ATF2 Status (Last December run)

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CLIC Physics Meeting
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Introduction

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Conclusion and Prospects

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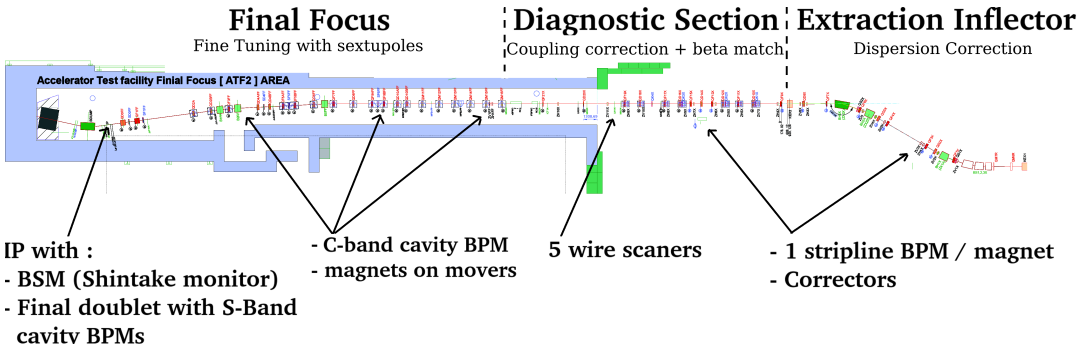
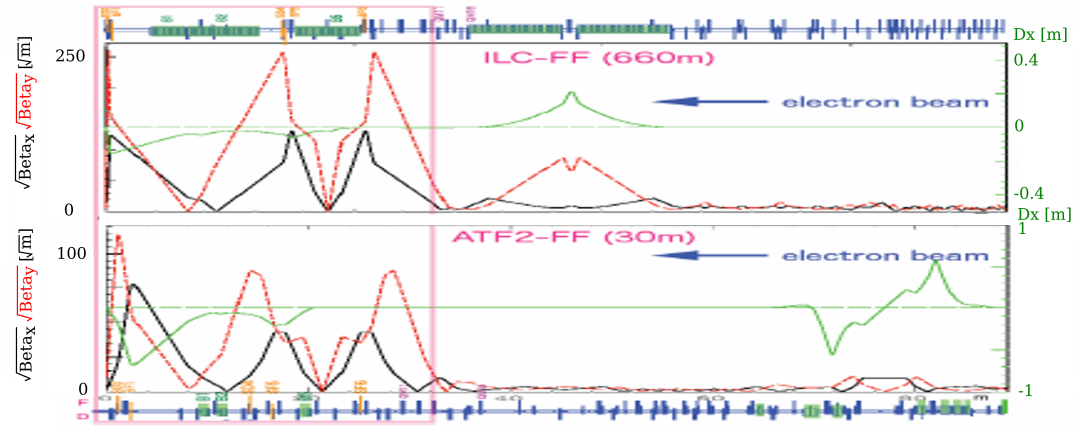
ATF2 at KEK





Parameter	Nominal value
ϵ_x	1.0×10^{-9}rad.m
ϵ_y	1.0×10^{-11}rad.m
Energy	1.3GeV
Intensity	$1.10^{10} e^-$
σ_y^*	40nm

Goals and procedure

Goals

- Demonstrate local chromaticity correction scheme.
- Establish tunning techniques, training.
- Reach σ_y^*40nm.
- 1nm beam stability at IP (multibunch).

Procedure

- Dispersion and coupling correction in EXT.
- Beta matching.
- Scan knob based on sextupole displacement and skew sextupole strengths.

