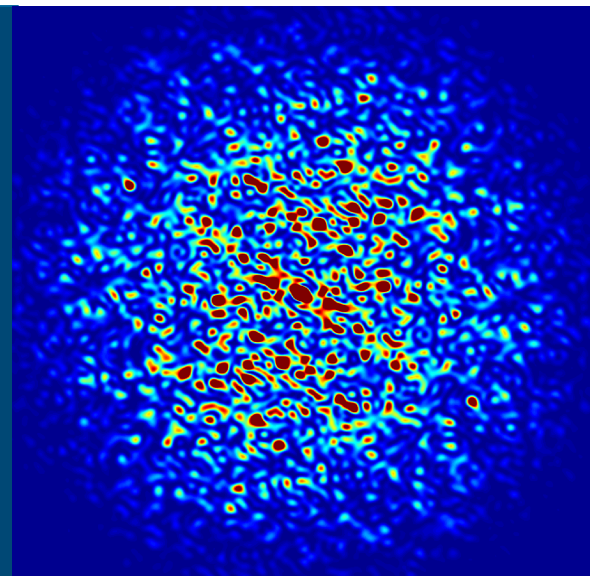


# Beamline Start Ups Post APS-U Dark Period



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August 18, 2022

# Introduction

- The APS-U is upon us
  - APS-U Shutdown Readiness Review is going on this week
  - Beamline work has been going on for some time
    - 28-ID phase I complete, operating as IDEA beamline
    - 25-ID in technical commissioning
    - 20-ID-E construction in the LBB
    - 8-ID, 9-ID preparation for demolition underway
- Detailed planning for the restart of APS-U beamlines is underway
  - Today's talk will focus on activities by the Commissioning Readiness Review Team (CRRT)

# Definitions\*

- Check Out – Testing of equipment, systems without beam
- Ops Commissioning – First beam, shielding verification
  - Controlled by CRRT
- Technical Commissioning – With-beam testing of the beamline
  - Debugging systems, measurement of beam properties, measurements on standards, etc.
  - Controlled by beamline scientists
- Scientific Commissioning – Early experiments
  - Often with enhanced support, limited capability
  - May include outside users

