

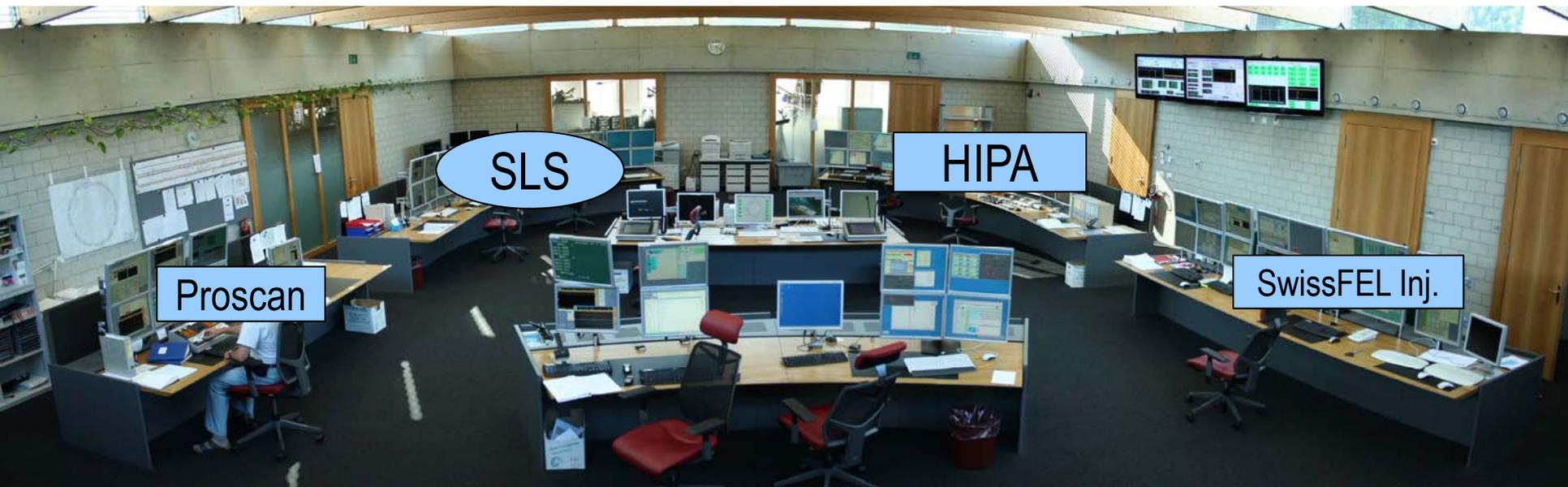


Wir schaffen Wissen – heute für morgen

Paul Scherrer Institut
Andreas Lüdeke

Status of the Swiss Light Source
at the 18th ESLS workshop at ELETTRA

PSI Large Research Facilities: how do we operate?



