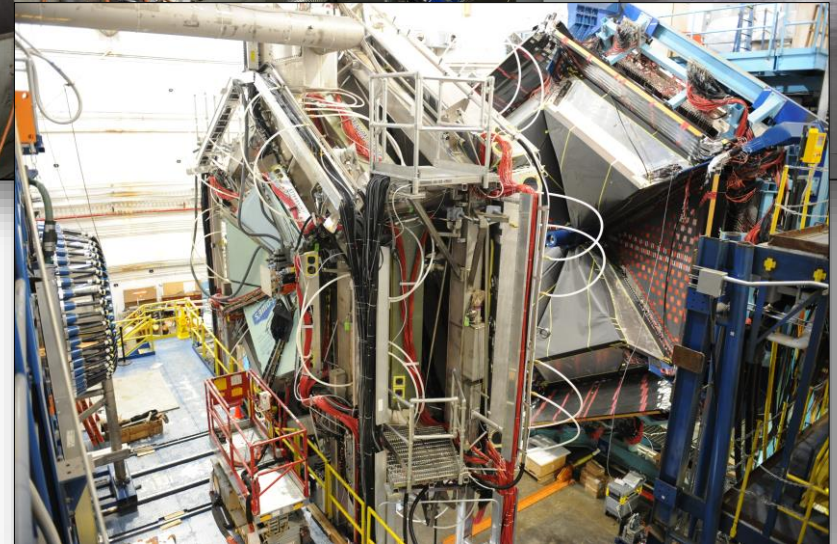
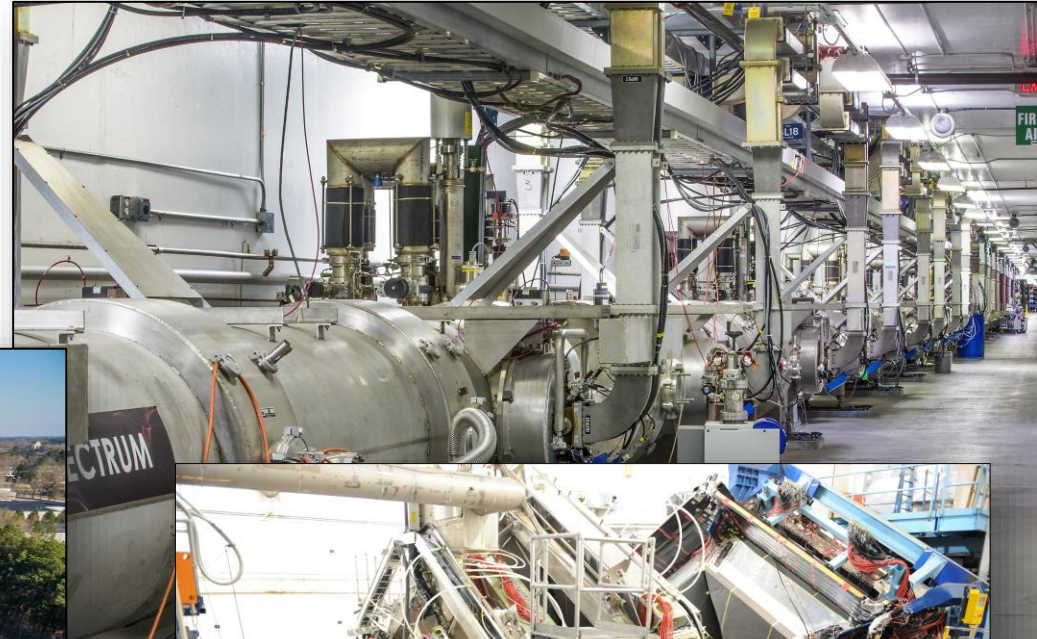


# Recent ARR Experience at JLab

Accelerator Safety Workshop  
Tuesday, September 10, 2019



# REVIEW

- From the ASO, we know that
  - an accelerator readiness review (ARR) program that ensures facilities are adequately prepared for safe commissioning and/or operations must be included in accelerator safety programs [4.b.(5)]
  - DOE Field Element Managers approve Start of commissioning activities after ensuring that an appropriate Accelerator Readiness Review (ARR) has been conducted [5.b.(4)(b)]
- From the ASO CONTRACTOR REQUIREMENTS DOCUMENT (CRD), we know that
  - An accelerator readiness review (ARR) program that ensures facilities are adequately prepared for safe commissioning and/or operations must be included in the contractor organization's in an accelerator safety program, and
  - ARR's must be performed before
    - DOE approval for commissioning and routine operation, and
    - As directed by the DOE Program Secretarial Officer/NNSA Deputy Administrator or a DOE Field Element Manager.

