

CHAPTER – 5

Prequalification document for Rewinding of 6 HP PMDC motors

1 BRIEF NOTE ON THE GMRT PROJECT

The National Centre for Radio Astrophysics (NCRA) of the Tata Institute of Fundamental Research (TIFR) has an active research program in many areas of astronomy and astrophysics. NCRA has setup a unique facility for radio astronomical research using the metre-wavelengths of the radio spectrum, known as the Giant Metre Wave Radio Telescope (GMRT), it is located at a site about 80km north of Pune. GMRT consists of 30 fully steerable parabolic dishes of 45m diameter each, spread over distances of upto 25km. Fourteen of the thirty dishes are located more or less randomly in a compact central array in a region of about 1 sq.km (Refer figure 1). The remaining sixteen dishes are spread out along the 3 arms of an approximately 'Y'-shaped configuration (Refer figure 2) over a much larger region, with the longest interferometry baseline of about 25km.

2 BRIEF DESCRIPTION OF GMRT SERVO SYSTEM

The GMRT Servo Control System is located at the base of each antenna and facilitates the accurate tracking of targets by positioning the Azimuth (AZ) and Elevation (EL) axes of the antenna. The servo electronics housed in three cabinets, namely AZ and EL drive-Power cabinets and control cabinets. The 45m diameter parabolic dish of the antenna is mounted on EL axis, which in turn rests on AZ axis. Counter-weights are used to balance the load in the EL drive system. AZ axis is steerable in the range of -270 to +270 degree and EL axis can be steered from 15 to 110 degree. Each axis is driven by two numbers of 6HP Permanent Magnet Direct Current (PMDC) motors which have in-built fail-safe brake, tachometer and thermostat. Each motor is driven by a four quadrant thyristor based DC Servo Amplifiers. AZ/EL axes are coupled to respective motor pair through reduction gears. Motors are coupled in counter torque arrangement so as to reduce back-lash errors. Refer annexure – II for GMRT Servo System specifications.

3. PREQUALIFICATION CRITERIA :

1. Applicant must have been in the business of servicing, repairing and rewinding of brushed DC motors for the past three years. Document evidencing the same like purchase orders / work orders executed and on hand needs to be submitted.
Applicant to please enclose copy of certificate of their authorized service partners along with the quotation.
2. Intending firms / contractors must have been registered with shops and Establishments, company incorporated, registered partnership firm etc.
3. Must have valid Service Tax and VAT Registration.
4. Must have valid insurance policy for their Work/Service Centre including cover for third party materials.

4. **LANGUAGE :**

The prequalification bid prepared by the bidder, as well as all correspondences and documents relating to the bid and exchanged by the bidder and NCRA, shall be written in English language.

5. **SUBMISSION OF PREQUALIFICATION DOCUMENT :**

Documents complete in all respect must be submitted in a sealed envelope duly superscribed to be sent to:

**Purchase Officer,
National Centre for Radio Astrophysics (NCRA),
Tata Institute of Fundamental Research (TIFR),
NCRA, Pune University Campus, Post Bag 3, Ganeshkhind,
Pune 411 007, India.**

6. **OPENING OF BIDS :**

If sufficient responses are received by the due date, it will be opened after the due date, if not, reminders will be sent extending the due date for submission.

7. **CLARIFICATION OF BIDS :**

During evaluation of the prequalification document the Centre may, at its discretion, ask the parties for clarifications. The request for clarification and the response shall be in writing.

8. **RIGHT TO ACCEPT OR REJECT PREQUALIFICATION DOCUMENT :**

Centre reserves the right to accept or reject any or all responses without assigning any reasons.

9. **EVALUATION OF THE RESPONSES :**

Response received against this advertisement will be scrutinized and list of parties who meet our pre-qualification criteria will be prepared. Centre will use this list subsequently for floating limited tenders. Centre may restrict the number of prequalified parties to any number deemed suitable to whom limited tender will be sent by it if too many applications are received satisfying the prequalification criteria.

