Government of India
Bhabha Atomic Research Centre
Accelerator Control Division

Ref: ACnD/ACSS/RTK/2019/224 Date: 27/08/2019

----------TO WHOM SO EVER IT MAY CONCERN----------

Sub: Minor Fabrication job for "Fabrication, component procurement, assembly and testing of RF Power Amplifiers (150W, 300W, 2-30MHz) as per technical specifications" conforming to technical specification no ACnD/ACSS/RTK/TS15 dated 14/05/2019

Dear Sir/Madam,

1. Quotations are invited for, 'Fabrication, component procurement, assembly and testing of RF Power Amplifiers (150W, 300W, 2-30MHz) as per technical specifications' conforming to technical specification no ACnD/ACSS/RTK/TS15 dated 14/05/2019.
2. Bidder shall quote for purchase of raw materials, fabrication, assembly, integration, testing and supply of all items and its accessories.
3. Taxes and Duties shall be quoted separately.
4. The quotation must reach **The Head, Accelerator Control Division** by 12/09/2019 (12:00 PM) and must be sent in a sealed envelope super scribed with the reference number & the due date given above only through India Ordinary Post/Speed Post.
5. The address on the envelop should read:
   The Head,
   Accelerator Control Division,
   1-328S, First floor, Modlab-D block,
   BARC, Trombay,
   Mumbai - 400 085.
   (Kind Attn: Shri R T Keshwani, SO/F, ACnD)
6. The bidder shall complete the job within 36 weeks from the date of firm work order issued to the bidder. The finished components shall be delivered by the bidder at Accelerator Control Division, BARC, Trombay, Mumbai - 400 085.
7. Head, Accelerator Control Division reserves the rights to accept / reject any or all quotations without assigning any reason.
8. Delivery charges if any must be clearly mentioned in the offer.
9. Quotation must indicate the validity of offer. Quotation must also indicate the PAN no, GST tax, registration number registered with local ST authority /CST authority. Quotation must be submitted in printed letterhead. Quotations should be preferably neatly typed and corrections are not acceptable. The quotation has to be signed by authorized person with company seal.
10. Drawings / Sketches (if any) must be returned along with the offer.
11. Payment will be made by ECS only after satisfactory completion of work on production of bill, delivery challan and advance stamped receipt. It may be noted that IT@2% shall be deducted from your bills. Also, items intended to be procured/fabricated in this work attract concessional rate of GST as per the said notifications. Exemption Certificate shall be issued on placement of firm PO. As this work is for R & D purpose, 5% GST is applicable and GST exemption certificate shall be provided. The supplier has to produce GST undertaking in standard format along with bills after satisfactory completion of work order
12. Job will be guaranteed against material and manufacturing defects for 1 year from the date of supply.
13. In case of technical clarifications, the suppliers may kindly contact Shri R. T. Keshwani, SO/F, ACnD (Ext No: 022-25590947)

Encl.: Technical Specification Sheet no: - ACnD/ACSS/RTK/TS15 dated 14/05/2019.

RKeshwani

27.8.19

Head, ACnD

डॉ. गोपाल जोशी/Dr. Gopal Joshi
अध्यक्ष,त्वरक नियंत्रण प्रभाग/Head, Accelerator Control Division
भारत सरकार/Government of India,
भाभा परमाणु अनुसंधान केंद्र/Bhabha Atomic Research Centre
ट्रॉम्बे, मुंबई-400 085/Trombay, Mumbai-400 085
संख्या-जी/624/001/Computer No. G/624/001

Technical Specification for minor fabrication enquiry

Specification no.	Revision no.	Date of Issue	No of pages
ACnD/ACSS/RTK/TS15	0	14/05/19	04

Fabrication, component procurement, assembly and testing of RF power amplifiers (150W, 300W, 2-30MHz)

1.0. Scope of work:

It is required to carry out component procurement, fabrication, assembly and testing of wide band (2 to 30 MHz) solid state RF power amplifiers as per technical specifications detailed in subsection 1.1. The work shall be executed in two stages:

Stage I:
In the first stage, 150 W SSRFPA shall be fabricated as per the specifications, assembled and tested by supplier. It shall be evaluated by the indenting authority.

Stage II:
After successful evaluation and acceptance testing in stage I, 300W SSRFPA shall be fabricated as per the specifications, assembled and tested by supplier. It shall be evaluated by the indenting authority. The supplier shall procure all components (including spare components) as per bill of material (BOM in subsection 3.0) enclosed. The enclosures to be fabricated and punched as per the details that will be provided by indenting authority. The indenting authority shall provide all the necessary details required for the job at various stages of fabrication, assembly and testing.

1.1 Technical specifications

Solid state RF Power Amplifiers (SSRFPA) of 150W and 300W (2-30 MHz) are to be fabricated and tested with control electronics. Specifications of the power amplifier are given below.

1. Frequency range : 2 to 30 MHz
2. RF output power : 150W/300W (min.)
3. Power supply to amplifier: 50V,10A (max)
4. Power gain : 55dB
5. Maximum input power: 0dBm
6. VSWR at output : 65:1or better
7. Input return loss : 25dB or better
8. Control /protection electronics for overdrive, over temp. and excess reflected power is to be provided. Block diagram level design information will be provided. A RF switch is to be used to switch OFF the RF input in case of any fault status detected. EMI shielding to be provided for the electronics board.
9. Suitable heat sinks (heat pipes embedded heat sinks) and/or required cooling is to be fabricated for reliable operation.

