

# Access Training for Radiological Control Technicians

Controlling Access to  
the NSRL Primary  
Enclosure

OPM 4.1 & OPM 4.44

*Created: August 2007*

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# Purpose of Training

- Train RCTs in concepts and procedures necessary to control routine access to NSRL target area
- By the end of this training, you will be able to:
  - Establish PASS conditions necessary to make safe access to NSRL area under normal conditions
  - Allow entrants to make entries to NSRL target room
  - Reestablish PASS conditions necessary to resume beam operation
  - Understand conditions necessary for safe access into NSRL area and prevent entry or set security state of PASS system to prevent beam operations until safe conditions are reestablished

# Objectives of this Module

- In this training module, you will learn about
  - **OPM 4.1 – Access Control Procedures for Access to Primary Enclosures** and
  - **OPM 4.44 – Operation of PASS**
- Learn key ideas and critical steps in controlling access to the NSRL target enclosure

# Making Access to a Primary Area

- **Primary Area**

- *any interlocked enclosure designed to prevent access to uncollided or primary beam (OPM 2.16)*

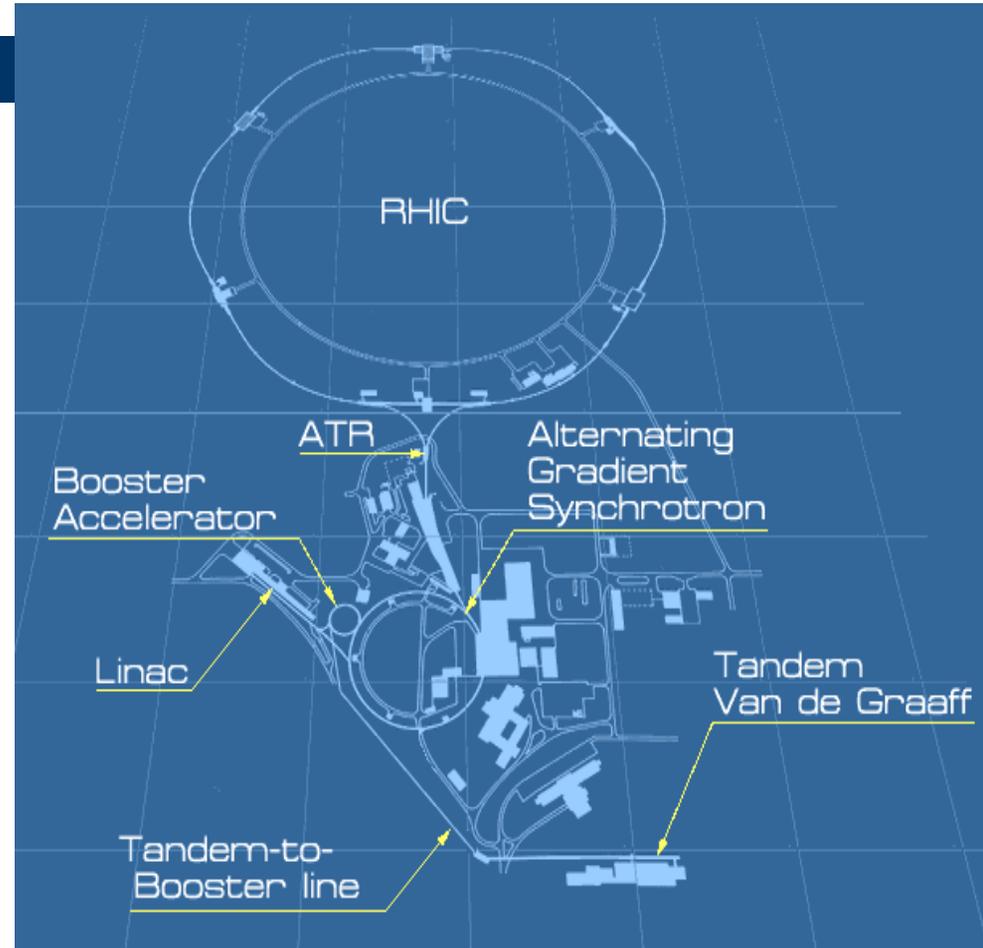


- **Control of access necessary to prevent exposure to potentially lethal radiation from particle beams and other hazards present in an accelerator**

