



भारत सरकार / GOVERNMENT OF INDIA
अंतरिक्ष विभाग / DEPARTMENT OF SPACE
विक्रम साराभाई अंतरिक्ष केंद्र / VIKRAM SARABHAI SPACE CENTRE
तिरुवनंतपुरम / THIRUVANANTHAPURAM - 695 022

विज्ञापन सं. वीएसएससी/पी/विज्ञापन/22/2009 दिनांक 17.02.2010

ADVT NO. VSSC/P/ADVT/22/2009 DATED: 17.02.2010

भारत के राष्ट्रपति के लिए तथा उनकी ओर से, निम्नलिखित कार्य के लिए, वरिष्ठ प्रधान, क्रय एवं भंडार, विक्रम साराभाई अंतरिक्ष केंद्र (वीएसएससी) मोहरबंद निविदाएं आमंत्रित करते हैं।

For and on behalf of the President of India, the Sr. Head Purchase & Stores, Vikram Sarabhai Space Centre (VSSC) invites Sealed Tenders for the following work.

सं. NO.	निविदा सं. TENDER NO.	मद / ITEM	मात्रा (सं.) QTY. (Nos.)	निविदा शुल्क TENDER FEE
1	7084-2009-6598	एस-बैंड रेडार प्रेषित्र का मरम्मत यह दो भागवाली निविदा है। भाग-1 (तकनीकी तथा वाणिज्यिक बोली) भाग-2 (मूल्य बोली) Refurbishment of S-Band Radar Transmitter THIS IS A TWO PART TENDER Part-1 [Technical & Commercial Bid] Part-2 [Price Bid]	01	रू./Rs. 225/-

निविदा फॉर्म जारी करने की अंतिम तिथि Last Date for issue of Tender Forms	24.03.2010 16.00 बजे तक/up to 16.00 Hrs
निविदा स्वीकृति की नियत तिथि Due Date for Receipt of Tender	25.03.2010 16.00 बजे तक/up to 16.00 Hrs
निविदा खोलने की तिथि Tender Opening Date	26.03.2010 10.00 बजे/at 10.00 Hrs

नोट / Note:

1. उक्त मद के संपूर्ण विवरण तथा विनिर्देशन एवं निविदा प्रस्तुत करने के संबंध में पालन किए जानेवाले सामान्य अनुदेश निविदा दस्तावेजों में दिए गए हैं।

Full details and specifications of the item and general instructions to be followed regarding submission of tenders are indicated in the tender documents.

2. इसरो वेब साइट www.isro.gov.in में निविदा दस्तावेज उपलब्ध हैं। इच्छुक निविदाकार इस वेब साइट से अपनी इच्छानुसार निविदा दस्तावेजों को डाउनलोड करें और निविदा अधिसूचना में दिए गए विवरणों के अनुसार अपने प्रस्तावों को निर्धारित निविदा लागत के साथ (बैंक ड्राफ्ट के रूप में) प्रस्तुत करें।

Tender documents are available on ISRO website www.isro.gov.in. Interested tenderers may, at their option download the tender documents from the website and submit their offers along with the prescribed tender cost [in the form of Bank Draft] as per details given in the tender notification.

3. निविदा दस्तावेजों को निम्नलिखित पते से भी प्राप्त किया जा सकता है:

वरि. क्रय एवं भंडार अधिकारी, क्रय यूनिट-IV, एमवीआइटी/वीएसएससी, वलियमला, तिरुवनंतपुरम - 695 547

Tender Documents can also be obtained from the following address:

Sr.Purchase & Stores Officer, Purchase Unit - IV, MVIT/VSSC, Valiamala, Thiruvananthapuram - 695 547

4. निविदा शुल्क का भुगतान मात्र रेखित डिमांड ड्राफ्ट के रूप में किया जाए। अन्य विधि का भुगतान स्वीकार्य नहीं है। यह डिमांड ड्राफ्ट वरिष्ठ लेखा अधिकारी, यूनिट सं. IV, एमवीआइटी/वीएसएससी लेखा, वीएसएससी के नाम पर भारतीय स्टेट बैंक, वलियमला शाखा, तिरुवनंतपुरम पर देय होना चाहिए।

Tender Fee shall be paid in the form of CROSSED DEMAND DRAFT ONLY. Other mode of payment is not acceptable. The Demand Draft should be in favour of: Senior Accounts Officer, Unit No.IV, MVIT/PSLV Accounts, VSSC payable at State Bank of India, Valiamala Branch, Thiruvananthapuram.