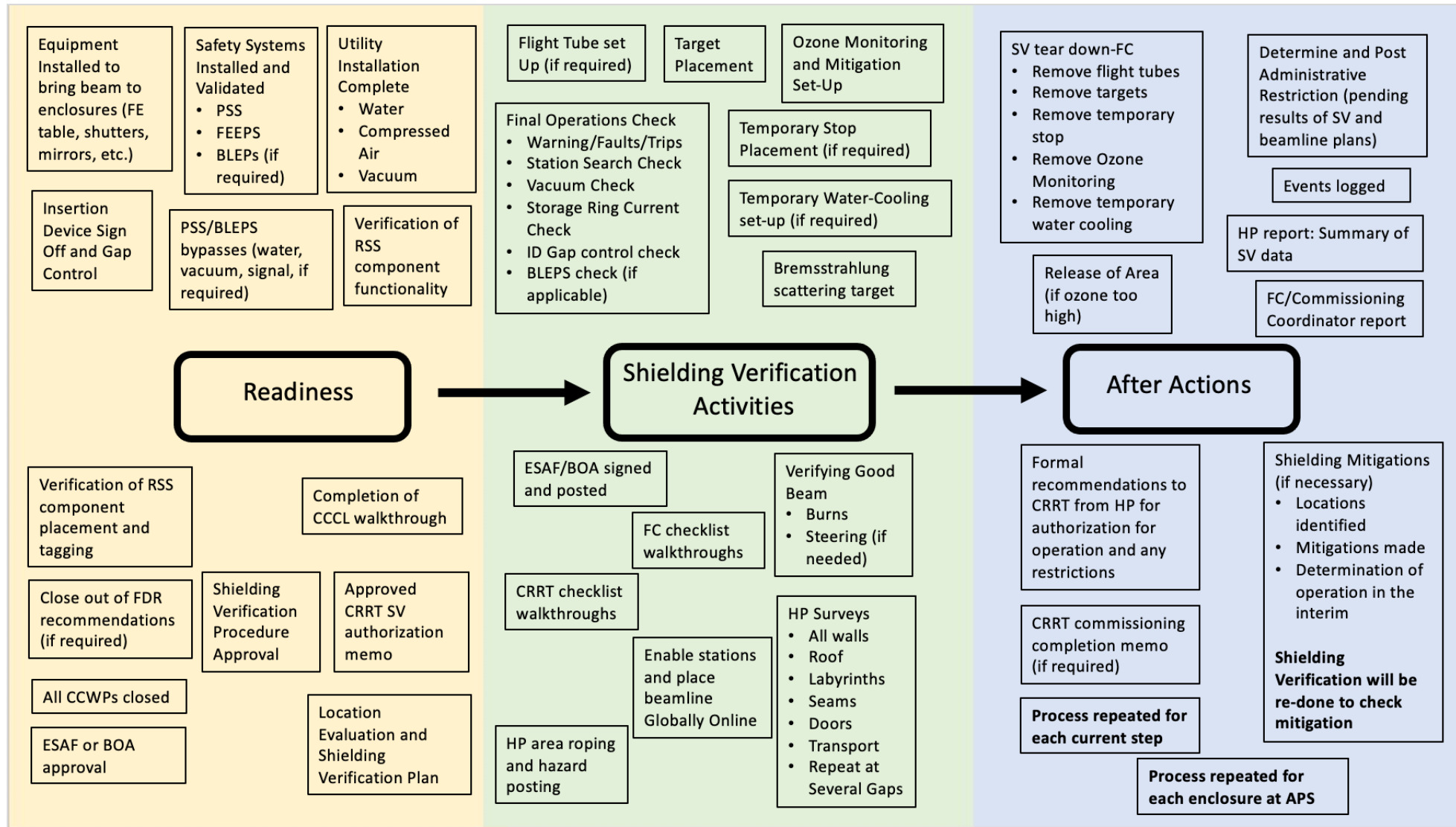
Technical Commissioning can begin before Ops Commissioning is complete (more below)

Often there is a blurry transition between Technical and Scientific Commissioning

# Post Dark Period Beamline Startup

- Every beamline at the APS needs to meet pre-beam requirements for Ops Commissioning
- Every shielded enclosure and section of shielded transport is required to undergo shielding verification post-dark period
  - New shielded transport is measured at 1 atm pressure
    - Often requires temporary windows
    - We will seek an exemption for existing transport
- There are ~54 ports for active beamlines → this is a logistical challenge
  - Limited number of HP crews (probably two most of the time)
  - Limited FC/CRRT coverage
- Coordination needed with the Accelerator Commissioning
- Goal – Get as many beamlines into Technical Commissioning as soon as possible
- The large amount of existing, previously used beamline infrastructure is a big plus
- Gaining experience with the new, low emittance beam will be a challenge for everyone

