Rapport sur la 1^{ere} annee du commissioning d'ATF2

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REUNION ACTIVITES PHYSIQUE DES ACCELERATEURS
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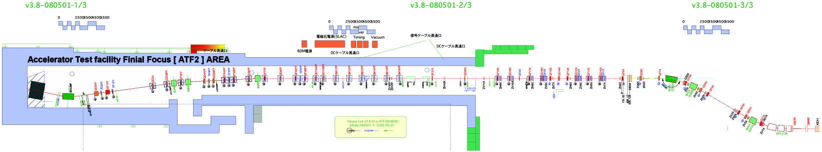
Outline

ATF2



- ATF2 is a 90m long Final Focus prototype scaled from ILC Beam Delivery System.
- Is is placed at the extraction of the ATF damping ring (best vertical emmitance of the world).

Outline

beam size

why small beam size

- In a linear collider, low bunch collision frequency
- To keep the luminosity reasonable, very small beam sizes required
- $\Rightarrow$ Very strong foccussing and very low emmitance.

ATF2 goals

- $37nm$ vertical beam size at IP.
- Get experience with local chromaticity correction.
- nm horizontal stabiliy of the beam.

Outline

Commisioning

Start big, going small

- Start with High β^* optics, to relaxes tolerences.
- Going to small beam size when instruments are ready (several steps).
- Parallele devlopement of the instruments.

Present status

- optics for 300nm at IP vertical beam size.

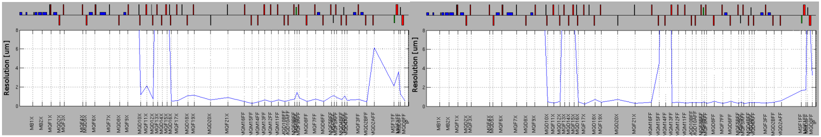
Correction scheme

correction applied

- Beam Based Allignement.
- Steering.
- Dispersion correction (X then Y).
- Coupling correction.
- Beta match.
- Decrease beam size using sextupoles knobs.

Cavity BPMS Status

- All C-Band have good resolution (attenuator on).
- Calibration is stable over several weeks.
- Still some scale problem with the non-movers ones.



horizontal and vertical resolution

IP Size montiors

10 um Tungsten Wire

works well, background tolerent but $\simeq 3\mu m$resolution.

5 um Carbon Wire

recently used, sensitive to background, $\simeq 1\mu m$resolution.

Shintake monitor

Powerfull laser creating interference patern interacting with beam by Compton effect.
Resolution from $2\mu m$ to $2nm$ thought 4 modes.
Very sensitive to background.

Outline

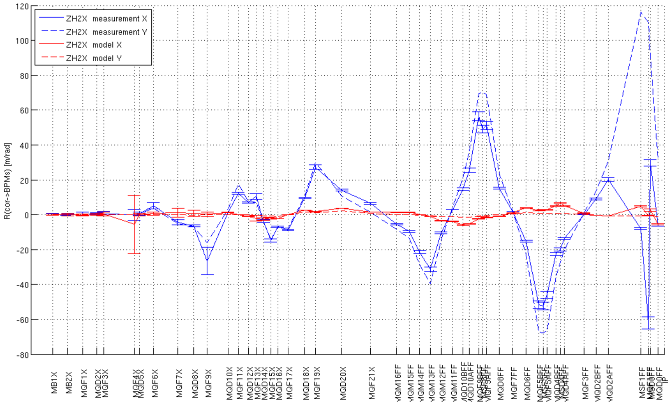
Principle

- Change corrector strength or displace quadrupole.
- Fit the slope of the position in all BPM function of that change.
- Compare with the expected one from magnet current settings.
- If no agreement, possibility to apply fudge factor to 1 quad to reproduce measurement.

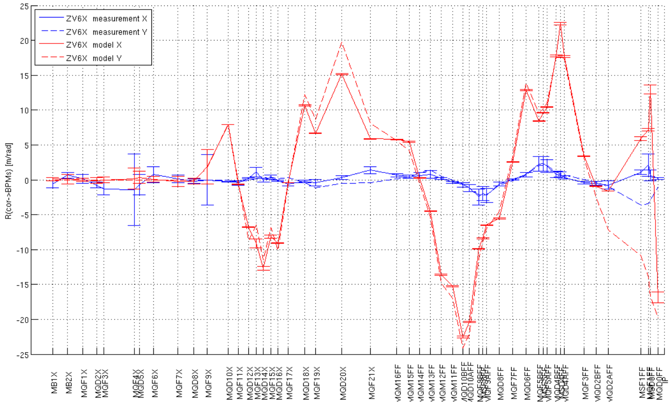
Experimental test

- Lots of sign problems due to different conventions for various instrumentations.
- Identify non-calibrated BPMs.
- Now really good agreement from mid-EXT line.
- Sometimes problems at the begining of EXT line.

