ID X-ray BPM Feedback/ Feedforward and Implications for User Gap Control

G. Decker

- ID xbpm feedforward / feedback implementation status and plans

- Insertion device gap control algorithm

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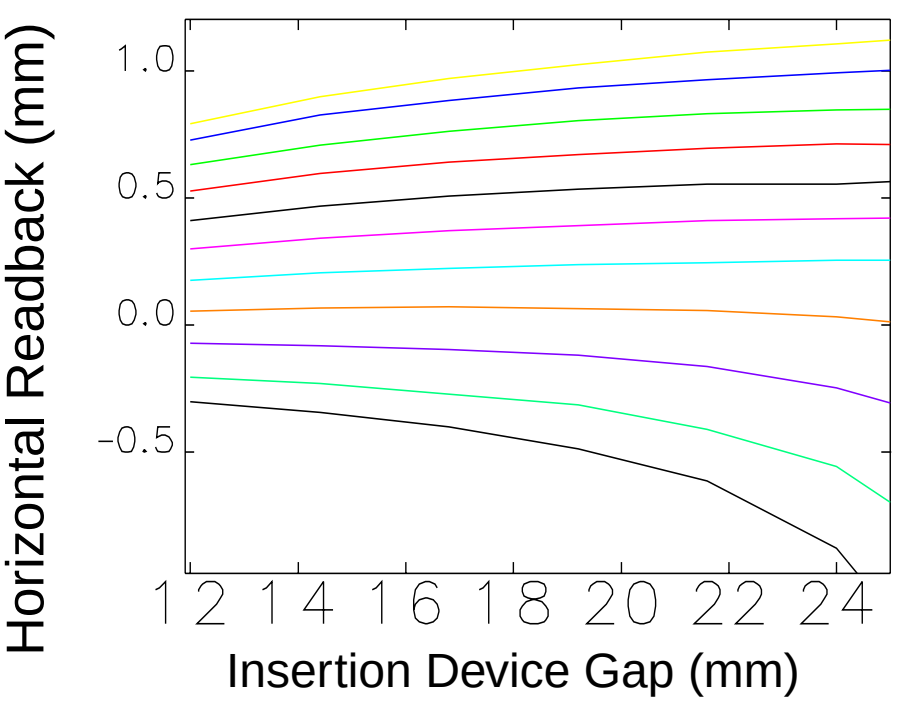
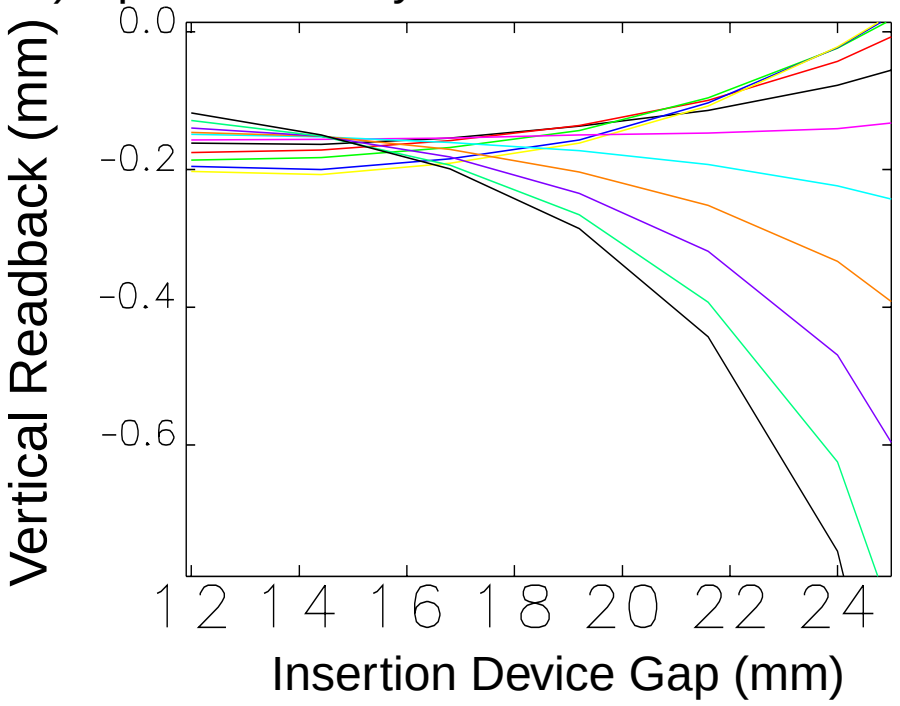
Insertion Device X-ray BPM Feedback / Feedforward Implementation Status

