PAUL SCHERRER INSTITUT

PSI

Christopher Arrell:: Bernina :: Paul Scherrer Institut

PSD diagnostics overview

SwissFEL Performance Workshop – January 2022

Outline

- Device updates
- Beamline changes/upgrades 2022
- Online data processing requirements

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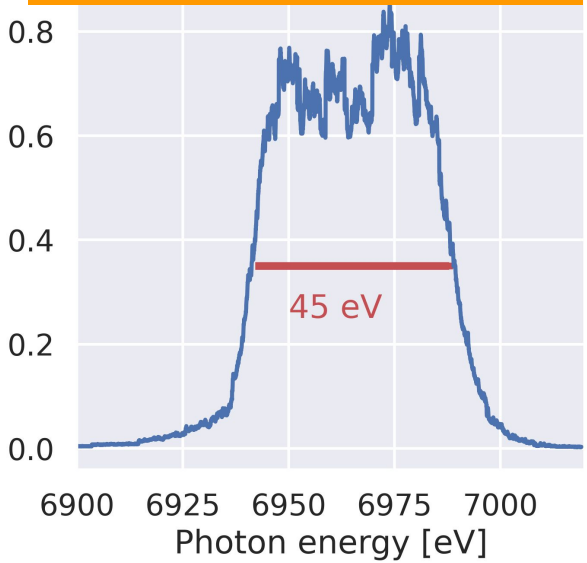
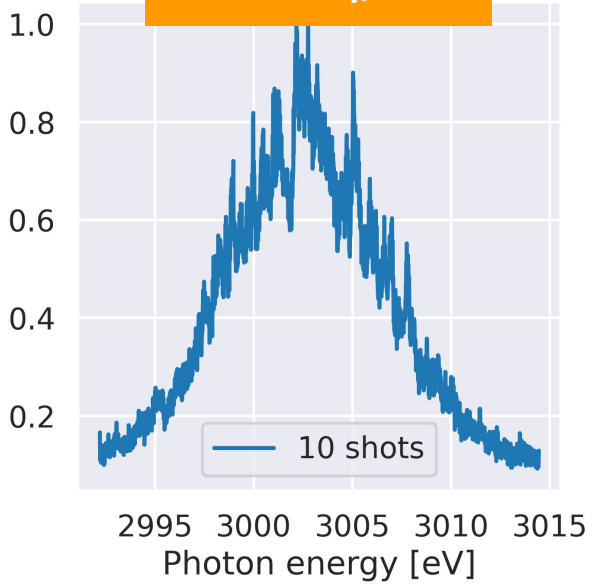
Spectral - Aramis

- Single panel for spectral data overview, control and semi automated alignment
- User operable scripts to extend use of PSSS to scanning mode for large bandwidth and 3rd harmonic use for tender X-ray

