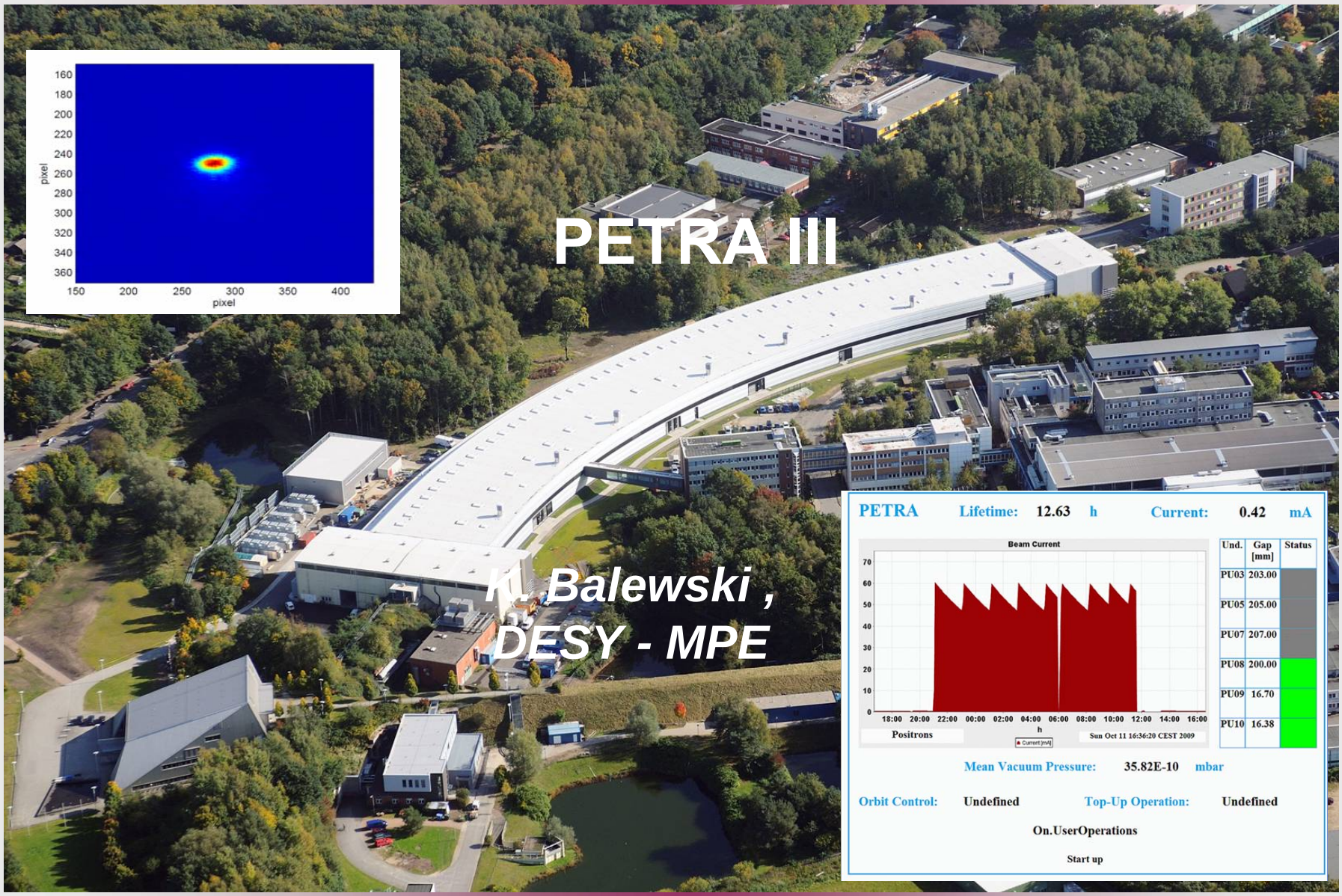
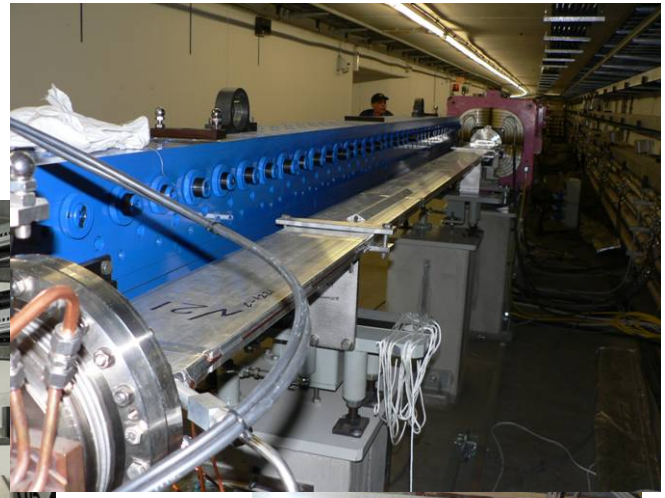

PETRA III
K. Balewski ,
DESY - MPE
pixel
pixel
PETRA
Lifetime: 12.63 h
Current: 0.42 mA
Beam Current
Positrons
Sun Oct 11 16:36:20 CEST 2009
Und.
Gap [mm]
Status
PU03 203.00
PU05 205.00
PU07 207.00
PU08 200.00
PU09 16.70
PU10 16.38
Mean Vacuum Pressure: 35.82E-10 mbar
Orbit Control: Undefined
Top-Up Operation: Undefined
On.UserOperations
Start up

Status in March 2009

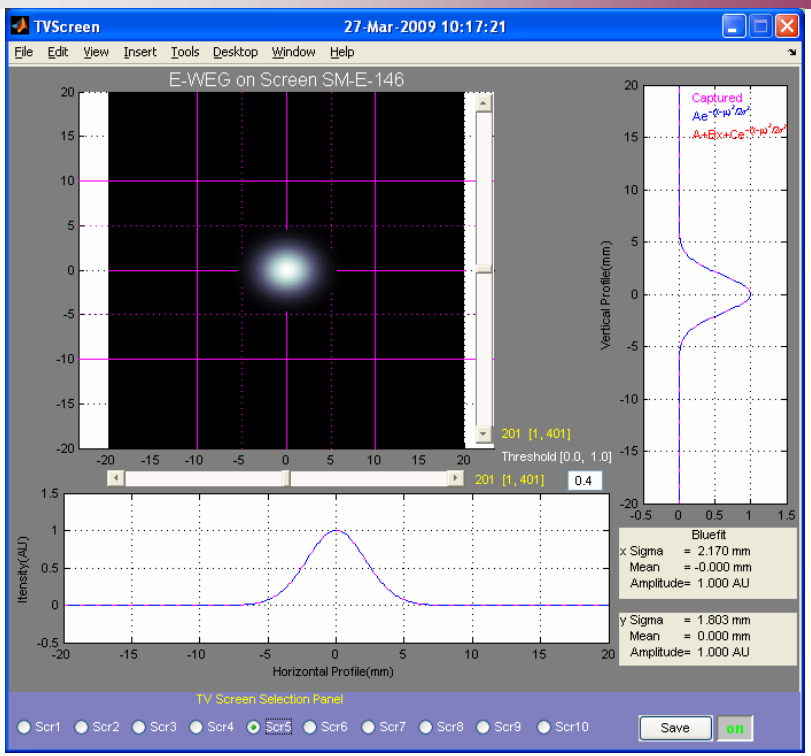
Installation and work on personal interlock completed March 20
Not all power supplies available at the beginning

