



PETRA III

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- PETRA III Status
- Near future: PETRA III Extension

Operation 2011



- About 9 month of user run (≈ 4800 h)
- 1 summer shut down, 4 service weeks, 3 bunch patterns

	Februar	Maerz	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember
1		1 mA	40	240		40	Interlock	240	60	240	40
2			40	240		40	Interlock	240	60	MDT	40
3		240	40	240		40	Interlock	240	60	240	40
4		240	40	MDT		40		240	60	240	40
5		240	40	60		40		240	MDT	240	40
6		240	MDT	60	240	MDT		240	40	240	40
7		240	40	60	240	40		MDT	40	240	MDT
8		240	40	60	MDT	40		240	40	240	40
9		MDT	40	60	240	40		240	40	MDT	40
10		240	40	60	240	40		240	40	40	40
11		240		MDT	240				40	40	40
12		240	Interlock	40	240				MDT	40	40
13		240	Interlock	40	240				40	40	40
14		240		40	240			S4,S5,S6,S7	40	40	MDT
15	M	240		40	MDT		240	S4,S5,S6,S7	40	40	240
16	setup	MDT		40	240		240	S4,S5,S6,S7	40	MDT	240
17		240		40	240		MDT		40	40	240
18		240	40	MDT	240		240		40	40	240
19		240	40	240	240		240	240	MDT	40	240
20		240	MDT	240	240		240	240	40	40	240
21	tSch P08/O	240	240	240	240		240	MDT	40	40	240
22		240	240	240	MDT		240	60	40	40	
23		MDT	240	240	60		240	60	40	MDT	
24		60	240	240	60		MDT	60		60	
25		60	240	MDT	60		240	60		60	
26		60	240	240	60		240	60	S1,S2,S3,S8,S9	60	
27		60	MDT	240	60		240	60	S1,S2,S3,S8,S9	60	
28	StSch P10	60	240	240	60		240	MDT	S1,S2,S3,S8,S9	60	
29		60	240	240	MDT		240	60	TdoT	60	
30		MDT	240		40		240	60		MDT	
31		40					MDT		240		

Beam Parameters 2011

Bunches		40	60	240
Beam Current	[mA]	85/80	100	100
Bunch Current	[mA]	2.1/2.0	1.7	0.42
Lifetime	[h]	2	2,5	10
Emittance hor.	[nm rad]	1	1	1
Emittance vert.	[pm rad]	10-20	10-20	10-20

Remarks: operating the machine in top-up without any problems
 orbit stability within specs
 record vertical emittance $\varepsilon_y \approx 5$ pm rad
bunches \geq 240: vertical beam blow up due to e-cloud

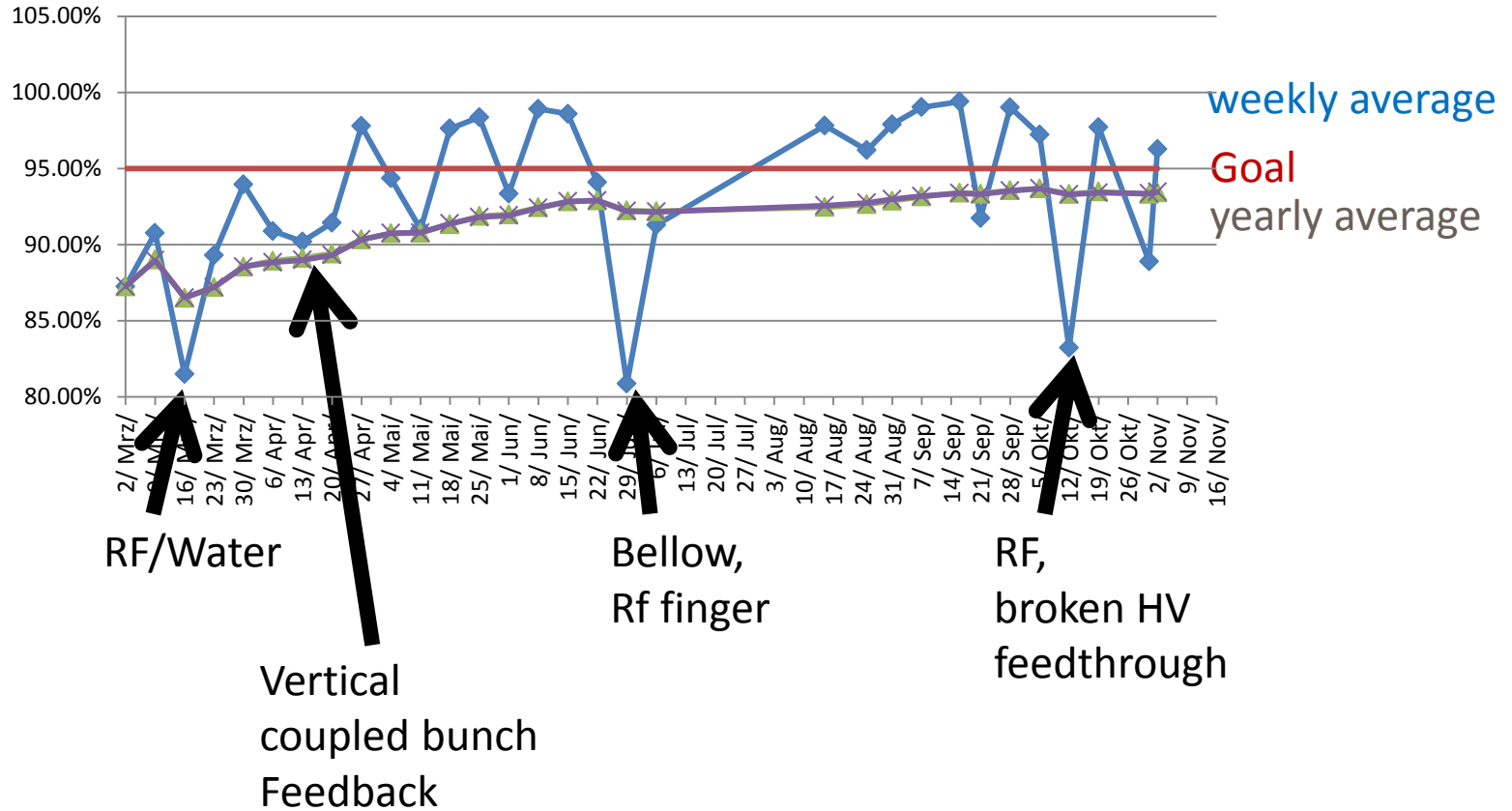
Technical Problems

- A narrow Escape:



Statistics 2011

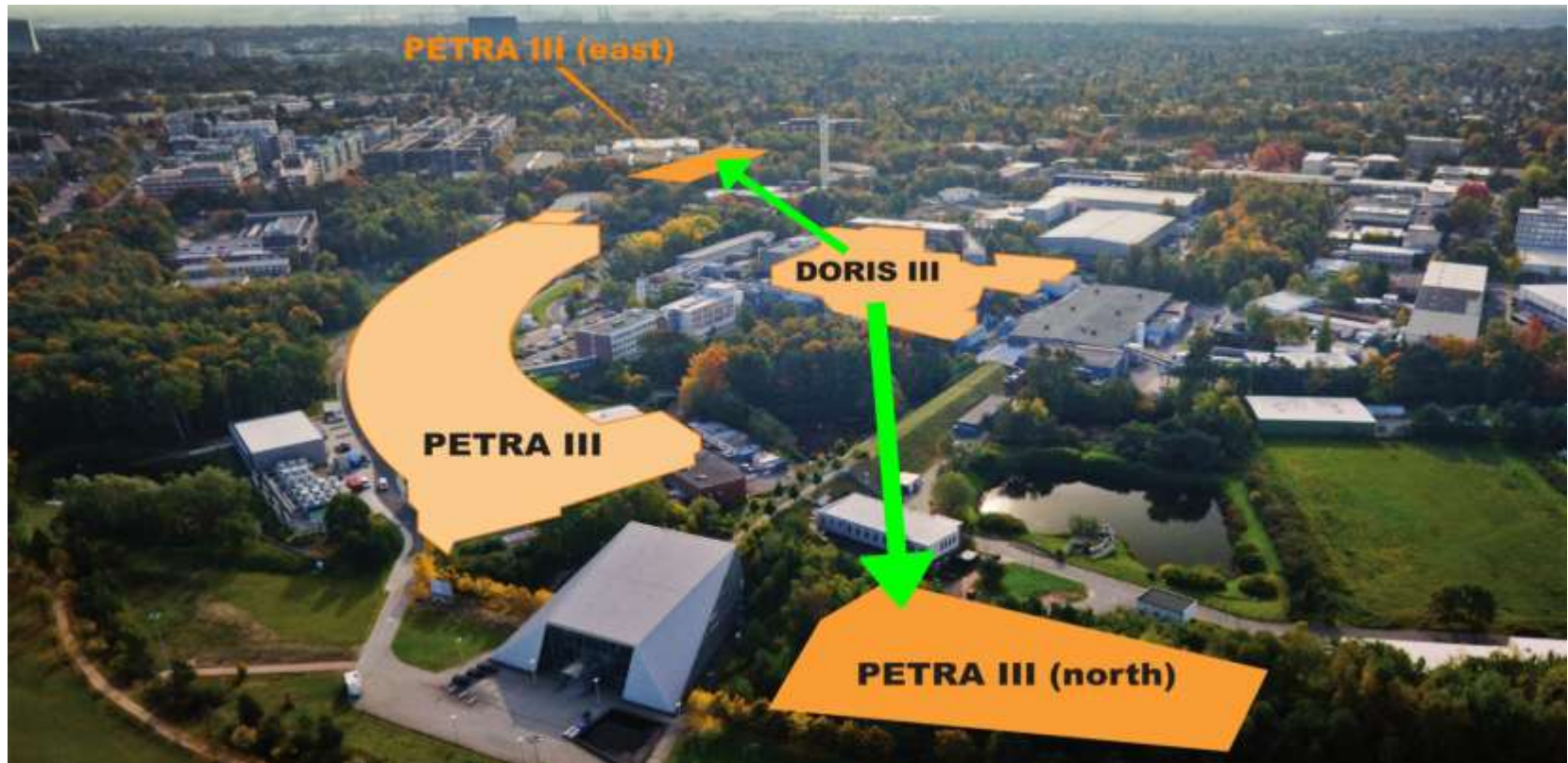
PETRA III Availability 2011



PETRA III – Extension



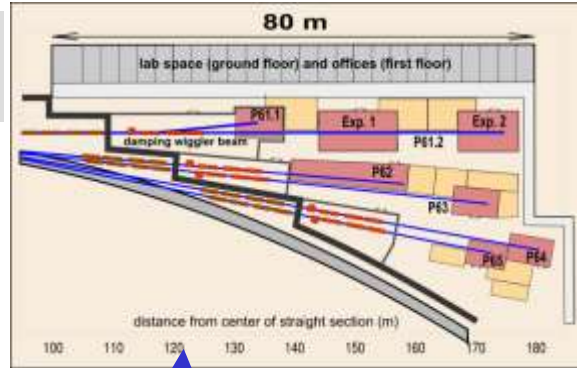
- PETRA III beamlines in operation overbooked by app. a factor of 3
- DORIS end of operation end of 2012– end of Synchrotron-radiation operation October 2012
 - Move beamlines from DORIS to PETRA
- Additional beam lines for international partners: Sweden, India, Russia ...
- Down time due to extension should be as short as possible ($\leq \frac{3}{4}$ a)



