

Scheme for Precise Correction of Orbit Variation Caused by Dipole Error-Field of Insertion Device

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1. Background

- **Correction and source suppression, both are crucial towards the ultimate stability**
- **Presently, the number and variety of IDs are being increased in a SR source**
- **ID error-field is thus one of the most serious perturbation sources for the orbit stability**

2. Motivation

A limiting factor for the precise correction is noise in measured orbit data

➔ A new idea to extract a signal precisely




2004/12/13

Can you find out gold dust
in the sand of a river bottom

3. New Approach

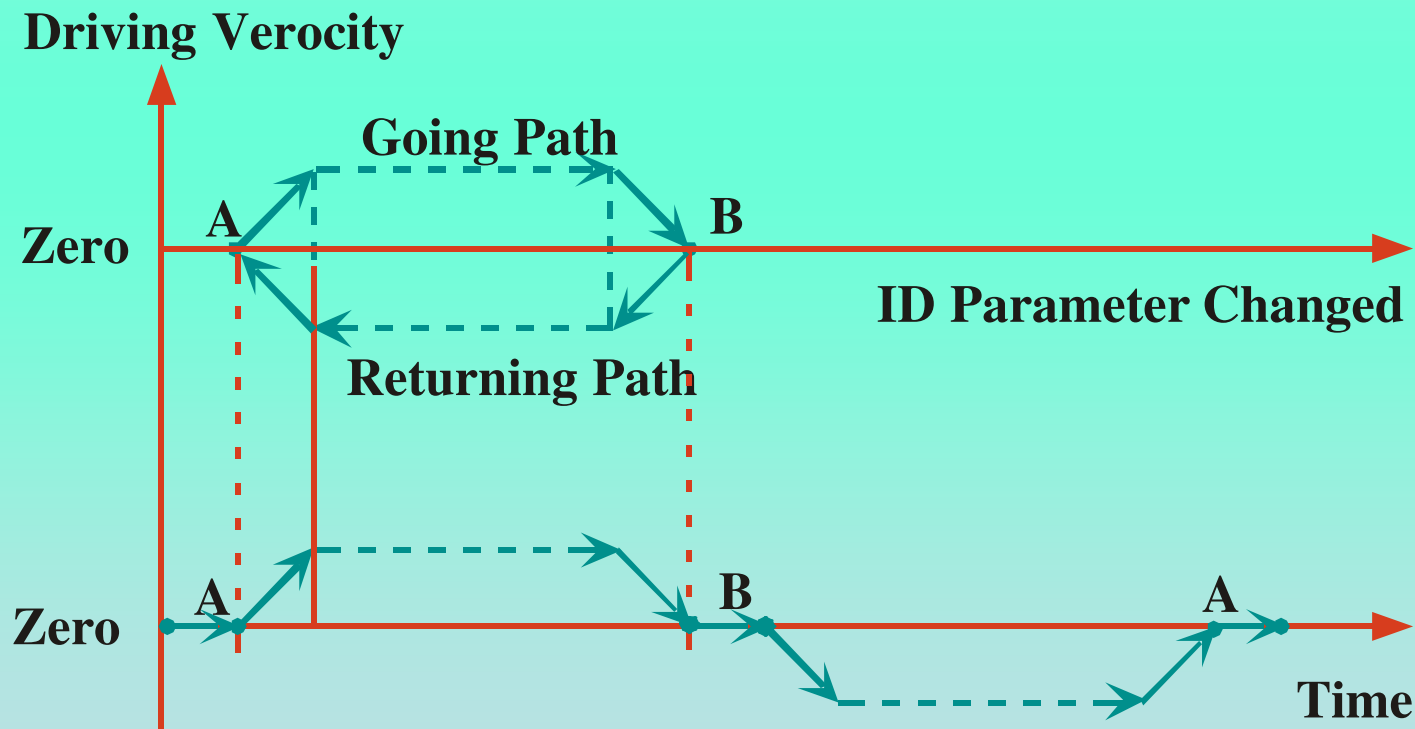
The new approach is based on “**signal modulation with a mirror symmetric driving pattern**”

