

Rate Contract for PCB Layout Design and Simulation

Request for Proposal (RFP)

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1. INTRODUCTION

ECAD/AMFF of URSC is responsible for design and simulation of PCB layouts for various electronic sub-systems of different projects of URSC. At present there is a need to outsource the PCB layout and simulation services to established and experienced ECAD Service providers (Vendors) on Rate Contract basis.

The purpose of this RFP is to lay down general guidelines for outsourcing of ECAD based PCB layout services, wherein the Service Provider at their premises shall carry out the PCB layout design and simulation works based on the job requirements specified by ECAD/AMFF, URSC. These type of services will necessitate continuous interactions between URSC and the Service Provider to understand and fulfil the job requirements.

The Service Provider shall submit bids for Technical information in the format given in Annexure-I. The design unit computation details are provided in Annexure-II. The offers containing incomplete or false information will be summarily rejected.

2. TERMS AND DEFINITIONS

Following terms and definitions apply to this document:

- 2.1 Service Provider:** The Vendor(s) or Contractor(s) selected to provide the ECAD based PCB layout design and simulation services and/or their focal point.
- 2.2 ECAD Services:** ECAD based PCB layout design and simulation services which includes footprint creation, PCB schematic capture and layout design, layer stackup design with controlled impedance requirements, signal integrity, power integrity and thermal simulations, etc. for multilayer, rigid, flexi-rigid, HDI and RF PCBs.
- 2.3 AMFF:** Avionics Cad & Mechanical Fabrication Facility
- 2.4 URSC:** U. R. Rao Satellite Centre, Bengaluru
- 2.5 URSC Coordinator:** The focal person identified as the main point of contact from AMFF/URSC to handle job outsourcing and facilitate interaction between URSC and Service Provider.
- 2.6 URSC end user:** The users from URSC who generate the PCB design and simulation requirements and are the end users of PCBs.
- 2.7 URSC QC & QA:** Quality Control & Quality Assurance entity of URSC.
- 2.8 Ground job:** PCBs designed for use in ground / simulation model of satellites.
- 2.9 Flight Job:** PCBs designed for use in the flight model of satellites.

3. SCOPE OF WORK

The scope of this Contract is limited to outsourcing of ECAD services for various ground and flight PCBs of URSC for a period of two years. The job requirements shall be generated by URSC and shall be carried out by the Service Provider within a stipulated time as per the instructions given by URSC.

4. DETAILS OF WORK

4.1 PCB Layout Design

- 4.1.1 Part library creation:** This includes symbol, foot print, 3D Models creation of components based on URSC guidelines and component datasheets, their mapping and assignment of appropriate attributes provided by URSC.
- 4.1.2 Schematic capture:** Capturing schematic circuit diagram from the inputs provided in the form of schematic diagram (hand-drawn/PDF/.dsn) and component list.
- 4.1.3 Electrical Rule Check (ERC) / Design Rule Check (DRC):** Setting of ERC/DRC as per URSC guidelines and implementing the same in PCB layout. There may be certain design specific rules which will be provided case to case by URSC.
- 4.1.4 PCB outline generation:** PCB outline generation and placement of stacking holes as per the mechanical drawings of given format, assembly requirements and identification of no-route areas.
- 4.1.5 Component placement:** Components shall be placed based on URSC guidelines, mechanical drawing, nearest connectivity in the net-list, electrical, mechanical and thermal constraints.
- 4.1.6 Layer Stack-up design:** Vendor shall design / Implement the layer stackup based on the controlled impedance, PCB material, assembly and routing resource requirements. Layer stack-up shall be formally approved by URSC before incorporating in the design.
- 4.1.7 PCB Routing:** Routing shall be carried out based on URSC guidelines, minimum route-length, minimum number of vias, and electrical constraints specified by URSC.
- 4.1.8 Layout Vs. Schematic verification:** Verifying PCB layout with respect to schematic by comparing respective netlists.
- 4.1.9 Vendor QC:** Vendor shall carry out relevant Quality Checks after every stage of the design Viz., footprint creation, schematic capture, component placement, routing and submit the design along with the filled in checklists for review and approval of URSC. Vendor shall progress to the next design stage only after formal approval of the previous design stage by URSC.
- 4.1.10 DFM checks:** Vendor shall carry out DFM checks to assess the feasibility of fabrication of the design. The DFM criteria shall be derived from the relevant ISRO-PAX documents and those applicable to URSC qualified fabricators.
- 4.1.11 Document generation:** Vendor shall generate all fabrication documents Viz., Gerber, drill, route files, cutout details, paste mask files for SMT line, layer stackup with layer wise impedance details and all other relevant documents necessary for PCB fabrication.

4.2 PCB Simulation

The PCB simulation requirements shall be specifically mentioned in the job requisition. The Vendor has to carry out all the necessary simulations in pre and post layout phases

and incorporate all the required changes in the layout so that the final layout meets the critical requirements of SI, PI, EMI/EMC and Thermal limits. It is to be noted that not all PCB layout jobs have simulation requirements. The simulation requirements shall be specifically mentioned in the requisition and all the relevant inputs shall be provided to the Vendor.