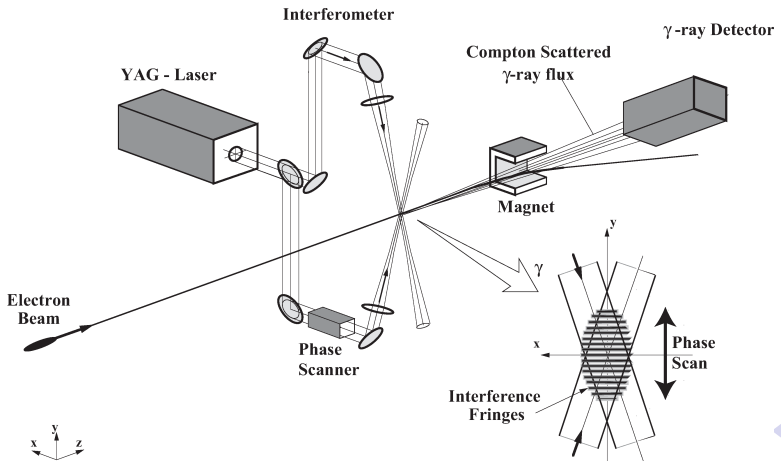
Measure beam size at IP

instruments

- Wire scanner for $\sigma_y^* > 2\mu$m (H, V and 2 deg).
- Screen (alignment of laser wrt the beam only).
- Shintake monitor $\sigma_y^* < 2\mu$m (3 modes).

Shintake monitor

- Compton interaction on interference fringes.
- Fringes scanned modifying laser phase.
- Modulation of the Compton signal related to σ_y^*.