New experimental Halls



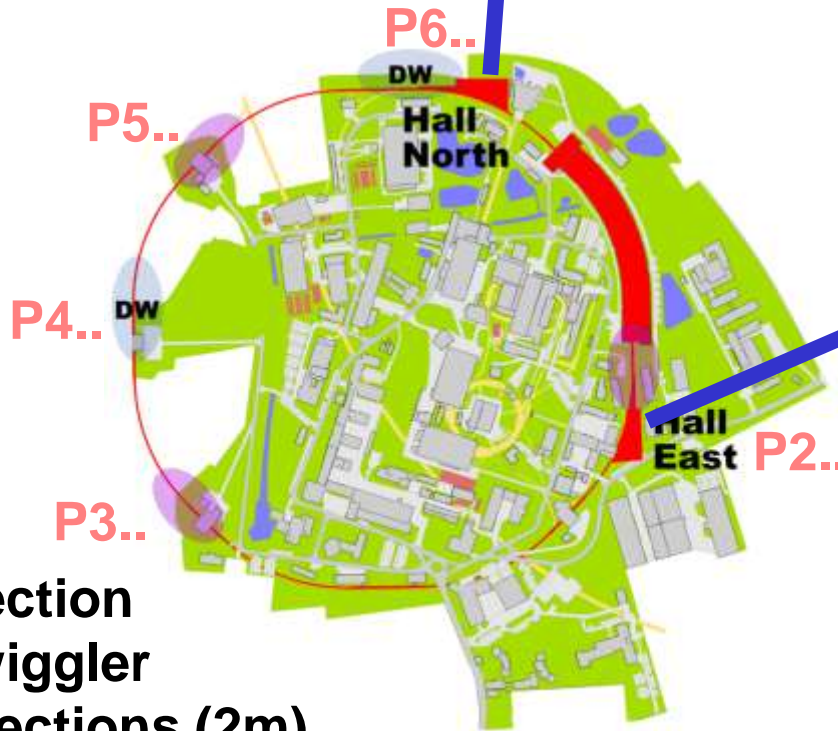
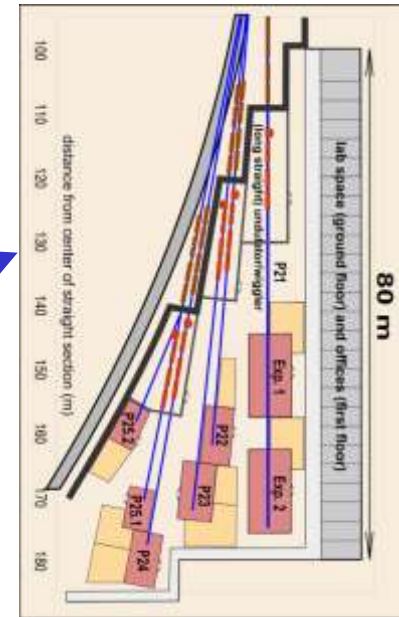
Hall North



North

- o damping wiggler straight (already present)
- o 4 new straight sections (2m) in the arc

Hall East

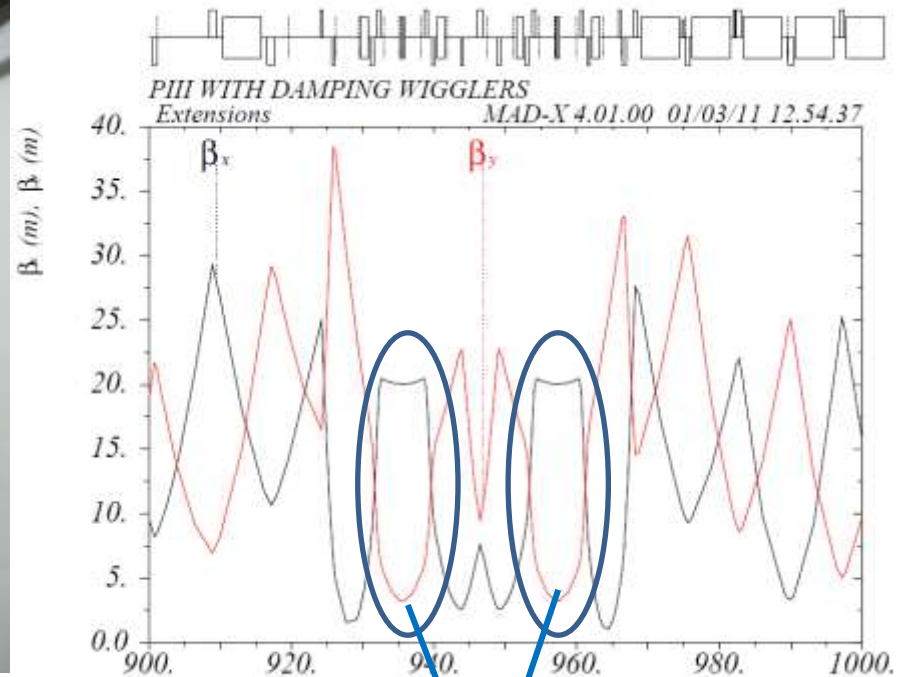


East

- o Long straight section for undulator / wiggler
- o 4 new straight sections (2m) in the arc



Current situation

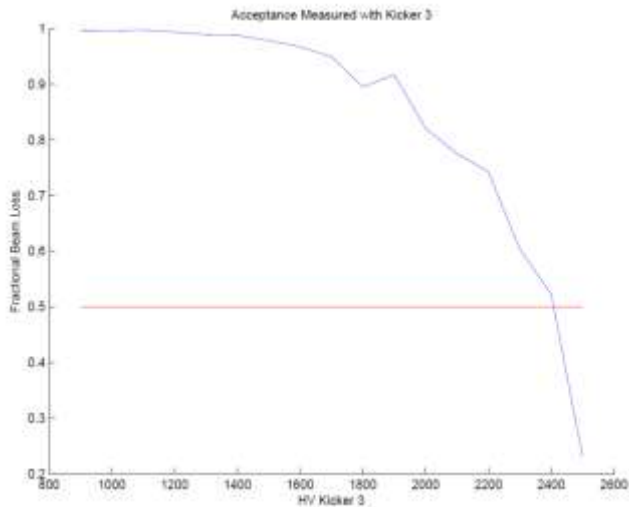


- Sextupoles have to be removed:
 - 10 SF and SD
 - Impact on off and on momentum aperture
- Impedance will increase
 - Impact on single bunch limit



