


Cover page to the tender document

	<p align="center"><b>ELECTRONICS CORPORATION OF INDIA LTD</b>  <b>(A Government of India Enterprises)</b>          Communication Systems Group, ECIL(PO), Hyderabad - 500 062</p>
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Name of Organisation	Electronics Corporation of India Limited, Hyderabad - 500 062 {A.P.}		
Type of Organisation	Public Sector Undertaking	Ministry : Department of Atomic Energy	
Tender Ref. No :	ECIL/CNSG-MMD/S/09-5933PT		
Tender Title:	Development of New Sources for the following items: (i) Diplexer & Radar Suppression Filter (ii) V/UHF Antenna (iii) VHF and UHF Filters.		
Product Category	Electronic equipment .		
Document Cost:	Rs. 2,000		
Tender Value	Source Development		
Tender type:	Source Development		
Location:	Hyderabad {Telangana}		
Request for quote date	23.09.2015		
Last date for submission of bids	31.10.2015 up to 15.00 hrs.		
Description of Item:	Item Description	Quantity	
	Manufacturing of Diplexer and Radar Suppression Filter, V/UHF Dipole Antenna and VHF & UHF Digitally Tunable Filters.	250 nos. each item for five years (50 nos. every year of each item)	
Pre – Qualification	As per specifications given in the tender		
Tender Document	<a href="#">View Tender Document</a> *		
Technical Document	<a href="#">View Technical Document</a> *		
Sector:	Electronics		
State:	Telangana State		
For further Information Contact: DGM, MMD-CNSG,ECIL			
E – Mail:	<a href="mailto:cndmmd@ecil.co.in">cndmmd@ecil.co.in</a>		
Phone:	+94-40-2712 1471		
Fax:	+91-40-2712 1606		

**Electronics Corporation of India limited**  
**(A Government of India enterprise)**  
**Communication Systems Group, ECIL (PO)**  
**Hyderabad – 500062 {Telangana} India**  
**CIN: U32100AP1967GOI001149**  
**Telephone : +91-40-2712 1471, Fax :+91-40-2712 1606**  
**E-mail: [cndmmd@ecil.co.in](mailto:cndmmd@ecil.co.in) {<http://www.ecil.co.in>}**

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Tender No: ECIL/CNSG-MMD/S/09-5933PT

### **Tender Document**

#### **1. Invitation to Tender:**

Electronics corporation of India limited, communication system group invites “ Development of Sources for Diplexer, Radar Suppression Filter, V/UHF Dipole Antenna, VHF and UHF Filters” as per details given below.

#### **2. Important Dates**

Due date for submission of Tender Documents: **31.10.2015 up to 15.00 Hrs.**

After evaluation of the technical specifications, qualified list of vendors will be finalized.

#### **3. Manner and method of submission of offers:**

All pages of the tender shall be numbered and typed on the letter head of the vendor and be duly signed and stamped by company’s authorized signatory. Hand written quotation will be summarily rejected. Corrections if any shall be duly authenticated with signature and seal of the company.

The quotation in prescribed form to this invitation shall be submitted in sealed envelope super scribing tender number with due date.

The technical document shall be submitted to the attention of Deputy General Manager, CNSG-MMD, ECIL Post, Hyderabad 500 062, Telangana, India.

#### **4. Cost of Tender Documents:**

Tender fee of Rs. 2,000/- is to be remitted along with the technical documents in the form of a crossed bank draft favoring “Electronics Corporation of India Limited” from a nationalized bank payable at Hyderabad. The cost of tender document is non- refundable.

#### **5. Items tendered for Present Procurement:**

Sl. No	Items description	Qty
01	Development of Diplexer and Radar Suppression Filter, V/UHF Antenna and VHF & UHF Digitally Tunable Filters.	250 nos. each (50 nos. for every year of each item)

Intending bidders who have not yet registered with ECIL are also requested to download “Suppliers Registration Form” from web site [www.ecil.co.in/tenders](http://www.ecil.co.in/tenders), fill it up and send the same along with the bids.

