Summary of Photon-B: Operation logistics session

Scope

- Exchange of information of operation-related status & issues
- Goal: improvement of efficiency; increase of robustness with minimizing operational “uncertainty”

Program

- First experiments – SFX & operation schemes (Jae Hyun Park, PAL-XFEL)
- First Experiments and User operation at SwissFEL (Luc Patthey, SwissFEL)
- Strategy for efficient and robust operation (Kensuke Tono, SACLA)
- Wavefront measurements at the SPB/SFX instrument (Patrik Vagovic, European XFEL)
- Operations (Diling Zhu, LCLS)

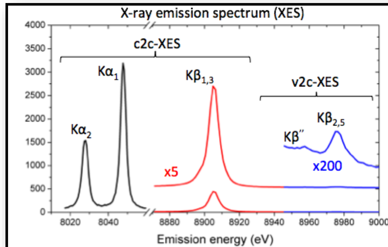
Luc Patthey
PAUL SCHERRER INSTITUT

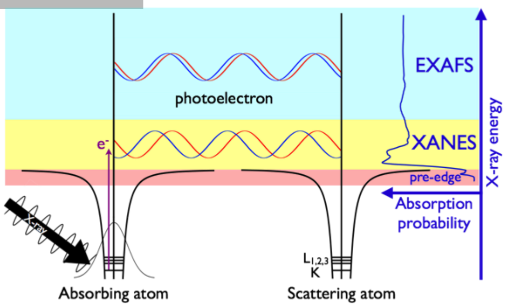
Experimental Station A at ARAMIS

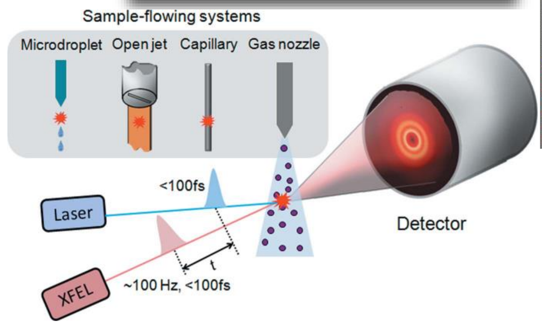
C. Milne, J. Szlachetko*, J. Schneider and G. Knopp

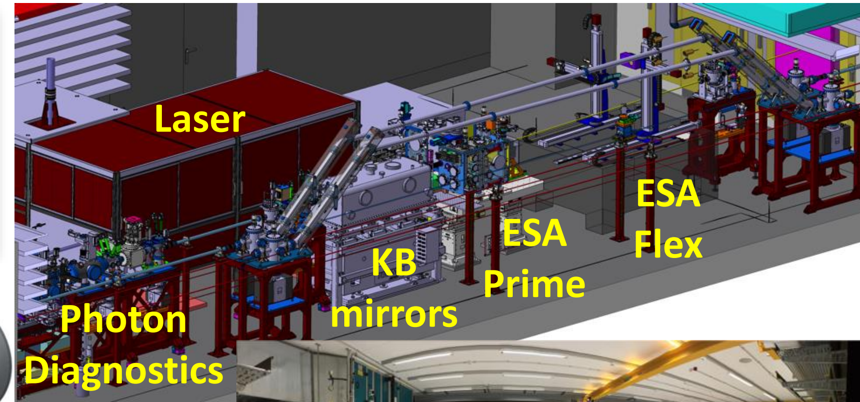
ESA:

Ultrafast photochemistry and photobiology

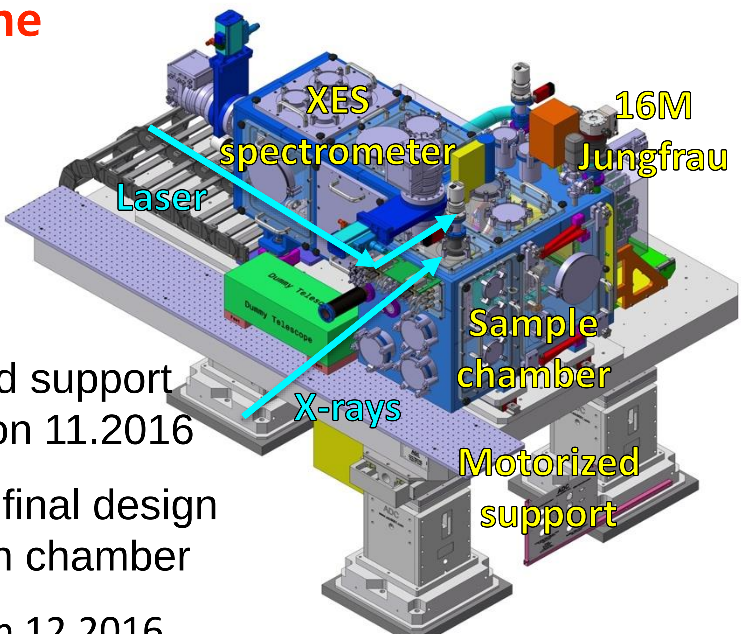






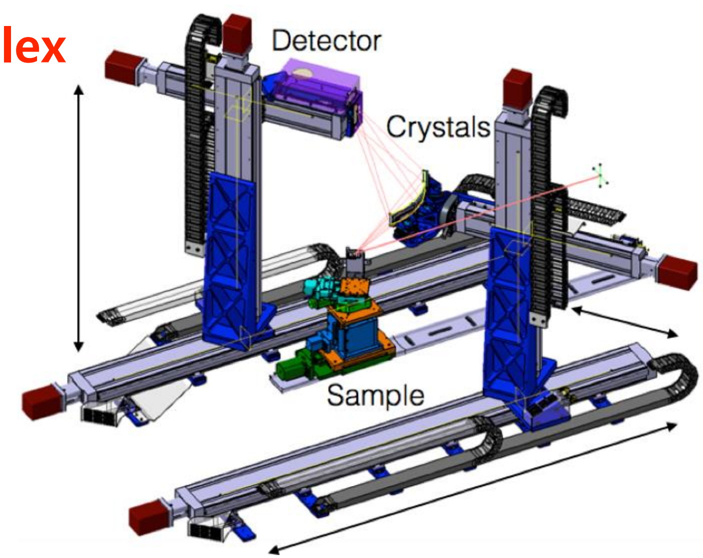


ESA Prime



- Motorized support installation 11.2016
- Awaiting final design review on chamber
- Delivery in 12.2016