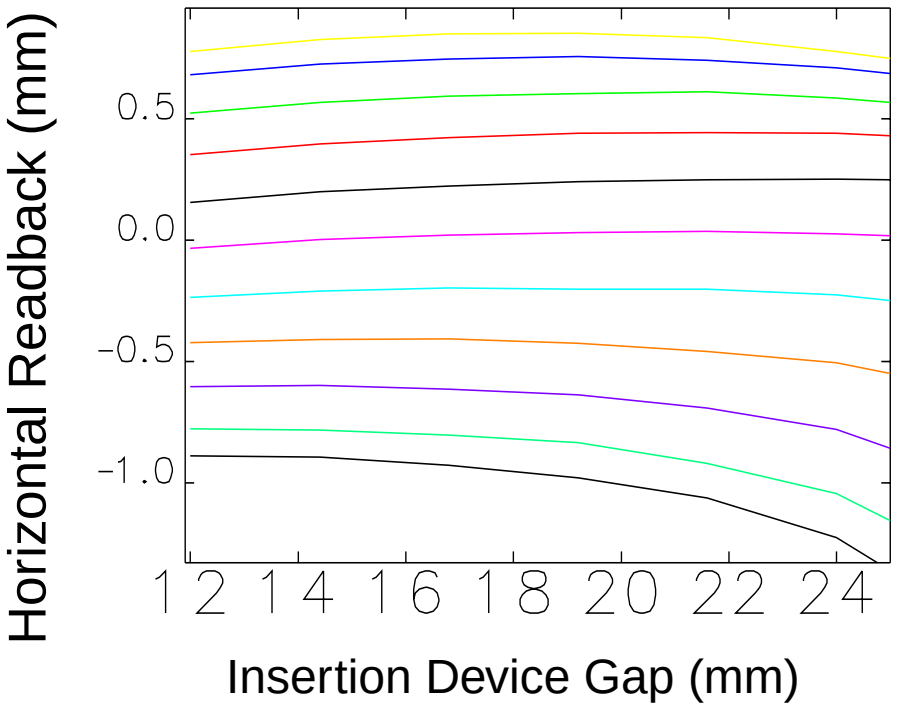
- X-ray beam position monitors in beamlines 5ID, 6ID, 18 ID, 22 ID, and 34 ID have been used off and on for DC orbit control, at 10 Hz, since July 16.
- A background feedforward process compensates for residual x-bpm gap-dependent systematic errors.
- The orbit correction algorithm stops if the insertion device gap is too large.
  - Signal / noise ratio < 1 past about 30 mm gap (approx. 13 keV)

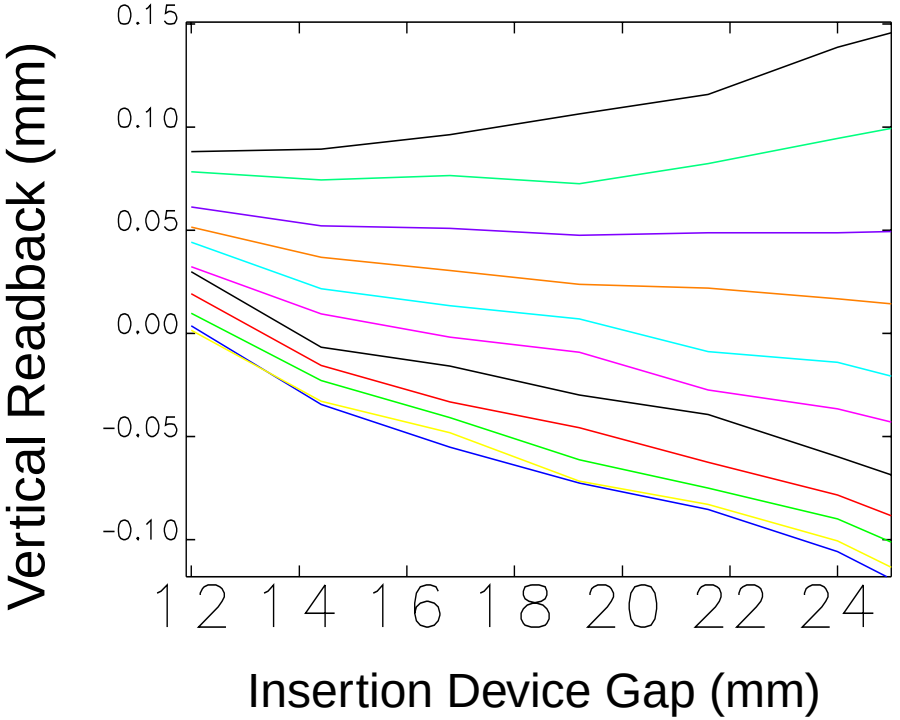
Unmodified Sector (1-ID) Upstream X-ray BPM