1	CST Registrati0n Number	
2	TIN Number.	
3	Income Tax PAN Number	
4	ISO-9000 Certificate or any other certificate	
5	MSME Registration Number, if applicable.	
6	Any other relevant information	

**Note :** The vendor shall submit offer in the above format only. Against each instructions mentioned below the Vendor shall give a comment Complied ( √ ) or Not complied ( x )

**Instructions:**

- a. No Columns shall be left blank in the format.
- b. Incomplete forms, counter offer and deviation from the terms and conditions will be summarily rejected.

**General criteria for acceptance of tenders**

1. **Technical specification:** vendor shall comply with the technical specification given in the technical document. complied/ not complied
2. **Experience:** vendor shall provide details with documentary evidence the experience in supply of similar systems - complied / not complied.
3. **Facilities:** details of factory assembly and testing facility shall be furnished. A committee of ECIL may visit to verify the facilities of the vendor.
4. **Service center:** Details of service center location/engineers working
5. **Acceptance of tenders:** No tender will be accepted after due date. ECIL will not be responsible for postal/courier delay or lost in transit if any.

**Note:** vendor shall provide documentary proof to prove his adherence to the qualifying criteria where ever necessary. Claims without support will not be considered.

## **GENERAL TERMS AND CONDITIONS**

This tender and any order resulting from this tender shall be governed by the following terms and condition of contract and the supplier quoting against this tender shall be deemed to have read and understood the same. In case counter terms and condition of business have been offered by the supplier, ECIL shall not be deemed to be governed unless specific written acceptance thereof has been obtained from ECIL.

**TECHNICAL DOCUMENT**

**TECHNICAL SPECIFICATIONS**

1. RADAR SUPPRESSION FILTER

2. DIPLEXER

3. CO-AXIAL DIPOLE ANTENNA

4 VHF AND UHF DIGITALLY TUNABLE BANDPASS FILTERS

5. ENVIRONMENTAL TESTS

6. ESS SPECIFICATIONS

# 1. RADAR SUPPRESSION FILTER

## **Description:**

Radar suppression filter, Model no: NRSF 100-400-500W is a constant low pass filter cascaded with two helical bands reject filters at input and output, compatible to 50Ω system operating frequency band of 100 to 400 MHz with rejection at 500 MHz. The Filter offers low insertion loss, high rejection due to helical cavity and 500w with standing power. The housing material used is copper with silver plating.

## Specifications:

### **Electrical**

Filter Type	: Low Ripple, 11 Sections, Chebshev, Low pass.
Insertion	: ≤0.3 dB over 100-400 MHz
Rejection (in Stop Band)	: >30 dB at 500 MHz : >60 dB at 588 MHz
VSWR (in Pass Band)	: < 1.3:1 (Both ports)
Power Handling	: 500 watts (CW)
RF Connectors	: N (F) both port.
Dimensions	: L=260mm (Max), W=55mm (Max), H=55mm (Max)
Weight	: 700g (Max)

### **Description:**

At two-port to one-port multiplexer is known as diplexer. Diplexer is a passive device that implements frequency domain multiplexing. Two ports VHF, UHF or multiplexed on to third port (sum port) V/UHF port. The signal on ports VHF and UHF occupy disjoint frequency bands. Consequently the signals at V/UHF port can coexist separately at VHF, UHF ports without interfering with each other.

Typically the signal on port VHF will occupy a single low frequency band and the signal on port UHF occupy a single higher frequency band.

The diplexer consists of low pass filter connecting ports VHF and V/UHF (sum port) and high pass filter connecting port UHF and V/UHF (sum port). Ideally all the signal power on port V/UHF is transferred to the VHF port and vice-versa, at the same time all the signal power on port V/UHF is transferred to port and vice versa depending upon the frequency.

Practically the separation of the signals is complete with the specified insertion loss and the return loss.

The diplexer consists of the VHF low pass filter and the VHF high pass filter. The frequency range of the VHF filter is 100-156 MHz and the frequency range of UHF filter is 225-400 MHz. These filters are realized with the Inductors (L) And Capacitors (C) which are the Passive components.