Wigglers in parking position



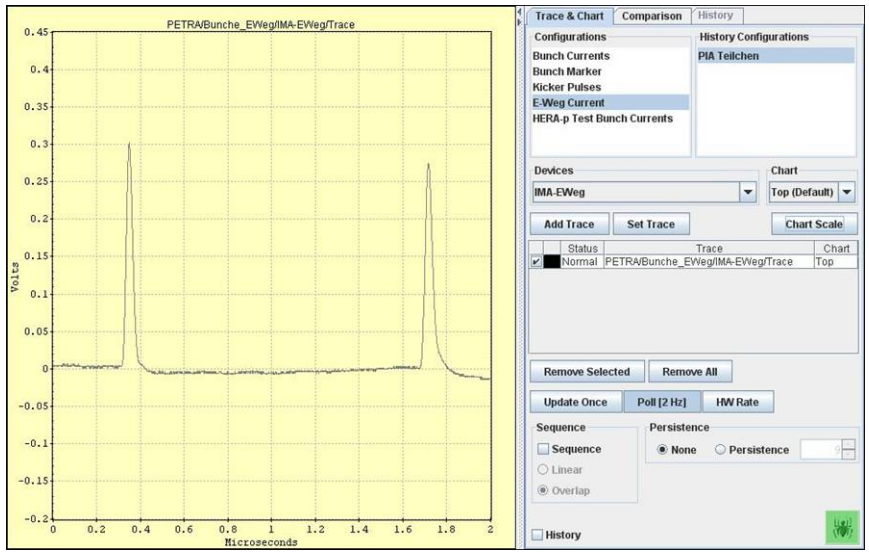
Regular cells in PETRA North

Transferline



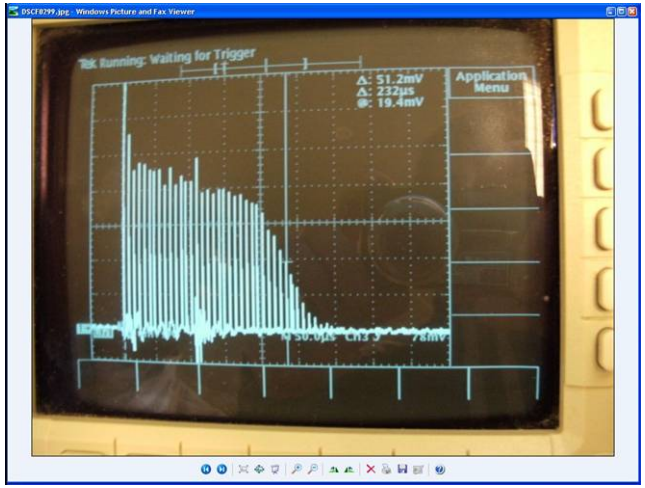
First beam through transferline on 24.03

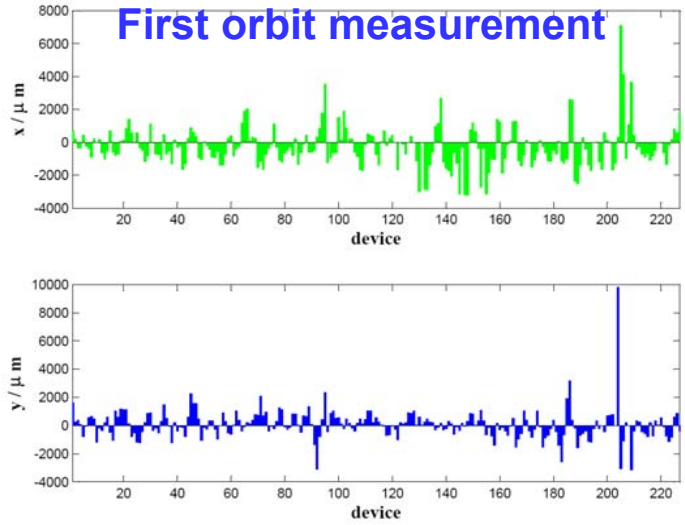
Optics about correct, i.e. measured profiles agree with theoretical within 10%

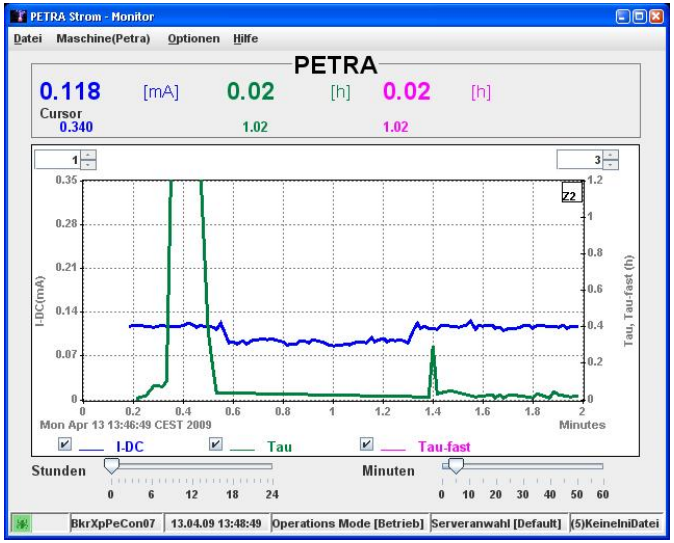


Stored beam

Beam was stored on April 13 (one bunch with 20 µA i.e. about 10^9 e+)
RF – phase right and orbit empirically corrected in the new octant



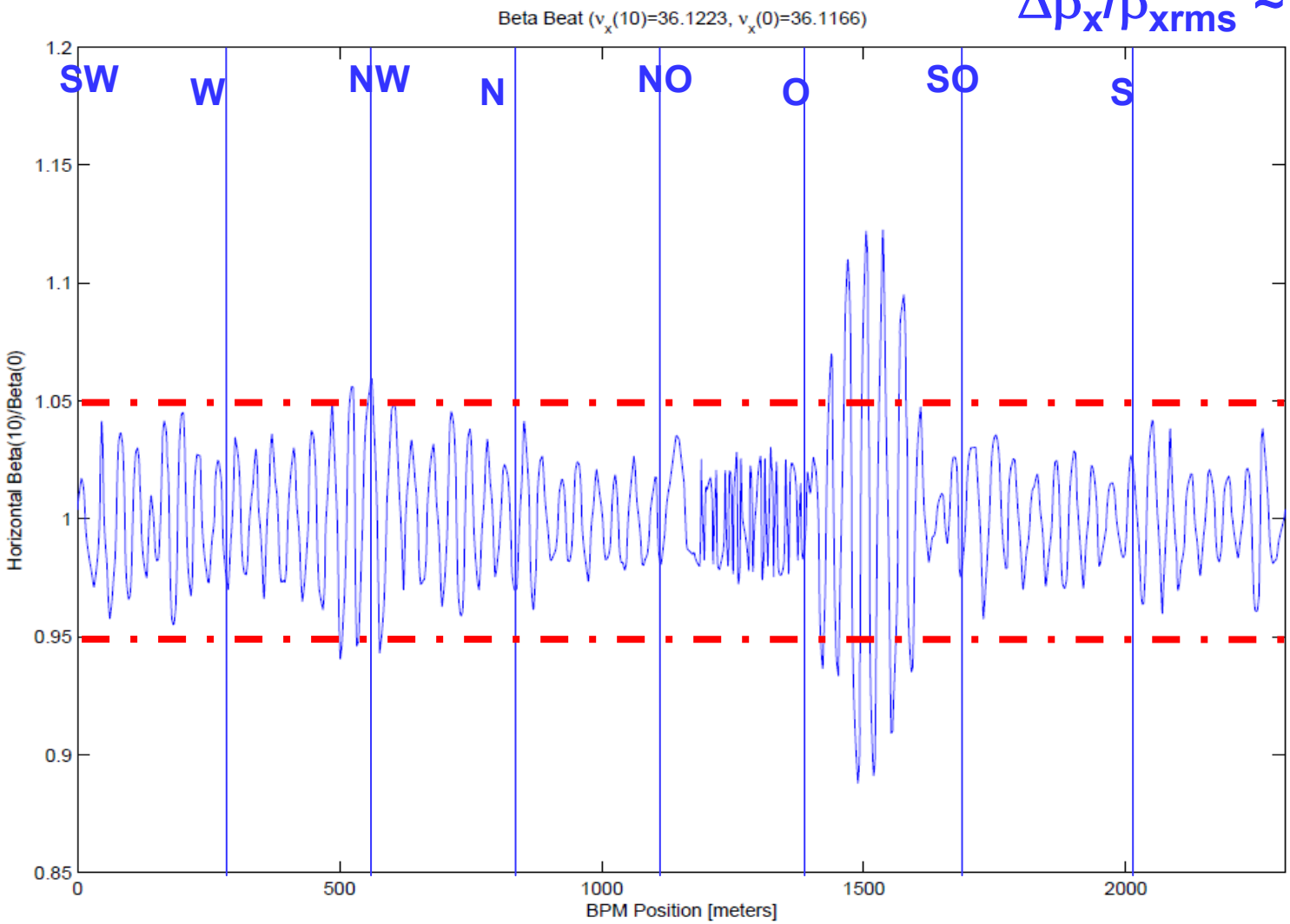




- Tests of several procedures for example
  - BBA
  - Orbit & dispersion correction
  - ORM
  - Machine protection system
  - …
- Installation of wigglers in steps; finished August 15
- Summary of findings during commissioning with all wigglers