4.2.1 Signal Integrity

- Setting up signal delays, noise-budget, impedance, coupling and other constraints for critical nets as per URSC requirements.
- Designing interconnect topologies and verifying the adequacy of the routing topologies in meeting the signal requirements.
- Pre-layout SI checks for generation of layout constraints for trace lengths, impedance requirements, termination scheme, optimization of component placement (using IBIS / SPICE model files). URSC shall provide IBIS models that are available, rest shall be arranged by the Vendor based on availability.
- Post layout SI checks by extracting actual parasitic from the board, trace impedances, placement optimization based on signal flow, Buffer and / or Termination Sweep Analysis and delay requirements.
- Frequency domain Simulations for Insertion losses, Return losses and Impedance profile.
- Time domain Simulations for reflection analysis Viz., ringing, overshoot, undershoot, noise margins and timing analysis Viz., Propagation, skew, transition delays.
- Crosstalk analysis
- Eye diagram analysis, jitter analysis and Simultaneous Switching Noise (SSN) analysis.
- Differential Trace checks / Analysis for skew and length matching.
- Specific interface analysis Viz., DDR, SERDES wherever applicable.
- Layer Stack up analysis
- Applicable Co-Simulation to be performed if necessary

Vendor shall carry out required modification in the design to meet the SI requirements.

4.2.2 Power Integrity

PI analysis shall be carried out at both pre and post layout stages.

- DC drop analysis
- De-cap optimization
- Noise coupling analysis
- PDN Impedance analysis
- Applicable Co-Simulation to be performed if necessary

Vendor shall carry out required modification in the design to meet the PI requirements.

4.2.3 EMI/EMC Simulation

- Simulations for near and far field radiated emissions that meets the URSC requirement.
- Perform analysis for various I/O Buffers, Stackup & Via Configuration
- Topology and / or Termination Analysis to meet SI/EMI Compliance

Vendor shall carry out required modification in the design to meet the EMI/EMC requirements.

4.2.4 Thermal Simulation & Analysis

Thermal analysis shall be carried out on finished board to simulate the thermal profile of the components and PCB.

- Thermal simulation at ambient and vacuum conditions using FEM / FVM based (or equivalent) 2D/3D simulation software for the specified boundary conditions.
- Thermal analysis with embedded or non-embedded, full or partial Metal core thermal layer.
- Heat-sink optimization

Vendor shall carry out required modification in the design to meet the thermal requirements.

4.3 PCB Design Modification & Miscellaneous PCB Design Jobs

The scope of this Contract also includes modifications of heritage designs. The original layout design might have been carried out either by URSC or Vendor. However, all the required inputs needed to complete the job will be provided to the Vendor. All such jobs shall be treated as new jobs and the billing shall be done on actual quantum of work based on modifications carried out by the Vendor. Miscellaneous PCB Design Jobs(MDJ) are Part jobs of any of the PCB Design activity, to be executed as part Job as per Table 3.

5. PCB DESIGN GUIDELINES AND STANDARDS

All flight jobs shall be carried out as per the guidelines laid out in ISRO-PAX-301: Design Requirements for Printed Circuit Board Layout.

This shall be the main controlling document. As and when URSC / ISRO updates PCB guidelines the same will be shared with the Vendor. In addition, Vendor is expected to follow the best practices in industries for layout design and simulation.

6. OPERATIONAL PROCEDURE OF RATE CONTRACT

- 6.1** As and when the requirement of new PCB design arises, a request will be put up to the Review Committee internally at URSC. The committee will allocate the job to a particular service provider based on service provider's present load, capability, experience on similar design and delivery schedule.
- 6.2** Based on the committee's recommendation, URSC focal person shall allocate the job to the Vendor clearly indicating title of the PCB, nature of job, list of input documents and special instructions, if any.

- 6.3** After receipt of new job, the Vendor shall study the job requirements and revert back in case of any query/clarification or insufficient inputs.
- 6.4** Once all the inputs are in place, the Work Order shall be generated based on no. of design-unit's calculation of the job as specified in Annexure II.
- 6.5** URSC focal person shall issue a new work order duly approved by GM, ECAD/AMFF to the Vendor through E-mail. The work order shall indicate the quantum of work (No. of design Units), delivery schedule and shall carry a unique work order number. All the queries and communication related to this work shall be referred to this work order number only.
- 6.6** Frequent interactions may be required between URSC and the Vendor to understand the job requirements and workflow. These interactions shall be held either at URSC or Vendor's premises as applicable.
- 6.7** After completion of every stage of design Viz., part creation, schematic capture, component placement, routing or as the need may be the Vendor shall fill in the applicable checklists and submit the design along with the checklist for review and approval from URSC.
- 6.8** After completion of a job, all the deliverables (which include soft copies of design files, checklists, post-processed data, reports, etc.) shall be delivered to URSC focal person by email/FTP.
- 6.9** URSC will review the deliverables and if the original design requirements are not met, Vendor shall be asked to carry out the required changes and re-submit the deliverables.
- 6.10** Once the deliverables are accepted by URSC, Vendor shall submit the work report indicating the number of design-units in the format specified in Annexure II. The work report will be verified by URSC based on the actual quantum of work carried out and after due certification by the URSC end user, URSC focal point and approved by GM, ECAD/AMFF, work order will be cleared for billing.
- 6.11** If there is any change in the quantum of work from the initial estimate, due to modification/addition/deletion by URSC, then a work order amendment will be issued by URSC with revised quantum of work and delivery schedule.
- 6.12** After obtaining work report clearance, Vendor shall submit the invoice for billing. The work report after due certification by URSC focal point and approved by GM, ECAD/AMFF shall be forwarded to accounts for releasing the payment to the Vendor.
- 6.13** As the material will not be delivered at URSC stores, no MIRV shall be generated.
- 6.14** During the currency of the Contract, regarding changes and modifications in jobs undertaken by the Vendor, following two scenarios may arise:
- 6.14.1** URSC may change the requirement of ongoing job by modifying/adding/deleting footprints, components, placement, nets etc. Such changes will have impact on overall design-units and delivery schedules. All such changes shall be accounted for in the quantum of work and billed accordingly.
- 6.14.2** Vendor may have to change the layout based on analysis results (SI/ PI/ Thermal/ EMI/ EMC, etc.) or due to non-compliance of URSC guidelines. Such changes shall be considered as part of original design requirements and shall not be considered for billing.