By using this device the VHF, UHF frequency bands are separated and given to VHF digitally tunable band pass filter and UHF digitally band pass filter respectively for the two band communication applications.

#### **Technical Specifications of Diplexers:**

<b>SNo.</b>	<b>Parameter</b>	<b>Specification</b>
1	Insertion Loss	100-156 MHz : 0.3dB (Max) 225-400 MHz : 0.5dB (Max)
2	Isolation	30dB (Min)
3	VSWR	1.5:1 max
4	Power Handling	200 W
5	Dimensions	125x98x52 mm
6	RF Connectors	N(F) Reduced Flange
7	Weight	Filter Unit < 500 Grams
8	Operating Temperature	-20 °C to 55 °C

## **2. DIPLEXER**

#### **Description:**

At two-port to one-port multiplexer is known as diplexer. Diplexer is a passive device that implements frequency domain multiplexing. Two ports VHF, UHF or multiplexed on to third port (sum port) V/UHF port. The signal on ports VHF and UHF occupy disjoint frequency bands. Consequently the signals at V/UHF port can coexist separately at VHF, UHF ports without interfering with each other.

Typically the signal on port VHF will occupy a single low frequency band and the signal on port UHF occupy a single higher frequency band.

The diplexer consists of low pass filter connecting ports VHF and V/UHF (sum port) and high pass filter connecting port UHF and V/UHF (sum port). Ideally all the signal power on port V/UHF is transferred to the VHF port and vice-versa, at the same time all the signal power on port V/UHF is transferred to port and vice versa depending upon the frequency.

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3	VSWR	1.5:1 max
4	Power Handling	200 W
5	Dimensions	125x98x52 mm
6	RF Connectors	N(F) Reduced Flange
7	Weight	Filter Unit < 500 Grams
8	Operating Temperature	-20 °C to 55 °C

**Note:** 1. For Thermal Cycling Test either S.No.2 or S.No.3 can be chosen.

2. Screened Components only to be used (MIL Grade).

## **3. CO-AXIAL DIPOLE ANTENNA**

### **Descriptions**

The antenna consists of dipole arms made of broadband cone domes, is fabricated of aluminum alloy sheet and fixed vertically using FRP insulator. The top cone is covered with flat plate whereas the bottom cone to Radical cage of same diameter as cone, to facilitate low frequency operation.

The N-type input connector is connected to the dipole feed point and moisture transmission line for broadband matching.

The feed point cavity is filled with dielectric foam for sturdiness and moisture free operation.

The antenna is painted with navy grey polyurethane paint to matt finish as per CND STD 15 for marine environmental protection.

The antenna is light in weight and has good comparable operation life.

### **Electrical And Mechanical Specification of Co-axial Dipole**

SNo.	Parameter	Specification
1	Frequency Range	100-1300 MHz
2	Power Handling Capacity	400 watts up to 400 MHz, 150 watts at 1300 MHz
3	Input Impedance	50 Ohms
4	VSWR	<2:1 up to 1000 MHz and max 2.5:1 up to 1300 MHz
5	Gain wrt ISOTROPIC	≥2dB
6	Polarization	Vertical
7	Horizontal Radiation Pattern	Omni
8	Max. Departure from Circulatory	+/-1dB
9	Vertical Radiation Pattern	Dipole Pattern
10	Dimension	1100 mm ± 2mm x, 308 mm dia ± 1mm
11	Weight	6.9 kgs ± 100 gms
12	Permissible Wind Velocity	160 kmph
13	Wind Load	180 N at 160 kmph
14	Connector	N type
15	Operating Temperature	-20 °C to 55 °C



## 4. VHF AND UHF DIGITALLY TUNABLE BANDPASS FILTERS

### INTRODUCTION:

ECIL is manufacturing V/U Transceivers. These requires low pass, high 'Q' digitally tunable band pass filters for suppressing the harmonics coming out of Transmitters to a large extent. For this need, ECIL is looking forward for the design, development and manufacturing of DTF's in VHF, UHF ranges. Complete technical details are given below.