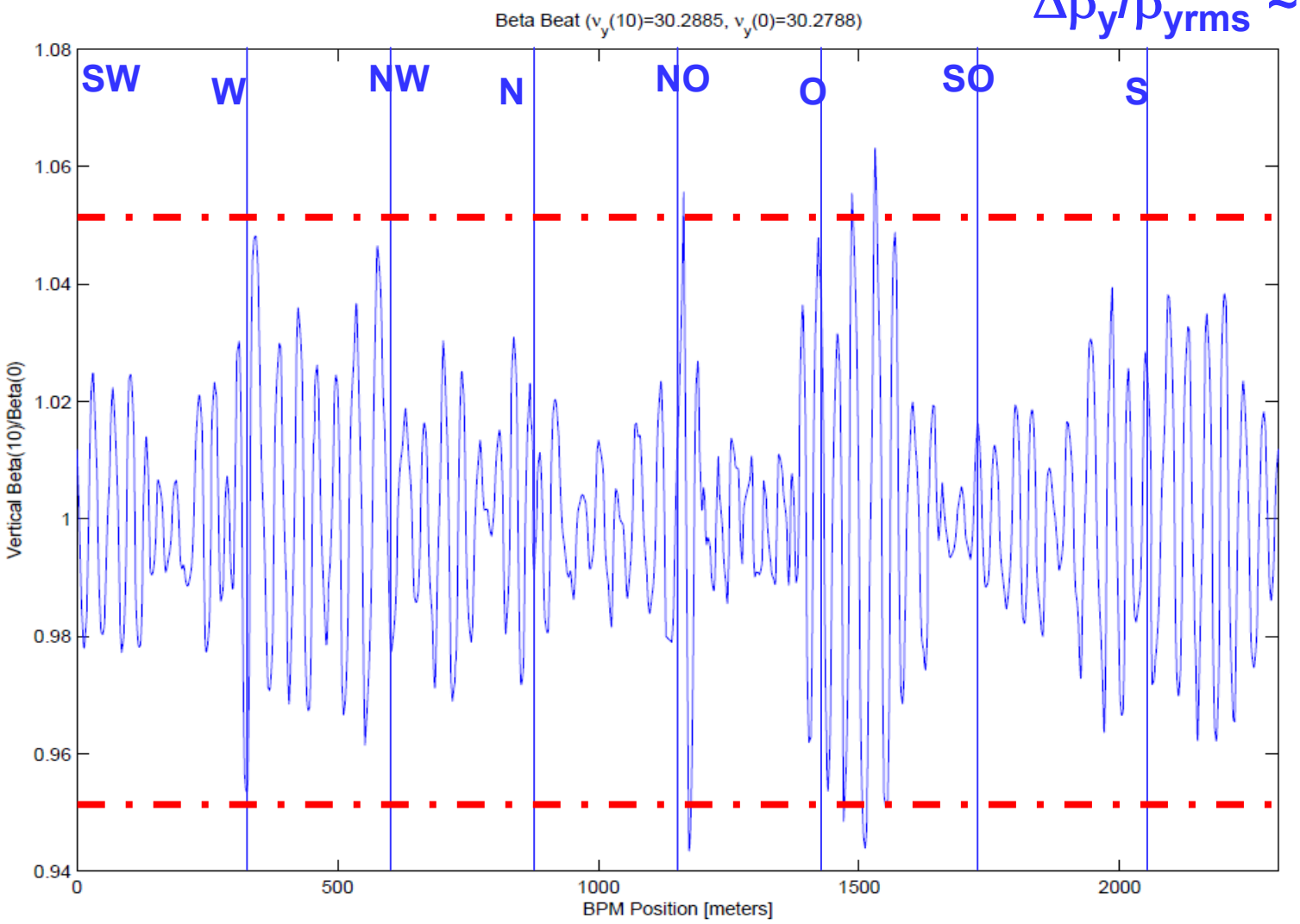
Beta beating horizontal (2nd iter.)

$\Delta\beta_x/\beta_{xrms} \approx 3\%$

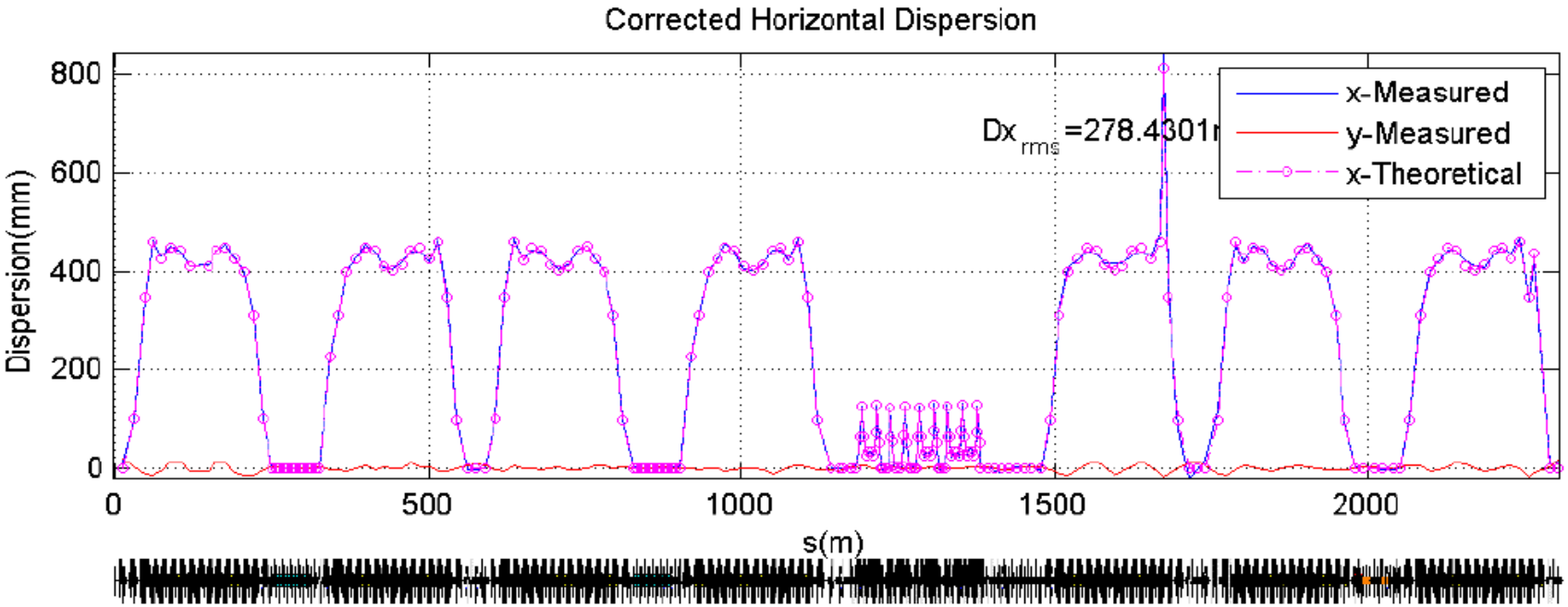


Beta beating vertical (2nd iter.)