- Unanticipated radiation exposure from activated and contaminated components
- High electric and magnetic fields and their associated voltages and currents

# Two Types of Access Control Systems

- *Conventional Relay Logic*
  - AGS
  - Booster
  - SEB
- *Particle Accelerator Safety System (PASS)*
  - RHIC
  - ATR
  - **NSRL**



# NSRL Target Area and Beamline

- NSRL target and beamline are primary areas
- RCTs will control access to the target area
- NSRL is controlled by PASS



# PASS

- **Particle Accelerator Safety System**

- Operator interfaces built around touchscreen displays
- Buttons used to send commands
  - Represented by rectangles with raised borders
  - Dark blue buttons for screen navigation
- Indicators report information and status
  - Rectangular icons with slightly raised or depressed borders



BGE1

NSRL  
Operations

RA



# PASS Divisions

- System consists of two fully redundant independent safety systems
  - ‘A’ Division
  - ‘B’ Division
- Systems comprised of Programmable Logic Controllers (PLCs)



# PASS Keys and Tokens

- Controlled access keys serve as tokens in PASS
  - Keys (**tokens**) are carried by the entrants
  - Keys are required to gain access to an area through simultaneous release
  - All keys for an area must be **captured** in order to place the area in the *No Access* state
- Keys are grouped in key trees
  - All trees must have all keys captured in order to enter *No Access* state
  - For NSRL, the key tree resided near the gate
    - Keys are released when the user authenticates using the iris scanner



# Access States



- PASS controls various **access states**
- Access states provide protection from exposure to primary, accelerated beam
  - **Critical devices** are controlled to inhibit or allow beam into the machine and into the NSRL target
  - **Radiation monitors** can interlock critical devices through the PASS system to protect personnel from radiation exposure
  - **Permit links** are monitored to protect equipment from unnecessary or undesired radiation exposure
  - **Gates** are monitored and can be locked or unlocked depending on the status of the PASS system
  - PASS also monitors the security (**sweep**) status of the areas under PASS control, preventing beam delivery when areas are unsecured, and required that the areas be secured before beam operation in an area commence

NSRL Status  
Panel

A & B  
Division  
Details

NSRL  
Maintenance

NSRL  
Access

NSRL  
Operations

Previous  
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Main Menu

# Access States (Modes) in PASS

## • **NA** *No Access (Mode 24)*

- No access permitted
- Beam operations are imminent or ongoing
- All critical devices are on

## • **CA** *Controlled Access (Mode 16)*

- Access to enclosure permitted and controlled by gatewatch and key system
- Entrants must authenticate using iris scanner and be allowed and logged in and out through gatewatch
- Beam off
- All critical devices turned off

# Access States (Modes)

## ● **RA** *Restricted Access (Mode 8)*

- Access restricted to those with appropriate training
  - Training signified by possession of appropriate key
- No gatewatch needed for *Restricted Access*
- All critical devices turned off