### OPERATION:

The two types of digitally tunable band pass filters are electromechanical in nature with high 'Q' cavities and should meet the enclosed specifications.

Each filter is tuned by a stepping motor, geared to the tuning shaft. A microcomputer is used for all control function and MOSFETs are used for driving the stepping motor. Tuning accuracy is maintained through the use of an absolute tuning shaft encoder or any other reference element. The encoder which is mechanically coupled to the stepped motor by gear assembly precisely tracks the tuning shaft movements and at all times knows what frequency the filter is tuned to, thus providing a closed loop system.

Frequency commands are input through a 37 pin 'D'-type connector located on the front panel, in the BCD form to the parallel input port of the microprocessor. With the reception of valid command, the microprocessor moves to the tuning state. The microprocessor reads the 'reference value' to determine its present frequency location. This determines the distance and direction of the new frequency command. The microprocessor now outputs a stepping routine to the motor drive FETS via an inverter/buffer. As the motor is stepped the reference element feeds the frequency positioning data back to the microprocessor. The filter is now capable of RF transmission.

To operate the filter proper DC voltage is applied and the desired frequency in terms of BCD is applied. While the filter turns to frequency (approx 6 seconds) a "tune complete" line will be TTL-Low meaning the filter is busy tuning and will go to TTL High when tuning is complete. The filter will ignore frequencies entered during this time.

The input and output signals are coupled to the input and output tuning elements.

### MECHANICAL DESCRIPTION:

The DTF's contains 3(UHF), 4(VHF) large tuning cavities made out of milled aluminum plates in which tuning elements are placed. The complete control circuits, gear assembly, reference elements etc., are located in a chamber located behind the front panel. The entire filter box should be painted to protect it from salty environment. All the gears, shafts, screws etc., should be Stainless Steel. Windows with cover are to be provided near the tuning elements to help in fine-tuning. The filter components should be rigidly fitted to withstand vibrations.

Techniques like annealing and chemical milling can be used in the fabrication of capacitor plates. The cavity of the filter is to be thickly silver-plated.

The prototype filters submitted by vendors for evaluation shall have gold plating of parts wherever necessary.

#### **INFRASTRUCTURE AND CAPABILITIES REQUIRED:**

1. The vendor should have RF design, development and manufacturing capabilities and experience.
2. The vendor should have RF test equipment like Network Analyzer, RF Power meters, CRO, Software packages like KIEL, Universal Programmer. He should also make his own test jigs for testing various electrical parameters.
3. The vendor should have mechanical workshop, assembly facilities with anti-static benches, temperature controlled soldering irons etc.,
4. The vendor should have proper quality system to ensure the quality of input raw materials and to test the final product.

#### **37-PIN D-CONNECTOR PIN DETAILS:**

<b>PIN</b>		<b>FUNCTION</b>
1	<b>LSB</b>	0=0 kHz, 1=25 kHz, 2=50 kHz, 3=75 kHz
2	<b>MSB</b>	
3	<b>LSB</b>	BCD representation of 100 kHz digit (0-9)
4		
5		
6	<b>MSB</b>	
7	<b>LSB</b>	BCD representation of 1 MHz digit (0-9)
8		
9		
10	<b>MSB</b>	
20	<b>LSB</b>	BCD representation of 10 MHz digit (0-9)
21		
22		
23	<b>MSB</b>	
24	<b>LSB</b>	BCD representation of 100 MHz digit (0-9)
25	<b>MSB</b>	
26		Tune Complete
32		Spare
17,18,19		Ground
35,36,37		28 VDC

#### **4-A ELECTRICAL SPECIFICATIONS OF VHF FILTER**

Tuning Range	:	100-155.975MHz
Tuning Time	:	3-15 sec max
Insertion loss	:	2.5 dB max
3 dB band width	:	0.7% @ 155.975 MHz

