



INDIAN INSTITUTE OF TECHNOLOGY MADRAS  
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The Senior Manager (Project Purchase)

Date: 20.12.2023

Open Tender Reference No: EE/DEEP/060/2023/COHERENTOPT

GEM NAR ID: GEM/GARPTS/11122023/LE31JZPNN0VZ

Due Date/Time: 09.01.2024 @ 3:00 PM

Dear Sir/Madam,

On behalf of the Indian Institute of Technology Madras, Tenders are invited in two bid system from Class-I local suppliers and Class II local suppliers, for the supply of: “**Coherent Optical Communication Test Setup**” Conforming to the specifications given in **Annexure -A**.

Tender Documents may be downloaded from Central Public Procurement Portal <https://etenders.gov.in/eprocure/app>. Aspiring Bidders who have not enrolled / registered in e-procurement should enroll / register before participating through the website <https://etenders.gov.in/eprocure/app>. The portal enrolment is free of cost. Bidders are advised to go through instructions provided at “**Help for Bidder**”. [Special Instructions to the Bidder / Bidders for the e-submission of the bids online through this eProcurement Portal”]

Bidders can access tender documents on the website (For searching in the NIC site, kindly go to Tender Search option and type ‘IIT’. Thereafter, click on “GO” button to view all IIT Madras tenders). Select the appropriate tender and fill them with all relevant information and submit the completed tender document online on the website <https://etenders.gov.in/eprocure/app> as per the schedule attached.

1)	<b>Pre-bid Meeting Details</b>	:	NA
2)	<b>ICSR Bidder Registration</b>	:	<b><u>Bidder registration code</u></b> . Bidder registration with IC&SR (IITM) is mandatory for bidders to participate in tenders.  ** <b><u>For Bidder Registration &amp; Guidelines, Please follow the website :</u></b> <a href="https://icandsr.iitm.ac.in/Bidderportal">https://icandsr.iitm.ac.in/Bidderportal</a> ; Helpdesk: <a href="mailto:Bidderhelpdesk@icsrpiis.iitm.ac.in">Bidderhelpdesk@icsrpiis.iitm.ac.in</a>

**No manual bids will be accepted.** All tender documents including Technical and Financial bids should be submitted in the E-procurement portal.

<b>Last date for receipt of tender</b>	:	<b>09.01.2024 @ 3:00 PM</b>
<b>Date &amp; time of opening of tender</b>	:	<b>10.01.2024 @ 3:00 PM</b>

### 3. Instructions to the Bidder:

A)	<b>Searching for tender documents</b>	:	<ul style="list-style-type: none"> <li>• There are various search options built in the CPP Portal, to facilitate bidders to search active tenders by several parameters. These parameters could include Tender ID, organization name, location, date, value, etc. There is also an option of advanced search for tenders, wherein the bidders may combine a number of search parameters such as organization name, form of contract, location, date, other keywords etc. to search for a tender published on the CPP Portal.</li> <li>• Once the bidders have selected the tenders they are interested in, they may download the required documents / tender schedules. These tenders can be moved to the respective “<b>My Tender</b>” folder. This would enable the CPP Portal to intimate the bidders through SMS / email in case there is any corrigendum issued to the tender document.</li> <li>• The bidder should make a note of the <b>unique Tender ID</b> assigned to each tender, in case they want to obtain any clarification / help from the Helpdesk.</li> </ul>
B)	<b>Assistance to bidders</b>	:	<ul style="list-style-type: none"> <li>• Any queries relating to the tender document and the terms and conditions contained therein should be addressed to the Tender Inviting Authority for a tender or the relevant contact person indicated in the tender.</li> <li>• Any queries relating to the process of online bid submission or queries relating to CPP Portal in general may be directed to the 24x7 CPP Portal Helpdesk. The contact number for the helpdesk is [0120-4200462, 0120-4001002, 0120-4001005]</li> </ul>
C)	<b>Enrollment Process to Bidders</b>	:	<p><b><u>REGISTRATION</u></b></p> <ul style="list-style-type: none"> <li>• Bidders are required to enroll on the e-Procurement module of the Central Public Procurement Portal <a href="https://etenders.gov.in/eprocure/app">URL:https://etenders.gov.in/eprocure/app</a> by clicking on “Online Bidder Enrollment”. Enrollment on the CPP Portal is free of charge.</li> <li>• As part of the enrolment process, the bidders will be required to choose a unique username and assign a password for their accounts.</li> <li>• Bidders are advised to register their valid email address and mobile numbers as part of the registration process. These would be used for any communication from the CPP Portal.</li> <li>• Upon enrolment, the bidders will be required to register their valid Digital Signature Certificate (Class II or Class III Certificates with signing key usage) issued by any Certifying Authority recognized by CCA India (e.g. Sify / TCS / nCode / eMudhra etc.)</li> <li>• Only one valid DSC should be registered by a bidder. Please note that the bidders are responsible to ensure that they do not lend their DSCs to others which may lead to misuse.</li> <li>• Bidder then may log in to the site through the secured log-in by entering their user ID / password and the password of the DSC / eToken.</li> <li>• Possession of a Valid Class II/III Digital Signature Certificate (DSC) in the form of smart card/e-token in the company's name</li> </ul>

			<p>is a prerequisite for registration and participating in the bid submission activities through <a href="https://etenders.gov.in/eprocure/app">https://etenders.gov.in/eprocure/app</a></p> <ul style="list-style-type: none"> <li>● Digital Signature Certificates can be obtained from the authorized certifying agencies, details of which are available in the web site <a href="https://etenders.gov.in/eprocure/app">https://etenders.gov.in/eprocure/app</a> under the “Information about DSC”.</li> </ul>
<b>D)</b>	<b>Preparation of bids</b>	:	<ul style="list-style-type: none"> <li>● Bidder should take into account any corrigendum published on the tender document before submitting their bids.</li> <li>● Please go through the tender advertisement and the tender document carefully to understand the documents required to be submitted as part of the bid. Please note the number of covers in which the bid documents have to be submitted, the number of documents including the names and content of each of the document that need to be submitted. Any deviations from these may lead to rejection of the bid.</li> <li>● Bidder, in advance, should prepare the bid documents to be submitted as indicated in the tender document / schedule and generally shall be in PDF / XLS formats as the case may be. Bid documents may be scanned with 100 dpi with black and white option.</li> <li>● To avoid the time and effort required in uploading the same set of standard documents which are required to be submitted as a part of every bid, a provision of uploading such standard documents (e.g. PAN card copy, GSTIN Details, annual reports, auditor certificates etc.) has been provided to the bidders. Bidders can use “<b>My Documents</b>” area available to them to upload such documents. These documents may be directly submitted from the “<b>My Documents</b>” area while submitting a bid, and need not be uploaded again and again. This will lead to a reduction in the time required for bid submission process.</li> </ul>
<b>E)</b>	<b>Submission of bids</b>	:	<ul style="list-style-type: none"> <li>● Bidder should log into the site well in advance for bid submission so that he/she can upload the bid in time i.e. on or before the bid submission date and time. Bidder will be responsible for any delay due to other issues.</li> <li>● The bidder has to digitally sign and upload the required bid documents one by one as indicated in the tender document.</li> <li>● Bidder has to select the bid security declaration. Otherwise, the tender will be summarily rejected.</li> <li>● A standard BOQ format has been provided with the tender document to be filled by all the bidders. Bidders are requested to note that they should necessarily submit their financial bids in the format provided and no other format is acceptable. Bidders are required to download the BOQ file, open it and complete the detail with their respective financial quotes and other details (such as name of the bidder). If the BOQ file is found to be modified by the bidder, the bid will be rejected.</li> <li>● The server time (which is displayed on the bidders’ dashboard) will be considered as the standard time for referencing the deadlines for submission of the bids by the bidders, opening of bids etc. The bidders should follow this time during bid submission.</li> </ul>

		<ul style="list-style-type: none"> <li>● The Tender Inviting Authority (TIA) will not be held responsible for any sort of delay or the difficulties faced during the submission of bids online by the bidders due to local issues.</li> <li>● The uploaded tender documents become readable only after the tender opening by the authorized bid openers.</li> <li>● Upon the successful and timely submission of bids, the portal will give a successful bid submission message &amp; a bid summary will be displayed with the bid no. and the date &amp; time of submission of the bid with all other relevant details.</li> <li>● Kindly add scanned PDF of all relevant documents in a single PDF file of compliance sheet.</li> <li>● More information useful for submitting online bids on the CPP Portal may be obtained at: <a href="https://etenders.gov.in/eprocure/app">https://etenders.gov.in/eprocure/app</a>.</li> <li>● All tender documents including pre-qualification bid, Technical Bid &amp; Financial Bid should be submitted separately in online CPP portal as per the specified format only. Right is reserved to ignore any tender which fails to comply with the above instructions. <b>No manual bid submission will be entertained.</b></li> </ul>
F)	Marking on Technical Bid	<ul style="list-style-type: none"> <li>● The bidder eligibility criteria, technical specification and supply of item for this tender is given in Annexure A.</li> <li>● The Bidders shall go through the specification and submit the technical bid.</li> <li>● The Technical bid should be submitted in the proforma as per Annexure-B in pdf format only through online (e-tender). No manual submission of bid will be entertained.</li> <li>● The technical bid should have a page-wise heading as “Technical Bid” and page no. in all pages with seal and signature of authorized signatory. The total no. of pages should be mentioned at the last page of the documents.</li> <li>● The technical bid should consist of bidder eligibility criteria details and all technical details along with catalogue/ pamphlet which will give a detailed description of product with technical data sheet so that technical compliance can be verified.</li> </ul>
G)	Marking on Price Bid	<ul style="list-style-type: none"> <li>● Financial bid (BoQ) should be submitted in the prescribed proforma format as per Annexure-C in xls format through e-tender only. No manual or other form of submission of Financial Bid will not be entertained</li> </ul>

