

 <p>IIT PALAKKAD</p>	<p>भारतीय प्रौद्योगिकी संस्थान पालक्काड  <b>Indian Institute of Technology Palakkad</b>  अहलिया एकीकृत कैम्पस, कोज़िपारा  Ahalia Integrated Campus, Kozhipara  पालक्काड- 678557  Palakkad – 678 557</p>	<p>दूरभाषसंख्या/ Phone no:  04923 – 226300/586  ईमेल/ Email :  purchase@iitpkd.ac.in</p>
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Prof. Job Kurian  
Registrar i/c

Ref : Software Defined Radios/IIT Palakkad  
Date: 27.10.2017

**Open Tender No: IITPKD/ELE/SS/050/2017**

**Due Date: 17.11.2017 @ 3 PM**

Dear Sir/Madam,

On behalf of the Indian Institute of Technology, Temporary campus, Palakkad, Quotations are invited for **“SOFTWARE DEFINED RADIOS (SDR)”** The Specifications are given in the Annexure.

***Pre-bid meeting – The pre-bid meeting is scheduled to be held on 01.11.2017 & 10.00 AM at Conference Room, Academic Block, IIT Palakkad.***

***Technical bid Opening: The Technical bid will be opened on 17.11.2017 at 3.30 PM at Conference Room, Academic Block, IIT Palakkad***

**Instructions to the Bidder**

- (i) **Preparation of Bids:** - The tenders should be submitted under two-bid system (i.e.) Technical bid and Financial bid in separate envelopes. The technical bid should consist of all technical details along with commercial terms and conditions. No prices should be included in the technical bid. Financial bid should indicate item – wise prices for the items mentioned in the technical bid. The technical and the financial bids should be put in separate cover and sealed. Both sealed covers should be put into a bigger cover. Technical bids must either be spiral bound/ Stapled together. No loose sheets will be accepted. All pages must be numbered.
- (ii) **Delivery of the tender:** - The tender shall be sent to the below-mentioned address either by post or by courier so as to reach this office before the due date and time specified in the Schedule. The offer/bid can also be dropped in the tender box on or before the due date and time specified in the schedule. The tender box is kept in the office of the “Academic Block, IIT Palakkad, Ahalia Integrated Campus, Kozhipara, and Palakkad-678 557.
- (iii) **Opening of the tender:** - The offer/Bids will be opened by a committee duly constituted for this purpose. The technical bids will be opened first and it will be examined by a technical committee which will decide the suitability of the bid as per our specifications and requirements. The bidders will be invited for opening of

Technical bids. In respect of opening of financial bid, those bidders who are technically qualified only will be called for.

- (iv) **Prices:** - The price should be quoted in net per unit (after breakup) and must include all packing and delivery charges indicated separately for each item. The offer/bid should be exclusive of taxes and duties, which will be paid by the purchaser as applicable. However the percentage of tax & duties should be clearly indicated.

The price should be quoted without custom duty, the custom duty will be paid at concessional rate against duty exemption certificate.

In case of import supply, the price should be quoted on EX-WORKS/CIP basis indicating the mode of shipment.

- (v) **Agency Commission:** - Agency commission, if any, will be paid to the Indian agents in Rupees on receipt of the equipment and after satisfactory installation. Agency Commission will not be paid in foreign currency under any circumstances. The details should be explicitly shown in Tender even in the case of 'Nil' commission. The tenderer should indicate the percentage of agency commission to be paid to the Indian agent. The foreign Principal should indicate about the percentage of payment and it should be included in the originally quoted basic price, if any.
- (vi) **Terms of Delivery:** - The Item Should be supplied to our institute as per purchase order. In case import supply, the items should be delivered at the cost of supplier to our institution. The Installation and commissioning should be completed as specified in our important conditions.
- (vii) IIT Palakkad reserves the full right to accept / reject any tender at stage without assigning any reason.