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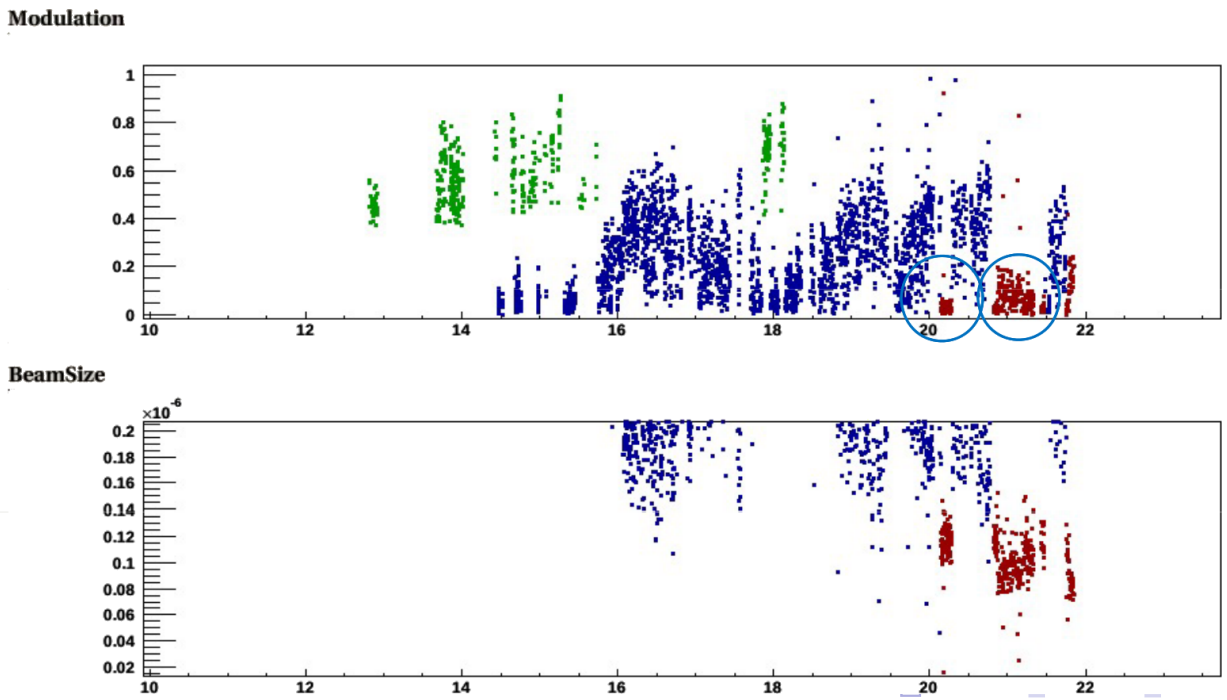
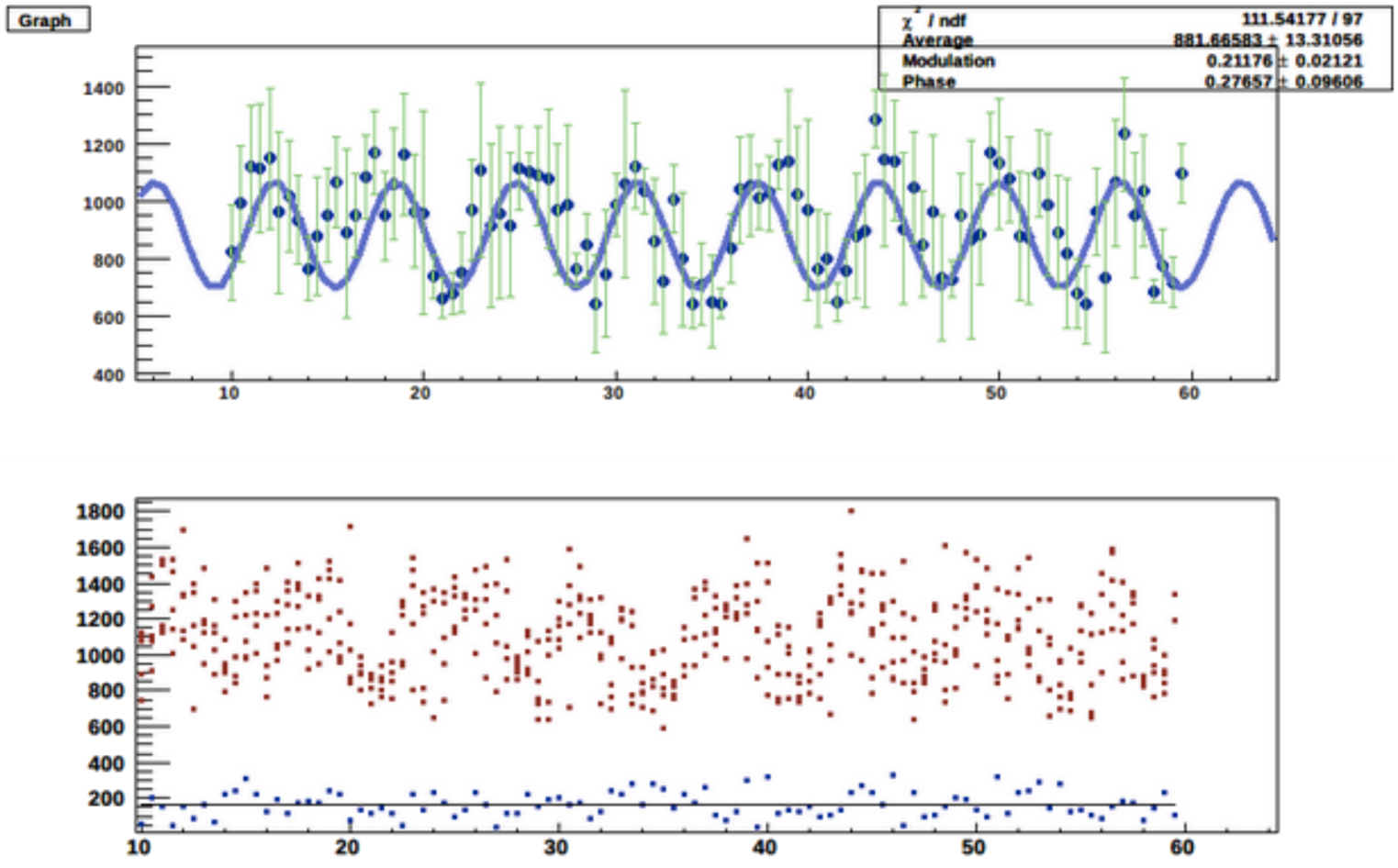
Program

1.
   - Shintake monitor commissioning.
   - Study emittance growth in EXT.
   - Big earthquake $\Rightarrow$ realign ring's magnets.
2. Large extracted emittance since the earthquake, tunning
3. Low intensity operation, tunning.

