Requirements / Specification Document

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

TITLE: Polarization-Entangled Photon Source

Requesting Laboratory / Division / Group:

Communications Technology Laboratory
Quantum Communications Division
Quantum Network Architecture and Protocols Group (676.02)

General Statement of Need:

This acquisition seeks to procure a polarization-entangled photon source based on spontaneous parametric down-conversion (SPDC). The source must be capable of accepting an external pump laser and generating high-quality polarization-entangled photon pairs. Critically, the system should be built using a periodically poled lithium niobate (PPLN) waveguide, which offers efficient nonlinear conversion and compact integration. Additionally, the source must include the ability to temperature-tune the phase-matching conditions, allowing for precise control over the output wavelengths and optimization of entanglement quality.

Item Specifications and Quantities:

Item 1:	Polarization-Entangled Photon Source (Based on PPLN Waveguide)	
Quantity:	1 EACH	
Specifications:	1.1	Turnkey alignment-free source
	1.2	Photon pairs wavelength centered at 1550 nm with 3 nm bandwidth
	1.3	Noise suppression >75 Db
	1.4	Fidelity >98%
	1.5	Pair generation rate >2 MHz
	1.6	Two-photon interference visibility >98%
	1.74	Based on type-2 nonlinear process
	1.85	Input and output are fiber-coupled and terminated with FC/APC connectors
	1.96	Capability to connect an external temperature controller
	1.10	Capability to take an external pump laser
	1.11	Continuous Operation: Designed for reliable 24/7 operation

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 ☐ N/A	☒ NIST-Gaithersburg Mail Stop: 676.02 100 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: 16 weeks ARO ☐ Delivery Shall Be Made No Earlier Than: Click or tap to enter a date. ☐ Scheduled Deliveries: Item Number | Due Date ☐ Other: [List Other Shipping, Delivery or Special Requirements.]

Electronic Media

☒ N/A

[Enter Electronic Media Requirements by Item.]

- ☐ Software
- ☐ Electronic Manuals
- ☐ License Key
- ☐ Other:
  [List Any Other Electronic Media Requirements]
- ☐ US Government Email Address for Software Delivery:
  [Enter Address]

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: SME 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:	120 (V)
Maximum Current:	10 (A)
Phase:	Single phase
Frequency:	60 (Hz)
NEMA Plug Type:	Standard 120 V (i.e.: NEMA L5-20P)
Environment:	Common Lab / Office 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 Not Expected to Exceed 7 Business Days
- ☒ Acceptance Expected to Exceed 7 Business Days:
  [Duration]
- ☒ Inspection and Acceptance Plan:
  POC will setup and test systems
- ☐ 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: SME 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 [Enter Other Requirements] ☐ 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 [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)
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.