Signal modulation by periodical “gap” or “phase” change of target ID

 **S/N improvement by averaging and filtering procedures**

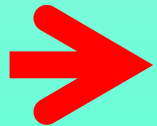
3. New Approach (Con't)

By folding the data against a symmetry point, two effects by static and dynamic error fields are separately extracted



3. New Approach (Con't)

The separation of two effects by static and dynamic error fields



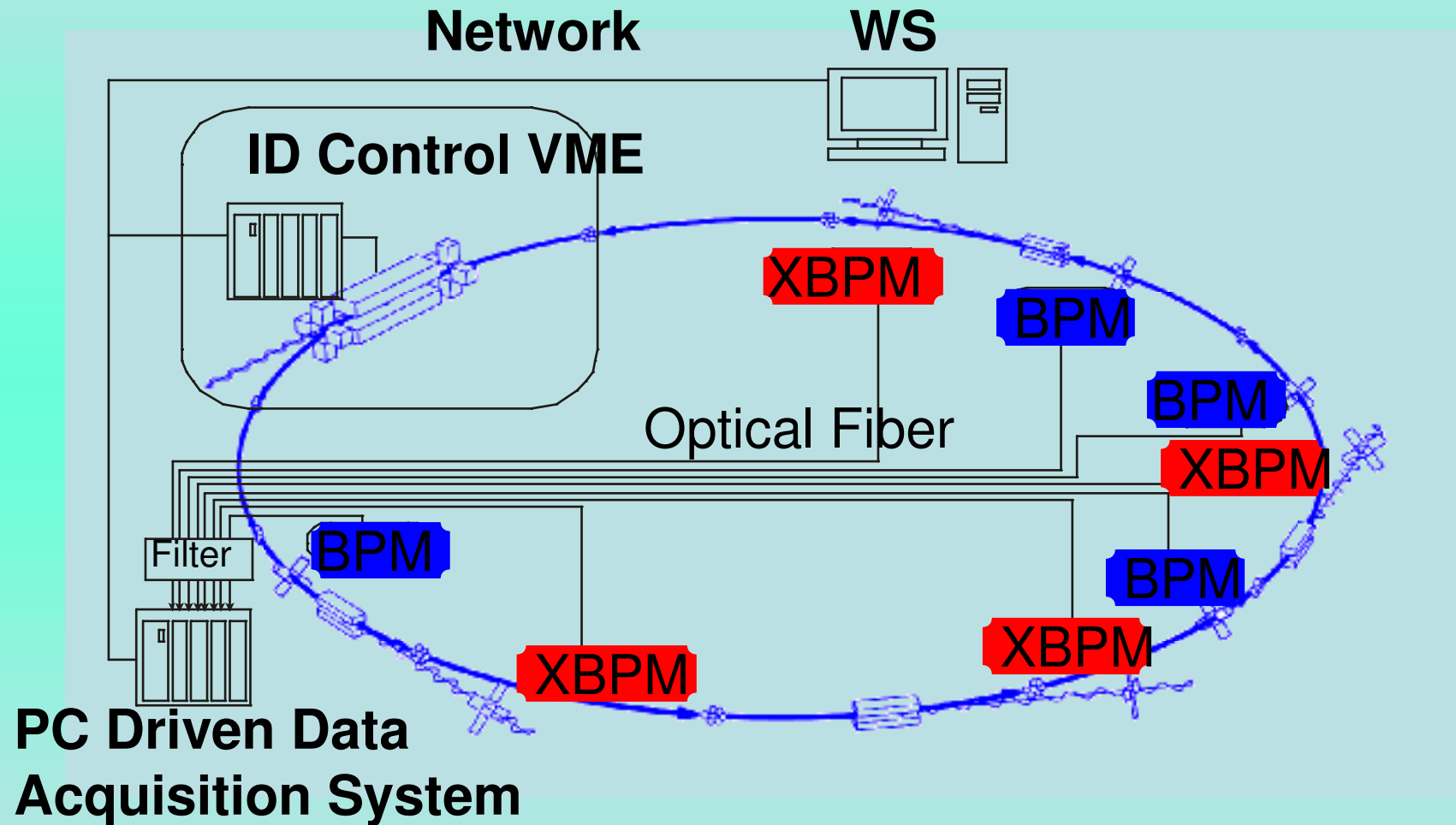
correction for a certain driving pattern
adjustable for any patterns by **only scaling** a part of correction table, the data for dynamic error correction