# REVIEW, cont'd.

- From the ASO CONTRACTOR REQUIREMENTS DOCUMENT (CRD), we know
  - As part of the ARR Process the contractor must demonstrate to the satisfaction of the Field Element Manager that the following processes are in place:
    - a. Contractor Assurance System that maintains an internal assessment process;
    - b. Facility Configuration Management Program that is related to accelerator safety; and
    - c. Credited controls and appropriate administrative processes related to accelerator safety (e.g. training, procedures, etc.).
- JLab conducted an ARR

The screenshot shows a web page titled "Accelerator Readiness Review Plan for the Upgraded Injector Test Facility (UITF)". The page includes a navigation menu on the left with items like "Overview", "Scientific Programme", "Timetable", "Contribution List", "Author List", "My Conference", and "My Contributions". The main content area features a description of the ARR team's role, a clock icon indicating the review period from June 26, 2019, to June 28, 2019, and a list of documents including the UITF ARR Team Charter, Team Charge Letter, and various reports and plans.

# REVIEW, cont'd.

- From the Guide, we know that
  - 2.3.4 ASE Review and Approval Process: The ASE should be reviewed as part of the ARR process, and
  - 2.5.2 Training Program Elements/Content: The *major elements of the training program* are to be in place before initial accelerator-commissioning activities begin and *should be reviewed as part of the ARR process*
  - 2.6 **Unreviewed Safety Issue Process Development:** Hazard analysis, safety analysis, contractor assurance programs, the SAD, the ASE, and *ARR processes are all critical elements of an effective accelerator safety program.*
  - 2.10 **Accelerator Readiness Review:** provides a means to verify that an accelerator facility's personnel, documentation, and equipment are adequate to safely support the full scope of activities proposed for commissioning and/or routine operations.

# WHAT PROMPTED AN ARR?

- An ARR was required because
  - UITF was
    - ✓ a new module to an existing facility is constructed
    - ✓ a substantial upgrade or change to an existing facility
    - ✓ A resumption of operation of an existing facility that has been shut down for an extended period of time...
  - The ARR was tailored based on
    - The JLab ARR Process



## Accelerator Readiness Review Program

(This is a Class #3 Document)

Document Number: QACI-041

Approval Date: 08/13/2015

Revision Number: 3.2

Periodic Review Date: 08/13/2021

Document Owner: [Robert May](#)

### Content Classification:

[C1](#) = Contract or Regulatory requirement. Requires TJSO review and/or approval.

[C2](#) = Technical Content. Requires management or Subject Matter Expert review and/or approved by Laboratory Director.

[C3](#) = Risk Code  $\geq 2$ , affects +1 work groups, or at management discretion. Reviewed by SME(s) and approved by affected group manager(s).

## 1.0 Overview

### 1.1 Purpose

Conduct and document an accelerator readiness review (ARR) within the Jefferson Lab Integrated Safety Management System (ISMS) and integrated Contractor Assurance System (CAS) that meets the requirements of the DOE Order 420.2C, "Safety of Accelerator Facilities (ASO)".

