Requirements / Specification Document

NIST National Institute of Standards and Technology U.S. Department of Commerce

TITLE: Zero Boiloff Cryostat

Requesting Laboratory / Division / Group:

Communications Technology Laboratory
RF Technology Division
Superconductive Electronics Group, 672.06

General Statement of Need:

The National Institute of Standards and Technology (NIST), along with the Superconductive Electronics Group (672.06), requires a zero boiloff cryostat system for testing superconducting chips at 4 K in liquid helium. Because of the increasing difficulty and expense in acquiring liquid helium, we require a zero-boiloff recondensing cryostat system where a small volume of liquid helium (<10 L) is initially condensed from helium gas cylinders. We also require that this cryostat system is compatible with our existing liquid helium dip probes using a load-lock to introduce the probe to the cryostat and that the system captures and re-condenses the helium gas that is boiled off while cooling down the probe.

Item Specifications and Quantities:

Item 1:	Zero Boiloff Cryostat	
Quantity:	1 EACH	
Specifications:	1	The cryostat shall have at least 200 mm depth of liquid helium over a diameter greater than 35 mm in the reservoir to cover our experimental space.
	2	The cryostat shall have between 5 L and 10 L of liquid helium in the reservoir in steady state with a 200 mW heat dissipation load from the NIST probe.
	3	The cryostat system shall have a heater and temperature controller to maintain steady state operation.
	4	The cryostat shall have a liquid helium level gauge in the reservoir.
	5	The cryostat system shall recover to steady state from having 1 L of liquid helium boil-off while cooling down the probe in less than 1.5 hours.
	6.1	The cryostat shall have at least one >NW40 access port on the top of the reservoir with an air lock and a gate valve for the NIST probe; the NIST probe has a diameter that is a little less than 35 mm and a length of 200 mm. The top of the airlock shall have a standard 3” sanitary (tri-clover) flange to mate with the seal on the NIST probe. The airlock should provide temperature regulation to keep it near room temperature during probe removal.

	6.2	The cryostat system shall include a small vacuum pump and valves for evacuating and venting the airlock.
	6.3	The cryostat shall have a distance from the top of the airlock to the bottom of the liquid helium reservoir that is less than 1100 mm.
	6.4	The cryostat system does not need any additional customer wiring; all of the electrical wiring/coax needed by NIST is contained within the sealed probe.
	6.5	The cryostat tail shall have sufficient thermal conductivity to ensure that the helium bath remains isothermal with temperature regulation on this stage being the primary sensor.
	7	The cryostat system shall have an integrated helium gas storage (dump) that is compatible with capturing and recondensing at least the 1 L of liquid helium that is boiled-off while cooling down the probe.
	8	The cryostat system shall include an overpressure relief valve which can be connected to a recovery system and an emergency overpressure relief valve to atmosphere.
	9	The cryostat shall be electrically isolated from the compressor (though we do not care about vibration).
	10	The cryostat system shall include an integrated cold trap that is compatible with using 99% pure He gas to cool down and top off the system.
	11	There will be a plan for cryocooler maintenance.
	12	The cryostat system must be an established commercial product with at least one cryogenic unit of comparable complexity operating successfully in the field. Experimental items are not acceptable.
	13	The cryostat system shall be a new (not refurbished or reconditioned) item covered by the original manufacturer's full warranty. The use of "gray market" components not authorized for sale in the U.S. by the proposer is not acceptable.

Procurement Support Information and Ancillary Services:

Section		Requirements/Specifications
Planning Considerations ☒ N/A	☐	List any visits required to allow potential vendors to see site specific constraints. [Explain Requirements.]
	☐	US citizen required on-site (foreign nationals require pre-registration 30 days prior to visit.)
	☐	Vendor Representative On-Site more than three (3) days.
	☐	Other Considerations: [List other considerations to ensure an accurate quote.]
Shipping & Delivery	Shipping Address:	
	☒	NIST-Boulder

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☐ N/A

ATTN: Paul Dresselhaus
Mail Stop: 672.06
325 Broadway
Boulder, CO 80305

☐ NIST-Gaithersburg
ATTN:
Mail Stop:
100 Bureau Dr
Gaithersburg MD 20899

☐ [Alternate Shipping Address]

Shipping Criteria:

☐ Partial Delivery Acceptable

☐ [Enter Shipping and Delivery information by item.]

☐ Direct Delivery to OU Building Required

[Explain Need for Requirement]
Building /Room Number: [Enter Building/Room Number]
☐ Building has Loading Dock
Containerization Preference: [Enter Container Type]

Other Requirements:

[List Any Other Requirement]

Delivery Date Criteria:

☒ Delivery Shall Be Competed No Later Than:
6 Months After Release of Order

☐ Delivery Shall Be Made No Earlier Than:
Click or tap to enter a date.

☐ Scheduled Deliveries:

Item Number	Due Date

☐ Other:

Electronic Media

☐ N/A

[Enter Electronic Media Requirements by Item.]