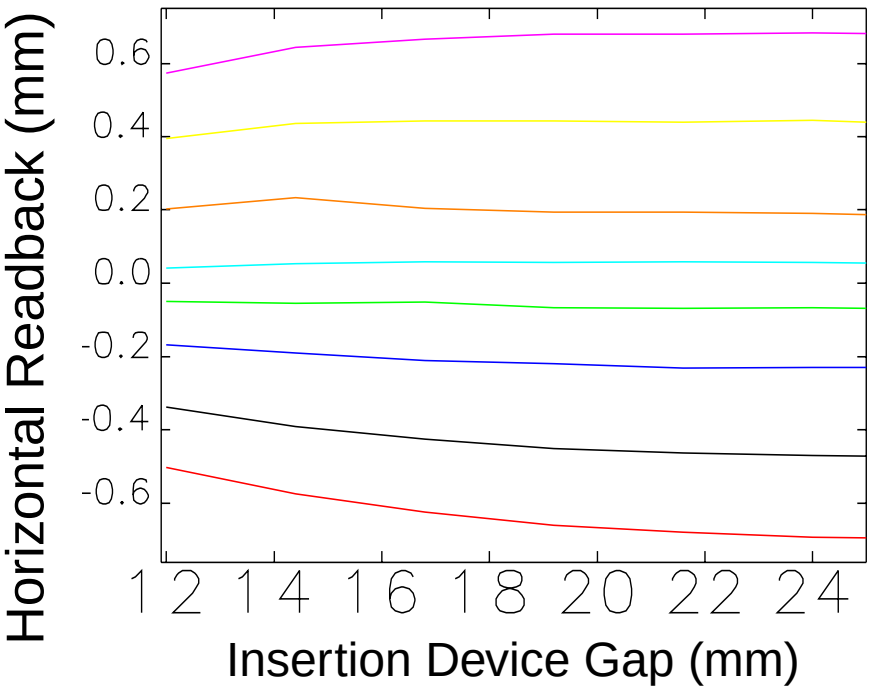


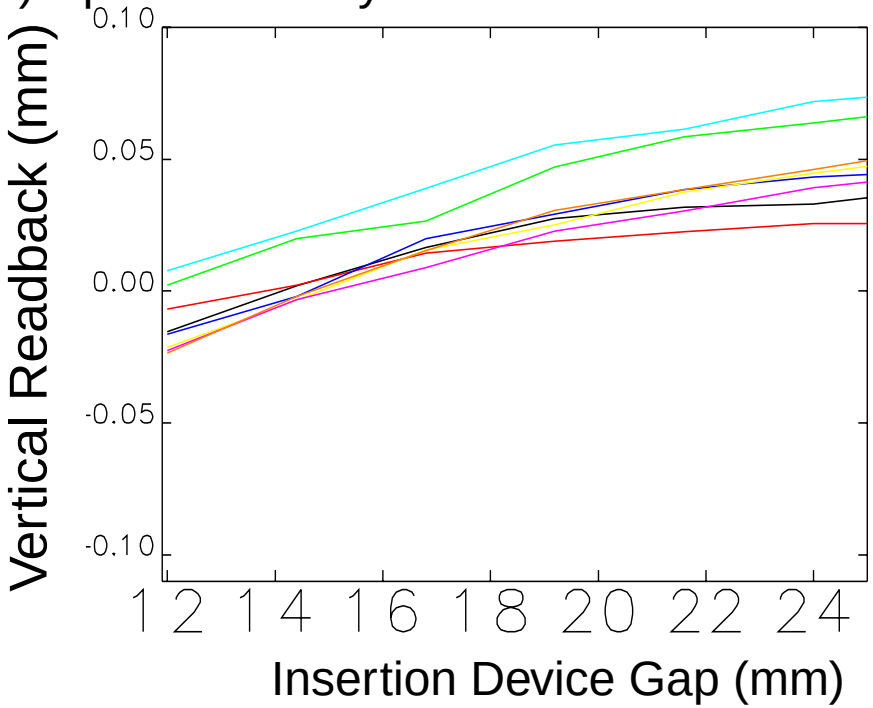
Unmodified Sector (1-ID) Downstream X-ray BPM