### 1.2 Scope

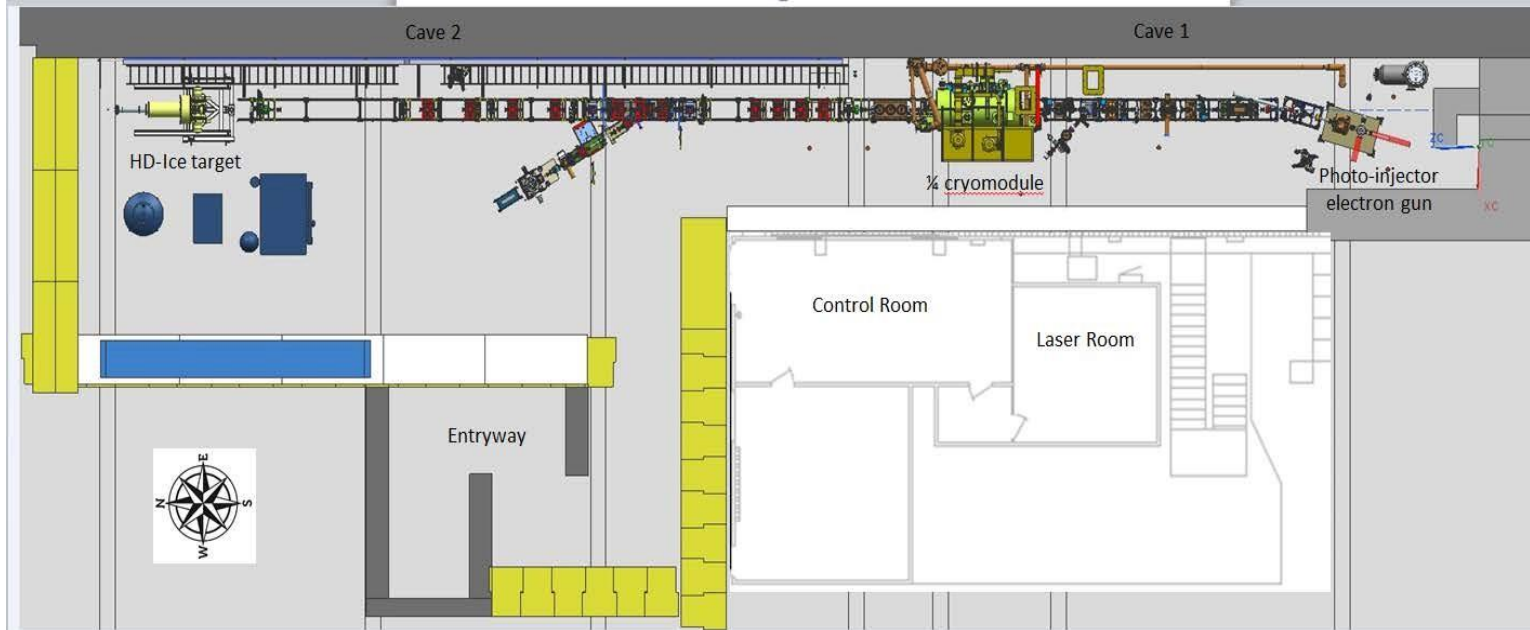
An ARR is a structured method for verifying that hardware, personnel, and procedures associated with commissioning or routine operation are ready to permit the activity to be undertaken safely.

# FACILITY OVERVIEW

- UITF is neither large, nor complex as accelerators go



The UITF is an upgrade to the former Injector Test Stand (ITS) located in the Test Lab High Bay. The UITF occupies both the former ITS cave (Cave 1) and includes a second contiguous enclosure (Cave 2) that extends the former ITS further into the High Bay area. The upgrade extends the capability of the former ITS 100 kV electron source to 10 MeV by adding a  $\frac{1}{4}$  cryomodule based on the same superconducting RF acceleration used in CEBAF.



# PRE-ARR EVENT

- Worked with Facility Manager to conduct a series of three sequential and dependent internal reviews as ARR preparation
- Reviews needed to be functionally important for the facility staff (who needed to be convinced that it was worth the effort)
- The Reviews:
  - 1) The “will it work” review (does it have scientific merit, does what we want to build seem like it will work, does it have a reasonable chance of success within the existing context of lab operations)?
  - 2) The “can it be made to work safely and efficiently” review (what is necessary to evaluate and document hazards and controls, what controls are necessary for us to make it work safely)?
  - 3) Now that the answers to 1) and 2) are yes, there is the “how are we actually going to operate it” (conduct of operations) review?
- These constituted the internal readiness plan/process
  - Captured as part of the assessment process associated with the lab CAS