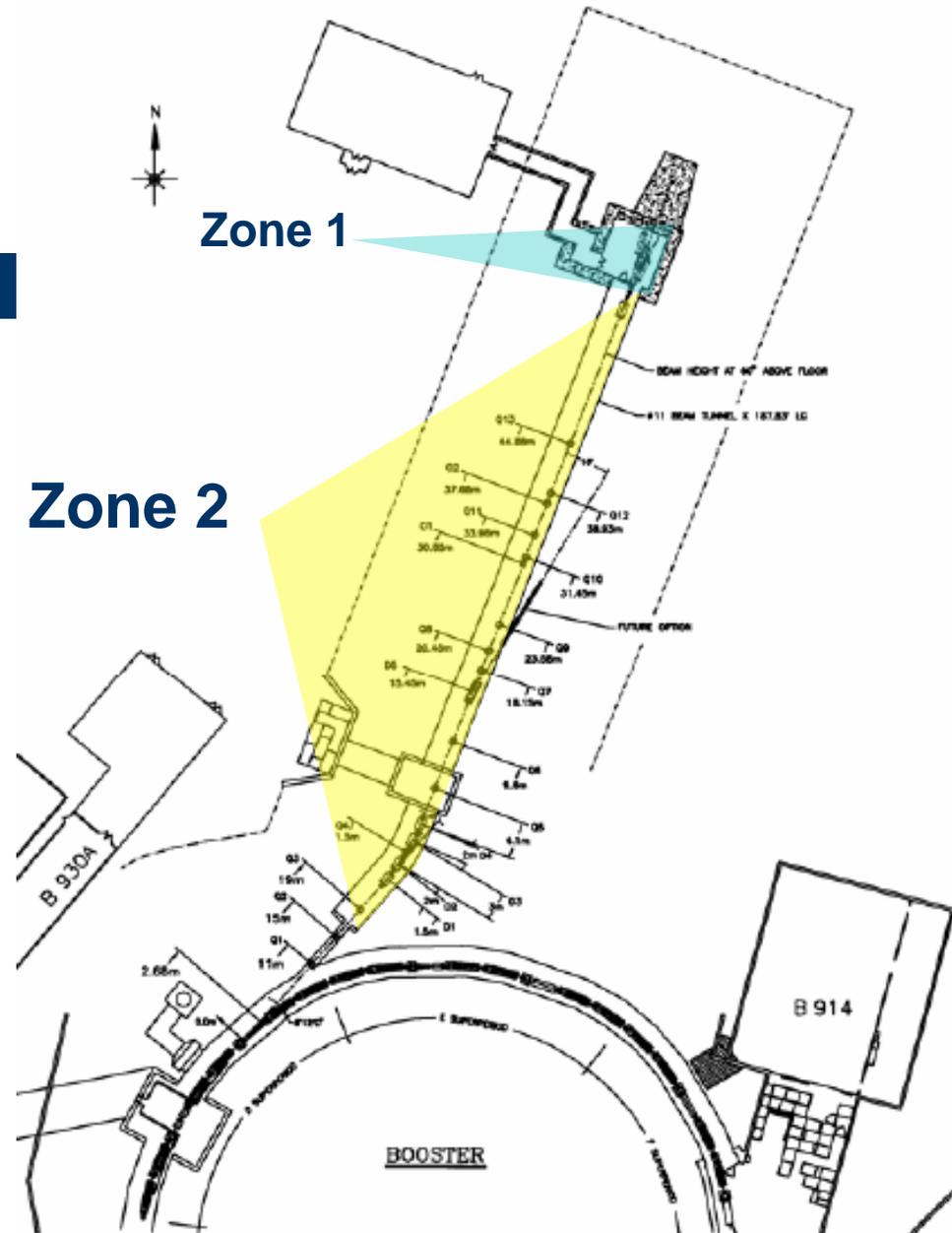
## ● **SA** *Safe Access (Mode 2)*

- State activated by the PASS system when security breach or other hazard is detected by the system
  - For example, if gate detected to be opened while in the *No Access* state
  - Crash button pressed
  - Captured key removed while in the *No Access* state
  - Attempt made to switch from NA to CA while critical devices on
- All critical devices turned off by PASS
- Access conditions similar to *Controlled Access*
- Beam off