ZH2X R_{12} and $R32$ measurement



ZV6X R_{34} and $R14$ measurement



Sum-up

- Easy to use interface.
- Quick determination of modeling problems (1 corrector scan = few min).
- Quick determination of problematic BPMs.
- Possibility to test hypothesis (quad fudge factor).
- Already well tested in beam.

Outline

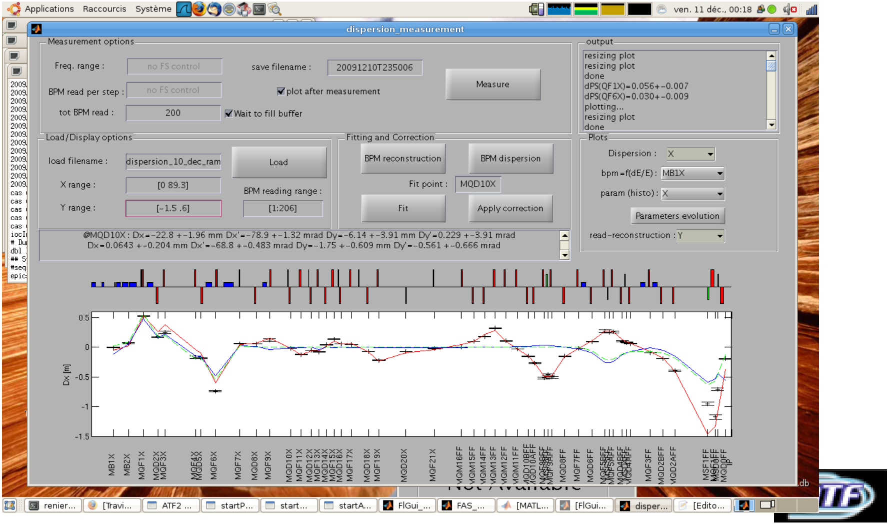
Principle and status

- $X\ X'\ Y\ Y'\ \frac{dE}{E}$ reconstruction at selected point with selected BPMs.
- Fit the dispersion from correlation in all BPMs with reconstructed energy (can be parasitic with other measurements).
- Fit the dispersion at the selected point using dispersion in selected BPMs.
- Compute correction (apply never tested except on simulation).

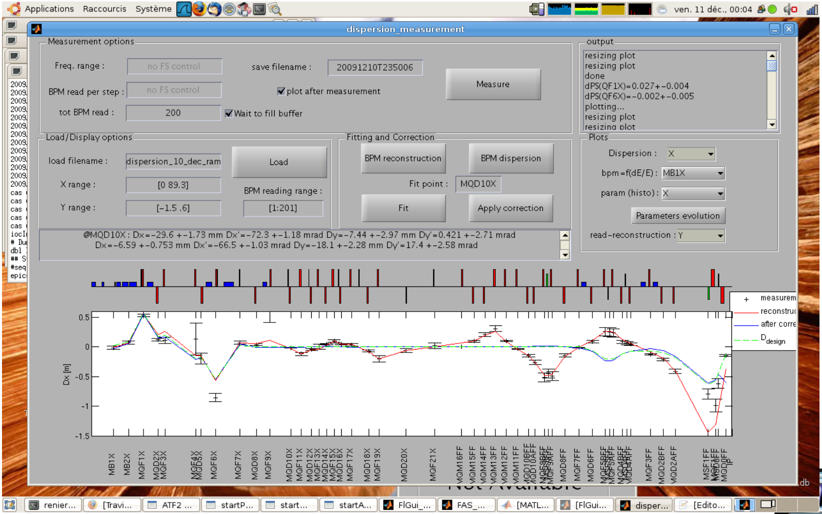
Experimental test

- parameters reconstruction seems good (steps in energy when Δf ramp used are well reconstructed).
- Dispersion measurement reconstructed fits very well with dispersion measured in all goods BPMs.
- Dispersion measurement with beam fluctuation !