4)	<p><b>Preparation of Tender:</b> The bidders should submit the bids in two bid system as detailed below.</p> <p><b>Bid I _Technical Bid</b></p> <p>The technical bid should consist of bidder eligibility criteria and technical specification compliance sheet as per Annexure-B.</p> <p><b>Bid II _Price Bid</b></p> <p>The price bid should be submitted in excel format (BoQ) as per the proforma (Annexure C) uploaded in the e-Tender web site. The Quoted price should be for supply and installation of the item and inclusive of all cost and statutory levies at IIT Madras.</p>
5)	<p><b>Price:</b></p> <ol style="list-style-type: none"> <li>a) The price should be quoted only in INR net per unit (after breakup) and must include all packing, transit insurance and delivery charges to the <b>Department of Electrical Engineering</b>.</li> <li>b) The rate quoted shall be all inclusive of all taxes and no extra payment will be made other than statutory revisions as per the terms and conditions stipulated in this contract document.</li> <li>c) The percentage of tax &amp; duties should be clearly indicated separately. IIT Madras is eligible for custom duty (5.5%). Relevant certificates will be issued wherever necessary.</li> <li>d) The offer/bids should be submitted through online only in two bid system i.e. Technical Bid and Financial Bid separately.</li> </ol>
6)	<p><b>Tenderer shall submit along with this tender:</b></p> <ol style="list-style-type: none"> <li>(i) Proof of having ISO or other equivalent certification given by appropriate authorities.</li> <li>(ii) Name and full address of the Banker and their swift code and PAN No. and GSTIN number.</li> <li>(iii) GST registration proof showing registration number, area of registration etc.</li> <li>(iv) All of your future correspondences including Invoices should bear the GST No. and Area Code.</li> </ol>
7)	<p><b>Terms of Delivery:</b></p> <p>Supplier will be fully responsible for the safe carriage, Installation/Commissioning of goods up to the <b>Department of Electrical Engineering</b>, or named place as per PO, Insurance coverage will be in the scope of the supplier.</p> <p>The tenderer should indicate clearly the time required for delivery of the item (subject to the approval of the Executive Committee-IIT-Madras). In case there is any deviation in the delivery schedule, liquidated damages clause will be enforced or penalty for the delayed supply period will be levied.</p> <p>In the event of delay or non-supply of materials/execution of Contract beyond the date of delivery/completion of job. The penalty will be levied @1% per week of delay subject to a max of 10% of the value of purchase order and if the delay is more than accepted time frame by IIT M, the PO would be partially or fully cancelled and liquidated damages will be enforced accordingly.</p>
8)	<p><b>Period for which the offer will remain open:</b></p> <p>The Tender shall remain open for acceptance/validity till: 120 days from the date of opening of the tender. However, the day up to which the offer is to remain open being declared closed holiday for the Indian Institute of Technology Madras, the offer shall remain open for acceptance till the next working day.</p>
9)	<p><b>EMD:</b></p> <p>The EMD of <b>Rs. 5,00,000</b> to be transferred to the account details mentioned in Annexure G and proof should be enclosed in the Technical Bid. Any offer not accompanied with the EMD shall be rejected summarily as non-responsive.</p>

	<p>The EMD of the unsuccessful bidders shall be returned within 30 days of the end of the bid validity period. The same shall be forfeited, if the tenderers withdraw their offer after the opening during the bid validity period. The Institute shall not be liable for payment of any interest on EMD.</p> <p>EMD is exempted for Micro and Small Enterprises (MSE) as defined in MSE Procurement Policy issued by Department of Micro, Small and Medium Enterprises (MSME) and Startups as recognized by Department of Industrial Policy &amp; Promotion (DIPP). (MSE/MSME/DIPP PROOF should be enclosed in the cover containing technical bid)</p>
10)	<p><b>Performance Security: -</b></p> <p>The successful bidder should submit Performance Security for an amount of 5% of the basic invoice value of the contract/supply. The Performance Security may be furnished in the form of an Account Payee DD, FD Receipt in the name of “The Registrar, IIT Madras” from any scheduled commercial bank or Bank Guarantee from any scheduled commercial bank in India. The performance security should be furnished within 14 days from the date of the purchase order.</p> <p>Performance Security in the form of Bank Guarantee: - In case the successful bidder wishes to submit Performance Security in the form of Bank Guarantee, the Bank Guarantee should be routed directly to IIT Madras from the Bank.</p> <p>The Bank Guarantee should remain valid for a period of sixty days beyond the date of completion of all contractual obligations of the supplier including the warranty obligations.</p>
11)	For the same tender, either the OEM or the authorized dealer/service provider can only quote. But both of them cannot quote separately for the same tender.
12)	The offers/bids should be sent only for an item/Equipment’s of latest version that is available in the market and supplied to a number of customers. A list of customers in India with details must accompany the quotations. Quotations for a prototype machine will not be accepted
13)	Original catalogue (not any photocopy) of the quoted model duly signed by the principals must accompany the quotation in the Technical bid.
14)	Compliance or Confirmation report with reference to the specifications and other terms & conditions should also be obtained from the principal/OEM.
15)	<p><b>Risk Purchase Clause</b></p> <p>In the event of failure of supply of the item/equipment within the stipulated delivery schedule, the purchaser has all the right to purchase the item/equipment from other sources on the total risk of the supplier under risk purchase clause.</p>
16)	<p><b>Payment:</b></p> <p>(i) No Advance payment will be made. However, 90% Payment against Delivery and 10% after installation are agreed to wherever the installation is involved.</p> <p>(ii) Advance Payment: No advance payment is generally admissible. In case a specific percentage of advance payment is required, the Bidder has to submit a Bank Guarantee from a scheduled commercial bank in India equivalent to the amount of advance payment.</p>
17)	<p><b>On-site Installation:</b></p> <p>The equipment/item or Machinery has to be installed or commissioned by the successful bidder within the number of days (as prescribed by PI) from the date of receipt of the item at the site of IIT Madras.</p>
18)	<p><b>Warranty/Guarantee:</b></p> <p>The offer should clearly specify the warranty or guarantee period for the machinery/equipment. Any extended warranty offered for the same has to be mentioned separately (For more details please refer our Technical Specifications).</p>

	<b>** Note: PO which involves installation, warranty/guarantee shall be applicable from date of installation.</b>
19)	<p><b>Acceptance and Rejection:</b></p> <p>Failure to comply with any of the instructions stated in this document or offering unsatisfactory explanations for non-compliance will likely to lead to rejection of offers.</p> <p>I.I.T. Madras has the right to accept the whole or any part of the Tender or portion of the quantity offered or reject it in full without assigning any reason.</p>
20)	<p><b>Debarment from Bidding:</b></p> <p>In case of breach of Terms &amp; Conditions, Bidder may be suspended from being eligible for bidding in any contract with the IIT Madras up to 2 Years [as per Rule 151(iii) of GFR] from the date of Tender.</p>
21)	<p><b>Disputes and Jurisdiction:</b></p> <p><b>Settlement of Disputes:</b> Any dispute, controversy or claim arising out of or in connection with this PO including any question regarding its existence, validity, breach or termination, shall in the first instance be attempted to be resolved amicably by both the Parties. If attempts for such amicable resolution fails or no decision is reached within 30 days whichever is earlier, then such disputes shall be settled by arbitration in accordance with the Arbitration and Conciliation Act, 1996. Unless the Parties agree on a sole arbitrator, within 30 days from the receipt of a written request by one Party from the other Party to so agree, the arbitral panel shall comprise of three arbitrators. In that event, the supplier will nominate one arbitrator and the Project Coordinator of IITM shall nominate on arbitrator. The Dean IC&amp;SR will nominate the Presiding Arbitrator of the arbitral tribunal. The arbitration proceeding shall be carried out in English language. The cost of arbitration and fees of the arbitrator(s) shall be shared equally by the Parties. The seat of arbitration shall be at IC&amp;SR IIT Madras, Chennai.</p> <p>a. <b>The Applicable Law:</b> The Purchase Order shall be construed, interpreted and governed by the Laws of India. Court at Chennai shall have exclusive jurisdiction subject to the arbitration clause.</p> <p>b. Any legal disputes arising out of any breach of contract pertaining to this tender shall be settled in the court of competent jurisdiction located within the city of Chennai in Tamil Nadu.</p>
22)	<p><b>Force Majeure:</b> The Supplier shall not be liable for forfeiture of its performance security, liquidated damages or termination for default, if and to the extent that, it's delay in performance or other failure to perform its obligations under the Contract is the result of an event of Force Majeure.</p> <p>For purposes of this Clause, "Force Majeure" means an event beyond the control of the Supplier and not involving the Supplier's fault or negligence and not foreseeable. Such events may include, but are not limited to, acts of the Purchaser either in its sovereign or contractual capacity, wars or revolutions, fires, floods, epidemics, quarantine restrictions and freight embargoes.</p> <p>If a Force Majeure situation arises, the Supplier shall promptly notify the Purchaser in writing of such conditions and the cause thereof. Unless otherwise directed by the Purchaser in writing, the Supplier shall continue to perform its obligations under the Contract as far as is reasonably practical, and shall seek all reasonable alternative means for performance not prevented by the Force Majeure event.</p>
23)	<p><b>Eligibility Criteria:</b></p> <ul style="list-style-type: none"> <li>➤ <b>As per the Government of India Order, only "Class - I Local Suppliers" and "Class - II Local Suppliers" <u>can participate in this tender.</u></b></li> <li>➤ <b><u>Bidder should confirm their acceptance that they comply with the provisions with report to "Guidelines for eligibility of a bidder from a country which shares a land border with India as detailed at Annexure-E. The bidder should submit Certificate for "Bidder from/ Not from Country sharing Land border with India &amp; Registration of Bidder with Competent Authority" as per Order of DoE F.No.6/18/2019-PPD dated 23.07.2020 as mentioned.</u></b></li> </ul>

