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Revision History

Revision	Date Released	Description of Change
R0	TBD	Original Release.

	Interface Control Document
LCLS-II	**Document Title: LCLS-II ICD with JLAB for LERF Test Facility**
	Document Number: LCLSII-2.7-IC-1116-R0 Page 2 of 6

1   Purpose

Interface Control Documents (ICDs) are interface or boundary documents that define the boundaries between two systems. ICDs are used to describe the boundaries or endpoints of one specific system with respect to another system, the physical interface between the two, and/or the limits of responsibilities for the two systems or contributors.

This document defines the interfaces between and responsibilities of SLAC National Laboratory and Jefferson National Laboratory [JLab] for LCLS-II Project with respect to the cryomodule testing in the LERF facility at JLAB.

2   Scope

The scope of this document is to define roles and responsibilities for the LLRF project team comprising of individuals from SLAC and JLab.

The scope of this work ends when the LERF test facility is ready to operate and does not include any of the cryomodule configuration or testing planned at this facility.

3   Definitions

I&C	Instrumentation and Controls
RF	Radio Frequency
CW	Continuous Wave
LLRF	Low level RF
SCRF	Superconducting RF
HPRF	High Power RF
EEIP	(SLAC) Electrical Equipment Inspection Program
LERF	Low Energy Recirculating Facility
PSS	Personal Safety System
CM	Cryomodule

4   Responsibilities

Table below defines the Partner lab leading the development for each of the LLRF system elements. Every system or element is collaboration between partner labs and SLAC, and the specific roles and responsibilities are defined in the following table.

System or Element	**Partner Lab Lead**
LLRF	SLAC
Cryomodule Controls	SLAC
Cryo System Controls (LERF)	JLAB

System or Element	Partner Lab Lead
Local waveguide and Cabling installation	JLab
Utilities	JLab
Safety and access control	JLab
HPRF	SLAC
Controls Computing Infrastructure (CCI) and Networking	SLAC
Vacuum	SLAC

System or Element	SLAC Area of Responsibility	JLab Area of Responsibility
Project Support	• Provide project management guidance • Provide and update project schedule • Provide coordination between collaborating labs. • Facilitate weekly communications and Design reviews • Interface between LCLS-II project management and the LERF team • Provide requirements and documentation • Provide Project support for reviews, manage and manage SLAC teams. • Provide shipping support for the elements provided by SLAC in this document	• Assemble and edit requirements and specifications. • Provide requirements and documentation • Participate in weekly updates • Provide Project support for reviews, manage and manage JLAB teams. • Install and test the hardware • Provide return shipping support for the elements to be returned to SLAC after the tests are complete.
RF Power Hardware	• Loan 16 SSAs • Loan 16 isolators and dummy loads • Loan 16 Directional Couplers	• Design, procure and install all waveguide distribution • Provide and connect to AC power, LCW water cooling • Network connections for SSAs (within LERF VLAN): 16 connections total • Provide RF Cabling • Ensure PSS is functional and working
RF Power SW	• Provide the software necessary to commision and operate the RF system at LCLS-II	

System or Element	SLAC Area of Responsibility	JLab Area of Responsibility
LLRF Hardware	• Loan 4 full racks to control 16 cavities • Racks come pre-loaded with full set of LLRF hardware connected and tested • 2 configured RF CPUs • 2 network switches for RF local private networks	• Local installation support • Provide LO distribution • Terminal server for CPU console access • Network connections for RF CPUs and LLRF electronics chassis (within LERF VLAN): 18 connections total • Provide RF cables to LLRF racks and chassis
LLRF Firmware	• All integrated firmware for testing	• Local support
LLRF Software	• Provide the software necessary to commision and operate the RF system at LCLS-II	• Contribute to definitions and requirements for LCLS-II LLRF software • Local support
Cavity Test Software	• Provide fundamental/production EPICS controls for operating a cryomodule (RF, Cryo, Vacuum). • Provide firmware and PLC support for developing cavity test applications • Assist in developing the EPICS cavity test software	• Define RF test applications • Provide the software (EPICS/Labview) necessary to test cryomodules at LERF (and CMTF)
Vacuum System Hardware	• Provide pumps, gauges and controllers • Provide PLC, HMI and terminal server (for serial communication) • Provide He Scavenging Pump Cart • Provide documentation	• Interfaces with LERF vacuum • Provide all cables and connectors for pumps and controllers • Provide valve actuation mechanism (such as compressed air)
PLC and EPICS	• Software configuration and controls	• Local support • Provide requirements and guidance

