Status of DR and EXT in Feb. and Mar. 2012

2012.03.19.

Kiyoshi KUBO (KEK)

DR status

- Small COD after orbit correction
  - All magnets re-aligned in summer~winter.
  - BBA (beam based offset correction) of most BPM-Magnet pairs.
- Vertical emittance ~10 pm after usual emittance tuning (dispersion and coupling).
- No instability is observed, in single bunch operation.
- Orbit around extraction region
  - Horizontal can be changed, if desired, by a few mm (?), without significant emittance increase.
  - Vertical bump orbit (>0.5 mm) affected emittance.
  - To correct small drift, DR tuning can be done fixing orbit in EXT.

DR status -2

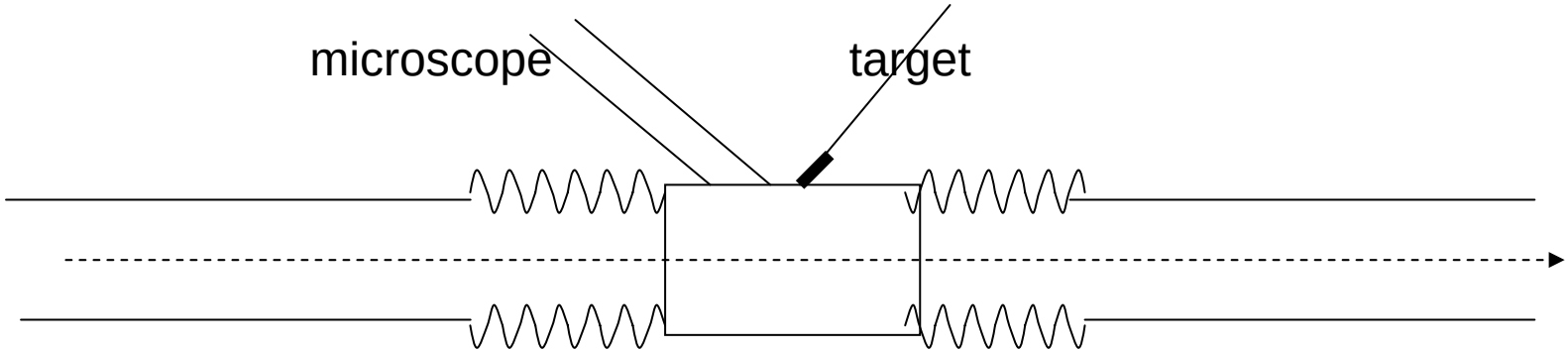
Beam current was not stable, especially in March.

- Problem of the GUN and/or Linac RF
- Injected beam energy is fluctuating, probably.
- Tuning could make energy acceptance a little larger.
- This problem is still not solved.

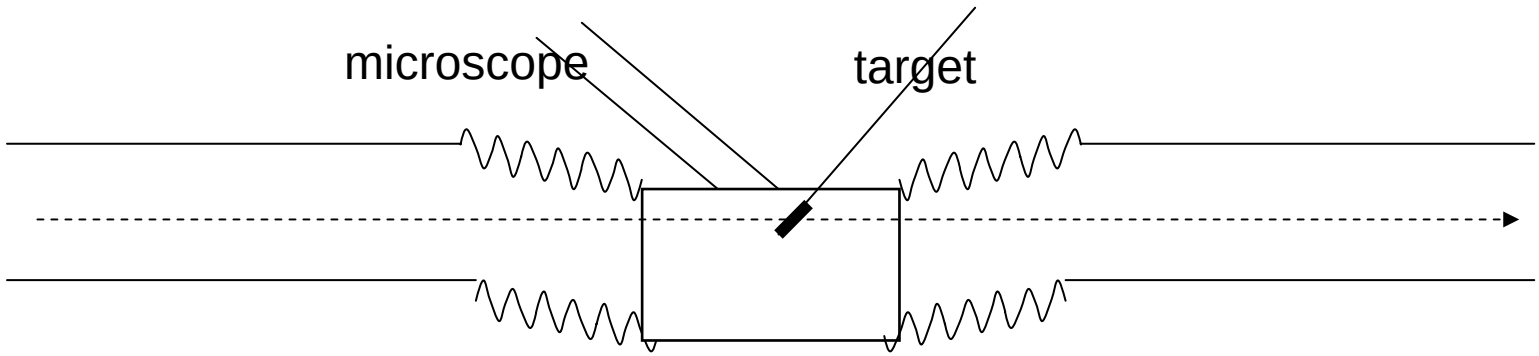
EXT emittance -1

- We investigated ‘abnormal emittance growth’ in EXT.
- We found and solved one problem: Wakefield of OTR monitors.
  - Upstream monitors should be at ‘NonOTR’ position
- We Removed 2nd kicker from beam line
  - Emittance seemed to be reduced. But not clear. And not confirmed.
- We measured emittance dependence on beam orbit (at kicker, septum, bend etc.)
  - No clear dependence was confirmed.