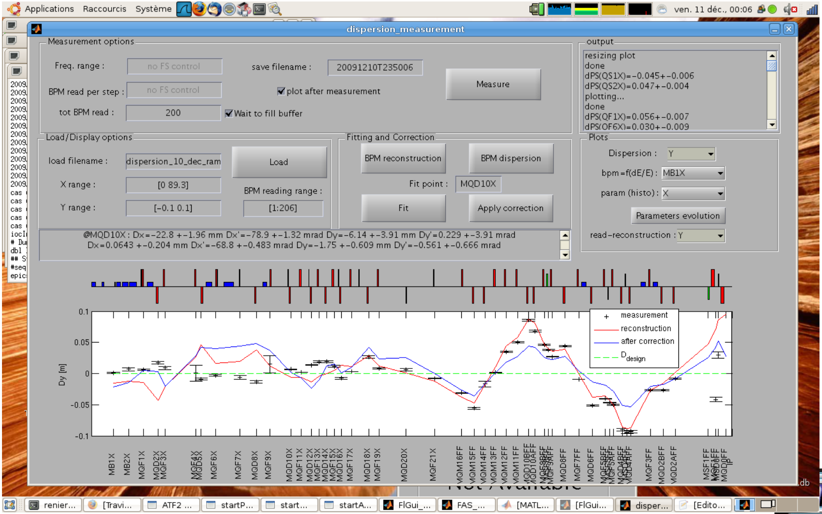
Horizontal dispersion measurement ramp on



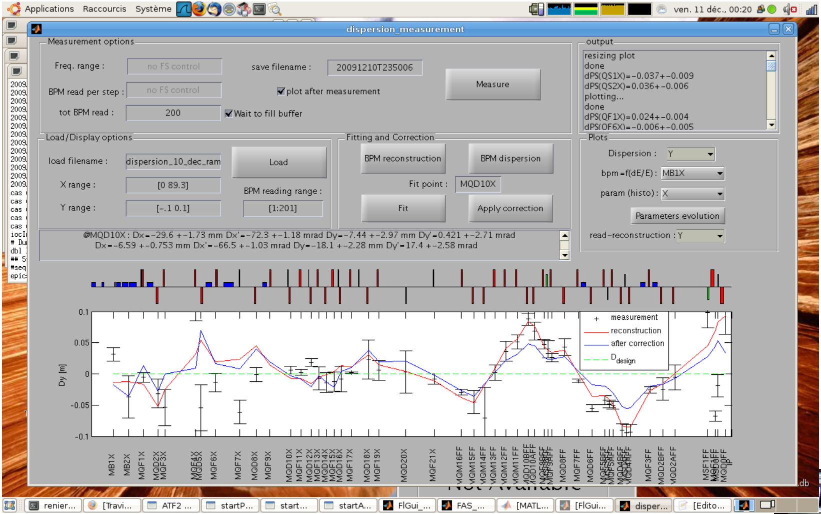
Vertical dispersion measurement ramp off



Horizontal dispersion measurement ramp on



Vertical dispersion measurement ramp off



Sum-up

- Powerful reconstruction of parameters and incoming dispersion.
- Allows monitoring their evolution.

Outline

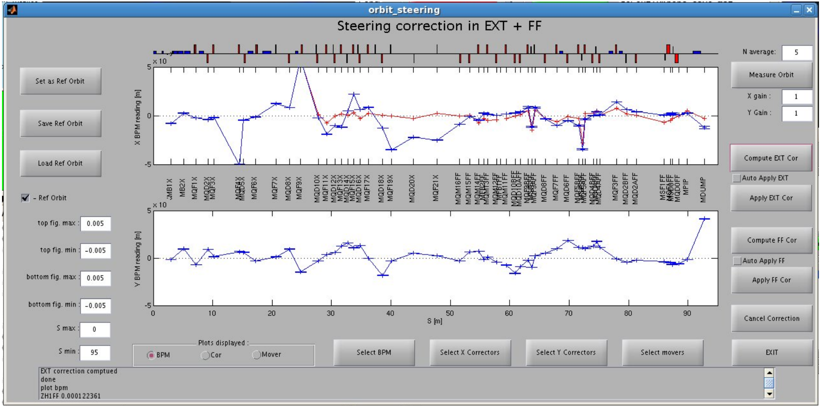
Features

- Measure average beam orbit with cuts.
- chose the BPM, correctors, mover involved in correction.
- Compute EXT or FF line correction to a reference orbit.
- Display the estimated orbit after correction.
- Display the corrector strengths or mover change involved.
- Apply the correction and compare with the predictions.
- Allows to cancel the corrections.