Controls Software	• Instructions for JLab to build LCLS-II-like software infrastructure, including
	   · EPICS base, modules, extensions
	   · LinuxRT infrastructure
	   · Alarm handler
	   · Screen for iocConsole
		• Controls infrastructure
		• 2 64-bit RHEL6 Dell servers, configured to mimic LCLS-II environment (as specified by SLAC):
		   · 1 application server
		   · 1 development server
		• Network switch

System or Element	SLAC Area of Responsibility	JLab Area of Responsibility
		• Remote access to LERF servers • Access to SLAC GitHub site from LERF · Local support · EPICS archiving system (JLab system to be used; archiver appliance as backup plan if there are issues) • Electronic logbook for record-keeping and documentation, with ability to attach screenshots and other files • Provide access to existing datasets
Cryogenics	• Interface with JLAB	• Provide Liquid He supply with valves and interlocks • Guard He supply with valving
Liquid He Controls	• PLC programming to interface with JLAB's infrastructure and LCLS-II LERF Controls	• Local support • Provide requirements and guidance
Cryomodule Controls Hardware	• Loan a complete set of controls hardware for two cryomodules. This consists of 1 double-bay rack per cryomodule. 2 double bay racks total will be supplied by SLAC to support both cryomodules. • SLAC does not have fluxgate monitoring in baseline scope. Fluxgate monitoring hardware and support is not in this scope. • Provide a UPS in 2 cryo racks. The UPS supplies 120 VAC power to LLRF rack for tuner motor control, powers the 24 VDC PS in cryo rack, and powers 1 level monitor.	• Local installation support • Provide requirements and guidance • Provide rack placement location details for review • CDA for 4 total JT valves. Two JT and two cooldown valves. • Install pneumatic lines • Provide feedcap and end cap designs for additional interfacing with control system. • JLab provides fluxgate monitoring if deemed necessary by JLab. • JLab provides conduit, wire, junction boxes or twist locks deemed necessary for UPS integration between cryo and LLRF racks. • CryoControl racks must not be located in vault location. • Multi-conductor cable provided by JLab. Any cabling not matching exactly what's used in production must meet the same specifications as production. (ie. Gauge, twisted, shielded pairs with 1 drain wire per pair).

		• Cryomodule connectors to be procured and terminated by JLab. • Provide quantity 3, 120 VAC feeds per cryomodule rack. •
Cryomodule Controls Software	• Provide LCLS-II Production CM controls logic in PLC and EPICS • Provide Rockwell Studio 5000 Logix Designer license for PLC programming.	• Local support • Provide requirements and guidance • Provide PC for PLC programming. PC must be remotely accessible from SLAC personnel for PLC programming. Expect only one remote session available at a time for accessing the PC remotely.
Network and Computing HW	• Provide consultation for computing • Provide consultation for networking	• Provide two servers (one for controls applications, one for development) • Local installation and management (RHEL6-64, EPICS R3.15) • Integration with local or site computing services (Archiver, Elog, Remote access, OPIs, etc.) • Account management • Network management • Remote access management
Racks and Cables	• Provide all cabling information with details • Provide L1 CAPTAR with necessary changes	• procure and install cabling and racks (where applic • procure all connectors to interface to cryomodule • terminate all connectors that interface to cryomodule

5   References

LCLSII-2.5-IC-0056	Accelerator Systems to Cryogenic Systems ICD
LCLSII-2.1-IC-0156	Accelerator to Infrastructure Systems ICD
LCLSII-2.7-FR-0371	Performance and Functional Requirements for the LCLS-II Low Level RF System (FRS)
LCLSII-2.7-IC-0437	SLAC to Partner Laboratories LLRF Controls (ICD)
LCLSII-2.4-ES-0150	RF Solid State Amplifier (ESD)