$\Delta\beta_y/\beta_{yrms} \approx 2\%$



Dispersion



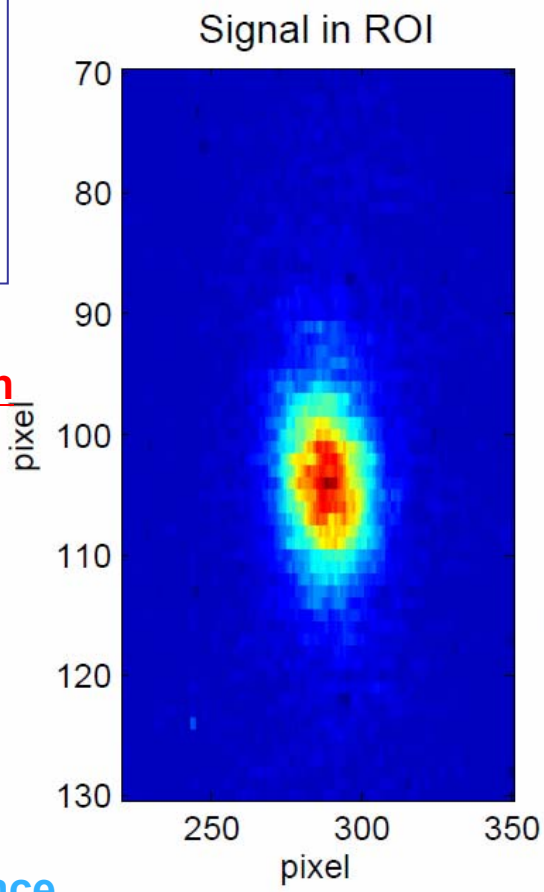
Spurious vertical dispersion in Damping wiggler sections ≈ 1mm

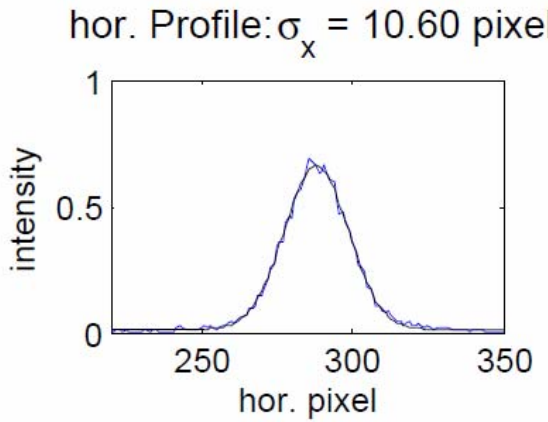
Emittance Measurement

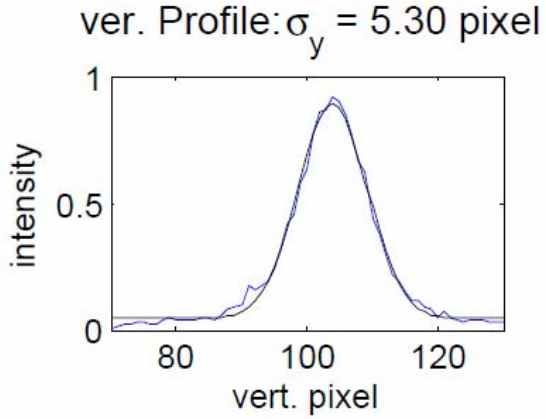
Calculated horizontal width: $\sigma_x \approx 44$ µm

Calculated emittance $\varepsilon_x \approx 0.9$ nm rad

- **lousy lifetime**
- **for I = 1.4 mA => t = 1.5h**





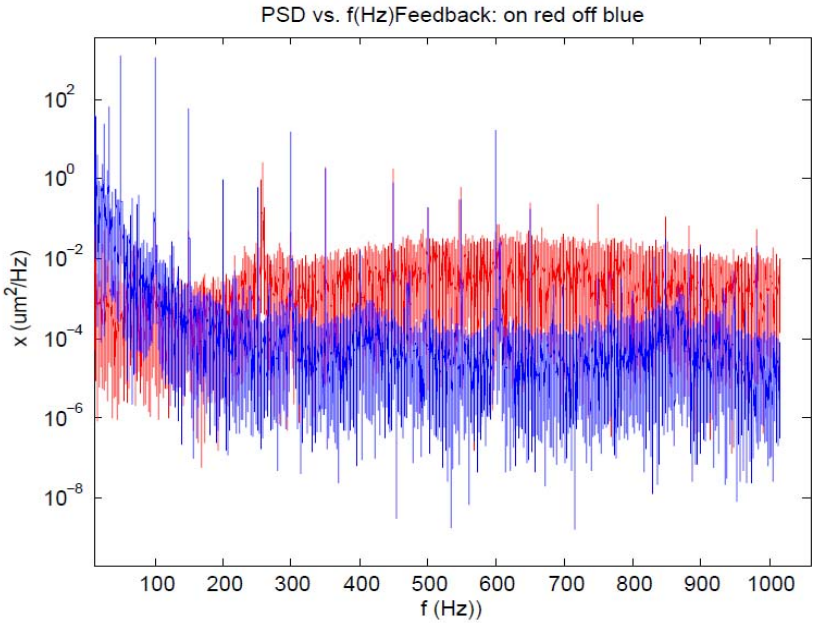


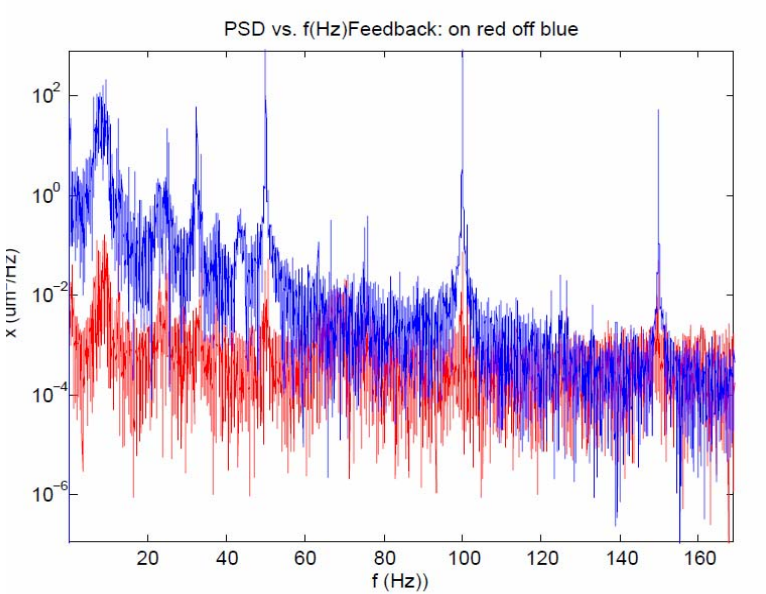
Measured emittances
$0.87 \leq \varepsilon_x \leq 1.04$

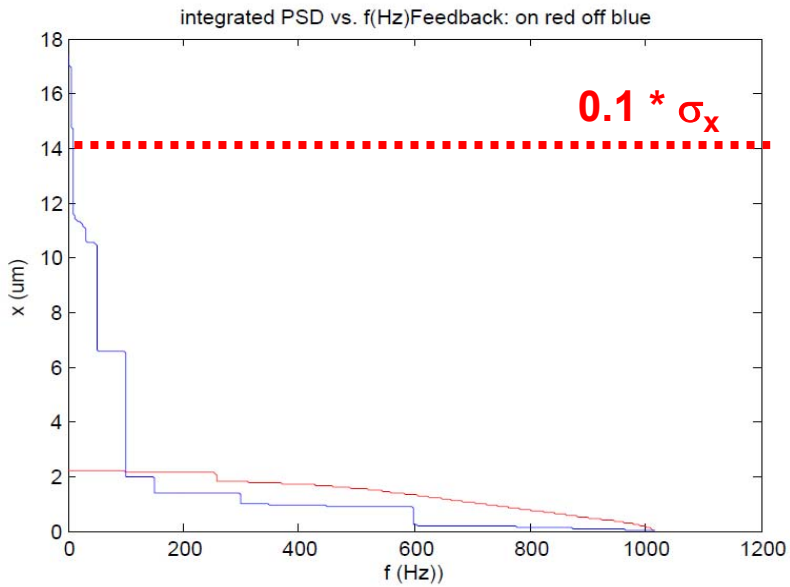
Expected emittance
$\varepsilon_x \approx 0.9$ nm rad