ESA Flex



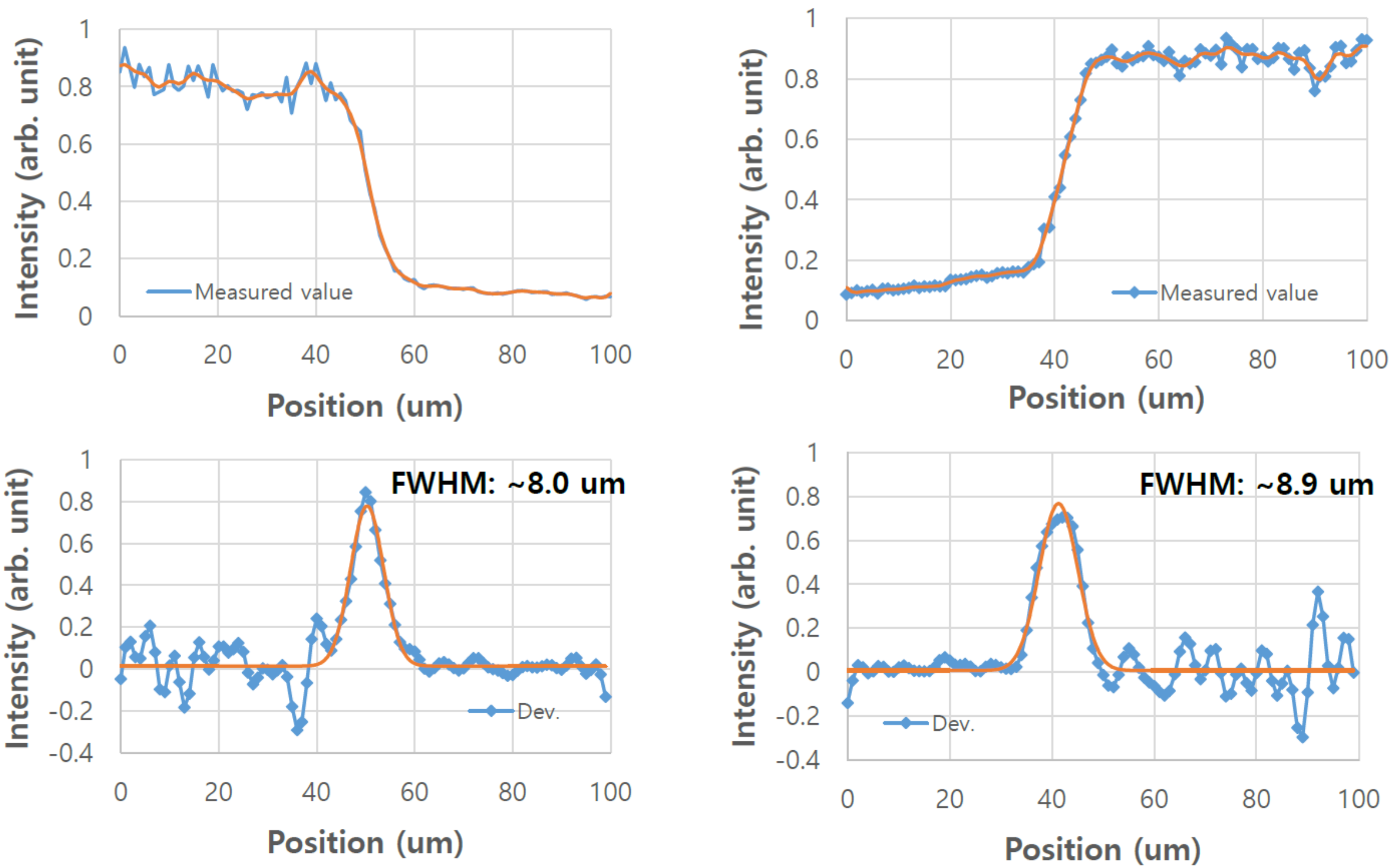
- Built and commissioned at the SLS
- Ready for installation at SwissFEL

Jae Hyun Park

K-B mirror focusing @ NCI (6.1 keV)

