10Hz Orbit Feedback

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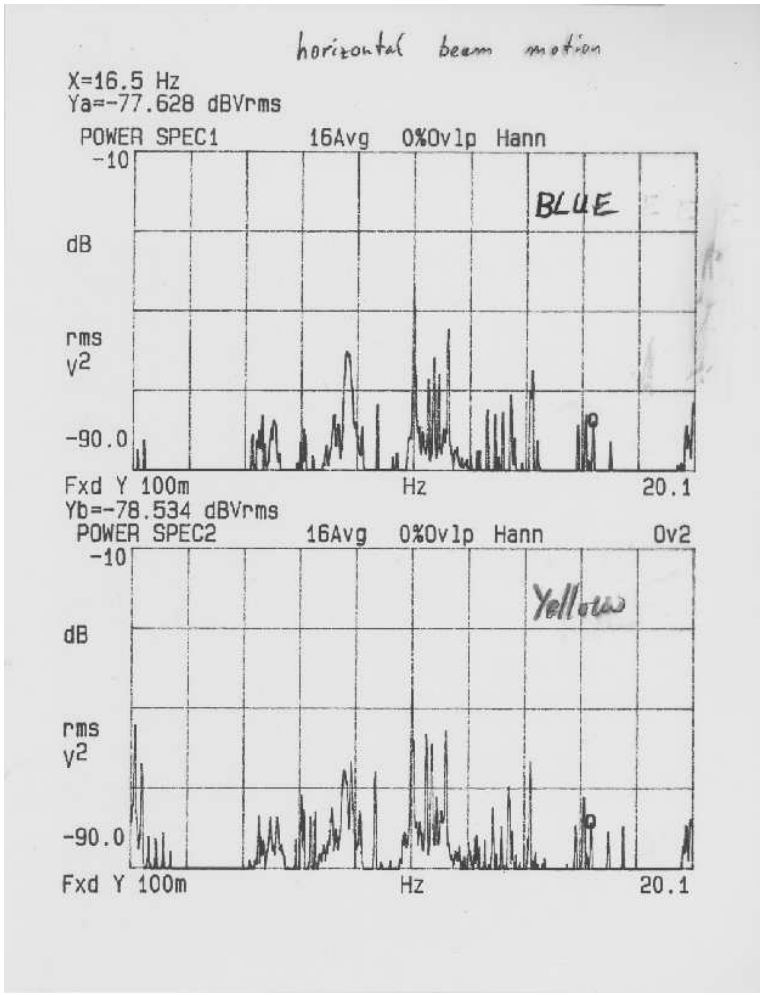
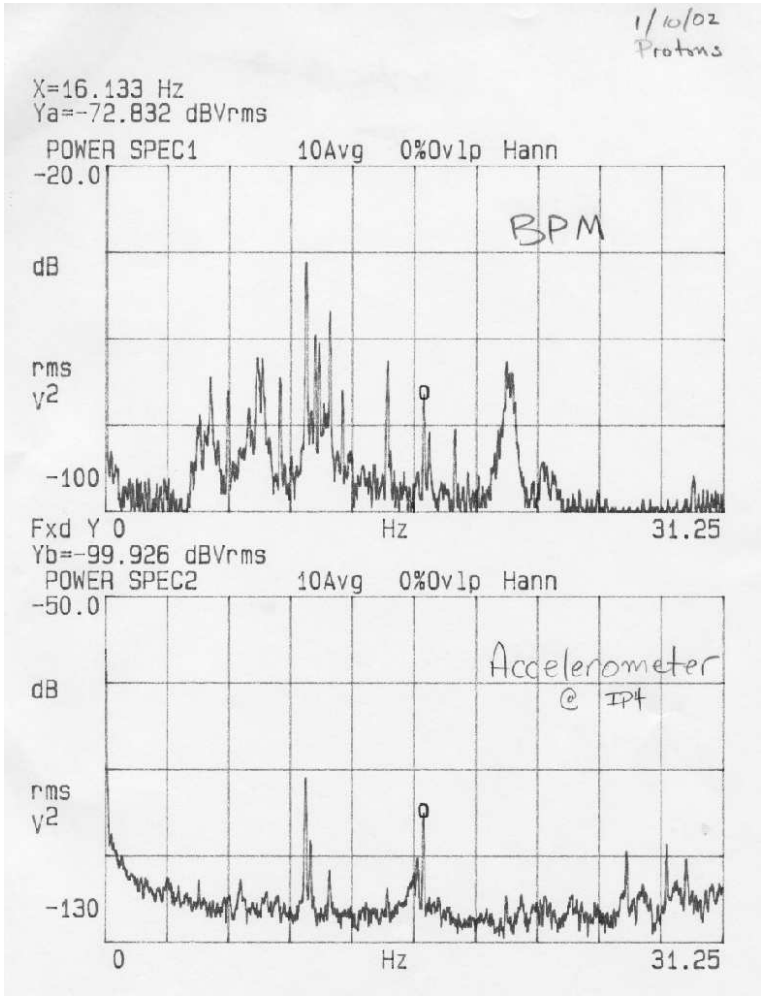
