



BIDDING DOCUMENT

No. _____

**SUPPLY, INSTALLATION AND COMMISSIONING OF
SPECTRUM MONITORING SYSTEM FOR
EXPANSION OF NFMMS PROJECT**

**FREQUENCY ALLOCATION BOARD HEADQUARTERS
ISLAMABAD, GOVERNMENT OF PAKISTAN**

TABLE OF CONTENTS

Section I.	Invitation for Bids-----	01
	-	
	Notes on the Invitation for Bids	01
Section II.	Instructions to Bidders-----	02
	-	
	Table of Clauses	02
	Notes on the Instructions to Bidders	03
Section III.	Bid Data Sheet-----	23
	-	
	Notes on the Bid Data Sheet	23
Section IV.	General Conditions of Contract-----	26
	-	
	Table of Clauses	26
	Notes on the General Conditions of Contract	27
Section V.	Special Conditions of Contract-----	39
	-	
	Table of Clauses	39
	Notes on the Special Conditions of Contract	40
Section VI.	Technical Specifications and Drawings-----	45
	Table of Clauses	45
	Notes on Preparing the Technical Specifications and Drawings	47
Section VII.	Sample Forms and Procedures-----	94
	-	
	Table of Clauses	94
	Notes on the Sample Forms and Procedures	95
	1. Bid Forms and Price Schedules	95
	2. Bid Security Form	103
	3. Bank Guarantee Form for Advance Payment	104

4. Manufacturer's Authorization Form	105
5. Performance Security Forms	106
6. Contract Form	107
7. Form of Completion Certificate	108
8. Form of Operational Acceptance Certificate	109

SECTION-I
INVITATION FOR BIDS

INVITATION FOR BIDS

Date: March 2008

1. “Frequency Allocation Board Headquarters, Islamabad” invites sealed bids from eligible bidders to supply, install and commission the following compatible, off-the-shelf, standard interfaced equipment on turnkey basis for Expansion of National Frequency Management & Monitoring System. The bidders must have proven past experience in production, supply and installation of spectrum management and monitoring systems. Bidders must bid for complete lots of systems mentioned below, with complete hardware, software and firmware: -

Detail of Equipment

Lot No	Type of Equipment	Qty	Bid Security (Rs)
1.	VHF/UHF Mobile Monitoring System	01	5% of bid value
2.	VHF/UHF Portable / Handheld Monitoring System	07	
3.	Transportable / Mobile Microwave Monitoring Station	02	
4.	RF Field Strength Meter	07	
5.	Mobile Vehicles (4x4)	03	

2. Bidding will be conducted through international competitive bidding, and is open to all bidders from eligible source countries.

3. Interested/eligible bidders may obtain further information in writing from the office of Director (Monitoring) Frequency Allocation Board Headquarters, Plot No. 112, Sector H-10//4, Islamabad, Telephone: +92-51-9257597 Fax: +92-51-9257595, email: dirmon@pta.gov.pk.

4. A complete set of bidding documents may be purchased by interested bidders on submission of written application (mentioning the bidder’s complete name, address, contact person, contact numbers and email), to the above and upon payment of nonrefundable fee of Rs. 5000/- (Rupees five thousand only) or US\$ 100. The mode of payment will be in the form of Pay Order/Demand Draft or through direct deposit in National Bank of Pakistan, Industrial Area Branch H-9/4 Islamabad (Branch Code:1531), Account No. 1042-8, in favor of “Frequency Allocation Board Headquarters Islamabad”. The Bid Document will be sent by courier / airmail. The same can also be obtained by hand from the office of the undersigned.

5. Pre-bid meeting will take place at the above office at 1100 hours on 02nd April 2008. Bids must be delivered to the above office on or before 13:00 hours 05th May 2008 and must be accompanied by a bid security of 5% (five percent) of the bid value.

6. Bids will be opened in the presence of bidders or their authorized representatives, who choose to attend at 13:00 hours on 05th May 2008 at Frequency Allocation Board Headquarters, Plot No. 112, Sector H-10/4, Islamabad.

7. “Frequency Allocation Board, Headquarters” reserves the right to accept or reject any bid without assigning any reasons to the bidder(s).