[निविदा शुल्क अप्रतिदेय है।/ The tender fee is NON - REFUNDABLE]

5. निविदा दस्तावेजों के लिए अनुरोध करते समय लिफाफे पर "निविदा दस्तावेजों के लिए अनुरोध-निविदा सं. _____ दिनांक _____" का उल्लेख करें।

While requesting for Tender Documents please indicate on the envelope as "Request for Tender Documents - Tender No. dt."

6. अपने प्रस्ताव को प्रस्तुत करते समय लिफाफे पर ऊपरी भाग में स्पष्ट रूप से निविदा सं. तथा नियत तिथि लिखी जाए तथा ऊपर की क्रम सं. 3 के प्रेषितों को भेजा जाए।

While submitting your offer, the envelope shall be clearly superscribed with Tender No. and Due Date and to be sent to the addressee at Sl. No. 3 above.

7. नियत तिथि / समय के बाद प्राप्त होनेवाली दर सूचियों पर विचार नहीं किया जाएगा।

Quotations received after the Due Date / Time will not be considered.

8. डाक व्यवस्था के कारण, दस्तावेज प्राप्ति में होनेवाले किसी विलंब / अप्राप्ति के लिए वीएसएससी, तिरुवनंतपुरम उत्तरदायी नहीं है।

VSSC, Trivandrum is not responsible for any postal delay / loss of documents in transit.

9. वरि. प्रधान, क्रय एवं भंडार, वीएसएससी, तिरुवनंतपुरम को यह अधिकार होगा कि वे कोई कारण बताए बिना किसी/या सभी निविदाओं को भागों में या पूर्णतः स्वीकार या अस्वीकार कर सकते हैं।

Sr.Head Purchase & Stores, VSSC, Thiruvananthapuram reserves the right to accept or reject any / or all the tenders in part or full without assigning any reasons thereof.

(एम पी कृष्णन कुट्टी / MP Krishnan Kutty)

वरि.क्रय एवं भंडार अधिकारी, वीएसएससी/ Sr.Purchase & Stores Officer, VSSC

SPECIFIC CONDITIONS

1. Offer to be submitted in two separate sealed parts

a. Part 1 : Technical Bid should contain

- i. Technical offer specifying the conformance to the specification details provided in Annexure-1
- ii. Commercial terms and conditions
- iii. Schedule of testing, delivery, installation and commissioning
- iv. Answer to the questionnaire enclosed in Annexure-2.
- v. Lists and details of the projects undertaken on similar type of Radar Transmitter.

b. Part 2 : Price Bid

2. In case of any clarifications, the following person(s) may be contacted :

- a. Shri VS Mohanachandran Nair, SPSO, MVIT/Purchase
0471-2567507
- b. Smt Sreemathi P, PSO, MVIT/Purchase - 0471 - 2567335

Annexure –1
S – Band Radar Transmitter
Specification Document

1.0 INTRODUCTION:

Vikram Sarabhai Space Centre, Indian Space Research Organisation (ISRO), Thiruvananthapuram is planning to replace the S-band Radar transmitter along with associated circulator and TR Limiter of one of their old S-band conical scan type of tracking Radar. The tracking radar is used to support the tracking requirements of sounding rockets and balloons for meteorological purpose.

The scope of work pertains to the design, develop, manufacture, test, supply and commissioning of the transmitter in the radar site at Thiruvananthapuram. The transmitter subsystem along with other units shall be installed, commissioned and interfaced to other subsystems to the satisfaction of the user. The supplier shall demonstrate the performance of the transmitter, as per the mutually agreed Acceptance Test Procedures for acceptance of the radar by ISRO.

2.0 CONTENT OF WORK:

The block diagram of the transmitter subsystem along with the associated RF plumbing is shown in figure 2.1. The simple block diagram is indicated in figure 2.2. The specifications of the transmitter subsystem are indicated in Table 2.1. The brief specifications of microwave units external to the transmitter cabinet are also provided. The interface details and facilities required are indicated in section 2.3.

The supplier shall submit the offer with relevant technical details for evaluation by the user.