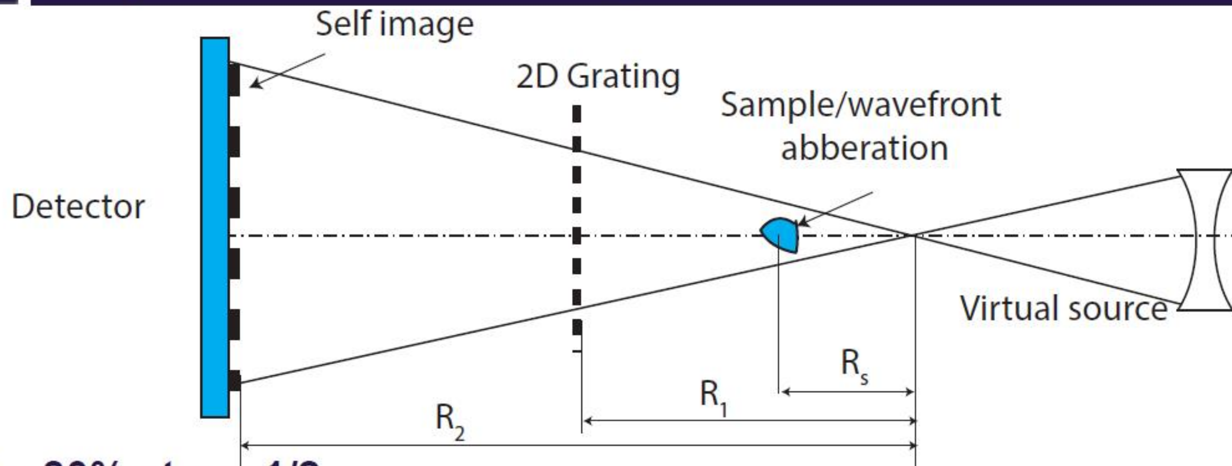
Vertical direction

Horizontal direction



Patrik Vagovic

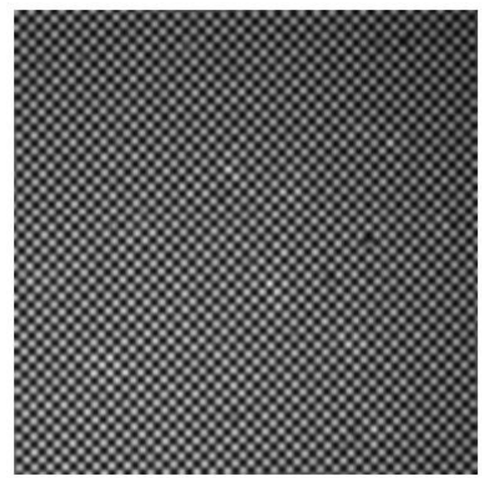
Experimental testing at Petra III P10 GINNIX



R2 ~ 5m
E = 8 keV
Focusing:
- **2D wave guide**
- **KB**

V >= 80% at p = 1/2
>= 60% at p = 3/2

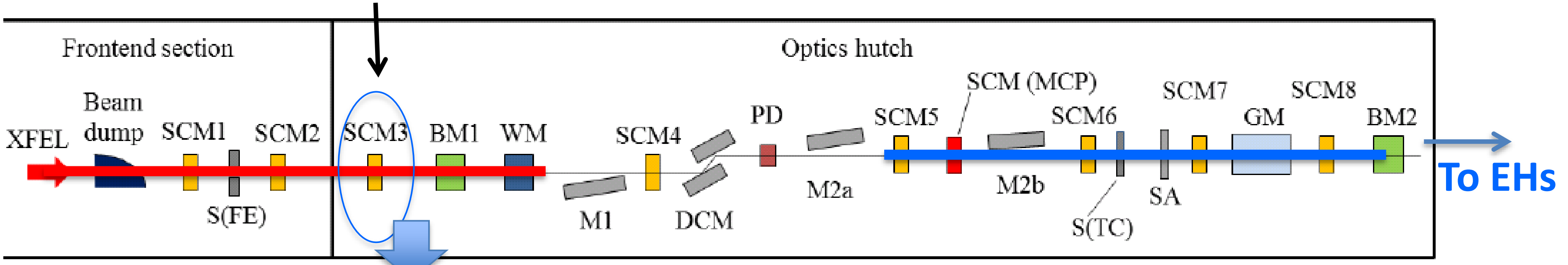
R1: 184mm - 24 mm

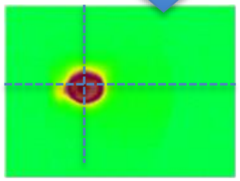


Kensuke Tono

Procedures for routine BL tuning

~150 m from the source





15 µm/pixel

Accelerator tuning

Pulse energy, beam profile, photon energy

Keep the incident X-ray beam axis

Check beam position on SCM3

≤2 pixels => ≤ 30 µm => ≤ 0.2 µrad

Fix the beam axis, not move samples to the beam

BL tuning

Fine tuning of DCM or double mirrors

Keep the exit optical axis to EHs

Check beam positions on SCM6, 8, 9, ...

Check beam properties

- Energy spectrum with DCM scan
- Beam profile with SCMs
- BL transmission with BMs

Tuning 1-µm focusing incl. knife-edge scan

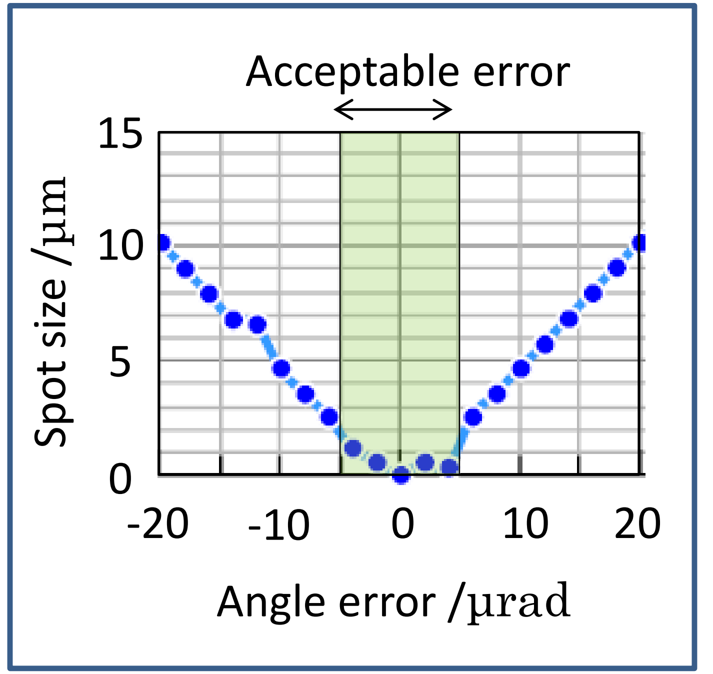
Routing tuning is conducted by operators (Engineering Team), based on the protocols set by ACC & BL scientists

