Status of ANKA

E.Huttel for the Machine and THz Group

ANKA (Status) Report:

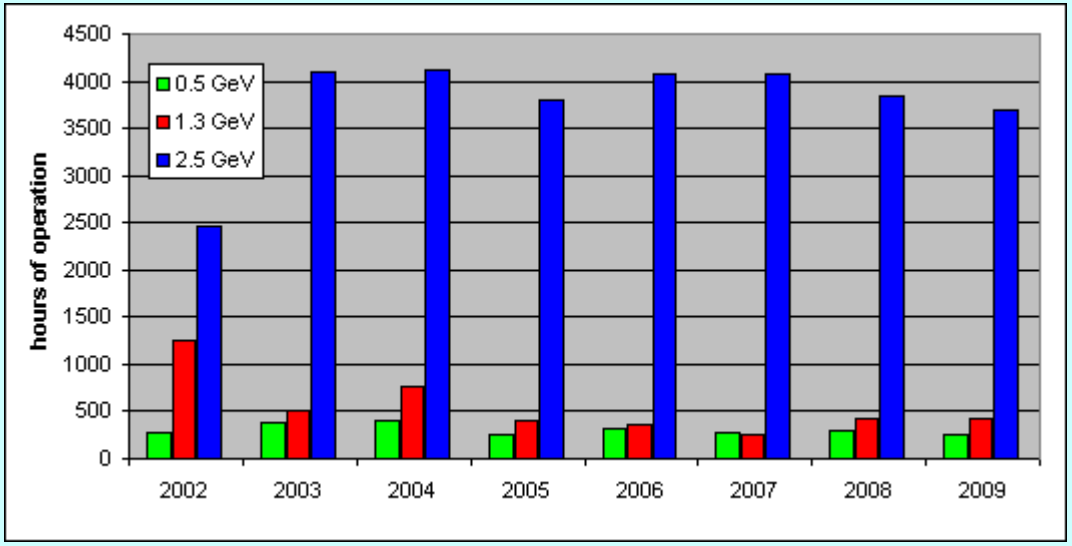
- Building extension /New beamlines
- New ‚beamline' for streak camera
- Bunch by Bunch Feedback
- Low alpha
- Control-System

Beam-Time-Calendar

	Apr 10				Mai 10				Jun 10				Jul 10				Aug 10				Sep 10			
			Shift				Shift				Shift				Shift				Shift				Shift	
Weekday	Day	Week	9-18	19-8	Day	Week	9-18	19-8	Day	Week	9-18	19-8	Day	Week	9-18	19-8	Day	Week	9-18	19-8	Day	Week	9-18	19-8
Mo		13				17				22				26				30				35		
Tu									1		UO8	UO8												
We									2		UO8	UO8									1		UO8	UO8
Th	1		NO	NO					3				1		UO	UO					2		UO8	UO8
Fr	2		NO	NO					4				2		UO	UO					3		UO8	UO8
Sa	3				1				5				3								4		UO8	UO8
Su	4				2				6				4				1				5		UO8	UO8
Mo	5	14	NO	NO	3	18	NO	St	7	23	NO	St	5	27	NO	St	2	31	NO	St	6	36	UO	UO
Tu	6		NO	NO	4		UO	UO	8		UO	UO	6		UO8	UO8	3		UO8	UO8	7		UO	UO
We	7		NO	NO	5		UO	UO	9		UO	UO	7		UO8	UO8	4		UO8	UO8	8		UO	UO
Th	8		NO	NO	6		UO	UO	10		UO	UO	8		UO8	UO8	5		UO8	UO8	9		UO	UO
Fr	9		NO	NO	7		UO8	UO8	11		UO	UO	9		UO8	UO8	6		UO8	UO8	10		UO	UO
Sa	10				8		UO8	UO8	12		UO	UO	10		UO8	UO8	7		UO8	UO8	11			
Su	11				9		UO8	UO8	13		UO	UO	11		UO8	UO8	8		UO8	UO8	12			
Mo	12	15	NO	NO	10	19	UO8	UO8	14	24	UO8	UO8	12	28	NO	NO	9	32	UO	UO	13	37	NO	UO
Tu	13		NO	NO	11		UO8	UO8	15		UO8	UO8	13		NO	NO	10		UO	UO	14		UO	UO
We	14		NO	NO	12		UO8	UO8	16		UO8	UO8	14		NO	NO	11		UO	UO	15		UO	UO
Th	15		NO	NO	13				17		UO8	UO8	15		NO	NO	12		UO	UO	16		UO	UO
Fr	16		NO	NO	14				18		UO8	UO8	16		NO	NO	13		UO	UO	17		UO	UO
Sa	17				15				19				17				14				18			
Su	18				16				20				18				15				19			
Mo	19	16	NO	MP	17	20	NO	MP	21	25	NO	MP	19	29	NO	MP	16	33	NO	MP	20	38	NO	MP
Tu	20		MP	MP	18		MP	MP	22		MP	MP	20		MP	MP	17		MP	MP	21		MP	MP
We	21		SUO	SUO	19		SUO	SUO	23		SUO	SUO	21		SUO	SUO	18		SUO	SUO	22		SUO	SUO
Th	22		SUO	SUO	20		SUO8		24		SUO	SUO	22		SUO8		19		SUO	SUO	23		SUO8	
Fr	23		SUO	SUO	21		SUO8		25		SUO	SUO	23		SUO8		20		SUO	SUO	24		SUO8	
Sa	24				22				26				24				21				25			
Su	25				23				27				25				22				26			
Mo	26	17	NO	UO	24	21			28	26	NO	UO	26	30	NO	UO	23	34	NO	UO	27	39	NO	NO
Tu	27		UO	UO	25		NO	St	29		UO	UO	27		UO	UO	24		UO	UO	28		NO	NO
We	28		UO	UO	26		UO	UO	30		UO	UO	28		UO	UO	25		UO	UO	29		NO	NO
Th	29		UO	UO	27		UO	UO					29		UO	UO	26		UO	UO	30		NO	NO
Fr	30		UO	UO	28		UO	UO					30		UO	UO	27		UO	UO				
Sa					29		UO	UO					31				28							
Su					30		UO	UO									29							
Mo					31	22	UO8	UO8									30	35	NO	St				
Tu																	31		UO8	UO8				

Yearly scheme: 4 x (10 weeks of operation 2 weeks shut down)
Monthly scheme: 2 weeks user operation +
1 week machine physics and special user operation +
1 week user operation
Daily scheme: 2 injections per day with 1 h