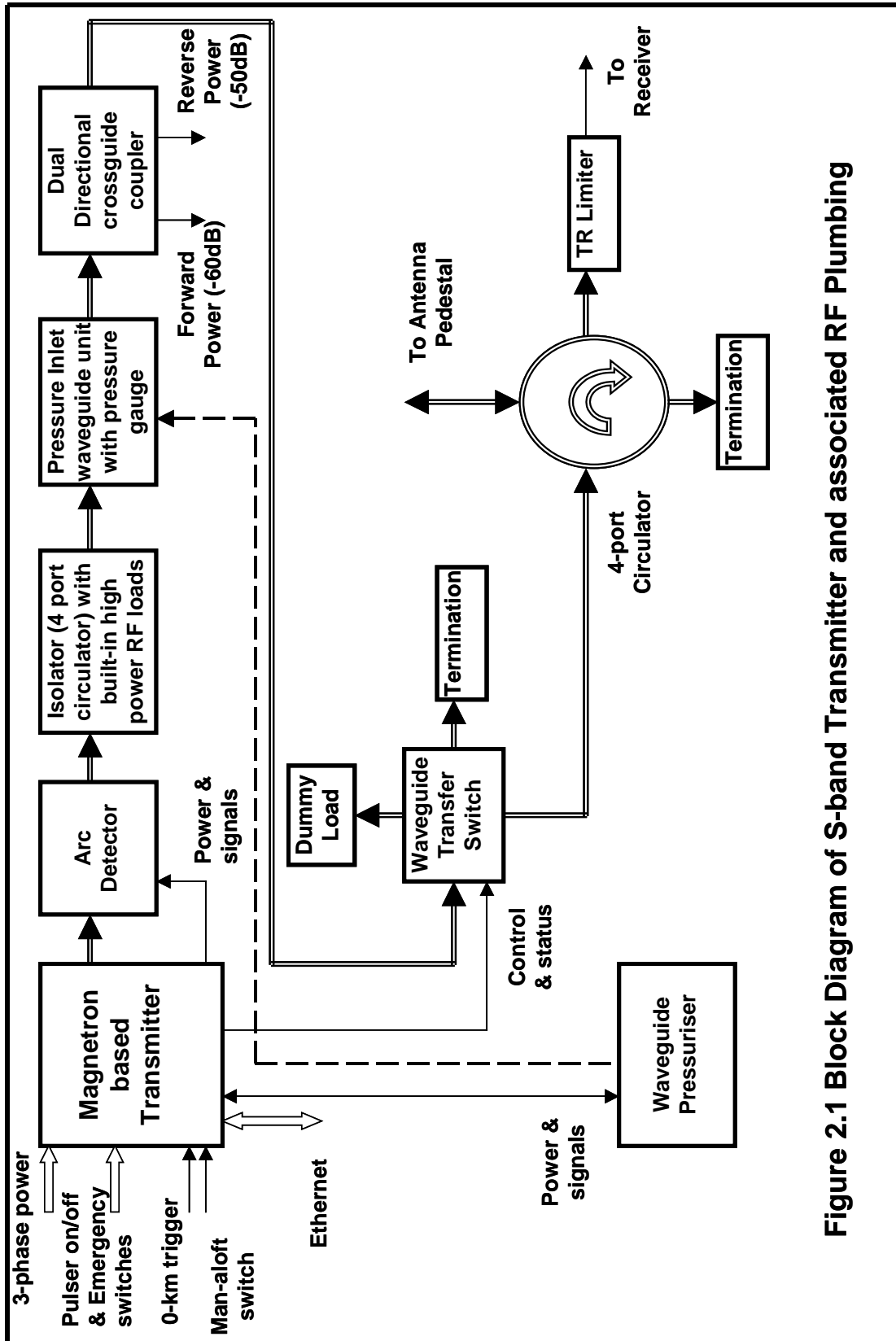


Figure 2.1 Block Diagram of S-band Transmitter and associated RF Plumbing

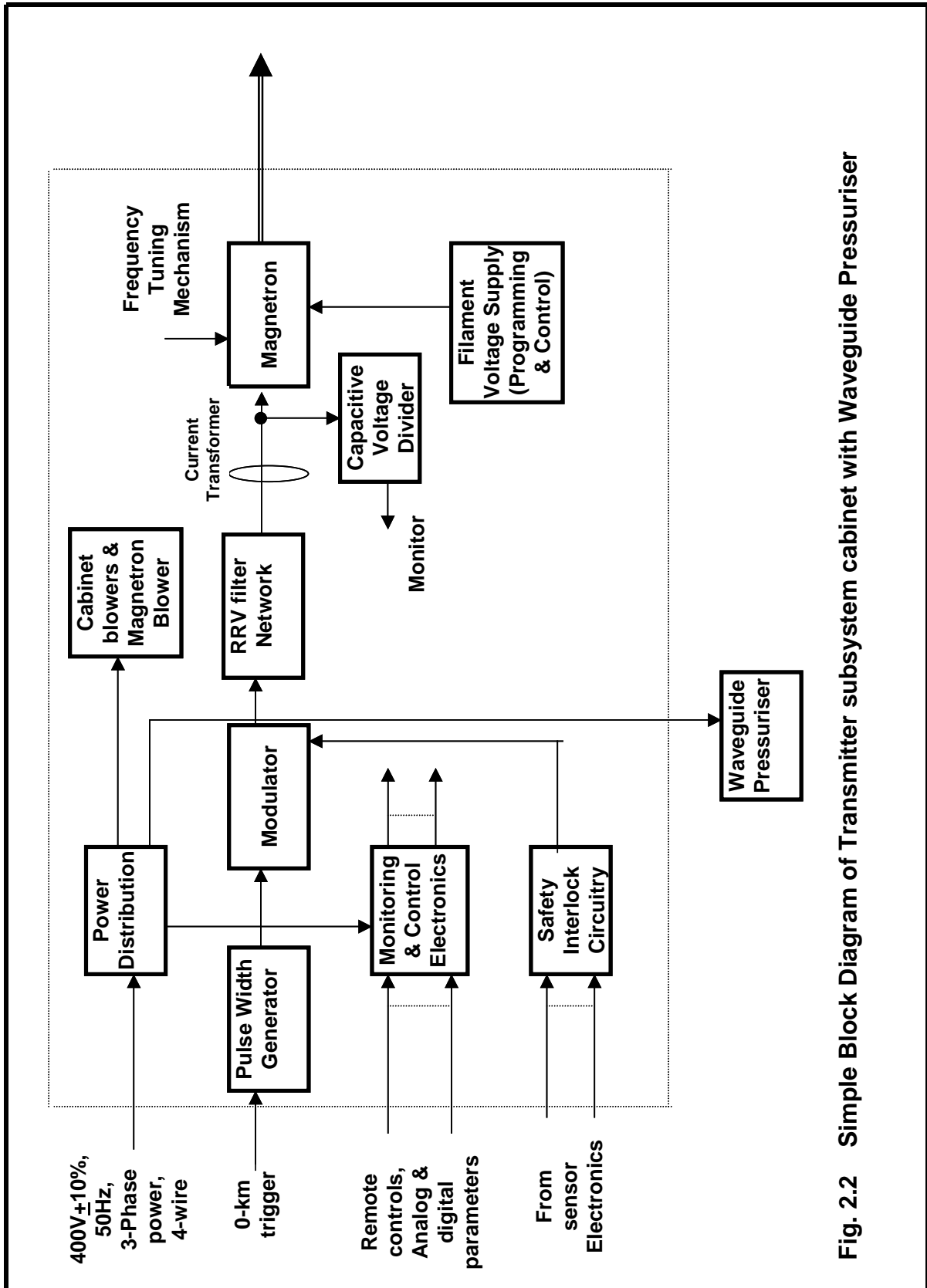


Fig. 2.2 Simple Block Diagram of Transmitter subsystem cabinet with Waveguide Pressuriser

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Specification Document



Table 2.1 Specifications of S-band Transmitter

Sl.No	Parameter	Specification
1	Type of Transmitter	Magnetron (Coaxial) based, with modulator of Hard Tube type / IGBT based/ Line type
2	Frequency of operation	2.7 to 2.9 GHz, tunable over the band
3	Peak Power	1 MW maximum at the output of Magnetron
4	Average Power	1 kW maximum at the output of Magnetron
5	Pulse Width	1.0 micro second
6	PRF	585.5 or 292.75 or 146.375 Hz selectable
7	Spurious output	-25 dBc or better
8	Harmonics	-30 dBc or better
9	VSWR	1.5: 1 or better
10	RF pulse rise and fall times	Less than 100 nSec
11	Power output stability	0.5 dB pulse to pulse
12	Magnetron Filament Voltage programming	Filament voltage varies as per Average current
13	Pulse Width Jitter	+/- 20 nano-sec maximum
14	Pulse to pulse jitter	+/- 20 nano-sec maximum
15	Tx-output sample level for Skin AFC	+10 dBm or more at the output of transmitter
16	Waveguide output	WR-284
17	Waveguide Flange	CPR 284G
18	Pressurisation system	20 PSIG maximum, 15PSIG operating
19	Magnetron Frequency tuning	Manual tuning facility from front panel switches, with motor control
20	Features required	<ul style="list-style-type: none"> a) Arc Detector at the output of magnetron, to sense any arcing at the mouth of magnetron and shutdown pulser b) Waveguide Isolator after Arc detector with loads catering to full reflection of RF power c) Pressure inlet waveguide section, with pressure gauge d) Crossguide type of Dual Direction coupler, with forward and reverse coupling values adequate for VSWR interlock. e) Waveguide switch for routing RF power to Antenna or Dummy Load. Selection is to be allowed only with pulser off. f) Transmitter sample (max. +10dBm) for monitoring on Spectrum Analyser, on N(F)