Large bandwidth scanning

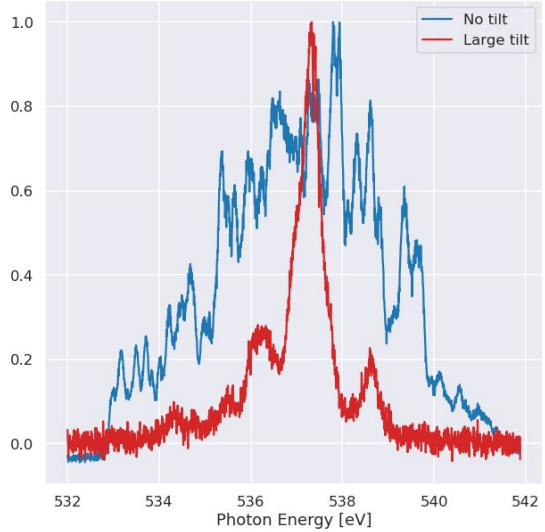


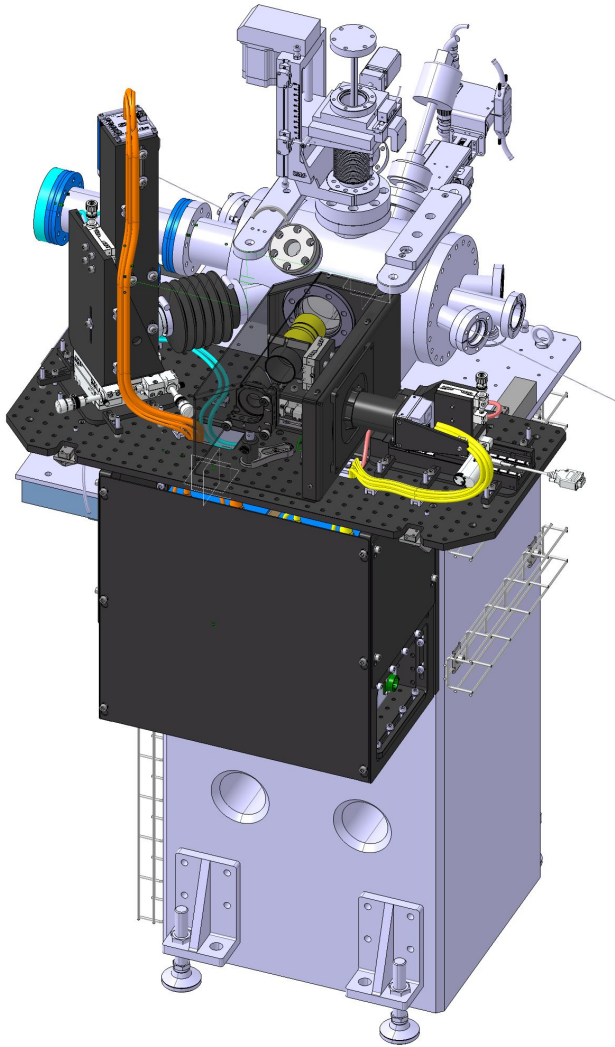
Tender X-ray, 3 keV



Spectral - Athos

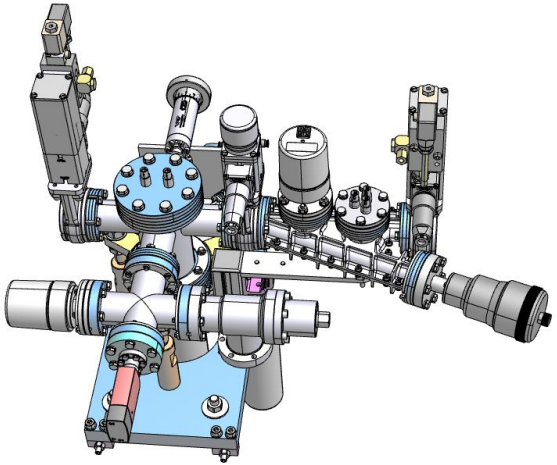
- Installed and commissioned beamline spectrometers for Athos (PMOS)
- Use for Athos machine development studies
- 2022 - full automation and online use of monochromator bandwidth optimisation