Estimated vertical emittance
$\varepsilon_x \leq 20$ pm rad

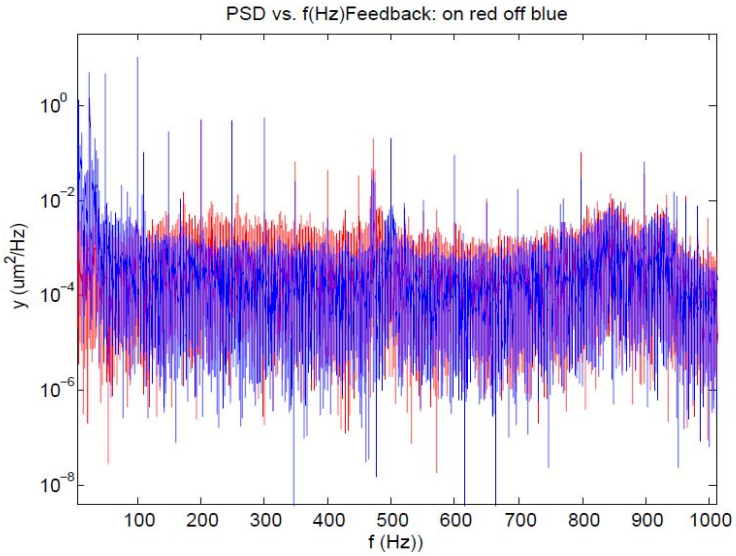
First test of Orbit feedback horizontal plane

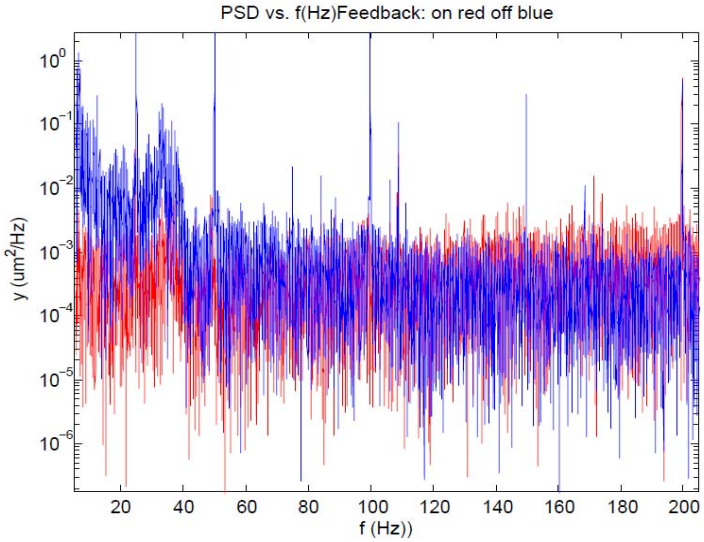


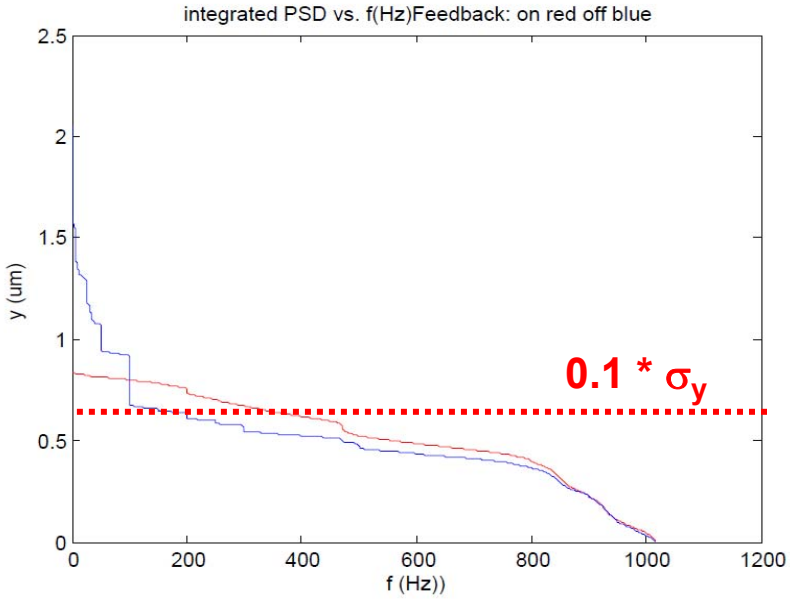




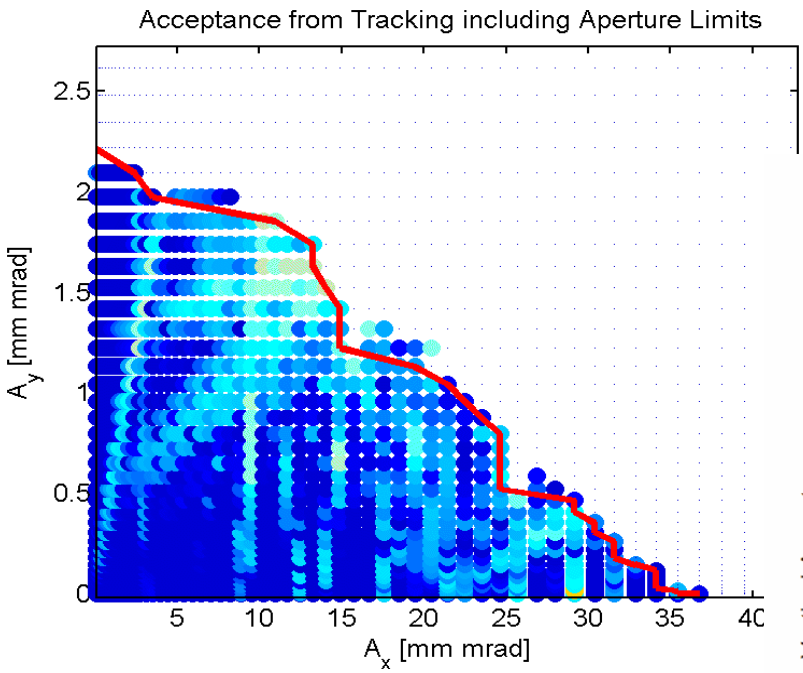
First test of orbit feedback vertical plane