VSWR	:	2:1 max
30 dB band width	:	±3 MHz
40 dB band width	:	±4 MHz
50 dB band width	:	±5 MHz
Frequency Accuracy	:	±0.1% max of tuned Freq
DC input, Power	:	±28V, 35W
Impedance	:	50 Ω
Power Handling	:	120 W (Average)
Input & Output Connectors	:	N-Female
Control	:	37-pin Male D-type
Dimensions L X W X H	:	585x122.9x374.4 mm

#### **4-B ELECTRICAL SPECIFICATIONS OF UHF FILTER**

Tuning Range	:	225-399.975MHz
Tuning Time	:	3-15 sec max
Insertion loss	:	2.5 dB max
3 dB band width	:	0.3% @ 399.975 MHz
VSWR	:	2:1 max
30 dB band width	:	±3 MHz
40 dB band width	:	±4 MHz
50 dB band width	:	±5 MHz
Frequency Accuracy	:	±0.1% max of tuned Freq
DC input, Power	:	±28V, 35W
Impedance	:	50 Ω
Power Handling	:	120 W (Average)
Input & Output Connectors	:	N-Female

Control : 37-pin Male D-type

Dimensions L X W X H : 495.5x161x204 mm

## 5. ENVIRONMENTAL TESTS

The items VHF Filter and UHF Filter shall be evaluated as per the Environmental Tests given below.

### Environmental Tests

SNo.	Name of the test	JSS 55555 test ref.	Remarks
1	Vibration: 5-14Hz $\pm 1.25$ mm displacement 14-23Hz $\pm 0.25$ mm displacement 23-100Hz $\pm 30$ mm/sec constant velocity (Unit in the rack)	28	Resonance Search & Endurance in each axis for 1 hr at pre-selected frequencies.
2	High Temperature(Operation at +55° C, followed by storage at +70° C, 16 hrs) Procedure 6, Test condition 'K'	17	Unit to be switched ON in last half-an-hour for performance check for operation. Performance check after recovery for storage.
3	Damp Heat, +40 °C, 95% RH, 16 hours	10	Unit to be switched ON in last half-an-hour for performance check.
4	Low Temperature(Operation at -10 °C $\pm 3$ ° C, followed by storage at -40° C, 16 hours), Procedure 4, Test Condition 'H'	20	Unit to be switched ON in last half-an-hour for performance check.
5	Bump Test 40g, 6ms, 4000 bumps in vertical axis in packed condition	5	Performance check after test.
6	Shock Test 50g , 11ms(Vertical), and 22g, 11ms(lateral), 3 shocks in each of 6 faces (Unit in the rack)	NSS Grade II	Performance check after test.
7	Corrosion Salt Test 2 hours spray, 22 hours storage, 3 cycles Procedure 2 (On material samples)	9	-
8	Mould growth 29° C $\pm 1$ ° C at RH 90% for 28 days (On material samples)	21	-
9	Drip Proof Test Duration 15 minutes (Unit in the rack)	11	Unit to be switch ON, BITE monitored during testing. Performance check after test.

## 6. ESS TESTS

- On successful completion of QT of the LRUs namely VHF Filter and UHF Filter, the following are the ESS specs for Productions units.