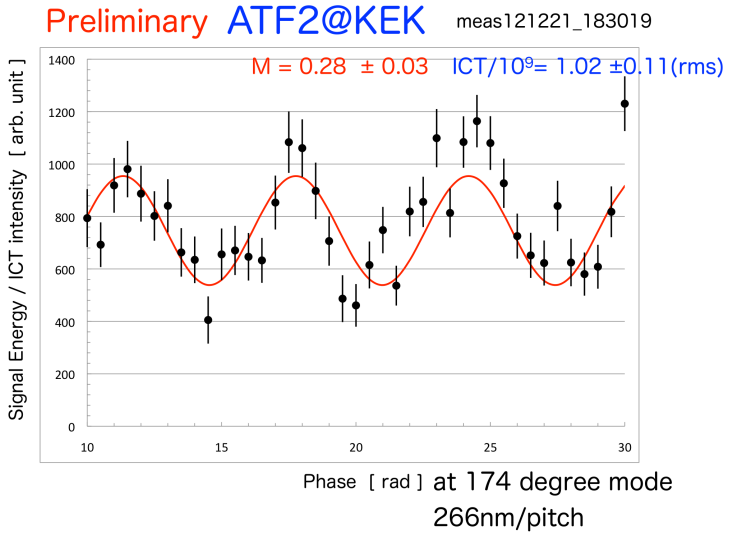


70 nm achieved



Scan 3x longer than usual, still consistent measurement.

Comaprison with FFTB results



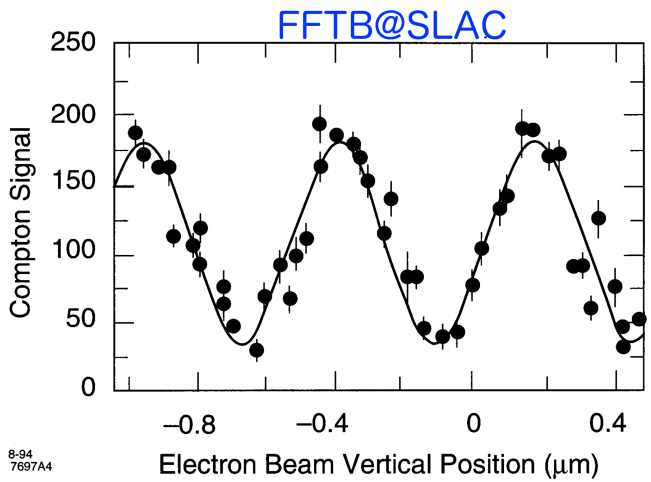
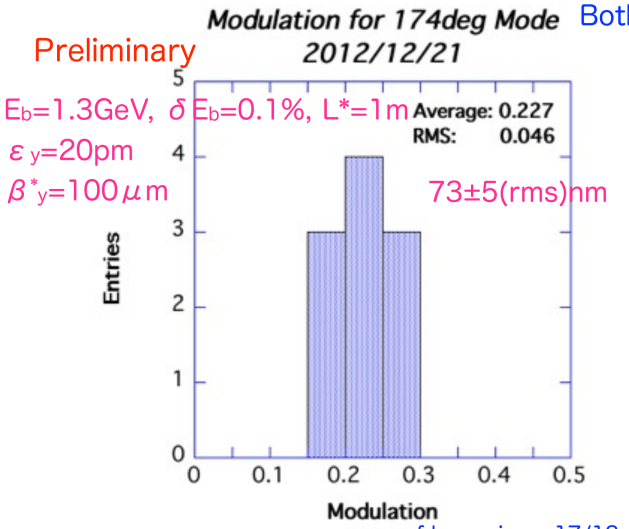


Figure 5.6: Laser-Compton beam size measurement performed in May of 1994. The measured size is 77±7 nanometers.



