Requirements / Specification Document

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

Use this document to detail the specifications/requirements for an item and/or ancillary services.

TITLE: CBr4 Gas Delivery System for Carbon doping of MBE grown devices

Requesting Laboratory / Division / Group:

Physics Measurements Laboratory
Applied Physics Division
Quantum Nanophotonics Group, 686.10

General Statement of Need:

Division 686 is involved in a series projects involving single quantum dots (artificial atoms), and their application as single and entangled photon pair sources. These quantum dots are prepared by molecular beam epitaxy (MBE). When the MBE system was installed in 2011 in included a carbon tetrabromide (CBr4) gas source system to supply carbon during material growth. The gas delivery system of the CBr4 source has failed and is no longer serviceable by the manufacturer and requires replacement. This system is necessary for the growth of quantum dot structures.

Item Specifications and Quantities:

Item 1:	Cryogenic system	
Quantity:	1	
Specifications:		**Base cryostat specifications:**
	1.1	Product should be a low-temperature gas source system the delivers CBr4 gas to and MBE system and be compatible with UHV.
	1.2	The system should be capable of doping in the range of 1e16 cm^3 to 1e20 cm^3 in MBE grown GaAs at 1 monolayer/s
	1.2	Must be compatible with VEECO molly software.
	1.3	Must be compatible with a dual gas source/solid source injector system on a VEECO GEN10 MBE
	1.4	CBr4 bottle must be housed in a sealed and vented cabinet that is temperature controlled.
	1.5	Injection lines must be heated to avoid condensation of CBr4 gas
	1.6	Closed loop pressure control of gas supplied to the MBE must have stability of <0.2 mTorr
		General Specifications
	3.1	The Carbon doping system must be an established commercial product with at least one unit operating successfully in the field. Experimental or prototype items are not acceptable.
	3.2	The Carbon doping 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.
	3.3	Manufacturer will test system on their site before shipping and send all temperature and pressure data for verification.

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.
	☐	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:
Shipping & Delivery ☐ N/A		Shipping Address:
	☒	NIST-Boulder ATTN: Kevin Silverman Mail Stop: 686.04 325 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: Click or tap to enter a date.

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

☐ Scheduled Deliveries:

Item Number	Due Date

☐ Other:
Delivery expected 6 months after receipt of order

Electronic Media

☐ N/A

☒ Software

☒ Electronic Manuals; All manuals shall be provided electronically.

☐ License Key

☐ Other:
[List Any Other Electronic Media Requirements]

☐ US Government Email Address for Software Delivery:
[Enter Address]

Installation

☐ N/A

☒ 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

☐ N/A

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

☐ On-Site

☒ 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

The cryostat system shall have a 1-year warranty.

☐ 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

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)

☐ 4 Option Periods (Maximum)

Government Furnished Material / Equipment

☒ N/A

List Any Government Furnished Material / Equipment Per Item]

☐ Equipment which will leave Government Site

☐ Description:

Serial Number:

NIST Property Number:

Other:

[Enter Description]

[Enter Serial Number]

[Enter NIST Property Number]

☐ Other: [Enter Other Details]

Sample

Travel

☒ N/A

[Describe any Travel Requirements Per Item]

☐ [Enter Justification / Requirement]

Other:

☐ [Enter Other Requirements]

[Enter Other Requirements]

NOTE TO VENDOR: To the maximum extent possible, include travel requirement estimates as part of pertinent sections above

Explain

(Installation, Maintenance, Repair, etc.). Otherwise, Travel will be a separate line item, reimbursable per the Federal Travel Regulation.

Attachments:

- Market Research
- Vendor Budgetary Estimate(s)
- Independent Government Cost Estimate