### ESS SPECIFICATIONS:

S.NO.	NAME OF THE TEST	SEVERITIES	ESS GUIDELINES	REMARKS
1	RANDOM VIBRATION	Acceleration Level: 6 Grms Frequency Limits: 20 – 2000 Hz Axes Stimulated serially or Concurrently: 3 Duration of Vibration (minimum): Axes stimulated serially: 10 Minutes/axis Axes stimulated concurrently: 10 Minutes Power On/Off: On Equipment Monitoring: Go/no-go Input Stimulus: PSD of $0.04g^2/Hz$ from 20 To 2000 Hz with a 3dB/octave roll-off between 80 – 20 Hz and 350 – 3000 Hz performance monitoring	No.: 66301/Policy-07/ DQA(N)/QA-07 dated 14 Jun 2013	Performance Check during the test.
2	THERMAL CYCLING (PRINTED WIRING ASSEMBLIES)	Temp. Range (Minimum): $-50^{\circ}C$ to $+75^{\circ}C$ Temp. Rate of Change (Minimum): $20^{\circ}C/Minute$ Temp. Dwell Duration: Unit Stabilization Temp. Cycles: 20 to 40 Power On/Equipment Operating: No Equipment Monitoring: No Electrical Testing After Screen: Yes (at ambient temperature)	No.: 66301/Policy-07/ DQA(N)/QA-07 dated 14 Jun 2013	
3	THERMAL CYCLING (EQUIPMENT LEVEL)	Temp. Range (Minimum): $-40^{\circ}C$ to $+71^{\circ}C$ Temp. Rate of Change (Minimum): $15^{\circ}C/Minute$ Temp. Dwell Duration: Unit Stabilization Temp. Cycles: 12 to 20 Power On/Equipment Operating: On during heating ,Off during cooling Equipment Monitoring: Go/no-go performance monitoring Electrical Testing After Screen: Yes (at ambient temperature)	No.: 66301/Policy-07/ DQA(N)/QA-07 dated 14 Jun 2013	Performance Check during the test.
4	BURN-IN TEST	168 Hrs at Room Temperature or 48 Hrs at $+55^{\circ}C$	No.: 66301/Policy-10/ DQA(N)/QA-10 dated 14 Jun 2013	Performance Check during and after the test.

**Note:** 1. For Thermal Cycling Test either S.No.2 or S.No.3 can be chosen.

2. Screened Components only to be used (MIL Grade).

## **Instructions to Vendor**

1. 2 Nos. of each tender items are to be offered to us on **NO COST, NO COMMITMENT** basis for evaluation.
2. Reps of ECIL and the vendor shall conduct the preliminary design review (PDR) at vendor premises. PDR shall cover module level design. BOM and engineering aspects.
3. Engineering practices and workmanship should be in accordance with military grade equipment requirement. Components used shall be MIL/LCSO/industrial grade. ECIL shall exercise control over these aspects at all manufacturing stages.
4. Progress reviews shall be carried out on monthly basis until the prototype is delivered.
5. If the reps of ECIL conducting progress reviews are not satisfied that the vendor has not made any sufficient progress and may not be able to deliver the prototype may get cancelled.
6. Vendor shall submit ATP for electrical, environmental and EMI/EMC tests as per Section 5 of the tender.
7. Electrical ATP shall be held at vendor premises and vendor shall organize required tests and measuring equipments.
8. Vendor shall successfully complete environmental and EMI/EMC testing and field trials of the prototype in the system already mentioned.
9. Selected party must participate in ETMA evaluation trials
10. After successfully completing electrical ATP, environmental and EMI/EMC tests and field trials at our Customer Premises (ETMA, Mumbai) and integration with the main equipment at their own cost. The prototype shall be accepted and the vendor may be qualified for as an approved source.
11. Vendor shall supply along with each equipment a user/technical manual containing operating procedures, technical descriptions, module level BOM with component layout drawings, schematic drawings at module and equipment level, maintenance procedures and other related technical aspects.
12. Vendor shall be provided full access to the information on existing equipment to ensure utmost commonality of the newly engineered equipment with the existing equipment. Vendor shall sign a non-disclosure agreement to protect this information.
13. Specifications are subject to change in case of exigencies.
14. ECIL shall own the intellectual property rights over the design, development engineering and manufacturing of this product, as we have to integrate this filter to the transceiver. Vendors shall not have any rights what so ever over the products development for ECIL under this contract.
15. Vendors should ensure service support for a period of 15 years.
16. Suitable test jigs are to be designed, developed and manufactured by supplier only.
17. 2 sets of Design, Development and Testing Documents are to provided.
18. ESS Tests have to be carried out on each and every unit of the production items as per the then latest guidelines issued by DQAN ( Section 6 of the tender document).
19. The items under this contract (Digitally tunable filters VHF and UHF) are to be supplied exclusively to ECIL. Once vendor is included in list of vendors for supply of the items mentioned in this tender, the same should not be supplied to any other customers. The vendors should maintain all the related information confidentially.