Stripline BPM status

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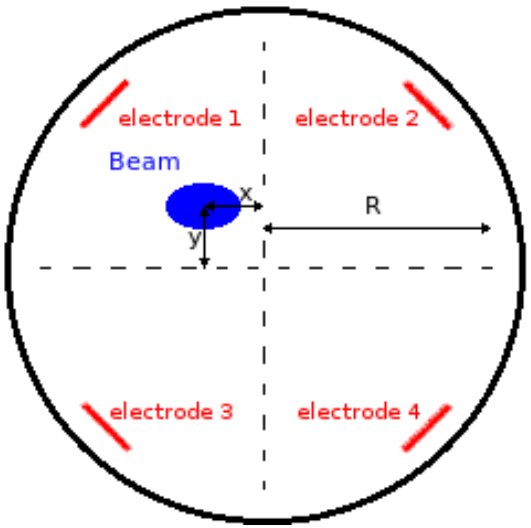
Outline

Principle

Stripline BPMs description

- 4 longitudinal electrodes picking I_1 to I_4.
- This signal passes through a diode and is amplified.
- $x = \alpha \times \frac{(I_1+I_3)-(I_2+I_4)}{I_1+I_2+I_3+I_4}$ signal.
- $y = \alpha \times \frac{(I_1+I_2)-(I_3+I_4)}{I_1+I_2+I_3+I_4}$ signal.



Outline

Intensity dependence

description of the measurements

- BPM readings obtained at each stripline.
- Intensity was changed detuning the Klystron 8 phase.
- Plots show the BPM readings function of intensity, compared to the reading at $4.10^9 e^- / bunch$.

Effect of intensity dependence

- Non reproducibility of measurements if the intensity changes.

