

Limited Tender

Government of India  
Department of Atomic Energy  
BHABHA ATOMIC RESEARCH CENTRE  
Beam Technology Development Group  
Mumbai-400085

Ref: 23751/2021/L&PTD.

Date: 13/12/2021

**Sub: Minor Fabrication of Optical Power Measuring System**

*DUE DATE: 25<sup>th</sup> December 2021*

1. Quotations are invited for the fabrication, installation, testing and commissioning job as per the enclosed job details.
2. The quotations must reach. **Head, Laser & Plasma Technology Division** by above mentioned due date and must be sent in a sealed envelope super-scribed with the above reference number and due date given above.
3. As this is a limited tender, the suppliers who are contacted by the purchaser may only quote for this work.
4. The address on the envelope should read  
(Attn. Pooja Chakraborty)  
To,  
Head,  
Laser & Plasma Technology Division  
BARC, Mumbai - 400 085
5. The quotation must be submitted on printed letter head of the company and should contain **PAN and GST** number else the quotation shall be rejected.
6. The finished components, fabricated at vendors' works, shall be dispatched for installation and commissioning at site only after the approval of our engineer. Necessary inspection facilities should be provided to our engineers during fabrication at bidder's premises
7. Head Laser and Plasma Technology Division, BARC reserves the right to accept or reject any or all quotations without assigning any reason.
8. The drawing for the quoted items should be included with quotations.
9. Sealed quotation shall be received on or before 25<sup>th</sup> December 2021 through **Speed post/ Registered post of Indian Postal Services only.**
10. BARC reserves the right to reject any or all tenders/ applications without assigning any reason thereof.
11. For any further clarification Pooja Chakraborty, L&PTD, (Ext No. 25068/20214) may be contacted.

Yours faithfully,

Head L&PTD

M. L. Mascarenhas

अध्यक्ष/Head

लेजर और प्लाज्मा प्रौद्योगिकी प्रभाग  
Laser & Plasma Technology Division  
भा.प.अ. केंद्र/B.A.R.C.

## Job Detail

### Technical Specification of Power Measurement System

#### 1. Scope of work:

It includes fabrication of Optical Power measuring system to measure the optical power levels of Visible and IR lasers.

#### 2. Components:

SL. NO.	COMPONENTS	QTY	
1.	Laser Power Meter with Photodiode sensor	1 set	
2.	Optical Lens	Focal length = 20 mm	5 units
		Focal length = 22 mm	5 units
		Focal length = 18 mm	5 units
3.	InGaAs Photodiode with FC/PC receptacle	20 units	

## 2.1 LASER POWER METER Qty 1 set

- 1) Accessories and software
- 2) Photodiode Sensor (Visible Range) Model No: PD300-1W with FC connector
- 3) Photodiode Sensor (IR Range) Model No: PD300-IRG with FC connector
- 4) Display Unit Model No: Vega

### DETAIL TECHNICAL SPECIFICATION

#### I) Power Meter:

- i) **Measurement:** Energy and Power
- ii) **Display Features Required:** TFT 320 x 240-pixel graphics LCD display. Large 16mm digits. Bar graph and chart display. Display of parameters like energy, Power density, Exposure, energy, average, exposure, frequency
- iii) **Outputs:** USB, RS232 and user selectable 1, 2, 5 and 10Volt full scale analog output
- iv) **Screen Refresh Rate:** 15 Hz or better
- v) **Include Battery specs:** Rechargeable NiMH batteries with typically 15-20 hours between charges
- vi) **Data Handling:** On Board storage of up to 250,000 data points Data transmission rate of 500 points/s or better to PC. RS232 baud rate of 38400
- vii) **Sensor Feature:** Compatible with Photodiode Sensor-both IR and visible range (Specification mentioned below).

#### II) Accessories and software for Power Meter:

- i) USB cable for Field upgrade and PC interfacing
- ii) RS232 Cable for data transfer
- iii) Battery Charger
- iv) Analog Output Connector
- v) Power Meter SDK and drivers for PC interfacing and data display

III) Photodiode Sensor (Visible Range):

1.	<b>Detector Type</b>	Silicon	
2.	<b>Aperture</b>	10 mm × 10 mm	
3.	<b>Filter Option</b>	Yes	
4.	<b>Filter Mode</b>	Filter OUT	Filter IN
5.	<b>Spectral Range(nm):</b>	400-1100	
6.	<b>Power Range</b>	0.5nW-30mW	200μW- 1W
7.	<b>Power Scales</b>	30mW to 30nW	1W to 30mW
8.	<b>Resolution</b>	>0.01 nW	
9.	<b>Accuracy (filter Out):</b>	±3% or better	
10.	<b>Damage Threshold</b>	10 W/cm <sup>2</sup>	
11.	<b>Maximum Pulse Energy</b>	2 μJ	100 μJ
12.	<b>Noise Level for filter out</b>	20 pW	
13.	<b>Response Time with Meter</b>	0.2 sec or better	
14.	<b>Beam Position Dependence</b>	±2 %	
15.	<b>Fiber Adapter</b>	FC/PC	



IV) Photodiode Sensor (IR Range):