Proscan

HIPA

SLS

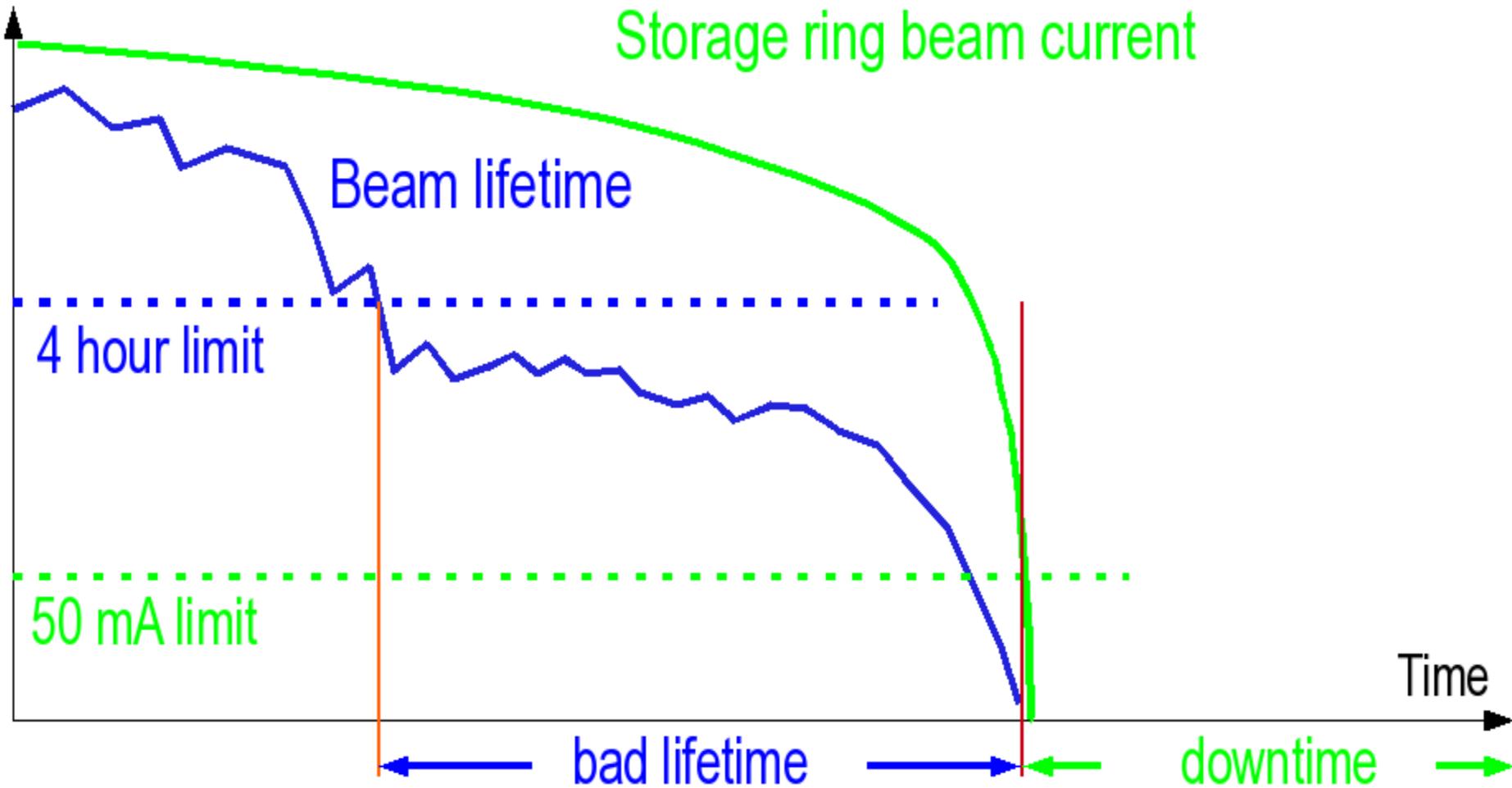
SwissFEL Injector

- Independent facilities, no common shutdowns → real 24/365 operation
- Section operation
 - 7 groups of 1 shift-leader + 2 operators
 - 3 “reserve” shift-leaders (incl. section leader & operation manager SLS)
- Shift duties
 - 7 week shift cycle
 - Operators are electricians, mechanics, etc.
 - Operators: 65% shift work / 35% other work
 - Operators stay (mainly) in control room
 - Participate in commissioning & physics studies
- Shift crew supported by on-call staff (15 people on-call for PSI)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
1. week	morning shifts						
2. week			normal				
3. week	evening shifts						
4. week			normal				
5. week	normal			night shifts			
6. week			normal				
7. week	night shifts						



Failure Analysis: what is a Failure?





- Defining *event types* by rules
 - Start “Downtime”: when beam-current $< 50 \text{ mA}$
 - Stop “Downtime”: when beam-current \geq nominal current
- Workflow
 - Automatic recording of *events*
 - Automatic creation of reference to *related data*
 - *Event browser* to analyse event
 - Assignment of *failure causes*
 - Automated failure statistics, weekly overviews, ...
- SLS data
 - In operation since 2006: currently seven event types, >1600 events
 - Documented rules \rightarrow clear metrics
- For details see PRST-AB EPAC'08 Special Edition:
 - A. Lüdeke: *The Operation Event Logging System of the SLS*

SLS Event Logging: Browser usage

Active logbook

Machine Shift Summaries

Entry date	Priority	Author
04/07/2008 06:00	N	-> Operator
04/07/2008 06:00		
Title		
04.Jul Früh, User Operation		
Logbook entry		
-8<		
Früh: Friday 04. July 2008 (Woche 27)		
Schichtcrew: Barchetti, Vonarburg, Facchetti		