24)	<p><b>Preference to “class I Local Suppliers”:</b> preference will be given to “<b>class 1 local suppliers</b>” (subject to class -I local supplier’s quoted price falling within the margin of purchase preference ) as per public procurement (preference to make in India) order 2017 .O.M No P- 45021/2/2017 – pp(BE - 11) dt 04/06/2020 subject to the conditions that the “class 1 Local Supplier” should agree to supply goods / provide service at L1 rate and furnish a certificate with the technical bid document that the goods/service provided by them consists local content equal to or more than 50%.( certificate from Chartered Accountant in case value of contract exceeds Rs 10 crore).</p> <ul style="list-style-type: none"> <li>➤ <b>‘Class - I local supplier’</b> means a supplier or service provider whose goods, services or works offered for procurement consists of local content equal to or more than 50% as defined under the above said order. <b>Declaration to be provided as per Annexure-D per item/service/work.</b></li> <li>➤ <b>‘Class - II local supplier’</b> means a supplier or service provider whose goods, services or works offered for procurement consists of local content equal to 20% but less than 50% as defined under the above said order. <b>Declaration to be provided as per Annexure-D per item/service/work.</b></li> <li>➤ <b>‘Margin of purchase preference’:</b> - The margin of purchase preference shall be 20%. The Definition of the margin of purchase preference is defined in the Govt. of India Order No: <b>P-45021/12/2017-PP (BE-II) Dt.4th June, 2020) Order 2017. As per the Government of India Order – “Margin of Purchase Preference” means the maximum extent to which the price quoted by a “Class-I local supplier” may be above the L1 for the purpose of purchase preference.</b></li> </ul> <p><b>**Note: Local content percentage to be calculated in accordance with the definition provided at clause 2 of revised public procurement preference to Make in India Policy vide GoI Order no. P-45021/2/2017-PP (B.E.-II) dated 15.06.2017 (subsequently revised vide orders dated 28.05.2018, 29.05.2019and 04.06.2020) MOCI order No. 45021/2/2017-PP (BE II) Dt.16th September 2020 &amp; P-45021/102/2019-BE-II-Part(1) (E-50310) Dt.4th March 2021</b></p>
25)	<p><b>Evaluation of Bids</b> Bid evaluation will take place in two stages.</p> <p><b>Stage I Technical Bid evaluation</b> All bidders who have fully complied with bidder eligibility criteria I, II and technical evaluation (Annexure A) will only be considered for opening of price bid.</p> <p><b>Stage II: Price Bid Evaluation</b> The price bid evaluation will be based on price quoted by the bidder. The rate quoted for <b>COHERENT OPTICAL COMMUNICATION TEST SETUP</b> unit will alone be taken up for arrival of Lowest Bid (L1) value.</p>
26)	<p>In accordance to the Rule 173 of GFR,2017 and relevant provisions thereof in Procurement Manuals, 2022, IC&amp;SR, IITM reserves the right to carry out the negotiation process through its purchase/technical committee with L1/H1 (as applicable) Bidder to ensure price reasonability before final recommendation to the Competent Authority. The negotiation details, if any, on case to case basis shall be recorded in minutes of meetings suitably for records.</p>
27)	<p><b>Selection of successful bidder and Award of Order</b> The order will be directly awarded to the technically qualified bidder as per the condition in para 3A of DIPP, MoCI Order No. 45021/2/2017-PP (BE II) dated 16th September 2020.</p>
28)	<p>All information including selection and rejection of technical or financial bids of the prospective bidders will be communicated through e-Tender portal. In terms of Rule 173(iv) of General Financial Rule 2017, the bidder shall be at liberty to question the bidding conditions, bidding process and/or rejection of bids.</p>
29)	<p>The tenderer shall certify that the tender documents submitted by him / her are of the same replica of the tender document as published by IIT Madras and no corrections, additions and alterations made to the</p>



	same. If any deviation is found in the same at any stage and date, the bid / contract will be rejected / terminated and actions will be initiated as per the terms and conditions of the contract.
<b>30)</b>	Clarification to the queries and doubts raised by the bidders will be issued as a corrigendum/addendum in the e-tenders portal.
<b>31)</b>	In the e-tender process, participation of bidders after the due date is not possible. The eligible bidders can login to the e-Procurement portal to ascertain the tender status.

## **ACKNOWLEDGEMENT**

It is hereby acknowledged that I/We have gone through all the points listed under “Specification, Guidelines, Terms and Conditions” of tender document. I/We totally understand the terms and conditions and agree to abide by the same.

**SIGNATURE OF TENDERER ALONG WITH  
SEAL OF THE COMPANY WITH DATE**

## **Bidder Eligibility Criteria and Technical Specification for Coherent Optical Communication Test Setup**

Tender No. **EE/DEEP/060/2023/COHERENTOPT**

### **Bidder Eligibility Criteria – I (Public Procurement – Preference to Make in India)**

Only 'Class-I local suppliers' and 'Class-II local suppliers', as defined under DIPP, MoCI Order No. P-45021/2/2017-PP (BE-II) dated 16<sup>th</sup> September 2020 and other subsequent orders issued therein.

EMD as per Tender or EMD is exempted for Micro and Small Enterprises (MSE) as defined in MSE Procurement Policy issued by Department of Micro, Small and Medium Enterprises (MSME) and Startups as recognized by Department of Industrial Policy & Promotion (DIPP). (MSE/MSME/DIPP PROOF should be enclosed in the cover containing technical bid).

### **Bidder Eligibility Criteria – II**

1. The participating Bidder's firm shall be the Original Equipment Manufacturer (OEM) or OEM Certified authorized firm. (Annexure F)
2. The Bidder/OEM should have supplied similar high-speed coherent communication systems to other research laboratories. Purchase Orders, Invoice copies, Work Completion Certificates, Performance Certificates along with contact details of the end user need to be submitted as the proof of supply. IIT Madras reserves its right to verify the claims submitted by the bidder and the feedback from the previous customers will be part of technical evaluation.
3. OEM / OEM Authorized Bidder should have a well-established repair / service set up in India. Proof of local service center to be submitted.
4. Bidder should have a turnover of at least 20 crore INR per year, in the last three financial years. Proof to be submitted.
5. The Bidder who is the single point of contact for supplying all the items as per the tender specifications, should have valid authorization from the OEM for each items listed in BoQ.

### **III. Technical Specification for COHERENT OPTICAL COMMUNICATION TEST SETUP**

Proposals are invited for establishing a complete test setup for high-speed coherent optical measurements. The setup should include complete hardware and software solutions, allowing the generation of advanced complex signals with any modulation scheme (QPSK, nQAM, etc.), detection and analysis of BER, eye pattern. It should be capable of characterizing optical transmitters and receivers with complex phase modulation techniques individually and in back-to-back configuration and dual polarization testing.

Bidders should quote all the line items mentioned below for the Test Set-up which should be capable of providing following functions.

- Complex modulation signal generation
- Optical Modulation with dual polarization
- Coherent optical detection and demodulation
- Testing Coherent optical Receivers
- Multi-channel transmission experiments for system design.
- Equivalent-time oscilloscope capable of characterizing optical waveform analysis.
- 2/4 Port Vector Network Analyzer with measurement options of Time domain, Phase noise, spectrum analyzer, and noise figure.
- Vector Signal Analyzer with demodulation capability of 5G and vector modulated signals and Radar Signal analysis.
- Analog Signal Generator with Analog and Pulse Modulation Signal Generation Capability.