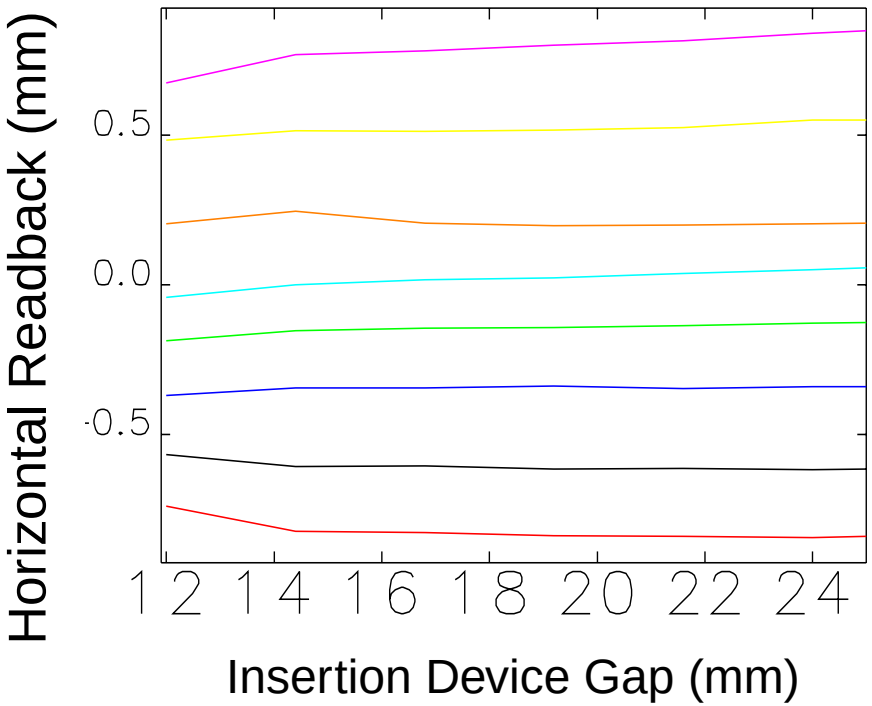


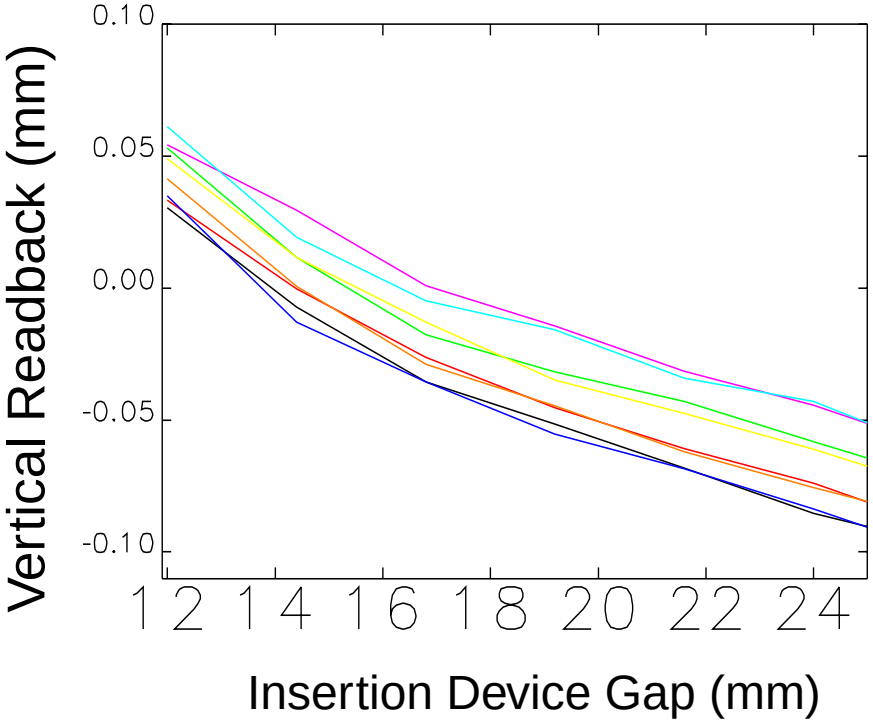
Modified Sector (34-ID) Upstream X-ray BPM