‘NonOTR position’: No significan wakefiled



‘OTR position’: Lens of scope should be close to the target for measreument.
Significant wakefiled affect downstream. (Even if target is not inserted.)



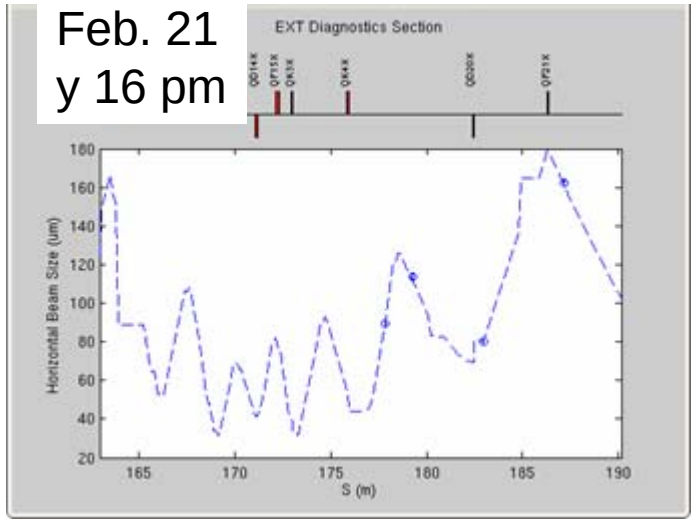
EXT emittance -2

- Emittance in extraction line achieved < 20 pm, every week (with different DR conditions), after careful tuning.
  - Orbit correction using kicker and steering magnets.
  - Dispersion correction. (~5 mm or less in OTR-Wire Scanner region)
  - OTR monitor should be properly set up (e.g. focusing and calibration).
  - Coupling correction using QKs.
    - All 4 QKs, one by one, finding minimum emittance (or minimum vertical size at a sensitive OTR moni.)

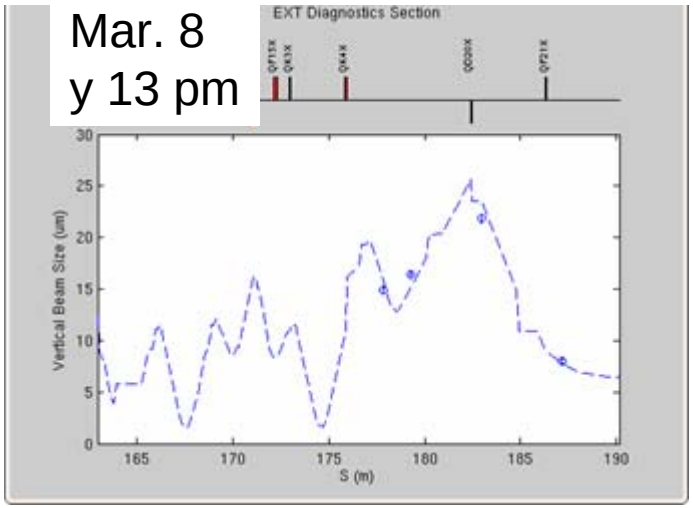
Emittance measurement by 4 OTRs

Vertical emittance
~ 15 pm every week.