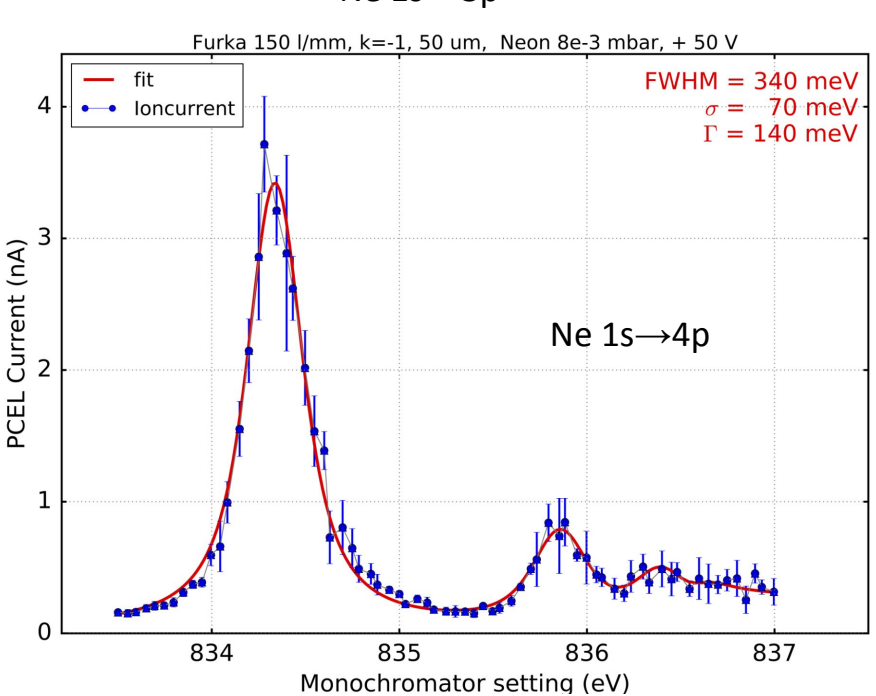




Athos monochromator commissioning

Installation of ionisation gas cell for mono calibration and resolution

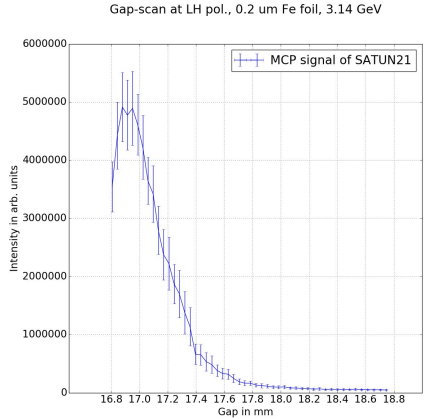


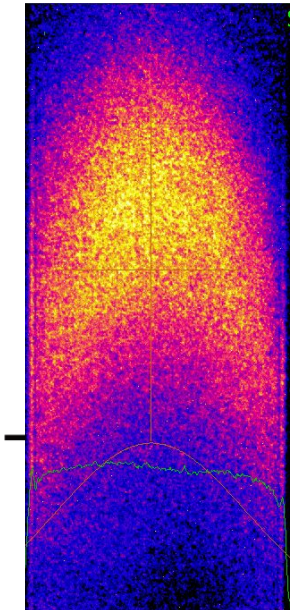


Insertion device diagnostics

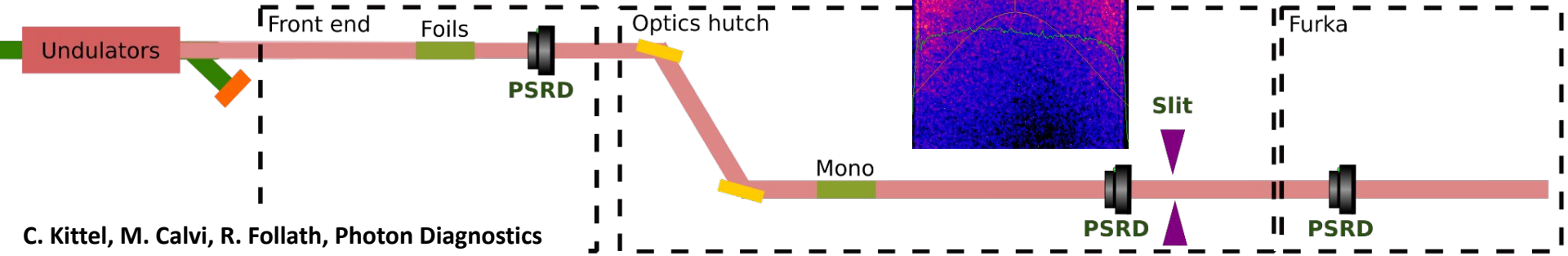
Aramis & Athos

2 new spontaneous radiation detectors (PSRD) for undulator calibration and pointing commissioned, upgrade of Aramis PSRD planned 2022





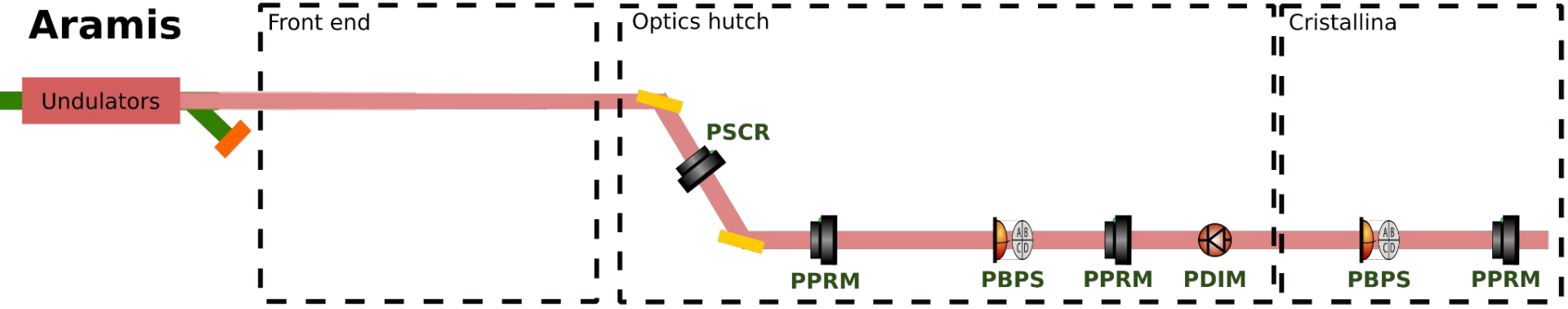
Athos



C. Kittel, M. Calvi, R. Follath, Photon Diagnostics

Aramis - Cristallina

- 4 screens, 2 position monitors and 1 intensity monitor installed 2021
- Device commissioning January - March 2022



