

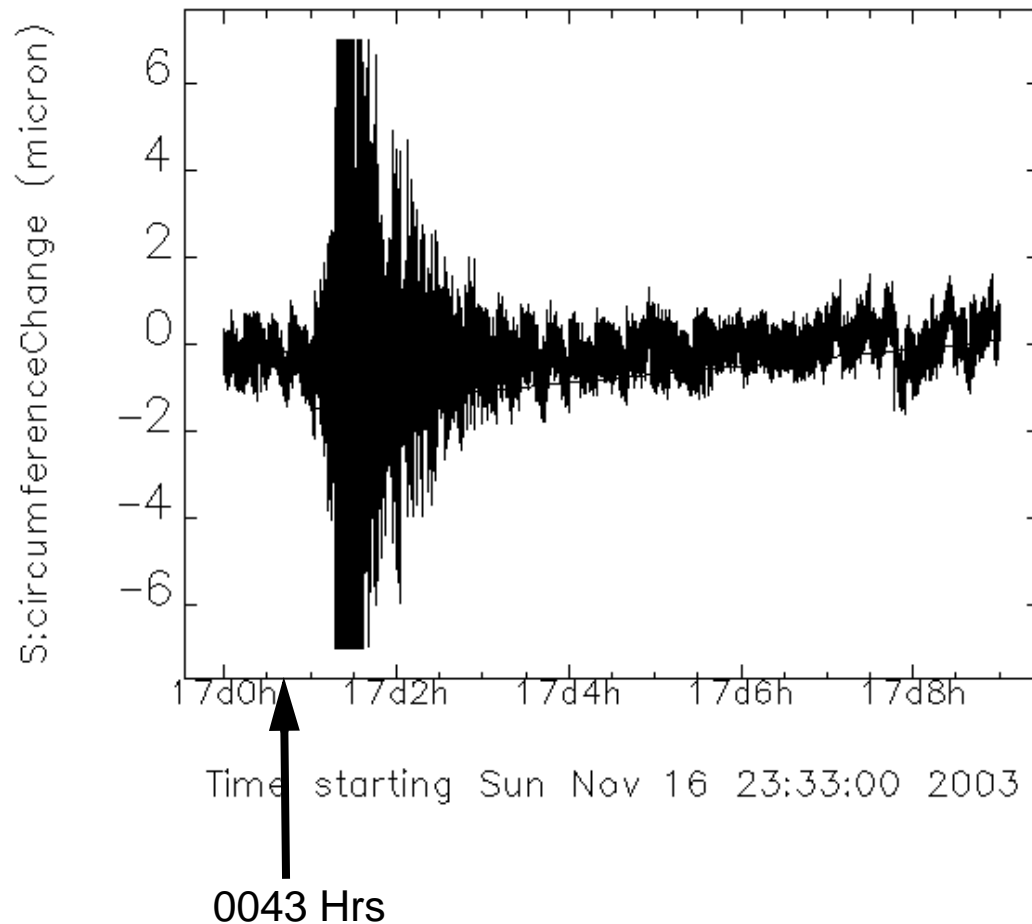
# **Storage ring status and possible upgrade paths: higher current, customized beta functions, etc.**

G. Decker

- Etc.
- ID xbpm status
- Avenues toward higher current
- Customized beta functions

A magnitude 7.8 earthquake IN THE RAT ISLANDS, ALEUTIAN ISLANDS has occurred at: 51.33N 178.64E Depth 33km

Universal Time (UTC) Mon Nov 17 06:43:06 2003  
Central Standard Time (CST) Mon Nov 17 00:43:06 2003