7. WORK ON DEPUTATION BASIS

- 7.1** Certain complex layout designs involving new technologies, proprietary devices and high density routing may need continuous interaction between URSC and Vendor. To handle such jobs Vendor may have to depute their layout engineers to URSC on temporary basis to understand the design requirements, interact with URSC end users and URSC focal point till the completion of the job.
- 7.2** All the necessary infrastructure like workstations, software and workspace shall be provided by URSC. During deputation period, the deputed engineers are required to work in URSC premises and are required to carry valid ID proof, issued to the Vendor. The normal working hours are 08.30hrs to 17.00hrs. Normal working days are Monday to Friday. To meet the schedule requirements, the deputed engineers may require to extend the working hours and may have to come on weekends and holidays.
- 7.3** URSC will not provide any kind of compensation to deputed engineers. The stay and transportation shall be arranged by the Vendor. Any claim in this regard shall not be entertained.
- 7.4** The deputation will be decided by the URSC focal person. However, all other normal jobs shall be carried out at Vendor's site.
- 7.5** The Service Provider shall take all safety precautions required while executing the work at URSC Premises. They shall also be responsible for any loss or damage caused to URSC Property/Personnel due to negligence of the workforce and shall make good the losses by the Service Provider at his own cost, failing which cost thereof, shall be recovered from the outstanding/running bills/Security Deposit of the Service Provider
- 7.6** URSC shall not be responsible for any damages, losses, claims, financial or other injury to any of the work-force engaged by the Service Provider in the course of their performing the functions/duties at URSC Site or for payment towards any compensation. The work-force shall adequately be insured by the Service Provider against accidents including loss of life. For this purpose, without limiting any of the other obligations or liabilities, the Service Provider concerned shall at their own expense, take and keep a Comprehensive All Risk Insurance (ARI) Policy for their workforce from any of the Insurance Companies as approved by the Insurance Regulatory & Development Authority of India (IRDA), and for all the work during the execution at URSC Premises.

8. RESPONSIBILITIES OF URSC FOCAL PERSON

URSC focal person shall be the overall coordinator and supervisor for outsourcing ECAD services from URSC. As the PCB schematic and layout design works are to be carried out for different projects of URSC, the Vendor shall have to co-ordinate with different users as per the instructions from URSC focal person. All relevant inputs like schematic, placement details, datasheets, Bill-of-Material, routing constraints and SI/PI/thermal requirements shall be provided by the focal person.

The following applicable design details/data will be provided by URSC:

- 8.1** Schematic diagrams in form of hand-drawn/PDF/.dsn file.

- 8.2 Bill of material (BOM) containing component identification, package style and other design requirements/constraints.
- 8.3 Mechanical drawing (hand-drawn/PDF/.dxf) showing board outline, size, cut-out, no-route areas, restricted areas for components, stacking-hole detail, placement details etc.
- 8.4 Dimensional details and data sheet of the components for which new foot-print and part library to be generated.
- 8.5 Approved component footprint library with optional step files for 3D view, if available.
- 8.6 Layout datasheet for flight jobs.
- 8.7 Applicable PCB design guideline documents and amendments as and when they are released.
- 8.8 Special instructions to be followed while carrying out PCB Layout design work, if any.

9. RESPONSIBILITIES OF THE SERVICE PROVIDER

- 9.1 Vendor shall deploy experienced and qualified personnel at his end to carry out PCB layout and simulation jobs of highest standards, meeting all the design and schedule requirements.
- 9.2 QC inspection shall be an integrated part of layout design flow and the Vendor shall ensure that each layout phase is reviewed and cleared by his QC expert(s), before submitting to URSC.
- 9.3 Vendor shall have all the necessary infrastructure (workstations, software tools, etc.) to carry out the job. Vendor shall ensure that all the software utilized in carrying out the job are licensed version and under maintenance. URSC reserves the right to inspect the same.
- 9.4 Before taking up the job, the Vendor must completely understand the design requirements. Vendor must study the specific PCB layout requirements of components, placement, signal routing, termination, topology, signal integrity, power integrity, thermal and assembly requirements etc. The Vendor must also consider the overall functionality of the board to be designed, critical parameters of finished board like board thickness, material, number of layers, technology (HDI, Rigid-flex etc.) critical signals, power and ground reference planes, thermal performance, etc. The design must be optimum with respect to overall size, density, number of layers and manufacturability.
- 9.5 Vendor shall maintain daily log for the works carried out for tractability and reference.
- 9.6 Vendor shall comply with the all PCB design requirements, procedures, terms and conditions as described in this document and other applicable documents, including quality requirements and standards, which shall be provided by URSC.
- 9.7 Vendor shall obtain approval of URSC at each stage of PCB design work like Creation of Footprints and Part Library Creation, Schematic Capture, Component Placement, PCB Routing etc.