# Zone Layout for NSRL

- Zone 1
  - NSRL target room
- Zone 2
  - R-line

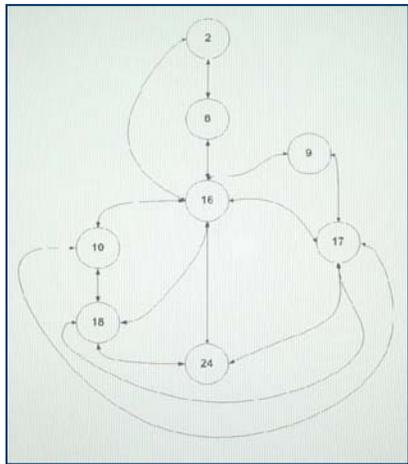






# Changing States in PASS

- To change state, the appropriate mode selector button is pressed



- For NSRL, only certain changes of states are possible

# Opening Gates in PASS Under Controlled Access

- Gatewatch must give a **simultaneous release** to the entrant
  - Gatewatch presses the touchpad to open the gate
  - At same time, entrant turns *Controlled Access (CA)* key to open gate
    - Entrant will hear high-pitched buzzer when gate button is being pressed in MCR



- Gatewatch must continue touching pad until gate fully opens and closes or sweep will be lost for area

# Remote Gatewatch Console (MCR 7)



# Remote Controlled Access (RCA)

- Access controlled from MCR
- Entrants authenticate at iris scanner
  - Verifies qualification and identity
  - Generates log entry
  - Releases controlled access keys (*tokens*) from keytree
    - Token is held by entrant and prevents PASS system from returning to the *No Access* state until token is returned to keytree
    - Beam cannot be restored to area until *No Access* state is restored
- Gatewatch registers successful iris scan and logs entrant both entering and leaving enclosure
- Gatewatch gives releases to both allow entrant into enclosure and exit enclosure in secure manner
- Remote gatewatch cannot be used if the video system is not working



# Responsibilities

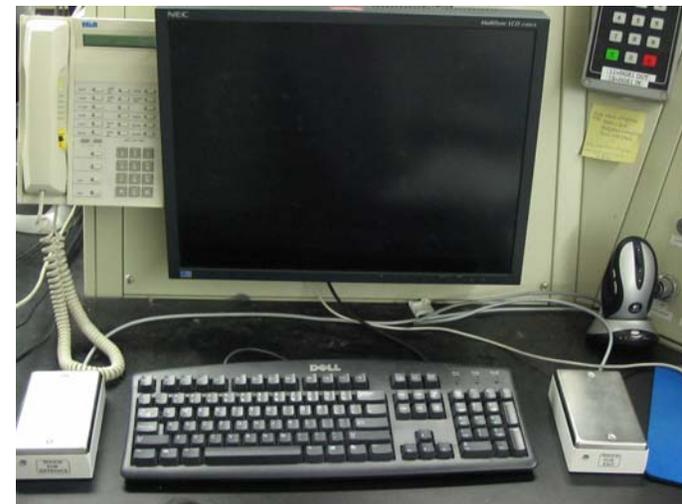
- Gatewatch accounts for all people who enter and exit enclosure
- Operations coordinator approves and initiates both access and resumption of beam operations
- Entrants responsible for observing and obeying radiological postings and other warnings

# Modes of Beam Operation

- Inclusive Mode
  - Used when multiple users require acceleration in the Booster
  - Critical devices:
    - 20° bending magnets (RD1&2)
    - Beam plug
  - This mode requires additional time for critical devices to return to nominal state
- Exclusive Mode
  - Used when NSRL is sole Booster user
  - Critical device:
    - Tandem-to-Booster (TTB) beamstops
  - This mode allows for faster access to NSRL target

# Access to Target Area

- Beam to NSRL target is turned off
  - Beam permit link is disabled
  - Beam inhibited in Booster
- Press '5' on the intercom when audible page is heard
- Turn off critical devices using *TAPE* (inclusive) or beamstops (exclusive)
- Reset chipmunks 133 and 134 if necessary (should be automatic)
- After request to enter, enable touch pads
- Touch ENTER pad momentarily