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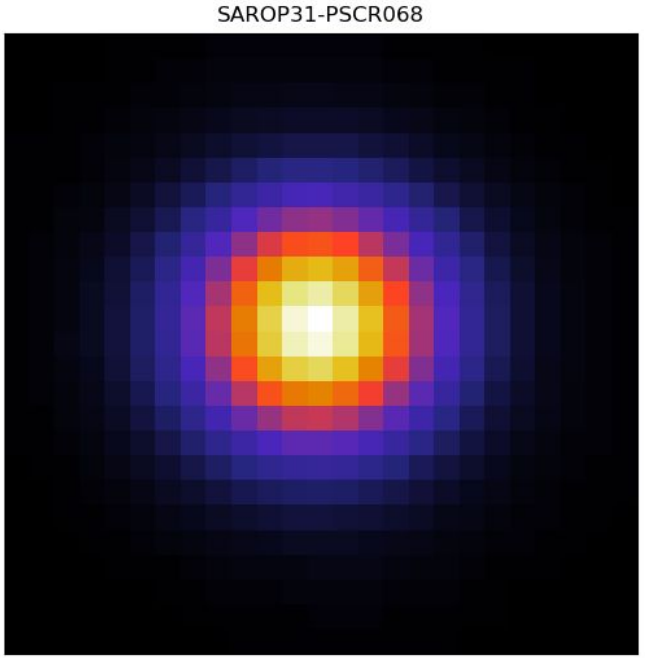
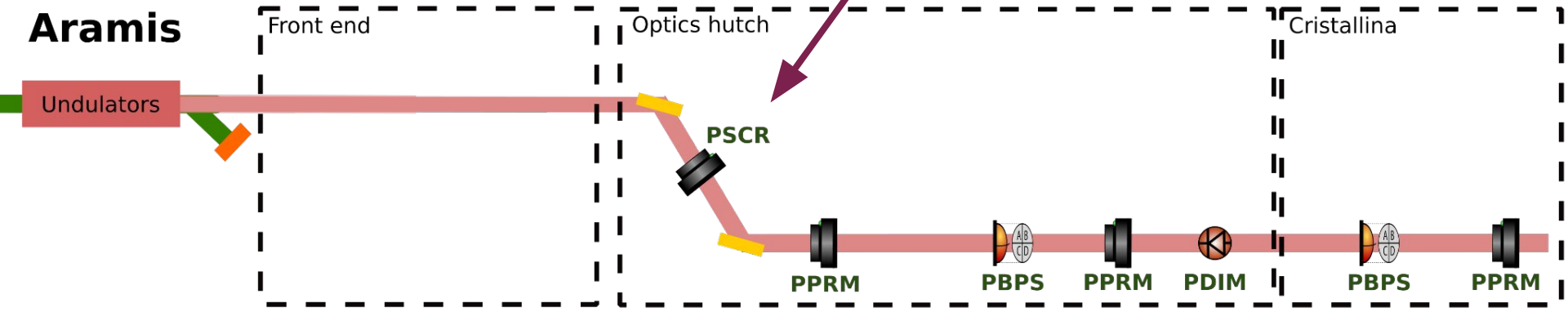
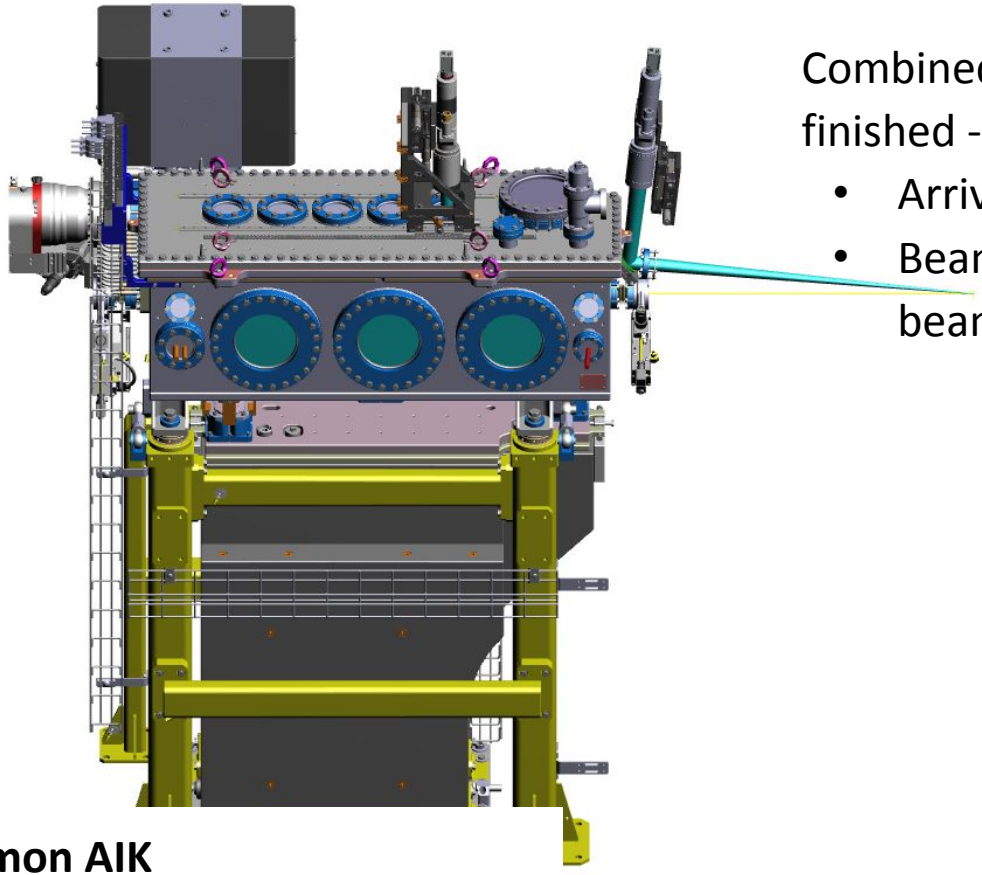