S. No	Parameters	Specifications
<b>Coherent Optical Communication Test Setup should comprise of following specifications</b>		
	Wavelength range	1528 nm – 1570 nm
	Data formats generation/ detection capabilities	QPSK, nQAM, etc
	Polarization modes for I & Q	Dual Polarization
	Optical power sensitivity (typical)	-20dBm
	DAC Resolution/ADC Resolution	8 bits
	Subsystems required are listed below	
1.a	<b>Complex Modulation Signal Generator with 256GS/s on Two channels</b>	
	No of channels	4 (each differential, so total 8 outputs)
	Analog Bandwidth (3dB) typical	70 GHz or better
	Sampling rate	Minimum 128GS/s on 4 channels and 256GS/s on two channels
	Sample memory	512K Samples/channel or better
	Output type	Single-ended or differential
	Amplitude Range	100 mVpp to 0.625 Vpp, single ended, into 50 $\Omega$
	Amplitude resolution	1mV in single ended mode
	Skew between any pair of channels within the same module	$\leq 1$ ps
	Random Jitter	$\leq 75$ fs rms
	Skew Adjustment range	$\pm 1$ ns
	Skew adjustment resolution	at least 25fs
	Rise/fall time (20/80)	$\leq 6$ ps
	ENOB	at least 5 Bits at full bandwidth
	Total Harmonic Distortion	$\leq -37$ dBc
	Clock Generator module	Should be included within same chassis.
	Embedded controller	Should be included within same chassis.
	Comprehensive Warranty	at least 3 Years
<b>Alternate Specification:</b>		
1.b	<b>Complex Modulation Signal Generator with 256GS/s on Four channels</b>	
	No of Channels	4 (each differential, so total 8 outputs) synchronized
	Formfactor	AXIe Chassis System with modular framework
	Sample rate	256GS/s or better in each channel
	DAC Resolution	8 bits or better
	Internal Sample Memory	1024Ksa per channel or better
	Output type	Single-ended or differential
	Analog Bandwidth(3dB) typical	80 GHz or better
	Rise/fall time (20%/80%)	3ps or better
	Amplitude	300 mVpp, to 2.5 Vpp, single-ended into 50 $\Omega$
	Skew adjustment range	$\pm 25$ ns or higher
	Skew between any pair of outputs	0 ps $\pm 1$ ps (typ) or smaller
	Built in Calibration	Frequency and phase response calibration for clean output signals should be available
	Random Jitter	75 fs or smaller
	Clock Generator Module	Should be included with in-chassis.
	Connector type	1.00mm (female)
	Modulation Support	Instrument should support complex modulation formats from QPSK to mQAM
	Clock Input	Should be available
	Ref Clock Input	Should be available
	Ref Clock output	Should be available
	Power Consumption	250 W or smaller

	Programming interfaces	SCPI should be available
	Comprehensive Warranty	at least 3 Years
2	<b>Optical Multi-Format Transmitter</b>	
	XY Polarization Imbalance [dB]	<1
	Gain Imbalance [dB]	<1
	DC Extinction Ratio [dB]	>18
	Insertion Loss [dB]	< 16 dB
	Automatic bias control	Internal
	Maximum Optical Input Power	at least +18dBm
	Optical In-/Output Connector	FC/APC
	E/O Bandwidth(typical)	60 GHz or better
	Electrical RF Connectors	1.85mm, female, differential ; cable compatible with AWG should be provided
	Internal laser	Should be available
	Frequency range	(1528 - 1570nm)
	Frequency Fine Tune Resolution	1 MHz or better
	Channel Spacing	Continuous
	Spectral Line Width; 3dB instantaneous	<100 kHz
	SMSR (typical)	>40dB or better
	Warranty	at least 3 Years
3a	<b>Optical Modulation Analyzer System (80 GHz)</b>	
	Maximum detectable symbol rate	DC- 160 Gbaud
	Sample rate	256GS/s
	Operating frequency range (Oscilloscope)	DC-80 GHz
	Maximum record Length	200M Samples or better
	ADC Resolution	10bits or larger
	Relative skew after correction	< ± 0.5 ps
	Signal Input Power	>=+14 dBm
	Comprehensive Warranty	at least 3 Years
<b>Alternate Specification:</b>		
3b	<b>Optical Modulation Analyzer System (110 GHz)</b>	
	Maximum detectable symbol rate	DC- 220 Gbaud
	Sample rate	256GS/s
	Operating frequency range (Oscilloscope)	DC - 110 GHz
	Maximum record Length	200M Samples or better
	ADC Resolution	10bits at leaset
	Relative skew after correction	< ± 0.5 ps
	Signal Input Power	>=+14 dBm
	Comprehensive Warranty	at least 3 Years
4	<b>Optical Receiver Specifications</b>	
	Analog bandwidth (-3 dB) typical	> 90 GHz
	Receiver polarization extinction ratio	>40dB
	Signal input wavelength range	1528nm – 1570nm
	Average input power monitor accuracy	± 0.5 dB
5	<b>Internal Local Oscillator (LO) and LO output</b>	
	Wavelength Range	1528nm – 1570nm
	Linewidth	<100 kHz
	Sidemode suppression ratio	> 50 dB
	Optical CW output power	> +14 dBm
	External LO input power range	0 dBm to +14dBm
	Comprehensive Warranty	at least 3 Years
6	<b>Equivalent-Time oscilloscope</b>	
	Optical Channel Count	1
	Optical Channel Bandwidth, -3 dB`	28GHz or better with optional quote for 45GHz

	Nominal Wavelength Range	1250 nm to 1600 nm
	Factory Calibrated Wavelengths	1310 nm ( $\pm 20$ nm) 1550 nm ( $\pm 20$ nm)
	Scale factor Spec	Minimum 5uW and Maximum 500uW
	CW Offset Range	+1.0 mW to -3 mW
	Maximum Non-destruct power	(+7 dBm) or larger
	Fiber Input	9/125 $\mu$ m
	Channel ADC	16 Bits
	Clock Recovery	Should be Inbuild for 24-29 Gbaud data rates, optional quotation for 48-58 Gbaud.
	Time base scale	Minimum 100fs/div and Maximum of 100us/div
	Filters Rate	25 – 29 Gbaud filters should be available.
	Sample Delay	<10nS
	Jitter	200 fs rms
	Record length	1 to 268,435,456
	Sample rate	Up to 100 kHz
	Recovered Clock out	$\geq 200$ mVpp
	Random jitter of recovered clock	200 fs maximum
	Auto relocking	Yes, should be available
	Measurement capability	BER, TDECQ, Eye analysis
	Impulse response correction	Should be available
	Comprehensive Warranty	3 Years
7	<b>Vector Network Analyzer</b> VNA should be a dedicated single box solution 10 MHz to 40 GHz, 4 port Vector Network Analyzer with configurable test set, source attenuators, combiner, mechanical switches and all the required hardware, software pre-installed in it.	
	Frequency range	10 MHz to 40 GHz
	Frequency Resolution	1 Hz or better
	Frequency Accuracy	$\pm 0.7$ ppm
	No. of ports	2 ports. <b>Provide an optional quote for 4 ports</b>
	No. of sources	2
	System Dynamic Range	At least 110 dB for frequency range: 0.1 GHz to 40 GHz
	Source power level	At least 0 dBm for frequency range: 0.1 GHz to 40 GHz
	Maximum Input Power Level	+27 dBm, 7 VDC
	Minimum settable power	$\leq -60$ dBm
	Harmonics	Not greater than -20 dBc
	Phase Noise @ 10 KHz offset Typical	1 GHz: -120 dBc/Hz 5 GHz: -110 dBc/Hz 10 GHz: -105 dBc/Hz 20 GHz: -95 dBc/Hz 40 GHz: -90 dBc/Hz
	IF Bandwidth range	$\geq 15$ MHz
	No. of Points	100000 or more
	Power resolution	0.1dB or better
	Test port connectors	2.4 mm (male), 50 Ohm , Cables compatible with all components in the test system must be provided.
	10MHz Reference In & Out	Must be available
	Operating System	Windows 10 or higher
	Interfaces	LAN, GPIB, USB
	Screen	Built-in, Integrated with instrument
	Accessories	1. Test port cables - 4nos 2. 2 port E-cal kit with male (M) and female (F) connectors 3. Provide 4 port E-cal kit with male (M) and female (F) connectors as options.

	Low Noise Receiver up to total bandwidth	Should be available
	Internal combiner	Should be available
	Direct Access Loops	Should be available
	DDS Source	Should be available
	Scalar Mixer Measurement	Should be available
	Time Domain Analysis	Should be available
	Group delay measurement	Should be available
	IMD3 measurement	Should be available
	Mixer, frequency converter measurements	Should be available
	Spectrum Analysis	Should be available
	Noise Figure Measurement	Should be available
	Phase Noise Measurement	Should be available
	Comprehensive Warranty	3 Years
8	<b>Signal Analyzer</b>	
	Frequency Range	2 Hz to 40 GHz
	Frequency Counter Resolution	0.001 Hz or better
	Aging per year	$\pm 3 \times 10^{-8}$ or better
	Display range for frequency axis	10 Hz to max frequency of the instrument
	Frequency Span Resolution	2 Hz or better
	No of Sweep Points	1 to 100,000
	Resolution Bandwidths	1 Hz to 10 MHz
	Video Bandwidths	1 Hz to 10 MHz
	Analysis Bandwidth	500 MHz
	Measurement Range	DANL to +20 dBm (preamp off/with attenuation)
	Maximum Safe input Power Level	+20 dBm with internal attenuator = 0 dB
	Internal Preamplifier	Should be available
	Displayed Average Noise Level	-130 dBm at 40 GHz with Preamp OFF -145 dBm at 40 GHz with Preamp ON
	SSB Phase Noise (CF = 1 GHz)	
	10 Hz	-90 dBc (typical)
	100 Hz	-110 dBc/Hz
	1 kHz	-120 dBc/Hz
	10 kHz	-130 dBc/Hz
	100 kHz	-135 dBc/Hz
	1 MHz	-140 dBc/Hz
	10 MHz	-150 dBc/Hz
	Analysis Software	1. Cellular communications: 4G, 5G New Radio (NR) LTE- Advanced, LTE, W-CDMA/HSPA+, GSM/EDGE Evolution, cdma2000®, TD-SCDMA 2. Wireless standards such as: WLAN 802.11, Bluetooth 3. Analog Demodulation: AM, FM, PM 4. Digital Demodulation: OFDM, FSK, MSK, BPSK, QPSK, OQPSK, DQPSK, 8PSK, D8PSK, QAM, etc. measurements: spectrum analysis, constellation diagram, EVM, EVM vs. time, EVM vs. frequency, IQ offset, quadrature error, gain imbalance, SNR etc. 5. Radar pulse: pulse, frequency hopping, FMCW 6. Measure in-band signal quality and out-of-band emissions 7. Custom modulation: Evaluate non-standard or custom OFDM
	RF input impedance	50 Ohms
	Input Connector	2.4 mm/ 2.92 mm Male, Female adaptors for cable connection should be provided.
	USB interface	2 Ports, type A plug or more