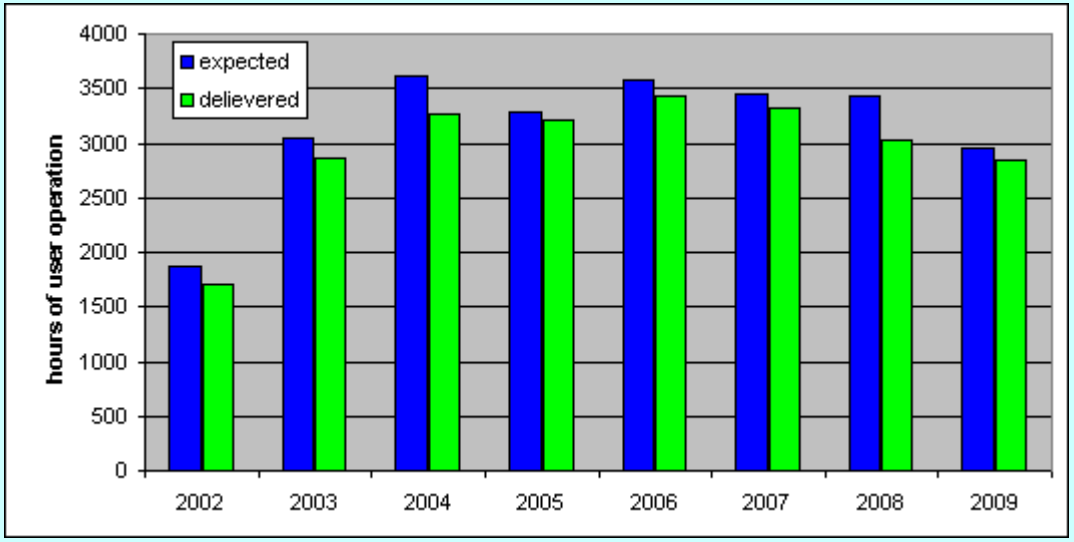
Operation-Statistics



4500 h per year

250 h at injection
450 h at 1.3 GeV
3800 h at 2.5 GeV

3300 h for user operation
95% availability

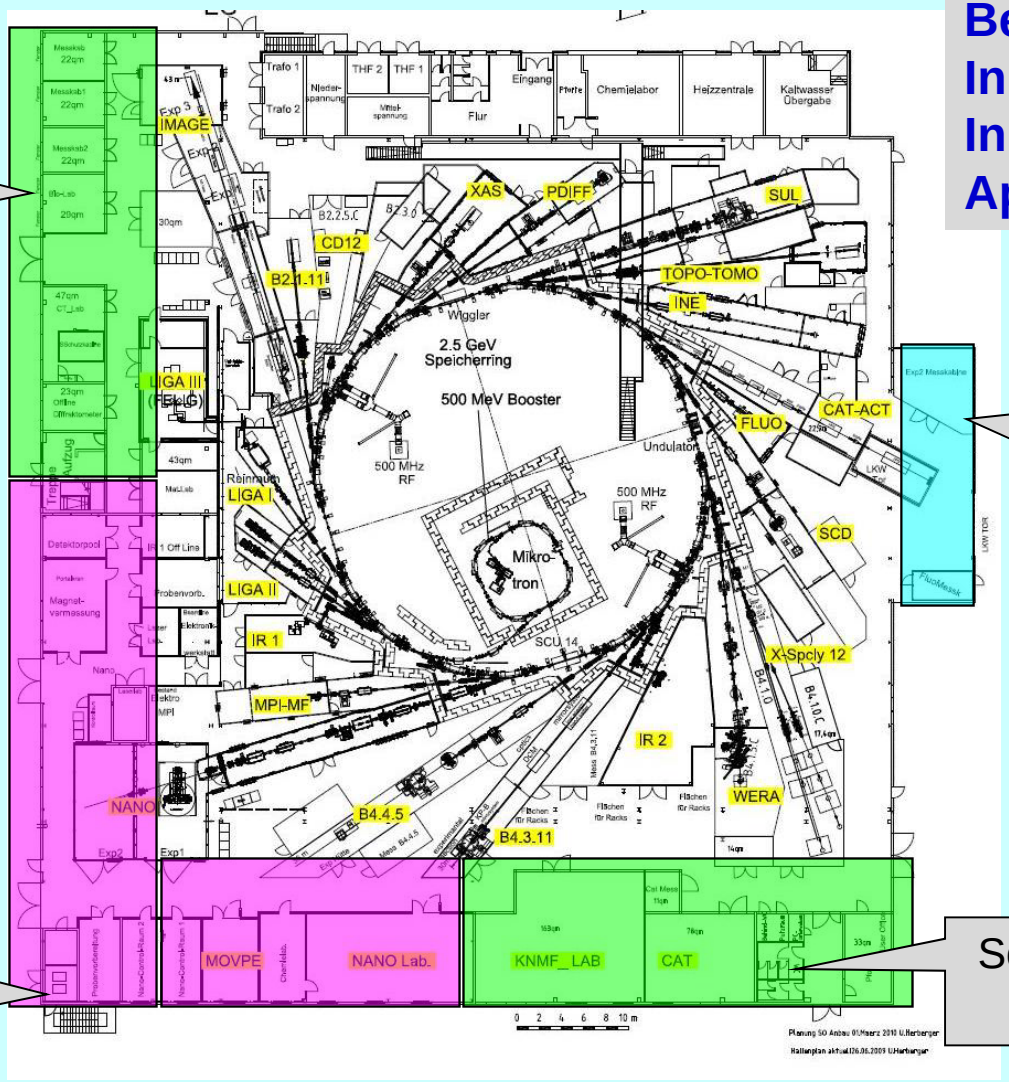


2008: Less availability due to e-gun vacuum leaks and longer start-up time (SUL-wiggler-AL-vac.-chamber)

