles) and experiment is good.
  - The beta-beating introduced by the displacement of the sextupoles plays an important role and is confirmed by phase advance measurements.
  - The decoherence factor is confirmed.
  - Local discrepancies may be due to sextupolar lattice errors and beta-beating.