Decision of the Centre in this regard is final. No interim correspondence shall be entertained.

10.0 SCOPE OF WORK

1. Rewinding of 6HP PMDC Motors are per detailed scope of work,

11.0 PLACE OF WORK

1. **Motor rewinding – At vendor / contractor premises.**

12.0 DURATION OF CONTRACT

1. April – 2015 to March – 2017

13.0 ORDER QUANTITY FOR REWINDING

S.No	Description	Period of Contract	Quantity
1	1) Armature rewinding with Class H Insulation 2) Repair/Replacement of Commutator Segment 3) Armature Shaft repair 4) Tacho Generator Rewinding	April-2015 to March-2017	25 Motors

14.0 TECHNICAL SPECIFICATIONS OF PMDC MOTOR

14.1 Motor

Make	:	Kollmorgen
Type	:	TTB2-53810-3036-T, Permanent Magnet, Low inertia
Power	:	6 HP
Maximum Speed	:	2250 RPM
Continuous Current	:	85 A
Peak Current	:	200 A
Maximum Terminal Voltage	:	150 V
Dimensions	:	549 x 238 x 227 (L x H x W)
Weight	:	~80 Kgs

14.2 Tacho Generator

Voltage Sensitivity	:	17 V/ KRPM
Output	:	DC

14.3 Brake

Input	:	90 V, 0.39 A
Brake Torque	:	22 ft-lb

14.4 Cost of Motor

Approximate cost of Motor	:	Rs. 4 Lakhs
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15.0 DEAILED SCOPE OF WORK FOR REWINDING

15.1 SCOPE OF WORK

1. Armature Rewinding with class H Insulation
2. Repair/Replacement of Commutator Segment
3. Armature Shaft repair
4. Tacho Generator Rewinding & Others

15.2 ISSUE OF MOTORS

1. The Vendor / Contractor should pick up the motors from GMRT, Khodad immediately with in two working days from our notification by e-mail.
2. Only **Four motors** will be provided for repair / rewinding at a time. Vendor / Contractor will be responsible for the safety of the motors during transit as well as in their custody during repair.
3. The transportation of serviced motors from GMRT, Khodad to Vendor / Contractor premises and vice versa is the responsibility of the Vendor / Contractor.
4. The Contractor / Vendor should take care of Octroi / escort etc.
5. Vendor / Contractor should submit the insurance policy taken by them for their workshop and for our four motors.
6. Only on receipt of previous lot of repaired items, next lot of motors for repair will be given.
7. Motors will be taken out from GMRT premises only with valid gate pass duly signed by the authorized person. The gate pass should indicate the Serial Number, Make of the motor along with reason for taking out from GMRT.

15.3 DURATION OF SERVICE

FOR REWINDING: Within three weeks from the date of receipt of our motors.

FOR REPLACEMENT of ANY PART: One week from the data of our conformation.

15.4 DELIVERY OF MOTORS

1. The Vendor / Contractor should deliver the rewind motors at GMRT, Khodad and inspection will be done by servo engineer in front of him at the test setup.
2. Before delivery Vendor / Contractor should check the rewind motors at it premises for normal operation.

15.5 VALIDATION AND TESTING

1. Vendor / Contractor has to take prior appointment and intimate us the date of visit one week in advance by email / Telephone.
2. Megger value should be minimum of 2000M Ω at 1000V.
3. Repaired or Re-wound motors will be tested with amplifier speed loop test setup located at GMRT, Khodad in front of the contractor / vendor.

4. Load test will be conducted on rewound motor upto 40A of current.
5. Refer the attached test report for validation. All the test results must be satisfactory and performance of rewound motor was good then only it will be accepted. Rewound motors are failing the various tests Contractor / Vendor may repair the same. During this GMRT will not pay the charges for transportation.

15.6 GURANTEE

Re-wounded/ Repaired items of the motors must be guaranteed for a period of one year for the satisfactory functioning.