2009: Less beam-time for built up of IRII and NANO Frontend

Building Extension

North West (2011)
Image-Beamline++



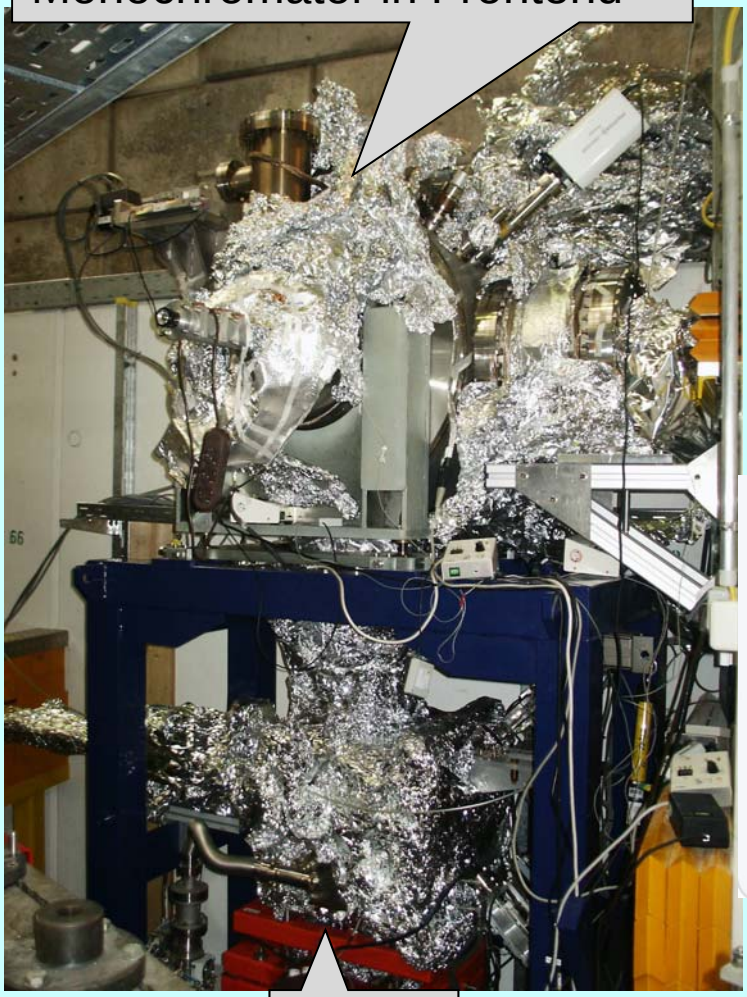
West (?)
CATACT

South West (2009)
Image-Beamline++

South-East (2011)
LABS

Beamlines
In operation: 17
In constr.: 1
Approved: 1

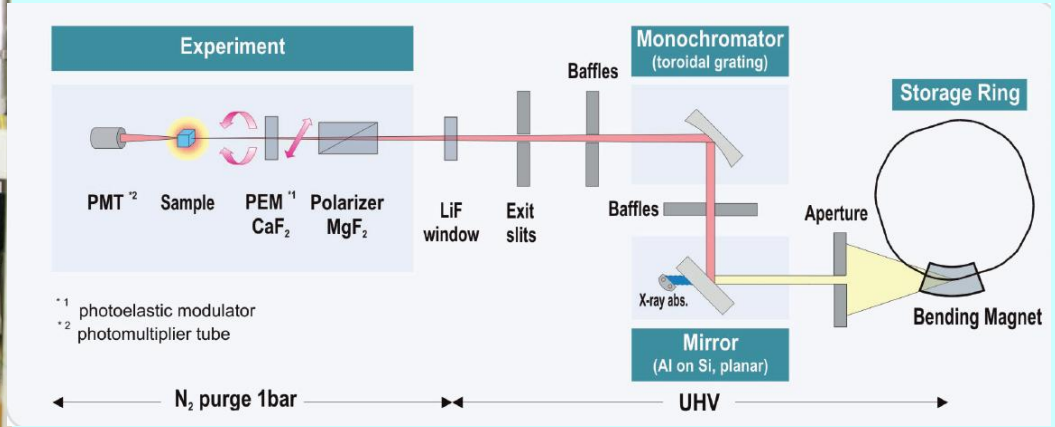
New Beamline in Operation UVCD



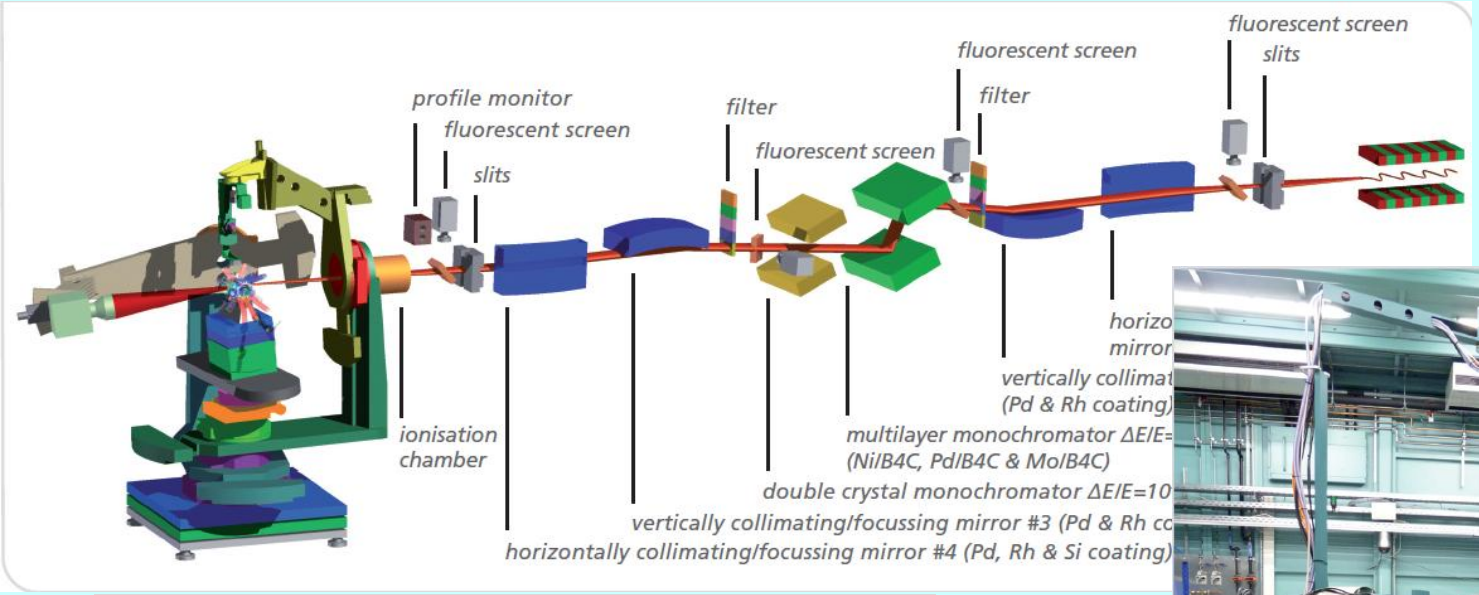
Ultra-Violet-Circular-Dichroism

Old Daresbury CD12 beamline

Protein Research