PIII 140 Sextupole

On momentum

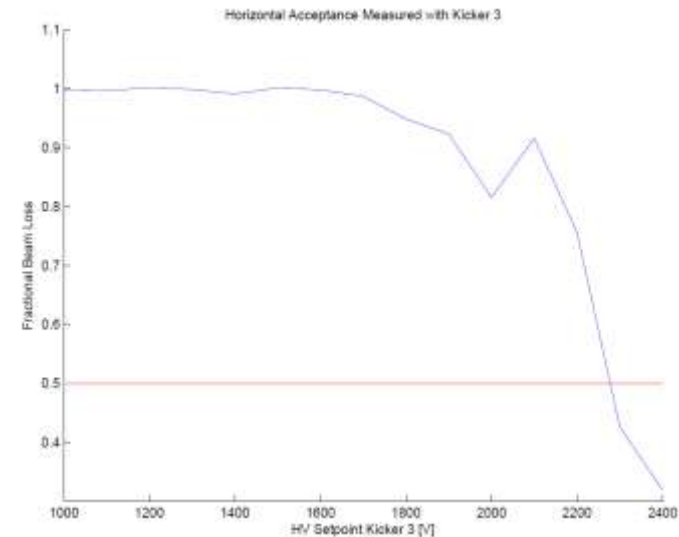


Ax= 25.3 mm mrad

Off momentum

Toushek lifetime
measurements: 1.6 %

PIII ,extension' 120 Sextupole



Ax= 22.8mm mrad

(expected from tracking 21 mm mrad)

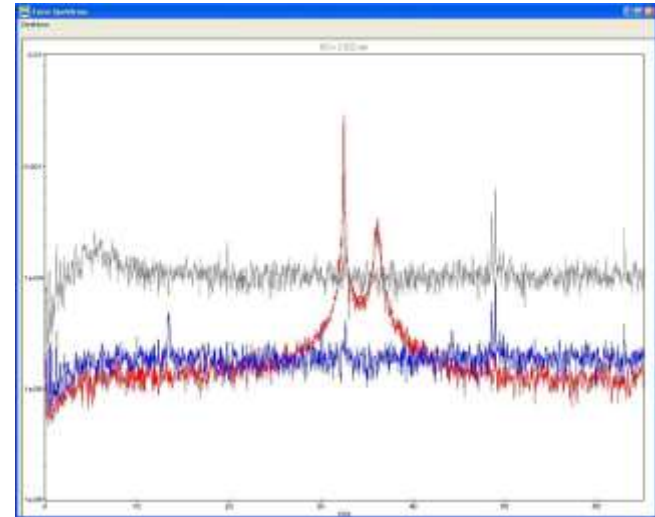
Toushek lifetime
measurements: 1.45 %

(expected from tracking 1.5 %)

Single bunch current limit

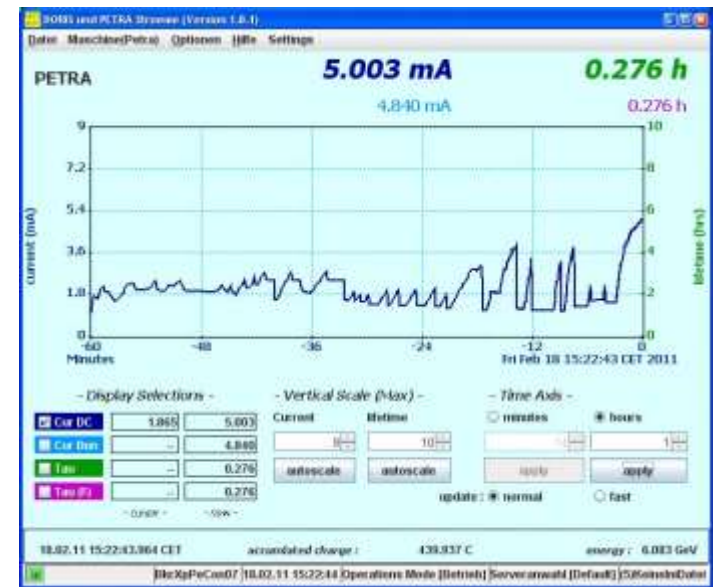


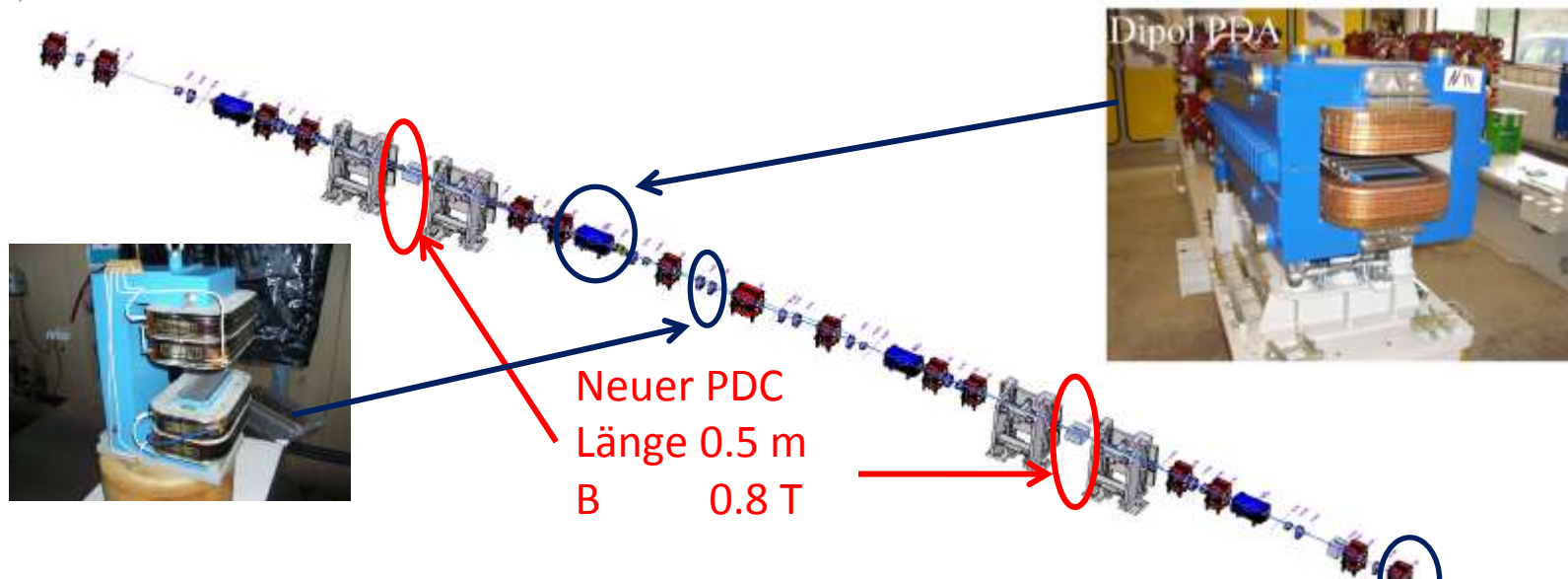
Without feedback single bunch current
Limited to 2.4 mA; probably limited by
Transverse mode coupling