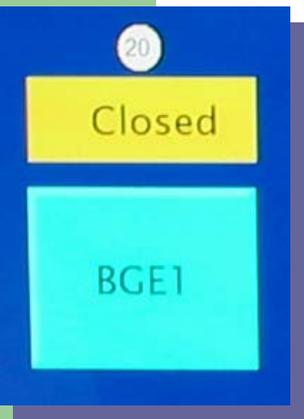
# Access to Target Area

- Target area switched from **No Access** (Mode 24) to **Experimenter Access** (Mode 18)
- Gatewatch touches **MODE PERMIT** button to change the state
  - *Allow beam plug to fully insert*



# Access to NSRL Target Area

- Entrant authenticates using iris scanner and removes key
- Gatewatch issues release by ***touching*** and ***holding*** ENTER pad as entrant uses key to open gate
- While gatewatch continues to touch ENTER pad, entrant removes key from switch and enters door
  - Gatewatch issues release until doors open and fully close behind entrant
- After door indicates **CLOSED**, gatewatch releases touch pad
- Gatewatch logs entrant ***in*** on electronic gate log



# Gate Watch Logs

- Remote Gatewatch with Iris Scanner

C-A Electronic Gate Security Log Sheet for Remote Access  
for use Only With Remote Key Tree (Gates: BGE1, 12GE1,  
6GE1, 8GE1, 10GE1, 12GE1)

Select Shift                      8/27/2004

**Sweep Required**

Select Operator                      Expr: NSRL

**NO.**

UserID	FirstName	LastName	Date	Time	Status	Watch
22xxx	FirstName1	LastName1	9/2/2004	4:30:23 PM	IN	OPR
22xxx	FirstName1	LastName1	9/2/2004	4:31:24 PM	OUT	OPR
22yyy	FirstName2	LastName2	9/2/2004	4:34:24 PM	IN	OPR
22yyy	FirstName2	LastName2	9/2/2004	4:41:49 PM	OUT	OPR
22xxx	FirstName1	LastName1	9/2/2004	4:49:37 PM	IN	OPR
22xxx	FirstName1	LastName1	9/2/2004	4:52:59 PM	OUT	OPR

# Gate Watch Logs

- Backup Iris Scanner Sheet

**C-A GATE SECURITY LOG SHEET FOR REMOTE ACCESS  
FOR USE ONLY WITH REMOTE KEY TREE (GATES: A3 / BGE1 / 2GE1/ 6GE1 / 8GE1 / 10GE1)**

Sheet No. \_\_\_ of \_\_\_

- 1) (Check one)      Shift (0001-0800) \_\_\_\_\_      Shift 2 (0801-1600) \_\_\_\_\_      Shift 3 (1601-2400) \_\_\_\_\_
- 2) Gate name \_\_\_\_\_ Date \_\_\_\_\_
- 3) Opened (N/A for multiple NSRL/A3 access) \_\_\_\_\_ (time) By (signature): \_\_\_\_\_
- 4) Locked (N/A for multiple NSRL/A3 access) \_\_\_\_\_ (time) By (signature): \_\_\_\_\_
- 5) Gate log reviewed by OC (signature)(N/A for multiple NSRL/A3 access) \_\_\_\_\_
- 6) Sweep Required (4 hrs / 26 entries):    (Check One)    \_\_\_yes    \_\_\_no  
 OC concurrence (signature) (N/A for multiple NSRL/A3 access) \_\_\_\_\_

	ENTRANT (LAST) NAME PRINT OR SIGN IN/OUT IF MCR CA KEY	ENTRY TIME IN (24 hour clock)	WATCH INITIAL IN	EXIT TIME OUT (24 hour clock)	WATCH INITIAL OUT	MCR CA KEY (X)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						

# Exit from Target Area and Restoration of Beam

- When experimenter is ready to leave gatewatch issues release by touching and holding EXIT pad to allow door to open
- Experimenter walks through (experimenter need not turn key to exit)
  - Gatewatch issues release until doors open and fully closes behind entrant
- Gatewatch logs entrant **out**
- Access state is changed from **Experimenter Access** to **No Access**
  - After 30 second timeout, critical devices become enabled
- Critical devices are turned on using TAPE or beamstops are opened
  - Beam is restored to target area
- Disable touch pads
- Push 'X' to turn off intercom