# PRE-ARR EVENT, CONT'D.

---

- These reviews derived from **2.10.3.1 Preparing for the ARR** in the Guide and addressed
  - (Review 3) Roles, responsibilities, accountabilities, and authorities that establish the expectations and duties of managers, supervisors, and operators for carrying out the commissioning consistent with external and internal requirements
  - (Review 2, 3) Procedures, administrative controls, and personnel training and qualification for commissioning at the stated intensity
  - (Review 2) Engineered safety systems that will be operable for the accelerator and accelerator-associated experimental facilities
  - (Review 3) Specific sub-systems and modes of commissioning



# ARR EVENT PLANNING

- The ARR plan and process was adjusted based on the
  - Size
  - Complexity, and
  - Inherent hazards associated with operation
- From the UITF ARR Plan from the ARR Plan Purpose and Scope statement
  - This ARR is conducted using a graded approach and, depending on the nature and extent of the hazard profile, the scope of the ARR will vary. This is evident in the specific criteria (CRAD) associated with each hazard and is further evident in the depth of the lines of inquiry (LOI) used to evaluate a particular criterion. CRAD and associated LOI are in ***Appendix 3: Upgraded Injector Test Facility (UITF) CRAD / LOI Documents***
  - This ARR shall address accelerator specific hazards associated with:
    - Ionizing and non-Ionizing Radiation
    - Electrical Hazards
    - Fire Hazards
    - Pressure and Vacuum Hazards
    - Cryogenics and Oxygen Deficiency Hazards
    - Magnetic Fields
    - Other Mechanical, Chemical, and Gaseous Hazards

# ARR EVENT PLANNING, CONT'D.

- The ARR Plan was CRAD/LOI based
  - CRAD/LOI help you define success
    - Met LOI = Met Criterion
    - Met Criteria = Readiness in the referenced subject matter area
  - CRAD/LOI help “show you cover the waterfront”

## Appendix 3: Upgraded Injector Test Facility (UITF) CRAD / LOI Documents

- 3.1 Accelerator Readiness Review (ARR) Process and Plan
- 3.2 Contractor Assurance System (CAS)
- 3.3 Safety Assessment Document (FSAD)
- 3.4 Accelerator Safety Envelope (ASE)
- 3.5 Credited Controls
- 3.6 Safety Configuration Management (SCM)
- 3.7 Unreviewed Safety Issues (USI)
- 3.8 Commissioning Plan (CP)
- 3.9 Cyber Security/ Software QA
- 3.10 Conduct of Operations
- 3.11 Operator Training and Quals
- 3.12 Accelerator Operations Procedures / Logs
- 3.13 Accelerator Maintenance and Repair Activities
- 3.14 Emergency Management

# ARR EVENT PLANNING, CONT'D.

- CRADs and LOI followed consistent format
- Unambiguous “Performance based” activity(ies) identified for each CRAD
- ARR Plan says the CRAD/LOI are guidance and not constraints

## 3.8 Commissioning Plan (CP)

### Objective

Verify that there is a documented Commissioning Plan consistent with the DRAFT Accelerator Facility Safety Implementation Guide for DOE O 420.2C, SAFETY OF ACCELERATOR FACILITIES (August 2012)

### Criteria

The Commissioning plan presents sufficient detail to describe the resources (people, equipment, and procedures), the organization, and the procedures necessary for safe commissioning. The Commissioning Plan must have sufficient internal review and oversight to ensure safe commissioning.

### Approach

**Record Reviews:** Review the results of the June 6-7, 2013, Directors Beam Commissioning Plan Review.

**Interviews:** Discuss the Beam Commissioning Plan with Operations Director, Accelerator Operators, Commissioning Advisory Board, CASA staff, and evaluate their level of integration – how well they understand the commissioning goals, their roles (responsibilities, authorities, etc.).

**Performance Demonstrations:** Observe Control Room Procedures and Staffing Plans, Operations (and CASA) Training activities.