With feedback and increased vertical
Chromaticity (+6) 5 mA could be stored
(intentionally limited to 5 mA in order not
To destroy BPM electronics!)

This is two times more than required and the
Impedance increase is less than a factor of two!!
40 bunch mode should be possible even after
P111 extension!





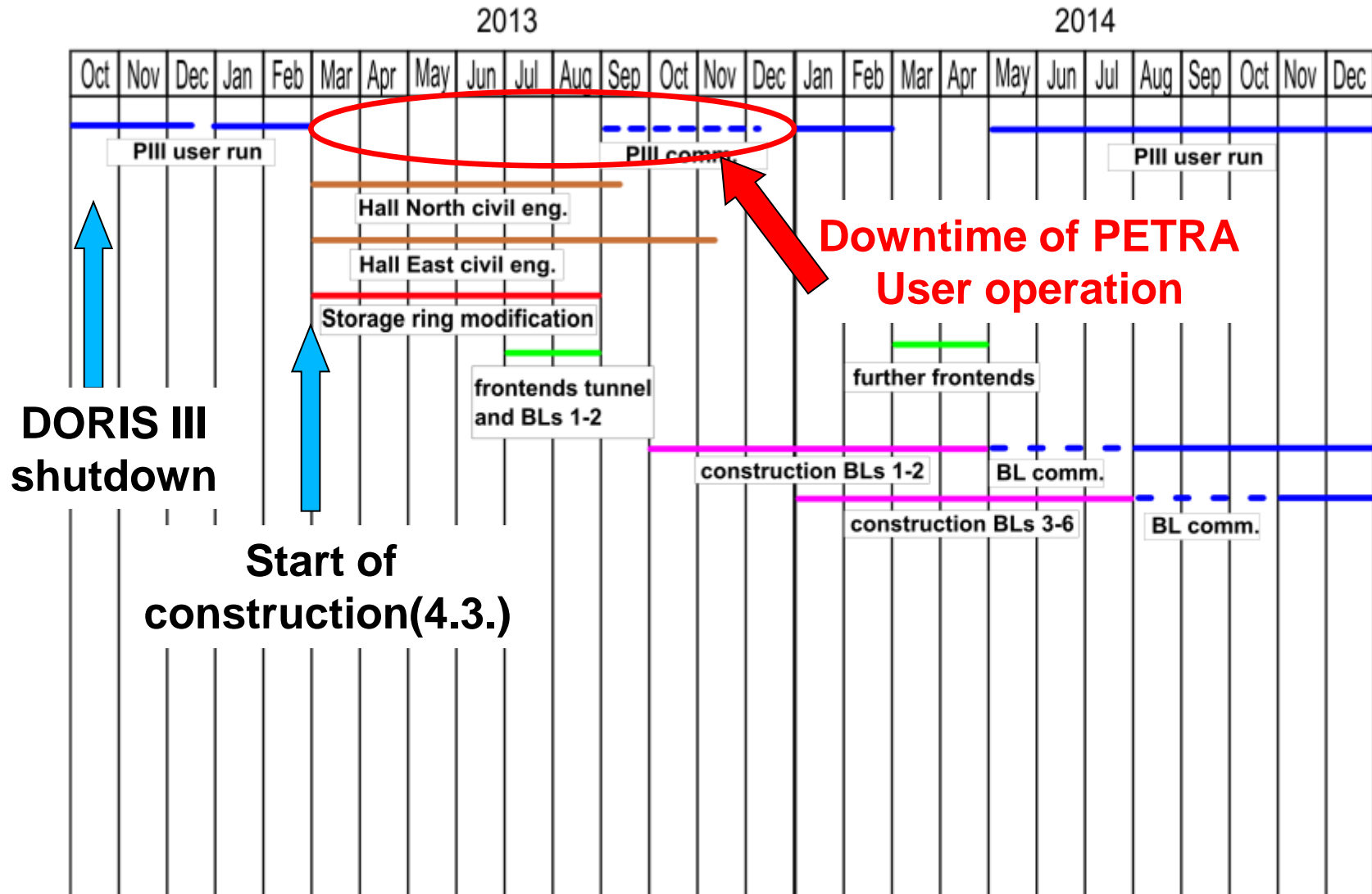
- Components identical with those of new octant
 - Magnets
 - Power supplies
 - BPM electronic and other diagnostics
- Simple concrete blocks as magnet supports

Work in progress

- New design of vacuum system necessary including outlet chambers
- Air-conditioning
- **Photon beam stability (see below)**



Schematic schedule (2013/2014)