New Beamline in Operation: NANO



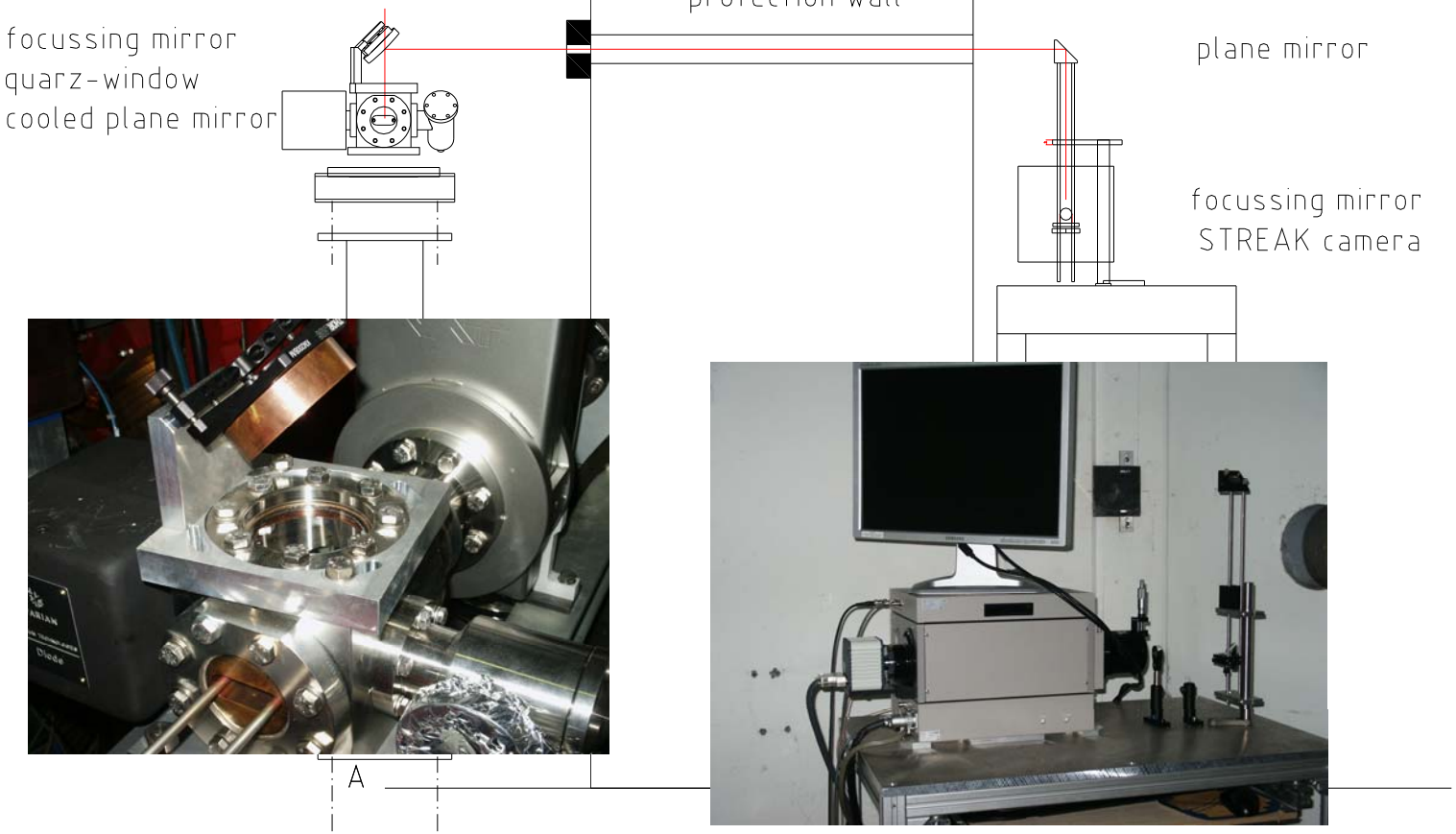
Surface –Science

Diffractometer for 500 kg load

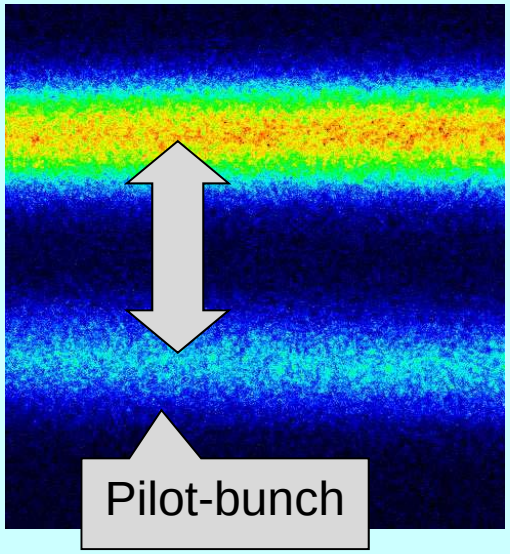
For mounting growth chambers

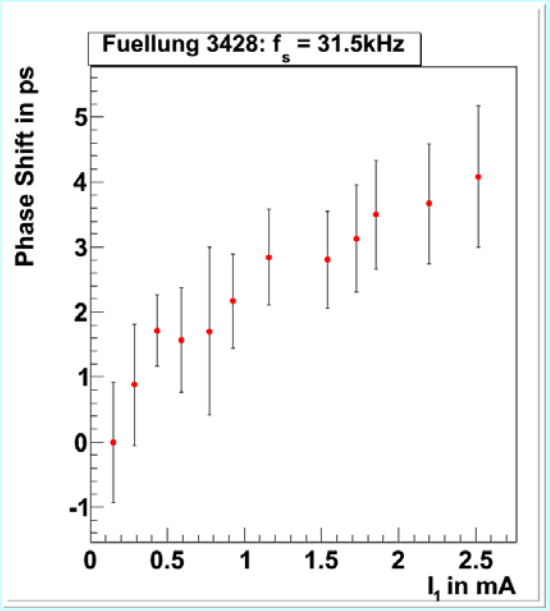
New Beamline for Streak Camera

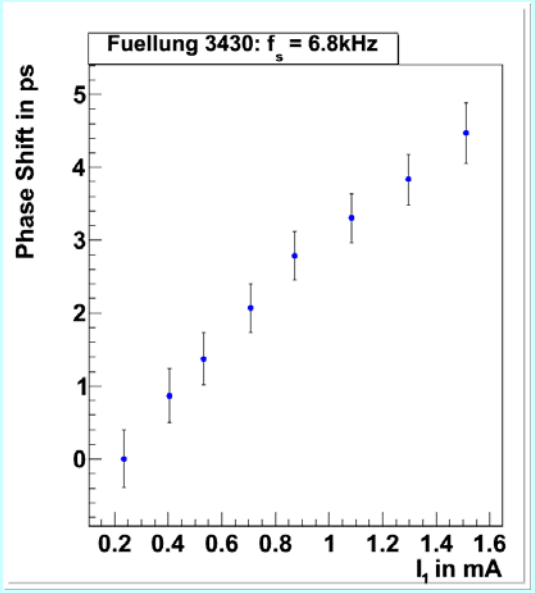
Get more flux compared to IR I
Independent of IR I use



Synchronous Phase-shift







Bunch length [mm]:	**5**	**1**
Phase shift [ps/m]:	**1**	**4**
		larger resistance

Pump-Probe at ANKA

Anton Blech:

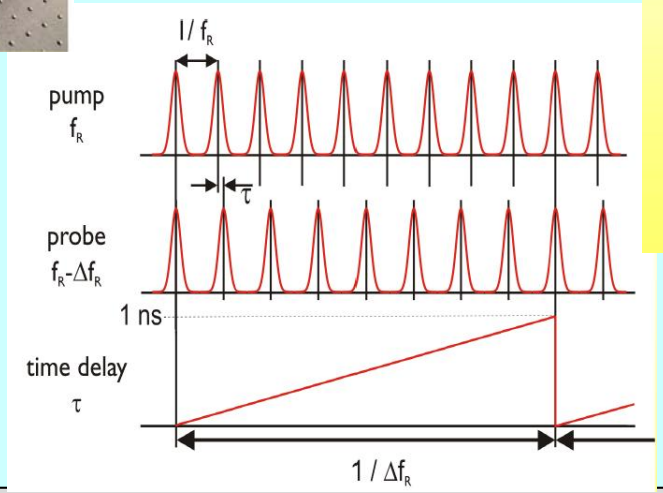
Excite/Pump Probe with fs laser

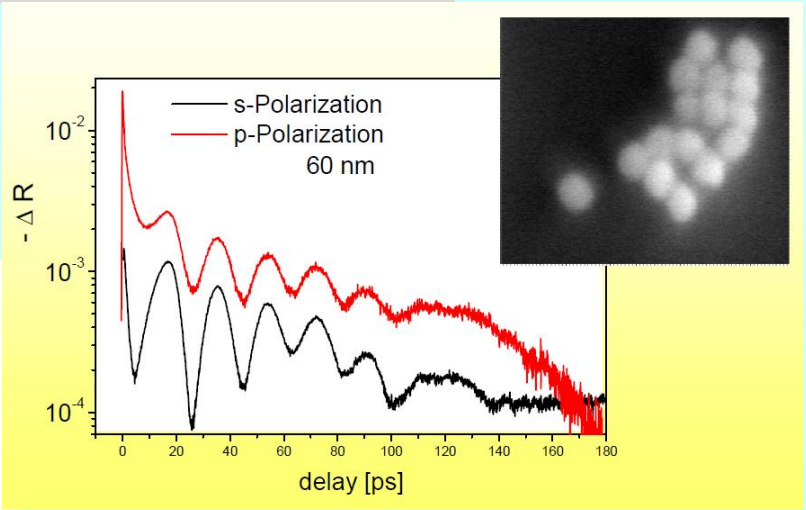
Probe with Synchrotron Radiation

Pump and Probe asynchron in phase

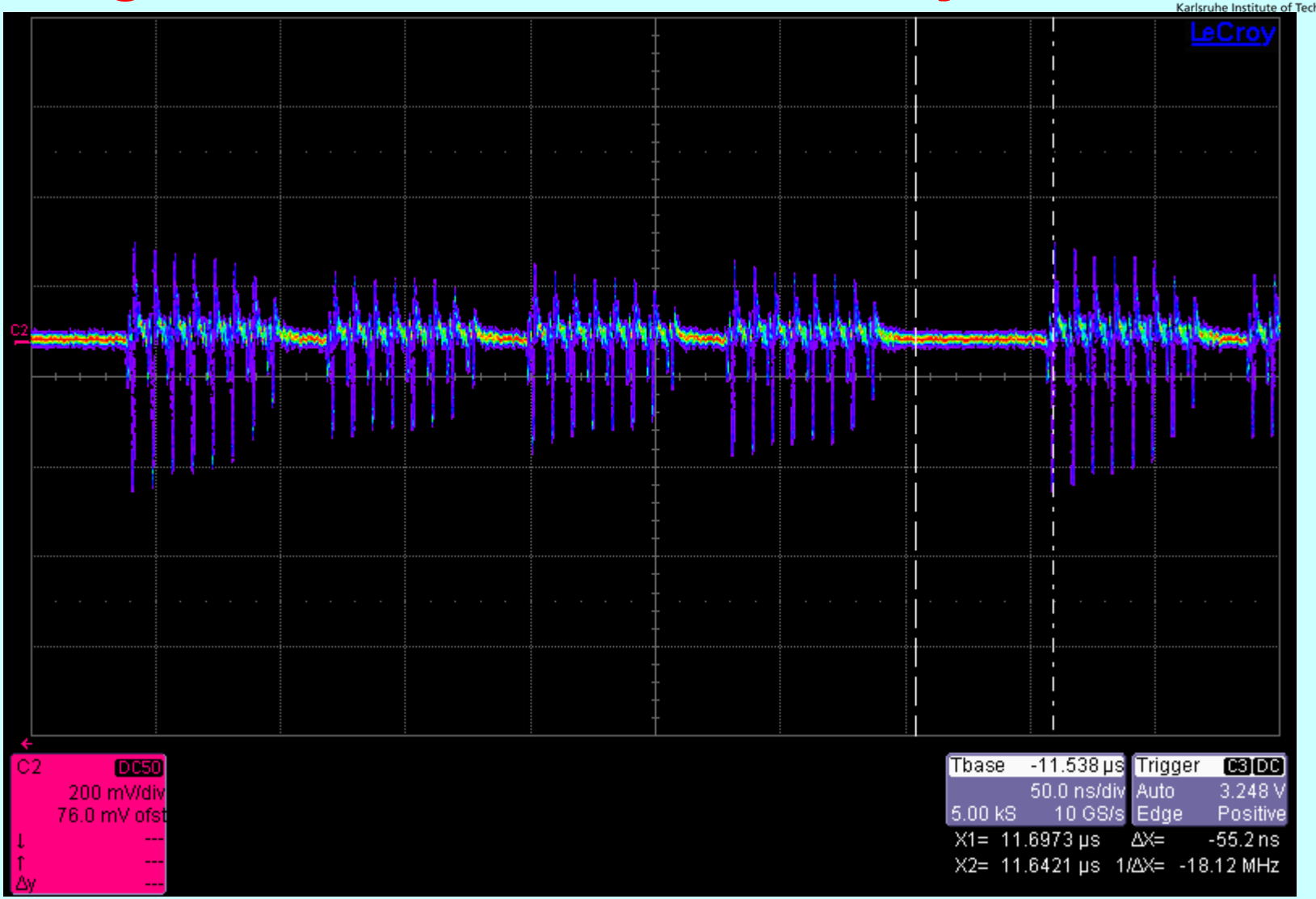
Study in time domain of ps

Storage ring operated in low alpha mode 1.6 GeV

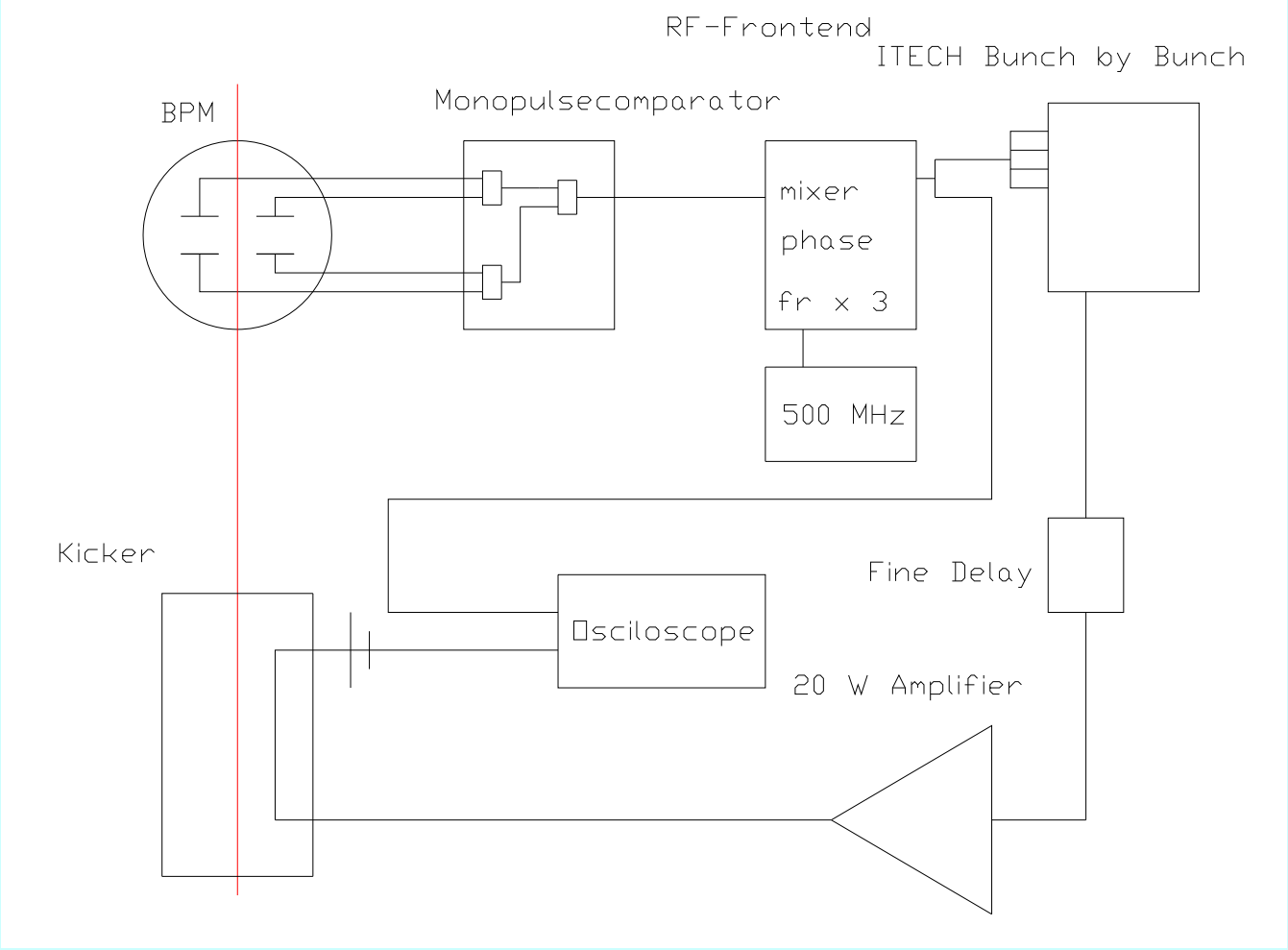




To Fight Multi-Bunch-Instability

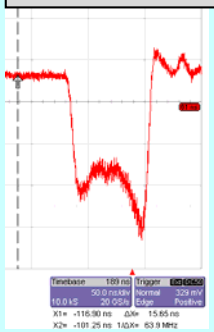


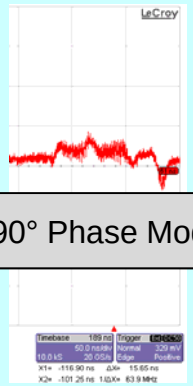
Bunch by Bunch Feedback



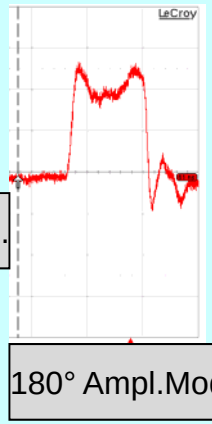
Bunch by Bunch Setup

0° Ampl.Mod.



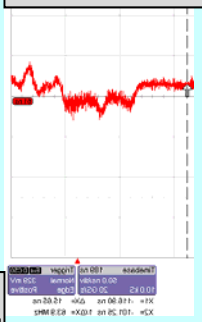


90° Phase Mod.



180° Ampl.Mod.