User Operation

Ereignisse

- 08:35 Für P. Pollet kurz den Trigger ausgeschaltet (Untersu... Booster-Diagnostik)
- 09:05 Erneut Trigger abstellen müssen; Beamdrop bis 392r
- 09:20 P. Pollet MPCT Unit exchanged again and reinitialize long cables with shorter ones. MPCT seems to work stable. channel for MPCT doesn't work, controls group informed.
- 10:30 Strahlverlust, Wasserwächter ARIMA-QSB09. Info an (Kramer)
- 11:00 Wasserwächter in Ordnung; MPS resettet, Ring zu, R gezykelt und Injiziert.
- 11:25 sehr starke Moden beim longitudinalen MBFB, die na wieder selber verschwanden. 400mA TopUp. Gaps zu.
- 12:50 Mit Skew-Quads die Lebensdauer wieder auf ca. 7.4 nach dem Strahlverlust nur noch bei ca. 5.5 lag.

Im Alarmhandler überbrückt

- ACOSA-MPS-UPS:51_0_15_BL (EZehnder ist verständigt)
- WBGB Bay5 (Mäder) [bis Bay5 wieder Läuft]
- ARIDI-BPM-11SD:OFB-STAT(Mäder)

Bekannte Probleme

- Im FPF Number of Shots nicht höher als 5 stellen.
- Langzeitprobleme:
 - Ausfall ARIMA-B [06/02/2006 15:00 (AL) 06.Feb Spät, U
 - ARIRF-3HC-CST:TT815C, ARIDI-BPM 11SD defekt.
 - X05LA-LAFE-BS1:TC2 im Alarmhandler angezeigt löst aber keinen b

Show: No. 99 [Link](#)

10:27:21 Stop 04-Jul-2008,11:30:43 [Get Log](#) [Link abs](#)

Channel	Status	Severity	Value
1 to 3	show=all hide=none	show all	
2:21	ARIMA-WW-QSB09:ILOCK	STATE	MAJOR
			NOT OK
			NOT OK
			Off

Swiss Light Source

home/slsop/archiver-data/LT/index [Gnuplot src.](#) [760 Bytes] [Data file](#) [2.4 KB]

[Back to channel selection](#) [Print View](#)

Archive: LT Archive [Plot](#) [Export Matlab](#) [Export Excel](#) [Export Text](#)