Both assumes no modulation reduction

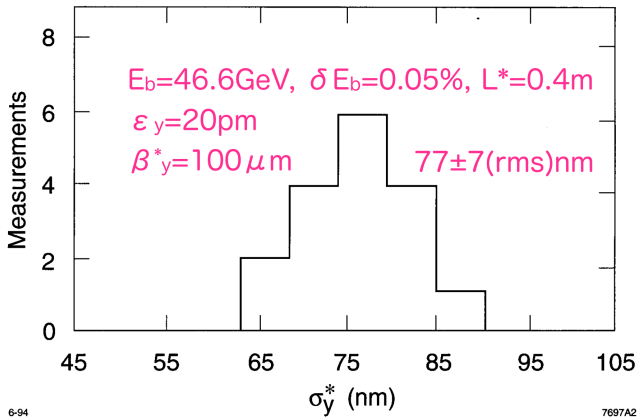


Figure 5.7: Histogram of measurements made during the last 3 hours of the May, 1994 FFTB run. Average size measured was 77 nm, with an RMS of 7 nm.

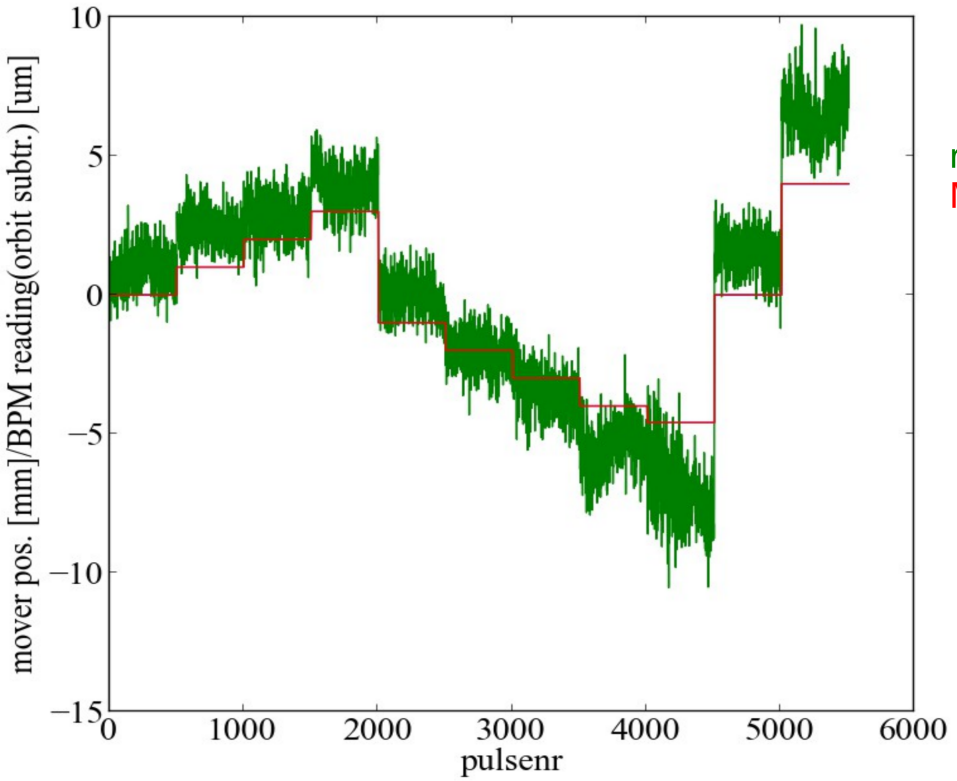
rms of laser size = 50um -> M reduction of 10%