	Reference inputs	10 MHz
	Reference outputs	10 MHz
	Display	10 inch (diagonal) capacitive multi-touch screen
	Operating system	Windows 10 or higher
	Programming Compatibility	Standard SCPI Command Set
	Comprehensive Warranty	3 Years
9	<b>Analog Signal Generator</b>	
	Output Frequency Range	50 KHz to 40 GHz
	Frequency Resolution	0.001 Hz
	Aging Rate	$< \pm 1 \times 10^{-7}/\text{year}$
	Reference Output	10 MHz
	External Reference Input	10 MHz
	Output Power Level	$\geq +15 \text{ dBm}$ from 1 MHz to 40GHz
	Power (Level) Resolution	0.01 dB
	Minimum settable power	-133 dBm
	Maximum Reverse Power Protection	$\geq +25\text{dBm AC}$
	Harmonics (Typ.)	$< -30 \text{ dBc}$ at level +10dBm
	Non-Harmonics	$< -55 \text{ dBc}$
	Subharmonics	$< -53 \text{ dBc}$
	SSB Phase Noise Carrier offset 10 KHz	$< -135\text{dBc/Hz}$ , F=100MHz $< -140\text{dBc/Hz}$ , F=500MHz $< -135\text{dBc/Hz}$ , F=1GHz $< -105\text{dBc/Hz}$ , F=40GHz
	Modulation	FM, AM, PM & Pulse Modulation
	Waveform Generation	Should generate Sine, Triangle, Square, Positive Ramp, Negative Ramp and Pulse
	Pulse ON/OFF Ratio	$< 80 \text{ dB}$
	Pulse Rise Time/Fall Time	$< 10 \text{ n sec}$
	Minimum Pulse Width	$\geq 1\mu\text{s}$ with ALC ON $\geq 20\text{ns}$ with ALC OFF
	VSWR	$< 2.0:1$
	RF O/P Connector	RF-50Ω, 2.4mm Male ; female adaptors for connecting cables must be available
	Operation	Should Support through a) Manual (Front Panel) b) USB /GPIB/Ethernet
	Programming Compatibility	Standard SCPI Command Set
	Comprehensive Warranty	3 Years

S. No	Other Requirements
1.	Hardware calibration data should be provided for use in pre-emphasis of AWG waveforms for all symbol rates upto 100 Gbaud for the complete system. VNA to be demonstrated for calibration of the entire system.
2.	Drivers should be linear to support multi-level amplitudes-test report on linearity should be provided.
3.	Built-in power meter in transmitter and receiver for output power monitoring for lasers.
4.	Dedicated software controller with full functionality of built-in Laser and ABC.
5.	USB/Ethernet/appropriate connectivity to be provided.



6.	Attenuators with appropriate bandwidth to be provided to adjust the input RF voltage from a 1V source.
7.	Matching cables with spares to be provided for connection from AWG and to the realtime oscilloscopes.
8.	Independent access for the laser source should be provided for both transmitter and receiver Ability to connect external laser sources should be provided for both transmitter and receiver.

S. No	Additional Terms and Conditions
1.	IITM intends to purchase the entire coherent communication test bed with optical and RF signal generation and analysis capabilities. The bidder must quote for the entire test bed with all items and demonstrate integrated system. IITM has the right to choose a subset of the list of items required to satisfy the above requirements, based on the project requirements and recommendations of the committee.
2.	Bidder must quote for all items and for the integrated system package. All additional options possible should be mentioned clearly with corresponding quotes in the bid.
3.	All optical connectors should be of FC/APC type.
4.	All electrical connectors in the system should preferably be of the same type. Appropriate adaptors with spares to be provided otherwise.
5.	Matching cables, terminations and spares for all electrical cables must be provided.
6.	Quote should be inclusive of the computer/workstations of appropriate configuration and the software should be preloaded in the system/workstations.
7.	Bidder should be able to characterize the complete setup for optical 96 Gbaud 64 QAM– AWG, Coh Tx, Coh Rx, and RT Scope and do a complete pre-distortion and demonstrate the same during installation.
8.	Bidder should install the entire setup onsite, specifications should be demonstrated onsite and the Bidder should provide detailed in-house training to the users.
9.	Installation must be completed within 3 months of the date of the release of PO.
10.	The Bidder must ensure support for the OMA and AWG for cross functioning. VNA should be tested with the other electronic and opto-electronic units.
11.	a. Comprehensive Warranty for 3 years from the date of installation b. Free software upgrade to be provided at least for 6 years
12.	Price to be Quoted FOR Department of Electrical Engineering, IIT Madras.
13.	Compliance table should be provided for each item. Price should be provided for each item. Technical and commercial bids to be given - separately.
14.	Bidder should be the single point of contact for installation, maintenance, repair of all the equipment quoted in the tender.
15.	AMC for all items should be quoted as optional after expiry of Comprehensive Warranty period and should be for 5 years including calibration.
16.	Bidder should be able to attend the repair / fault intimation within 3-5 working days.
17.	Bidder should have capability and expertise to provide training.

**TECHNICAL BID PROFORMA**

Tender No. EE/DEEP/060/2023/COHERENTOPT

Item Name: COHERENT OPTICAL COMMUNICATION TEST SETUP

## 1.0 Bidder Eligibility Criteria:

I	Bidder Eligibility Criteria-I (Public Procurement – Preference to Make in India)	Class I / Class II	Local Content Percentage	Ref. Page No.
	Only 'Class-I local suppliers' and 'Class-II local suppliers', as defined under DIPP, MoCI Order No. P-45021/2/2017-PP (BE II) dated 16 <sup>th</sup> September 2020 and other subsequent orders issued therein.			
	EMD as per Tender or EMD is exempted for Micro and Small Enterprises (MSE) as defined in MSE Procurement Policy issued by Department of Micro, Small and Medium Enterprises (MSME) and Startups as recognized by Department of Industrial Policy & Promotion (DIPP). (MSE/MSME/DIPP PROOF should be enclosed in the cover containing technical bid).			

2.0	Bidder Eligibility Criteria-II	Complied/Not Complied	Ref Pg. No
1.	The participating Bidder's firm shall be the Original Equipment Manufacturer (OEM) or OEM Certified authorized firm. (Annexure F)		
2.	The Bidder/OEM should have supplied similar high-speed coherent communication systems to other research laboratories. Purchase Orders, Invoice copies, Work Completion Certificates, Performance Certificates along with contact details of the end user need to be submitted as the proof of supply. IIT Madras reserves its right to verify the claims submitted by the bidder and the feedback from the previous customers will be part of technical evaluation.		
3.	OEM / OEM Authorized Bidder should have a well-established repair / service set up in India. Proof of local service center to be submitted.		
4.	Bidder should have a turnover of at least 20 crore INR per year, in the last three financial years. Proof to be submitted.		
5.	The Bidder who is the single point of contact for supplying all the items as per the tender specifications, should have valid authorization from the OEM for each items listed in BoQ.		

**3.0 Technical Compliance:**

Proposals are invited for establishing a complete test setup for high-speed coherent optical measurements. The setup should include complete hardware and software solutions, allowing the generation of advanced complex signals with any modulation scheme (QPSK, nQAM, etc.), detection and analysis of BER, eye pattern. It should be capable of characterizing optical transmitters and receivers with complex phase modulation techniques individually and in back-to-back configuration and dual polarization testing.

Bidders should quote all the line items mentioned below for the Test Set-up which should be capable of providing following functions.

- Complex modulation signal generation
- Optical Modulation with dual polarization
- Coherent optical detection and demodulation
- Testing Coherent optical Receivers
- Multi-channel transmission experiments for system design.
- Equivalent-time oscilloscope capable of characterizing optical waveform analysis.
- 2/4 Port Vector Network Analyzer with measurement options of Time domain, Phase noise, spectrum analyzer, and noise figure.
- Vector Signal Analyzer with demodulation capability of 5G and vector modulated signals and Radar Signal analysis.
- Analog Signal Generator with Analog and Pulse Modulation Signal Generation Capability.