Yours sincerely,

**Registrar, I.I.T. Palakkad**

## SCHEDULE

### Important Conditions:

1. The due date for the submission of the tender is **17.11.2017 at 3 PM**
2. The offers / bids should be submitted in two bids systems (i.e.) Technical bid and financial bid. The Technical bid should consist of all technical details / specifications only. The Financial bid should indicate item-wise price for each item and it should contain all Commercial Terms and Conditions including Taxes, transportation, packing & forwarding, installation, guarantee, payment terms, pricing terms etc. The Technical bid and financial bid should be put in separate covers and sealed. Both the sealed covers should be put in a bigger cover. The Open Tender for "**SOFTWARE DEFINED RADIOS (SDR)**" should be written on the left side of the Outer bigger cover and sealed.
3. **EMD: - EMD should be at 2% (two percent) of the tender value quoted by the bidder.** The EMD should be enclosed with the financial bid which will not be opened for Technical evaluation. Enclosing the EMD in the Technical bid will automatically disqualify the tenderer. EMD should be in the form of DD in favour of "**Indian Institute of Technology Palakkad**" and payable at Palakkad. The tender without EMD would be considered as UNRESPONSIVE and REJECTED. Photo/FAX copies of the Demand Draft/Banker's pay orders will not be accepted. No interest will be paid for the EMD and the EMD (Bid Security) will be refunded to the successful bidder on receipt of Performance Security.
4. **Performance Security:-** The successful bidder should submit Performance Security for an amount of 5% of the value of the contract/supply. The Performance Security may be furnished in the form of an Account Payee DD or FD Receipt from the commercial bank or Bank Guarantee from any nationalized bank of India.

**Only after submission of Performance Security, Purchase Order/Work Order will be released / L.C will be opened.**

**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 through the Beneficiary Bank to the end user bank. Otherwise, the Indian Agent of the foreign vendor has to submit a Bank Guarantee from a Nationalized Bank of India.

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.

5. If an Indian agent is involved, the following documents must be enclosed:  
Foreign principal's proforma invoice indicating the commission payable to the Indian Agent and nature of after-sales service to be rendered by the Indian Agent.
  - ✓ Copy of the agency agreement with the foreign principal and the precise relationship between them and their mutual interest in the business.
  - ✓ The enlistment of the Indian agent with Director General of Supplies & Disposals under the Compulsory Registration Scheme of Ministry of Finance.
6. The offer/bids should be sent only for a machine that is available in the market and supplied to a number of customers. A list of customers in India and abroad with details must accompany the quotations. Quotations for a prototype machine will not be accepted.
7. **Original catalogue (not any photocopy) of the quoted model duly signed by the principals must accompany the quotation in the Technical bid. No prices should ever be included in the Technical bid.**
8. Compliance or Confirmation report with reference to the specifications and other terms & conditions should also be obtained from the principal.
9. **Validity:** Validity of Quotation not less than 90 days from the due date of tender.
10. **Delivery Schedule:-** The tenderer should indicate clearly the time required for delivery of the item. 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.
11. Loading and unloading charges will be borne by the supplier.
12. **Risk Purchase Clause:-** 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.
13. **Payment:-** No Advance payment will be made for Indigenous purchase. However 90% Payment after supply and 10% after installation are agreed to wherever the installation is involved. In case of import supplies the payment will be made only through 100% Letter of Credit i.e. (90% payment will be released against shipping documents and 10% after successful installation wherever the installation is being done).
14. **Advance Payment:-** No advance payment is generally admissible. In case of specific percentage of advance payment is required, the Foreign Vendor has to submit a Bank Guarantee equal to the amount of advance payment and it should be routed through the Beneficiary Bank to the end user Bank. Otherwise, the Indian Agent of the foreign vendor has to submit a Bank Guarantee through a Nationalized Bank of India.