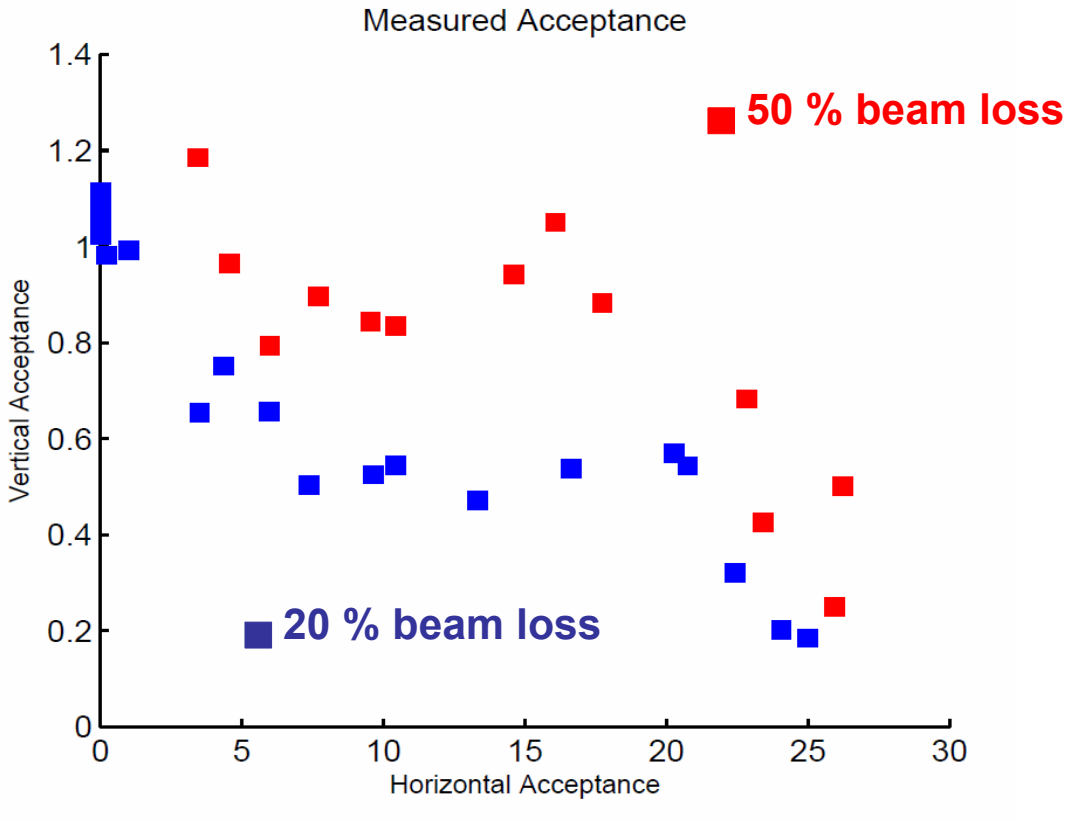




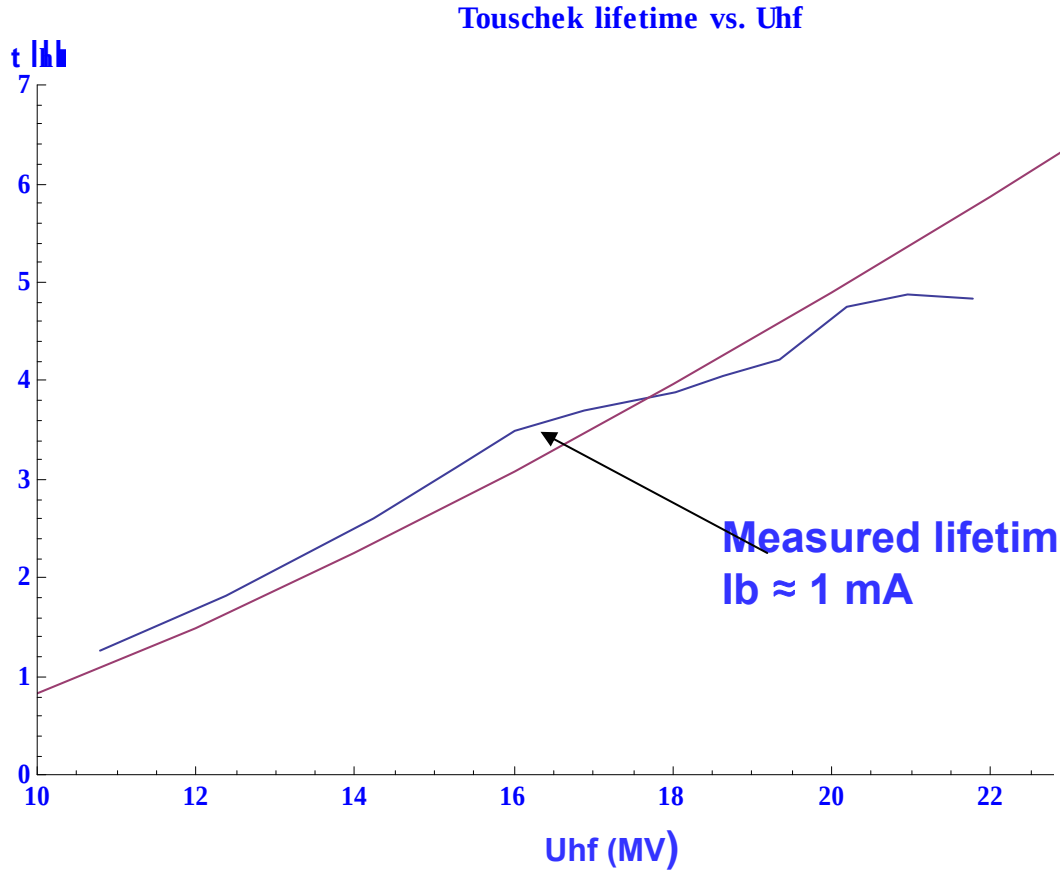


Acceptance


Acceptance from Tracking including Aperture Limits
A_y [mm mrad]
A_x [mm mrad]
0
0.5
1
1.5
2
2.5
5
10
15
20
25
30
35
40


Measured Acceptance
50 % beam loss
20 % beam loss
Vertical Acceptance
Horizontal Acceptance
0
0.2
0.4
0.6
0.8
1
1.2
1.4
0
5
10
15
20
25
30