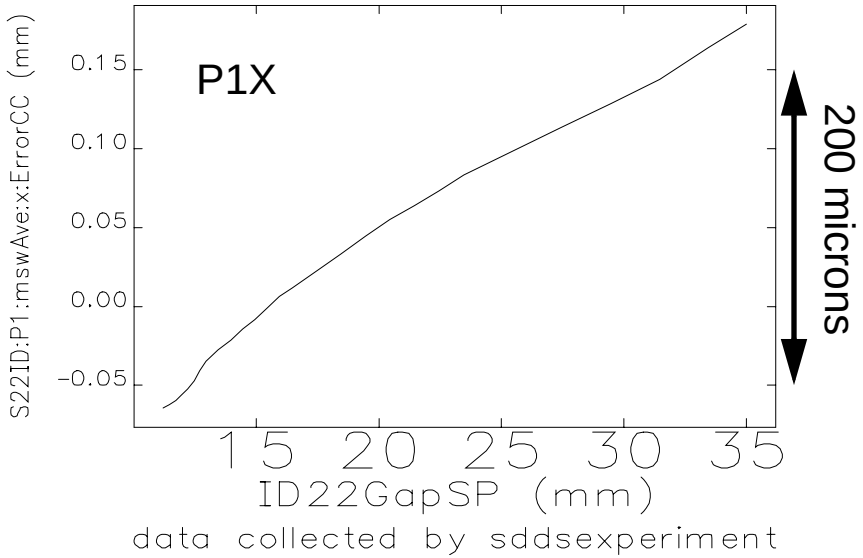


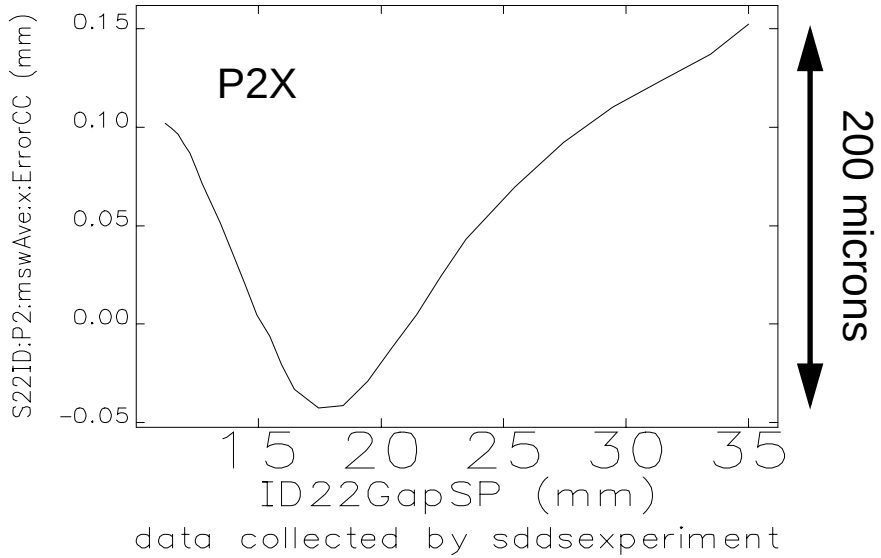
Modified Sector (34-ID) Downstream X-ray BPM