XC

NA



# Maintaining the Security of the NSRL Target Area

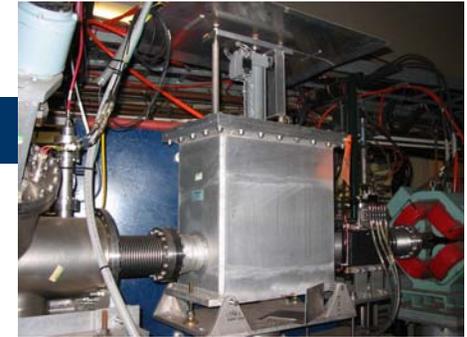
- In order to enter target room, a release must be given from MCR throughout period when door is open
  - Otherwise, sweep is lost – *'blown sweep'*
  - Security for area and lost and a sweep must be performed



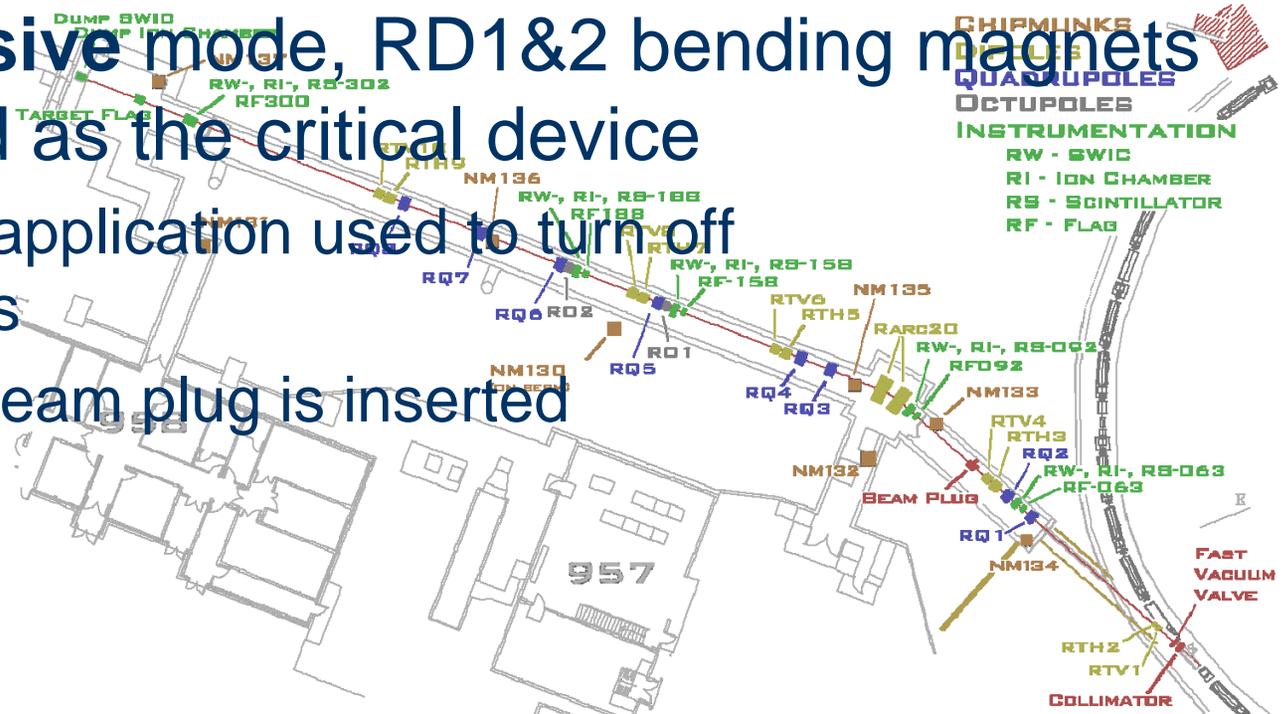
# Conditions for Blowing a Sweep

- Tailgating
  - More than one authorized person at a time enters the enclosure
  - Note: This is allowed for this area if number of people entering area is known in advance and all entrants have scanned out a key from key tree
- Unqualified Entry
  - A person without appropriate qualifications makes entry
    - Person without token key from keytree
    - Token is passed to entrant who did not properly authenticate at the iris scanner
- Unexpected or Improper Entry
  - Person(s) who were not expected to make entry enter the enclosure
- Uncertain or Insecure Conditions
  - Conditions for making an entry consistent with entry procedures are uncertain or do not exist
  - Operator should either slow down or halt entry whenever conditions are uncertain