☒ Software

☒ Electronic Manuals

☐ License Key

☐ Other:

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[List Any Other Electronic Media Requirements]

☒ US Government Email Address for Software Delivery: paul.dresselhaus@nist.gov

Installation

☐ N/A

[Enter Installation Requirements by Item]

☒ Vendor Technician on Site

☐ Rigging

☐ Uncrating / Unpackaging

☐ Removal of Packaging Material

☒ Equipment Set Up

☒ Start-Up Services

☐ Turnkey Installation

☐ Other:

[Enter Details]

NOTE: TPOC shall be the coordination POC.

Facility / Utility Considerations

☒ N/A

[List Site Specific Utility Considerations by Item]

☐ OFPM Work Order Numbers

[List Work Order Numbers]

☐ Power Available

Voltage: [Enter voltage] (V)

Maximum Current: [Enter max current draw] (A)

Phase: [Choose Phase]

Frequency: [Typically 60Hz] (Hz)

NEMA Plug Type: [Enter Plug Type] (i.e.: NEMA L5-20P)

Environment: [Choose Environment]

Other Power Considerations:

[List Any Other Power Considerations.]

☐ Utility Connections:

[List Relevant Available Utilities, Pressure(s) and Flowrate(s).]

☐ Other Considerations:

[List Other Considerations to Ensure an Accurate Quote.]

Inspection and Acceptance

[Inspection Requirements Per Item (Who, When, What, Where)]

☐ On-Site

☐ N/A

☒ Acceptance Expected to Not to Exceed 7 Business Days

☐ Acceptance Expected to Exceed 7 Business Days:
[Duration]

☐ Inspection and Acceptance Plan:
[Explanation]

☐ Other:
[Enter Other Requirements]

Training
☒ N/A

Training Requirements (Who, When, What, Where)

☐ Number of Trainees: [Enter Number of Trainees]

☐ On-Site

☐ Off-Site Location: [Enter Location(s)]

Is Trainee Travel Required: [Choose Answer]

Scope of Training

☐ Operation ☐ Maintenance ☐ Troubleshooting

☐ Safety ☐ Other

[Enter Other Scope of Training Requirements]

☐ Training Materials to be Provided by Government:
[Describe Materials]

☐ Training Materials to be Provided by Vendor:
[Describe Materials]

☐ Other
[Enter Other Training Requirements]

NOTE: TPOC shall be coordination POC.

Warranty
☐ N/A

Base Manufacturer Warranty is acceptable

Warranty Length: 1 - year

What is included?

☐ Labor ☒ Parts ☐ Travel

☐ Cost and Liability for Returns

☐ Other

☐ 1 Option Period

☐ 2 Option Periods
☐ 3 Option Periods
☐ 4 Option Periods (Maximum)

Calibration
☒ N/A

[Describe Calibration Requirements Per Item]
Calibration Plan Length: [i.e. 3 - Years]
What is Included?
☐ Labor ☐ Spare Parts ☐ Consumables
☐ Travel ☐ Cost and Liability for Shipment
☐ Software Updates ☐ Manuals
☐ Other
[Enter Other Requirements]
☐ Requirements:
[Enter Requirements] (i.e.: On-Site Within 72 hours, etc.)
☐ 1 Option Period
Length: [i.e. 1 – Year / 6 - Months]
☐ 2 Option Periods
☐ 3 Option Periods
☐ 4 Option Periods (Maximum)

Maintenance
☐ N/A

[Describe Maintenance Requirements Per Item]
Maintenance Plan Length: [i.e. 3 - Years]
What is Included?
☐ Labor ☐ Spare Parts ☐ Consumables
☐ Travel ☐ Cost and Liability for Shipment
☐ Software Updates ☐ Manuals
☒ Other
There shall be a plan for cryocooler maintenance which may require an additional fee.
☐ Requirements:
[Enter Requirements] (i.e.: On-Site Within 72 hours, etc.)
☐ 1 Option Period
Length: [i.e. 1 – Year / 6 - Months]
☐ 2 Option Periods
☐ 3 Option Periods

	☐ 4 Option Periods (Maximum)
Government Furnished Material / Equipment ☒ N/A	List Any Government Furnished Material / Equipment Per Item] ☐ Samples for Testing ☐ Equipment which will leave Government Site Description: [Enter Description] Serial Number: [Enter Serial Number] NIST Property Number: [Enter NIST Property Number] ☐ Other: [Enter Other Details]
Travel ☒ N/A	[Describe any Travel Requirements Per Item] ☐ Explain: [Enter Justification / Requirement] ☐ Other: [Enter Other Requirements] NOTE TO VENDOR: To the maximum extent possible, include travel requirement estimates as part of pertinent sections above (Installation, Maintenance, Repair, etc.). Otherwise, Travel will be a separate line item, reimbursable per the Federal Travel Regulation.