Start Date: 04 Jul 2008 & Time: 10:27:21 today

End Date: 04 Jul 2008 & Time: 11:30:43 last 8 hours

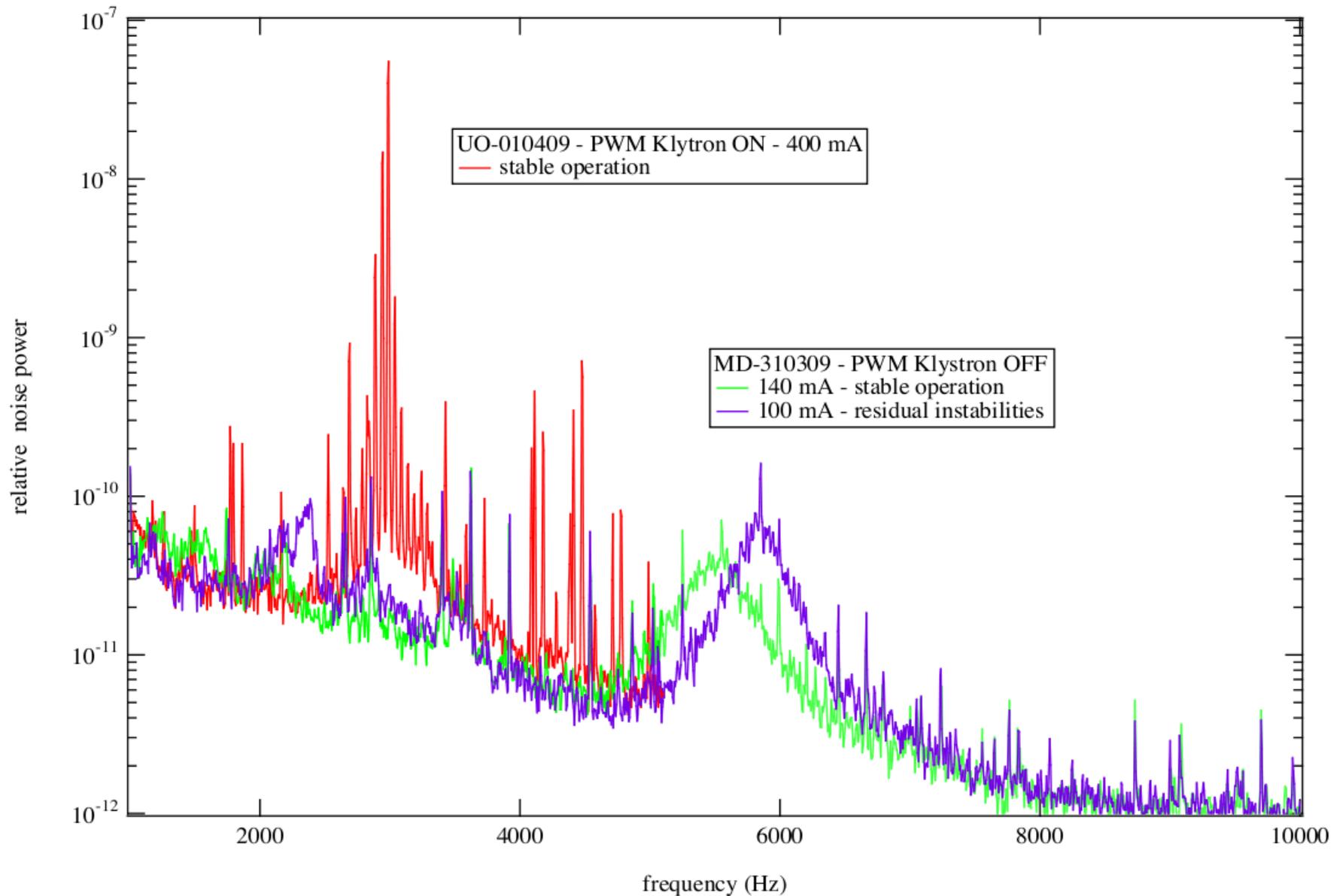
Options: Mean of 0 [s] Status No plot extrapolation Legend Channel