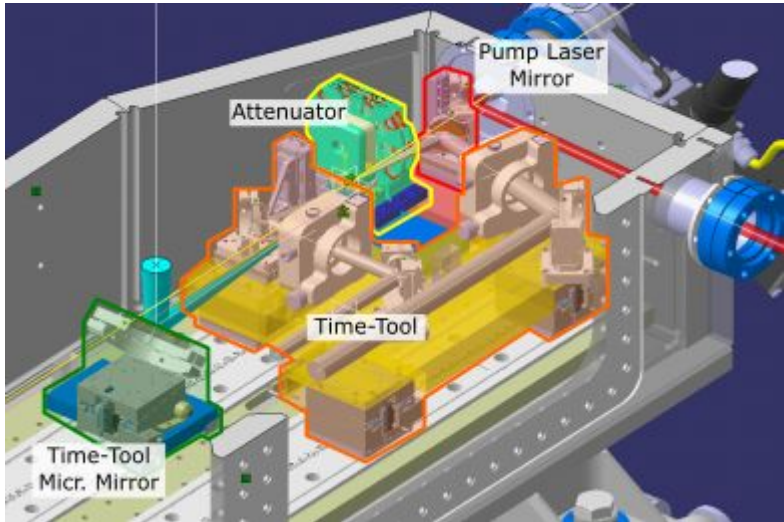


Furka diagnostics



Combined diagnostics chamber design finished - delivery 2022

- Arrival time tool (spectral encoding)
- Beamline attenuation, and I0 using beam sampling grating

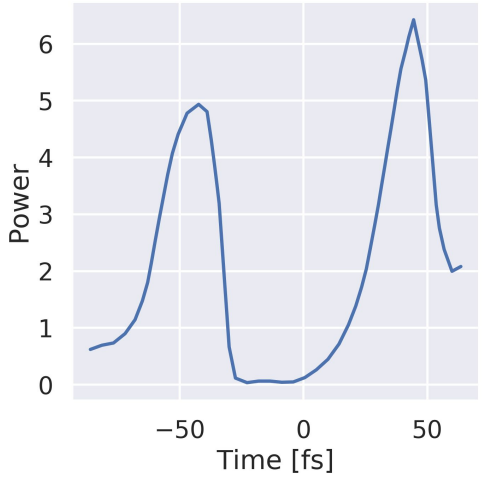


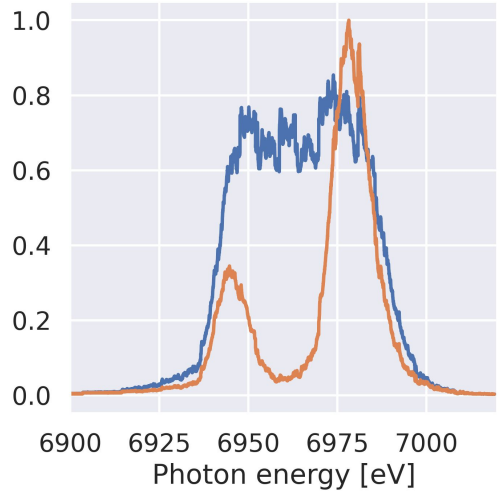
A Ammon AIK

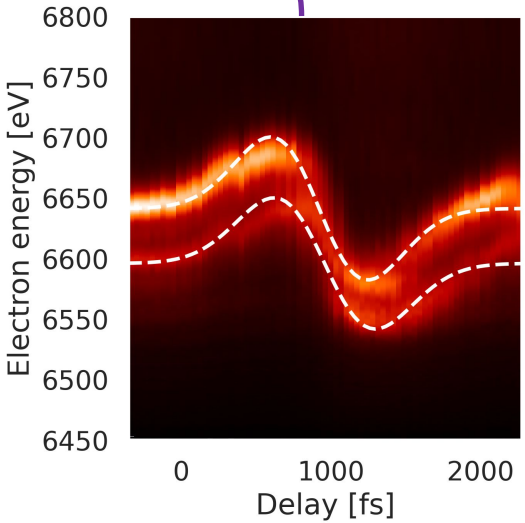
New methods: Aramis 2 colour X-rays

Indirect photon measurement

Direct photon measurements







Passive streaker

Photon spectrometer

THz streaking

Collaboration : SwissFEL & SLS Beam Dynamics, Gun laser, RF, Photon Diagnostics, Experimental Laser

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- Beamline changes/upgrades 2022
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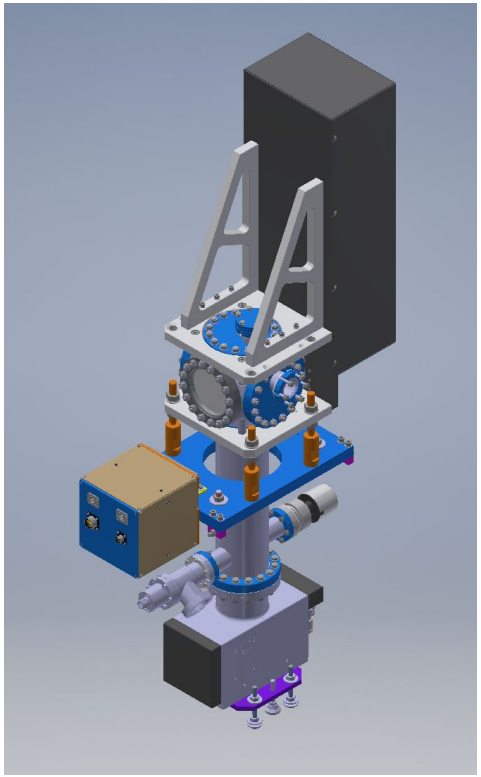
Beamline changes/upgrades 2022

