

Present Status of Orbit Stabilization at SPring-8

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**On behalf of SPring-8 Project Team
for Beam Orbit Stabilization**

1. Progress in These Two Years

- **Cycle by cycle reproduction of ID photon beam axes by XBPM Sep'03**
- **Introduction of top-up operation May'04**
- **Increment in the number of Steering magnets in SOFB (24->48) Sep'04**

2. Present Performance

Fast orbit stab. (0.1Hz ~ 200Hz)

Hori. r.m.s. ~4um @ID's H.size=360um

Vert. r.m.s. ~1um @ID's V.size=5~6um

Slow orbit stab. (<0.1Hz)

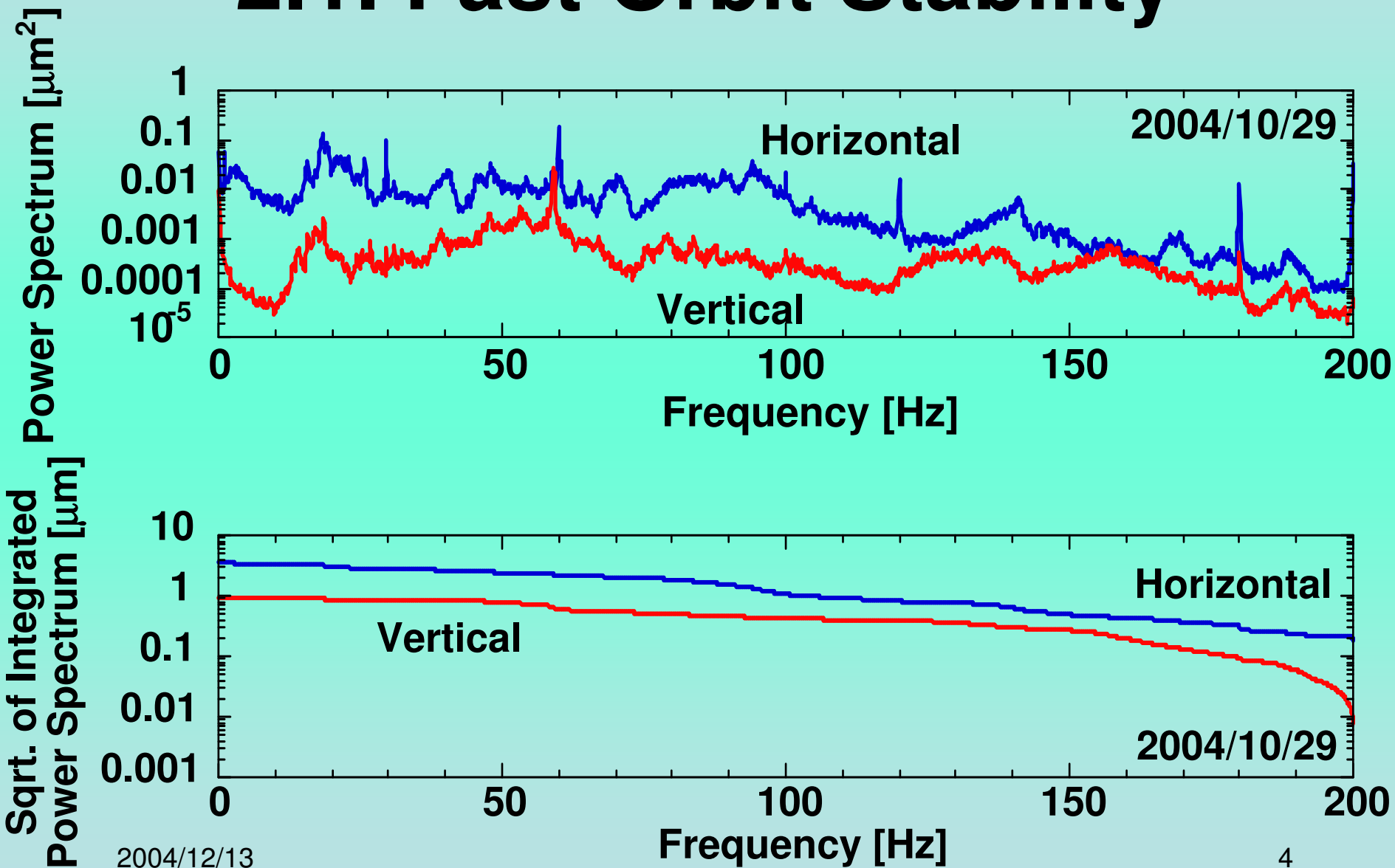
Hori. r.m.s. 1~2 micron / week

Vert. r.m.s. 2~3 micron / week

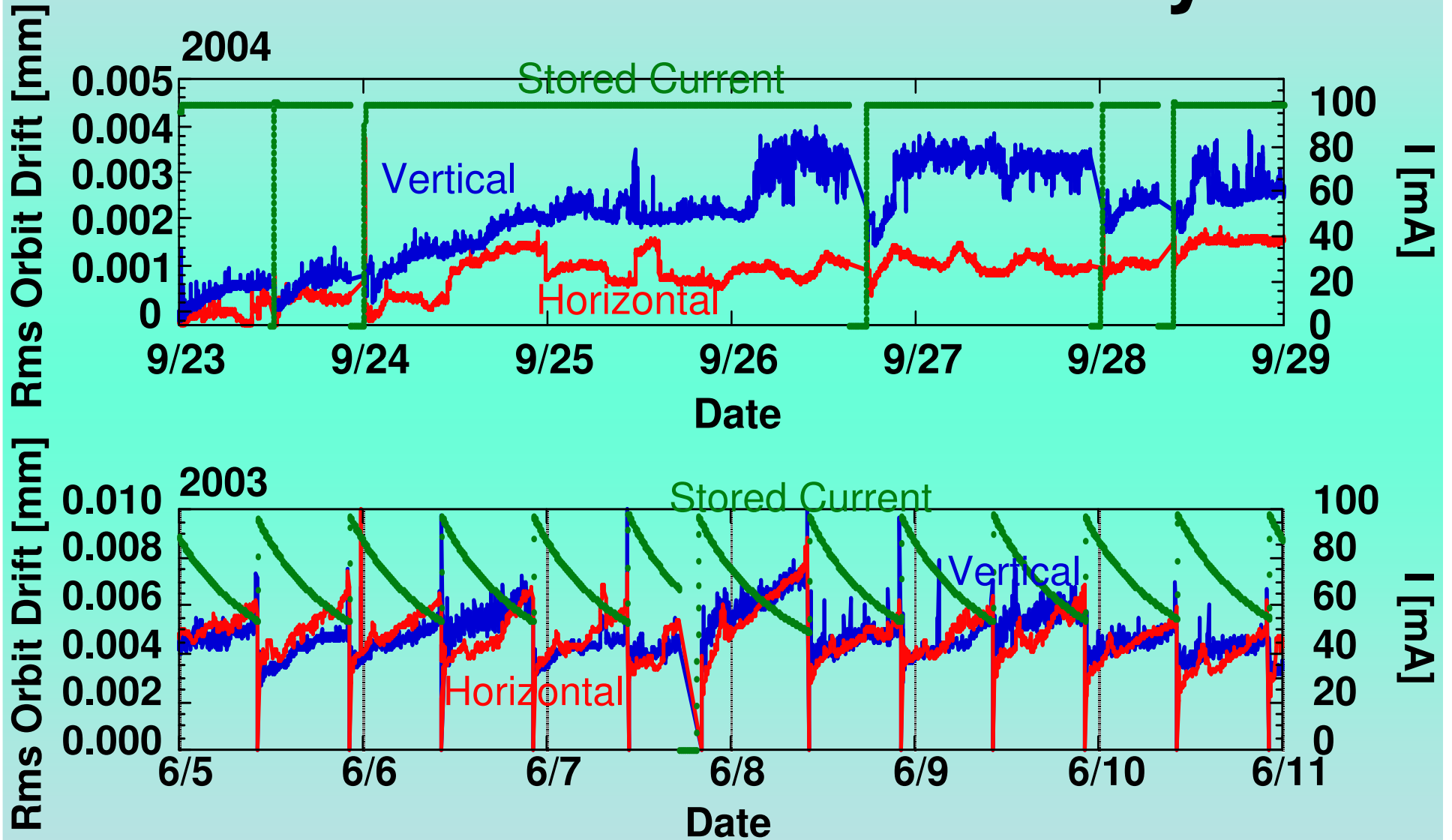
Energy drift

~ 2×10^{-5} (full width)