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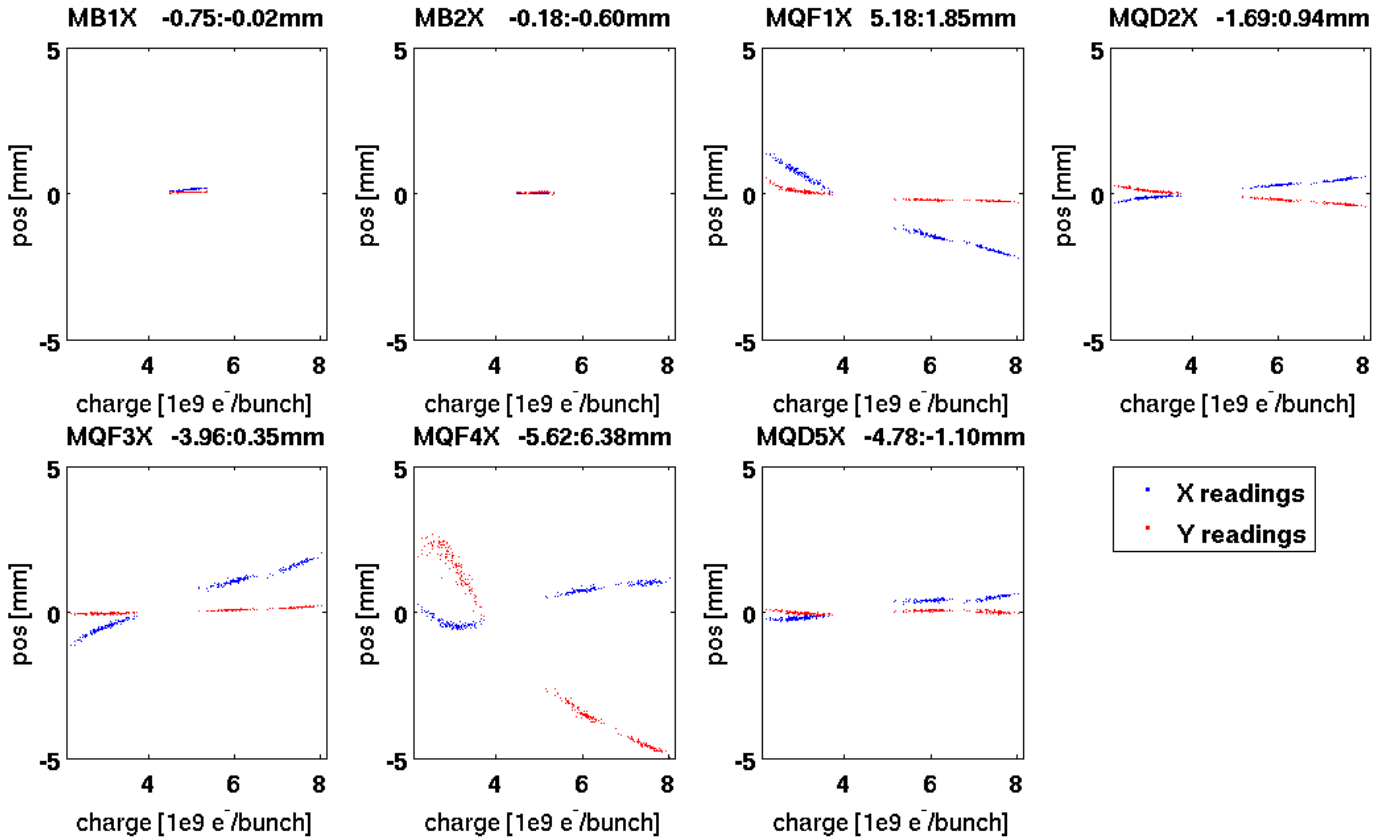
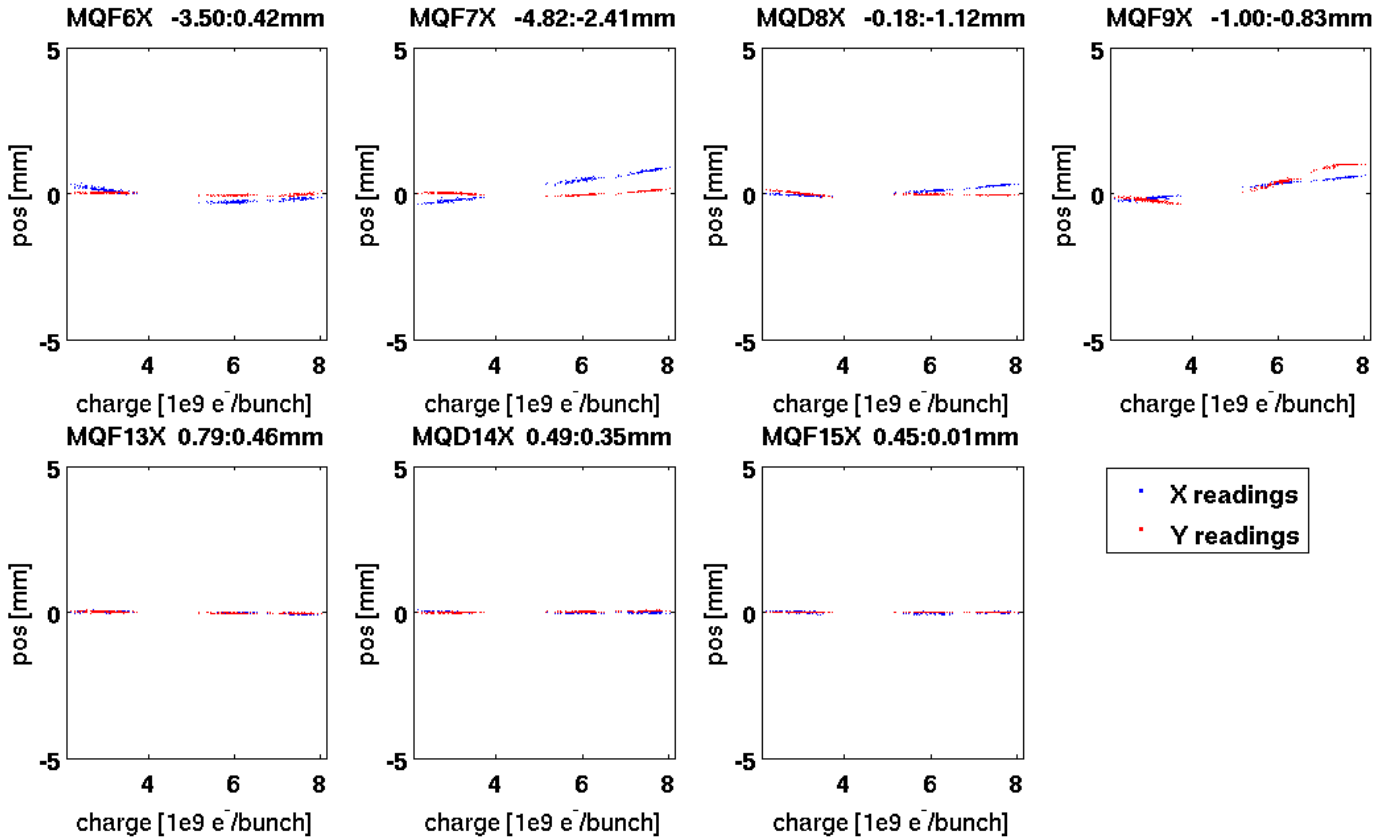


Intensity dependence



Outline

Intensity dependence causes

Causes

There is intensity dependence because :