1.	<b>Detector Type</b>	InGaAs	
2.	<b>Aperture</b>	5 mm Dia	
3.	<b>Filter Option</b>	Yes	
4.	<b>Filter Mode</b>	Filter Out	Filter In
5.	<b>Spectral Range(nm):</b>	800-1700	
6.	<b>Power Range</b>	10pW-800μW	150μW-200mW
7.	<b>Power Scales</b>	800μW to 800pW	300 mW to 3mW
8.	<b>Resolution</b>	> 0.1 pW	>1nW
9.	<b>Accuracy (filter Out):</b>	±3% or better	
10.	<b>Damage Threshold</b>	5 W/cm <sup>2</sup>	50 W/cm <sup>2</sup>
11.	<b>Maximum Pulse Energy</b>	1 μJ	100 μJ
12.	<b>Noise Level for filter out</b>	±300 fW	
13.	<b>Response Time with Meter</b>	0.2 sec or better	
14.	<b>Beam Position Dependence</b>	±1 %	
15.	<b>Fiber Adapter</b>	FC/PC	

2.2 OPTICAL LENS:

A) **Optical lens of focal length 20 mm units**

Qty-5

- i) Plano convex lens of effective Focal length = 20mm, **diameter= 9mm**
- ii) Coating Specification: Ravg <1.25% @ 400-700nm
- iii) Surface Quality: 40-20
- iv) Irregularity (P-V) @ 632.8nm:  $\lambda/4$
- v) Centering (arcmin):  $\leq 1$
- vi) Edge Thickness ET (mm): 1.5
- vii) Clear Aperture CA (mm): 6.4mm NA= 0.16
- viii) Typical Energy Density Limit: 500mJ/cm<sup>2</sup> @ 633nm, 10ns
- ix) Coating: Single layer MgF<sub>2</sub> (400-700nm)
- x) Substrate: Fused silica
- xi) Power (P-V) @ 632.8 nm:  $1.5\lambda$
- xii) Focal Length Tolerance (%): +/-1
- xiii) Center Thickness CT (mm): 2.68 +/- 0.2
- xiv) Radius R1 (mm): 9.17
- xv) f/#: 2.2

**B) Optical lens of focal length 22 mm -**

**Qty 5**

- i) Plano convex lens of effective Focal length = 22mm, **diameter= 9mm**
- ii) Coating Specification:  $R_{avg} < 1.25\%$  @ 400-700nm
- iii) Surface Quality: 40-20
- iv) Irregularity (P-V) @ 632.8nm:  $\lambda/4$
- v) Centering (arcmin):  $\leq 1$
- vi) Edge Thickness ET (mm): 1.5
- vii) Clear Aperture CA (mm): 6.4mm NA= 0.16
- viii) Typical Energy Density Limit: 500mJ/cm<sup>2</sup> @ 633nm, 10ns
- ix) Coating: Single layer MgF<sub>2</sub> (400-700nm)
- x) Substrate: Fused silica
- xi) Power (P-V) @ 632.8 nm:  $1.5\lambda$
- xii) Focal Length Tolerance (%): +/-1
- xiii) Center Thickness CT (mm): 2.68 +/- 0.2
- xiv) Radius R1 (mm):9.17
- xv) f/#:2.2

**C) Optical lens of focal length 18 mm**

**Qty 5**

- i) Plano convex lens of effective Focal length = 18mm, **diameter= 9mm**
- ii) Coating Specification:  $R_{avg} < 1.25\%$  @ 400-700nm
- iii) Surface Quality: 40-20
- iv) Irregularity (P-V) @ 632.8nm:  $\lambda/4$
- v) Centering (arcmin):  $\leq 1$
- vi) Edge Thickness ET (mm): 1.5
- vii) Clear Aperture CA (mm): 6.4mm NA= 0.16
- viii) Typical Energy Density Limit: 500mJ/cm<sup>2</sup> @ 633nm, 10ns
- ix) Coating: Single layer MgF<sub>2</sub> (400-700nm)
- x) Substrate: Fused silica
- xi) Power (P-V) @ 632.8 nm:  $1.5\lambda$
- xii) Focal Length Tolerance (%): +/-1
- xiii) Center Thickness CT (mm): 2.68 +/- 0.2
- xiv) Radius R1 (mm):9.17
- xv) f/#:2.2

## 2.3 InGaAs PHOTODIODE WITH FC/PC RECEPTACLE

Qty 20

1.	Detector Type	InGaAs
2.	Active Area Diameter	120 $\mu\text{m}$
3.	Spectral Range(nm)	800-1700
4.	Responsivity @ 1550nm	0.95 A/W(maximum)
5.	Responsivity @ 1310nm	0.9 A/W(maximum)
6.	Junction Capacitance @ 5V reverse voltage	1pF
7.	Noise Equivalent Power(NEP)	$<10^{-14}$ W/Hz <sup>-0.5</sup>
8.	Maximum Forward Current	>5 mA
9.	Maximum Reverse Current	2 mA or more
10.	Dark Current @ -5V	<5 nA
11.	Rise Time/Fall time @ -5V	<1 nsec
12.	Package	TO 46 with lensed cap
13.	Fiber Adapter	FC/PC
14.	ROHS compliant	Yes

### 2. Packing and Forwarding

These items are to be packed for damage free transport.

### 3. Inspection and Acceptance Criteria

- a. All fabricated components shall be inspected by purchaser.
- b. The items after fabrication will be delivered to BARC only after final inspection. The complete order has to be supplied within 60 days of the issue of the purchase order. The material is to be supplied at 1-359 H, Modular lab. , BARC Trombay. Shorter delivery period will be preferred.
- c. The circuit diagram of both PCBs will be provided.
- d. The delivery shall be in good quality packing materials to avoid any type of damage during transit.
- e. The material shall cover the guarantee/warranty of minimum one year against any form of defect and quality degradation after installation on site.