Kensuke Tono

Fixing the beam axis makes the tuning more efficient.

- Fix the XFEL beam axis according to the tuning procedure.
- As a result, pointing error can be within ~0.2 µrad.
  - ~30µm position error at SCMs.
  - ~ 150 m from the source.
  - *Much smaller than the acceptable error of the 1 µm KB system.*
- No need for the elaborate tuning of the KB mirror.

Angle error vs. spot size of the 1 µm KB at SACLA

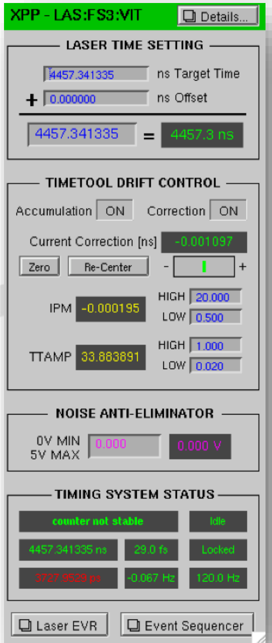


Diling Zhu

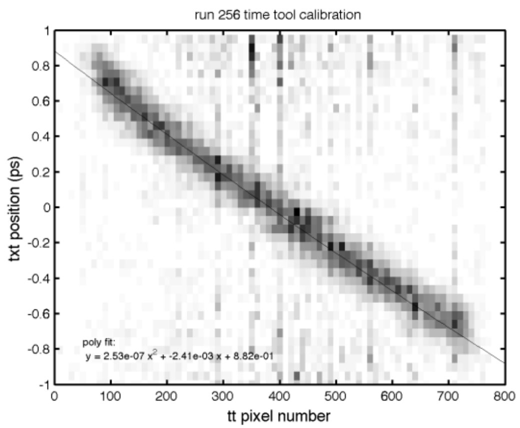
Automation Example: Timing Diagnostics & Feedback