Director (Monitoring)
FAB Headquarters, H-10/4 Islamabad
Postal Code 44000, Islamabad, Pakistan

SECTION-II
INSTRUCTIONS TO BIDDERS

Table of Clauses

A. Introduction.....	3
1. Source of Funds	3
2. Eligible Bidders	3
3. Eligible Plant, Equipment, and Services.....	3
4. Cost of Bidding.....	3
B. The Bidding Documents.....	4
5. Content of Bidding Documents	4
6. Clarification of Bidding Documents; and Pre-Bid Meeting	4
7. Amendment of Bidding Documents	5
C. Preparation of Bids	6
8. Language of Bid.....	6
9. Documents Comprising the Bid.....	6
10. Bid Form and Price Schedules.....	9
11. Bid Prices	9
12. Bid Currencies	10
13. Bid Security	10
14. Period of Validity of Bid	11
15. Format and Signing of Bid.....	11
D. Submission of Bids	12
16. Sealing and Marking of Bids	12
17. Deadline for Submission of Bids	13
18. Late Bids	13
19. Modification and Withdrawal of Bids	13
E. Bid Opening and Evaluation	14
20. Opening of Bids by Employer	14
21. Clarification of Bids.....	15
22. Preliminary Examination of Bids.....	15
23. Technical Evaluation	16
24. Opening of Financial Bids and Commercial Evaluation	16
25. Contacting the Employer	19
F. Award of Contract.....	20
26. Post-qualification	20
27. Award Criteria	20
28. Employer's Right to vary Quantities at Time of Award.....	20
29. Employer's Right to Accept any Bid and to Reject and or all Bids	20
30. Notification of Award.....	20
31. Signing of Contract.....	21
32. Performance Security	21
33. Corrupt and Fraudulent Practices	21

Instructions to Bidders

A. Introduction

- 1. Source of Funds**
 - 1.1 Frequency Allocation Board, Headquarters, hereinafter referred to as “the Employer” will complete the project through FAB funds.
- 2. Eligible Bidders**
 - 2.1 This Invitation of Bids is open to all suppliers from all countries except Israel.
 - 2.2 Bidders should not be associated, or have been associated in the past, directly or indirectly, with a firm or any of its affiliates which have been engaged by the Employer to provide consulting services for the preparation of the design, specifications, and other documents to be used for the procurement of the goods to be purchased under this Invitation for Bids.
 - 2.3 Bidders shall not be under a declaration of ineligibility for corrupt and fraudulent practices issued by the Government of Pakistan.
- 3. Eligible Goods, Equipment and services**
 - 3.1 All goods, equipment and related services to be supplied under the contract shall have their origin in eligible source countries defined by Government of Pakistan for Procurement, and all expenditures made under the contract will be limited to such goods and services.
 - 3.2 For purposes of this clause, “origin” means the place where the goods are manufactured or produced, or the place from which the related services are supplied to major parts of the world. Goods are produced when, through manufacturing, processing, or substantial and major assembly of components, a commercially recognized product results that is substantially different in basic characteristics or in purpose or utility from its components.
 - 3.3 The origin of goods and services can be distinct from the nationality of the Bidder.
- 4. Cost of Bidding**
 - 4.1 The Bidder shall bear all costs associated with the preparation and submission of its bid, and the Employer named in the Bid Data Sheet, hereinafter referred to as “the Employer” will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.

B. The Bidding Documents

- 5. Content of Bidding Documents**
- 5.1 The goods required, bidding procedures, and contract terms are prescribed in the bidding documents. In addition to the Invitation for Bids, the bidding documents include:
- (a) Instructions to Bidders (ITB)
 - (b) Bid Data Sheet (BDS)
 - (c) General Conditions of Contract (GCC)
 - (d) Special Conditions of Contract (SCC)
 - (e) Schedule of Requirements
 - (f) Technical Specifications
 - (g) Bid Form and Price Schedules
 - (h) Bid Security Form
 - (i) Form of Contract Agreement
 - (j) Performance Security Form
 - (k) Bank Guarantee for Advance Payment Form; and
 - (l) Manufacturer's Authorization Form
- 5.2 The Bidder is expected to examine all instructions, forms terms, and specifications in the bidding documents. Failure to furnish all information required by the bidding documents or to submit a bid not substantially responsive to be bidding documents in every respect will be at the Bidder's risk and may result in the rejection of its bid.
- 6. Clarification of Bidding Documents**
- 6.1 A prospective bidder requiring any clarification of the bidding documents may notify the Employer in writing or by facsimile or email at the Employer's address indicated in **BDS**. The Employer will respond in writing to any request for clarification of the bidding documents, which it receives no later than 15 days prior to the deadline for the submission of bids prescribed in the BDS. Written copies of the Employer's response (including an explanation of the query but without identifying the source of inquiry) will be sent to all prospective bidders that have received the bidding documents.
- 6.2 The Bidder may visit and examine the site for interfacing /integration with existing database system, subject to prior clearance / permission from the employer, where the facilities are to be installed and its surroundings and obtain for itself on its own responsibility all information that may be necessary for preparing the bid and entering into a contract for supply and installation of the facilities. The costs of

visiting the site shall be at the Bidder's own expense.