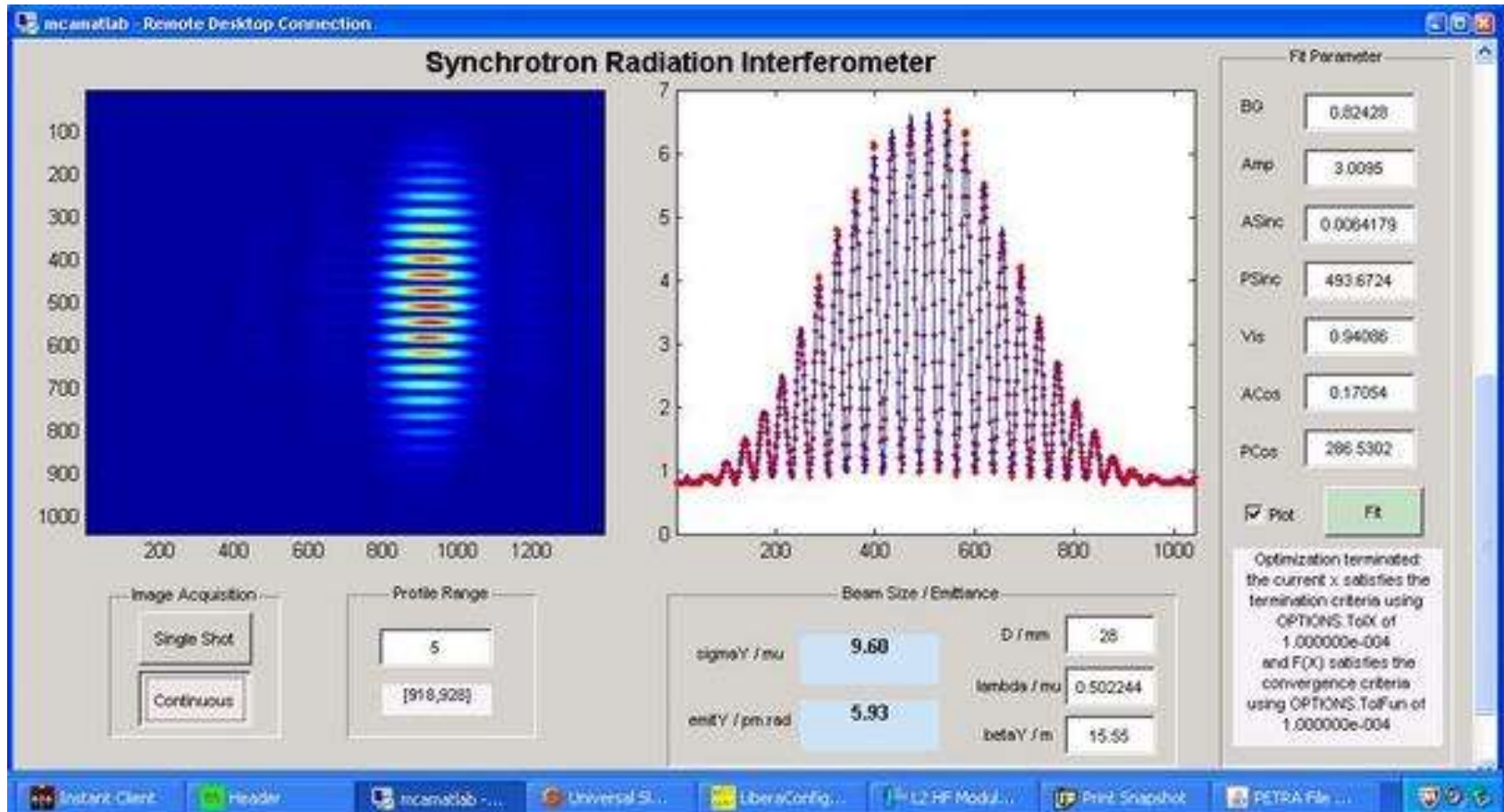


Summary

- Status PETRA III:
 - Accelerator parameters basically within specs
 - Availability slightly less than 95%
- PETRA III extension
 - Work in progress in particular
 - Design of vacuum chamber
 - Detailed layout of building and construction work
 - Beam stability

Thank you
for your attention

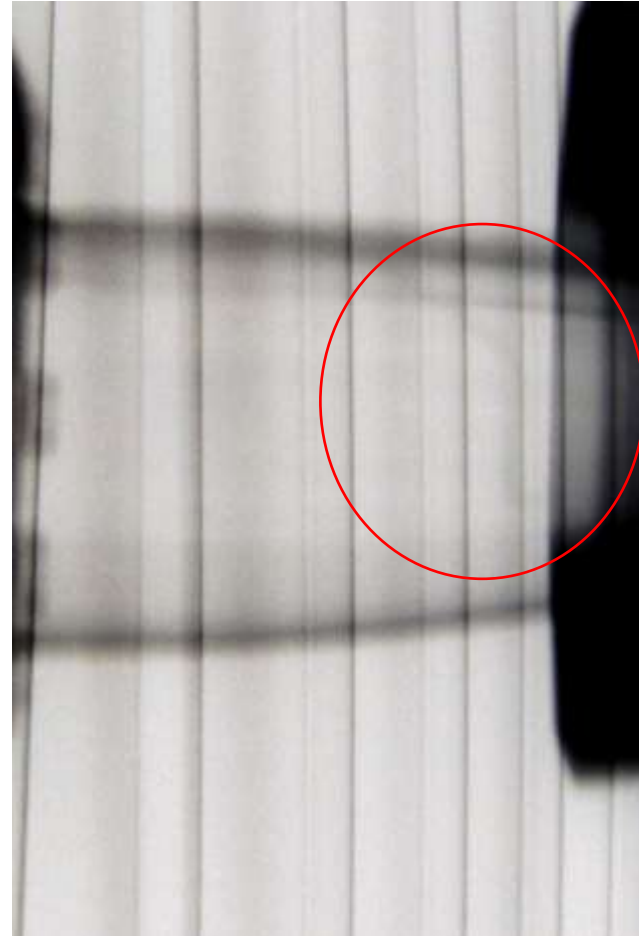
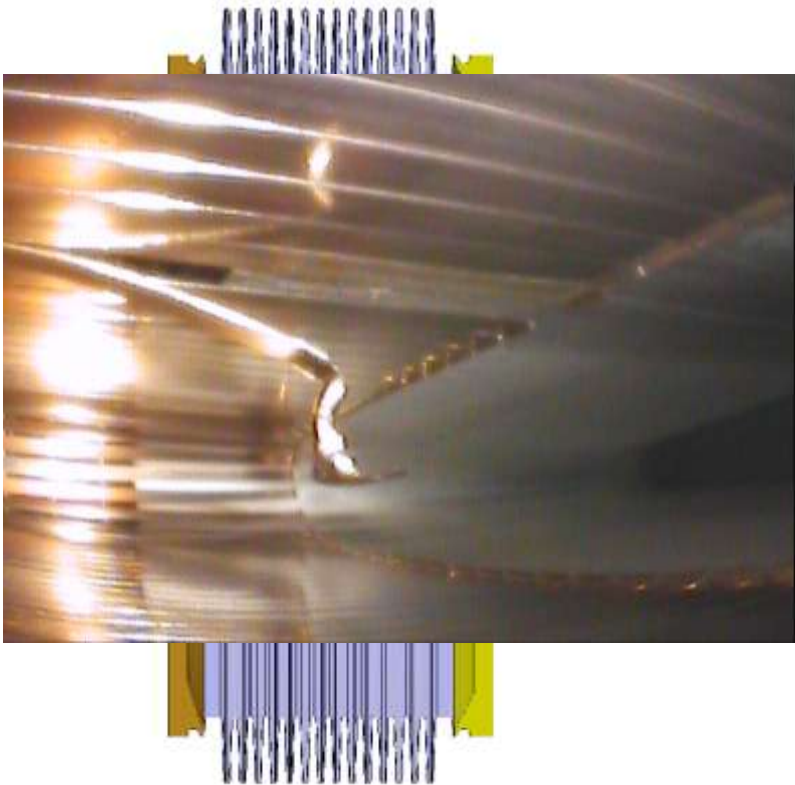
Vertical emittance