Y1 axis type: linear Min AUTO Max AUTO Plot every single point

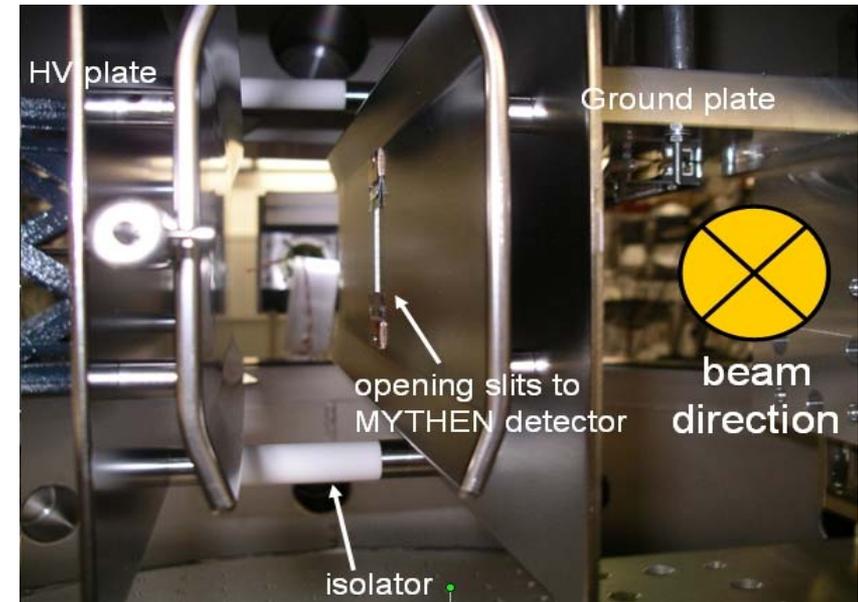
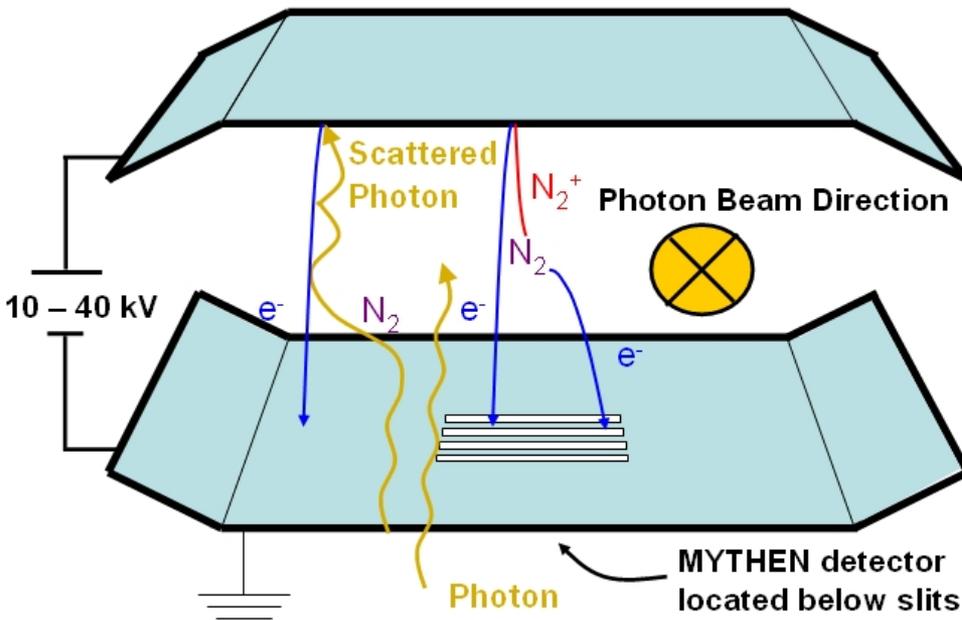
Option	Info
and large noise	Alarms
Now it has again and required GUN	Archiver OP
	Shift protocol
t ARIMA	Alarms
lock due to mit. Limit	Archiver OP
t.	Shift protocol