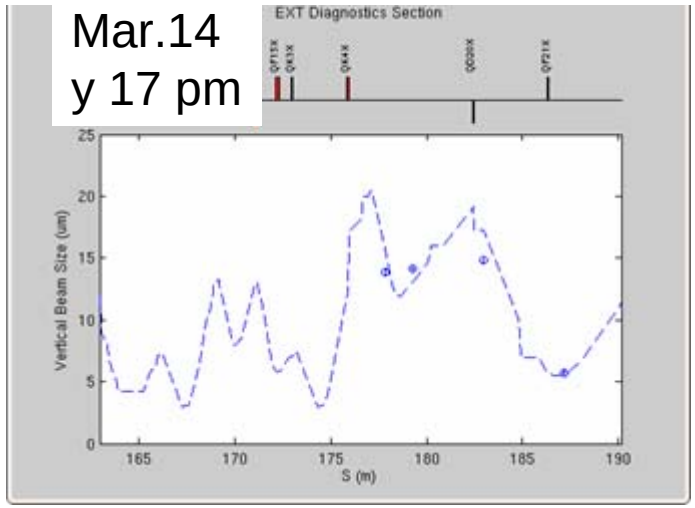
Feb. 21
y 16 pm



Mar. 8
y 13 pm



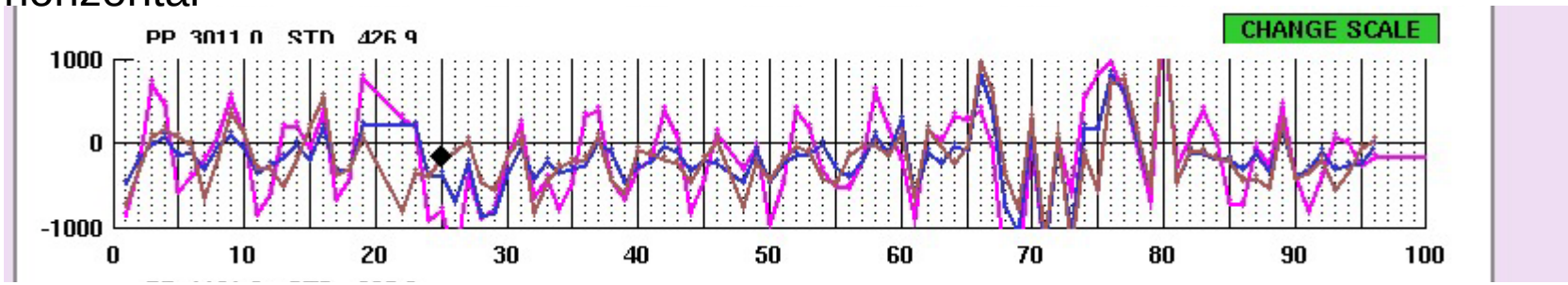
Mar.14
y 17 pm



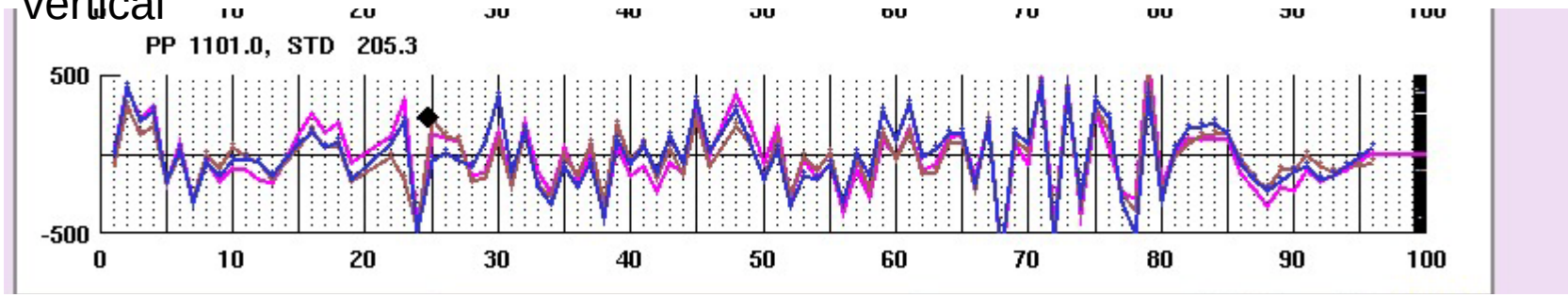
DR orbit

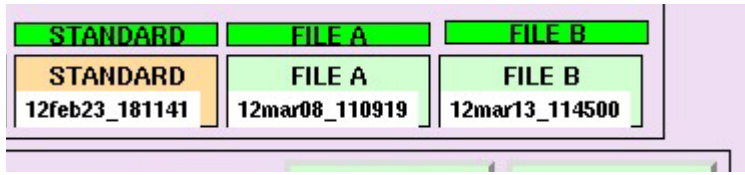
Feb. 23, Mar. 8 and Mar. 13.
Orbit around extraction-injection (happened to be) changed.

horizontal



vertical





EXT Optics matching

- Adjusting QM magnets strength based on multi-OTR monitor measurement was good enough.
  - May depend on quality of the measurement (?)
- After this matching, IP beam size tuning started.
  - Optics of upstream EXT line (from kicker to QMs) did not have to change for IP beam size tuning.

EXT Orbit stability

- 2nd kicker was still off line
  - Orbit jitter seemed small enough for FF study
- We observed orbit drift
  - Affected IP tuning
  - Source is unknown (may be from DR?)
  - Slow Orbit Feedback was applied
    - Using vertical steering magnets.
    - time constant ~ 30 sec (?)
    - It seemed to work well.

SUMMARY

- DR-EXT status was good enough for present stage of ATF2 FF study.
  - DR emittance ~10 pm,
  - EXT emittance ~15 pm
- Beam current was unstable because of problems with Linac.
- Slow orbit drift was observed. Cured by feedback.