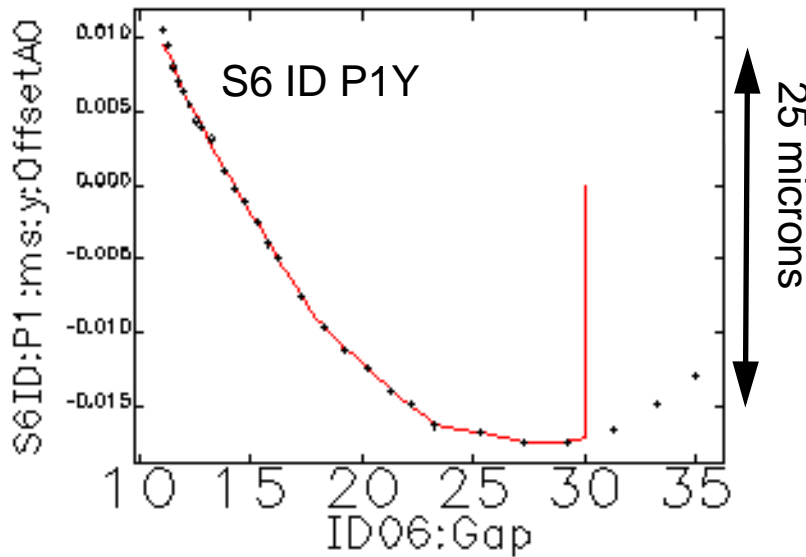


**TWG**  
**November 20, 2003**

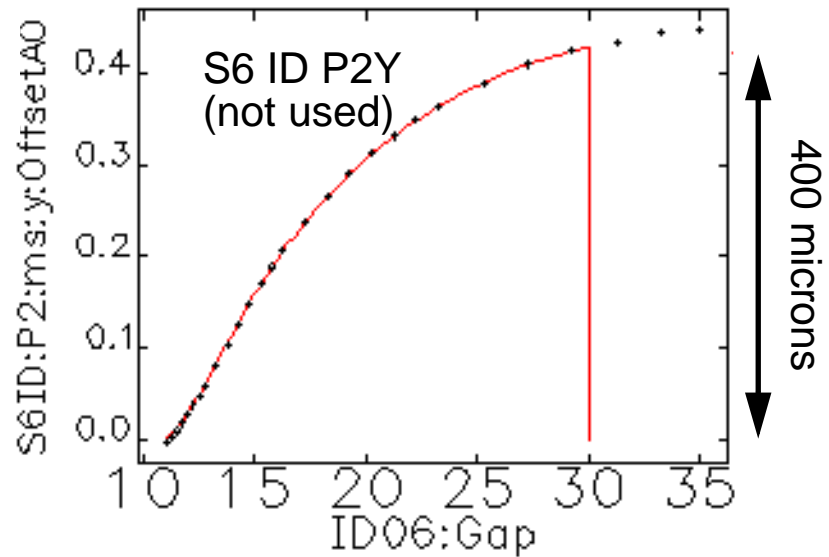
# Insertion Device X-ray BPM Feedback / Feedforward Implementation Status

- X-ray beam position monitors in insertion device beamline front ends at sectors 5, 6, 7, 8, 9, 10, 12, 15, 16, 17, 18, 19 (y only), 20, 22, 33 and 34 (y only) have been included in the orbit correction algorithm since November 12. (One of the sectors was removed a few days ago from the algorithm after a request for local steering.)
- A background feedforward process compensates for residual x-bpm gap-dependent systematic errors.
- The orbit correction algorithm used to stop if any insertion device gap got to be too large.
- Instead of doing this, the lookup tables have been taught how to fool the orbit correction algorithm into thinking that everything is ok if any insertion device gaps are opened past 30 mm.