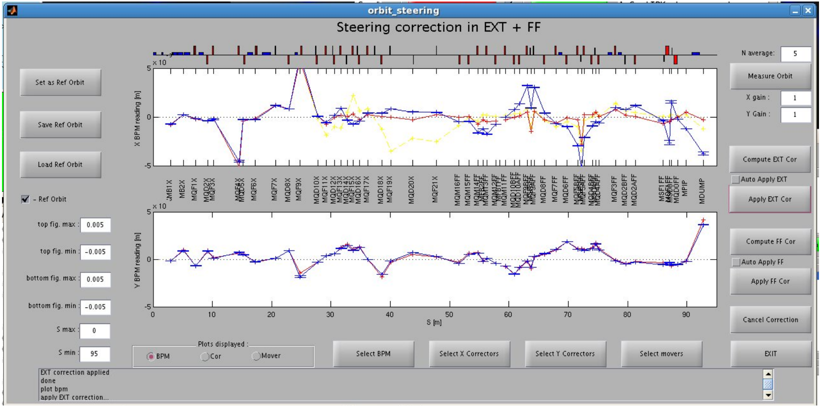
Exprimental test

- Works well (where modeling is good).
- Sometime fails due to incorrect setting of the correctors (need to cancel correction and apply again).

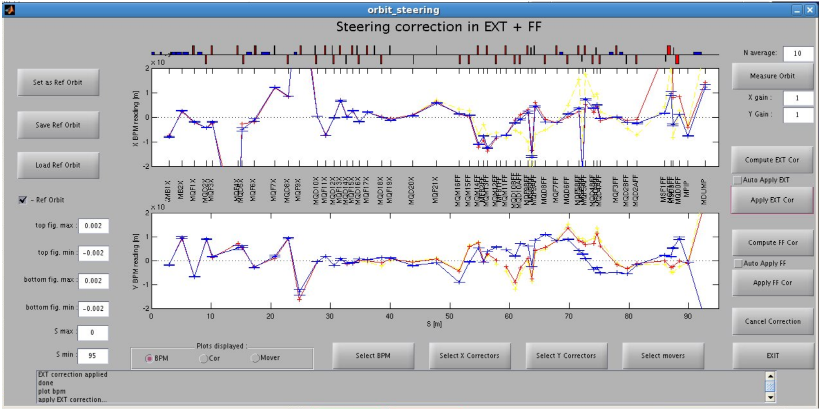
Before EXT X correction



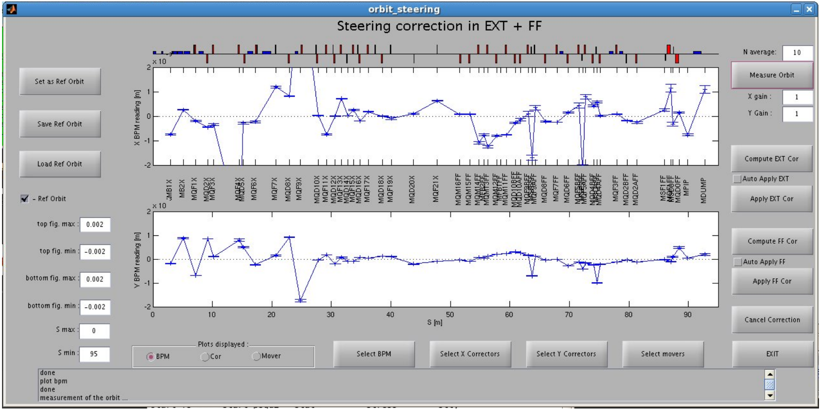
After EXT X correction



After 5 EXT X correction



After FF Y correction



Outline

Conclusion

- ATF2 commissioning is doing well.
- Instruments start to be close to nominal resolutions.
- Good modeling of the beam line.
- pulse to pulse fluctuation reconstruction works well.
- Allow dispersion measurement without Δf ramp
- Orbit steering works, some iterations needed.

Prospects

- Improvement of the striplines BPMs at the enter of the line.
- Need to implement the reconstruction running in background.
- Need to improve orbit steering to gain robustness.
- Smallest vertical beam size measured : $1\mu m$, still lots of work !