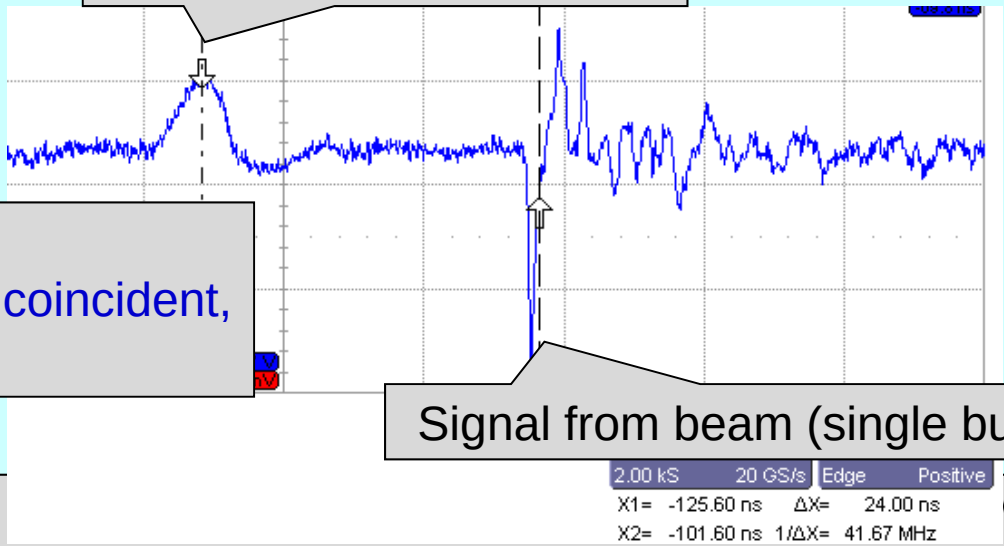
270° Phase Mod.



Phase RF-Frontend has to be set for:
Ampl.Mod. for betatron damping,
Phase.Mod.for synchrotron damping.

Problem:Phase different for 0.5 / 2.5 GeV

Signal from BbB amplifier



Signal from beam (single bunch)

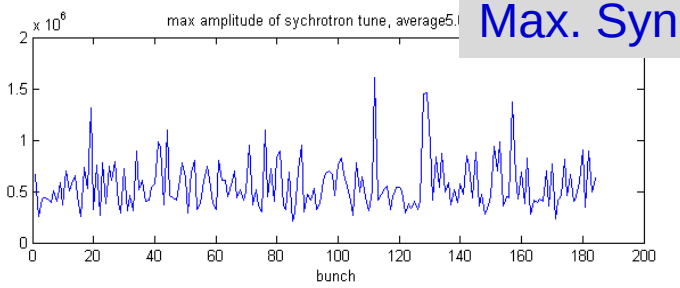
Timing to be set for:
e-bunch and kicker pulse to be coincident,
done with single bunch.

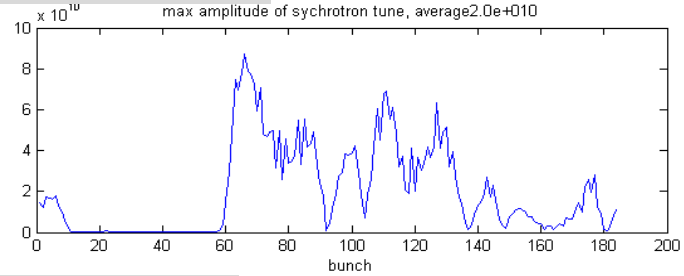
Instabilities

Vertical oscillations only

Vertical and longitudinal oscillations

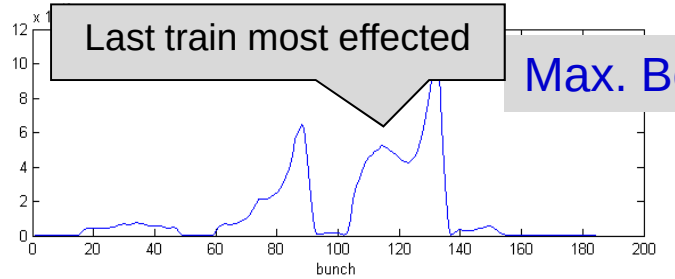
Max. Synchrotron Amplitude

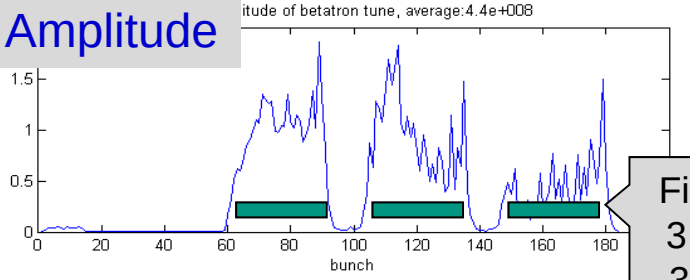




Last train most effected

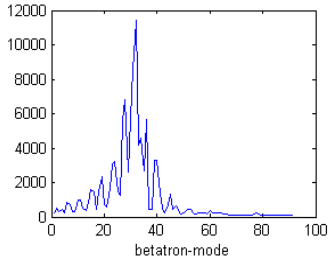
Max. Betatron Amplitude

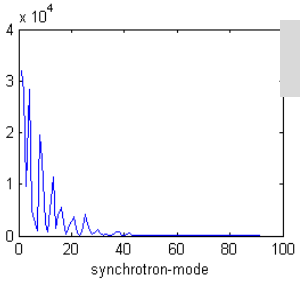


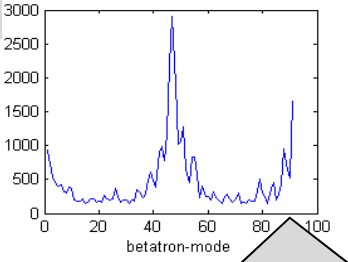


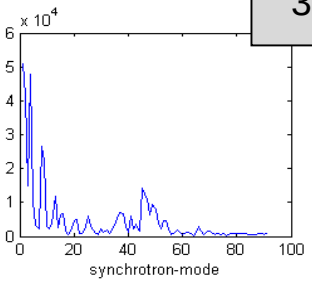
Fill structure:
3 trains with
33 bunches

Modes



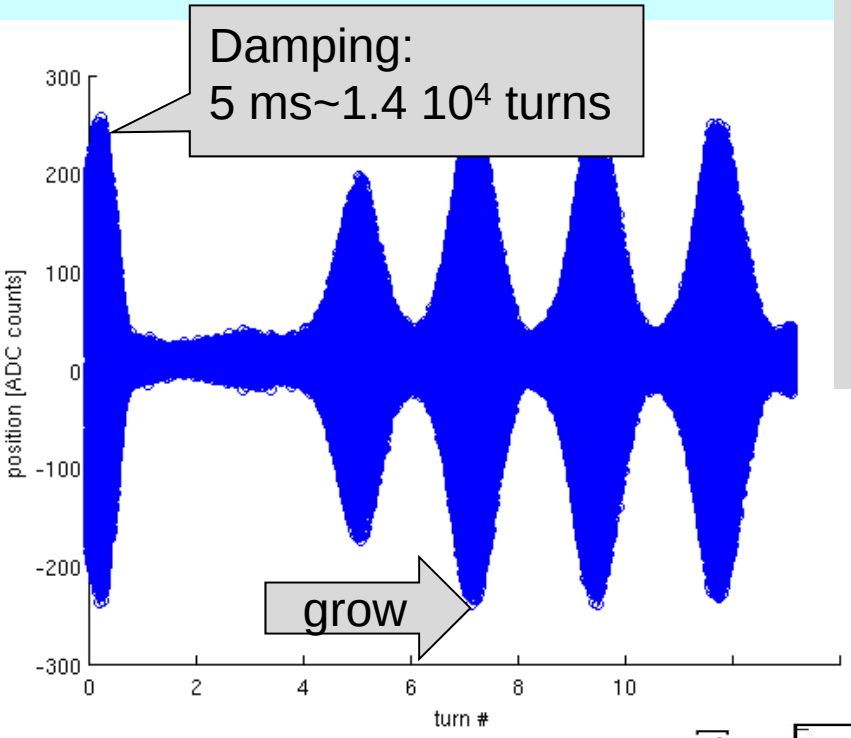






Mode 92 hard to damp,
needs 250 MHz

Grow-Damp



Feedback works at 2.5 GeV

(user operation)