S. No	Parameters	Specifications	Complied /Not Complied	Ref. Page No.
<b>Coherent Optical Communication Test Setup should comprise of following specifications</b>				
	Wavelength range	1528 nm – 1570 nm		
	Data formats generation/ detection capabilities	QPSK, nQAM, etc		
	Polarization modes for I & Q	Dual Polarization		
	Optical power sensitivity (typical)	-20dBm		
	DAC Resolution/ADC Resolution	8 bits		
	Subsystems required are listed below			
1.a	<b>Complex Modulation Signal Generator with 256GS/s on Two channels</b>			
	No of channels	4 (each differential, so total 8 outputs)		
	Analog Bandwidth (3dB) typical	70 GHz or better		
	Sampling rate	Minimum 128GS/s on 4 channels and 256GS/s on two channels		
	Sample memory	512K Samples/channel or better		
	Output type	Single-ended or differential		
	Amplitude Range	100 mVpp to 0.625 Vpp, single ended, into 50 Ω		
	Amplitude resolution	1mV in single ended mode		
	Skew between any pair of channels within the same module	<= 1 ps		
	Random Jitter	<= 75 fs rms		
	Skew Adjustment range	± 1ns		
	Skew adjustment resolution	at least 25fs		
	Rise/fall time (20/80)	<= 6 ps		
	ENOB	at least 5 Bits at full bandwidth		
	Total Harmonic Distortion	<= -37 dBc		
	Clock Generator module	Should be included within same chassis.		
	Embedded controller	Should be included within same chassis.		
	Comprehensive Warranty	at least 3 Years		
<b>Alternate Specification:</b>				

1.b	<b>Complex Modulation Signal Generator with 256GS/s on Four channels</b>				
	No of Channels	4 (each differential, so total 8 outputs) synchronized			
	Formfactor`	AXIe Chassis System with modular framework			
	Sample rate	256GS/s or better in each channel			
	DAC Resolution	8 bits or better			
	Internal Sample Memory	1024Ksa per channel or better			
	Output type	Single-ended or differential			
	Analog Bandwidth(3dB) typical	80 GHz or better			
	Rise/fall time (20%/80%)	3ps or better			
	Amplitude	300 mVpp, to 2.5 Vpp, single-ended into 50 $\Omega$			
	Skew adjustment range	$\pm 25$ ns or higher			
	Skew between any pair of outputs	0 ps $\pm 1$ ps (typ) or smaller			
	Built in Calibration	Frequency and phase response calibration for clean output signals should be available			
	Random Jitter	75 fs or smaller			
	Clock Generator Module	Should be included with in-chassis.			
	Connector type	1.00mm (female)			
	Modulation Support	Instrument should support complex modulation formats from QPSK to mQAM			
	Clock Input	Should be available			
	Ref Clock Input	Should be available			
	Ref Clock output	Should be available			
Power Consumption	250 W or smaller				
Programming interfaces	SCPI should be available				
Comprehensive Warranty	at least 3 Years				
2	<b>Optical Multi-Format Transmitter</b>				
	XY Polarization Imbalance [dB]	<1			
	Gain Imbalance [dB]	<1			
	DC Extinction Ratio [dB]	>18			
	Insertion Loss [dB]	< 16 dB			
	Automatic bias control	Internal			
	Maximum Optical Input Power	at least +18dBm			
	Optical In-/Output Connector	FC/APC			
	E/O Bandwidth(typical)	60 GHz or better			
	Electrical RF Connectors	1.85mm, female, differential ; cable compatible with AWG should be provided			
	Internal laser	Should be available			
	Frequency range	(1528 - 1570nm)			
	Frequency Fine Tune Resolution	1 MHz or better			
	Channel Spacing	Continuous			
	Spectral Line Width; 3dB instantaneous	<100 kHz			
	SMSR (typical)	>40dB or better			
	Warranty	at least 3 Years			
	3a	<b>Optical Modulation Analyzer System (80 GHz)</b>			
		Maximum detectable symbol rate	DC- 160 Gbaud		
		Sample rate	256GS/s		

	Operating frequency range (Oscilloscope)	DC-80 GHz		
	Maximum record Length	200M Samples or better		
	ADC Resolution	10bits or larger		
	Relative skew after correction	< ± 0.5 ps		
	Signal Input Power	>=+14 dBm		
	Comprehensive Warranty	at least 3 Years		
<b>Alternate Specification:</b>				
3b	<b>Optical Modulation Analyzer System (110 GHz)</b>			
	Maximum detectable symbol rate	DC- 220 Gbaud		
	Sample rate	256GS/s		
	Operating frequency range (Oscilloscope)	DC - 110 GHz		
	Maximum record Length	200M Samples or better		
	ADC Resolution	10bits at leaset		
	Relative skew after correction	< ± 0.5 ps		
	Signal Input Power	>=+14 dBm		
	Comprehensive Warranty	at least 3 Years		
4	<b>Optical Receiver Specifications</b>			
	Analog bandwidth (-3 dB) typical	> 90 GHz		
	Receiver polarization extinction ratio	>40dB		
	Signal input wavelength range	1528nm – 1570nm		
	Average input power monitor accuracy	± 0.5 dB		
5	<b>Internal Local Oscillator (LO) and LO output</b>			
	Wavelength Range	1528nm – 1570nm		
	Linewidth	<100 kHz		
	Sidemode suppression ratio	> 50 dB		
	Optical CW output power	> +14 dBm		
	External LO input power range	0 dBm to +14dBm		
	Comprehensive Warranty	at least 3 Years		
6	<b>Equivalent-Time oscilloscope</b>			
	Optical Channel Count	1		
	Optical Channel Bandwidth, -3 dB`	28GHz or better with optional quote for 45GHz		
	Nominal Wavelength Range	1250 nm to 1600 nm		
	Factory Calibrated Wavelengths	1310 nm (±20 nm) 1550 nm (±20 nm)		
	Scale factor Spec	Minimum 5uW and Maximum 500uW		
	CW Offset Range	+1.0 mW to -3 mW		
	Maximum Non-destruct power	(+7 dBm) or larger		
	Fiber Input	9/125 μm		
	Channel ADC	16 Bits		
	Clock Recovery	Should be Inbuild for 24-29 Gbaud data rates, optional quotation for 48-58 Gbaud.		

	Time base scale	Minimum 100fs/div and Maximum of 100us/div		
	Filters Rate	25 – 29 Gbaud filters should be available.		
	Sample Delay	<10nS		
	Jitter	200 fs rms		
	Record length	1 to 268,435,456		
	Sample rate	Up to 100 kHz		
	Recovered Clock out	≥ 200 mVpp		
	Random jitter of recovered clock	200 fs maximum		
	Auto relocking	Yes, should be available		
	Measurement capability	BER, TDECQ, Eye analysis		
	Impulse response correction	Should be available		
	Comprehensive Warranty	3 Years		
7	<b>Vector Network Analyzer</b>			
	VNA should be a dedicated single box solution 10 MHz to 40 GHz, 4 port Vector Network Analyzer with configurable test set, source attenuators, combiner, mechanical switches and all the required hardware, software pre-installed in it.			
	Frequency range	10 MHz to 40 GHz		
	Frequency Resolution	1 Hz or better		
	Frequency Accuracy	± 0.7 ppm		
	No. of ports	2 ports. <b>Provide an optional quote for 4 ports</b>		
	No. of sources	2		
	System Dynamic Range	At least 110 dB for frequency range: 0.1 GHz to 40 GHz		
	Source power level	At least 0 dBm for frequency range: 0.1 GHz to 40 GHz		
	Maximum Input Power Level	+27 dBm, 7 VDC		
	Minimum settable power	≤- 60 dBm		
	Harmonics	Not greater than -20 dBc		
	Phase Noise @ 10 KHz offset Typical	1 GHz: -120 dBc/Hz 5 GHz: -110 dBc/Hz 10 GHz: -105 dBc/Hz 20 GHz: -95 dBc/Hz 40 GHz: -90 dBc/Hz		
	IF Bandwidth range	≥ 15 MHz		
	No. of Points	100000 or more		
	Power resolution	0.1dB or better		
	Test port connectors	2.4 mm (male), 50 Ohm , Cables compatible with all components in the test system must be provided.		
	10MHz Reference In & Out	Must be available		
	Operating System	Windows 10 or higher		
	Interfaces	LAN, GPIB, USB		
	Screen	Built-in, Integrated with instrument		
	Accessories	1. Test port cables - 4nos 2. 2 port E-cal kit with male (M) and female (F) connectors 3. Provide 4 port E-cal kit with male (M) and female (F) connectors as options.		
	Low Noise Receiver up to total bandwidth	Should be available		
	Internal combiner	Should be available		
	Direct Access Loops	Should be available		
	DDS Source	Should be available		