- 9.8** Vendor shall complete the PCB design job with 100% routing, with no DRC/ERC errors and zero-defect in the layout. The completed job in the form of soft copies of plots and all deliverable items, shall be submitted to URSC.
- 9.9** Vendor shall provide all the related records, versions of PCB design along with generated reports and post processed CAM files (Gerber, Drill, Fabrication notes, layer stackup, impedance details etc).
- 9.10** Vendor shall complete the assigned job within the stipulated delivery schedule as indicated in the respective work orders.
- 9.11** Vendor shall send a weekly report on all the ongoing PCB Layout designs, specifying job progress and critical/problem areas if any.
- 9.12** All workstations and software used for PCB design should have authorized licenses and copies of the certificates of the same should be presented whenever it is sought. Vendor shall provide necessary access to URSC personnel for periodic inspection of the facility at their premises, and extend necessary cooperation for technical reviews as needed. URSC reserves the right to review the progress of work at various stages at Vendor's premises.
- 9.13** The technical information, drawings and other related documents given by URSC in the course of the work should remain the property of Government of India, Department of Space. The given Material/Documents should not be used for any other purpose or be duplicated in any case.
- 9.14** Part library newly created by Vendor for each job shall be supplied to URSC along with other deliverables. Also the Vendor must utilize the part already created for previous designs into new layouts and shall bill only those parts not available in library / not supplied by URSC and newly created specifically for a job.

10. DELIVERABLES

After successful completion of the job, Vendor shall provide softcopy of the following, only to URSC focal person:

10.1 PCB Layout Deliverables

- 10.1.1** Circuit Schematic (in CAD and pdf format)
- 10.1.2** CAD Netlist (IPC netlist)
- 10.1.3** Bill of Materials (BOM)
- 10.1.4** Footprint library
- 10.1.5** PCB design file (in CAD and pdf format)
- 10.1.6** Layer-stackup with impedance details in chart
- 10.1.7** Layer wise individual impedance track identification (if required) with color coding
- 10.1.8** Gerber files (RS-274X format) for all layers, silk, solder mask and fabrication layer
- 10.1.9** CNC Drilling and routing files (excellon2 format) and their reports. Drill and route files can also be provided in RS-274X format.
- 10.1.10** Generation of pdf / ps format of all necessary files.

10.2 SI, PI and EMC Analysis Reports

- Detailed Signal integrity, Power Integrity and EMC Analysis reports
- Selection of Critical nets, their constraints such as frequency of operation, rise time, fall time, timing budget, Overshoot, Undershoot, Crosstalk, etc.
- Simulation environment and attribute settings
- Assumptions and dependencies of various analysis parameters
- Impedance analysis
- Net Topology used for critical nets
- Pre-layout and post-layout analysis of critical nets in textual (tabular) format as well as in graphical (signal waveform, eye diagram) format
- Result of Near Field and far field radiation analysis
- Electrical power distribution analysis
- Results of DC drop/Noise/Decoupling/Current Density/PDN Impedance analysis
- Final conclusion shall address all the problems encountered and their respective remedies.
- Details of modifications carried out in layout design as per analysis.

10.3 Thermal Analysis report

- Detailed thermal analysis report with color coded details
- Analysis Methodology
- Simulation environment and settings for ambient or vacuum conditions, components and PCB thermal profile, enclosure property etc.
- Assumptions and dependencies of various analysis parameters
- Floor planning details
- Board thermal analysis with embedded or non- embedded, full or partial metal core (if required)
- Thermal Distribution diagram
- Conclusion shall address the thermal problems encountered and their respective remedies
- All above drawings and reports in PDF format

11. QUALIFICATION AND EXPERIENCE OF THE SERVICE PROVIDER

- 11.1 Manpower:** Service provider must have a team of experienced layout engineers and QC inspectors trained in PCB layout design and simulation of complex multi-layer boards with control impedance, Signal Integrity (SI), Power Integrity (PI) and thermal simulation requirements. All layouts to be inspected and approved by the Vendor's QC inspector after completion of each phase of layout.
- 11.2 Infrastructure:** The Vendor must have sufficient infrastructure required to carry out layout jobs, like high-end workstations, PCs, printers etc. Vendor must also have genuine licensed copies of professional ECAD tools for PCB design and simulation and they shall be under maintenance. PCB Design shall be carried out using Tools ORCAD,

Cadence Allegro, etc, PCB simulation shall be carried out using Tools Cadence Sigrity / Hyperlynx, etc., Vendors Company profile to be updated in table of Annexure-1

12. VENDOR'S SITE INSPECTION

URSC officers shall visit the Service Provider's premises for verification of information related to work orders / space / manpower / ECAD tools / quality control process etc. and other infrastructure facilities and equipment claimed. The technical bid of Service Provider, who is not able to substantiate/satisfy the technical requirements laid down in this RFP, is liable to be rejected.