16. TERMS & CONDITIONS FOR REWINDING

1. GMRT Servo Group has a right to distinguish the vendor for service and rewinding & keep the choice for not having common vendor for servicing and re-winding. If the contractor / Vendor selected for rewinding are not eligible for service of the same and vice-versa.
2. This specification is intended as a general description of quality envisaged for materials, workmanship and the finished work. It is not intended to cover minute details. The work shall be executed in accordance with the best modern practices and to the complete satisfaction of the GMRT.
3. Vendor / Contractor have to keep record all items taken such as quantity, Serial Number etc. from GMRT and delivered to GMRT.
4. All the quality standards to be followed for repair, service and rewinding of large permanent magnet DC motors.
5. Defective parts removed from the motor in the presence of our engineering staff to be listed properly with their part number, description, quantity, make etc. are to be handed over to Engineer or his authorized representative for surrendering to our IMD Cell.
6. Vendor / Contractor may submit copy of valid insurance policy taken against theft and fire for their service workshop including third party material lying in their workshop.
7. Inspection will be done by GMRT representative during the course of work.
8. Other than scheduled or planned repair and rewinding Contractor / Vendor may need to provide their service during emergency situations.
9. The Contractor / Vendor is advised to visit the site, after taking prior permission from the GMRT servo representative to inspect the antenna structure and the adjoining areas to familiarize himself with site conditions and the requirements in prior to submission of their bid.
10. **Settlement of Dispute:** For any dispute arising out of the contract, it should be the intention of both the parties to settle the matter amicably without referring it to the Court of Law. For any dispute, the matter will be referred to the Centre Director, NCRA whose decision will be final and binding on both the parties.

17. Contact person for the above visits etc. –

Shri B. Thiyagarajan /
Shri Suresh Sabhapathy
Servo Group,
Giant Metrewave Radio Telescope Office,
National Centre for Radio Astrophysics
Tata Institute of Fundamental Research,
Post Box No 6,
Khodad,Pune — 410504.
Phone: 02132-258300/320/420,