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		<p>connector</p> <p>g) Local PRF for stand-alone testing</p> <p>h) Capacitor Voltage Divider at the Magnetron Cathode for monitoring voltage.</p> <p>i) Current Transformer to monitor the Magnetron Cathode current pulse.</p> <p>j) Magnetron filament voltage programming</p> <p>k) All the controls required for transmitter operation are to be provided on the front door of one of the transmitter cabinets.</p> <p>l) Facility to monitor the status, interlocks and analog parameters is to be provided on a LCD panel on the front door of one of the transmitter cabinets.</p> <p>m) Remote control of Pulser On /Off is to be provided (Potential free contacts will be provided by user)</p> <p>n) Appropriate RLC network between modulator and Magnetron to limit the RRV of Magnetron voltage cathode as per the Magnetron chosen.</p>
21	Interlocks	<ol style="list-style-type: none"> 1) Door Interlocks (4 Nos.) 2) Duty Ratio interlock 3) Blowers interlock 4) VSWR interlock 5) Low Pressure Interlock 6) High Pressure Interlock 7) Magnetron Filament Voltage abnormal 8) Magnetron Peak current abnormal 9) Magnetron average current abnormal 10) Magnetron cathode Voltage abnormal 11) Magnetron body temperature abnormal 12) Local Emergency 13) Console Emergency (Potential free contacts will be provided by user) 14) Man-aloft interlock (Potential free contacts will be provided by user) 15) Modulator DC output abnormal 16) Modulator current abnormal 17) Arc Detector interlock <p>Provision is to be supplied to bypass all interlocks during maintenance.</p>
22	Dimensions & specs of electronic enclosures	The total dimensions of the cabinets should not exceed 2000 mm height x 1500 mm width x 800

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		mm depth. The high power microwave items may be mounted on the top of the cabinets, with maximum extra height of 500mm. EMI/EMC shielded cabinets should be used
23	Operating Temperature	0 to 50 deg C ambient
24	Life of the system	20 years minimum

2.1 The specifications of the Waveguide RF units are as follows:

2.1.1 Arc Detector

Sl.No.	Description of the item	Quantity
1.	Frequency of operation	2.7 – 2.9 GHz
2.	Transmitter Peak Power	1.5 MW or higher
3.	Transmitter Average Power	1.5 kW or higher
4.	Waveguide size	WR284
5.	Flanges	CPR 284G
6.	Pressure	15 PSIG operating & 20 PSIG withstanding
7.	Insertion Loss	0.05 dB or better
8.	VSWR	1.1 or better
9.	Input power	+28V
10.	Output	0 to 1V and 15 to 28V
11.	Response time	10 μsec or better
12.	Self test provision	To be provided
13.	Material	Aluminium
14.	Finish	Chromate
15.	Cooling	Natural Ambient
16.	Environment	Coastal
17.	Operating Temp	0 to 50 deg C, 95% RH

2.1.2 4-port circulator (Isolator)

The circulator must be provided with termination at Port 3 and Port 4 as specified in Sl. No. 7 and 8.

Sl.No.	Description of the item	Quantity
1.	Frequency of operation	2.7 – 2.9 GHz
2.	Peak Power	1.5 MW or higher
3.	Average Power	1.5 kW or higher
4.	Waveguide size	WR284
5.	Flanges	CPR 284G

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6.	Pressure	15 PSIG operating & 20 PSIG withstanding
7.	Peak Power & Average power (dummy load-port 3)	1.5 MW Peak & 1.5 kW average or higher
8.	Peak Power & Average power (dummy load-port 4)	15 kW Peak & 15 W avg or higher
9.	Isolation between ports	20dB min
10.	Insertion Loss	0.3dB max
11.	VSWR at all the ports	1.15:1 max
12.	Material	Aluminium
13.	Finish	Chromate
14.	Cooling	Natural Ambient
15.	Environment	Coastal
16.	Operating Temp	0 to 50 deg C, 95% RH

2.1.3 Dual Directional Coupler

Sl.No.	Description of the item	Quantity
1.	Frequency of operation	2.7 – 2.9 GHz
2.	Peak Power	1.5 MW or higher
3.	Average Power	1.5 kW or higher
4.	Waveguide size	WR284
5.	Flanges	CPR 284G
6.	Pressure	15 PSIG operating & 20 PSIG withstanding
7.	Type of coupler	Cross guide type
8.	Forward coupling	60 dB typical
9.	Reverse coupling	50 dB typical
10.	Accuracy of coupling (forward & reverse)	0.5 dB maximum
11.	Connectors for coupled ports	N(F)
12.	Insertion loss	0.2 dB max.
13.	Directivity	20 dB minimum
14.	VSWR (input & output	1.2:1 max.
15.	Calibration	Calibration chart for the coupling values of both forward and reverse coupling over the frequency band with accuracy of 0.2 dB has to be provided.