13. SELECTION CRITERIA FOR SERVICE PROVIDER

The Service Provider shall meet the following minimum requirements in order to technically qualify for this tender:

- 13.1** Service Provider must be a reputed engineering company registered with government agencies and in existence for a minimum of 5 years on the date of issue of this tender, with necessary facilities and experience and valid licenses in providing such Technical Services/Products (attach relevant P.O. copies, documents etc. along with quotes).
- 13.2** Service Provider shall be a valid ISO 9001:2015 / AS9100 certified company and copy of the certificate shall be provided along with the technical proposal.
- 13.3** Based on the documentary evidence, MSE and Startup Vendors are exempted from furnishing documents as mentioned at Clause 13.1 & 13.2 above.
- 13.4** Service Provider shall have at least five engineers trained in PCB design and analysis activities. Service Provider has to provide the list of such regular employees with their qualifications, experience etc. along with the technical proposal.
- 13.5** Service Provider shall have necessary infrastructure to carry out the jobs, like workstations, PCs, genuine ECAD software etc. The proof of original license along with up to date maintenance shall be provided with the technical proposal.
- 13.6** All the technically complied Vendors including MSE & Startups, have to obtain Certificate of qualification from QA, URSC as detailed at Clause No.13.7.
- 13.7** Service Provider qualified in techno-commercial bid will be asked to obtain Certificate of qualification from QA, URSC within one month from the date of intimation by email/EGPS portal. Failing which their quote will not be considered for further evaluation.
- 13.8** Service Provider's Company/firm should not have been banned or black-listed by any Government Department/Central Government Unit/Public Sector Unit/Financial Institutions/Court and submit a declaration in this regard.
- 13.9** Service provider should have a strict quality control process in place and should demonstrate the same when URSC officials visit their workplace, after PO release.

14 GENERAL TERMS AND CONDITIONS :

14.1 CONTRACT DURATION AND RENEWAL

Total duration of the Contract shall be 02 (two) years from the date of issue of purchase order. The Contract may be extended for further one year on mutual consent, depending on the need and exigencies, subject to the agreed quality of Services and other applicable terms and conditions. Minimum job order cannot be guaranteed. The jobs will be loaded as and when required.

14.2 SPLITTING OF ORDERS

14.2.1 To minimize the time undertaken for ECAD Services and in order to Split Rate Contract upto a maximum of Three, L1 rate or L1 negotiated rate shall be counter offered to the qualified Vendors in the sequence of L2, L3, L4 and so on. Total quantity/value will be split in ratio of 50:30:20 in case of three Vendors and in case of two Vendors, splitting of order will be in the ratio of 60:40. In case of only one Vendor, 100% of the total Contract value will be awarded to Single Vendor.

14.2.2 If the performance of any Vendor is not satisfactory due to continuous rejections, URSC has all rights to divert the partial contract value/quantity to other qualified Vendors in order to meet the ongoing Project schedules, till the Vendor improves their performance to the satisfaction of URSC- QC & QA.

14.3 MONETARY LIMIT

No guarantee can be given regarding minimum order against this Rate Contract. However, the entire Quantum of Rate Contract Design Units are about 50,000.

14.4 WARRANTY

The service offered by the Service Provider is to carry out the PCB Layout design and simulation works based on the job requirement specified by ECAD/AMFF, URSC. Payment is made only after all the deliverables are checked and accepted by URSC. Hence, warranty and performance guarantee are not applicable.

14.5 SECURITY DEPOSIT

The Service Provider shall execute Security Deposit for 3% of the value of the Purchase Order to ensure Satisfactory Performance of the Contract as per our specimen. The Security Deposit shall be executed within 20 days after Receipt of Purchase Order or any extension thereof. The Security Deposit is to be furnished in the form of Account Payee Demand Draft or Fixed Deposit Receipt or Bank Guarantee from Nationalized Bank/Scheduled Bank approved by RBI, having validity till the completion of all contractual obligations. The Security Deposit shall be executed on a Non-Judicial Stamp Paper of Rs. 200/- value. In case the Service Provider fails to furnish the Security Deposit within 20 days or any extension thereof the Purchase Order shall be Cancelled or Terminated and appropriate penal action shall be initiated. Any breach of the Terms and Conditions of the PO including Delivery Period, Security Deposit shall be forfeited and PO shall be terminated and cancelled at the Service Provider's risk, cost and liability. The Security Deposit will not carry any interest and shall be returned after completely executing the order.

14.6 DELIVERY SCHEDULE

Delivery schedule shall be based on design-unit's calculation for a job/work order. Time taken by URSC for design checking, verification and inspection at each stage of job completion (e.g.: footprint validation, schematic capture, placement, routing, simulation etc.) shall be excluded from the above-mentioned delivery schedule and Vendor shall not be accounted for the delay caused by this. In case of modification requirements generated by URSC, the date of final submission of modifications to the Vendor shall be considered as the start day for the revised delivery schedule. Delivery schedule in case of rework/modification will be based on exclusive design-units needed to carry out the required changes. Delivery schedule will be indicated in the respective work orders. Nominal duration for original design and design modifications/ updations will be two months to four months depending on Design Complexity and Degree of re-spin.

14.7 PAYMENT TERMS

14.7.1 Billing of work shall be based on total design-units consumed for accepted and completed jobs as per the Work Order issued in reference to Annexure II. After fixation of design-units, the value shall not be changed and the billing shall be made against the calculated design-units only. However, if any changes/modifications are requested in the original design by URSC while the job is being carried out by the Vendor or at later stage, the additional design-units required to carry-out the changes/modifications shall be taken into account by issuing amendment to work order.