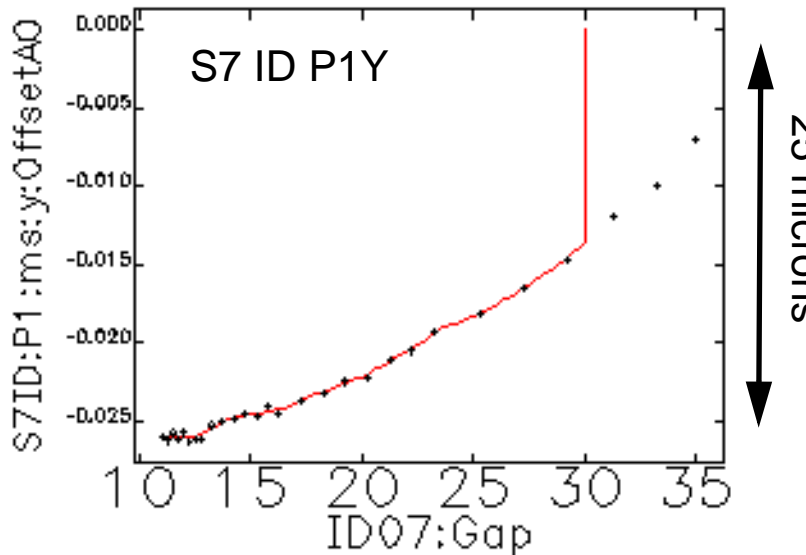
# Example Lookup Tables, Vertical, ID's 6 and 7



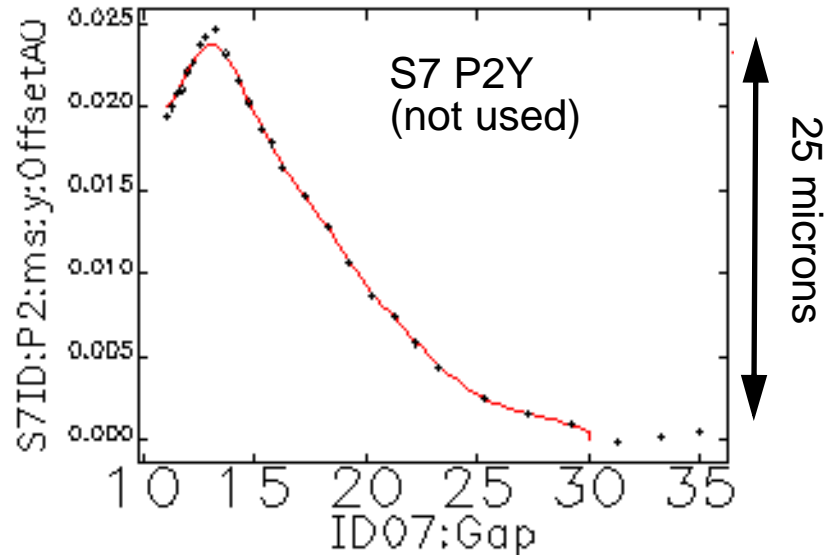
/home/phobus/DECKER/trans/bvg/bvg031120/IDcas-004.sdds plane v