4. Experimental set-up

ID specification to be tested

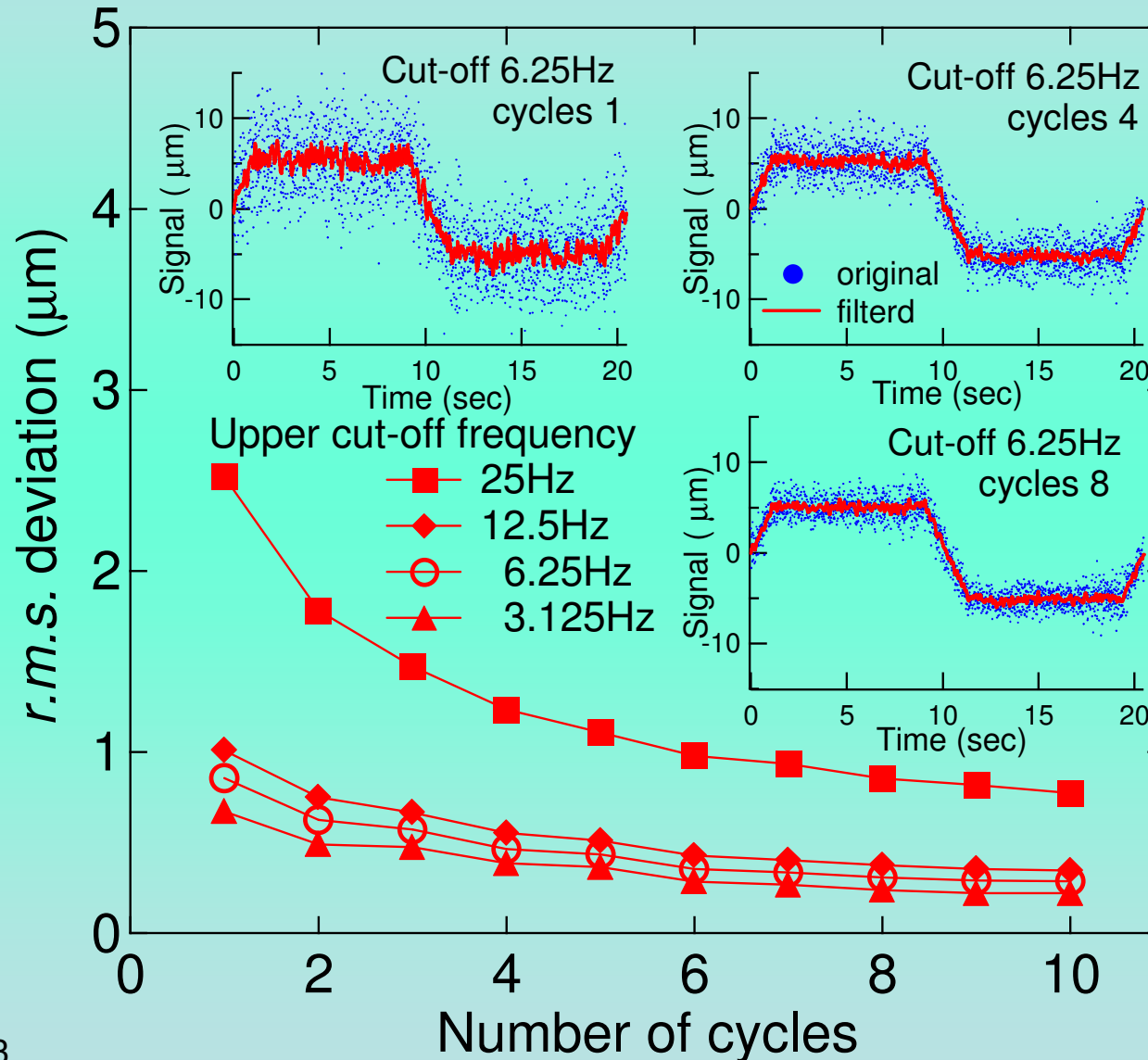
- **Type: Apple II type undulator ID23**
- **Maximum phase driving speed: 0.1 Hz**
- **Driving pattern: Trapezoidal**
- **Period length: 120 mm**
- **Maximum phase driving range: 240 mm**
- **Minimum ID gap: 25 mm**
- **Made in JAERI (not Kitamura Gr.)**