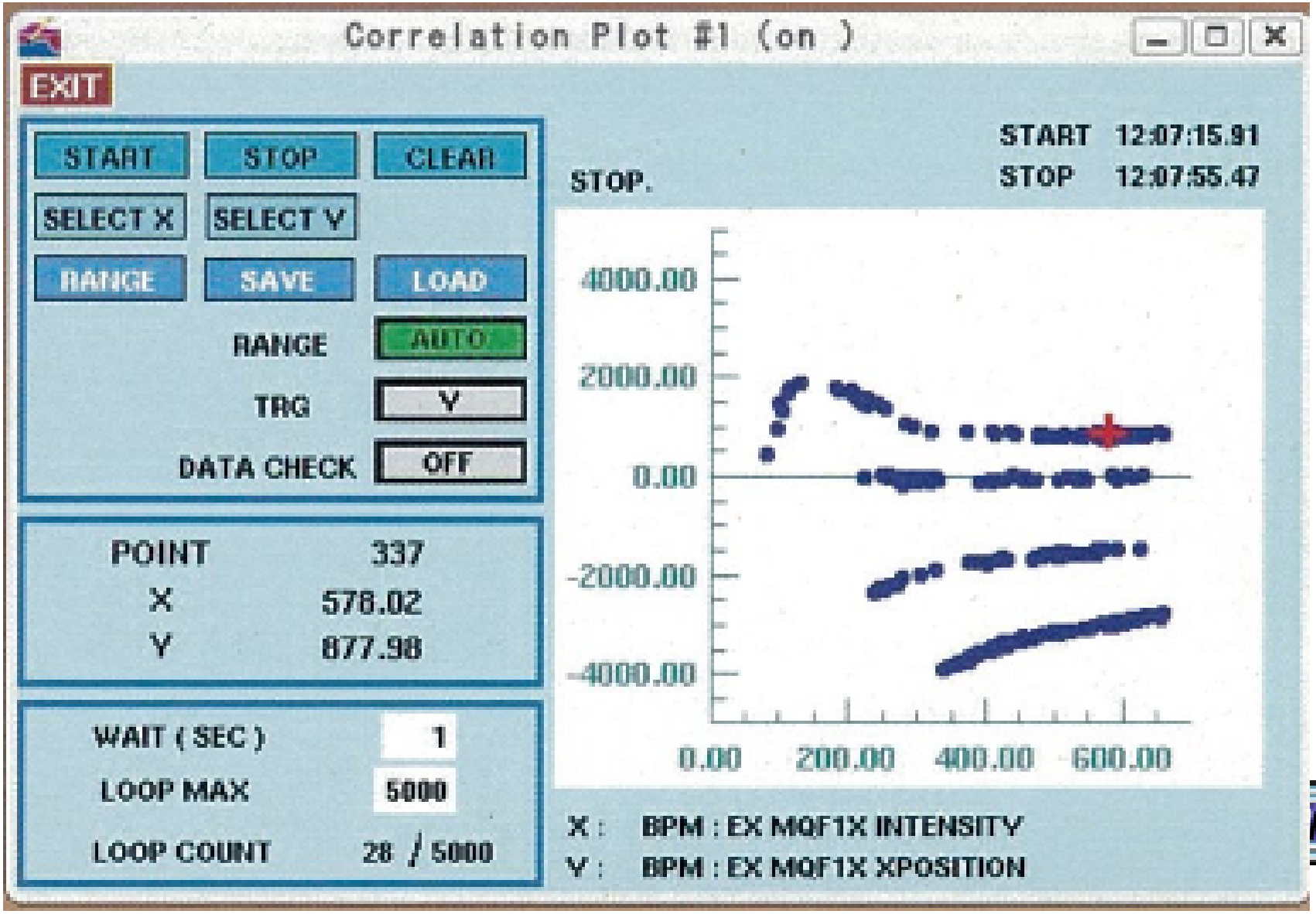
- Each BPM electrode is amplified.
- Amplifiers are not linear and each non-linearity is different.
- Find a small signal as the difference of high signals makes it very sensitive.

Each amplifier non-linearity is corrected by a calibration, but :

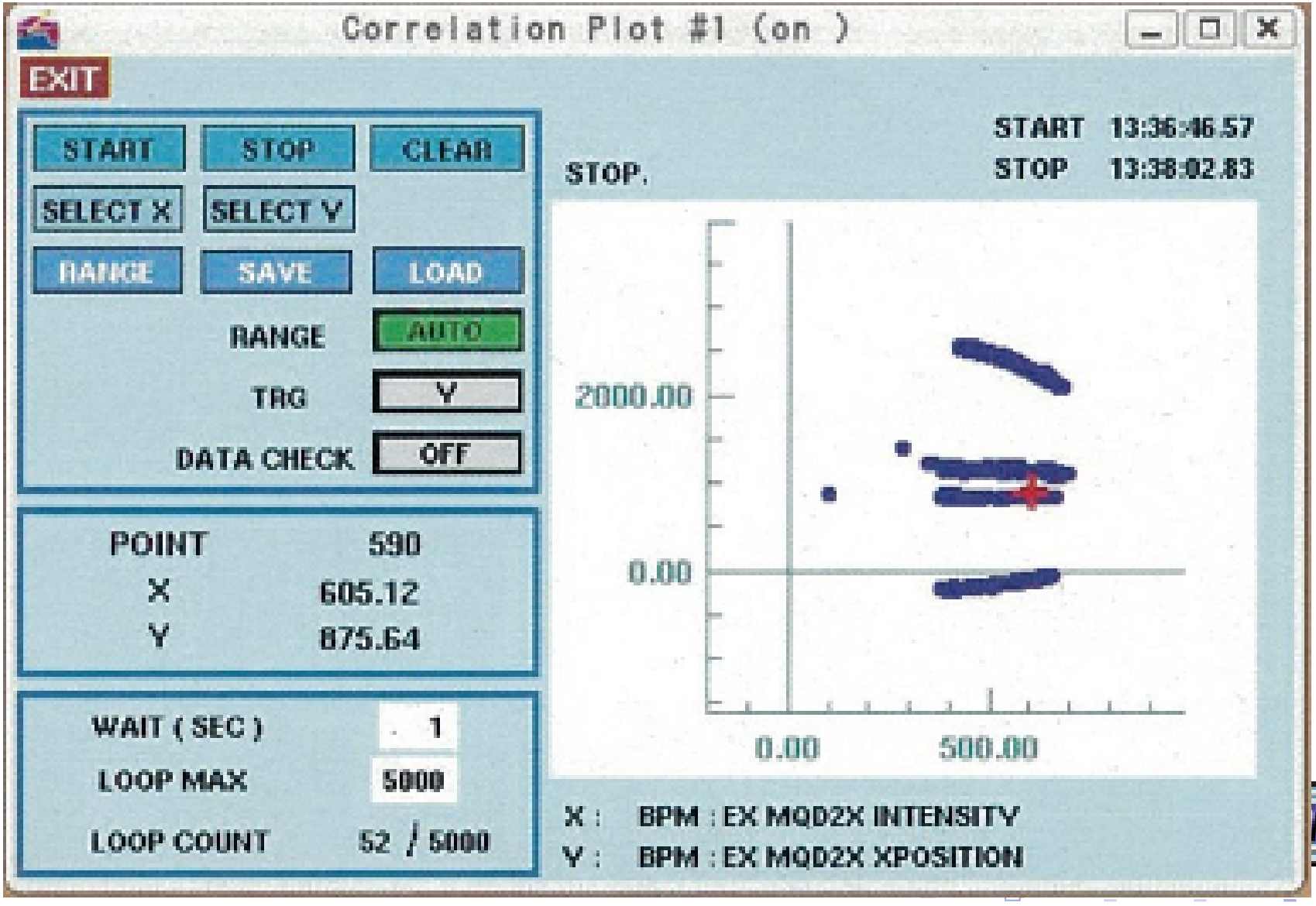
- The correction is not perfect (made with a pulser, not with the beam).
- The non-linearity may vary with temperature.