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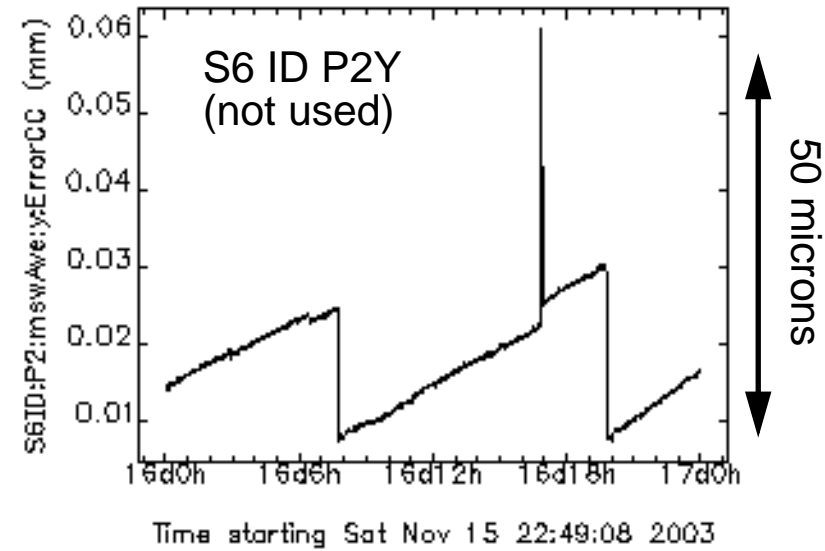
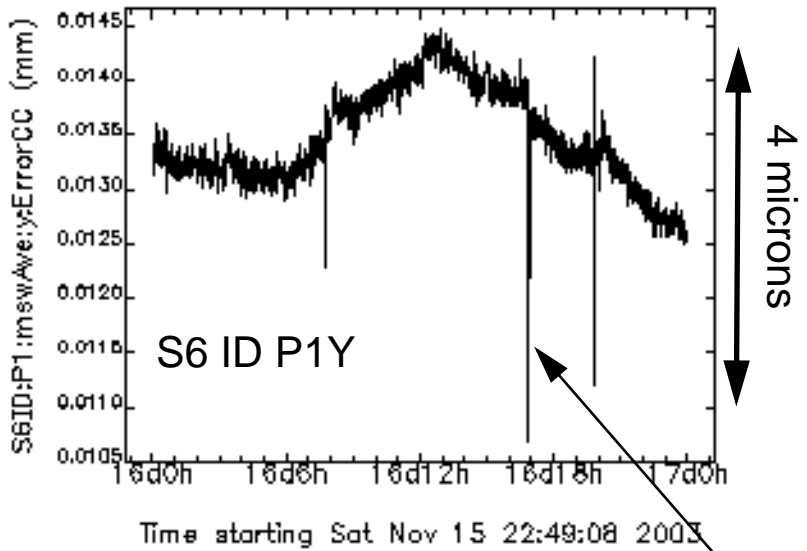