15. **On-site Installation:** - The equipment or machinery has to be installed or commissioned by the successful bidder within 15 to 20 days from the date of receipt of the **item at site of IIT Palakkad.**
16. **Warranty/Guarantee:** - 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).
17. **Late offer:** - The offers received after the due date and time will not be considered. The Institute shall not be responsible for the late receipt of Tender on account of Postal, Courier or any other delay.
18. **Acceptance and Rejection:** - I.I.T. Palakkad has the right to accept the whole or any part of the Tender or portion of the quantity offered or rejects it in full without assigning any reason.
19. **Do not quote the optional items or additional items unless otherwise mentioned in the Tender documents / Specifications.**
20. **Disputes and Jurisdiction:** - 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 Palakkad.
21. All Amendments, time extension, clarifications etc., will be uploaded on the website only and will not be published in newspapers. Bidders should regularly visit the above website to keep themselves updated. No extension in the bid due date/ time shall be considered on account of delay in receipt of any document by mail.

**Acknowledgement:-** It is hereby acknowledged that the tenderer has gone through all the conditions mentioned above and agrees to abide by them.

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

## Technical specifications for Software Defined Radios (SDR)

### 1. Overview

- a. Input power supply: USB or standard power supply of single-phase AC 240V±10% and frequency 50/60Hz.
- b. Connectivity to PC: USB or ethernet.
- c. Compatible operating systems: Linux (optional: Windows 7 and above).
- d. All required drivers/software for operations must be included.
- e. Must be controllable/programmable using **Matlab scripts and NI-LabView** (include all required drivers).
- f. All required cables, power adapters, antennas have to be quoted and supplied with the SDR.
- g. All connectors required for loopback communication must be provided.
- h. Any connectors/cables that may be required to connect to external RF devices must be provided.
- i. Manuals, documentations and datasheets of all supplied hardware must be provided.
- j. Bidder must have a standard service program for hardware support and repair.
- k. Any training required to operate the supplied hardware must also be provided.

### 2. Types of devices required:

- a. SDR type-1
  - i. Quantity: 20
  - ii. Detailed technical specifications

S. No.	Feature	Requirement
1	Maximum supported frequency (for both transmitter and receiver)	>= 6GHz
2	Frequency accuracy	<= 3 ppm
3	Instantaneous signal bandwidth (for both transmitter and receiver)	>= 55MHz
The required frequency range can also be obtained with external up/down-converters. In such a case, the external up/down-converters should also be quoted and supplied.		
4	Number of IQ channels	>=2
5	IQ rate - two channels (for both transmitter and receiver)	>= 30 MS/s
6	ADC/DAC	>= 12 bits
7	Gain range (for both transmitter and receiver)	>= 75 dB
8	Maximum output power (transmitter)	>= 20 dBm
9	Maximum input power (receiver)	>= -15 dBm
10	Supported MIMO configuration	2x2 MIMO

b. SDR type-2

i. **Quantity: 5**

ii. Detailed technical specifications:

Sl. No.	Feature	Requirement
1	Maximum supported frequency (for both transmitter and receiver)	$\geq 2.2\text{GHz}$
2	Frequency accuracy (must be capable of synchronizing the clock through GPS)	$\leq 15\text{ ppb}$
3	Instantaneous signal bandwidth (for both transmitter and receiver)	$\geq 20\text{MHz}$
The required frequency range can also be obtained with external up/down-converters. In such a case, the external up/down-converters should also be quoted and supplied.		
4	IQ rate (for both transmitter and receiver)	$\geq 25\text{ MS/s}$
5	ADC/DAC	$\geq 16\text{ bits}$
6	Gain range (for both transmitter and receiver)	$\geq 30\text{ dB}$
7	Maximum output power (transmitter)	$\geq 15\text{ dBm}$
8	Maximum input power (receiver)	$\geq 0\text{ dBm}$
9	Transceiver SFDR	$\geq 75\text{ dB}$
10	Supported MIMO configurations	2x2 MIMO 4x1 MISO 1x4 SIMO

c. Technical specifications that should be commonly satisfied by both SDR types- 1 & 2