Outline

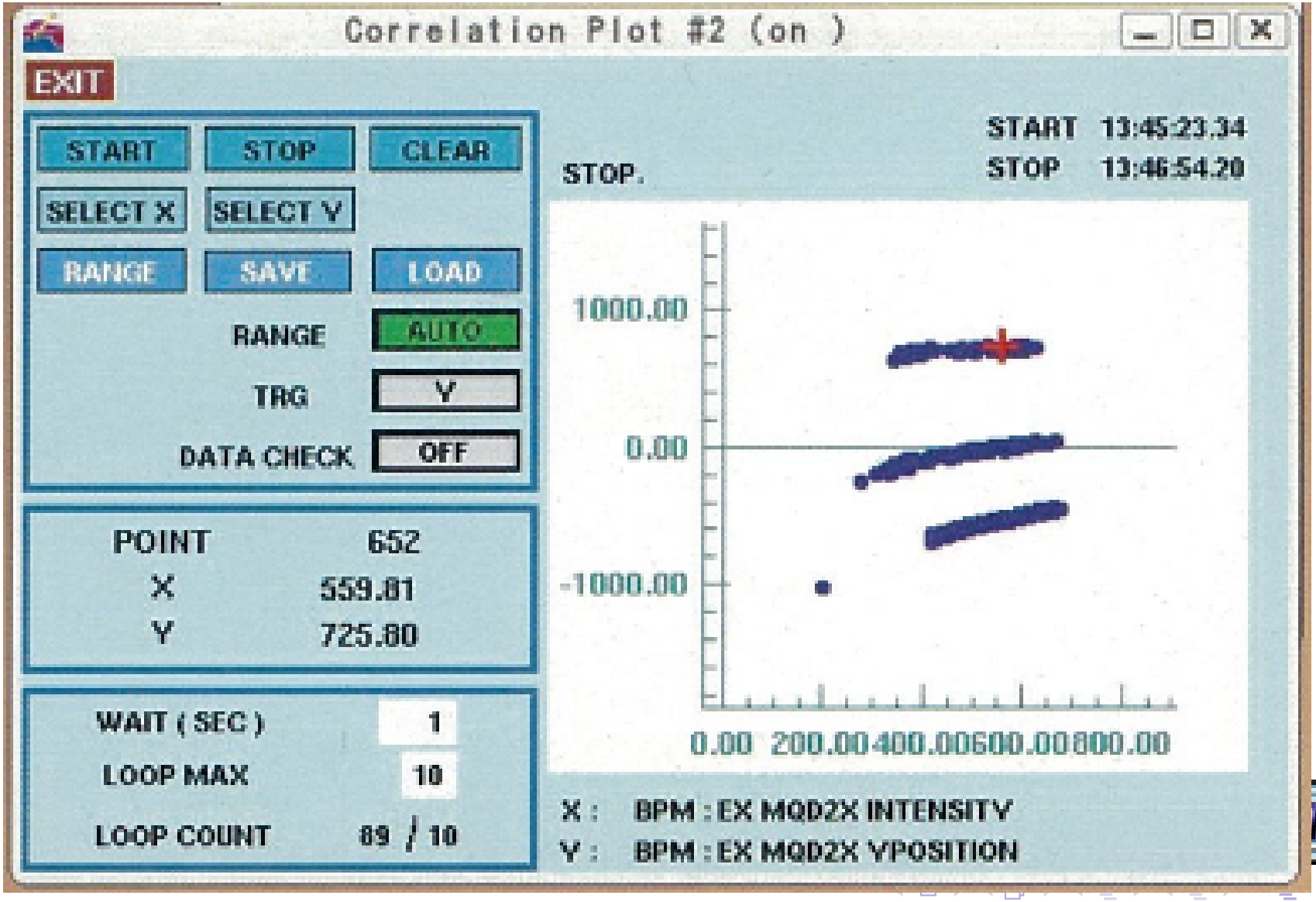
Intensity dependence at MQF1X (X)