- ***Gatewatch is expected to blow the sweep whenever the above conditions are encountered***
  - ***Safety of personnel and proper accounting for entrants into primary area is of paramount importance!***

# Turning Off Critical Devices Preparing for Access



- In **exclusive** mode, beamstops are the only critical device
- In **inclusive** mode, RD1&2 bending magnets are used as the critical device
  - TAPE application used to turn off devices
  - Also, beam plug is inserted



# Turning Off Beam to NSRL Target

- During routine operation, beam turned off automatically by NSRL dosimetry permit – permit link disabled
  - Acceleration equipment turned off when certain dose is achieved on target
    - RF is inhibited
    - Extraction dipoles (bumps) turned off
  - Prevents beam from being accelerated in Booster
- Acceleration equipment is restored to nominal state when dosimetry permit is enabled
  - Acceleration equipment turned on
  - Beam once again accelerated to Booster
- However, beam not extracted from Booster and allowed to reach NSRL target until critical devices are enabled

# TAPE

- **Tool for Automated Procedure Execution**

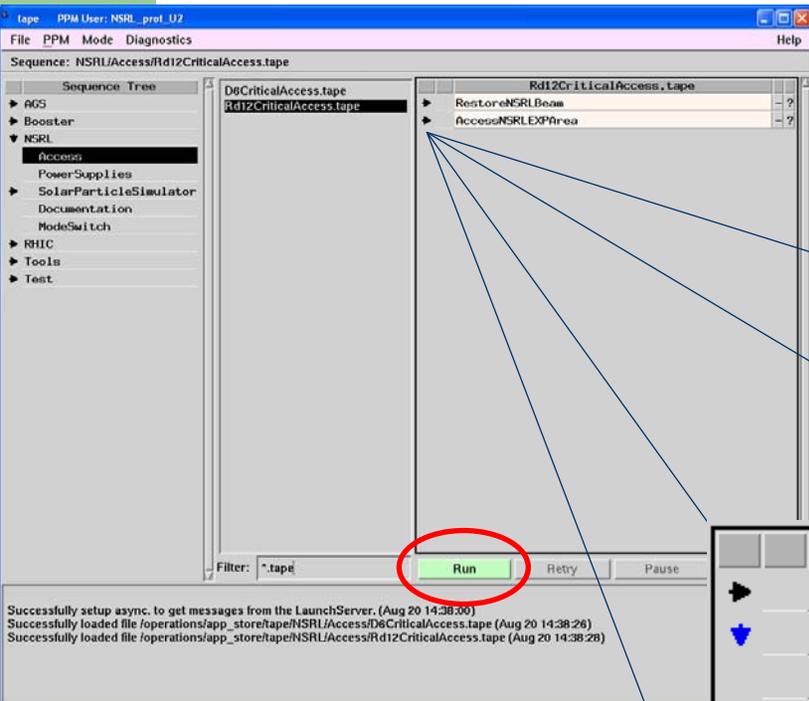
- Procedures organized in tree-structure