6.3 The Bidder's designated representative is invited to attend a pre-bid meeting, which will take place at the venue and time stipulated in the **BDS**. The purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage. The Bidder is requested, as far as possible, to submit any question in writing or by facsimile / email, to reach the Employer not later than 3 working days before the meeting. It may not be practicable at the meeting to answer questions received late, but questions and responses will be transmitted as indicated hereafter. Minutes of the meeting, including the text of the questions raised and the responses given, together with any responses prepared after the meeting will be transmitted within two (2) working days to all employers of the bidding documents. Any modification of the bidding documents listed in ITB Sub-Clause 5.1, which may become necessary as a result of the pre-bid meeting shall be made by the Employer **exclusively through the issue of an Addendum** pursuant to ITB Clause 7 and not through the minutes of the pre-bid meeting.

7. Amendment of Bidding Documents

7.1 At any time prior to the deadline for submission of bids, the Employer, for any reason, whether at its own initiative or in response to a clarification requested by a prospective Bidder, may modify the bidding documents by amendment.

7.2 All prospective bidders that have purchased the bidding documents will be notified of the amendment in writing either through fax or by email, and the same will be binding on them. Bidders are required to immediately acknowledge receipt of any such amendment, and it will be assumed that the information contained therein will have been taken into account by the Bidder in its bid.

7.3 In order to allow prospective bidders reasonable time in which to take the amendment into account in preparing their bids, the Employer, at its discretion, may extend the deadline for the submission of bids in which case, the employer will notify all bidders in writing either through fax or by email of the extended deadline.

C. Preparation of Bids

- 8. Language of Bid** 8.1 The bid prepared by the Bidder and all correspondence and documents related to the bid exchanged by the Bidder and the Employer shall be written in English language.
- 9. Documents Comprising the Bid** 9.1 The bid submitted by the Bidder shall comprise the Bid Form duly completed and signed by the Bidder, together with all Attachments identified in ITB Sub-Clause 9.2 below.
- 9.2 Each Bidder shall submit with its bid the following attachments:
- (a) Attachment 1: Bid Security
- A bid security furnished in accordance with ITB Clause 13.
- (b) Attachment 2: Power of Attorney
- A power of attorney, duly notarized, indicating that the person(s) signing the bid has(ve) the authority to sign the bid and that bid is binding upon the Bidder during the full period of its validity in accordance with ITB Clause 14.
- (c) Attachment 3: Bidder's Eligibility and Qualifications
- In the absence of prequalification, documentary evidence established in accordance with ITB Clause 2 that the Bidder is eligible to bid and is qualified to perform the contract if its bid is accepted.
- The documentary evidence of the Bidder's eligibility to bid shall establish to the Employer's satisfaction that the Bidder, at the time of submission of its bid, is from an eligible source country as defined in ITB Sub-Clause 2.1. The Bidder(s) shall provide an affidavit on stamp paper that the Bidder is eligible as defined in ITB Sub-Clause 2.2 and 2.3.
- The documentary evidence of the Bidder's qualifications to perform the contract, if its bid is accepted, shall establish to the Employer's satisfaction that the Bidder has the financial, technical, production, procurement, shipping, installation and other capabilities necessary to perform the contract, and, in particular, meets the experience and other criteria outlined in the **BDS**.

Bids submitted by a joint venture of two or more firms as partners shall comply with the following requirements:

- (i) The bid shall include all the information required for Attachment 3 as described above for each joint venture partner.
- (ii) The bid shall be signed so as to be legally binding on all partners.
- (iii) One of the partners responsible for performing a key component of the contract shall be designated as leader, this authorization shall be evidenced by submitting with the bid a power of attorney signed by legally authorized signatures.
- (iv) The leader shall be authorized to incur liabilities and receive instructions for and on behalf of any and all partners of the joint venture, and the entire execution of the contract, including payment, shall be done exclusively with the leader.
- (v) All partners of the joint venture shall be liable jointly and individually for the execution of the contract in accordance with the contract terms.
- (vi) A copy of the agreement entered into by the joint venture partners shall be submitted with the bid.