	Scalar Mixer Measurement	Should be available		
	Time Domain Analysis	Should be available		
	Group delay measurement	Should be available		
	IMD3 measurement	Should be available		
	Mixer, frequency converter measurements	Should be available		
	Spectrum Analysis	Should be available		
	Noise Figure Measurement	Should be available		
	Phase Noise Measurement	Should be available		
	Comprehensive Warranty	3 Years		
8	<b>Signal Analyzer</b>			
	Frequency Range	2 Hz to 40 GHz		
	Frequency Counter Resolution	0.001 Hz or better		
	Aging per year	$\pm 3 \times 10^{-8}$ or better		
	Display range for frequency axis	10 Hz to max frequency of the instrument		
	Frequency Span Resolution	2 Hz or better		
	No of Sweep Points	1 to 100,000		
	Resolution Bandwidths	1 Hz to 10 MHz		
	Video Bandwidths	1 Hz to 10 MHz		
	Analysis Bandwidth	500 MHz		
	Measurement Range	DANL to +20 dBm (preamp off/with attenuation)		
	Maximum Safe input Power Level	+20 dBm with internal attenuator = 0 dB		
	Internal Preamplifier	Should be available		
	Displayed Average Noise Level	-130 dBm at 40 GHz with Preamp OFF -145 dBm at 40 GHz with Preamp ON		
	SSB Phase Noise (CF = 1 GHz)			
	10 Hz	-90 dBc (typical)		
	100 Hz	-110 dBc/Hz		
	1 kHz	-120 dBc/Hz		
	10 kHz	-130 dBc/Hz		
	100 kHz	-135 dBc/Hz		
	1 MHz	-140 dBc/Hz		
	10 MHz	-150 dBc/Hz		
	Analysis Software	1. Cellular communications: 4G, 5G New Radio (NR) LTE- Advanced, LTE, W-CDMA/HSPA+, GSM/EDGE Evolution, cdma2000®, TD-SCDMA 2. Wireless standards such as: WLAN 802.11, Bluetooth 3. Analog Demodulation: AM, FM, PM 4. Digital Demodulation: OFDM, FSK, MSK, BPSK, QPSK, OQPSK, DQPSK, 8PSK, D8PSK, QAM, etc. measurements: spectrum analysis, constellation diagram, EVM, EVM vs. time, EVM vs. frequency, IQ offset, quadrature error, gain imbalance, SNR etc. 5. Radar pulse: pulse, frequency hopping, FMCW 6. Measure in-band signal quality and out-of-band emissions 7. Custom modulation: Evaluate non-standard or custom OFDM		

	RF input impedance	50 Ohms		
	Input Connector	2.4 mm/ 2.92 mm Male, Female adaptors for cable connection should be provided.		
	USB interface	2 Ports, type A plug or more		
	Reference inputs	10 MHz		
	Reference outputs	10 MHz		
	Display	10 inch (diagonal) capacitive multi-touch screen		
	Operating system	Windows 10 or higher		
	Programming Compatibility	Standard SCPI Command Set		
	Comprehensive Warranty	3 Years		
9	<b>Analog Signal Generator</b>			
	Output Frequency Range	50 KHz to 40 GHz		
	Frequency Resolution	0.001 Hz		
	Aging Rate	$< \pm 1 \times 10^{-7}/\text{year}$		
	Reference Output	10 MHz		
	External Reference Input	10 MHz		
	Output Power Level	$\geq +15 \text{ dBm}$ from 1 MHz to 40GHz		
	Power (Level) Resolution	0.01 dB		
	Minimum settable power	-133 dBm		
	Maximum Reverse Power Protection	$\geq +25\text{dBm AC}$		
	Harmonics (Typ.)	$< -30 \text{ dBc}$ at level +10dBm		
	Non-Harmonics	$< -55 \text{ dBc}$		
	Subharmonics	$< -53 \text{ dBc}$		
	SSB Phase Noise Carrier offset 10 KHz	$< -135\text{dBc/Hz}$ , F=100MHz $< -140\text{dBc/Hz}$ , F=500MHz $< -135\text{dBc/Hz}$ , F=1GHz $< -105\text{dBc/Hz}$ , F=40GHz		
	Modulation	FM, AM, PM & Pulse Modulation		
	Waveform Generation	Should generate Sine, Triangle, Square, Positive Ramp, Negative Ramp and Pulse		
	Pulse ON/OFF Ratio	$< 80 \text{ dB}$		
	Pulse Rise Time/Fall Time	$< 10 \text{ n sec}$		
	Minimum Pulse Width	$\geq 1\mu\text{s}$ with ALC ON $\geq 20\text{ns}$ with ALC OFF		
	VSWR	$< 2.0:1$		
	RF O/P Connector	RF-50Ω, 2.4mm Male ; female adaptors for connecting cables must be available		
	Operation	Should Support through a) Manual (Front Panel) b) USB /GPIB/Ethernet		
	Programming Compatibility	Standard SCPI Command Set		
	Comprehensive Warranty	3 Years		

S. No	Other Requirements	Complied/Not Complied	Ref Pg. No
1.	Hardware calibration data should be provided for use in pre-emphasis of AWG waveforms for all symbol rates upto 100 Gbaud for the complete system. VNA to be demonstrated for calibration of the entire system.		
2.	Drivers should be linear to support multi-level amplitudes-test report on linearity should be provided.		
3.	Built-in power meter in transmitter and receiver for output power monitoring for lasers.		



4.	Dedicated software controller with full functionality of built-in Laser and ABC.		
5.	USB/Ethernet/appropriate connectivity to be provided.		
6.	Attenuators with appropriate bandwidth to be provided to adjust the input RF voltage from a 1V source.		
7.	Matching cables with spares to be provided for connection from AWG and to the realtime oscilloscopes.		
8.	Independent access for the laser source should be provided for both transmitter and receiver Ability to connect external laser sources should be provided for both transmitter and receiver.		

<b>S. No</b>	<b>Additional Terms and Conditions</b>	<b>Complied/Not Complied</b>	<b>Ref Pg. No</b>
1.	IITM intends to purchase the entire coherent communication test bed with optical and RF signal generation and analysis capabilities. The bidder must quote for the entire test bed with all items and demonstrate integrated system. IITM has the right to choose a subset of the list of items required to satisfy the above requirements, based on the project requirements and recommendations of the committee.		
2.	Bidder must quote for all items and for the integrated system package. All additional options possible should be mentioned clearly with corresponding quotes in the bid.		
3.	All optical connectors should be of FC/APC type.		
4.	All electrical connectors in the system should preferably be of the same type. Appropriate adaptors with spares to be provided otherwise.		
5.	Matching cables, terminations and spares for all electrical cables must be provided.		
6.	Quote should be inclusive of the computer/workstations of appropriate configuration and the software should be preloaded in the system/workstations.		
7.	Bidder should be able to characterize the complete setup for optical 96 Gbaud 64 QAM- AWG, Coh Tx, Coh Rx, and RT Scope and do a complete pre-distortion and demonstrate the same during installation.		
8.	Bidder should install the entire setup onsite, specifications should be demonstrated onsite and the Bidder should provide detailed in-house training to the users.		
9.	Installation must be completed within 3 months of the date of the release of PO.		
10.	The Bidder must ensure support for the OMA and AWG for cross functioning. VNA should be tested with the other electronic and opto-electronic units.		
11.	a. Comprehensive Warranty for 3 years from the date of installation b. Free software upgrade to be provided at least for 6 years		
12.	Price to be Quoted FOR Department of Electrical Engineering, IIT Madras.		
13.	Compliance table should be provided for each item. Price should be provided for each item. Technical and commercial bids to be given - separately.		
14.	Bidder should be the single point of contact for installation, maintenance, repair of all the equipment quoted in the tender.		
15.	AMC for all items should be quoted as optional after expiry of Comprehensive Warranty period and should be for 5 years including calibration.		

16.	Bidder should be able to attend the repair / fault intimation within 3-5 working days.		
17.	Bidder should have capability and expertise to provide training.		

**SIGNATURE OF BIDDER ALONG WITH  
SEAL OF THE COMPANY WITH DATE**

**FINANCIAL BID (PROFORMA) - BILL OF QUANTITIES (BOQ)**  
**Item Name: COHERENT OPTICAL COMMUNICATION TEST SETUP**  
**Tender No. EE/DEEP/060/2023/COHERENTOPT**

It. No	Description of Items	Quantity	Units	Basic Rate in INR	GST in Percentage	Total Amount with taxes in INR
	Coherent Optical Communication Test Setup consisting of					
1.	Complex Modulation Signal Generator with 256GS/s on Two channels with Comprehensive Warranty for 3 year	1	No.			
2.	Complex Modulation Signal Generator with 256GS/s on Four channels with Comprehensive Warranty for 3 year	1	No.			
3.	Optical Multi-Format Transmitter with Comprehensive Warranty for 3 year	1	No.			
4.	Optical Modulation Analyzer System (80 GHz) with Comprehensive Warranty for 3 year	1	No.			
5.	Optical Modulation analyzer system (110 GHz) with Comprehensive Warranty for 3 year	1	No.			
6.	Optical Receiver Specifications	1	No.			
7.	Internal Local Oscillator (LO) and LO output with Comprehensive Warranty for 3 years	1	No.			
8.	Equivalent-Time oscilloscope with Comprehensive Warranty for 3 years	1	No.			
9.	Vector Network Analyzer with Comprehensive Warranty for 3 years	1	No.			
10.	Signal Analyzer with Comprehensive Warranty for 3 years	1	No.			
11.	Analog Signal Generator with Comprehensive Warranty for 3 years	1	No.			
12.	AMC for all items should be quoted as <b>optional</b> after expiry of Comprehensive Warranty period and should be for 5 years including calibration.	1	No.			
	Grand Total					

Total Amount Rupees in words \_\_\_\_\_

**FORMAT FOR AFFIDAVIT OF SELF-CERTIFICATION UNDER PREFERENCE TO MAKE  
IN INDIA**

**Tender Reference Number:**

**Name of the item / Service:**

Date: \_\_\_\_\_

I/We \_\_\_\_\_ S/o, D/o, W/o, \_\_\_\_\_  
Resident of \_\_\_\_\_

Hereby solemnly affirm and declare as under:

That I will agree to abide by the terms and conditions of the Public Procurement (Preference to Make in India) Policy vide GoI Order no. P-45021/2/2017-PP (B.E.-II) dated 15.06.2017 (subsequently revised vide orders dated 28.05.2018, 29.05.2019 and 04.06.2020) MOCI order No. 45021/2/2017-PP (BE II) Dt.16th September 2020 & P- 45021/102/2019-BE-II-Part (1) (E-50310) Dt.4th March 2021 and any subsequent modifications/Amendments, if any and

That the local content for all inputs which constitute the said item/service/work has been verified by me and I am responsible for the correctness of the claims made therein.