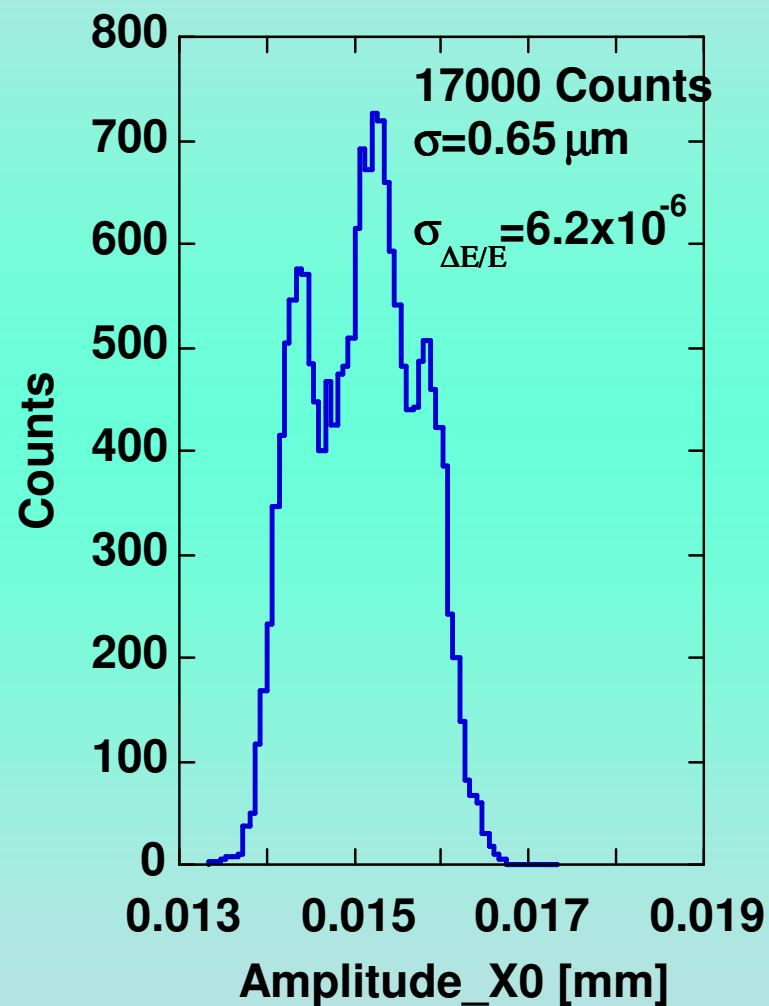
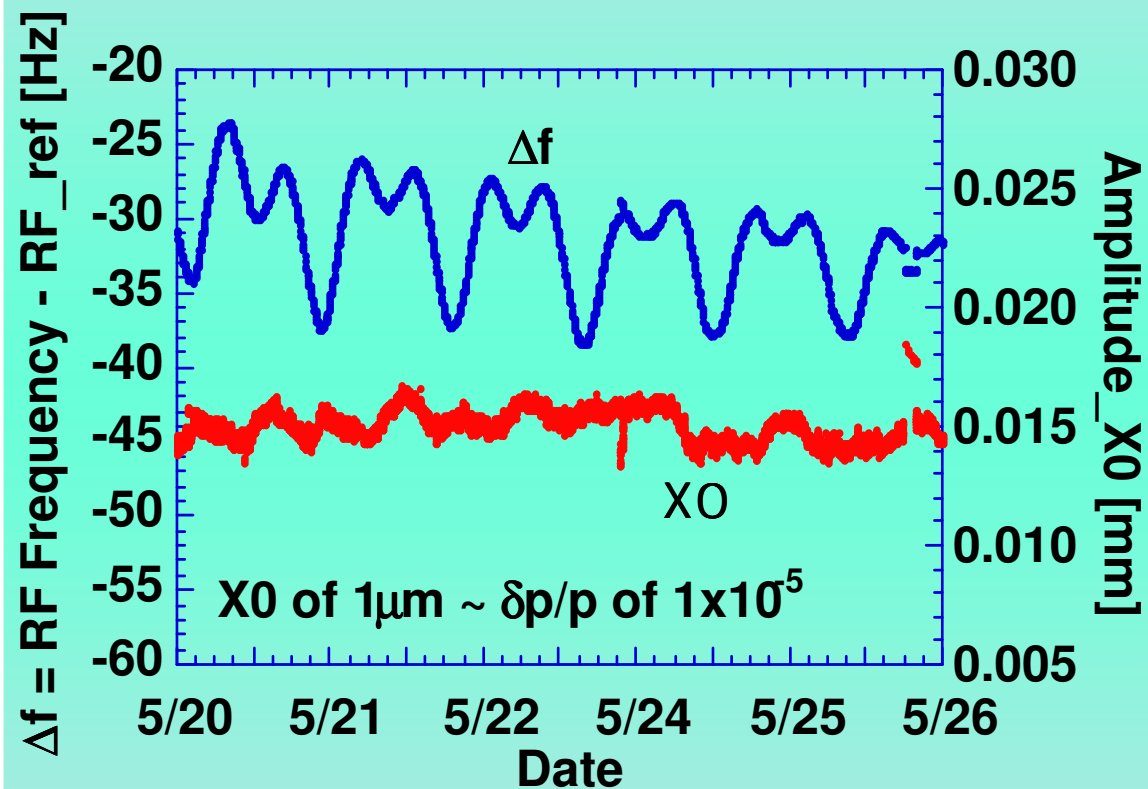
2.1. Fast Orbit Stability