Technical Problems

- **Bellows:**

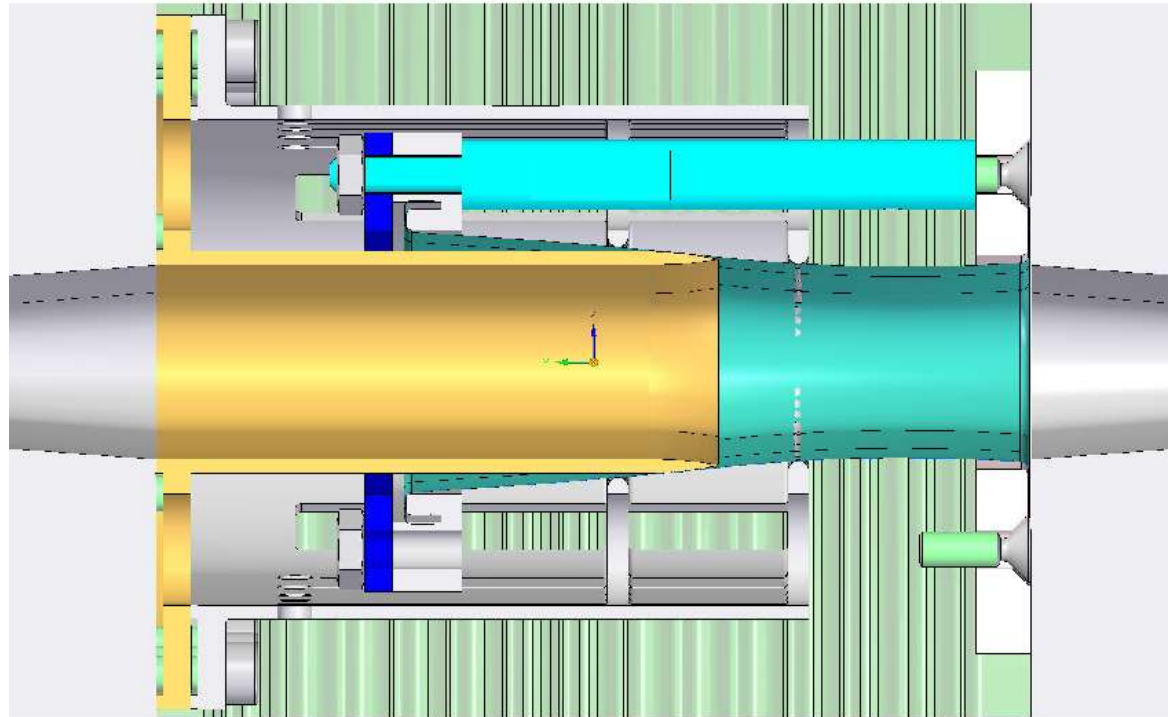
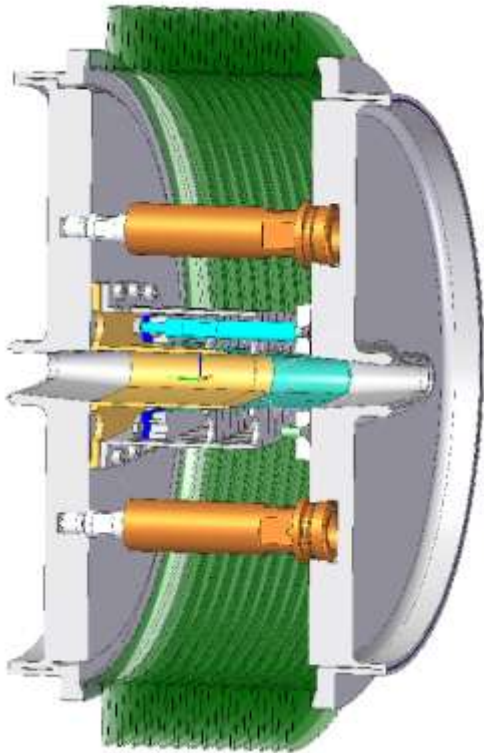
Another fault at 40 Bunches and 85 mA (afterwards: 80 mA).