In the case of a Bidder who offers to supply and/or install plant and equipment under the contract that the Bidder did not manufacture or otherwise produce and/or install, the Bidder shall (i) have the financial and other capabilities necessary to perform the contract; (ii) have been duly authorized by the manufacturer or producer of the related plant and equipment or component to supply and/or install that item in the Employer's country; and (iii) be responsible for ensuring that the manufacturer or producer complies with the requirements of ITB Sub-Clause 2.1 and meets the minimum criteria listed for an individual Bidder for that item.

In the case of a Bidder not doing business within Pakistan, the bidder is or will be (if awarded the contract) represented by an Agent in that country equipped and able to carryout the suppliers maintenance, repair, installation and spare parts-stocking obligations prescribed in the condition of contract and /or technical specifications.

(d) Attachment 4: Eligibility and Conformity of the Facilities

Documentary evidence established in accordance with ITB Clause 3 that the facilities offered by the Bidder in its bid or in any alternative bid (if permitted) are eligible and conform to the bidding documents.

The documentary evidence of the eligibility of the facilities shall consist of a statement on the country of origin of the plant and equipment offered, which shall be confirmed by a certificate of origin issued at the time of shipment.

The documentary evidence of the conformity of the facilities to the bidding documents may be in the form of literature, drawings and data, and shall furnish:

- (i) a detailed description of the essential technical and performance characteristics of the facilities;
- (ii) a list giving full particulars, including available sources, of all spare parts, special tools, etc., necessary for the proper and continuing functioning of the facilities for the period named in the **BDS**, following completion of facilities in accordance with provisions of contract; and
- (iii) a commentary on the Employer's Technical Specifications and adequate evidence demonstrating the substantial responsiveness of the facilities to those specifications. Bidders shall note that standards for workmanship, materials and equipment designated by the Employer in the bidding documents are intended to be descriptive (establishing standards of quality and performance) only and not restrictive. The Bidder may substitute alternative standards, brand names and/or catalog numbers in its bid, provided that it demonstrates to the Employer's satisfaction that the substitutions are substantially equivalent or superior to the standards designated in the Technical

Specifications.

- 10. Bid Form** 10.1 The Bidder shall complete the Bid Form and the appropriate Price Schedule furnished in the bidding documents, indicating the goods to be supplied, a brief description of the goods, their country of origin, quantity, and prices.
- 11. Bid Prices** 11.1 Unless otherwise specified in the Technical Specifications, bidders shall quote for the entire facilities on a “single responsibility” basis such that the total bid price covers all the Contractor’s obligations mentioned in or to be reasonably inferred from the bidding documents in respect of the design, manufacture, including procurement and subcontracting (if any), delivery, construction, installation and completion of the facilities. This includes all requirements under the Contractor’s responsibilities for testing, pre-commissioning and commissioning of the facilities and, where so required by the bidding documents, the acquisition of all permits, approvals and licenses, etc.; the operation, maintenance and training services and such other items and services as may be specified in the bidding documents. Items against which no price is entered by the Bidder will not be paid for by the Employer when executed and shall be deemed to be covered by the prices for other items.
- 11.2 The bidder shall indicate on the appropriate Price Schedule the unit prices (where applicable) and total bid price of the goods it proposes to supply under the contract.
- 11.3 Bidders shall give a breakdown of the prices in the manner and detail called for in the Price Schedules, in the following manner:
- Separate numbered Schedules shall be used for each of the following elements. The total amount from each Schedule (1 to 4) shall be summarized in a Grand Summary (Schedule 4) giving the total bid price(s) to be entered in the Bid Form.
- Schedule No. 1 Equipment including all the main systems, subsystems, software, firmware, components and any other accessories.
- Schedule No. 2 Incidental / Installation & integration Services
- Schedule No. 3 Maintenance Services / contract (for the period specified in BDS)
- Schedule No. 4 Grand Summary (Sum of Schedule

