NIST Requirements Document

Ring and core laser for the Fundamentals of Laser-Matter Interaction (FLaMI) testbed

I. BACKGROUND INFORMATION

The Production Systems Group (PSG) at NIST conducts research in metals-based additive manufacturing (AM) to develop and deploy advances in measurement science that will enable rapid design-to-product transformation. In collaboration with NIST and outside scientists, the group develops, analyzes, and applies advanced metrology and monitoring methods for AM measurement science at NIST. A Fundamentals of Laser-Matter Interaction (FLaMI) testbed was developed for this purpose. The FLaMI system is a fully custom, open laser processing system to advance understanding of laser-matter interaction physics, monitoring, and metrology research.

II. Purpose:

PSG is committed to advancing research in metal-based additive manufacturing (AM) processes. The goal of our research is to quantify and disseminate high-quality data on laser-matter interaction physics. To conduct experiments with the same building conditions as the real AM production system, FLaMI must be equipped with similar capabilities as state-of-art commercial machines. To remain at the forefront of AM technology and innovation, and in response to the current direction of AM development, we are undertaking an upgrade of the FLaMI system to a ring and core laser. This upgrade will place our research at the cutting edge of AM technology, reflecting the latest trends in AM development and bolstering our competitiveness in the field.

III. Minimum Requirements:

1. Laser Specifications

1.1. Optical Characteristics

• Operation Mode:	CW / Modulated
• Nominal Maximum Output Power:	≥1500 W
• Emission Wavelength:	1070 nm ± 10 nm
• Long-term Power Instability:	Less than ±1 %, 8 hours operation
• Switching ON/OFF Time:	≤5 µs
• Power Modulation Rate:	up to 100 kHz

1.2. Optical Output

• Beam Quality (M2):	<1.1 mm
• Fiber diameter:	≈15 µm
• Ring fiber diameter:	<60 µm

1.3. Electrical characteristics

• Operating voltage:	200-240 VAC, single phase, 50/60 Hz

1.4. General characteristics

• Cabinet Dimensions:	height <225 mm
• Width/Mounting:	19” rack-mountable
• Control:	Full operation over RS-232, Ethernet, or analog input

IV. Delivery:

Delivery shall be FOB destination and shall occur within the vendor’s standard commercial lead time, but no later than 15 weeks after contractor receipt of order. FOB Destination means: The contractor shall pack and mark the shipment in conformance with carrier requirements, deliver the shipment in good order and condition to the point of delivery specified in the purchase order, be responsible for any loss of and/or damage to the goods occurring before receipt and acceptance of the shipment by the consignee at the delivery point specified in the purchase order; and pay all charges to the specified point of delivery. All items shall be delivered to the following address:

DAVID DEISENROTH
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)
BLDG 301 SHIPPING & RECEIVING
100 BUREAU DR
GAITHERSBURG, MD 20899

NIST is a controlled-access facility, therefore delivery personnel must be a U.S. citizen or a U.S. permanent resident.

V. Inspection and Acceptance:

In addition to the inspection and acceptance terms articulated in the specific FAR clause that allows the Government reserves the right to perform such performance tests and evaluations as defined below to verify specified system performance. Such tests and evaluations, if performed, shall be conducted within the environment that the system is to be operated. The Contractor has the right to be present during the tests and evaluations, if performed, at the Contractor’s expense. The scope of general inspection included:

1. Structural, mechanical, and electrical evaluation of product
2. An operational evaluation of the Laser unit
3. Evaluation of the system’s performance and interfacing

A visual inspection of the equipment will be performed by the NIST POC to identify surface defects or any form of indication that any equipment was damaged during transport to NIST. The Government shall have sole discretion to require repair or replacement of damaged and/or nonconforming supplies at no cost to the Government. The Government at any time prior to acceptance shall reject the equipment due to defects and/or nonconformance. The vendor is responsible for latent defects discovered any time after final inspection. However, the extent of its liability shall be prorated over the useful life of the equipment.

Ownership of the equipment shall transfer to NIST upon acceptance by the Government.

The place of acceptance shall be:

100 Bureau Drive
Building 233
Gaithersburg, MD 20899

The Government will test, inspect, and accept or reject the equipment within 7 days of the receipt of the equipment unless otherwise indicated above. The Government reserves the right to conduct quality assurance testing to confirm that a given instrument(s) meets the manufacturer's and/or the Government's performance specifications. It is anticipated that the equipment will meet all manufacturer's specifications and/or the Government's performance specifications identified in the most recent operations and maintenance manual for each piece of equipment and/or in this document.

VI. Warranty

The contractor shall warrant the entire system in accordance with the contractor's or original equipment manufacturer's (OEM) standard commercial item warranty.

VII. Payment Schedule

The Contractor shall be paid, in accordance with Net 30-day payment terms, upon receipt and acceptance of a proper invoice, in accordance with the following schedule:

1.100% after receipt and acceptance by the SME of fully delivered system.

2.The Government anticipates inspection will occur upon:

a. After the testing procedures set forth in this document have been complete.