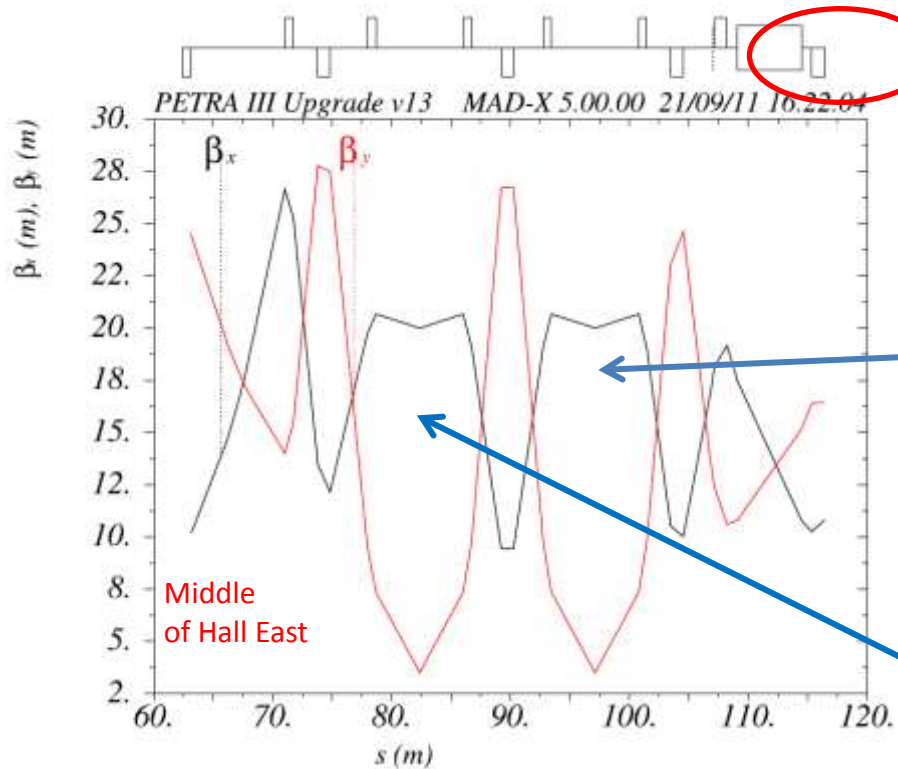
Technical Problems

- **Bellows:**

Quick repair, but we need a better design (prototype by Christmas):



Reconstruction of straight in the east



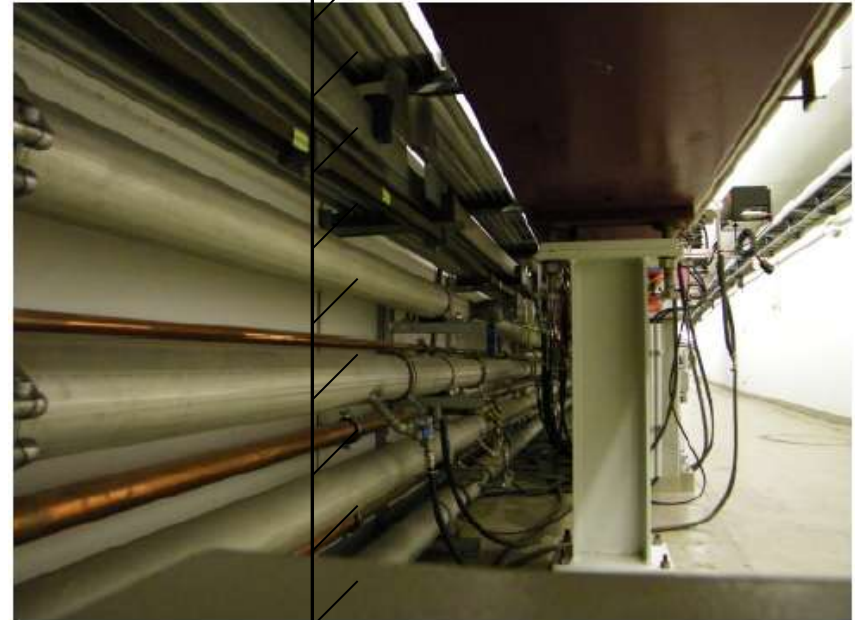
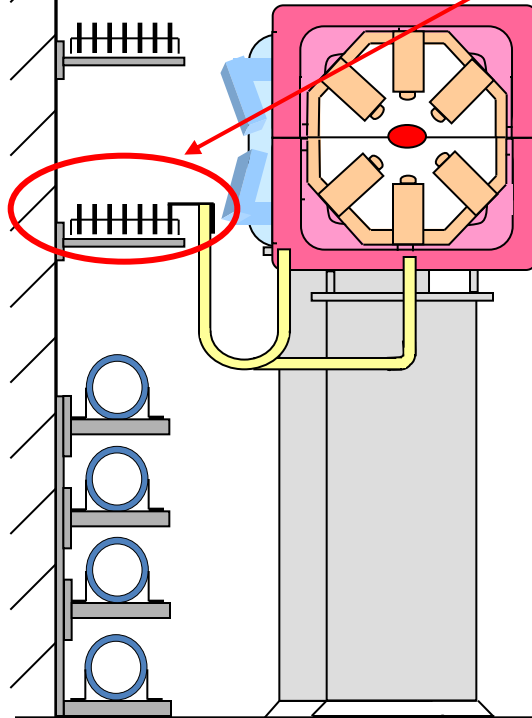
Required components

- Fast and conventional corrector magnets
- BPM's und Liberas
- HF Momos
- Power-Supplies
- Beam outlet
- Vacuum chamber similar to chamber of 10 m Undulator



Keep existing tunnel to accomplish extension
in a very short time

Some bus-bars have to be removed
To find space for beam outlets
Details under discussion



Cross section of PETRA Tunnel (not to scale)

Beam Stability



**According to measurements at comparable places
(slab of new octant wrt acc. tunnel NO):
 $\Delta h \leq 10 \mu\text{m}$ (vertical beam size 60 m behind source $\approx 100 \mu\text{m}$)**

