Requirements / Specification Document

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

TITLE: Dual Frequency Comb Laser

Requesting Laboratory / Division / Group:

Communications Technology Laboratory
672 Division
Waveform Metrology

General Statement of Need:

A dual optical frequency comb system is required for electro-optic sampling and characterization of radio-frequency and sub-terahertz electrical waveforms with measurement capability extending toward 1 THz. The system shall operate near 1550 nm to maximize compatibility with commercially available ultrafast electro-optic sampling components. It must provide two mutually coherent ultrafast pulse trains with stable repetition-rate offset control suitable for asynchronous dual-comb waveform reconstruction, including simultaneous amplitude and phase recovery through time-domain sampling and Fourier transformation. The system should provide sub-picosecond pulses, low timing jitter, clean spectral and temporal characteristics, RF synchronization outputs derived from internal photodiodes, optical monitor outputs, and both fast and coarse repetition-rate tuning actuators to support phase locking and long-term stabilization. The architecture shall support low-noise dual-comb EOS measurements with high temporal fidelity, broadband electro-optic interaction, and stable operation in a controlled laboratory environment using standard 115 V power.

Item Specifications and Quantities:

Item 1:	1550 nm Dual Frequency Comb Laser	
Quantity:	1 EACH	
Specifications:	1.1	250 MHz repetition-rate femtosecond fiber laser with factory-set repetition-rate matching between two systems to within <1 kHz at nominal piezo voltage.
	1-2	Center wavelength tunable within 1545–1570 nm with target operation near 1555 nm for compatibility with 1550 nm EO sampling and fiber infrastructure.
	1-3	Fiber-coupled output power specified between 30–50 mW with PM FC/APC output and PER >20 dB.
	1-4	Frequency-comb-optimized configuration with guaranteed free-running timing jitter below 20 fs over 1 kHz–10 MHz integration bandwidth.

	1-5	Integrated fast/fine piezo actuator with >20 kHz tuning bandwidth and resonance frequency typically >100 kHz for rapid repetition-rate stabilization.
	1-6	Independent coarse piezo actuator providing >6 kHz long-term repetition-rate tuning range for extended frequency locking and environmental drift compensation.
	1-7	Internal RF photodiode output with AC-coupled SMA connector generating clock output at the laser repetition frequency.
	1-8	Dedicated optical monitor output port (>2 mW) aligned to the slow axis of PM fiber for synchronization and diagnostic monitoring.
	1-9	Low-noise ALM05 filtered power supply with <50 µVRMS noise over 1 Hz–1 MHz and <1 µV/√Hz noise density above 10 Hz to minimize electrical noise coupling into timing stability.
	1-10	Hermetically sealed passively air-cooled compact laser enclosure (250 × 60 × 260 mm^3) optimized for stable long-term laboratory operation without water cooling.
	1-11	The equipment must be new (not refurbished or reconditioned) and covered by the original manufacturer's full warranty with service provided by that manufacturer's U.S.-based service organization.

Vendor Requirements

1. Possess at time of award/contracting an Export Control Classification Number (ECCN).

2. Possess at time of award/contracting a Unique Entity Identification Number (UEI) which registration is listed as "Active" on the GSA System for Award Management (SAM.gov).

Procurement Support Information and Ancillary Services:

[Provide input for each section Below or Mark Not Applicable (N/A)]

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

Shipping Address:

☒ NIST-Boulder
ATTN:
Mail Stop:
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:

[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: TPOC shall be the coordination POC.

Facility / Utility Considerations

[List Site Specific Utility Considerations by Item]

☐ OFPM Work Order Numbers

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☒ N/A [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 Not Expected 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: SME shall be coordination POC.

Warranty

☐ N/A

Base Manufacturer Warranty is Acceptable

Warranty Length: 12 months

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

[Describe any Travel Requirements Per Item]

☒ N/A

☐ 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.