4. Experimental set-up (Con't)

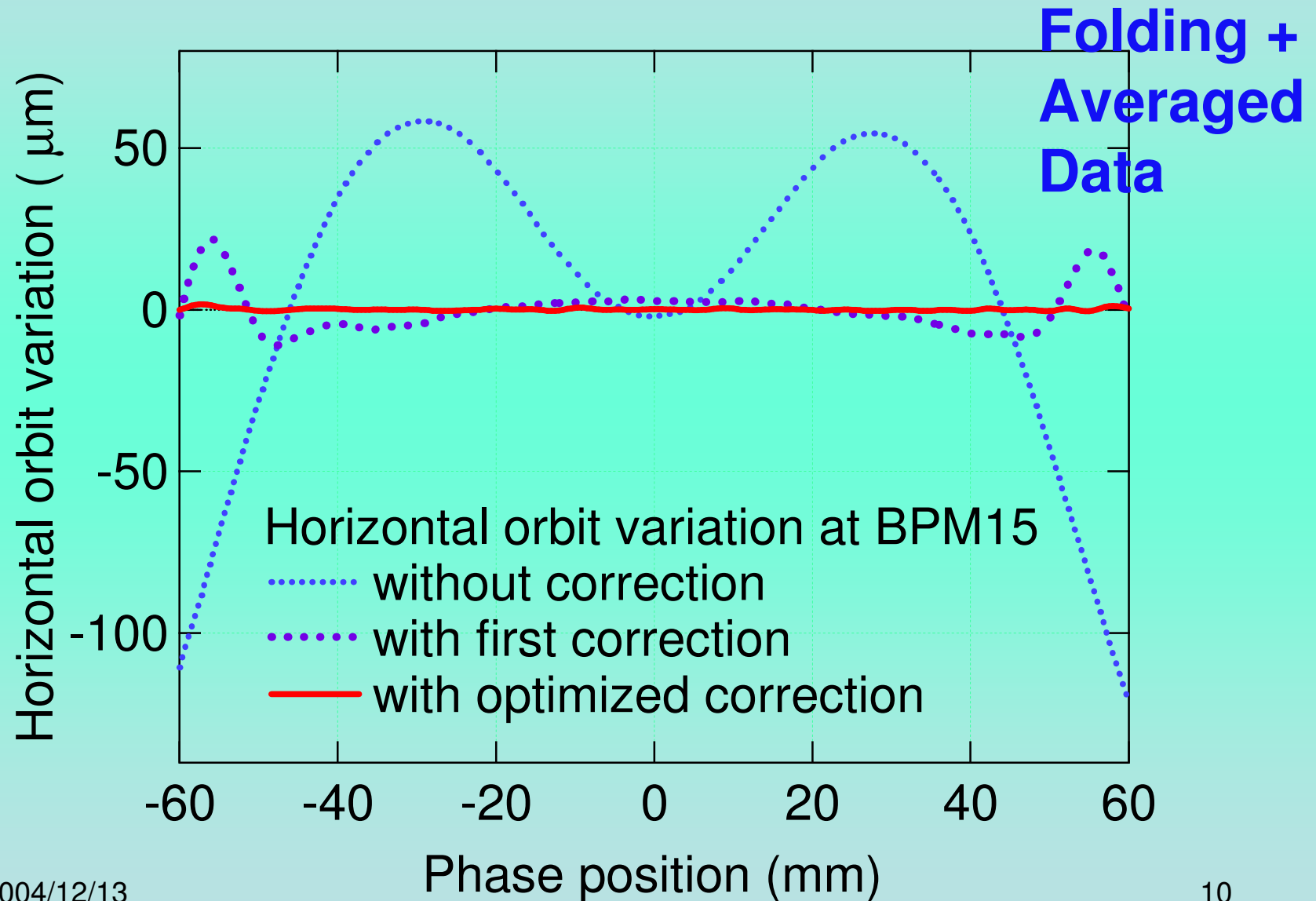


5.1. S/N Improvement

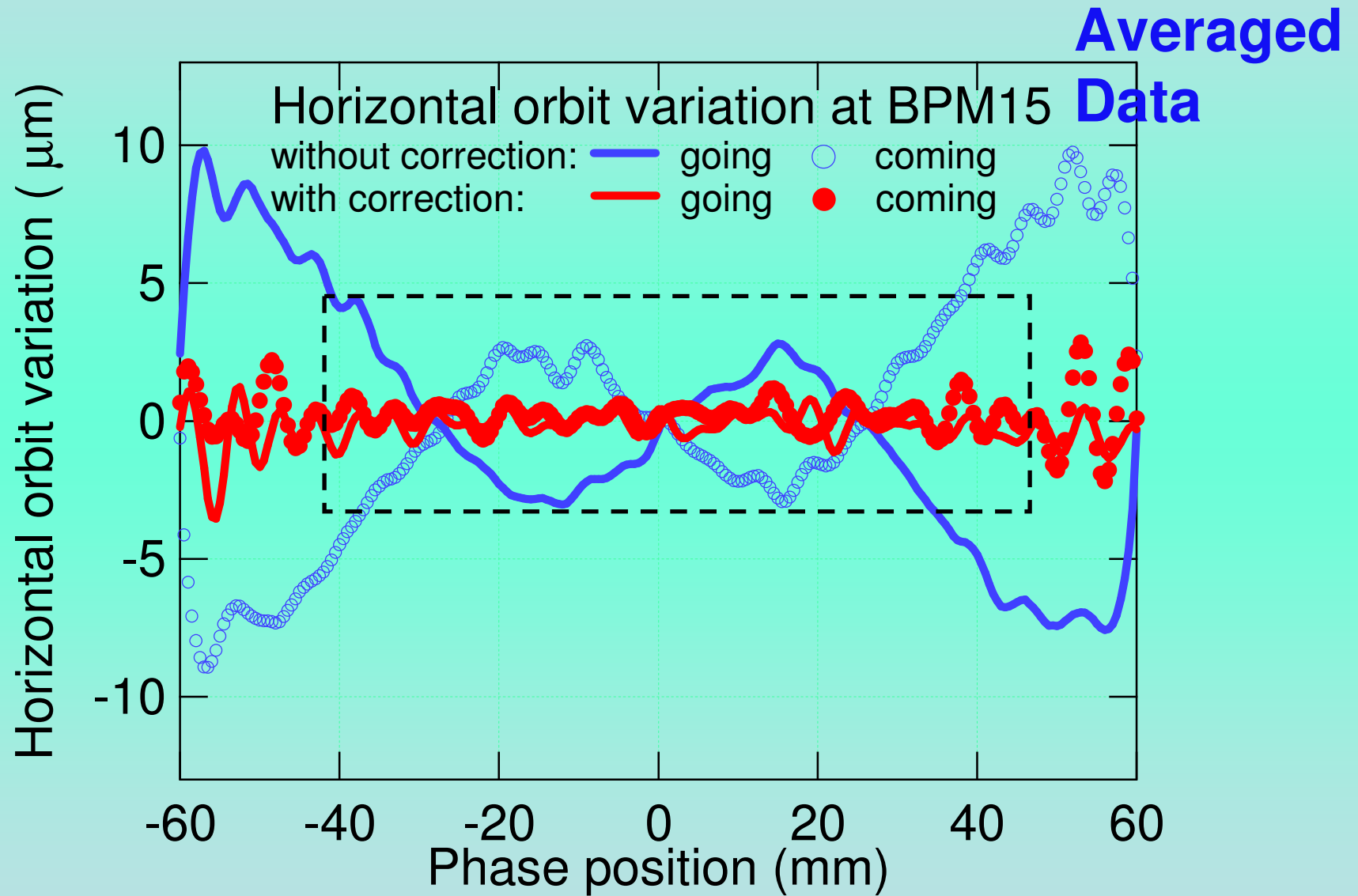
Test
Data