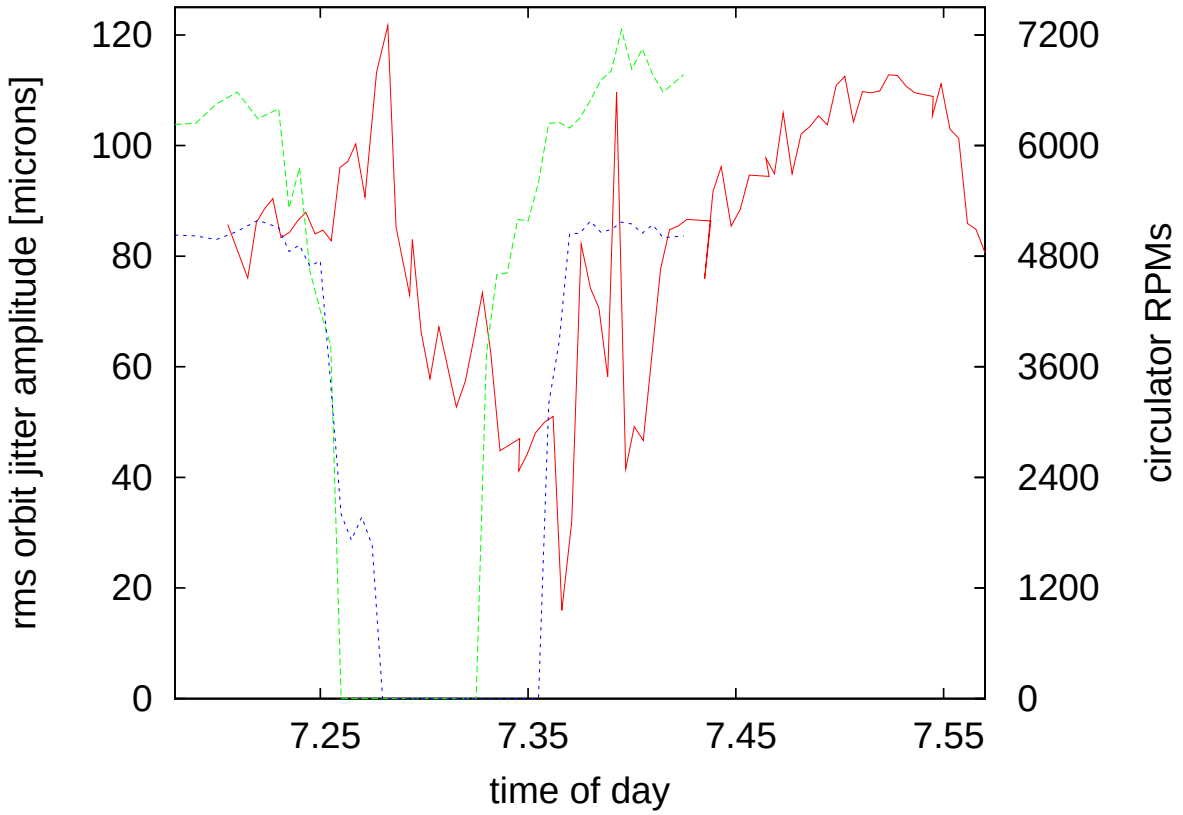
Horizontal beam jitter spectrum, caused by mechanical triplet vibrations due to helium circulator:

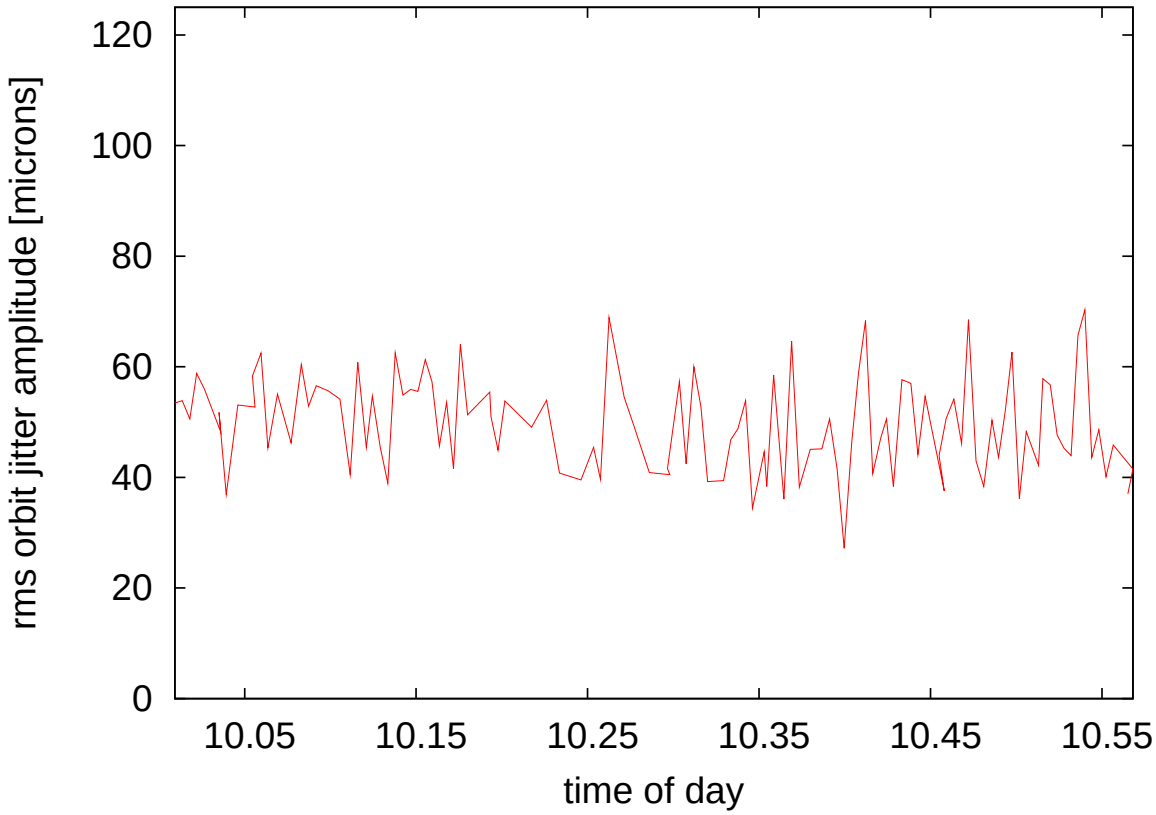




Circulator RPMs (blue and yellow) and blue RMS orbit jitter (8.5 - 14.5 Hz):



Blue RMS orbit jitter (8.5 - 14.5 Hz) during regular operations (circulators ON):



Orbit jitter leads to modulated beam-beam offsets at the interaction points.