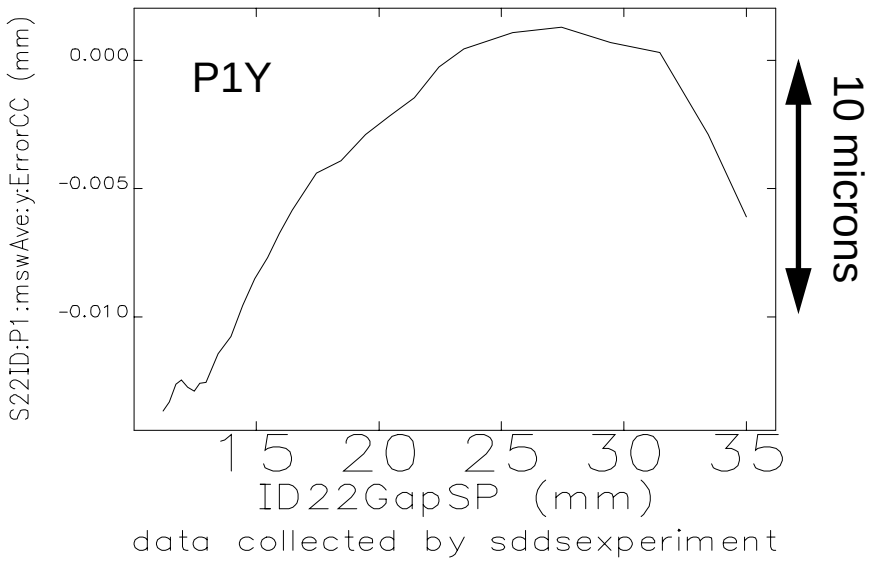


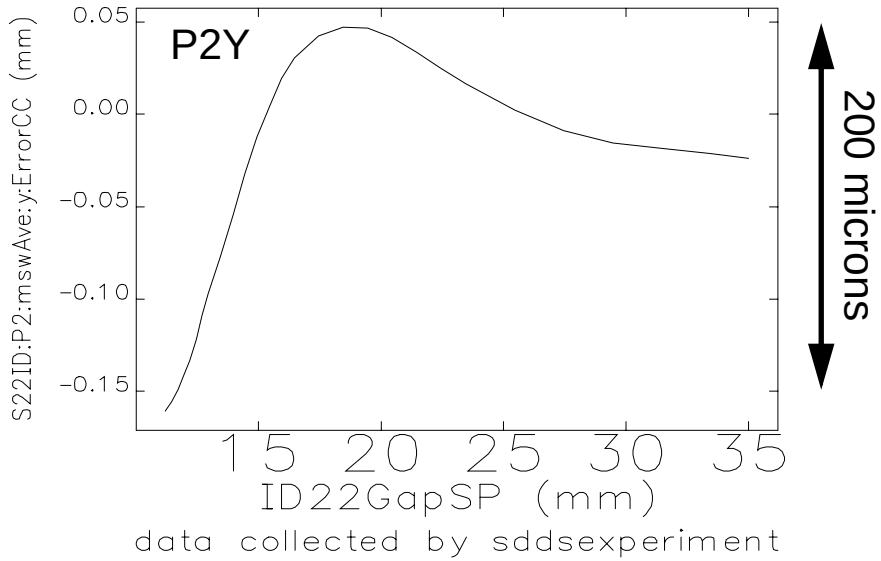


S22 ID Gap Scan, Closed Loop using RF bpm's









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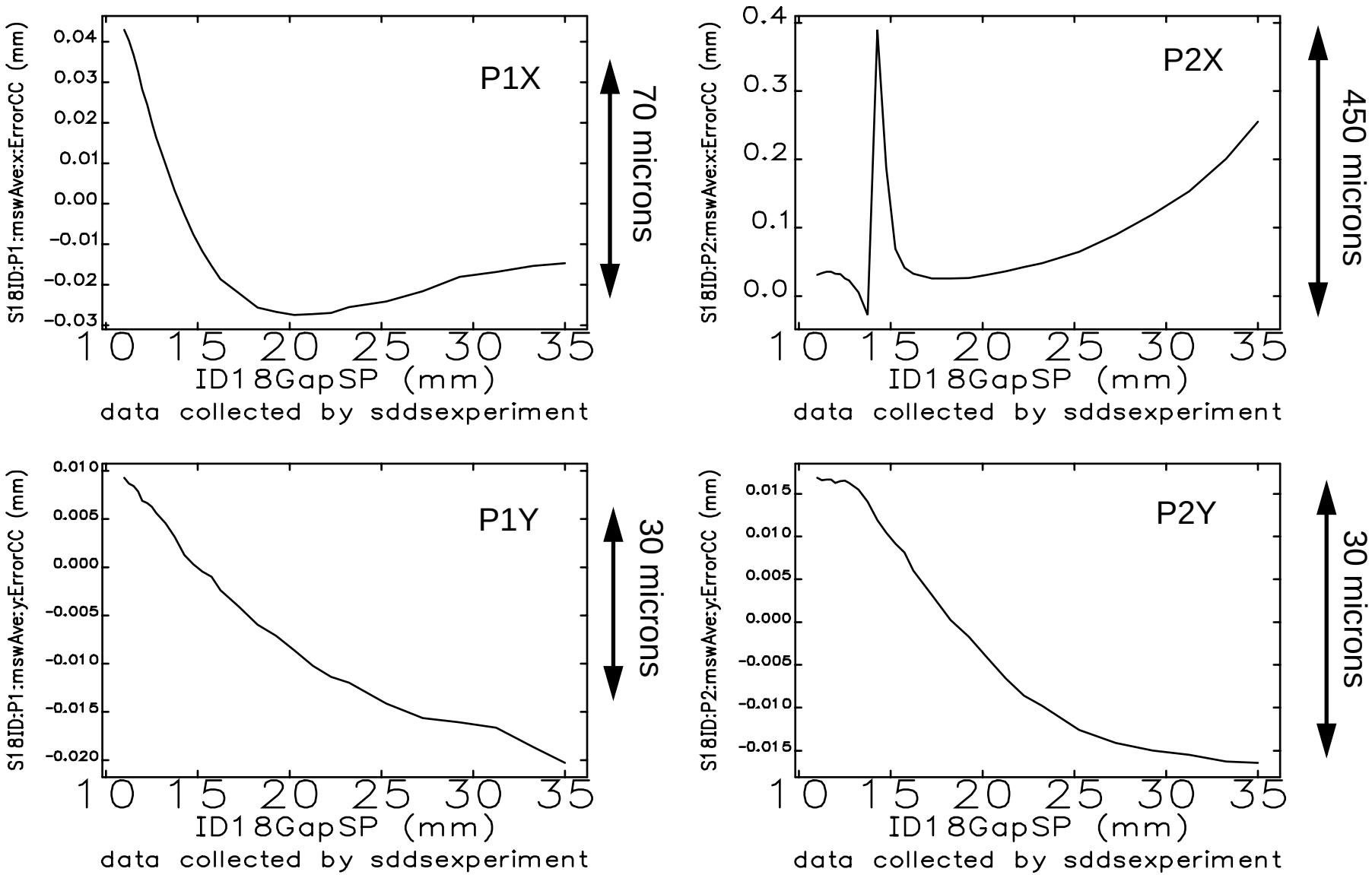
August 21, 2003