14.7.2 Payment for each work order shall be made within 30 days from the date of receipt and acceptance of all deliverables of PCB design job, work report by the focal point and Vendor Invoice.

14.8 LIQUIDATED DAMAGES

If the Vendor fails to complete the job and provide all the deliverables within the stipulated delivery schedule as indicated in respective work order / amendment to the work order, URSC shall recover from the Vendor as Liquidated Damages a sum of one-half of one percent (0.5 percent) of the work order cost of the undelivered job for each calendar week of delay or part thereof. The total Liquidated Damages shall not exceed Ten percent (10 percent) of the work order value.

14.9 RIGHTS OF URSC

URSC reserves the right to accept or reject any offer fully or partially without assigning any reasons, if:

14.9.1 The documentary proofs contradict the claims made in technical proposal.

14.9.2 The rates quoted are not rational and viable.

14.9.3 Any information provided by the Vendor seem doubtful, inconsistent or invalid.

14.9.4 Any of the clauses laid out in section 13 is not met.

14.10 INTELLECTUAL PROPERTY RIGHTS

Works carried out by the Service Provider shall remain the sole property of URSC. Neither the Service Provider nor his employees, carrying out the job shall claim any intellectual property rights on such works. The Intellectual property rights relating to the design, development, processes, models and other fabrication details given to and received from the Service Provider selected shall remain the exclusive property of URSC. Service Provider shall not attempt to unlawfully reveal, misuse or encroach upon the intellectual or private data, information to which they may have access to, as part of the work carried out.

14.11 CONFIDENTIALITY AGREEMENT

The complete PCB design and all the data related to design (CAD data, circuit details, netlist, component list, stackup, simulation reports etc.) are the sole property of URSC. The party is prohibited from further utilizing or passing on any of the design details in whatever form to any third party for use by them for any exploitation, commercial purpose or otherwise without written prior permission from URSC.

Service Provider shall not reveal, divulge, transfer or disclose any information relating to the PCB circuit design, schematics, layout, processes, fabrication procedures, product, intended use, quality control methods etc., that are exclusively provided by URSC to any third party. Service Provider shall not, without prior written consent from URSC, use such information for any purpose other than for fulfilling obligations under the Contract to be placed.

14.12 NON-DISCLOSURE AGREEMENT (NDA)

Service Provider shall maintain absolute secrecy and security of the circuit schematics, drawings, process methods/documentation etc., provided by URSC for the purpose of design and verification, both paper based and in digital format. Service Provider shall return the original document and copies of the same to URSC after completion of the work. The technical information/papers/drawings to be provided by URSC from time to time, are for the execution of this Contract only and should not be used/ copied/ reproduced/ published in any form or disclosed to any third party, by the Service Provider or his employees. Thus, the Service Provider is required to sign a Non-Disclosure Agreement (NDA) with URSC. Service Provider will also be responsible for any violation or infringement of NDA by his employees.

14.13 PARALLEL CONTRACT

URSC also reserves the right to enter into ad-hoc Contract simultaneously or at any time during this Rate Contract period with one or more Vendors.

14.14 MONITORING AND TERMINATION OF CONTRACT

14.14.1 URSC reserves the right to terminate the Contract or reduce the scope any time within the Contract duration at short notice, if the Service Provider fails to provide satisfactory Services or fails to comply with any of the clauses mentioned above and laid down in the Contract document.

14.14.2 URSC reserves the right to terminate the Contract at any time without any reason by giving a written notice of not less than 30 days.

14.14.3 Service Provider can provide the reason for termination of this Contract wholly or partly by giving, a written notice of not less than 30 days.

14.15 FALL CLAUSE

The prices charged per design-unit against this PO /Contract by the Service Provider shall in no event exceed the lowest price at which the Service Provider offers to execute jobs of identical description to any personnel[s]/organization[s] including the Purchaser or any Department of the Central Government or any Department of the State Government, as the case may be during the period till performances of all supply orders placed during the currency of the PO is completed. If at any time during the PO / Contract period, the Service Provider reduces the charges, sells or offers to sell such jobs to any other party/organization at a price lower than the price chargeable under this PO/ Contract, the Service Provider shall forthwith notify such reduction of charges applicable to Head, Purchase & Stores, U. R. Rao Satellite Centre. The charges payable under the PO / Contract for the jobs done after the date of coming into force of such reduction of charges shall stand correspondingly reduced.

14.16 FORCE MAJEURE

If at any time, during the currency of this PO / Contract , the performance in whole or in part by either party or any obligation under this PO / Contract shall be prevented or delayed by reason of any war, hostility, Acts of Public Enemy, Civil Commotions, Sabotage, Fire, Flood, Explosions, Epidemics, Quarantine restrictions, Strikes, lockouts or Acts of God (hereinafter referred to as events) then provided notice of happenings of any such event is given by either party to the other within 48 hours from the date of occurrence thereof, either party shall be reasons of such event, be entitled to terminate this PO / Contract nor shall either party have a claim for damages against the other in respect of such non-performance or delay in performance.