SLAC

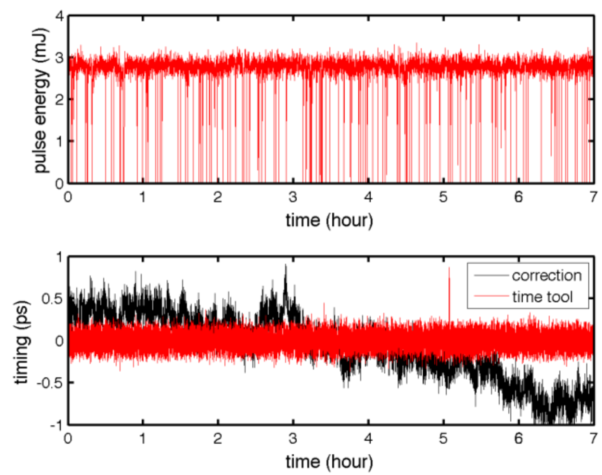
Standard **hardware**



high level
control interface



Automatic **calibration** routine

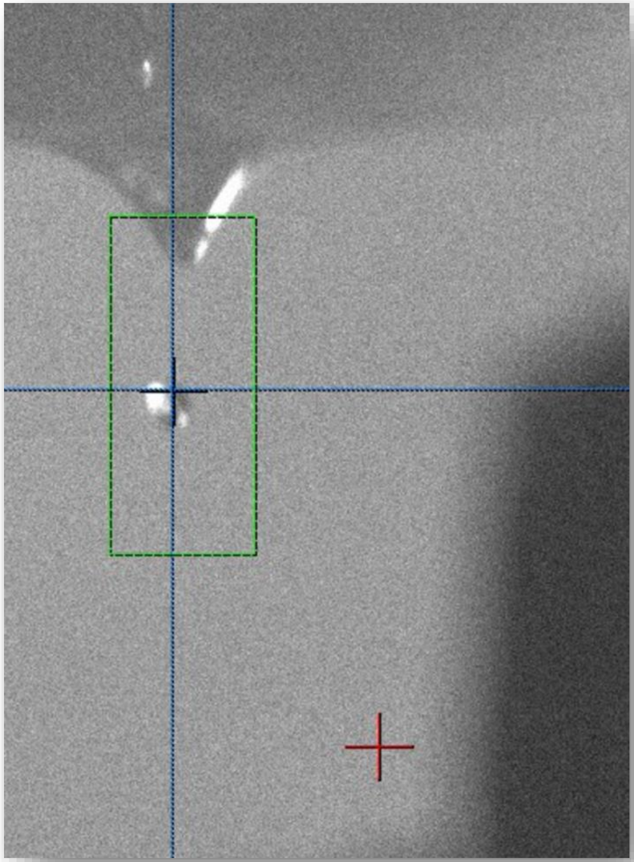


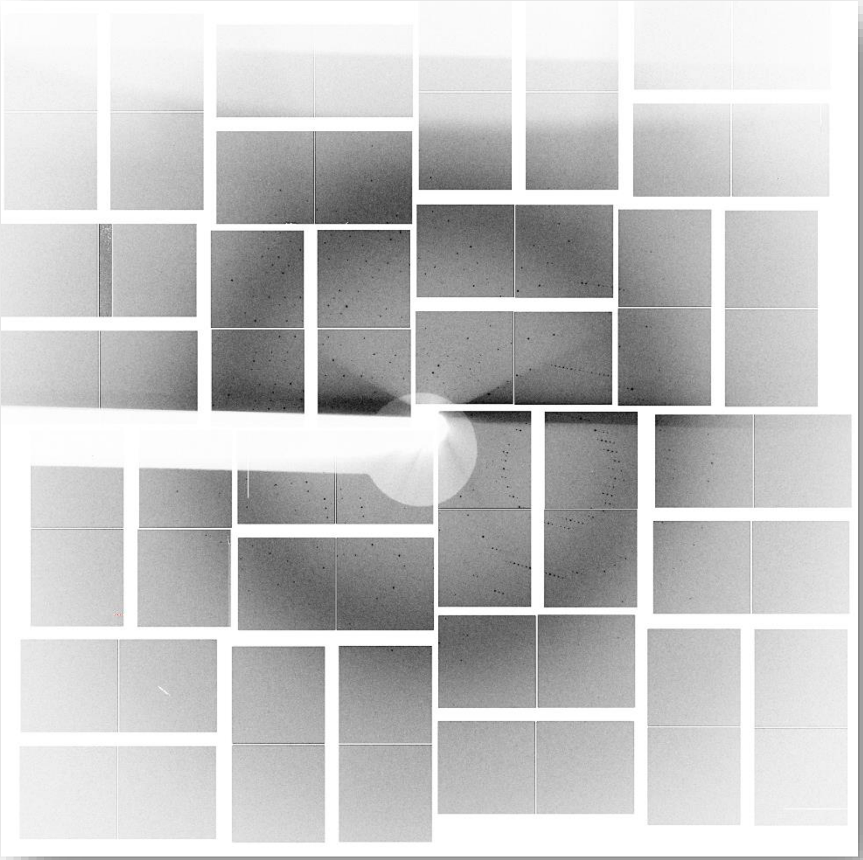
Feedback implementation to enable robust maintenance free operation

Diling Zhu

Automation Example: Droplet Tracking

SLAC





Acoustic Injector (Allen Orville) automatic droplet tracking: identify the correlation between the droplet position and the diffraction pattern.

Summary

- Although constraints and status were very different, communication among five facilities was very useful
- Discussions were limited
- A next key challenge: automation of beamline and endstation instruments

  → Establishment of reasonable tuning protocols becomes critical

  - Robust hardware with good reproducibility
  - Precise on-line diagnostics tools (wavefront, beam pointing, temporal, etc...)
  - Experimental configurations
- Increase importance of collaboration on operational issues