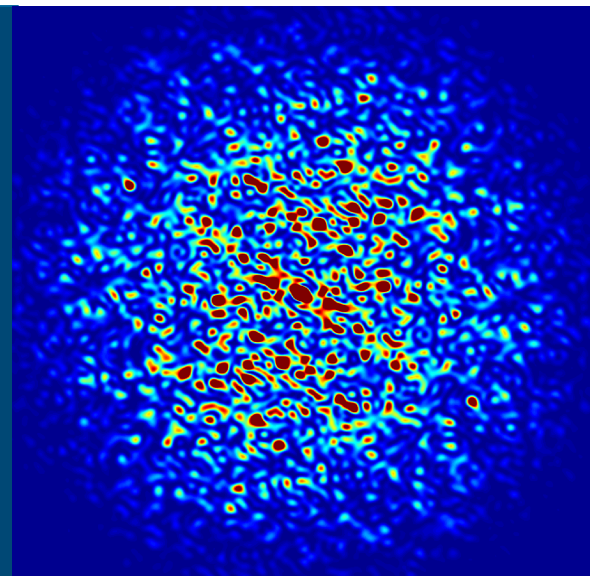


Beamline Start Ups Post APS-U Dark Period



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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

More 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

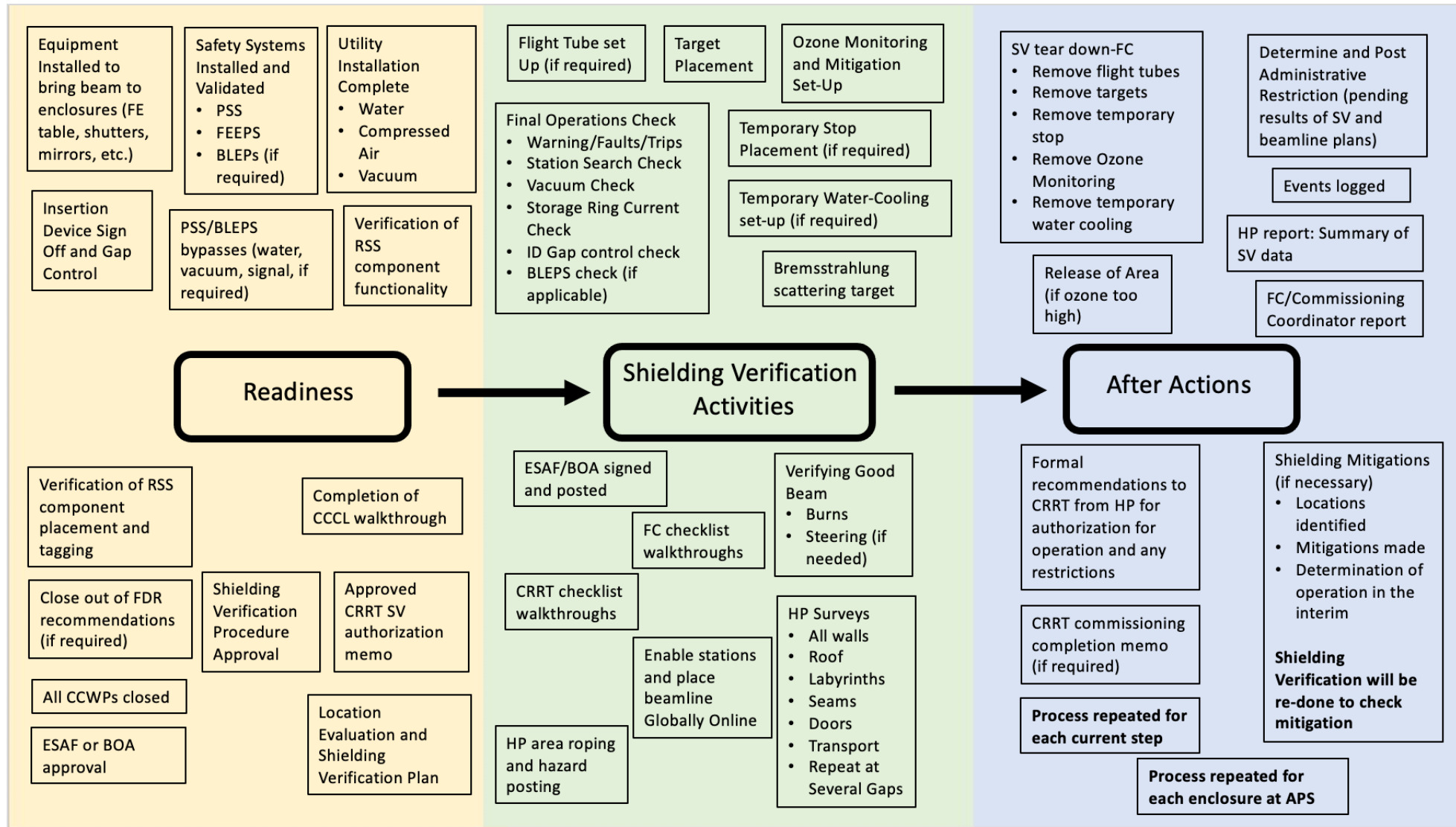
Technical Commissioning can begin before Ops Commissioning is complete (more below)

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

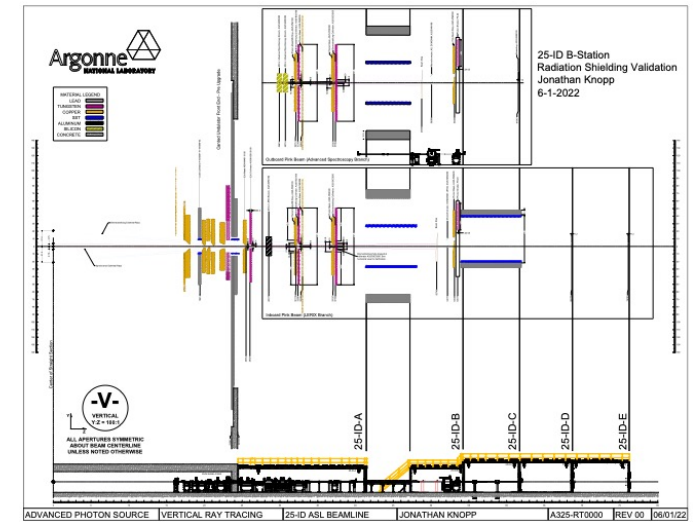
Shielding Verification Process



Floor Coordinator
 Perspective
 Courtesy of
 Ashley Wayman

CRRT Requirements to Open FE Shutter Post Dark Period

- For every beamline:
 - 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
 - All critical components tagged, logged into tracking system
 - 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



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

- Original version

Prepared by:
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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

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 ~Aug. 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??