2.1.4 Waveguide Switch

Sl.No.	Description of the item	Quantity
1.	Frequency Range	2.7 to 2.9 GHz
2.	Input Peak Power	1.5 MW or higher
3.	Input Average Power	1.5 kW or higher
4.	Duty Cycle	0.001(max)
5.	Pulse Width	Min 0.25 μ sec Max 1 μ sec
6.	Pulse Repetition Rate	Min 146 Hz, Max 585 Hz
7.	Isolation	60-dB minimum
8.	Switching time	100 mill-sec maximum
9.	Insertion Loss (dB)	0.05 dB maximum
10.	VSWR (ratio)	1.1:1 maximum
11.	Operating Voltage	28+/-2 V DC
12.	Electrical circuit	Standard, Latching type with manual override
13.	Life	1,000,000 cycles or better
14.	Temperature Range	0 to 50 deg C
15.	Pressurization	15 PSIG operating & 20 PSIG withstanding
16.	Wave guide Size	WR-284
17.	Flanges Input	CPR 284 G
18.	Dummy Load specs	1.5 MW peak power minimum, 1.5 kW average power minimum, VSWR of 1.1 maximum and natural ambient cooling
19.	Termination specs	Waveguide to coaxial (N, female) adapter with N(M) termination of 1W average power rating.

2.1.5 4-port circulator

Sl.No.	Description of the item	Quantity
1.	Frequency of operation	2.7 – 2.9 GHz
2.	Waveguide size	WR284
3.	Flanges	CPR 284G
4.	Pressure	15 PSIG operating & 20 PSIG withstanding
5.	Peak Power	1.5 MW or higher
6.	Average Power	1.5 kW or higher
7.	Peak Power & Average power (dummy load-port 4)	150 kW Peak & 150 W avg or better

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8.	Isolation between ports	20dB min
9.	Insertion Loss	0.3dB max
10.	VSWR	1.15:1 max
11.	Material	Aluminium
12.	Finish	Chromate
13.	Cooling	Natural Ambient
14.	Environment	Coastal
15.	Operating Temp	0 to 50 deg C, 95% RH

2.1.6 TR Limiter

Sl.No.	Description of the item	Quantity
1.	Frequency Range	2.7 to 2.9 GHz
2.	Input Peak Power	100 kW or higher
3.	Input Average Power	100 W or higher
4.	Duty Cycle	0.001(max)
5.	Pulse Width	Min 0.25 μ sec Max 1 μ sec
6.	Pulse Repetition Rate	Min 146 Hz, Max 585 Hz
7.	Spike Leakage Amplitude	200mW peak or 0.2 ergs max
8.	Flat Leakage	30mW
9.	Recovery Time at 3dB	5 microsec maximum
10.	Insertion Loss (dB)	0.6 dB maximum
11.	VSWR (ratio)	1.35:1 maximum
12.	Temperature Range	0 to 50 deg C
13.	Pressurization Input	15 PSIG operating & 20 PSIG withstanding
14.	Wave guide Size	WR-284
15.	Flanges Input	CPR 284 G / CPR 284
16.	Output Co-axial	N (F) connector

2.1.6 Waveguide Pressuriser

Sl.No.	Description of the item	Quantity
1.	Inlet air pressure	1.4 to 10 Kg /sq.cm
2.	Outlet air pressure	Dry air output with pressure settable between 1.0 to 2.0 Kg/sq.cm
3.	Outlet pressure dew point	-40 deg C
4.	Capacity	5 CFM
5.	Ambient Temperature	50 deg C maximum
6.	Desiccant	Activated Alumina
7.	Type	Heatless regenerative
8.	Compressor	Oil free type
9.	Tank capacity	10 litres or more

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10.	Input power supply	230V \pm 10% AC, 50Hz \pm 1%
11.	Safety valve	To protect the receiver and the system connected (load)
12.	Alarm & interlock	Pressure switches with settable low and high pressure limits. Potential free contacts of the switch are to be provided for sensing
13.	Pressure gauges	Two pressure gauges are to be provided to monitor the inlet and output pressures
14.	Type of operation	¼" BSP connector
15.	Mounting	The unit should be enclosed in a rust-free metal enclosure with vibration free mount

2.1 Requirements and Interface details:

1. The 0-km trigger for the transmitter will be provided by user's equipment to transmitter through differential line driver (26LS32 / Max3045B) over a twisted pair or fibre optical (FO) link. The transmitter should have provision to receive the trigger in both differential and FO link. This trigger is to be used in normal operation. In standalone mode, internally generated 0-km trigger is to be used with selectable PRF (Pulse repetition frequency) of 585.5 or 292.75 or 146 Hz PRF.
2. The required time delay for warm-up of magnetron filament is to be provided and interlocked to disable pulser to be made ON. The remaining time left for filament delay is to be displayed on the front door of the transmitter.
3. Three modes are to be provided for operation. In '**Stand-alone**' mode, the 0-km trigger is as per internally generated PRF and transmitter is completely operated locally. In '**Local**' mode of operation, the 0-km trigger is provided by user's equipment and the transmitter is completely operated locally. In "**Remote**" mode of operation, the 0-km trigger is provided by user's equipment and the transmitter is controlled locally except the pulser On and Off. User will provide two momentary DPDT illuminated switches on the

control console, whose potential free contacts will be used by transmitter for pulser Off and On and respective switch will be illuminated. The lamps of the switches may require 28V, 200mA.