✓ Tick ( ) and Fill the Appropriate Category	
<input type="checkbox"/>	I/We _____ [name of the supplier] hereby confirm in respect of quoted items that Local Content is equal to or more than 50% and come under “ <b>Class-I Local Supplier</b> ” category.
<input type="checkbox"/>	I/We _____ [name of the supplier] hereby confirm in respect of quoted items that Local Content is equal to 20% but less than 50% and come under “ <b>Class-II Local Supplier</b> ” category.

- The details of the location (s) at which the local value addition is made and the proportionate value of local content in percentage

Address \_\_\_\_\_ Percentage of Local content: \_\_\_\_\_%

For and on behalf of \_\_\_\_\_

(Name of firm/entity)

Authorized signatory (To be duly authorized by the Board of Directors)

<Insert Name, Designation and Contact No.>

[Note: In case of procurement for a value in excess of Rs. 10 Crores, the bidders shall provide this certificate from statutory auditor or cost auditor of the company (in the case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of suppliers other than companies) giving the percentage of local content.]

**This letter should be on the letterhead of the quoting firm and should be signed by a competent authority.  
Non-submission of this will lead to Disqualification of bids.**

(To be given on the letter head of the bidder)

No. \_\_\_\_\_

Dated: \_\_\_\_\_

**CERTIFICATE**

*(Bidders from India)*

I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India and hereby certify that I am not from such a country.

**OR**

***(whichever is applicable)***

*(Bidders from Country which shares a land border with India)*

I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India and hereby certify that I from \_\_\_\_\_ (Name of Country) and has been registered with the Competent Authority. I also certify that I fulfil all the requirements in this regard and is eligible to be considered. *(Copy/ evidence of valid registration by the Competent Authority is to be attached)*

Place:

Date:

Signature of the Tenderer  
Name & Address of the  
Tenderer with Office Stamp

**OEM CERTIFICATION FORM**  
**(In Original Letter Head of OEM)**

Tender No: ..... Dated: .....

We are Original Equipment Manufacturers (OEM) of..... (Name of the company) Ms..... (Name of the Bidder) is one of our Distributors/Dealers/Resellers/Partners (tick one) for the ..... and is participating in the above-mentioned tender by offering our product model.....(Name of the product with model number).

..... is authorized to bid, sell and provide service support warranty for our product as mentioned above.

Name and Signature of the authorized signatory of OEM along with seal of the company with Date

**TENDER CHECKLIST – Mandatory to be filled and sent (inside the Main Bid Cover) along with Bidding Document.**

- (1) I have registered as a Bidder with IC&SR. (Proof to be enclosed)
- (2) Technical bid cover and Financial Bid cover to be submitted separated.
- (3) Completed and **Signed Form of Tender**. The Form of Tender document shall be signed by a person legally authorized.
- (4) Completed Technical Compliance Statement
- (5) Evidence of similar contracts completed/Product supplied in case if the details are requested in (**Annexure – A**)
- (6) Certification of Class I / Class II (**As a part of technical bid**) per item / service / work as per (**Annexure – D**)
- (7) EMD (Ref. tender document pg.no. 6, Point no.9)
- (8) Land Border (**Annexure – E**)
- (9) Authorized agent certificate from OEM is mandatory if Indian agent/Indian office of OEM is participating in this tender on behalf of OEM. (**Annexure F**)

The bid will be valid only if all the above documents are provided. Bidders are asked to supply and tick off the required information. Failure to provide any of the stated documents may result in the bid being considered as non-compliant and rejected.

**Signature of the Bidder**

**FORM - A  
NON-BLACKLISTING DECLARATION**

**Date: XXXX**

To,  
The Indian Institute of Technology Madras,  
Sardar Patel road,  
Guindy, Chennai - 600036

**Subject: Non-Blacklisting declaration in connection with tender RFF No: XXXXXX for procurement of “XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX”**

Dear Sir,

This is to notify you that our Firm/Company/Organization *<provide Name of the Firm/Company/Organization>* intends to submit a proposal in response to the invitation for procurement of “XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX” In accordance with the above we declare that:

- a. We are not involved in any major litigation that may have an impact of affecting or compromising the delivery of services as required under this assignment.
  
- b. We are not blacklisted by any Central/ State Government/ agency of Central/ State Government of India or any other country in the world/ Public Sector Undertaking/ any Regulatory Authorities in India or any other country in the world for any kind of fraudulent activities in last XX years.

Sincerely,  
[BIDDERS NAME]  
Name  
Title Signature





CENTRE FOR INDUSTRIAL CONSULTANCY & SPONSORED RESEARCH (IC&SR)  
INDIAN INSTITUTE OF TECHNOLOGY MADRAS  
CHENNAI 600 036



**ELECTRONIC CLEARING SERVICE (Credit Clearing)/ REAL TIME GROSS SETTLEMENT (RTGS) FACILITY FOR RECEIVING PAYMENTS**

**A. Details of Account Holder**

Name of the Institution	Indian Institute of Technology - Madras
Complete Contact Address	Industrial Consultancy and Sponsored Research Indian Institute of Technology-Madras, IIT- Madras Campus Post Office, Sardar Patel Road, Guindy, CHENNAI - 600 036
Permanent Account Number (PAN)*	AAAAI3615G
GST REGISTRATION NO.	33AAAAI3615G1Z6
Telephone No./ Fax No.	Tel - 044-2257 8356
E- mail ID of the FO/AO/REG/DIR	dricsr@iitm.ac.in

**B. Bank Account Details:**

Institution Account Name (As per Bank Record)	The Registrar, Indian Institute of Technology - Madras
Account No.	2722101003872
IFSC CODE	CNRB0002722
SWIFT CODE	CNRBINBBIIT
Bank Name (in full)	Canara Bank
Branch Name	IIT-Madras Branch
Complete Branch Address	Canara Bank, IIT-Madras Branch, IIT- Madras Campus Post Office, Sardar Patel Road, Guindy, CHENNAI - 600 036
MICR No.	600015085
Account Type	Savings Account

Certified that the Institute's account is in an RTGS enabled branch.

I hereby declare that the particulars given above are correct and complete.

Date:

Signature of the Competent Authority  
of the Institution with seal.

उप कुलसचिव (आई टी एवं एस.आर.)  
DEPUTY REGISTRAR (IC & SR)  
आई आई टी. मद्रास, चेन्नै  
I.I.T. MADRAS, CHENNAI - 600 036.

## MANDATE FORM

**ELECTRONICS CLEARING SERVICE (CREDIT CLEARING)/REAL TIME GROSS SETTLEMENT (RTGS) FACILITY FOR RECEIVING PAYMENTS.**

\*\*\*\*\*

**A. DETAILS OF ACCOUNT HOLDER:-**

NAME OF ACCOUNT HOLDER	
COMPLETE CONTACT ADDRESS	
TELEPHONE NUMBER/FAX/E MAIL	

**B. BANK ACCOUNT DETAILS:-**

BANK NAME	
BRANCH NAME WITH COMPLETE ADDRESS, TELEPHONE NUMBER AND EMAIL	
WHETHER THE BRANCH IS COMPUTERISED?	
WHETHER THE BRANCH IS RTGS ENABLED? IF YES, THEN WHAT IS THE BRANCH <b>IFSC CODE</b>	
IS THE BRANCH ALSO NEFT ENABLED?	
TYPE OF BANK ACCOUNT (SB/CURRENT/CASH CREDIT)	
COMPLETE BANK ACCOUNT NUMBER (LATEST)	
MICR CODE OF BANK	

**DATE OF EFFECT:**

I hereby declare that the particulars given above are correct and complete. If the transaction is delayed or not effected at all for reasons of incomplete or incorrect information I would not hold the user institution responsible. I have read the option invitation letter and agree to discharge responsibility expected of me as a participant under the Scheme.

(.....)  
Signature of Customer

Date:  
Certified that the particulars furnished above are correct as per our records.  
(Bank's Stamp)

(.....)  
Signature of Customer

Date :

1. Please attach a photocopy of cheque along with the verification obtained from the bank.
2. In case your Bank Branch is presently not "RTGS enabled", then upon its up gradation to "RTGS Enabled" branch, please submit the information again in the above proforma to the Department at earliest.