### Lines of Inquiry, Status and Evidence for Each Criterion

Criterion 3.6: Commissioning Plan		
LOI	Status/Evidence	ARR Reviewer Notes
1. The Commissioning Plan fully describes roles, responsibilities, accountabilities, and authorities that establish the expectations and duties of managers, supervisors, and operators for carrying out the commissioning/operations and any related documented authorizations	Status:  Evidence:	

# ARR EVENT PLANNING, CONT'D.

- Team member selection and roles identified up-front
  - Listed in the plan
  - Unambiguous from the start to avoid confusion, but
  - Adjustable by the chair on request
- From ARR Plan Section 3.2, **Selecting the UITF ARR Team Members, Affiliation, (and Focus Areas)**
  - A team composed of experts will conduct the ARR. The ARR Team selected by the Associate Director, ESH&Q, reviewed by the SCMB, and recommended to the Laboratory Director consists of:
    - John Quintana, ANL, Chair,
    - Andrew Kimber, JLab, Vice Chair (accelerator hardware and system readiness, maintenance and operations processes),
    - Paul Vasilauskis, JLab (accelerator operations procedures, operator training, conduct of accelerator operations),
    - Doug Higginbotham, JLab (conduct of operations for users, user training, experimental readiness),
    - Harry Fanning, JLab (PSS systems, configuration management, accelerator specific hazards), and
    - Bob May JLab, Facilitator (ARR Process Facilitator, ESH&Q/general industrial safety)

# ARR EVENT

---

- The DOE provided oversight during the ARR
- DOE Site Office members will participate in the review as ex-officio members of the team
  - It is expected that they are asking questions, participating in the dialog, and contributing as team members , sometimes as facilitators
- A (multi-day) daily plan is provided as a tool for covering each subject matter area
  - Covers both in-room presentations and field visits to “kick the tires”
  - Some presentations are “in-situ” (in the control room in front of the equipment, etc.
  - Helps facilitate performance based review
- A list of speakers for each subject matter area is provided with a cross walk of CRAD #'s associated with each presentation

# ARR EVENT, CONT'D.

SESSION	SESSION TITLE	REVIEWERS						OBSERVERS		
		Quintana	Kimber	Higginbotham	Vasilauskis	Fanning	May	Hunt	Neilson	Epps
<b>WEDNESDAY AM</b>	<b>IN-BRIEF AND JOINT SESSIONS</b>									
<b>WAM-1</b>	Joint Sessions (Location TBD)									
<b>0800-0815</b>	In-brief	X	X	X	X	X	X			
<b>0815-0900</b>	Joint Session 1: ARR Plan and Process for the Review	X	X	X	X	X	X			
<b>0900-0930</b>	Joint Session 2: CAS and Facility Safety Basis (FSAD, ASE, USI)	X	X	X	X	X	X			
<b>0930-1015</b>	Joint Session 3: Configuration Management	X	X	X	X	X	X			
<b>Break</b>										
<b>1030-1145</b>	Joint Session 4: Commissioning Plan Overview and Results of Director's Review	X	X	X	X	X	X			
<b>Working Lunch</b>	TBD	X	X	X	X	X	X			
<b>WEDNESDAY PM</b>	<b>JOINT SESSIONS, CONT'D., TECHNICAL SESSIONS</b>									
<b>1315-1430</b>	Joint Session 5 Lessons Learned (Internal and External)	X	X	X	X	X	X			
<b>1430-1515</b>	Joint Session 6 UITF Conduct of Operations (Ops Directives) Commissioning and Operations Integration	X	X	X	X	X	X			
<b>Break</b>										
<b>WPM-1</b>	Technical Session 1 (Location TBD)									
<b>1515-1600</b>	Technical Session 1A Industrial Safety for accelerator specific hazards	X				X	X			
<b>1515-1600</b>	Technical Session 1B Radiation Control Program, Shielding, Prompt Rad. Policy Program Infrastructure, Waste Mgt. Shielding Configuration Management		X	X	X					
<b>WPM-2</b>	Technical Session 2 (Location TBD)									
<b>1600-1645</b>	Technical Session 2 Accelerator Controls – Cyber Security and Software QA Program - demonstrate change controls, problem resolution process) lead reviewer discretion	X	X	X	X	X	X			
<b>1645-1730</b>	ARR Team Executive Session (TBD)									