- Nos. 1 to 3)
- 11.4 Prices indicated on the Price Schedule shall be FOR basis, inclusive of all the taxes, duties, freight and transportation charges for the destination.
- 11.5 Bidders are required to quote the price for the commercial, contractual and technical obligations outlined in the bidding documents.
- 11.6 The term DDP (Delivered Duty Paid), shall be governed by the rules prescribed in the current edition of Incoterms published by the International Chamber of Commerce, Paris.
- 11.7 The Bidder's separation of price components in accordance with ITB Clause 11.3 above will be solely for the purpose of facilitating the comparison of bids by the Employer and will not in any way limit the Employer's right to contract on any of the terms offered.
- 11.8 Prices quoted by the Bidder shall be fixed during the Bidder's performance of the contract and not subject to variation on any account, unless otherwise specified in the Bid Data Sheet. A bid submitted with a adjustable price quotation will be treated as non-responsive and will be rejected, pursuant to ITB Clause 24. If, however, in accordance with the Bid Data Sheet, prices quoted by the Bidder shall be subject to adjustment during the performance of the contract, a bid submitted with a fixed price quotation will not be rejected, but the price adjustment would be treated as zero.
- 12. Bid Currencies** 12.1 Prices shall be quoted in Pak Rupees.
- 13. Bid Security** 13.1 Pursuant to ITB Clause 9, the Bidder shall furnish, as part of its bid, a bid security in the amount specified in the Bid Data Sheet.
- 13.2 The bid security is required to protect the Employer against the risk of Bidder's conduct, which would warrant the security's forfeiture, pursuant to ITB Clause 13.7.
- 13.3 The bid security shall be in Pak. Rupees and shall be a bank guarantee issued by a reputable AAA rated Bank located in Pakistan, in the form provided in the bidding documents or another form acceptable to the Employer and valid for thirty (30) days beyond the validity of the bid.

- 13.4 Any bid not secured in accordance with ITB Clauses 13.1 and 13.3 will be rejected by the Employer as non-responsive, pursuant to ITB Clause 22.
- 13.5 Unsuccessful bidder's bid security will be discharged or returned as promptly as possible but not later than thirty (30) days after the expiration of the period of bid validity prescribed by the Employer pursuant to ITB Clause 14.
- 13.6 The successful Bidder's bid security will be discharged upon the Bidder signing the contract, pursuant to ITB Clause 31, and furnishing the performance security, pursuant to ITB Clause 32.
- 13.7 The bid security may be forfeited:
- (a) if a Bidder withdraws its bid during the period of bid validity specified by the Bidder on the Bid Form; or
 - (b) In the case of successful Bidder, if the Bidder fails:
 - (i) To sign the contract in accordance with ITB Clause 31; or
 - (ii) To furnish performance security in accordance with ITB Clause 32.
 - (c) If the lowest / successful bidder withdraws his bid, the Employer will have the right to award the contract to the next lower bid without retendering, to save time and cost, or if it deems appropriate and/or necessary, the tender may be floated again.
- 14. Period of Validity of Bids**
- 14.1 Bids shall remain valid for the period specified in the Bid Data Sheet after the date of bid opening prescribed by the Employer, pursuant to ITB Clause 17. A bid valid for a shorter period shall be rejected by the Employer as non-responsive.
- 14.2 In exceptional circumstances, the Employer may solicit the Bidder's consent to an extension of the period of validity. The request and the responses thereto shall be made in writing or by facsimile or email. The bid security provided under ITB Clause 13 shall also be suitably extended. A Bidder may refuse the request without forfeiting its bid security. A Bidder granting the request will not be required nor permitted to modify its bid.
- 15. Format and Signing of Bid**
- 15.1 The Bidder shall prepare original and the number of copies of the bid indicated in the Bid Data Sheet, clearly marking each "ORIGINAL BID" and "COPY OF BID" as appropriate. In

the event of any discrepancy between them, the original shall govern.

- 15.2 The original and the copies of the bid shall be typed or written in indelible ink and shall be signed by the Bidder or a person or persons duly authorized to bind the Bidder to the contract. All pages of the bid, except for un-amended printed literature, shall be initialed by the person or persons signing the bid.
- 15.3 Any interlineations, erasures, or overwriting shall be valid only if they are initialed by the person or persons signing the bid.
- 15.4 The bidder shall furnish information as described in the Form of Bid on commissions or gratuities, if any, paid or to be paid to agents relating to this Bid, and to contract execution if the Bidder is awarded the contract.