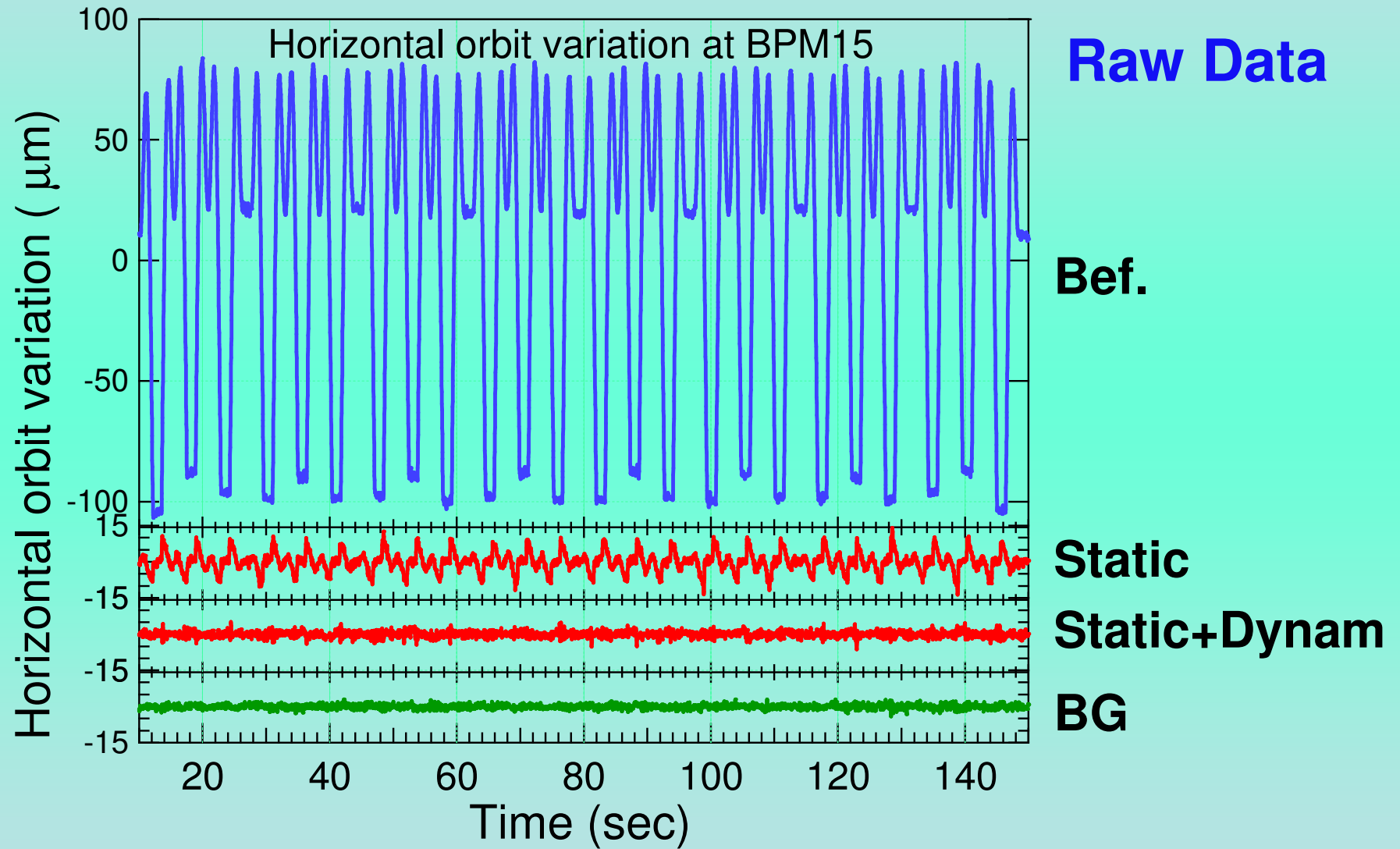
5.2. Correction of Static Error-Field



5.3. Correction of Dynamic Error-Field

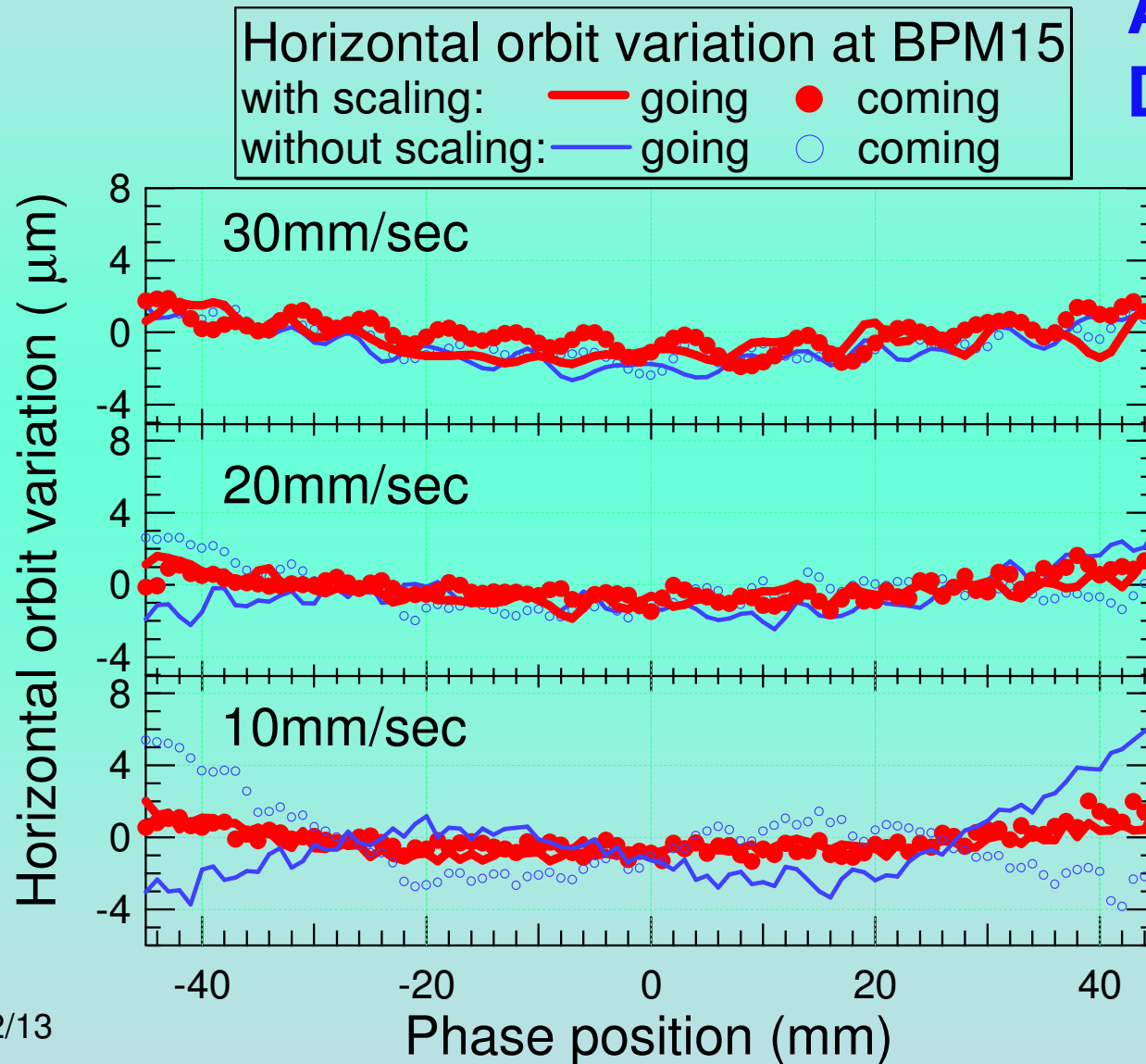


5.4. Correction Performance