Sl. No.	Feature	Requirement
1	Communication mode	Full duplex
2	Minimum supported frequency (for both transmitter and receiver)	$\leq 70\text{MHz}$
3	Frequency step size (for both transmitter and receiver)	$\leq 1\text{KHz}$
4	Clock synchronization	Support for supplying external clock
5	Gain step (for both transmitter and receiver)	$\leq 1\text{dB}$
6	Receiver noise figure	$\leq 7\text{ dB}$
7	External attenuators (to attenuate the input signal to Rx)	30 dB, and that required for loopback setup
8	Modulation schemes supported should include (Predefined experiment manuals, teaching manuals/courseware and source codes must be available)	AM, FM, PSK, QAM, FSK, ASK, GMSK, OFDM

9	Predefined experiment resources/source codes to convert the SDR to -	Vector signal generator and vector signal transceiver
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### 3. Accessories

Sl. No.	Feature	Requirement
1	Teaching manual, resources, and courseware for implementing: (Mandatory)	<ol style="list-style-type: none"> <li>1. Basic modulation schemes</li> <li>2. GPS receiver</li> <li>3. GSM receiver</li> <li>4. Generic communication systems</li> <li>5. Eye diagram</li> <li>6. Equalization</li> <li>7. IEEE 802.11 transceivers</li> <li>8. Channel sounders</li> </ol>
2	Antennas (Mandatory)	<ol style="list-style-type: none"> <li>1. Dual band: 2.4 GHz and 5GHz. Quantity: 10.</li> <li>2. Tri band antenna for frequencies. Quantity: 30.</li> <li>3. GPS receive antenna. Quantity: 8.</li> </ol>
3	RF power amplifiers (optional) <b>Price and duties/taxes must be quoted as a separate item</b>	<ol style="list-style-type: none"> <li>1. Frequency range: 200 MHz to 2.2 GHz.</li> <li>2. Peak output power <math>\geq</math> 30 dBm.</li> <li>3. Quantity: 5</li> </ol>

### Who can participate

Only those bidders fulfilling the following criteria should respond to the tender.

1. Bidder should be either an Original Equipment Manufacturer (OEM) of software-defined radios (SDR) or should be a reputed system integrator working in the area of SDRs or allied fields.
2. The bidder should be a company registered under the Companies Act, 1956/2013 OR a Limited Liability Partnership (LLP)/a registered partnership firm OR a sole-proprietorship entity. Appropriate Registration incorporation certificate to be submitted.
3. Bidder must have a registered office in Karnataka/Tamil Nadu/Telangana/Andhra Pradesh, or Kerala. Certificate of registration for the offices to be provided.
4. Bidder must also have a service center in Karnataka/Tamil Nadu/ Telangana/Andhra Pradesh, or Kerala. Certificate of registration for the centers to be provided.
5. Bidder must be in existence in the business of SDRs or allied fields for a minimum period of 5 previous financial years (before or since 01-April-2012). Documentary evidence of experience must be provided.
6. The bidder should have implemented orders of SDRs worth exceeding **INR 17 lakhs** during previous three financial years (April 1, 2014 – March 31, 2017). Purchase orders and certificates of successful implementation must be included. Copies of financial statements or evidence of turnover must be furnished.
7. The bidder should have documentary evidence of having supplied SDRs at a Centrally Funded Technical Institution (IIT, NIT, IISc). Bidder must provide a certificate of satisfactory performance of the supplied devices from the institute to which they had supplied. Contact details of faculty-in-charge of installed setup must also be provided.
8. Compliance sheet for the specification & OEM Brochure has to be attached along with Technical bid. Vendor has to fill the compliance sheet and mention page number or reference number in OEM brochure. Unfilled / partial filled sheets lead to disqualification.
9. Minimum service and warranty of three years for all supplied hardware must be provided.