4. The waveguide pressuriser shall be supplied along with the transmitter, with typical pressurisation level of 15 PSIG. The pressuriser shall have adequate tank volume (for nearly 30-feet waveguide length), to have duty of less than 30%. The pressuriser shall have required controls for setting the waveguide pressure, low-pressure interlock and high-pressure interlock.
5. The man-aloft switch at the antenna (provided by user), if activated, is to be made use to disable pulser. Potential free contacts of the switch are to be used by transmitter.
6. The input power supply shall be $400V \pm 10\%$, 3-phase AC, 4-wire, $50Hz \pm 2\%$. No UPS Power Supply will be made available. Transmitter must have built-in power line filter and surge protection device. User will provide two earth pits with earth resistance better than 5-ohm.
7. The transmitter should have facility for LAN connectivity to transmit all interlock status, monitoring and analog parameters. Remote data acquisition software to display the same should also be provided to display the parameters.
8. The supplier shall supply the following (please refer Figure 2.1)
 - i) The S-band transmitter subsystem in 2 or 3 EMI/EMC shielded cabinets along with waveguide units as shown in Figure 2.1.
 - ii) The waveguide pressuriser, with power and interlock signal cable (shielded cable between the transmitter and pressuriser) and hose pipe (to feed the dry compressed air to the waveguide plumbing). The waveguide pressuriser may be located away from transmitter cabinets by 20-feet maximum.
 - iii) The 4-core cable with shield to receive 3-phase power from user's power distribution box.

- iv) The waveguide with flanges to feed the transmitted power from 4-port circulator to the antenna pedestal mounted on a tower, which may be maximum of 30-feet away from transmitter cabinet.
 - v) The cable between the control console and transmitter for remote control of pulser On & Off, Emergency OFF and illumination of switches.
 - vi) The cable between the user's equipment and transmitter for 0-km trigger.
 - vii) The cable between the Ethernet port in the transmitter rack to the port in Control console, which may be maximum of 30 feet away from the transmitter cabinet.
9. Necessary monitoring parameters shall be provided for testing. They are typically the transmitter sample (for monitoring on spectrum analyser), magnetron cathode voltage, magnetron current, detected pulse output etc. The Forward coupling port output of the Dual direction coupler must be made available for monitoring the transmitter sample, RF detected pulse and for VSWR measurement.
10. The modulator shall have provision to adjust the pulsed high voltage continuously, to optimise the magnetron peak power.
11. All the analogue parameters, interlocks, current status of sensors etc. are to be displayed on a LCD panel on the front door of the transmitter. The same needs to be transmitted to a remote computer in Control Console using Ethernet. The required controls like Filament On /Off, Modulator supply On /Off, Pulser On /Off, Waveguide switch for RF power to Antenna /Dummy Load are to be provided on the front door of the transmitter.
12. The transmitter shall be designed with reliable and fail-safe interlocks for the safety of the personnel and the equipment.
13. The transmitter shall have necessary cooling units for heat generating units, for continuous operation of 8-hours without any interruption or trip.

14. The standard high voltage engineering practises are to be adhered to. All the high power microwave units and high voltage units should have a derating factor of 1.5.
15. All high voltage sections are to be adequately isolated and clearly marked. High voltage discharge probe should be built-in, for service engineers to discharge high voltage points before attempting service for maintenance.
16. Emergency hard switch and clear pulser ON indication are to be provided on the front door of the transmitter cabinet.
17. Personnel safety
 - Provisions for personnel safety shall be generally in accordance with MIL-E-16400F and the additional conditions imposed herein. Personnel shall not be endangered by unsafe radiation levels. The system shall be adequately shielded in both the operating and service positions for radiation exposure.
 - The microwave radiation levels for any personnel in the operating area shall not exceed 0.01 watts per square centimetre.
 - Adequate equipment shielding shall be provided to limit exposure of personnel to x-ray radiation to less than 2.5 milli-roentgens per hour and 100 milli-roentgens per week. Radiation levels shall be measured and documented.

18. Documentation

The documentation for the supplied transmitter shall include the following details:

- The operational manual, technical manual (design methodology, description & wiring), maintenance manual (including calibration /test procedures and trouble-shooting procedures).
- Each PCB or module shall be supplied with schematic diagram, General assembly, parts list (electrical and mechanical), technical description and test procedure.