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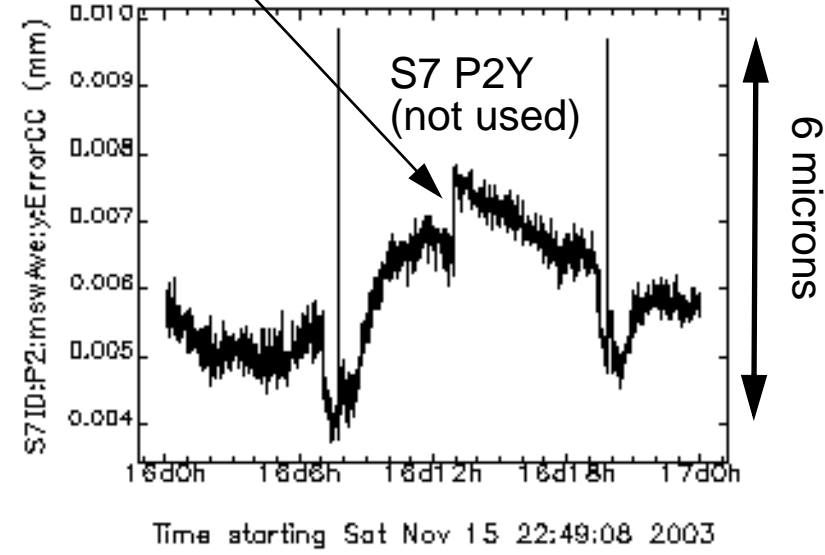
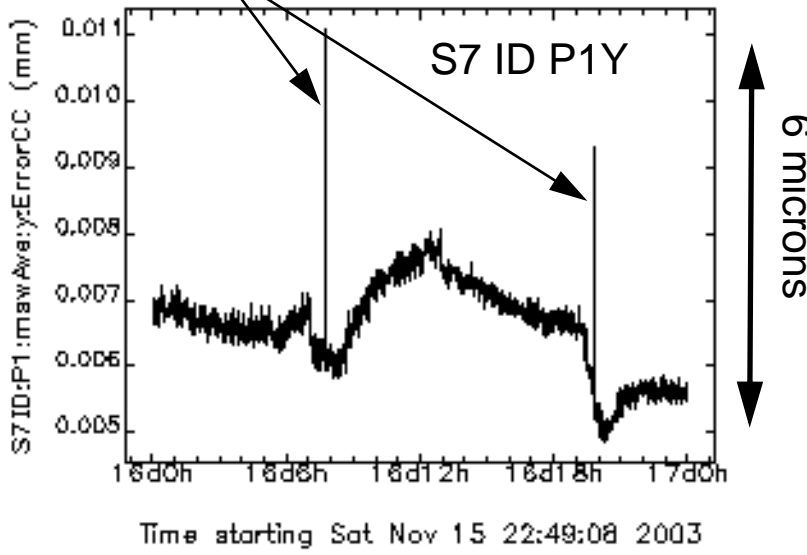
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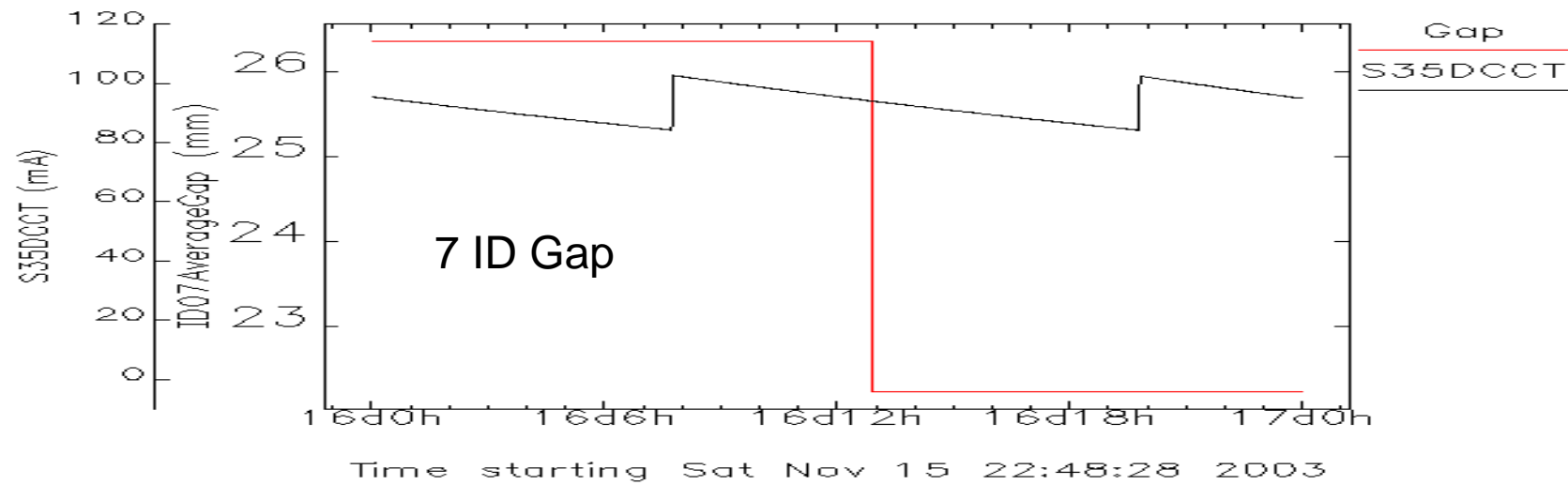
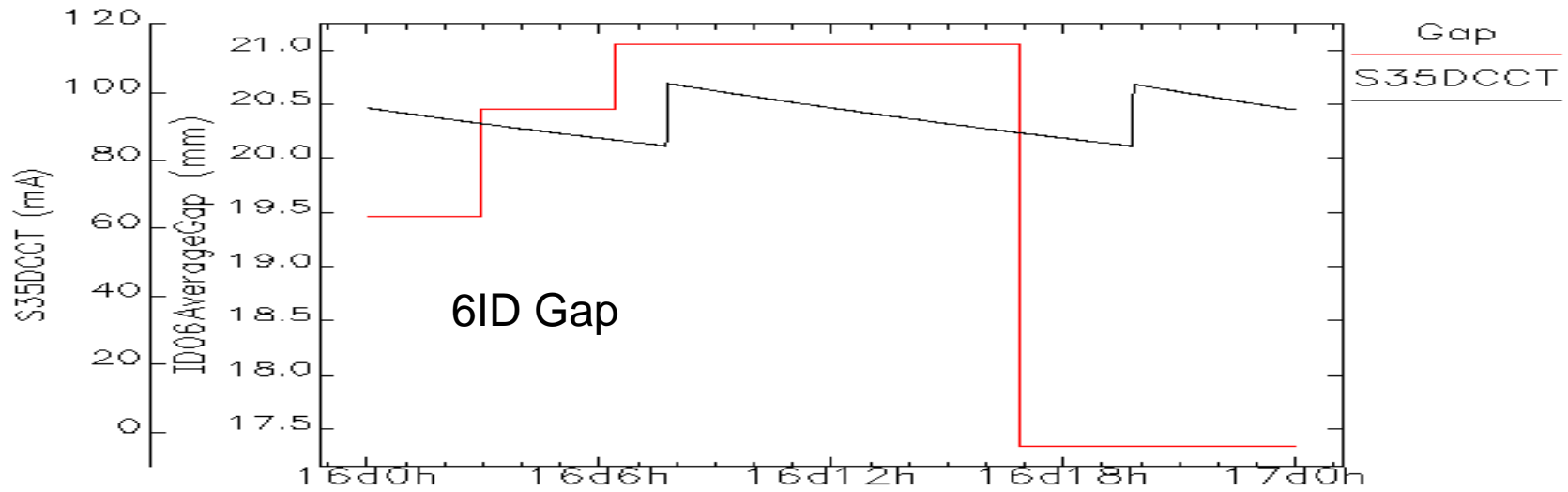
# Time series data, 6ID, 7ID, 324 bunch mode, 24 hours