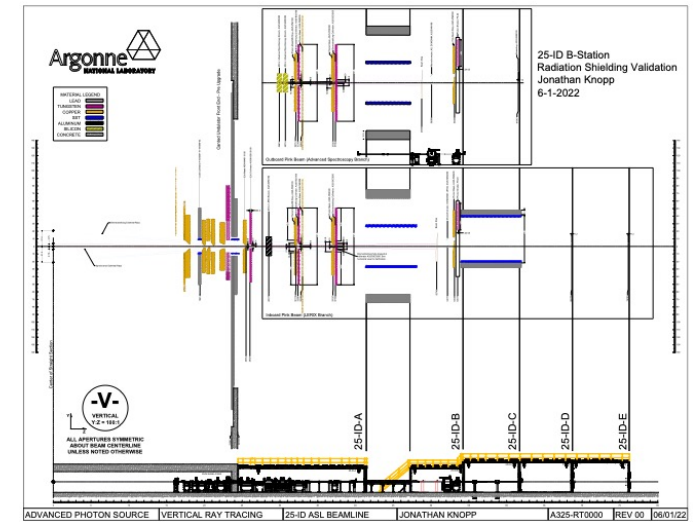
# Shielding Verification Process



Floor Coordinator  
 Perspective  
 Courtesy of  
 Ashley Wayman

# CRRT Requirements to Open FE Shutter Post Dark Period

- For every beamline:
  - Completion on CRRT readiness checklist, including:
    - FDR Update for beamline approved by PDRC, includes:
      - Ray-traces for the new APS-U source
      - Heat-load calculations for critical components
      - Changes to any shielding or critical component
      - All relevant issues closed out
    - Front End operational
    - ID operational
    - Beamline work verified as complete
      - Survey and alignment complete
      - PSS/BLEPS operational, verified
      - Mechanical/vacuum work affecting critical components complete
      - All critical components tagged, logged into tracking system
      - Beamline confirmation of readiness for beam
  - CRRT Procedure for Ops Commissioning approved
    - Detailed, step-by-step plan covering First Beam/Shielding Verification
    - Developed by CRRT in consultation with beamline staff
  - Authorization (from John Connolly, PSC ALD for Ops) for beamline to be brought on-line for Ops Commissioning



Advanced Photon Source

PROCEDURE Page 1 of 25  
ICMS Content ID: APS\_2019467  
DMS #: APS-PDR-BL-SL-AP79-00001  
Revision #: 0  
Issue Date: 6/27/22

**CRRT Shielding Verification of 25-ID-C, D, E Procedure**  
Changes made in this revision:

- Original version

Prepared by:  
Dean Haeffner, Chair Commissioning Readiness Review Team (CRRT)

Approved by:  
W. VanWingeren, Commissioning Coordinator  
E. Heyeck, Health Physics  
J. Connolly, PSC/Deputy ALD-Operations

The current version of this procedure is accessible from <https://www.aps.anl.gov/Document-Central>. Print or electronically downloaded copies may be obsolete. Before using such a copy for work direction, employees must verify that it is current by comparing its revision number to that shown in the online version.

# Three Step Ops Commissioning Process

General Ops Commissioning concept for ID beamlines

## 1. Low Power → Initial alignment of optics

- Limited to FOE, other optics containing enclosures
- Diagnostics are key to efficient process
- This phase should last a short period of time (~few hours)

## 2. Medium Power → Full alignment of optics

- ID gap limit(s) to allow access to commonly used energies for the beamline
- Avoid highest power if possible
- Allows vacuum conditioning at moderate power
- This phase may exist for some time to allow relatively low-risk operations

## 3. Full Power → Final shielding verification of beamline

- Most shielding, power issues show up here
- Outgassing can cause extensive delays
- Beamline may request the permanent ID gap limit be placed above the minimum

# Requirements for Completion of Ops Commissioning

- HP survey for each station and shielded transport
  - Strive for "worst-case" scattering conditions
    - Discussion between CRRT and beamline staff to determine such conditions
  - If there are open air beam paths → standard Al targets
  - If beam is completely in vacuum, move slits, mono crystals, etc. into beam to serve as targets
  - Number of targets and position of those targets decided by CRRT/FC/HP
- ID gap limits may be set to allow Tech. Comm. to proceed
  - Pending shielding mitigation
  - Limit outgassing
  - Avoid high-head-load conditions prior to full optics alignment
  - Subsequent HP surveys will be necessary to lower the gap limit
- Authorization (from Connolly) for beamline to be operational for technical commissioning





# Factors for Consideration

- Ops Commissioning is more procedural, has stricter protocol than in the past
  - Detailed written procedures
  - ICMS approval thread for procedures, authorizations
  - This requires time for processing
- Historically, we have tried to do initial shielding verification with nearly empty enclosures – this will not be the case post dark period
  - Very few white-beam enclosures will have ability to bring beam into air
  - Makes first alignment activities a little challenging
  - Big upside – essentially eliminate ozone production
- High power beam with poor vacuum should be carefully avoided to minimize chances of damaging mirror surfaces