18. PAYMENT : will be made within 15 days on receipt of acceptance of repaired / rewounded motors at GMRT, Khodad.

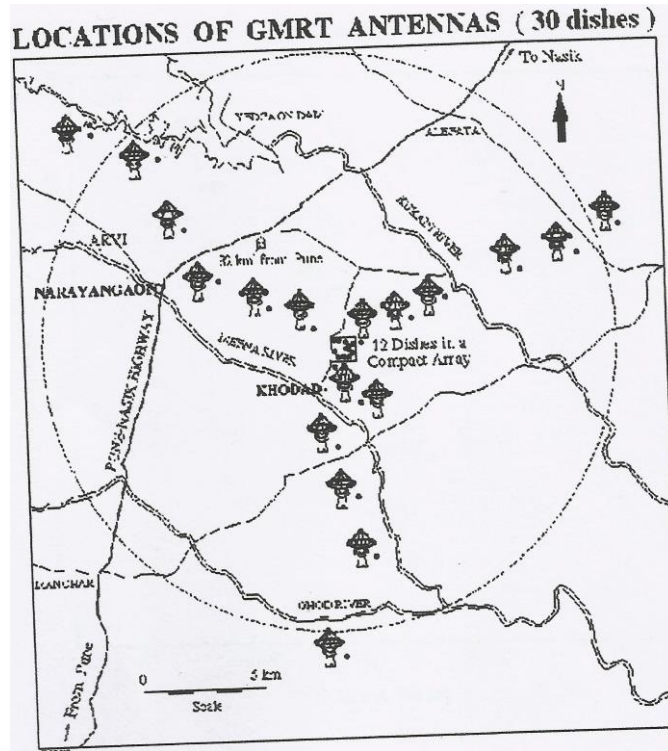
ANNEXURE - II

GMRT SERVO SYSTEM SPECIFICATIONS

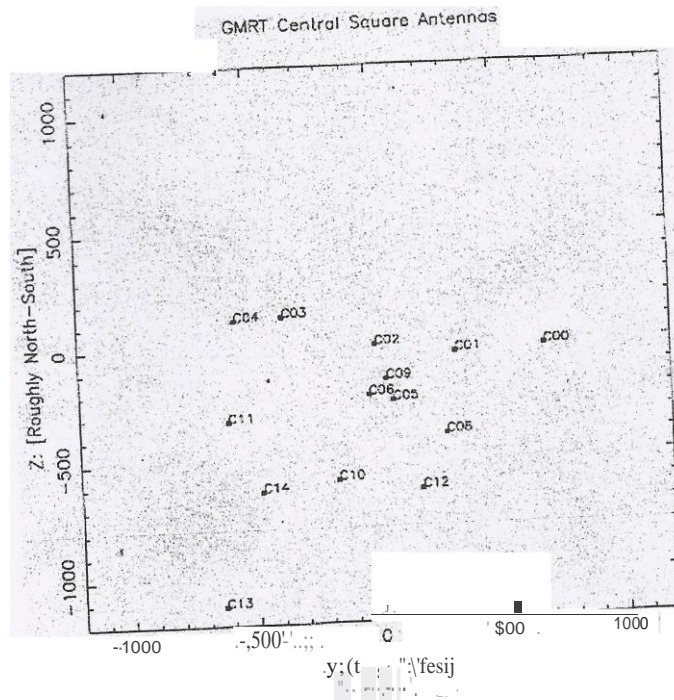
Dish Mount	Alt-Azimuth
Dish Movement	+/- 270 degree in Azimuth Axis 15 to 110 degree in Elevation Axis
Dish Speed	30 Deg/Min in Azimuth Axis 20 Deg/Min in Elevation Axis
Tracking Speed Minimum	5 Arc min/min in both axis
Tracking Speed Maximum	150 Arc min/min in Azimuth 15 Arc min/min in elevation
Pointing Accuracy	1Arc min rms for wind speed < 20KMPH Few Arc min rms for wind speed > 20KMPH
Gear Reduction Ratio	18963 in Azimuth 25162 in Elevation
Operating Voltage	415V AC, 3Phase, 50Hz.

Annexure - I

GMRT Antenna Location

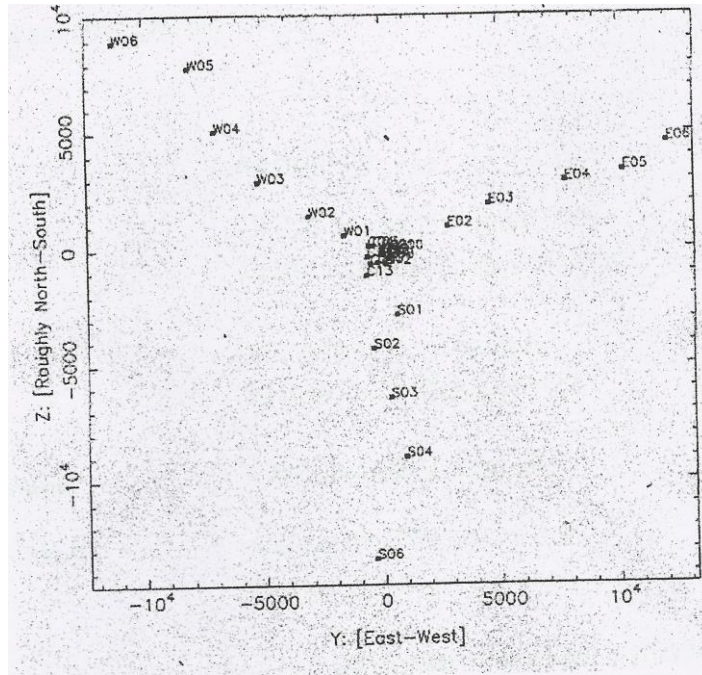


Central Square Antenna Configuration



Y-Array Antenna Configuration

GMRT Y-Array Antennas



Identification of faults on motors removed from antenna for repairs

Form K5

This sheet is to be filled by inspector and contractor for identifying the faults and for giving clearance for rectification of the same.