S18 ID Gap Scan, Closed Loop using RF bpm's



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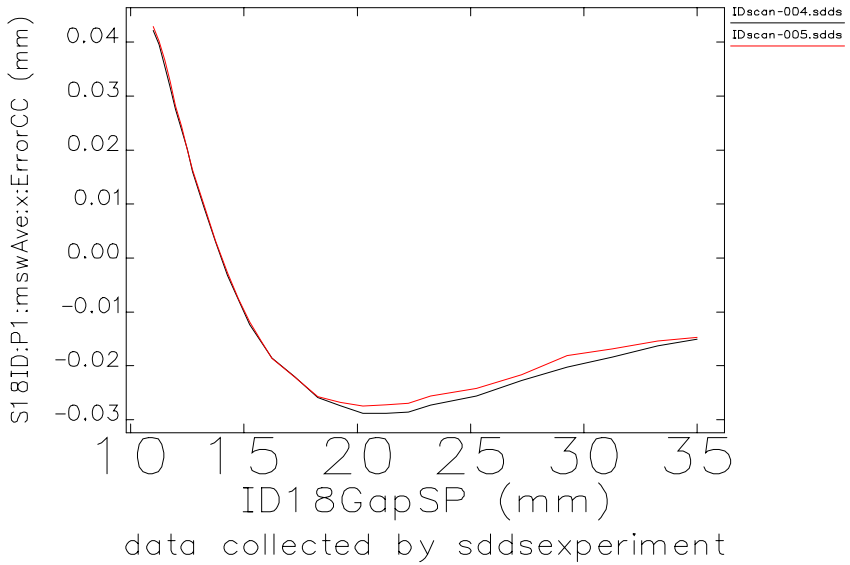
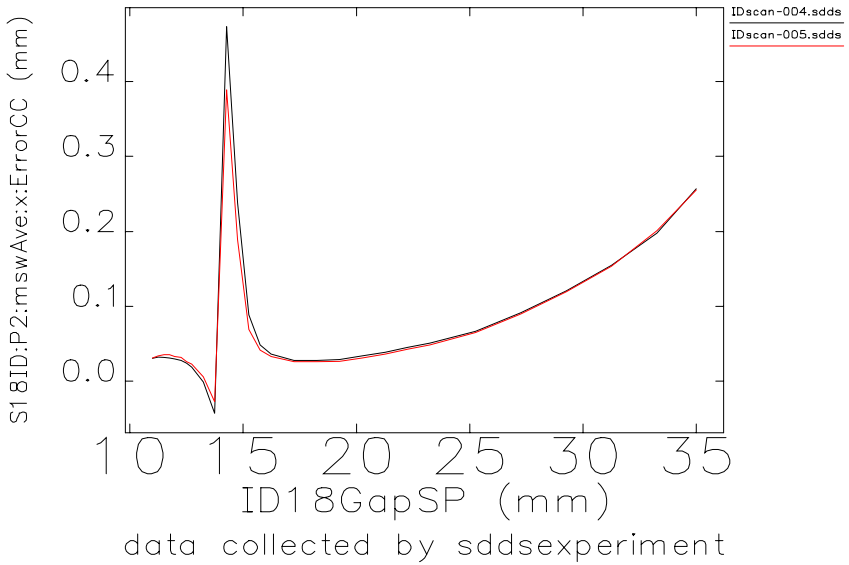
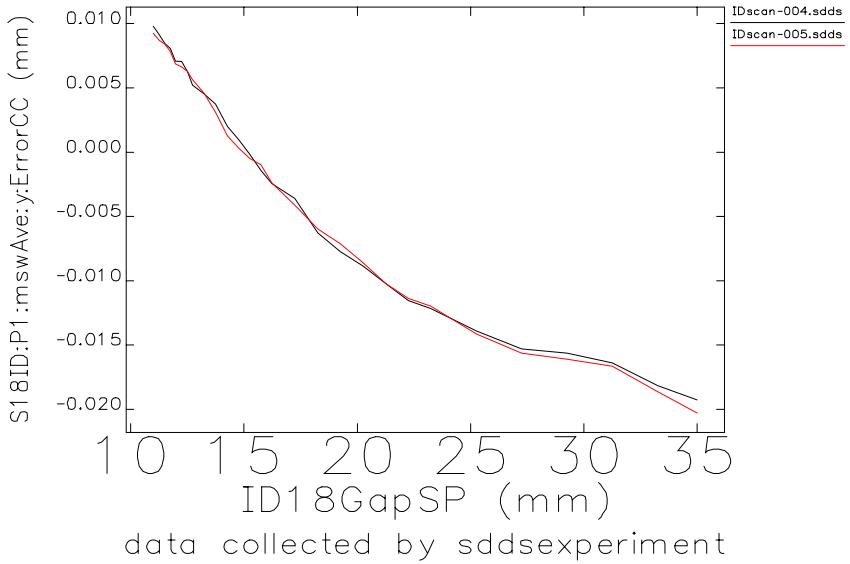
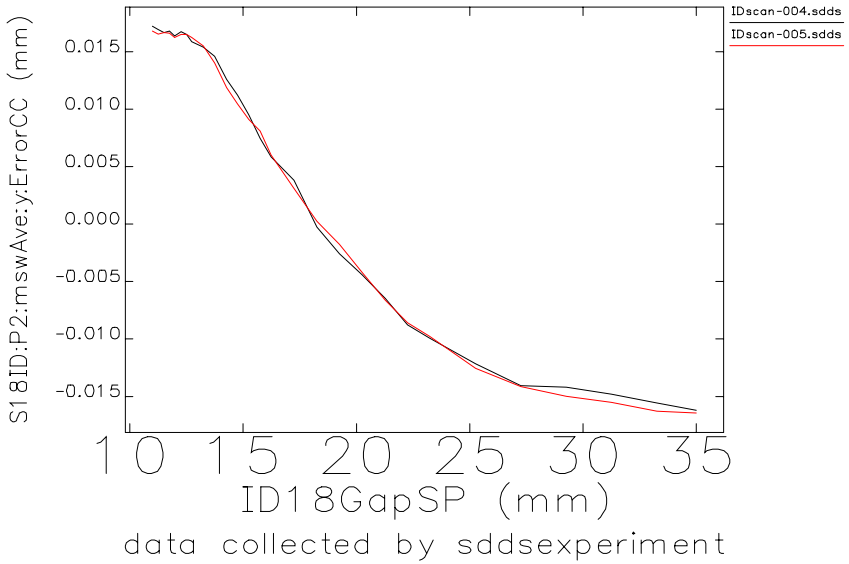
Gap Scan Repeatability, 18ID









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Insertion Device Gap Control

Use of insertion device x-ray beam position monitors for orbit control

Gaps are opened in several cases:

1. Beam is lost: all gaps are opened by the beam dump script to minimize radiation damage to the insertion devices. In this case, the orbit control programs are suspended, no operator intervention is required.

2. If the front end PS2 shutter remains closed for > 2 hours the gap is “opened” by an automatic process running in the ioc, to minimize gas load on front end pumps. So long as the gap remains within the range of the lookup tables, no operator intervention is required. The present open gap setting of 60 mm is incompatible with proper ID x-bpm operation. 30 mm is a suggested “open gap” setting for this purpose.

3. If the device gap is kept fully open due to an equipment problem, the X-ray bpms for that sector need to be removed from the orbit correction configuration (by a physicist / engineer).
(Note: This will be automated for run 03-3)

4. In case a gap is manually opened beyond 35 mm for any reason. Operations will contact EFO to have it closed to the nominal 30 mm “open gap” setting.
(Note: I lied - what we really do is just remove this beamlines id xbpm’s from the algorithm, by hand. This will be automated in run 03-3)

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