10. Forward and reflected power samples should be available through directional couplers on the front panel for monitoring on BNC connectors.
11. Heat sensors are to be mounted for measurement of temperature.
12. The DC voltage and current to the amplifier is to be measured and displayed. ZUP60-14/U can be an option for power supply. The power supply to be kept inside the power amplifier. 230V, 50Hz AC should be provided from outside.
13. The amplifier should be 19" rack mountable with depth not more than 50cm and height 30cm.
14. RF input connector to the amplifier is BNC and output power is to be available on N Type connector
15. Suitable enclosures have to be provided to meet EMI/EMC standards. Radiated emission and susceptibility, conducted emission and susceptibility must be complied as per IEC standard 61204-3. Design must take care of these aspects. Certification may be required.
16. Filters, switches and other protective components should be provided at inputs.
17. Local and remote display / control of different parameters of the amplifier and power supply should be given. Source code of software should be available for modifications.
18. RF power cables used must be such that shielding effectiveness of -100 dB or better is obtained.
19. In order to have desired performance, supplier shall do thermal calculations, analysis and simulations using suitable tools. The results of these exercise shall be sent to indenting authority.
20. Both amplifiers have to be characterized using suitable method in consultation with indenting authority. The results of this exercise shall be sent to indenting authority.

1.2 Assembly options:

On the base plate, heat pipe based heat sink (with RF pallets) and power supply of 50V,14A may be kept. Keep a aluminium plate on top of it (channels to be provided on the side for insertion of plate). Control board and controller may be on top of this aluminium plate so that so that there is no interference. Height of heat pipe based heat sink is to be minimized so that overall height of the amplifier is reduced.

2.0. Mode of execution:

a) Supplier shall procure each component with specifications mentioned in this document and provided while work execution.
b) Supplier shall assemble components as per drawing/s and inputs provided while execution of job.
c) The supplier can suggest any changes in drawings/design to improve overall outcome of assembly process and performance.
d) Procurement shall be done as per the bill of material and consent from indenting authority.
e) The components shall be assembled and soldered as per schematic/s provided.
f) Fabrication costs, component cost and assembly charges of job are to be mentioned separately in the quote.
g) All the items fabricated shall have onsite warranty for a period of one year from the date of

final acceptance against all manufacturing defects.
h) If required the purchaser along with experts will visit the supplier and evaluate the capability of the engineers employed by the supplier. Supplier must give details of jobs undertaken of similar complexity in the past three years for any organization.
i) The supplier must give the details of the infrastructure suitable for this job. In case the firm does not have these tools and equipment's but intend to bring them on rent or outsource part of work during the execution of the job then it should be clearly mentioned in the technical quotation.

3.0 BOM:

Total No of amplifiers required: 02 nos
Note: Only major components are listed here.

Sr No	Item Name	Qty
1	Amplifier pallet (HF150-0130HG) or equivalent for 150W amplifier	01 No + 02 No. spares.
2	Amplifier pallet for 300W amplifier	01 No.
3	Raspberry PI controller CPI-A070WR/ Other suitable microcontroller	02 No.
4	Control electronics card with all associated components	02 No.
5	Power supplies	02 No.
6	Directional Couplers	02 No.

4.0 Deliverables:
The following items shall be supplied to ACnD, BARC after satisfactory testing and inspection by indenting authority. The packaging, transportation and safe delivery shall be in scope of supplier.

Sr No	**Description**	**Qty**
01	150 W SSRFPA.	01 No.
02	300 W SSRFPA	01 No.
03	Test Reports.	01 Set.
04	150W amplifier pallet (spare)	02 No.

5.0 Documentation Requirements:
5.1 Before commencing manufacturing, supplier shall furnish the following for purchaser's approval:
5.1.1 The fabrication drawing shall be submitted for approval either in soft/ hard copy form.
5.2 The supplier shall submit a quality assurance (QA) plan to the buyer for acceptance. The plan shall ensure that each item offered for acceptance conforms to the requirements herein.

6.0 Requirements of supplier qualification:
6.1 Human resources: The supplier must give the details of human resources including Engineers, Draftsman, assembly mechanic, quality control inspector, etc.

6.2 Infrastructure: The supplier must give the details of infrastructure suitable for this job such as electronic testing equipment, etc. Assembly room and other tools & tackles, Inspection facilities etc.
6.3 Past experience: The supplier must give their past three-year turnover and job executed by them with reference, volume of work and completion schedule, present commitments and anticipated commitments inside and outside India.
6.4 Sub contract: Supplier should list the jobs, which they want to sub-contract. They should also produce the list of sub-contractors and their infrastructures and facilities.
6.5 Supplier shall have necessary electronic hardware test set up at their facility to carry out the above fabrication and testing.

7. 0 Requirement of price and delivery schedule:

7.1 The supplier shall give a lump-sum price with delivery schedule

8.0 Confidentiality clause:

8.1 No party shall disclose any information to any third party concerning the matters under this Contract generally. In particular, any information identified as "Proprietary" in nature by disclosing party shall be kept strictly confidential by the receiving party and shall not be disclosed to any third party without the prior written consent of the original disclosing party. This clause shall apply to sub-contractors, consultants, advisors or the employees engaged by a party with equal force.

8.2 . "Restricted information" categories under section 18 of the Atomic Energy Act, 1962 and "Official secrets" under section 5 of the Official Secrets Act, 1923: Any contravention of the above mentioned provisions by any contractor / sub-contractor, consultant, advisor or the employees of the contractor will invite penal consequences under the aforesaid legislation.

8.3 Prohibition against the use of BARC's name without permission for publicity purpose. The contractor or sub-contractors, consultants, advisors or the employees engaged by a party shall not use BARC's name for publicity purpose through any public media like: press, radio, TV or Internet without any prior approval of BARC (wide circular ref.: 2/Misc- 9/Lgl/2001/92 date 30/04/2001.