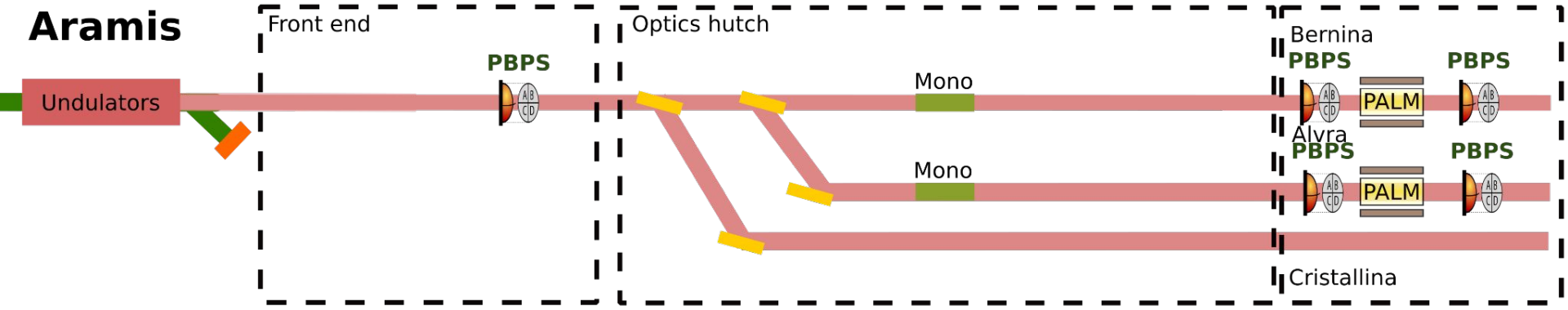
Athos

- Installation 4 absolute position screens
  - 2* Maloja
  - 2* Fukra
- Semi automated control of PMOS
- Installation of Furka diagnostics chamber



Beamline changes/upgrades 2022

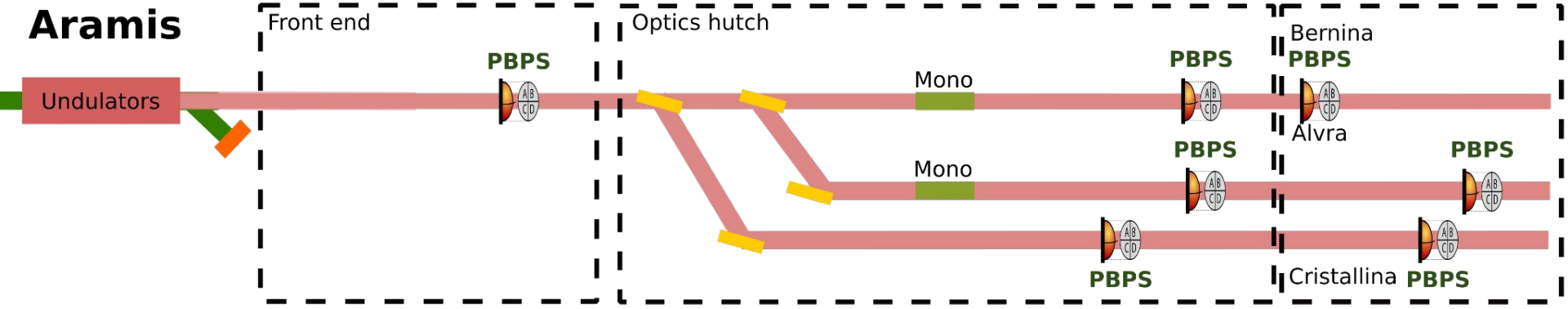
Aramis



Beamline changes/upgrades 2022

Aramis

- Moving a PBPS position monitor from experimental hutchs to optics hutch
  - Fewer interruptions for beam pointing and mono optimisation
  - Increased sensitivity for pointing feedback
- New data acquisition systems for PBPS
  - Simpler setup and lower noise
- Removal of PALMs from Alvra and Bernina