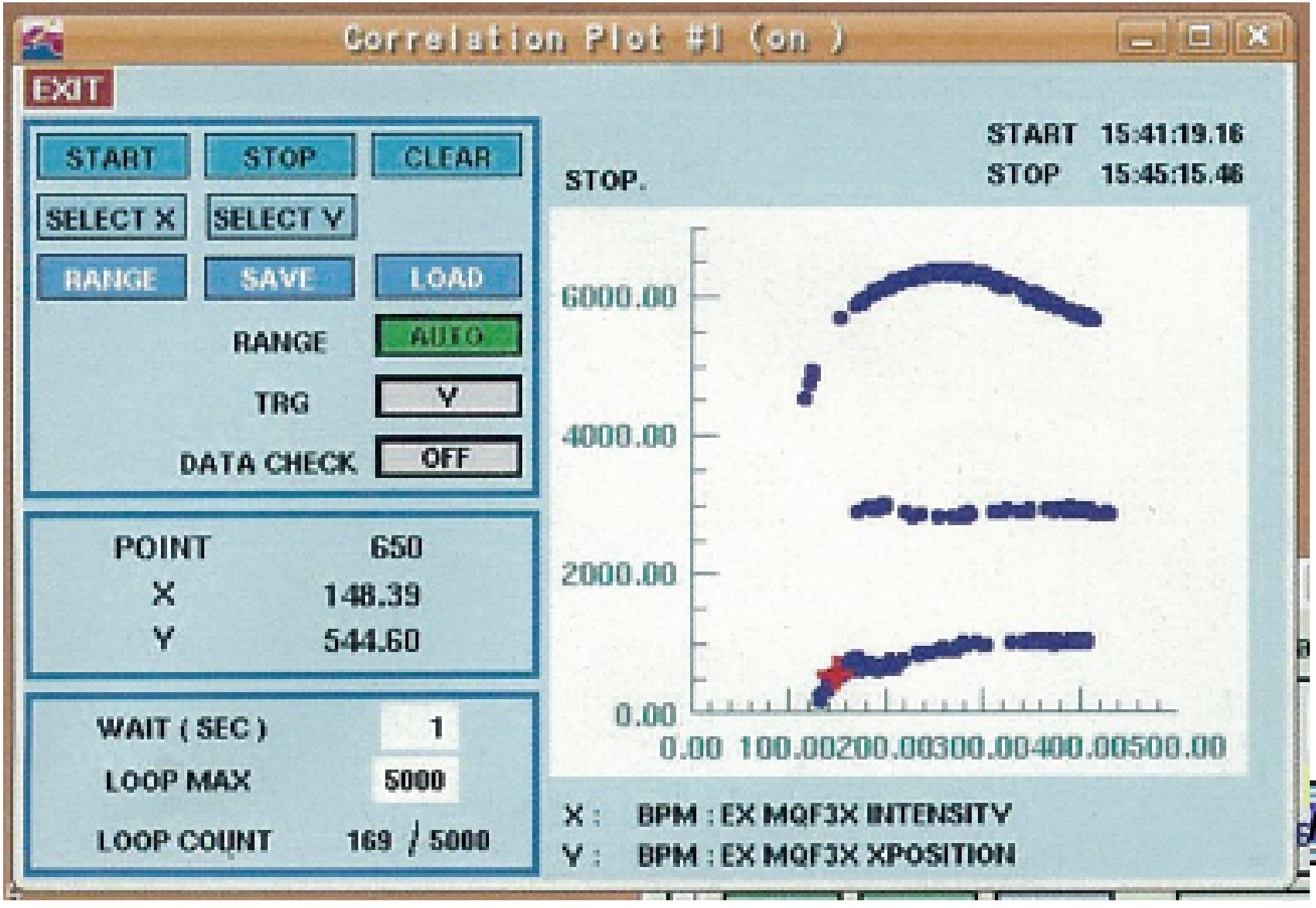
Intensity dependence at MQF2X (X)