# Factors for Consideration (cont.)

- Most shielding issues occur at or near closed ID gaps
  - ~ under 15-mm ID gap for the current APS
  - Low-level leaks at doors interfaces, ratchet wall/FOE seams
    - Existing stations could have issues at closed ID gap
    - Mitigation of shielding issues can be a tedious process
  - Outgassing can cause long delays during first exposures to high power
  - Caution due to heat-load concerns
- By initially avoiding closed ID gap conditions, we can speed up the overall process considerably
  - Most beamlines can operate avoiding closed-gap operations for a considerable period of time
    - Exceptions – e.g., 1-ID, 6-ID, 20-ID, 30-ID need to be identified and accommodated
- APS Policy and Procedure documents on returning beamlines to operations after the APS-Upgrade in preparation and will be available soon
  - Includes non-technical issues (Management Plans, etc.)

# Ops Commissioning Timing/Schedule

- April 17, 2023 – Dark Period begins
- January, 2024 – Accelerator Commissioning begins
  - Two months
- April 17, 2024 – Dark Period ends
- Beamline Ops Commissioning
  - ~54 beamlines
    - Canted beamline are considered one beamline for this purpose
  - Current estimate is 9 weeks to get ~49 beamlines to Tech. Comm.
    - Handful of beamlines will not be ready on 4/17/24
    - Many beamlines may have ID gap limits above the minimum
      - i.e., past Steps 1 & 2
  - Assumptions
    - Starting post-Dark Period
    - 5 days per week, 2 HP crews per day
    - Parametric beamline duration based on APS-U/FC/CRRT general knowledge

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# Ops Commissioning Timing/Schedule (cont.)

- Early commissioning during accelerator commissioning may be available
  - Key is 25 mA minimum, SR beam stability, reproducibility, FE BPMs
  - Likely weekday shifts only
  - If six weeks of early access
    - ~35 beamlines could transition to Tech. Comm. early
  - Need to make sure that enough beamlines are ready for early dates
- Expediting factors/possibilities
  - May have a third HP crew (Note – HP also covers Accelerator needs)
  - Some evening/weekend Ops. Comm. possible. Probably reserved to address unexpected issues to preserve schedule.
  - Fully functional, calibrated FE BPMs can really help with first beam alignment

# Risk Factors (i.e., Things to Worry About)

- SR beam not stable or reproducible at first
  - Brand new machine, after all!
  - Poor stability could require shielding verification to be done more than once
- Beamlines not meeting completion requirements
  - Likely problems:
    - Thermal calculations
    - Utilities
    - Survey & alignment
    - PSS delays
- Inexperienced personnel dealing with aligning, commissioning beamline for the first time
- HP, Floor Coordinator staffing
- Overload of oversight committees
  - Working to address this

# Info Needed for Schedule Development

- CRRT (i.e., Haeffner) will contact every beamline to gather detailed information to refine individual beamline plans
  1. Questionnaire on basic facts (sent out to CATs ~Aug. 1, due back Sept. 1)
    - General description of relevant beamline work
    - Relevant finish dates for beamline work
    - Contact information
  2. Follow up individual beamline meetings to figure out specific plans (next six months)
    - Staging of Ops commissioning for beamline
    - Worst case scattering conditions
  3. Individual CRRT beamline procedures with beamline staff included on approval chain (by Nov., 2023)
- Detailed schedule
  - Draft prioritization to APS management Nov., 2022
  - Probably will bin beamlines into groups
  - Finalize schedule (with APS management) ~Sept., 2023
    - Contingent on readiness of beamlines

# Questions??

# Definitions

- PDRC PSC Design Review Committee
- CRRT Commissioning Readiness Review Team
- HP Argonne Health Physics
- FC Floor Coordinators
- PSS Personnel Safety System
- BLEPS Beamline Equipment Protection System