Headlines

Wakefields

Evidence

- emittance, beam size increase with I.
- non-zero offset of the reference cavity for min σ_y*



residual BPM reading QD2AFF [um]
MREF3FF position [mm]

Clear correlation seen for all downstream BPMs with expected orbit pattern

But effect somewhat larger than expected.

plot from J. Snuverink

Wakefields

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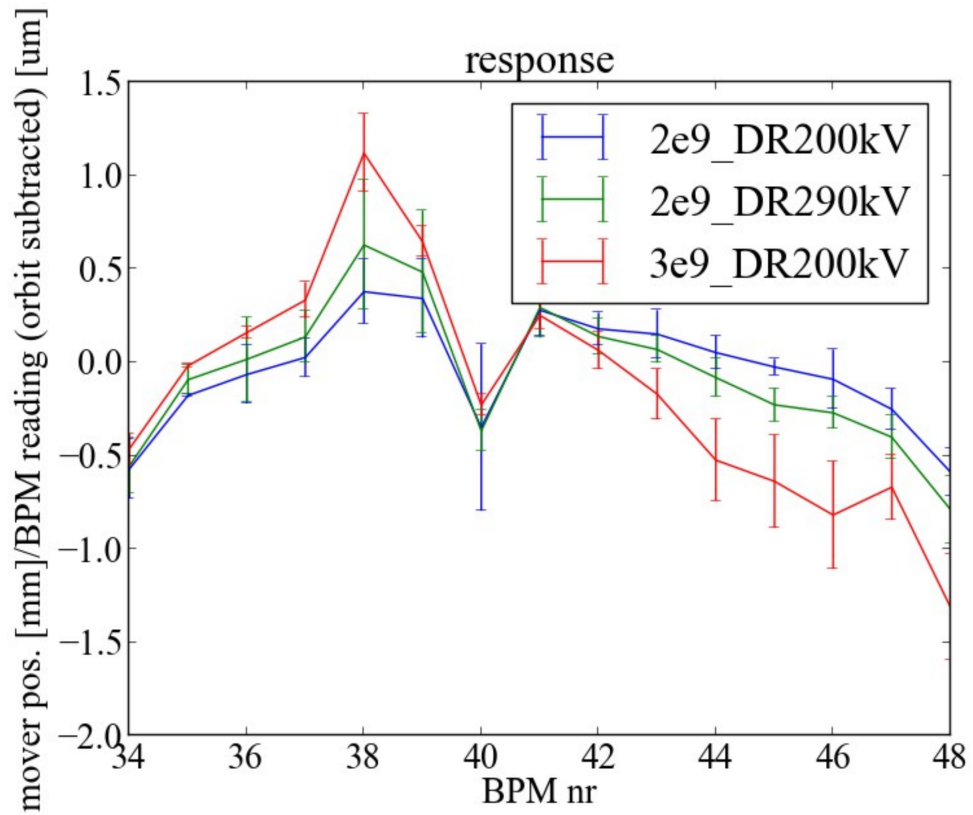


Corresponding wakefield of cavity mover system:
0.3-0.4 V/pC/mm

Larger value for higher charge?!