Contact: Andreas Lüdeke

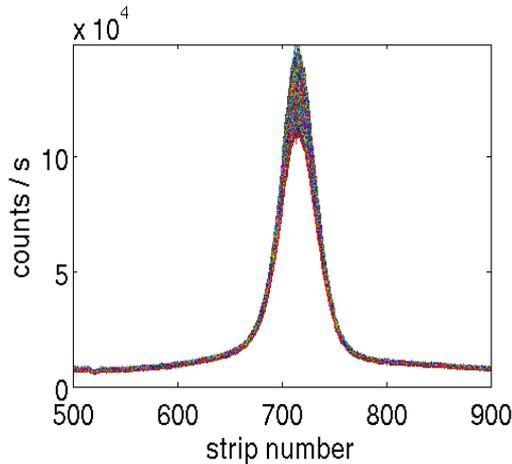
SLS Infrared Beamline: Noise Reduction



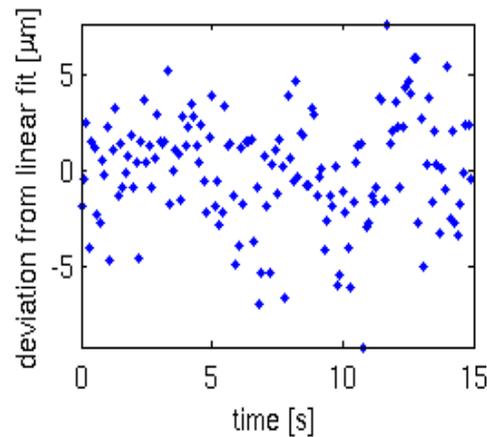
Residual Gas Photon Monitor Development



Photon Beam Profile



Photon Beam Position



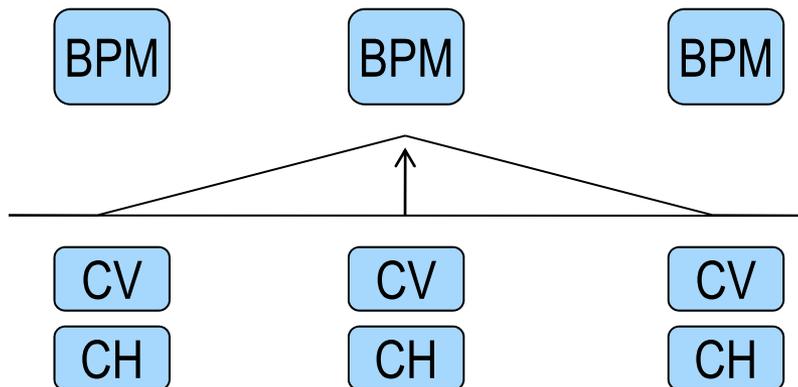
Preliminary Results from SLS

- position resolution:
 $\Delta x, y_{\text{ph}} = 2.9 \mu\text{m}$ (rms)
- profile resolution:
 $\sigma_{\text{ph}} = 4.4 \mu\text{m}$

Resolutions obtained for:

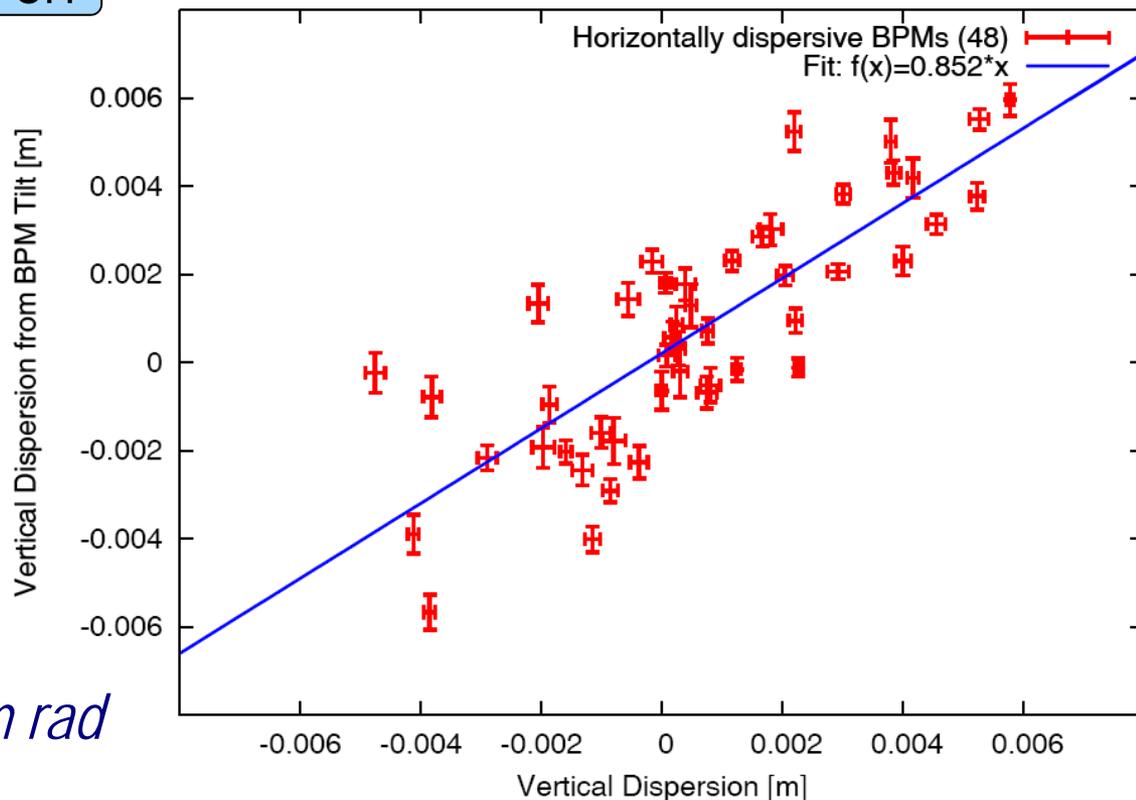
- photo- e^- @ 17 kV, 3.3 pbar N_2 , 100 ms integration time

SLS Coupling Correction



Vertical orbit reference bump

- Vertical displacement
 - Horizontal correctors used!
- Two possibilities
 - Tilt of correctors
 - Tilt of BPM
- If BPM \rightarrow dispersion
- Using tilt correction now
- Coupling reduced to $2 \text{ } \mu\text{m rad}$