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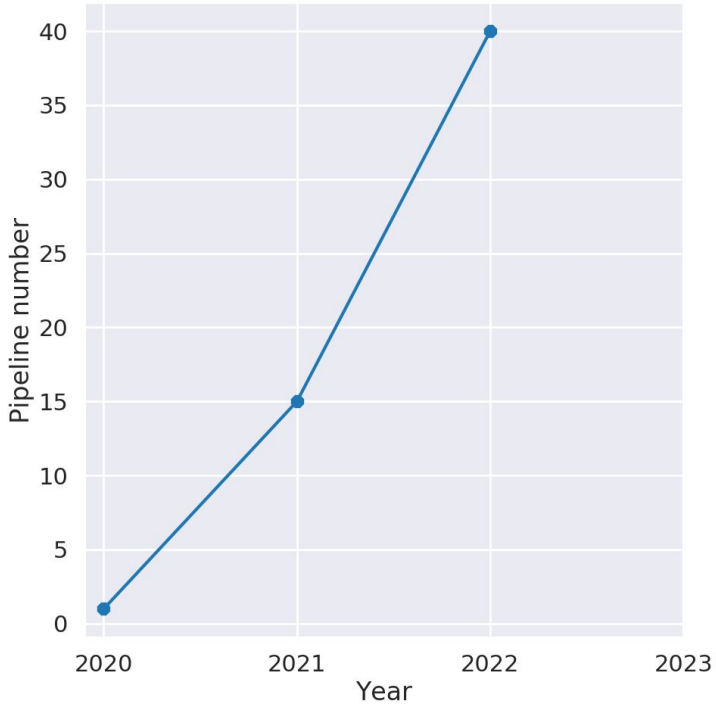
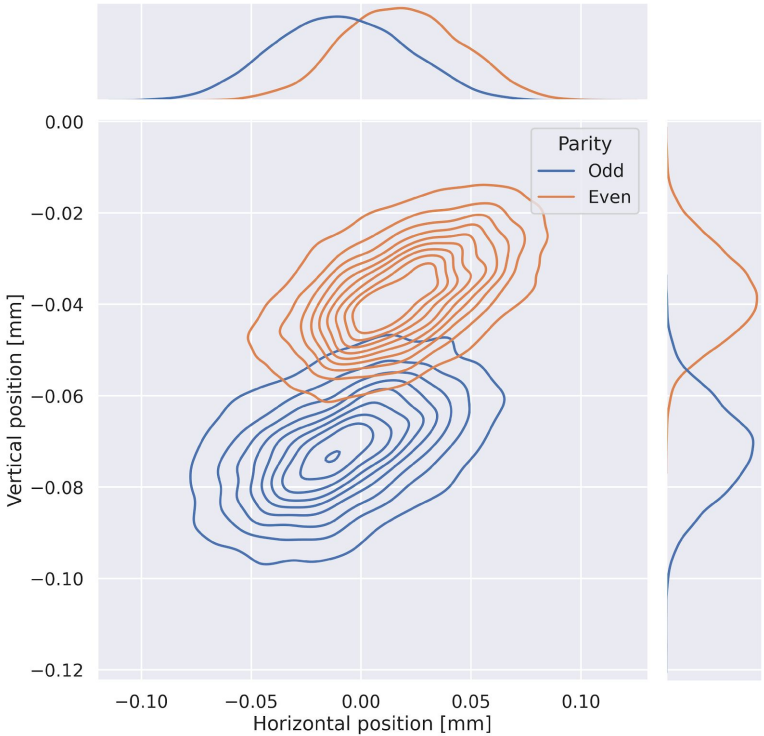
Online data processing pipelines



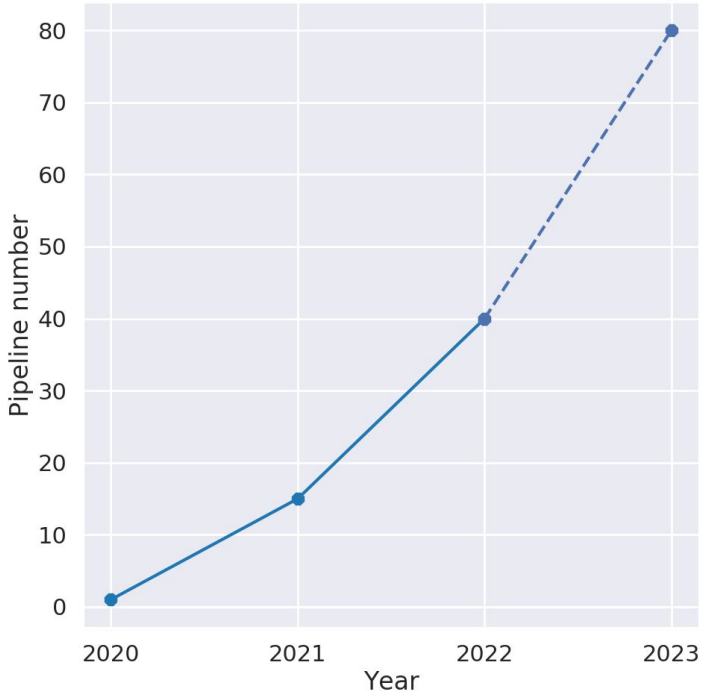
- Large increase in number of data processing pipelines used for photon diagnostics

Online data processing pipelines



- Large increase in number of data processing pipelines used for photon diagnostics
- Shot to shot analysis of beam synchronous data to extract more diagnostic information
  - Results provided both as PV and bs channel