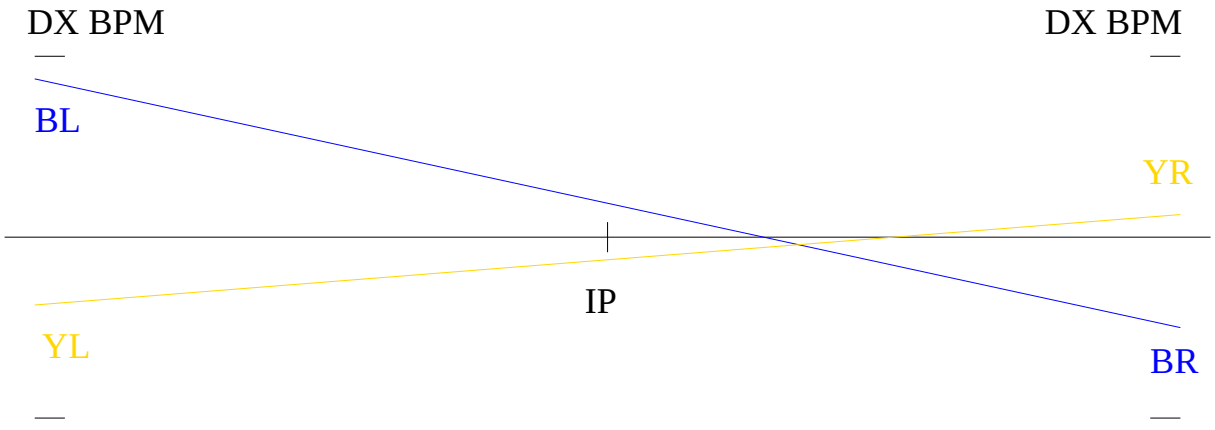
Simulation studies indicate that this causes emittance growth; however, modulated angle does not matter.

This may be the explanation for fast luminosity drop at the beginning of the store.

Something needs to be done to eliminate orbit jitter (at IPs).

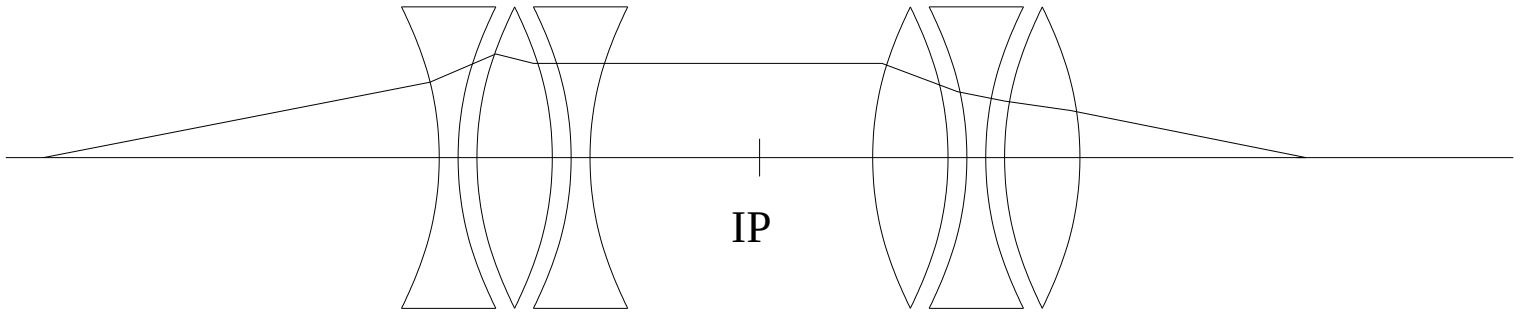
Since mechanical stiffening of the triplets turned out to be unfeasible, IR orbit feedback is being attempted.

Blue and Yellow orbits (AC coupled) are measured by DX BPMs on both sides of each IP; relative orbit offset at IP is compensated by feedback system acting on Blue only.



$$\delta x(IP) = \frac{BL + BR}{2} - \frac{YL + YR}{2}$$

IP orbit compensation is provided by 2-bump, with warm correctors placed at focal points of the triplets.