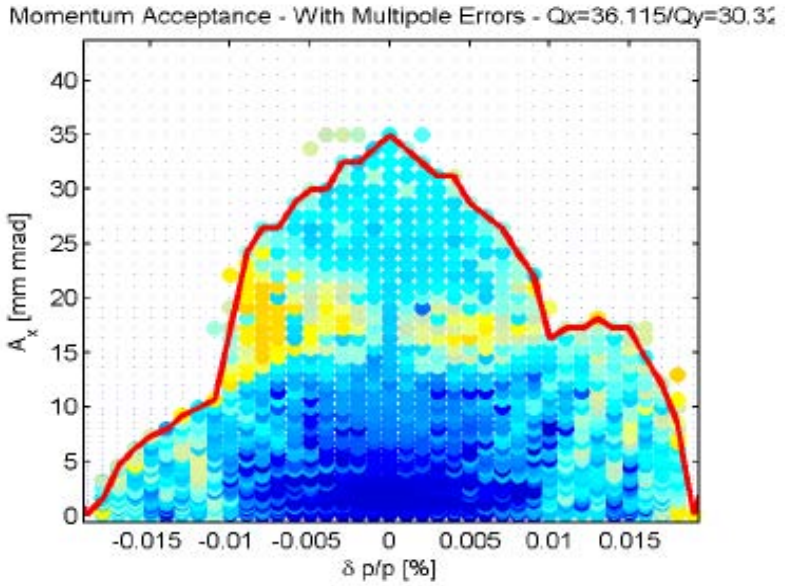
Momentum acceptance



Measured lifetime
Ib ≈ 1 mA

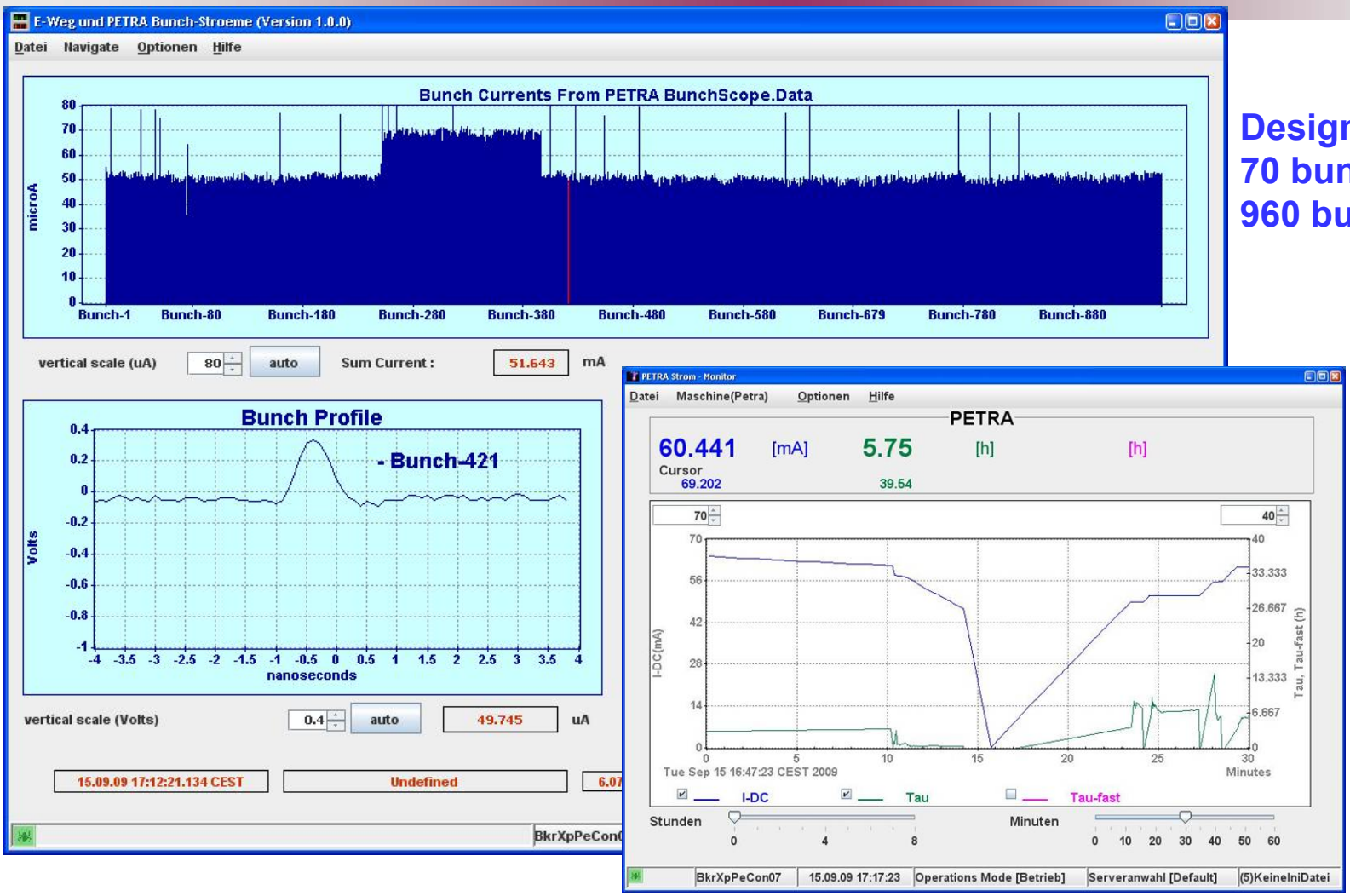
Calculated Touschek Lifetime (MAD)
ε_x = 0.9 nmrad
ε_y = 13 pmrad

Calcualted acceptance About 1.7 %



Estimated momentum acceptance about 1.6 %

Current limitations coupled bunch



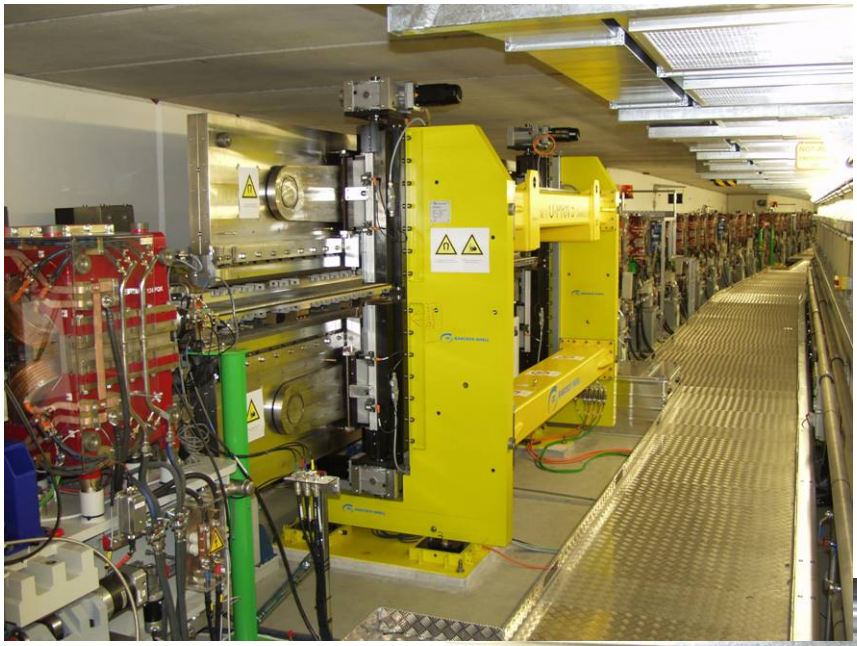
Design: 100 mA
70 bunches: 75 mA
960 bunches: 89 mA

Transverse broadband FB is working well

Longitudinal FB: at least 5 out of 8 broadband amplifiers destroyed! Why?

Undulator Installation

Undulator PU 10



Undulator PU 8 & 9

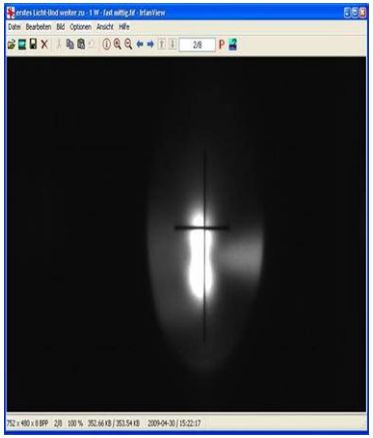
Undulator PU 4

APPLE II

8 of 14 Undulators have been installed

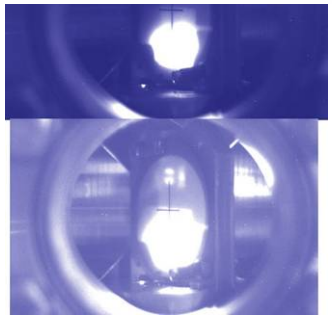
Status of PU 8, 9, 10

47m



First Light
April 30

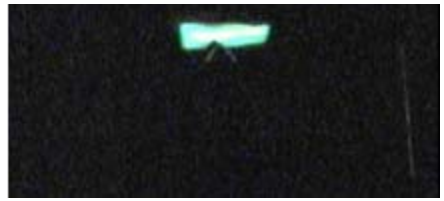
54m



Start of beamline commissioning
July 17

75m

First beam on diffractometer
September 27



First friendly users
October 5

Operation with currents
Up to 35 mA

Plans for 2010

- Base line parameters
  - Small emittance
  - Current at least 50 mA
  - Orbit stability
  - Top-up not from the start
- Restart on February 15
  - User run start on March 1 (basically beam line commissioning)
  - Until summer friendly users
- Service days and weeks parallel with DORIS

Summary

Parameter	Design	Achieved
Energy (GeV)	6	6
ε_x (nm rad)	1	1
ε_y (pm rad)	10	< 20
Current (mA)	100	89
Orbit stability	10% of beam size	X okay Y almost
# undulators	14	8