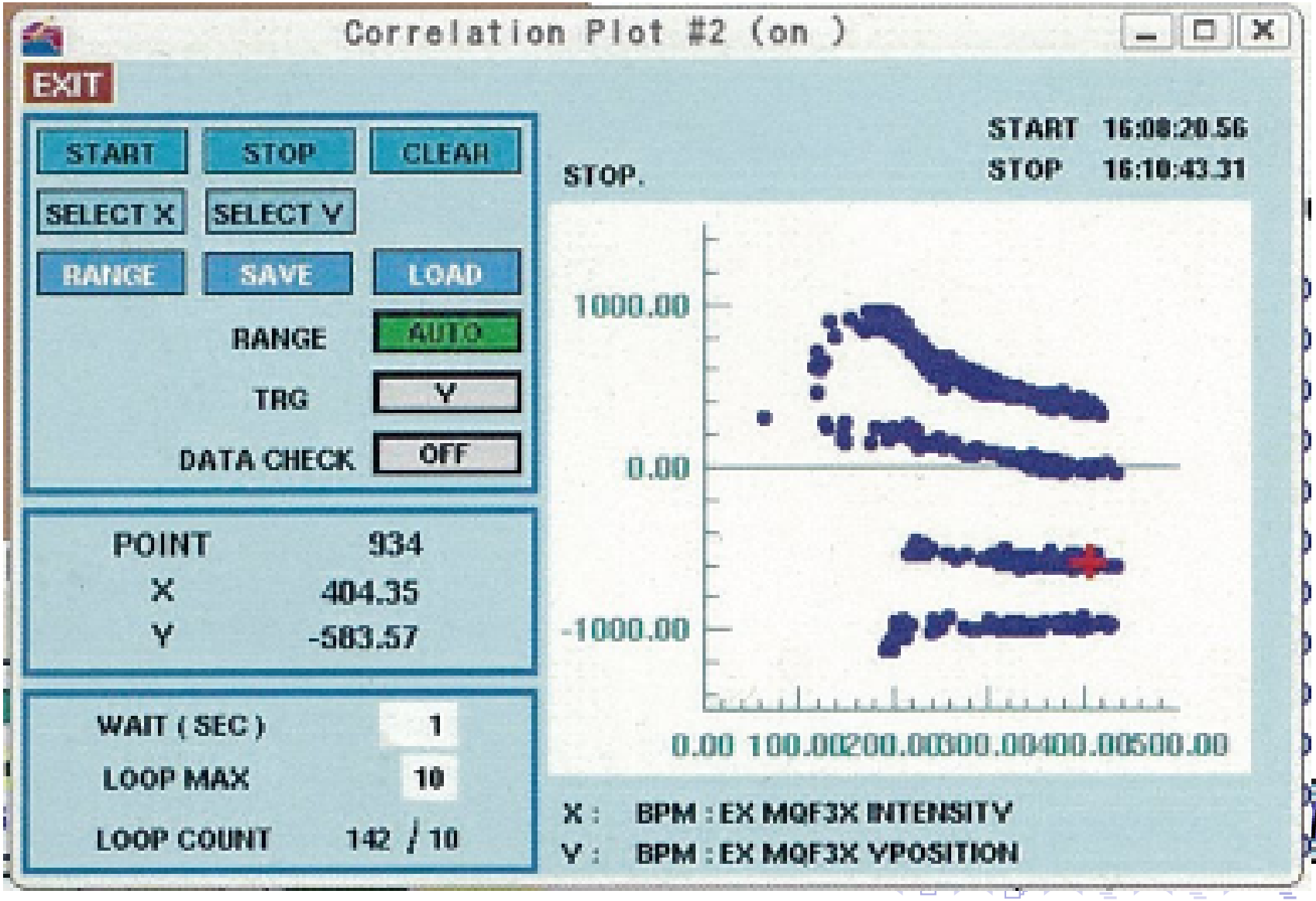
Intensity dependence at MQF2X (Y)



Intensity dependence at MQF3X (X)



Intensity dependence at MQF3X (Y)