5.5. Application to Different Patterns

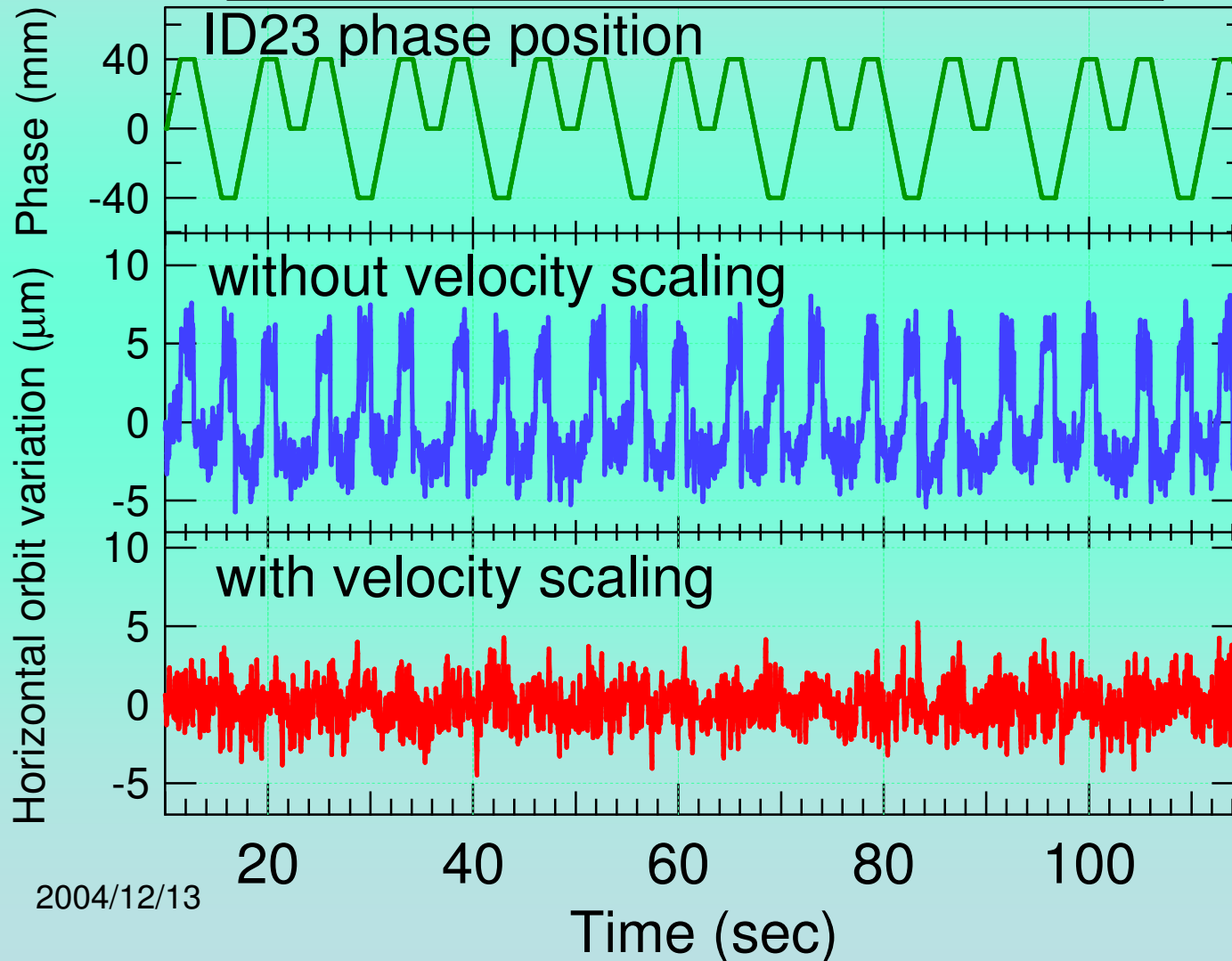
Averaged
Data



5.5. Application to Different Patterns (Con't)

Horizontal orbital variation at BPM15

Raw Data



6. Summary

- **The new scheme suppresses the ID inducing COD down to the sub-micron level**
- **The correction data once obtained can be applied to the correction for different driving patterns by only scaling the correction data for the dynamic error-field, keeping the correction performance**