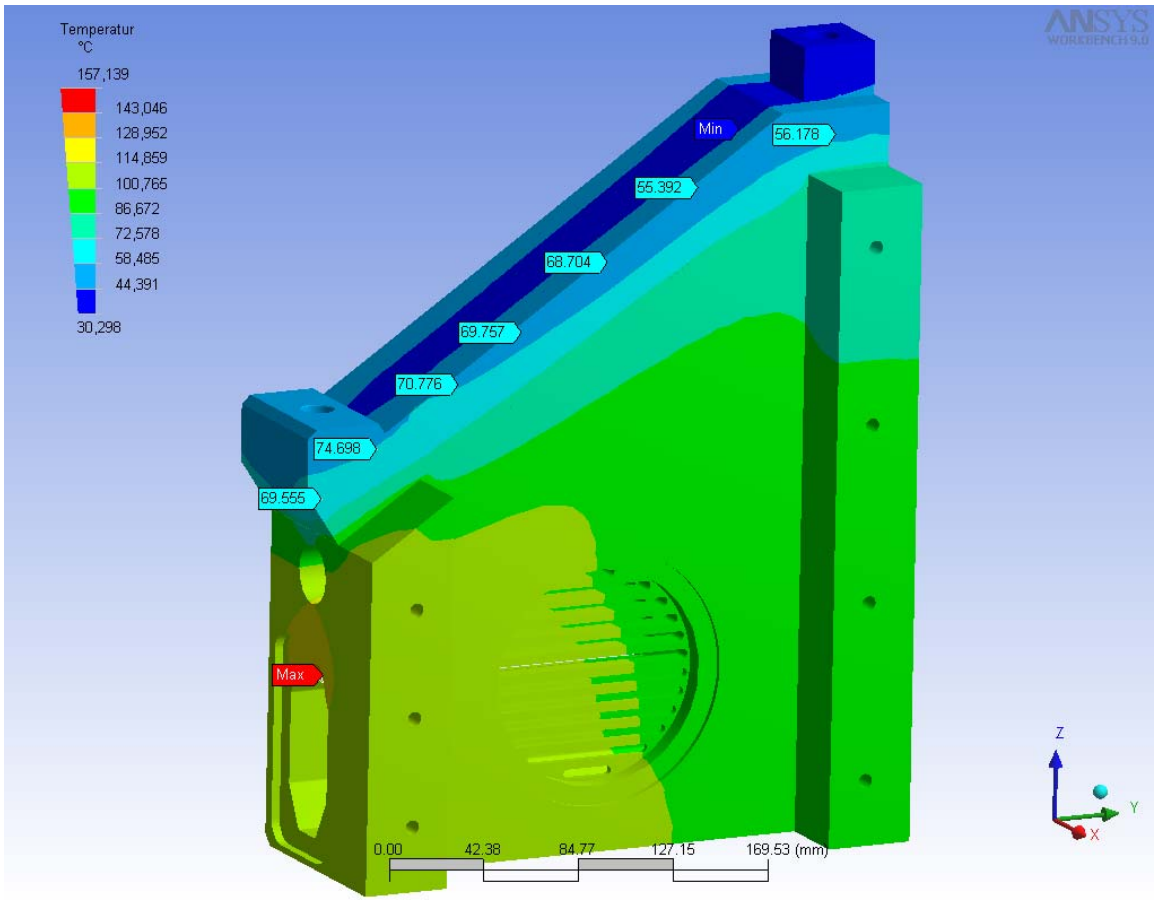
Thank you
for your attention

Current limitations
absorber temperatures

New Octant

Damping wiggler sections

Absorber temperatures



Temperature distribution for Absorber B @ 200 mA

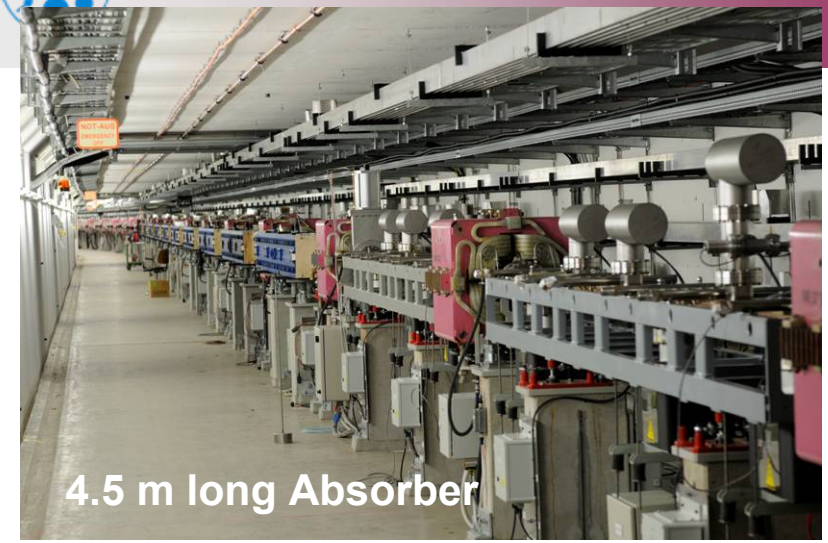
Absorber	Power load (W) @ 200 mA
A, A1	3300
B	6500
C	600
D, E	2100

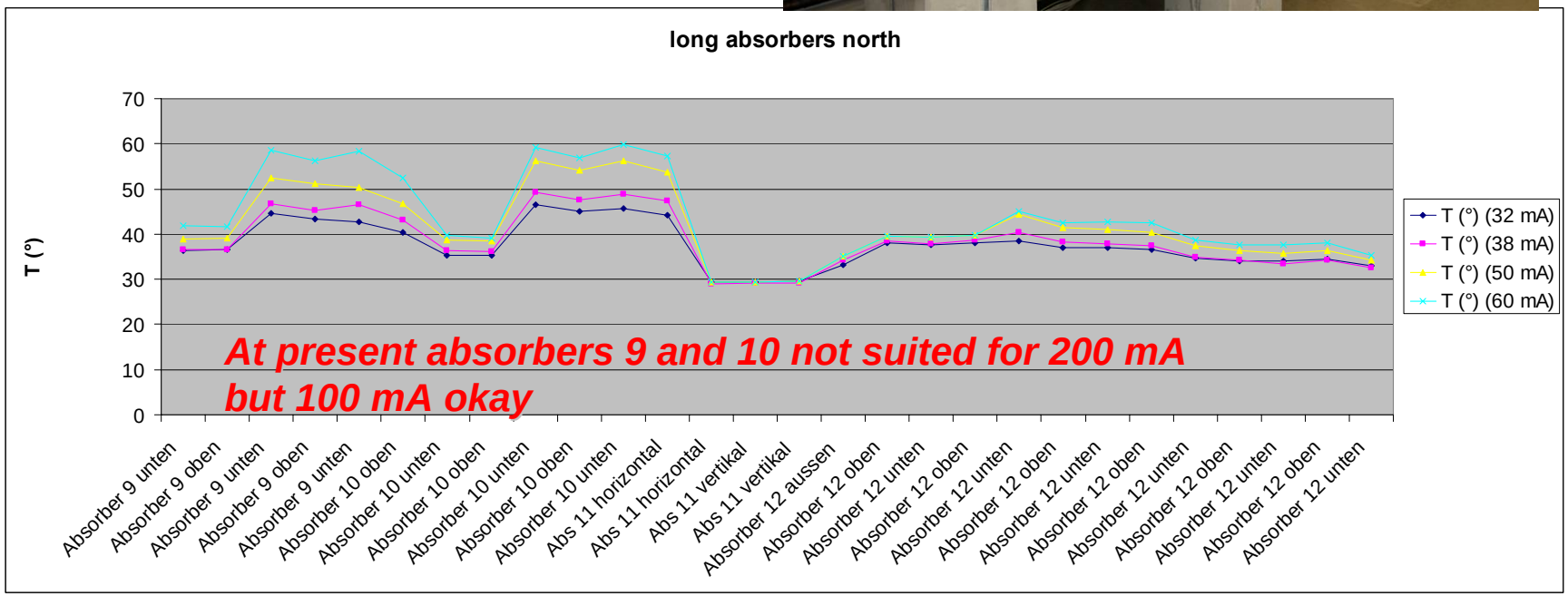
Absorbers B already at a Temperature of 70° @ 60 mA!

Neighbourhood is warmed up as well!!

Temporarily solution: water flow increased so that current of more than 100 mA possible but certainly not 200 mA

Absorber temperature DWS North





Temperature threshold beyond 100°

Impact of ID's
PU 8 wo / w feed-forward tables