D. Submission of Bids

16. Sealing and Marking of Bids

- 16.1 The original and all copies of the Technical Bid shall be placed in a sealed envelope clearly marked "Technical Bid" and the original and all copies of the Financial Bid in a sealed envelope clearly marked "Financial Bid" and warning: "**DO NOT OPEN WITH THE TECHNICAL BID**". Both envelopes shall be placed into an outer envelope and sealed.
- 16.2 The inner and outer envelopes shall: -
 - (a) be addressed to the Employer at the address given in the **BDS**, and
 - (b) bear the contract name indicated in the **BDS** and the statement "DO NOT OPEN BEFORE [date]," to be completed with the time and date specified in the **BDS**, pursuant to ITB Sub-Clause 20.1.
- 16.3 The inner and outer envelopes shall also clearly indicate the name and address of the Bidder.
- 16.4 If the outer envelope is not sealed and marked as required by ITB Sub-Clause 16.2 above, the Employer will assume no responsibility for the bid's misplacement or premature opening. If the outer envelope discloses the Bidder's identity, the Employer will not guarantee the anonymity of the bid submission, but this disclosure will not constitute grounds for bid rejection.

- 17. Deadline for Submission of Bids**
- 17.1 Bids must be received by the Employer at the address specified under ITB Sub-Clause 16.2 no later than the time and date stated in the **BDS**.
- 17.2 The Employer may, at its discretion, extend this deadline for submission of bids by amending the bidding documents in accordance with ITB Sub-Clause 7.3, in which case all rights and obligations of Employer and bidders will thereafter be subject to the deadline as extended.
- 17.3 If the deadline for submission of bids is extended by the Employer, then the bidder who has already submitted/sent their bids through courier which reach the Employer by due date, will be allowed to withdraw and resubmit the bid.
- 18. Late Bids**
- 18.1 Any bid received by the Employer after the bid submission deadline prescribed by the Employer, pursuant to ITB Clause 17, will be rejected and returned unopened to the Bidder.
- 19. Modification and Withdrawal of Bids**
- 19.1 The Bidder may modify or withdraw its bid after submission, provided that written notice of the modification or withdrawal is received by the Employer prior to the deadline prescribed for bid submission.
- 19.2 The Bidder's modifications shall be prepared, sealed, marked and dispatched as follows:
- (a) The Bidders shall provide an original and the number of copies specified in the **BDS** of any modifications to its bid, clearly identified as such, in two inner envelopes duly marked "BID MODIFICATIONS—ORIGINAL" and "BID MODIFICATIONS—COPIES." The inner envelopes shall be sealed in an outer envelope, which shall be duly marked "BID MODIFICATIONS."
- (b) Other provisions concerning the marking and dispatch of bid modifications shall be in accordance with ITB Sub-Clauses 16.2, 16.3 and 16.4.
- 19.3 A Bidder wishing to withdraw its bid shall notify the Employer in writing prior to the deadline prescribed for bid submission. The notice of withdrawal shall be any letter signed by the bidder or the authorized representative
- 19.4 Bid withdrawal notices received after the bid submission deadline will be ignored, and the submitted bid will be deemed to be a validly submitted bid. No bid may be

modified after the deadline for submission of bids, as specified in BDS.

- 19.5 No bid may be withdrawn in the interval between the bid submission deadline and the expiration of the bid validity period specified in ITB Clause 14. Withdrawal of a bid during this interval may result in the Bidder's forfeiture of its bid security, pursuant to ITB Sub-Clause 13.7.

E. Opening and Evaluation of Bids

20. Opening of Technical Bids by the Employer

- 20.1 The Employer will open the sealed bids in public, including withdrawals and modifications made pursuant to ITB Clause 19, in the presence of bidders' designated representatives and anyone who choose to attend, at the time, date, and location stipulated in the **BDS**. The bidders' representatives who are present shall sign a register evidencing their attendance.
- 20.2 Only the Technical bid shall be opened by the Employer. The Financial Bid shall remain sealed and deposited with the Employer.
- 20.3 Envelopes marked "WITHDRAWAL" shall be opened first and the name of the Bidder shall be read out. Bids for which an acceptable notice of withdrawal has been submitted pursuant to ITB Clause 19 shall not be opened.
- 20.4 The bidders' names, bid modifications and withdrawals, the presence (or absence) of bid security, and any such other details as the Employer may consider appropriate, will be announced by the Employer at the opening. Subsequently, all envelopes marked "MODIFICATION" shall be opened and the submissions therein read out in appropriate detail. No bid shall be rejected at bid opening except for late bids pursuant to ITB Clause 18.
- 20.5 The Employer shall prepare minutes of the bid opening, including the information disclosed to those present in accordance with ITB Sub-Clause 20.4.
- 20.6 Bids not opened and read out at bid opening shall not be considered further for evaluation, irrespective of the circumstances.
- 20.7 Evaluators of Technical Proposals shall have no access to the Financial Proposals until the technical evaluation, including any Bank reviews and issuance of a "no

objection” letter, is concluded.