14.17 ARBITRATION

In the event of any dispute/s, difference/s or claim/s arising out of or relating to the interpretation and application of the Contract, such dispute/s or difference/s or claim/s shall be settled amicably by mutual consultations of the good Offices of the respective Parties and recognizing their mutual interests attempt to reach a solution satisfactory to both the parties. If such a resolution is not possible, within 30 days from the date of receipt of written notice of the existence of such dispute/s, then the unresolved dispute/s or difference/s or claim/s shall be referred to the Sole Arbitrator appointed by Parties in accordance with the rules and procedures of Arbitration and Conciliation Act 1996 together with amendments thereto or any modification thereof. The expenses for the Arbitration shall be paid as may be determined by the Arbitrator. The Arbitration shall be conducted in Bengaluru. The considered and written decision of the Arbitrator shall be final and binding between the Parties. The 'Seat' for Arbitration shall be Bengaluru. The applicable language for Arbitration shall be 'English' only. Work under the Contract shall be continued by the Tenderer during the pendency of arbitration proceedings, without prejudice to a final adjustment in accordance with the decision of the Arbitrator unless otherwise directed in writing by the Purchaser or unless the matter is such that the works

cannot be possibly continued until the decision (whether final or interim) of the Arbitrator is obtained. Adherence and acceptance to this Clause is Compulsory or otherwise the Tender will be rejected.

14.18 ANTECEDENTS VERIFICATION

The Workforce of the Contractor deployed to ISRO/URSC for undertaking the work, antecedents / police verification shall be carried out by the Contractor and when necessary such records will have to be produced by them to the Authority concerned. The Contractor should submit a undertaking to Purchaser to the effect that the Engineers/Employees deputed at the Premises of Purchaser for carrying out the service, are not involved in any cyber-crime or any activity related to unlawful hacking etc., The Employee of Contractor shall be at their best behaviour while at URSC Premises and shall not indulge in any nefarious activities. In case of any misbehaviour/discourteous behaviour they should be immediately replaced by the Contractor.

14.19 RISK PURCHASE

In the event of failure on the part of the Contractor to deliver the design in accordance with the delivery schedule, extra cost, if any, involved in execution of the design by the Purchaser, from any other sources will be borne by the Contractor notwithstanding any other penalty.

14.20 SUBLETTING OF THE CONTRACT

The Vendor shall not sub-let the Contract or any work covered against this requirement to third party without prior permission of the Purchaser. Such sub-contracting shall in no way reduce or affect neither the rights of Purchaser nor the responsibility of the Vendor.

******* End of Document *******

**ANNEXURE-I
TECHNICAL BID**

Conditional Offers will not be accepted

The Service Provider should give relevant details wherever required in the following compliance table and NOT simply fill in the answers as “Yes” or “Complied”. The Service Provider shall also support the compliances by necessary documentary evidences along with the technical bid, failing which the bid will not be considered.

Table 1: Technical Compliance

Sl. No.	Description	Compliance/Remarks
<i>Infrastructure</i>		
1.	No. of years in PCB design business attached ≥ 5 Years or Proof Execution of ≥ 150 Numbers of PCB Designs	
2.	Number of permanent engineers trained in ECAD based PCB layout design with details on qualification and experience ≥ 5 Designers Diploma / B.E /B.tech(Company profile) attached	
3.	Genuine licensed copies of ECAD software under maintenance support (with documentary proof) (e.g. OrCAD, Allegro, etc.)	
4.	Genuine licensed copies of Simulation Tools for SI, PI, Thermal, EMI/EMC under maintenance support (with documentary proof) (e.g. Sigrity / Hyperlynx, etc.)	
<i>Design Capabilities</i>		
5.	MLB PCB layout design. Vendor should have the experience of MLB PCB Design more than 4-layers. Elaborate on the complexity of the design, functionality and application. Design Gist/ Associated data shall be produced as a Proof.	
6.	Vendor should have the experience of executing PCB Design with density ≥ 50 pins per sq inch Design Gist/ Associated data shall be produced as a Proof.	
7.	Design type and complexity handled, with brief details on each type:	
	• HDI	
	• Rigid MLB	
	• Rigid-flex MLB	
	• Hybrid PCBs	
	• Passive Embedded	

8.	Can handle control impedance requirements and design representative PCB stackup using Polar Instruments' Speedstack or equivalent stackup design tool	
Simulation Capabilities		
9.	Tool used for simulation with number of licenses	
	• SI	
	• PI	
	• Thermal	
	• EMI/EMC	
	• SI-PI Co-simulation	
	• PI- Thermal Co-simulation	
	• SI- EMI/EMC Co-simulation	
10.	Signal Integrity Analysis , Applicable co-simulations if necessary	
	• Pre and Post Layout SI	
	• Reflection and Timing Analysis	
	• Crosstalk Analysis	
	• Frequency Domain Analysis	
	• Eye Diagram, jitter and SSN Analysis	
	• DDR, SERDES Analysis (with max. data speed)	
11.	Power Integrity Analysis , Applicable co-simulations if necessary	
	• Pre and Post Layout PI	
	• DC Drop Analysis	
	• De-Cap Placement Analysis and Optimization	
	• Noise Coupling Analysis	
	• Current Density Analysis	
	• PDN Impedance Analysis	
12.	Thermal Analysis, Applicable co-simulations if necessary	
	• Board level 2D Analysis	
	• Board level 3D Analysis	
	• Chassis/System level Analysis	
13.	EMI/EMC Analysis	
	• Net level	
	• Board level	
14.	Has dedicated workforce for Simulation and Analysis	
15.	Can carry out SI/PI/Thermal/EMI/EMC analysis on PCB designs not carried out by Vendor	
DFM and DFA Analysis		

