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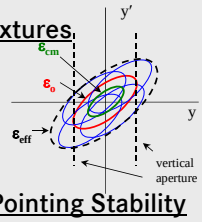
Introducing Fast Orbit Feedback (FOFB) at BESSY.

THP059

Quality of Experimental Conditions ...

Suffer from Perturbation Mixtures

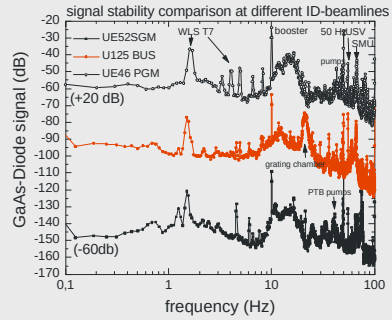
- Vibration Effects
- Heat Load Dynamics
- Electron Beam Stability
- Transients



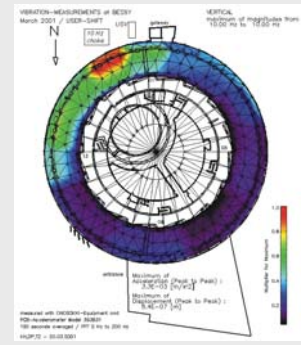
Depend on Beam Position/Pointing Stability

- Control Precision (μm, μrad)
- Frequency (Data Point, Scan, Shift)
- Reproducibility (Beam Time)

K.Holldack



Noise Sources Accelerator vs. Beamline



Base Approach [1,2]

Eliminate Perturbation Sources

- Detection and Suppression
- Local Compensation
- Accelerator Refinements
- Beam line Improvements

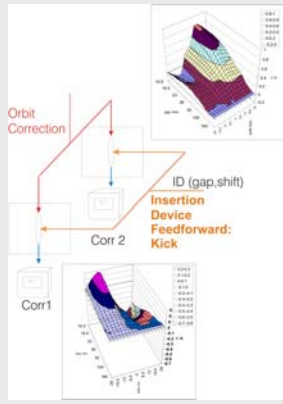
Precise Orbit Drift Control

- Now: ~1μm RMS / fill
- Now: 0.2 μm RMS fill to fill
- Now: Localized, const. Energy

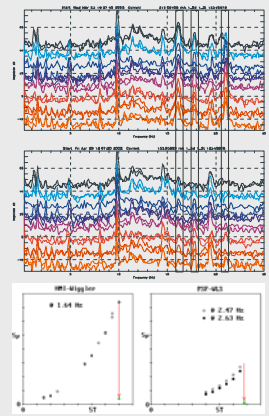
Add. FOFB Goals

- Suppression of Broad-Band Noise
- Compensation of Transients
- Increased Operational Headroom

Additional Tool: Enhance Contrast, Signal/Noise ...

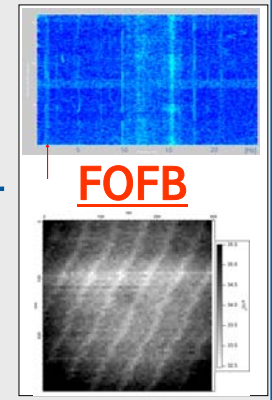


Systematic Compensation: *Feed-forward of ID-Kicks*



Hunting Noise Sources: *Pilot FOBF/ Cryostat Modification Equivalent*

+



Fighting Residuals: *New + Demanding Fast Experiments (STXM)*

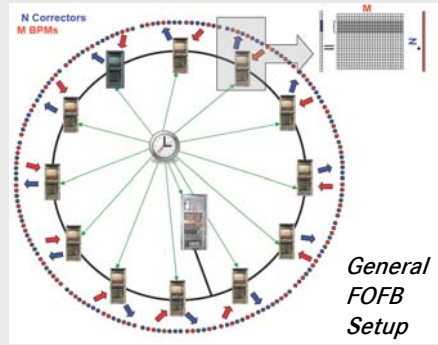
FOFB Status by Components

Fast BPM Data Aquisition: Existent

- 10 kHz Sample Rate
- FFT Diagnostic Use: 0.5 – 200Hz

Fast Data Distribution: to be completed

- UDP Multicast on Network: < 5ms
- Reflective Memory: Purchase in Progress



General FOFB Setup

Fast Powersupplies: 8/112 Installed

- Digital I/O modified, tested
- Tranfer function Magnet/ Vacuum pipe measured: < 200Hz

Optimized Algorithms: to be tuned

- SVD well established
- Closed Loop Test/ verification pending

Expected Performance

- Significant Damping of Orbit Perturbations up to 50Hz
- 1st Generation FOFB System (ALS, SLS ...) @ Moderate Cost
- Upgrade Path to modern 2nd Generation FOFB System (Diamond, Soleil, NSLS II ...) open

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[1] Orbit Stability at BESSY, J. Feikes, K. Holldack, P. Kuske, R. Müller Proc. of the Particle Accelerator Conference 2005, Knoxville, USA (2005)

[2] Orbit Stability in the 'Low Alpha' Optics of the BESSY Light Source, J. Feikes, P. Kuske, R. Müller, G. Wüstefeld Proc. of the 10th Eur. Particle Accelerator Conference 2006, Edinburgh, UK (2006)

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