- The complete source code (with comments) and flow charts for the algorithms shall be supplied.
- The parts list for the complete system should include electrical and mechanical details along with manufacturer's /supplier's address and part numbers.
- Two sets of hard copies and soft copies shall be supplied.

19. The supplier shall provide training to the operating personnel of the radar in operation, maintenance and trouble shooting the transmitter subsystem.

20. The supplier shall guarantee the availability of spares over the life of the transmitter. The supplier shall provide the list of spares to be procured by ISRO for operation of the transmitter for atleast 2-years of operation.

21. **Product Assurance:** The development process for the system shall follow the commonly adopted methodology in ISRO for product assurance with technical reviews like Preliminary Design Review (PDR), Factory acceptance Test (FAT), Site acceptance Test (SAT) and regular progress reviews of the overall system by the committee, constituted by ISRO. The recommendations of the committee are to be incorporated.

22. The supplier shall prepare the preliminary design report on system offered, within two months after receiving the purchase order. This document will be reviewed by a PDR (Preliminary Design Review) committee, constituted by ISRO. The recommendations of the committee are to be incorporated.

23. The transmitter system shall be commissioned by the supplier at the site within 15-months after receiving the purchase order.

24. **Warranty Clause:** The Supplier shall provide warranty for the satisfactory performance of the subsystem for a period of 24 months from the date of acceptance by user agencies, wherein supplier shall repair or replace the defective parts at no extra cost.

25. The Supplier shall also submit the offer with the following as **OPTIONAL** clause:

S-band Radar Transmitter
Specification Document



- i) Built –in Test Equipment Systems for the transmitter consisting of:
 - Storage Oscilloscope for Magnetron Current Measurement, Cathode voltage measurement and RF detected pulse etc.
 - Spectrum Analyser for Transmitter Sample etc.
- ii) Annual Maintenance Contract (Non-comprehensive/Service Only) for 3 years from the date of completion of Warranty period.

3.0 Deliverables:

The supplier shall deliver the following units as per the content of work

Sl.No.	Description of the item	Quantity
1.	The transmitter subsystem with magnetron as final output device, with associated power supplies, modulator, Interlock circuits, monitoring and control unit in standard electronic enclosures	One set
2.	Waveguide pressuriser unit, in metal enclosure and with associated compressor, low pressure and high pressure alarm settings	One No.
3.	Waveguide Arc Detector	One No.
4.	Waveguide Isolator	One No.
5.	Waveguide pressure inlet unit with pressure gauge	One No.
6.	Waveguide transfer switch, with high power load and termination.	One set.
7.	Waveguide 4-port circulator, with medium power load	One No.
8.	TR- Limiter	One No.
9.	Associated waveguide plumbing to connect the RF power to antenna pedestal of user.	One set
10.	Necessary cables, hosepipe and stainless steel fasteners.	One set
11.	Documentation (hard copies and soft copies)	Two sets

Annexure – 2
S-band Radar Transmitter
Questionnaire



Annexure - 2

The questionnaire for vendor evaluation is given as follows:

1. Name of the Establishment
2. Date of Establishment
3. Address for communication
4. Type of Establishment
5. Foreign collaboration if any
6. Number of employees
7. Area of operation
8. Quality norms followed and quality certificate from reputed agencies
9. Product Assurance norms followed in your organisation.
10. What is your production methodology
11. Production capacity
12. Are you having any R&D Department
13. Number of staff in R&D
14. Are you having any software department?
15. Date of entering into Radar Design and development
16. Date of entering into High power Radar transmitter design and development
17. Give brief account of your design capability in RF systems
18. Brief account of the design capability in Radar Subsystems
19. Detail account of the design capability in high power Radar Transmitters
20. Technical Manpower available in the field of high power Radar transmitter design.
21. Detail account of design capability in Line type / Hard tube type / IGBT based modulator for high power Radar Transmitters.
22. Can you undertake customised design in high power Radar Transmitter

Annexure – 2
S-band Radar Transmitter
Questionnaire



23. Are you subcontracting any of your activities, if so give details
24. Give brief account of projects undertaken on Radar Systems.
25. Account of the projects undertaken on similar type of Radar Transmitters.
Detail description of the specification requirements and specification achieved, time schedule of the project.
26. Brief account of the assembly and test facilities available for high power transmitter.
27. Whether EMI/EMC test facility available
28. Personnel Safety norms followed by the organisation in high power transmitter designs.
29. What are the standard high voltage engineering practises followed in your design.
30. After Sales services: mode of operation and how long can you support.
31. Previous contract/relation with ISRO
32. Annual Turnover