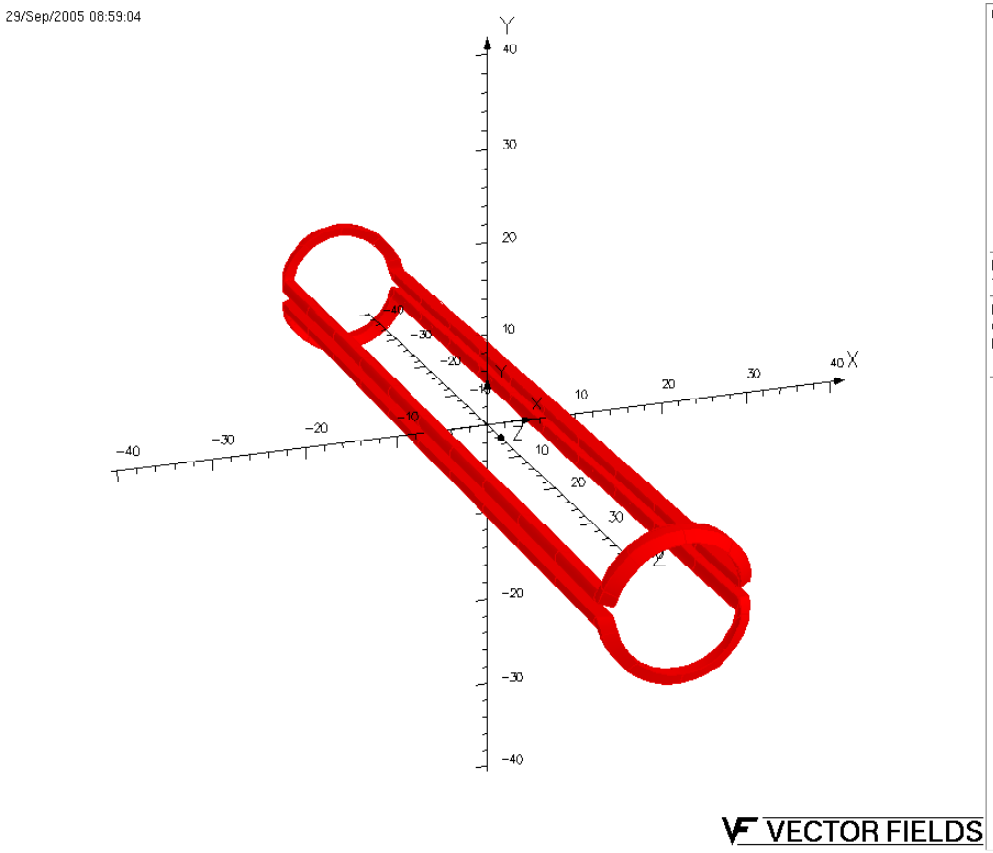


Corrector locations and kick angles are not symmetric due to anti-symmetric optics.
Kick angle asymmetry will be incorporated in number of coil windings $\Rightarrow$ single power supply sufficient.

Estimated required kick angles: 3.2 μrad (2.3 μrad) (asymmetry)
Corresponding integrated fields: 27 Gauss-meters (19 Gauss-meters)

$\Rightarrow$ 1 meter long air coil dipoles,
48 (35) turns/coil,
8 wire,
5 A nominal current,
powered by a single 12 A, 36 V power supply per IP

Air coil design



UNITS

Length	cm
Magn Flux Density	gauss
Magn Field	oersted
Magn Scalar Pot	oersted-cm
Magn Vector Pot	gauss-cm
Elec Flux Density	C/cm^2
Elec Field	V/cm
Conductivity	S/cm
Current Density	A/cm^2
Power	W
Force	N
Energy	J

PROBLEM DATA

1 conductor

Local Coordinates

Origin: 0.0, 0.0, 0.0

Local XYZ = Global XYZ

Status

- cables are being pulled this week
- power supplies have arrived; interface being designed
- BPM boards ordered ($\approx$ 6 weeks); need to be modified after arrival (2 – 3 days/board; 8 boards)
- DSP boards ordered
- eddy current measurement in preparation
- magnet winding in approximately 6 weeks (limited man-power); may have to install during maintenance day