Ref: GMRT/KH/MOT check:repairs/callsheet no:

Dated:

1.0 Continuity Test (Before Opening Motor)

S.No	Description	Armature		Tacho		Brake		Remarks
1	AZ Motor 1							
2	AZ Motor 2							
3	EL Motor 1							
4	EL Motor 2							

2.0 Megger Test

S.No	Description	2.1	2.2	2.3	2.4	2.5	2.6	Motor Frame No
1	AZ M1 Armature							
2	AZ M2 Armature							
3	EL M1 Armature							
4	EL M2 Armature							
5	AZ M1 Tacho							
6	AZ M2 Tacho							
7	EL M1 Tacho							
8	EL M2 Tacho							
9	AZ M1 Brake							
10	AZ M2 Brake							
11	EL M1 Brake							
12	EL M2 Brake							

2.1	Megger value taken at antenna site	2.2	Megger value taken at repair shop
2.3	Megger value taken after opening the motor	2.4	Megger value taken after blowing carbon brush
2.5	Megger value taken after cleaning with CTC	2.6	Megger value taken after heating

3.0 Rewinding / Service Status

S.No	Motor Frame No.	Action to be Taken	Rewinding of			
			Brake	Tacho	Armature	Commutator
1		Assmble/Rewind				
2		Assmble/Rewind				
3		Assmble/Rewind				
4		Assmble/Rewind				

Checked By _____

Contractor| _____

Approved By _____

(Approved for carrying out repairs as detailed in para no.3 above)

Signature:

Signature:

Signature:

Date:

Date:

Date:

Performance test report on serviced/repaired 6HP servo motors

Form K6

A.1 Megger Test for serviced / repaired motor as detailed below

S.No	Motor Frame No		Armature/Body		Tacho/Body		Brake/Body
1							
2							
3							
4							

B.1 Continuity Test for serviced / repaired motor as detailed below

S.No	Motor Frame No		Armature/Body		Tacho/Body		Brake/Body
1							
2							
3							
4							



IMPORTANT: PI should note the following polarity convention for avoiding over speed while checking motor in the amplifier test mode.

1. Connect Motor armature & tacho connectors to amplifier.
2. Rotate motor shaft CW by hand and measure tacho HI voltage (C4) MCC w.r.t GND.
3. Rotate motor shaft CW by hand and measure armature voltage (pin. 3) of TB using DMM w.r.t GND.
4. Measured polarity convention at Sr.No 2 & 3 should be opposite.

S.No	Description	Terminal	Direction of Rotation	
			CW	CCW
1	Armature Voltage between terminals			
2	Terminal voltage between terminals			

E.1 Motor Thermo Stat Status

S.No	Motor Frame No	Status (D & E)	S.No	Motor Frame No	Status
1			3		
2			4		

Requisition of 6HP Motor installation on GMRT Antenna

Form K8

Reg: GMRT/KH MOT INSTALL/K8

DATE:

Cross Ref: Callsheet No:

Dated:

S.No	Activity A	Activity B
1	Activity A means motors are released by GMRT for installation to contractor serviced or new one from outside agencies other than installation contractor.	Activity B means motors are serviced or repaired by the installation contractor at the motor repair shop in GMRT campus.

Dear Sir,

The following 6HP servo motors are to be installed in GMRT antenna as follows,

Antenna No		Axis	Azimuth	Elevation
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S.No	Motor Position in Antenna	Motor Serial No
1	Azimuth Left Motor	
2	Azimuth Right Motor	
3	Elevation Up Motor	
4	Elevation Down Motor	

Requisition Filled By		Fitment of Motors authorized by	
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Signature

Signature

Date:

Date:

Work Done Report

Antenna No:

Date:

Start Date		Vehicle No for transporting motors to antenna	
End Date		Number of persons deployed by contractor	
Fitment of motors on antenna checked by			

Signature

Contractor Signature

Date:

Date:

Note: This form is to be enclosed to the bill raised by the contractor for onward transaction of accounts