Outline

Relative measurements

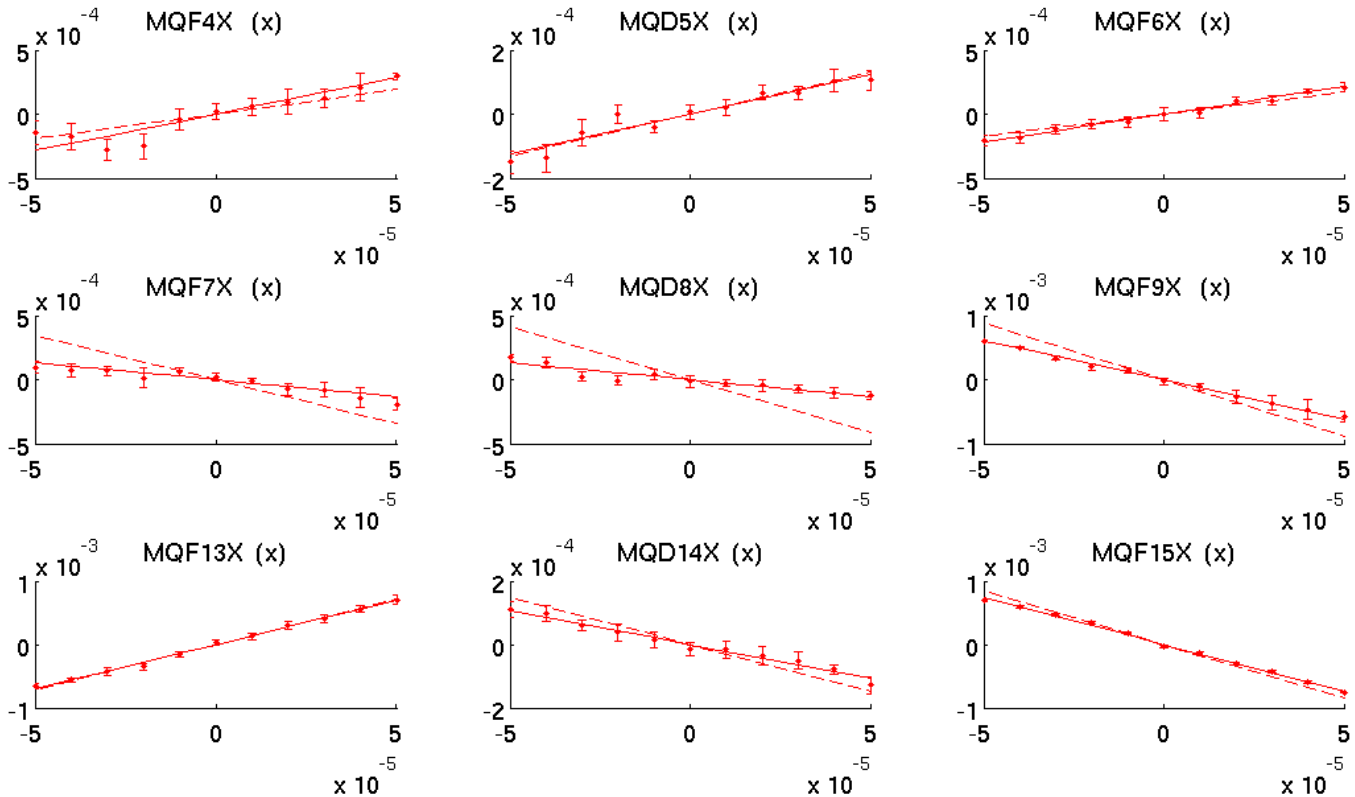
Principle of the measurement

- Different angles are introduced by ZH1X and ZV1X.
- Position variation at each striplines downstream is measured (average of 10 measurements).
- Compared with the simulation (dashed line).
- Plots show variation of position function of the angle introduced.
- **Simulation is valid** : works well with cavity BPMs on movers. (see tomorrow's talk on orbit correction)

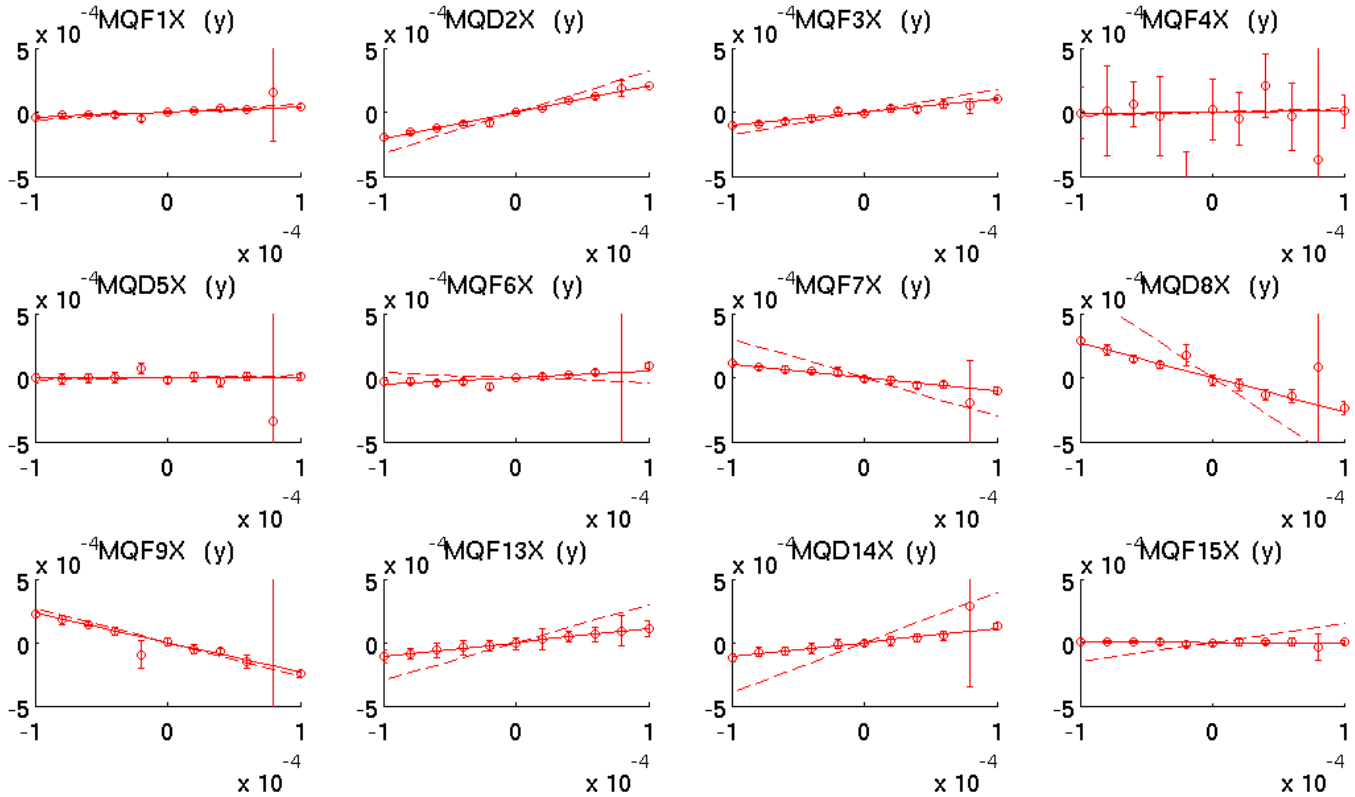
Results

- Linearity is good for most of them.
- Factor between simulation and measurement depends on the corrector and changes with time and/or offset.