- 21. Clarification of Bids**
- 21.1 During technical bid evaluation, the Employer may, at its discretion, ask any Bidder for a clarification of its bid. The request for clarification and the response shall be in writing, and no change in the price or substance of the bid shall be sought, offered or permitted.
- 22. Preliminary Examination**
- 22.1 The Employer will examine the technical bids to determine whether they are complete, whether any computational errors have been made, whether required sureties have been furnished, whether the documents have been properly signed, and whether the bids are generally in order.
- 22.2 The Employer may waive any minor informality, nonconformity or irregularity in a bid that does not constitute a material deviation, and that does not prejudice or affect the relative ranking of any Bidder as a result of the technical and commercial evaluation, pursuant to ITB Clauses 23 and 24.
- 22.3 Prior to the detailed evaluation, the Employer will determine whether each bid is of acceptable quality, is complete and is substantially responsive to the bidding documents. For purposes of this determination, a substantially responsive bid is one that conforms to all the terms, conditions and specifications of the bidding documents without material deviations, objections, conditionalities or reservations. A material deviation, objection, conditionality or reservation is one (i) that affects in any substantial way the scope, quality or performance of the contract; (ii) that limits in any substantial way, inconsistent with the bidding documents, the Employer’s rights or the successful Bidder’s obligations under the contract; or (iii) whose rectification would unfairly affect the competitive position of other bidders who are presenting substantially responsive bids.
- 22.4 If a bid is not substantially responsive, it will be rejected by the Employer, and may not subsequently be made responsive by the Bidder by correction of the nonconformity.
- 23. Technical Evaluation**
- 23.1 The Employer will carry out a detailed evaluation of the bids previously determined to be substantially responsive in order to determine whether the technical aspects are in accordance with the requirements set forth in the bidding documents. In order to reach such a determination, the Employer will examine and compare the technical aspects of

the bids on the basis of the information supplied by the bidders, taking into account the following factors:

- (a) overall completeness and compliance with the Technical Specifications and Drawings; suitability of the facilities offered in relation to the environmental and climatic conditions prevailing at the site; and quality, function and operation of any process control concept included in the bid. The bid that does not meet minimum acceptable standards of completeness, consistency and detail will be rejected for non-responsiveness.
- (b) achievement of specified performance criteria by the facilities
- (c) type, quantity and long-term availability of mandatory and recommended spare parts and maintenance services

23.2 After the technical evaluation is completed, the Employer shall notify those bidders whose proposals did not meet the technical specifications or were considered non responsive to the bidding document, indicating that their Financial Bids will be returned unopened after completing the selection process. The Employer shall simultaneously notify the bidders whose bids were found responsive as described in clause 23.1, indicating the date and time set for opening the Financial Bids. The opening date shall not be sooner than one week after the notification date. The notification may be sent by registered letter, facsimile, or electronic mail.

**24 Opening of
Financial Bids and
Commercial
Evaluation**

24.1 The Financial Bids shall be opened publicly in the presence of the Bidder's representatives who choose to attend. The name of the bidder, the bid prices including shall be read aloud and recorded when the Financial Bids are opened. The Employer shall prepare minutes of the public opening.

24.2 The evaluation committee will determine whether the Financial Bids are complete, correct and without any computational errors. Arithmetical errors will be rectified on the following basis. If there is a discrepancy between the unit price and the total price, which is obtained by multiplying the unit price and quantity, or between subtotals and the total price, the unit or subtotal price shall prevail, and the total price shall be corrected. If there is a

discrepancy between words and figures, the amount in words will prevail. If the Bidder does not accept the correction of errors, its bid will be rejected.