# ARR EVENT, CONT'D.

**List of Talks and Responsible JLab Staff**

Session Title and Contents	CRAD/LOI reference	Responsible JLab Staff <i>(producing/delivering talks and leading in-field reviews and discussions)</i>
Joint Session 1 ARR Plan and Process for the Review	3.1	R. May
Joint Session 2 CAS and Facility Safety Basis (FSAD, ASE, USI)	3.2, 3.3, 3.4, 3.5	R. May
Joint Session 3 Configuration Management	3.6, 3.7	H. Fanning
Joint Session 4 Commissioning Plan Overview	3.8	M. Poelker
Joint Session 5 Lessons Learned (Internal and External)	3.6, 3.7	M. Poelker
Joint Session 6 UITF Conduct of Operations (Ops Directives) Commissioning and Operations Integration	3.10	M. Poelker
Technical Session 1A Industrial Safety including non-Ionizing Radiation, Electrical Hazards, Fire Hazards, Pressure and Vacuum Hazards, Cryogenics and Oxygen Deficiency Hazards, Magnetic Fields, other Mechanical, Chemical, and Gaseous Hazards	3.3, 3.13	H. Fanning
Technical Session 1B Radiation Control Program, Shielding, Prompt Rad. Policy Program Infrastructure, Waste Mgt. Shielding Configuration Management	3.3, 3.13	K. Welch or designee
Technical Session 2 Accelerator Controls – Cyber Security and Software QA Program - demonstrate change controls, problem resolution process) lead reviewer discretion	3.9	M. Bickley
Technical Session 3A Operator Training, in-situ discussion and process observation (UTIF Control Room)	3.11, <a href="#">3.12</a>	M. Poelker

# ARR RESULTS

---

- Finding / Comment (or OFI) / Recommendation format is used for categorizing information
  - It helps to provide an out-brief format for the ARR Team to use
  - It helps to provide a draft report format as well
    - If you have a short time-frame for the final report, you better draft it yourself, in advance...
- Also capture any Noteworthy Practices
- Recommendations are things that required follow-up
  - Helpful to categorize recommendations as
    - Must be done before commissioning, routine operations,
    - Must be done before operations
    - Or both
    - May be done after commissioning but before operations
    - May be done after operations...
  - We put all Comments and Recommendations in our corrective action tracking system for follow-up



# ARR RESULTS, CONT'D.

- UITF ARR resulted in two Pre-Start recommendations
  - Readiness of People (Including Training) Pre-Start
    - Description of Finding/Issue \*Establish operator proficiency levels as required the the 6/27/2019 UOD document. Post the list of qualify operators in the control room. Must be updated and differentiate between the classes of operator's skills and assigned tasks
  - Readiness of Documentation (including process and procedures) Pre-Start
    - Revise and approve the UOD, FSAD and ASE consistent with Jefferson Lab safety analyses and management processes
- Resulted in two Post-Start recommendations
  - Readiness of People (Including Training) Post-Start
    - Model Operator training programs and records consistent with Jefferson Lab training, using the graded approach
  - Readiness of Documentation (including process and procedures) Post-Start
    - - Use the process/steps from the Commissioning Test Plan to develop a Start Up Procedure to be used in subsequent start ups. Continue to turn Test Plans into formal documentation for Operations use and training purposes.

# ARR RESULTS, CONT'D.

- ARR resulted in two OFIs
  - Install additional "operator aids" (e.g. more easily visible alarm lights) to help operators recognize alarm conditions from the Rapid Access Radiation Monitor
  - Operators who perform sweeps in the UITF are required to visually verify the positions of shielding that can be manually moved (e.g. shielding blocks near trenches)
- And seven Noteworthy Practices
  - A sample
    - The processes and procedures for configuration management are defined... and well integrated with the Lab's CAS
    - Use of common tools (UITFlist, UED, UITFlog, System readiness tool etc.) makes it easy for the workforce to own, operate and troubleshoot systems
    - Facility Manager demonstrated ability to skillfully perform OJT; the foundation of the UITF training scheme
    - Laser Operational Safety Procedure appears robust and offers clear expectations for operations and safety requirements. It is written as a clear "user document" and operator expectations are unambiguously conveyed

# SUMMARY

---

- In-depth review that was performance-based
- TJSO invested in ARR process and ARR conduct
- Useful results
- An effective process used effectively
- Questions?