Online data processing pipelines



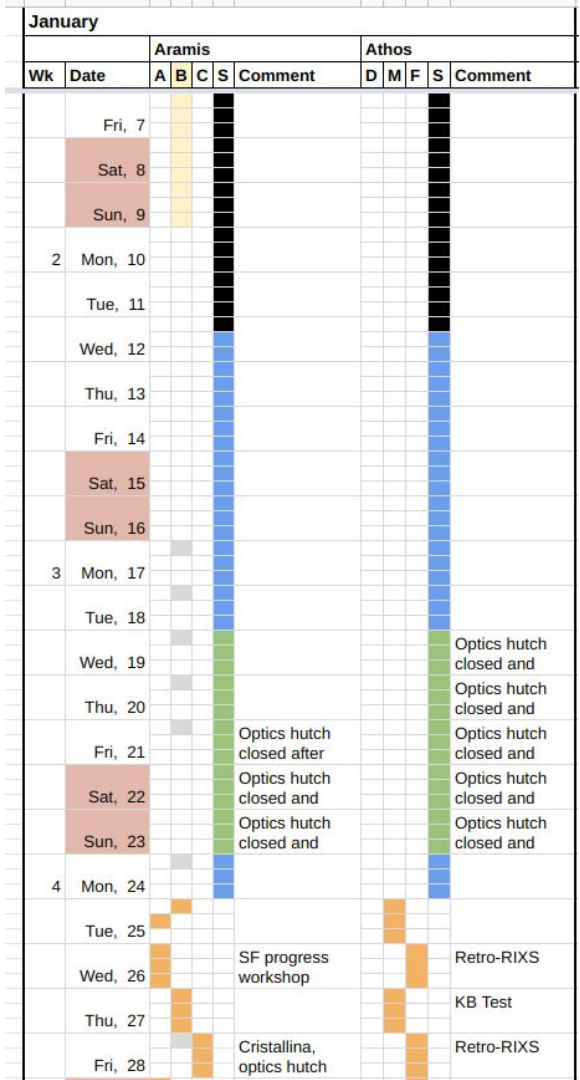
- Support from Alex Gobbo and Data Processing Development group (Usov and Janousch) is critical
- Plan **now** for future scaling and stability i.e data buffer disconnects
- **To exploit the information value from bs data for machine feedbacks need stability of local server and EPICS**

Beamline ready day?

Do we require a beamline ready day after long shutdown before endstation beam ready?

- Full use of diagnostics in optics hutches (PMOS - Athos, PBPS-Aramis)
- Check alignment, spectrum, spatial chirp, stability…..
- Endstation beam ready focused on beam parameters not IOCs!

~2 weeks



January

		Aramis					Athos				
Wk	Date	A	B	C	S	Comment	D	M	F	S	Comment
	Fri, 7										
	Sat, 8										
	Sun, 9										
2	Mon, 10										
	Tue, 11										
	Wed, 12										
	Thu, 13										
	Fri, 14										
	Sat, 15										
	Sun, 16										
3	Mon, 17										
	Tue, 18										
	Wed, 19										Optics hutch closed and
	Thu, 20										Optics hutch closed and
	Fri, 21					Optics hutch closed after					Optics hutch closed and
	Sat, 22					Optics hutch closed and					Optics hutch closed and
	Sun, 23					Optics hutch closed and					Optics hutch closed and
4	Mon, 24										
	Tue, 25										
	Wed, 26					SF progress workshop					Retro-RIXS
	Thu, 27										KB Test
	Fri, 28					Cristallina, optics hutch					Retro-RIXS

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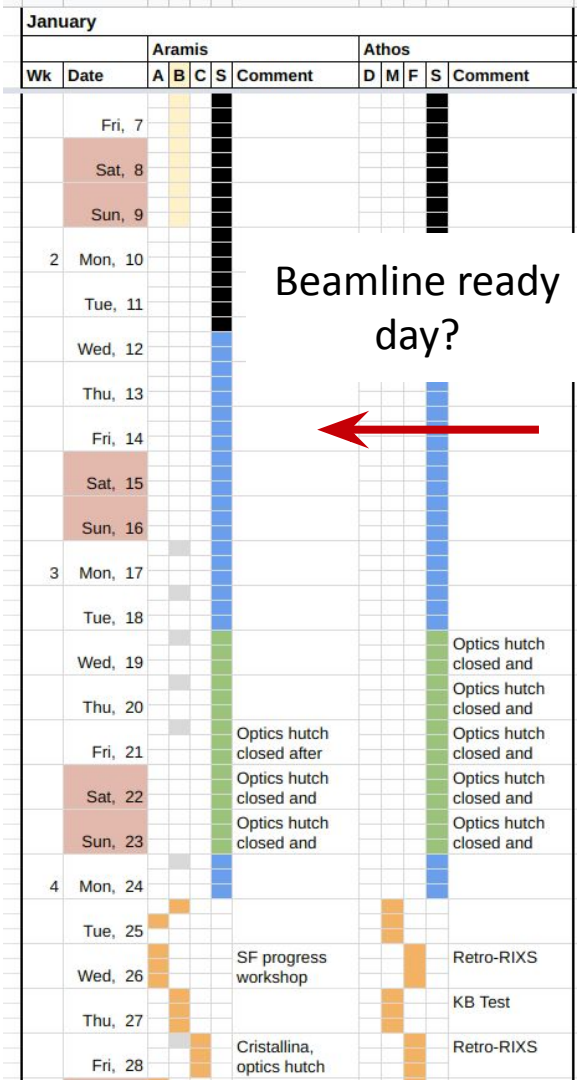

Thank-you

SwissFEL endstations and many experts groups at PSI!