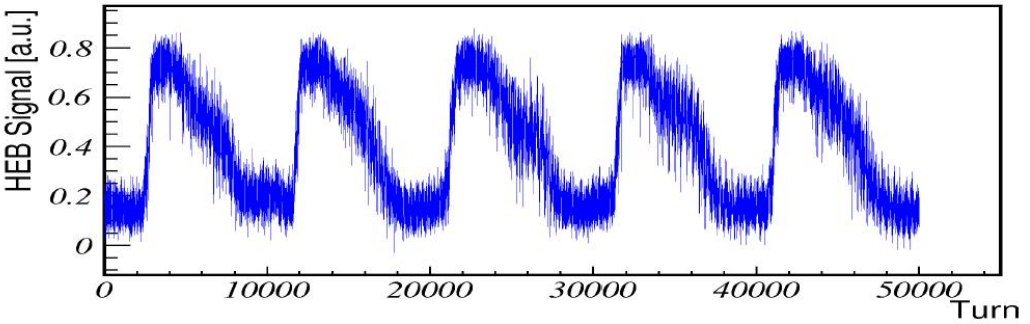
Problems at 0.5 GeV (Injection):

Phase RF Front-End

Long. Instabilities always present

100 Hz grow/damping oscillation

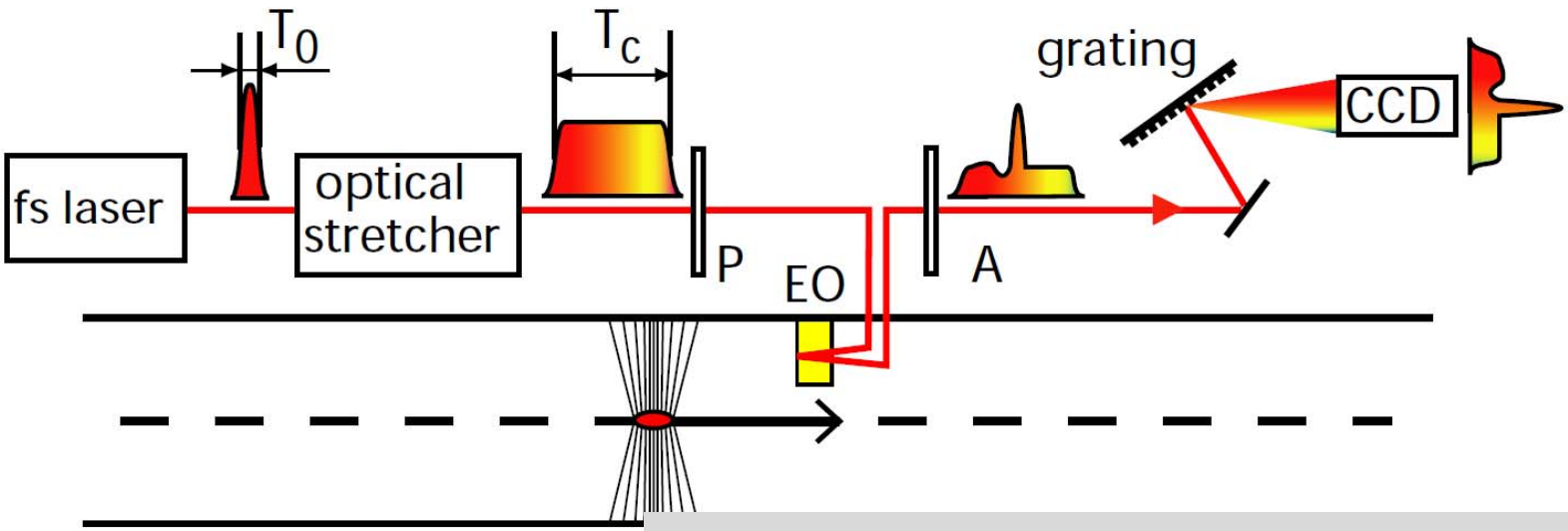
Also found in low-alpha experiment
CSR Bursting



Electro Optical Sampling (CSR)

Cooperation: KIT, TH Dortmond, TH Berlin, SLS
Phd Theses Nicole Hiller
Measure short e-bunch-length

B.Steffen,V.Schlott,F.Müller: DIPAC09

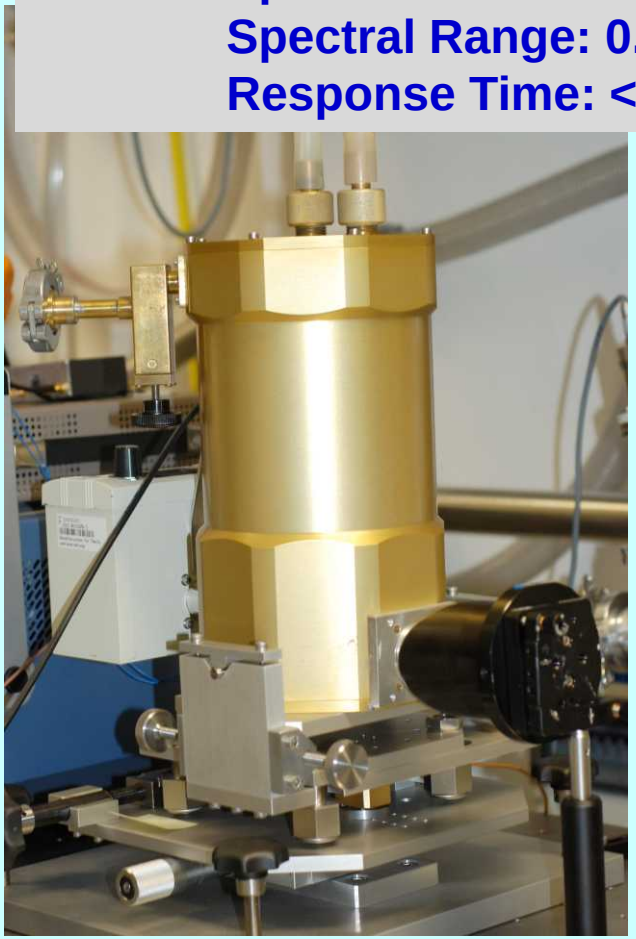


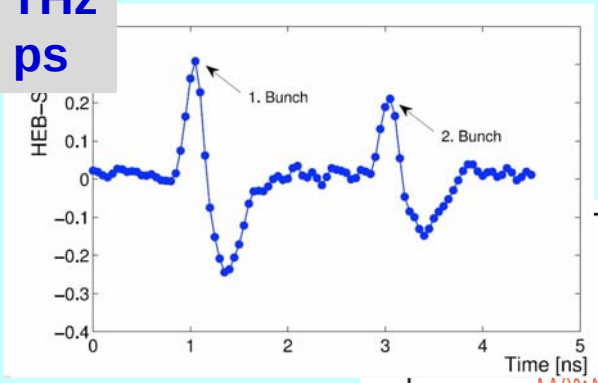
fs laser pulse is stretched (gratings), polarized, passing through elec.opt.crystal, e-pulse is changing polarization, laser pulse is analyzed, gives bunchlength