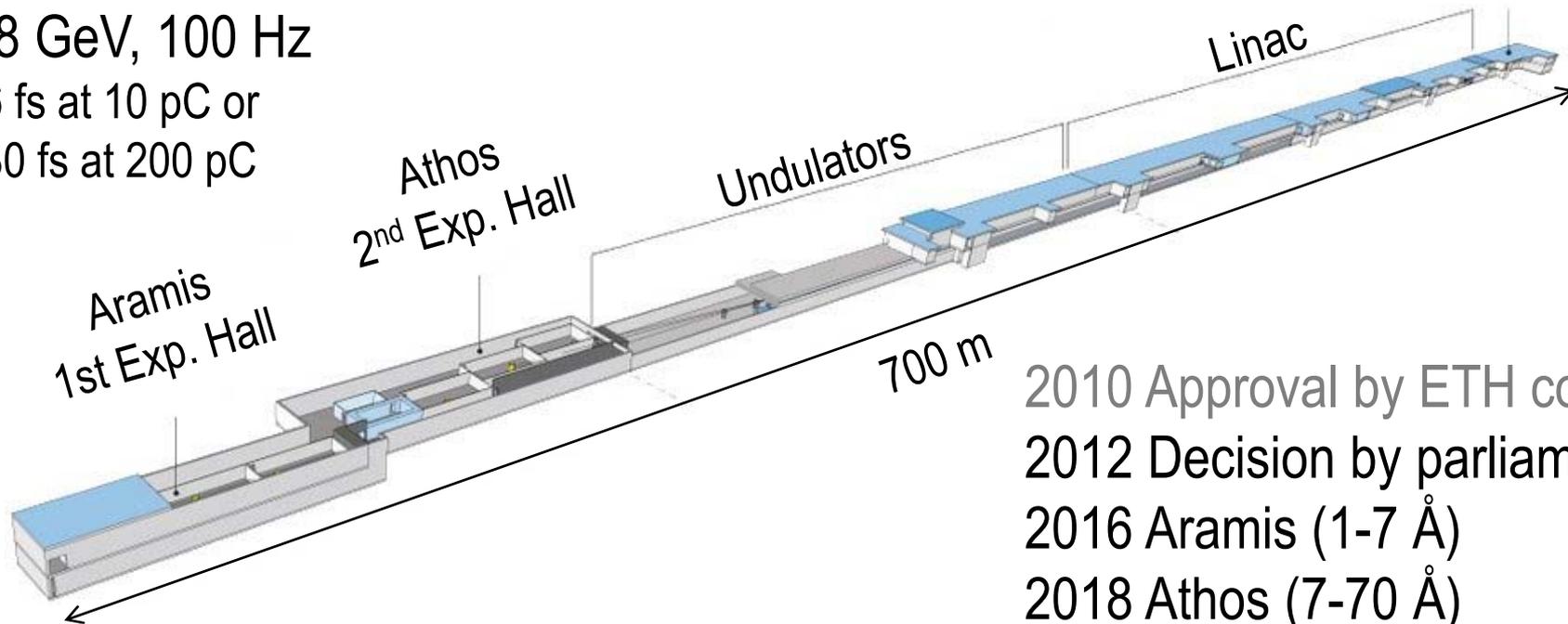


- **First 3rd generation light source without a wiggler**
 - Last wiggler (W61) removed, donated to Sesame
 - New undulator (CPMU14) will be installed in January
- **Installation of new scraper**
 - New vertical aperture limitation, impedance optimized
 - Protects in-vacuum insertion devices
- **RF upgrade: coincidence arc detection**
 - Until now about 20 arcs per year
 - No arcs at upgraded RF station anymore since April
- **Electro-optical measurement of FEMTO sliced bunch using CSR**
- **Collaboration with CERN, Maxlab and Frascati on damping ring studies**
 - Project in TIARA framework, starts next year
 - Further push SLS coupling beyond 0.05% or $\varepsilon_y < 2 \text{ pm rad}$
 - Create a test-bed for damping ring studies

PSI Large Research Facilities: future plans



- 5.8 GeV, 100 Hz
 - 6 fs at 10 pC or
 - 30 fs at 200 pC



2010 Approval by ETH council
 2012 Decision by parliament
 2016 Aramis (1-7 Å)
 2018 Athos (7-70 Å)