NSRL →

Access →

Rd12CriticalAccess.tape →

AccessNSRLEXPArea



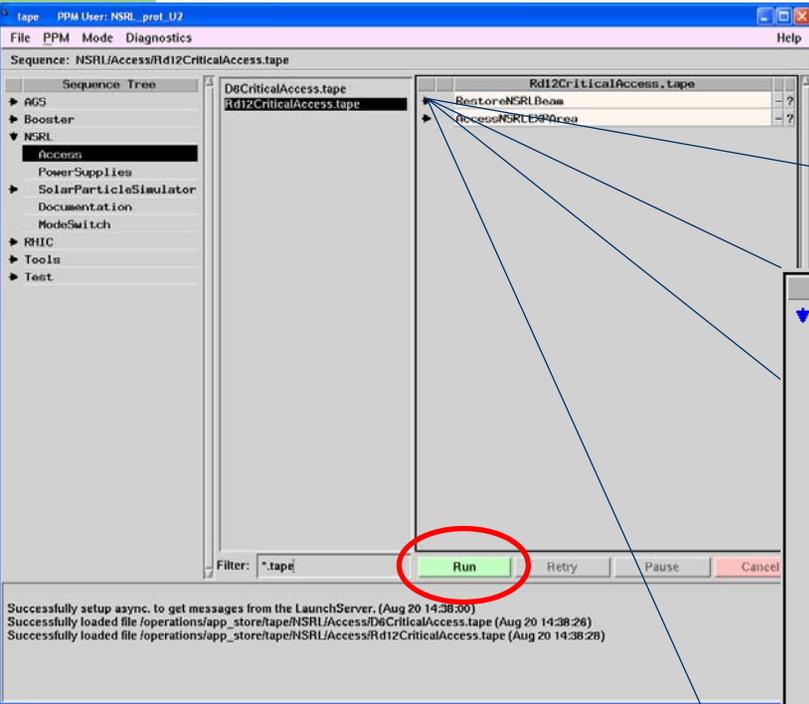
Rd12CriticalAccess.tape		
▶	RestoreNSRLBeam	- ?
▼	AccessNSRLEXPArea	- ?
	Check State	C ?
	Turn off Booster RF	P ?
	Turn off Booster RF	P ?
	Set 20 degree arc to standby	P ?
	Delay	P ?

# Turning on Critical Devices

## Preparing for Beam Restoration

- For restoration of critical devices, **No Access** state must be restored
- 30-second time out follows after **No Access** state is restored before critical devices are enabled
- Following time-out critical devices are enable
  - In inclusive mode, RD1&2 become enabled
  - In exclusive mode, beamstops can be opened

# TAPE



- NSRL →  
Access →  
Rd12CriticalAccess.tape →  
RestoreNSRLBeam

Rd12CriticalAccess.tape		
RestoreNSRLBeam	-	?
Check State	C	?
Turn 20 degree arc to standby	P	?
Delay	P	?
Get setpoint	P	?
calculate new setpoint	P	?
calculate lower setpoint	P	?
calculate lowest setpoint	P	?
set new setpoint	P	?
Turn on 20 degree arc	P	?
Delay	P	?
set lower setpoint	P	?
Delay	P	?
set lowest setpoint	P	?
Delay	P	?
Set old setpoint	P	?
Delay	P	?
TurnBoosterRFon	P	?
TurnBoosterRFon	P	?
AccessNSRLEXPArea	-	?

# Relieving the Gate Watch

- Once entry begins, gatewatch must remain at post until entry is concluded
- Gatewatch relief should occur roughly hourly
  - This should be worked out with other shift operations personnel assigned to NSRL watch

# Online Resources

- Access procedures and additional information can be found from the Operations homepage:

<http://www.cadops.bnl.gov/AGS/Operations/NSRL/setup.html>

Click the [NSRL Setup](#) link

# Problems and Questions

- Always feel free to ask operators any questions that may arise
- Let the coordinator know if there are problems with access or beam operation
- Never hesitate to ask experimenters to slow down or answer questions if issue of accounting or safety arise
  - Work toward making entries as smooth, rapid, and trouble-free as possible
  - Experimental samples are sensitive and require processing as efficiently as possible