16.	Can carry out pre/post layout DFM and DFA checks using CAM tools like CAM350/ UCAMX/ Genesis/ValorNPI or equivalent and do the required layout design changes	
17.	Tool used for DFM/DFA Analysis	
<i>Experience and Certification</i>		
18.	Major organizations for which PCB layout design and simulation services provided (with documentary proof) e.g. ISRO, DRDO, BARC, HAL, BEL, Intel etc.	
19.	Valid ISO certification details (with documentary proof) 9001:2015 AS9100 Certification	
20.	Declaration that the company has not been banned or black-listed by any Government / Public Sector / Financial Institute.	
21.	Has a strict quality control in place and shall allocate a dedicated QC inspector for this Contract.	
<i>General</i>		
22.	The Vendor has completely gone through this RFP document, understood and complying all the requirements and has signed every page of the document.	

ANNEXURE-II PRICE BID

Conditional Offers shall NOT be accepted

Note: Price shall not be disclosed in Technical bid. Otherwise offer is liable for rejections.

**Rate (in INR) per Design-unit to complete the PCB design job:
(Excluding GST)**

(Rates are fixed per design-unit basis to complete the total quantum of work. There is no differentiation in rates between various phases of job like PCB layout design or simulation or modification etc.)

DESIGN UNIT COMPUTATION DETAILS

Table 1: Design Parameters

Parts	No. of active and passive circuit elements	P
Part Types	No. of Active Part types	AT
	No. of Passive Part types	PT
	No. of Critical connectors/Socket types	CT
Pages	No. of schematic pages	SP
Connections	No. of pin to pin connections	C
Nets	No. of nets	N
Layers	No. of layers in the PCB	L
Signal Layers	No. of Signal/Mixed layers	SL
Length Matching Nets	No. of length matching nets	LN
Simulation Nets	No. of nets for which simulation has to be carried out	SN
Power Nets	No. of power nets for which simulation has to be carried out	PN
Files	Applicable file format generation	F
Vias	No. of Vias	Via
Miscellaneous Design Jobs	Miscellaneous PCB Design Jobs	MDJ

Table 2: Computation of Design Units

Sl. No.	Activity	Design Units
Layout Design		
1.	Job Study	$(P \times 0.009) + (L \times 0.5)$
2.	Foot Print Creation	$(AT \times 0.75) + (PT \times 0.25) + (CT \times 2)$
3.	Schematic Creation from original PDF file (A4 Size)	SP x 4
4.	Schematic Creation from scanned PDF file (A4 Size)	SP x 5
5.	Schematic Creation from hand drawn file (A4 Size)	SP x 6
6.	Schematic given in .dsn format (DRC setting and clearing netlist generation errors)	P x 0.015
7.	Board outline and placement	$(P / 25) + 8$
8.	Technology Setup	N x 0.007 (Minimum: 4)
9.	Routing and plane setting	C / 22
10.	Routing Optimization and Length Matching	$(SL \times 1) + (LN \times 0.05)$
11.	Post Process	$(P / 90) + 2$
12.	Board QA	$(P \times 0.009) + (L \times 0.5)$
13.	DFM/CAM and Deliverables	$(L \times 1) + 2$
14.	DFA Analysis	$(AT \times 0.5) + (PT \times 0.15) + (CT \times 1) + 6$
15.	Miscellaneous PCB Design Jobs	MDJ
Analysis		
16.	Signal Integrity Analysis and modification to meet the requirement	SN x 0.75
17.	Power Integrity Analysis and modification to meet the requirement	PN x 3.2
18.	Thermal Analysis and modification to meet the requirement	P x 0.35
19.	Net level EMI	SN x 0.75
	Total Design Units	Sum of 1 to 19 whichever is applicable for a given job

Table 3: Miscellaneous PCB Design Jobs (MDJ) Computation of Design Units

Sl. No .	Activity	Design Units
1	Fabrication & Assembly file generation for RF Layout Designs etc,. – Part Job	$(F \times 0.75) + 8$
2	Via-fill files generation for new process requirements	$(Via \times 0.01) + (F \times 0.5) + 4$
3	Quickly assessing Circuit feasibility study for new PCB designs	$(P / 25) + 8$
4	Generation of stencil file for SMT Line Assembly Process	$(AT \times 0.5) + (PT \times 0.05) + (P \times 0.01) + CT + 4$
5	Polarity checking of assembly process flow for all the projects	$(P \times 0.01) + 1$
6	Print generation of Intermediate output files	$(F \times 0.75) + 1$
7	Generation of Suitable file formats for the Interface of Stake holders for respective EDA platform. Viz ODB++, IPC2581, IDX, DXF, Centroid files etc,.	$(F/2) + 1$
8	Files for DFA	$(F \times 0.75) + 1$
9	Files for DFM	$(F \times 0.75) + 1$
10	Building 3D model Component library for ECAD-MCAD Interface,	$(AT \times 0.75) + (PT \times 0.1) + (CT \times 2) + 1$
11	Library Part Generation	$(AT \times 0.75) + (PT \times 0.25) + (CT \times 2) + 1$
12	Documentation support File generation Technology transfer	$F \times 0.75 + 1$
13	Conversion of Qual /Proto model Design files to Flight Model Design file	$(F / 5) + 1$
	Total Design Units of Miscellaneous Design Jobs	MDJ (Sum of 1 to 13 whichever is applicable for a given job)

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