ZH1X relative measurement



ZV1X relative measurement



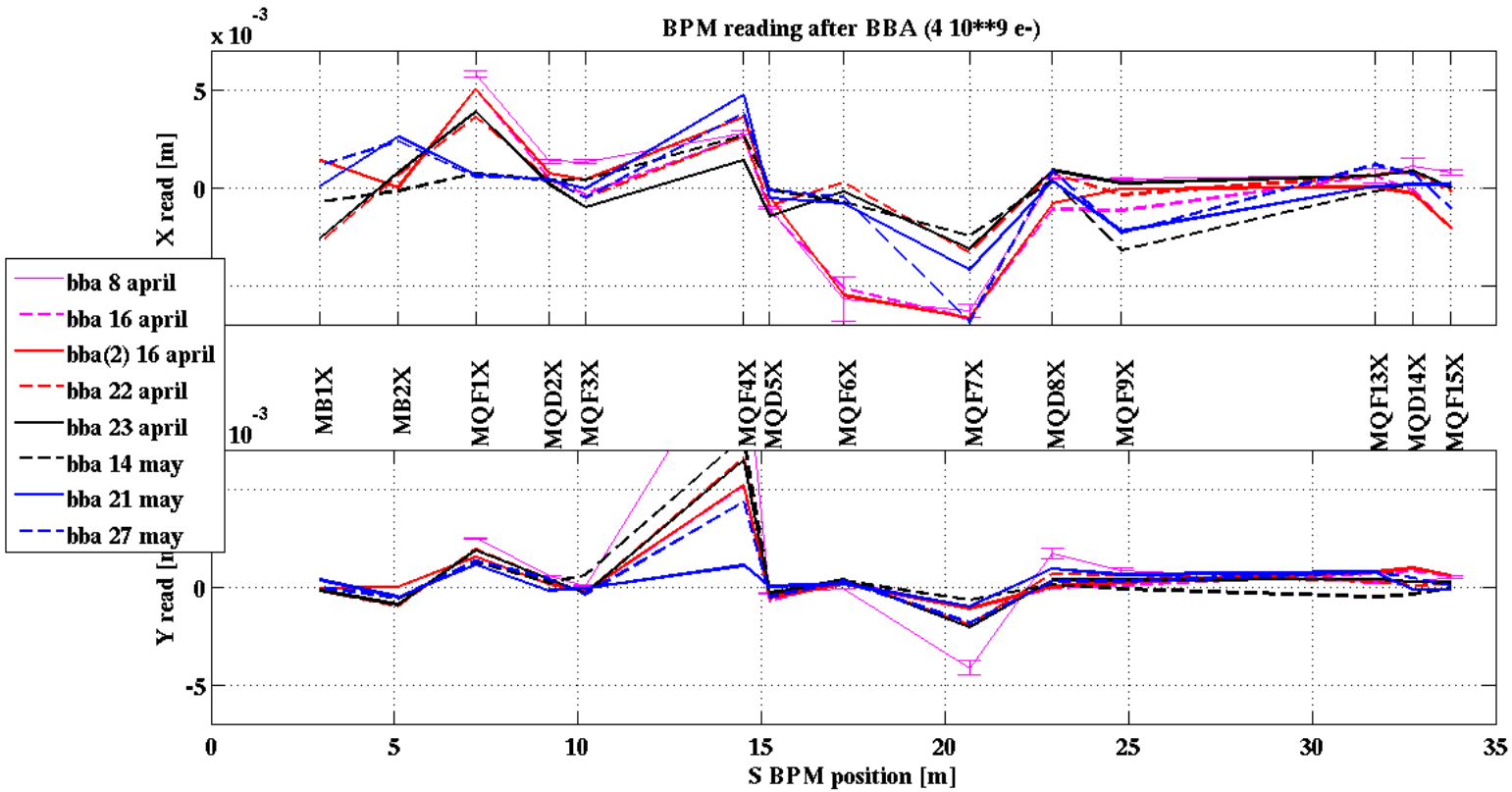
Outline

Position after BBA

Principle of the measurement

- Beam Based Alignment (BBA) was done weekly to find magnetic centre.
- Stripline BPMs are fixed to the magnet, it can be taken as a reference.
- BBA alignment procedure has a finite resolution.
- Compare the spread of the stripline readings after BBA to this resolution.

Readings after BBA



Outline

Summary table

BPM name	type	X/Y resolution w/o correction	X/Y resolution with correction	remarks
MQF1X	short, large aperture.	100/50	45/35	
MQD2X		40/15	30/10	
MQF3X		55/25	45/15	
MQF4X		80/500	60/170	very bad
MQD5X		90/35	90/30	good in absolute
MQF6X	short, small aperture.	20/20	20/15	
MQF7X		60/75	50/25	
MQD8X		15/50	15/25	
MQF9X	long, small aperture.	150/80	35/20	strange
MQF13X		35/30	35/30	no intensity dependen
MQD14X		20/15	20/15	no intensity dependen
MQF15X		35/10	30/10	no intensity dependen

Outline

Conclusion

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- Striplines **cannot** be used to restore an orbit (most of the absolute readings are not constant).
- They can be used to make relative measurements (Dispersion or orbit stabilisation).
- In that case, the algorithm must be very robust to scale factor errors (0.5 to 3 observed).
- The needed automation to reproduce/preserve a very low emittance in EXT is prevented by their present status.

Prospects

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- Is the electronics tunable in such a way that the above problems could be solved ?
- Otherwise is an upgrade necessary ?