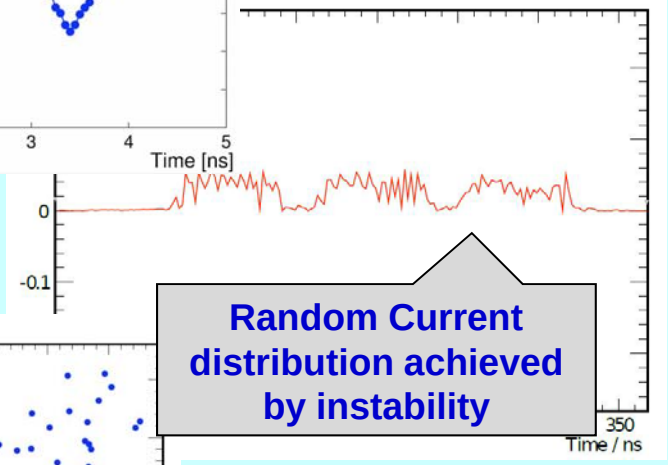
Hot Electron Bolometer (CSR)

Hot ElectronBolometer:
Development: IMS & DLR
Spectral Range: 0.1-3 THz
Response Time: <160 ps

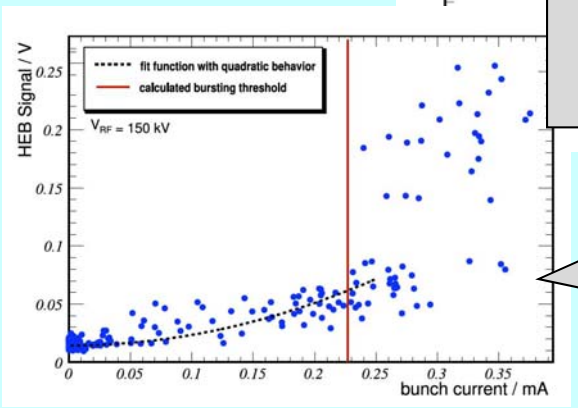
Vitali Judin diploma theses





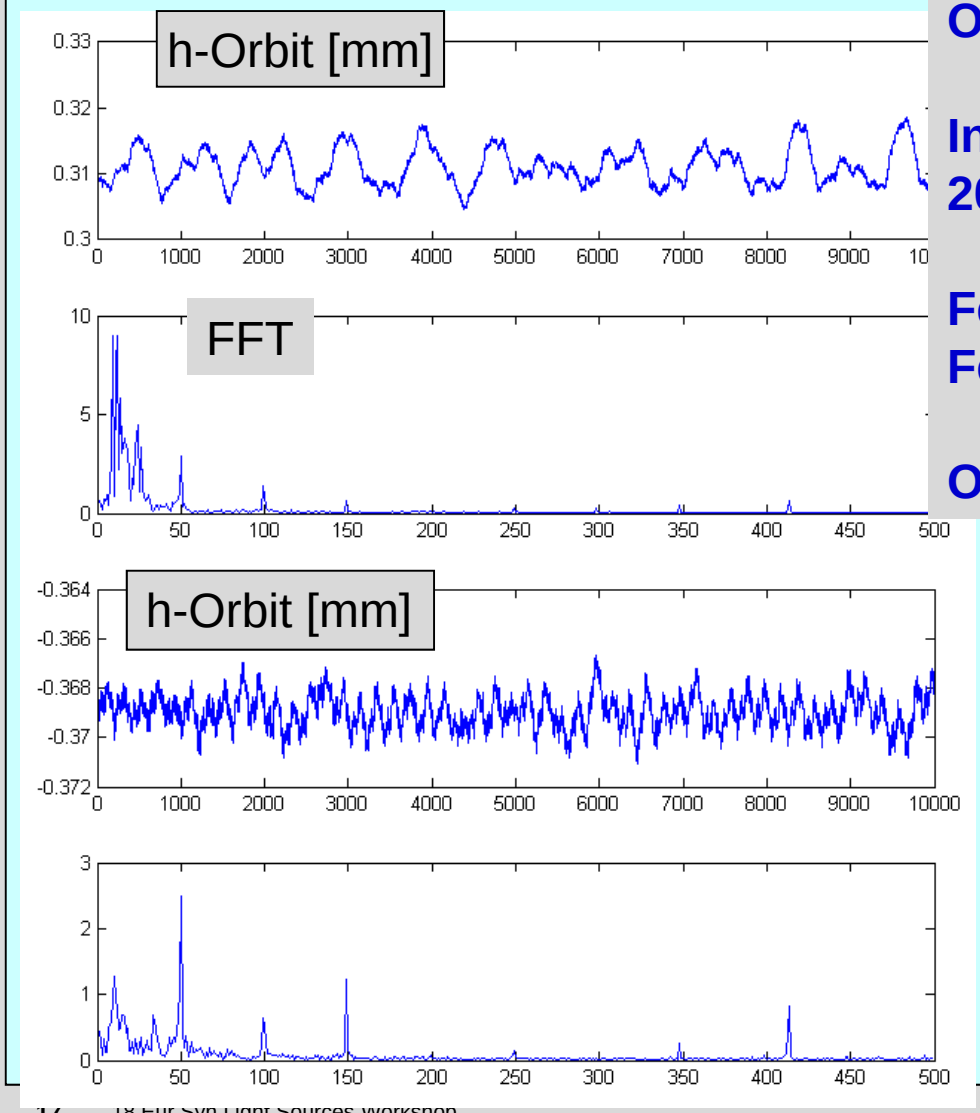


Random Current distribution achieved by instability



Analyze per bunch gives complete spectra

Fast Orbit Oscillations



Observe 10 Hz noise

Intend to install fast orbit feedback
20 Brilliance BPM Electronics acquired

Feasible with installed corrector PS?
Feasible with installed correctors??

Origin: roots pump 500 m away?

BPM Upgrade

Present System: 40 BPM from Development from Jülich
Multiplexed, µm precision for slow acquisition serial interface, (system is aging)

+ 2 BRILLIANCE

Upgrade: 20 BRILLANCE acquired,
use it in parallel to old system,
explore turn by turn and 10 kHz option,
replace all

Control-System-Status

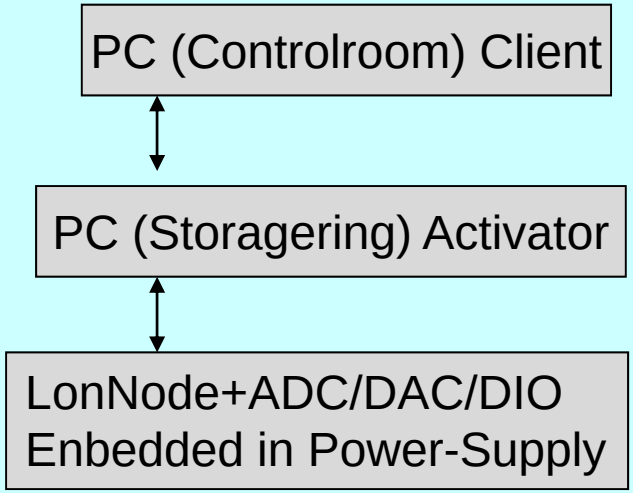
Software: ACS (COSYLAB)
unique at ANKA less reliable after upgrade

PVSS (SIEMENS) for PLC
Process Visualization Software

Hardware: LONBUS (US: building control)
DAC, ADC, RS232 card (COSYLAB)

PLC-S7

ACS becomes less reliable!
Being dependent from one manufacturer!
Hardware is aging!



Control-System Plans

Migrate from ACS

Go to PVSS/PLC/S7 if possible
done for RF, next vacuum

Next steps:

Evaluate EPICS/TANGO
integrate ITECH (BRILLIANCE),
then slow Power Supply,
then ramped Power Supply,
Which Hardware?
Preference for 'off shelf', NI?