2.2. Slow Orbit Stability



2.3. Beam Energy Stability



3. Merit of Top-up

Purpose of beam orbit stabilization

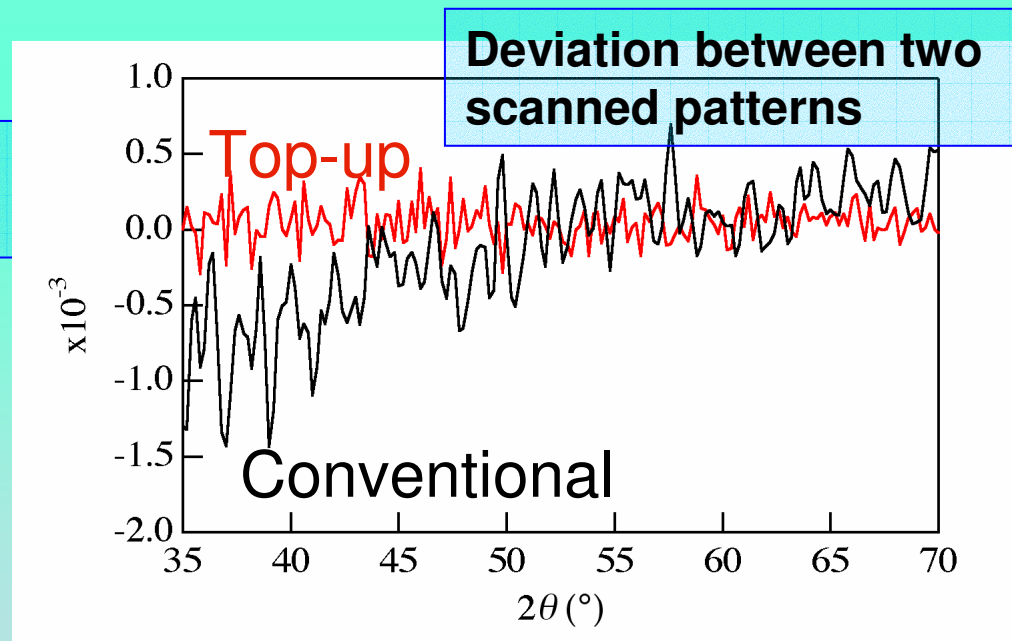
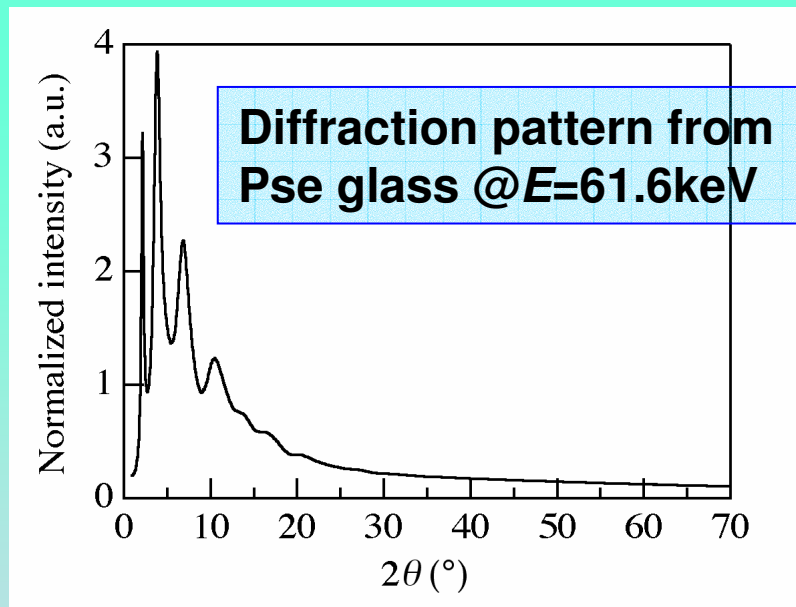
 **X-ray beam stabilization at experimental stations**