Injection

Gap Change





# Higher Current Options

- Machine limitations

Single bunch stability limit  $5.5 \text{ mA} * 24 \text{ bunches} \rightarrow \text{approx. } 130 \text{ mA}$

RF power ( Total current \* Energy loss per turn) is not a limitation.

We have stored 200 mA using a many bunch fill pattern.

( $U_0 = 5.5 \text{ MeV} + \text{ID loss / turn}$ , usually less than 6.5 MeV)

Present practical machine limitation using a relatively small number of bunches is most likely a result of wakefields heating the five ceramic pulsed injection magnet vacuum chambers  $\rightarrow$  approx. 200 mA results in 180 degrees C temperature rise with 48 bunches.

- Other limitations

Front end components safe to operate with 1 undulator A closed to minimum 11 mm gap up to 130 mA.

Many beamline concerns  $\rightarrow$  Critical component czar working on it.

## Custom Lattice Functions

Horizontal	Sigmax um	Sigmaxp urad	etax m	etaxp	betax m	alphax	gammax 1/m
Unmoved BM	86.5	55.1	0.056	-0.032	2.00	0.91	0.91
ID	266.9	10.9	0.169	0.000	19.50	0.00	0.05 ←
Moved BM	89.4	54.7	0.058	-0.031	2.12	0.96	0.91

Vertical	Sigmay um	Sigmayp urad	betay m	alphay	gammay 1/m
Unmoved BM	24.6	1.2	26.38	0.75	0.06
ID	8.2	2.8	2.90	-0.00	0.35 ←
Moved BM	24.5	1.1	26.08	0.58	0.05

coupling = 0.010  
 emittance = 2.3e-9 m-rad  
 energy spread = 1e-3

$$\text{Sigmax} = \text{Sqrt}[\text{betax} * \text{emittance} + (\text{etax} * \text{energySpread})^2]$$

$$\text{Sigmay} = \text{Sqrt}[\text{betay} * \text{emittance} * \text{coupling}]$$

$$\text{Sigmayp} = \text{Sqrt}[\text{emittance} * \text{coupling} / \text{betay}]$$