**Performance report of 6HP motors fitted on antenna by the installation contractor
(Either activity A or Activity B)**

Form K9

Ref: GMRT/KH/MOTINSTALL/K9

I. Motors fitted as per form K8	On:	Antenna	
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II. Mechanical Performance

Axis	Motor No	Description	Status			
AZ	A.1	Locating of key and inserting the motor shaft into the hollow block coupling and fitting of flange bolts.	OK		Not OK	
	A.2	If A.1 OK then see blow, else repeat alignment, rotation of antenna axis in manual mode and check for any abnormal sound and current variation from min to max value.	Normal Sound	OK	Not OK	
			Range of current value			
EL	E.1	Locating of key and inserting the motor shaft into the hollow block coupling and fitting of flange bolts.	OK		Not OK	
	E.2	If E.1 OK then see blow, else repeat alignment, rotation of antenna axis in manual mode and check for any abnormal sound and current variation from min to max value.	Normal Sound	OK	Not OK	
			Range of current value			

Axes cleared for checking by servo person

Checked By Mechanical Person			Signature Date:
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III. S.1 Testing in MANUAL – Single Motor operation and recording currents for AZ Motor A (LH)

Direction	Input POT	Tacho A	Tacho B	Amm A	Crnt A	HHT			
						Tacho A	Tacho B	Crnt A	
CW	1 V								
	5 V								
CCW	1 V								
	5 V								

S.1 Testing in MANUAL – Single Motor operation and recording currents for AZ Motor B (RH)

Direction	Input POT	Tacho A	Tacho B	Amm B	Crnt B	HHT			
						Tacho A	Tacho B		Crnt B
CW	1 V								
	5 V								
CCW	1 V								
	5 V								

S.1 Testing in MANUAL operation and recording currents for both AZ Motors

Direction	Input POT	Tacho A	Tacho B	Amm A	Amm B	Crnt A	Crnt B	HHT			
								Tacho A	Tacho B	Crnt A	Crnt B
CW	1 V										
	5 V										
CCW	1 V										
	5 V										

IV. S.1 Testing in MANUAL – Single Motor operation and recording currents for EL Motor A (DN)

Direction	Input POT	Tacho A	Tacho B	Amm A	Crnt A	HHT			
						Tacho A	Tacho B	Crnt A	
UP	1 V								
	5 V								
DN	1 V								
	5 V								

S.1 Testing in MANUAL – Single Motor operation and recording currents for EL Motor B (UP)

Direction	Input POT	Tacho A	Tacho B	Amm B	Crnt B	HHT			
						Tacho A	Tacho B		Crnt B
UP	1 V								
	5 V								
DN	1 V								
	5 V								

S.1 Testing in MANUAL operation and recording currents for both EL Motors

Direction	Input POT	Tacho A	Tacho B	Amm A	Amm B	Crnt A	Crnt B	HHT			
								Tacho A	Tacho B	Crnt A	Crnt B
UP	1 V										
	5 V										
DN	1 V										
	5 V										

S.2 Testing in LOCAL mode operation and recording currents:

Azimuth

Directi on	Input POT	Tacho A	Tacho B	Amm A	Am m B	Crnt A	Crnt B	HHT				
								Tacho A	Tacho B	Crnt A	Crnt B	
CW												
CCW												

Elevation

Directi on	Input POT	Tacho A	Tacho B	Amm A	Am m B	Crnt A	Crnt B	HHT				
								Tacho A	Tacho B	Crnt A	Crnt B	
UP												
DN												

S.3 Testing in REMOTE mode operation and recording currents:

Azimuth

Directi on	Input POT	Tacho A	Tacho B	Amm A	Am m B	Crnt A	Crnt B	HHT				
								Tacho A	Tacho B	Crnt A	Crnt B	
CW												
CCW												

Elevation

Directi on	Input POT	Tacho A	Tacho B	Amm A	Am m B	Crnt A	Crnt B	HHT				
								Tacho A	Tacho B	Crnt A	Crnt B	
UP												
DN												

Remarks

Checked By Servo Person			Signature Date:
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