- **Improvement of X-ray optics stability**
- **Reduction of current-dependent noise in beam orbit variation**

3. Merit of Top-up (Con't)

Example: Quality-improvement of Diffraction Data

Diffraction data especially at higher 2θ , which need relatively large integration time, was improved in accuracy



4. Facing Problems -A

4.1. Precise measurement of X-ray beam axes during user operation

Measured data by **XBPM** have gap and phase dependences

Measured data by **rfBPM** up- and downstream of ID have at least gap, stored current, and filling dependences

 **These prevent “hard correction”**

4. Facing Problems -A (Con't)

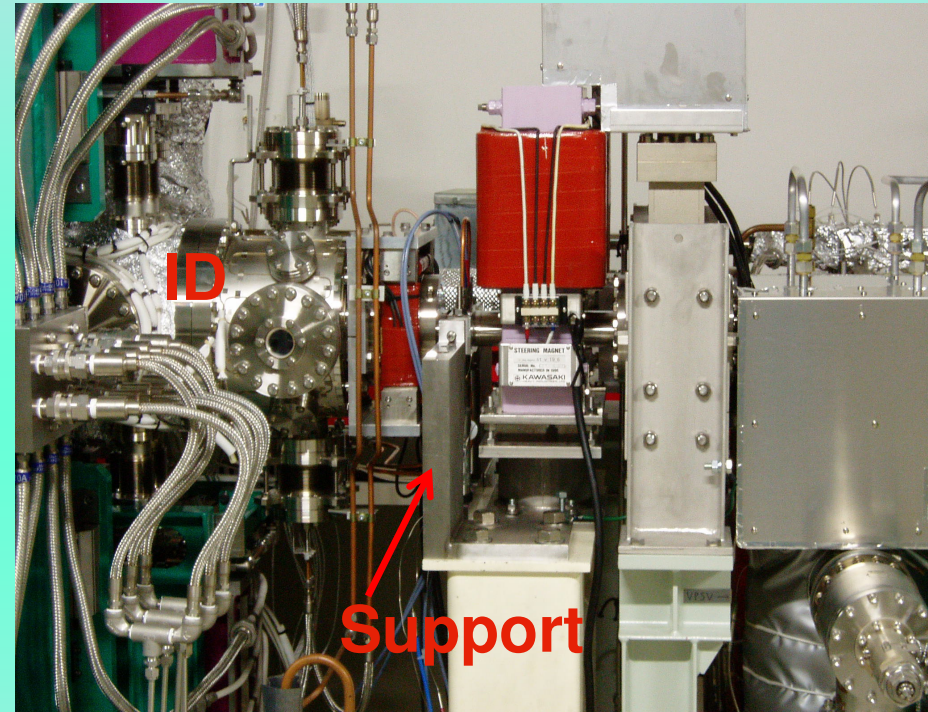
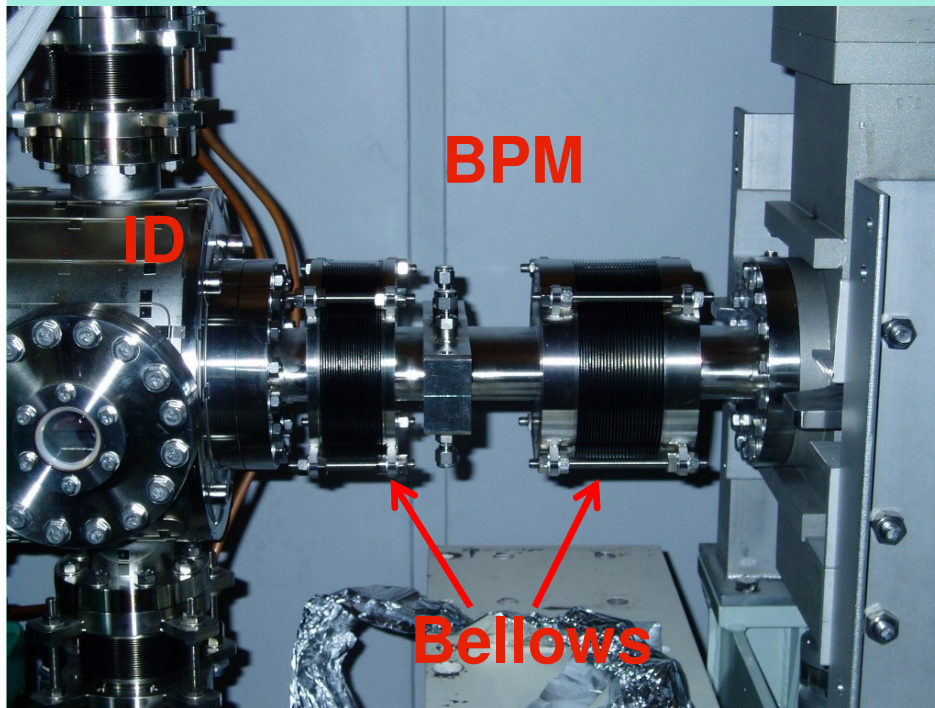
Counter-measures:

New BPM chamber with bellows and cooling channels

Improvement of BPM support rigidity

Introduction of narrow path-band filters to electric circuit (under investigation)

4. Facing Problems -A (Con't)



Beam test for global + local correction
will start in **next year**

4. Facing Problems -B

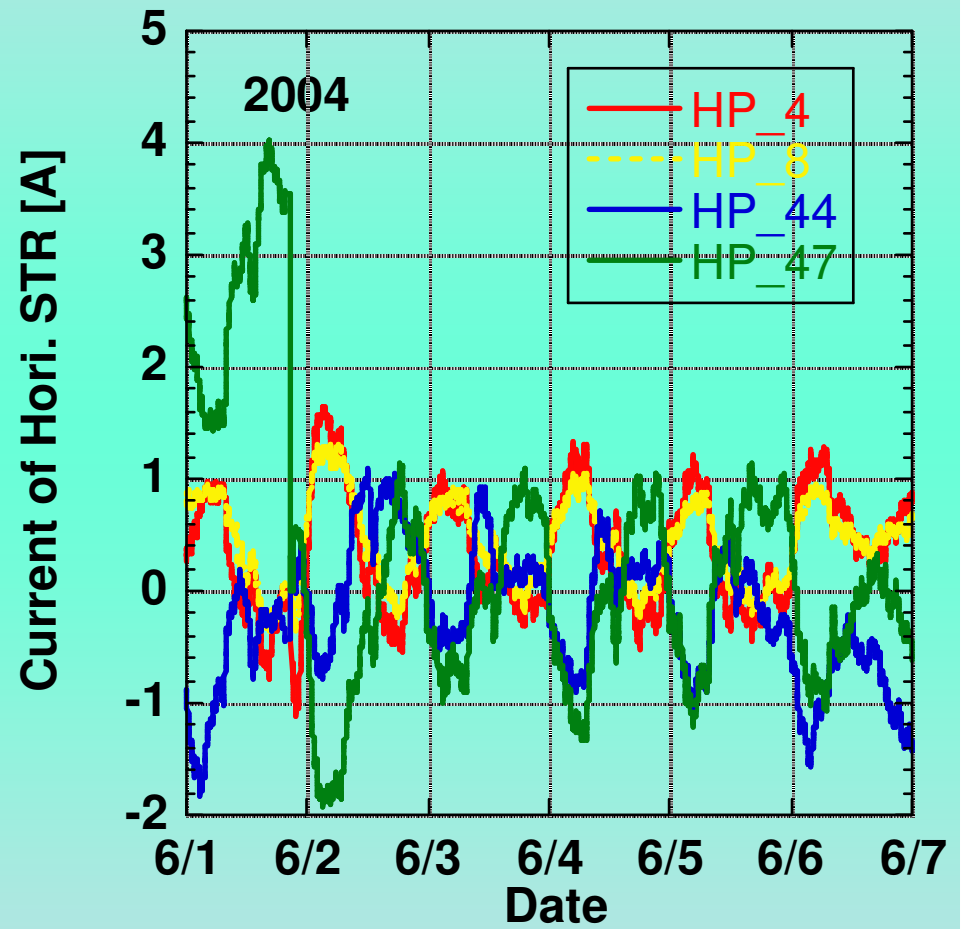
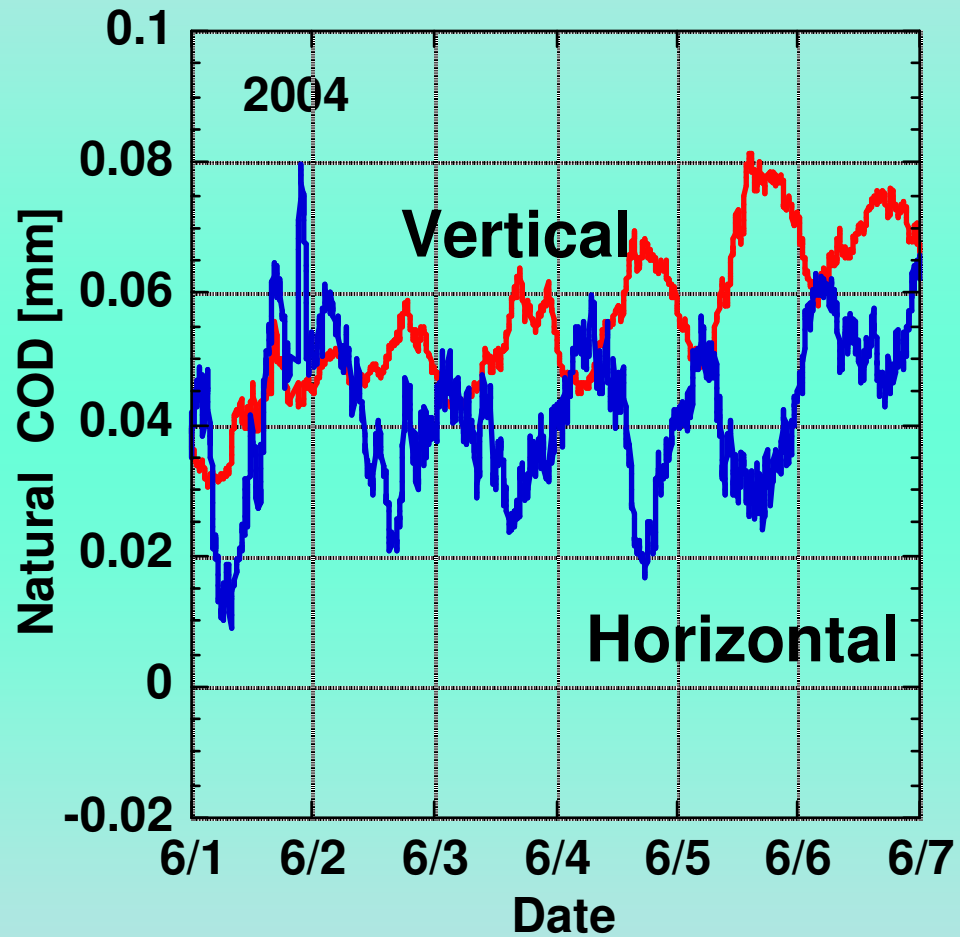
4.2. Clear one-day (periodic) orbit slow variation