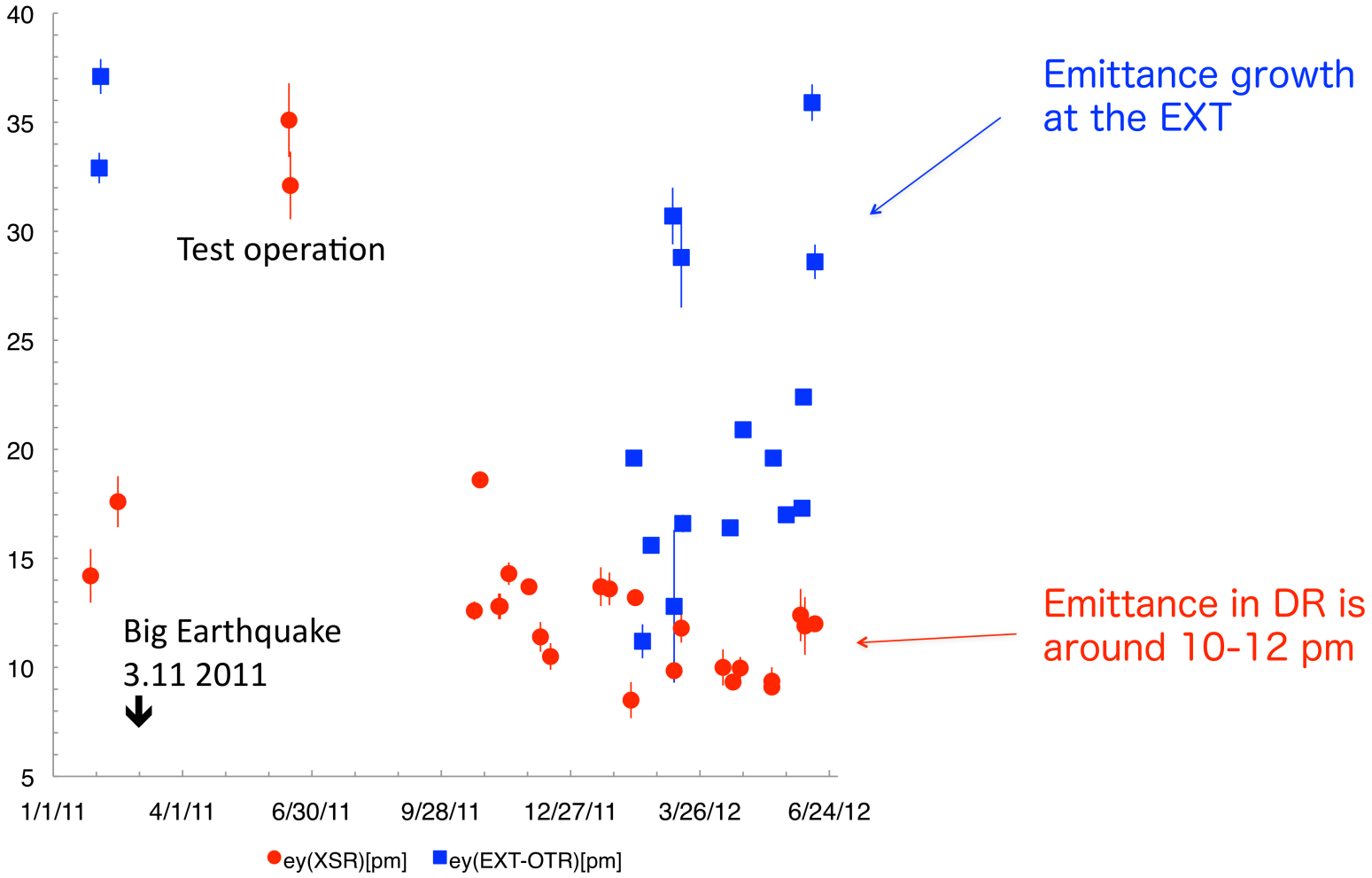
Recall simulation (including bellows):

0.21 V/pC/mm

plot from J. Snuverink

Emittance growth in EXT

Vertical emittance at DR and EXT



Beam jitter

Problem

- $10 - 30\%$ jitter (normalized to σ).
- Energy drift due to temperature.
- Sextupoles are at high beta location and dispersive region.
- Induce coupling and focusing errors.

Next presentations will give more details.

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Conclusion

- $\sigma_y^* = 70$nm measured at ATF2.
- Small beam size only measured at low intensity.
- Main limitation are identified, still not totally understood.

Prospects

- Investigate wakefields, emittance growth and jitter sources.
- Upgrade of the cooling system and klystrons next summer.