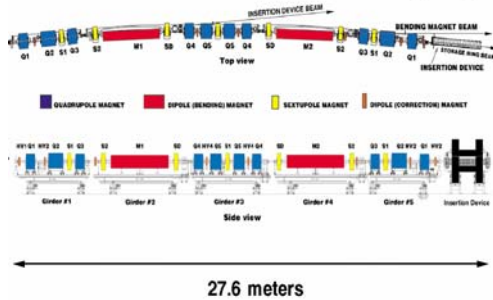


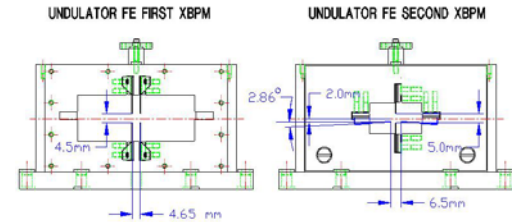
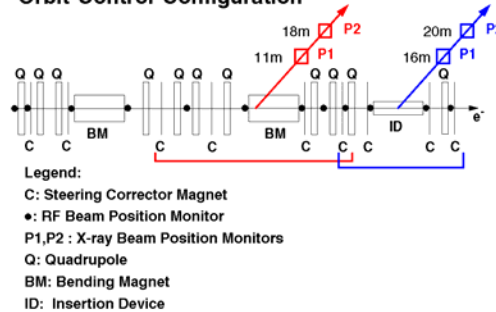
# Routine Achievement of 200 Nanoradian RMS Pointing Stability of Insertion Device Beams using X-ray Beam Position Monitors - Glenn Decker, Om Singh - APS Operations Division

Abstract - Since APS routine operation began c. 1996, the storage ring orbit correction systems have incrementally evolved to their present configuration. Most recently, insertion device x-ray beam position monitors (x-bpm's) located in the beamline front ends have been incorporated into the DC global orbit correction algorithm, operated at a 10 Hz update rate. This has given the benefit of improving the DC pointing stability over a 48 hour period by up to a factor of 10, to below 200 nrad rms. This effort required considerable effort, performed in conjunction with other major upgrades, specifically the addition of 42 bending magnet x-bpm's, 62 narrowband rf bpm's (both types with all new associated data acquisition), and a timing system upgrade for the original monopulse rf bpm's. As a result, the APS is well-positioned to achieve routine 200 nrad rms pointing stability at insertion device source points over time periods up to 48 hours. The different elements describing how this is

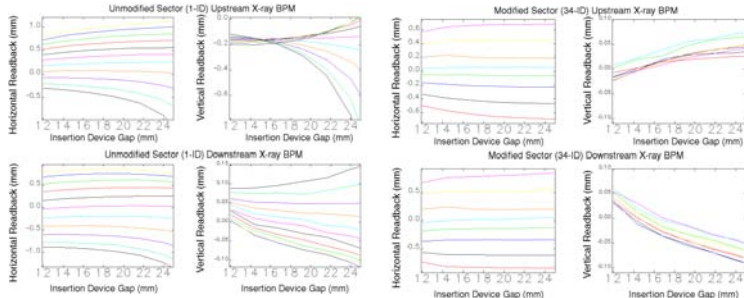
## One Sector of the Advanced Photon Source Storage Ring



## Orbit Control Configuration



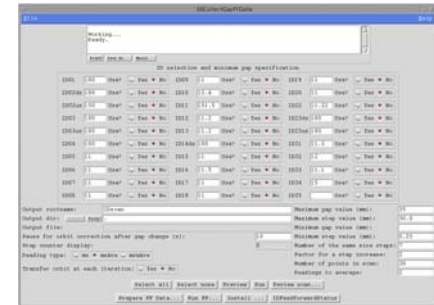
## Reduction of Insertion Device X-ray Beam Position Monitor Gap - Dependent Systematic Errors Arising from Stray Radiation



G. Decker, O. Singh "A Method for Reducing X-ray Background Signals from Insertion Device X-ray Beam Position Monitors," Phys. Rev. ST Accel. Beams 2 (1999)

Procedure allowing inclusion of ID X-bpm's in orbit correction algorithm

- 1) With orbit held fixed using standard orbit correction configuration (without ID X-bpm's), as many as 27 insertion device gaps are simultaneously scanned, noting the position readbacks of associated x-ray bpm's
- 2) The resulting data is fit to a smooth curve using a Savitsky-Golay algorithm, resulting in a set of lookup tables.
- 3) During machine operation, a feedforward algorithm applies offset corrections derived from the lookup tables when any insertion device gaps are changed.



High-level application for generation of lookup tables. Used for collection of x-bpm vs. gap data, curve fitting, and feedforward implementation