**After introducing top-up operation,
clear one day orbit variation appears**

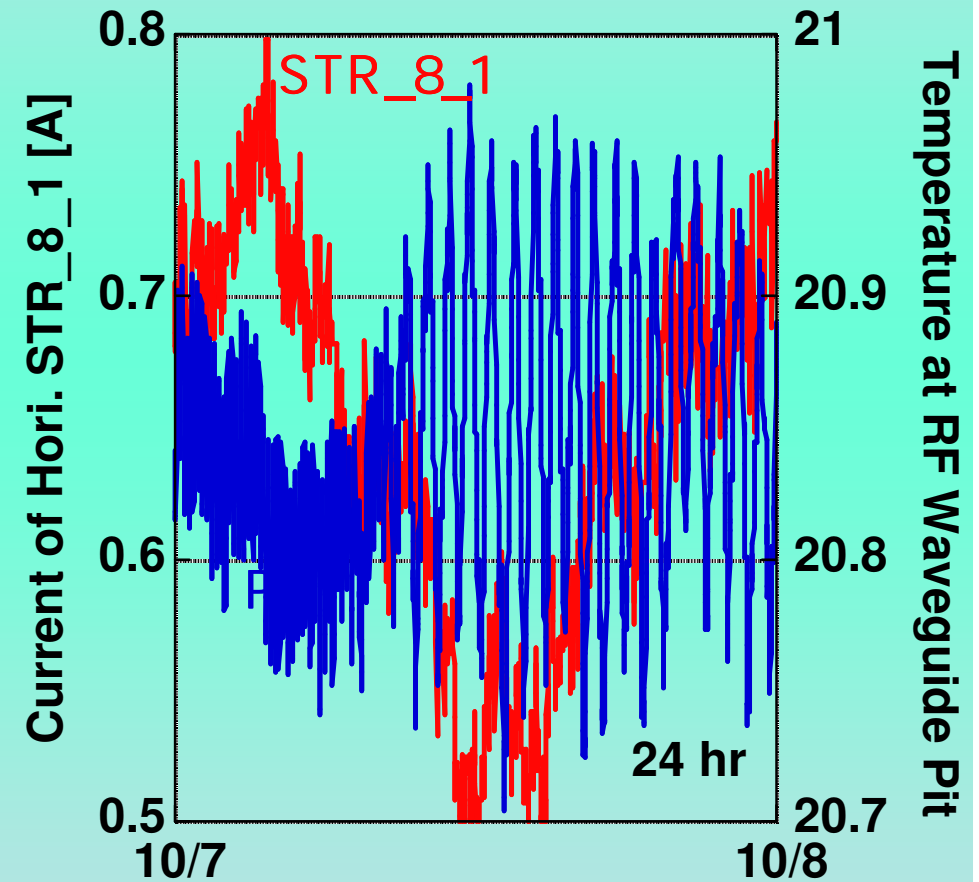
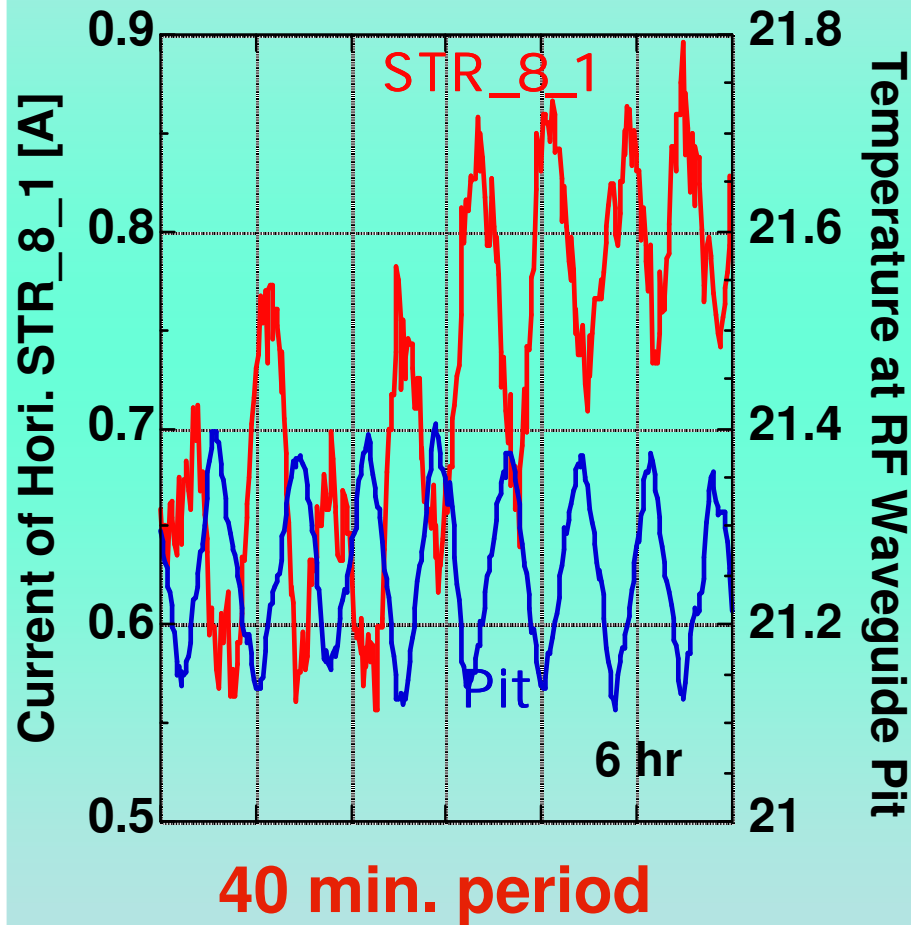
Season-dependence

Strange correlation between STs

4. Facing Problems -B (Con't)



4. Facing Problems -B (Con't)



4. Facing Problems -B (Con't)

We have been trying to find out these perturbation sources and mechanism of this orbit variation

We hope to report the complete story in next IWBS

4. Facing Problems -C

Q: Is fast orbit feedback (FOFB) necessary at SPring-8 or not ?

A: Although the answer depends on the mode in higher frequency regime, SOFB seems to meet the condition rather than FOFB

5. Summary

By introducing top-up operation, slow orbit drift was reduced to some extent

To request for further slow orbit stability, the local feedback loop will be provided BL by BL

We will be continue source-hunting to reduce the fast orbit variation lower than 200Hz without FOFB