- 24.3 The comparison shall be, on the total price in Price Schedule No.4 Grand Summary (Total of Schedule Nos. 1 to 3), for delivery at final destination to the Employer and inclusive of all foreign and local taxes, duties, freight and Insurances including but not limited to delivery, installation & testing & training.
- 24.4 The Employer's evaluation of a bid will take into account, in addition to the bid prices indicated in Price Schedule Nos. 1 through 4, the following costs and factors that will be added to each Bidder's bid price in the evaluation using pricing information available to the Employer, in the manner and to the extent indicated in ITB Sub-Clause 24.5 and in the Technical Specifications:
- (a) the cost of all quantifiable deviations and omissions from the contractual and commercial conditions and the Technical Specifications and other deviations and omissions;
 - (b) compliance with the time schedule called for in the the Form of Contract Agreement and evidenced as needed in a milestone schedule provided in the bid;
 - (c) the projected operating and maintenance costs during the life of the facilities;
 - (d) the functional guarantees of the facilities offered;
 - (e) the extra cost of work, services, facilities, etc., required to be provided by the Employer or third parties;
- 24.5 Pursuant to ITB Sub-Clause 24.4, the following evaluation methods will be followed:
- (a) **Contractual and commercial compliance**

The evaluation shall be based on the evaluated cost of fulfilling the contract in compliance with all commercial, contractual and technical obligations under this bidding document.
 - (b) **Time schedule (program of performance)**

The plant and equipment covered by this bidding are required to be shipped and installed, and the facilities shall have the pre-commissioning completed within the **time schedule** specified in the **BDS** after the effective date specified in the Form of Contract Agreement. Bidders are required to base their prices on the time schedule given in the corresponding Appendix to the Form of Contract Agreement (Time Schedule). If no time schedule is given, bidders shall base their price on the **completion date(s)** given in the **BDS**. The goods covered under this invitation are required to be delivered (shipped) within the range of weeks, acceptable to the Employer. Within this acceptable range, an adjustment per week, as specified in the **Bid Data Sheet**, will be added for evaluation to the bid price of bids offering deliveries later than the earliest delivery period specified in the Schedule of Requirements. No credit will be given for earlier completion.

(c) **Operating and maintenance costs**

(i) Since the operating and maintenance costs of the facilities being procured form a major part of the life cycle cost of the facilities, these costs will be evaluated according to the principles given in the **BDS**, including the cost of maintenance services for the period of operation stated in the **BDS** and based on prices furnished by each Bidder in Price Schedule No. 3. Such costs shall be added to the bid price for evaluation.

(ii) The bidder has to provide guaranteed after sales service with replacement of faulty parts/components and spares availability in Pakistan for a period of atleast ten years.

(d) **Work, services, facilities, etc., to be provided by the Employer**

Where bids include the undertaking of work or the provision of services or facilities by the Employer in excess of the provisions allowed for in the bidding documents, the Employer shall assess the costs of such additional work, services and/or facilities during the duration of the contract. Such costs shall be added to the bid price for evaluation.

(e) **Deviation in payment schedule**

- (i) Bidders shall state their bid price for the payment schedule outlined in the SCC. Bid will be evaluated on the basis of their base price. Bidders are, however, permitted to state an alternative payment schedule and indicate the reduction in bid price they wish to offer for such alternative payment schedule. The Employer may consider the alternative payment schedule offered by the selected Bidder.
- (ii) The SCC stipulates the payment schedule offered by the Employer. If a bid deviates from the schedule and if such deviation is considered acceptable to the Employer, the bid will be evaluated by calculating interest earned for any earlier payments involved in the terms outlined in the bid as compared with those stipulated in this invitation, at the average rate per annum prevalent in Pakistan.

24.6 Any adjustments in price that result from the above procedures shall be added, for purposes of comparative evaluation only, to arrive at an "Evaluated Bid Price." Bid prices quoted by bidders shall remain unaltered.

25. Contacting the Employer

- 25.1 No Bidder shall contact the Employer on any matter relating to its bid, from the time of the bid opening to the time the contract is awarded. If the Bidder wishes to bring additional information to the notice of the Employer, it should do so in writing.
- 25.2 Any effort by a Bidder to influence the Employer in its decisions on bid evaluation, bid comparison, or contract award may result in the rejection of the Bidder's bid.

F. Award of Contract

- 26. Post Qualification**
- 26.1 In the absence of prequalification, the Employer will determine to its satisfaction whether the Bidder that is selected as having submitted the lowest evaluated responsive bid is qualified to perform the contract satisfactorily, in accordance with the criteria listed in ITB Clause 9.2 (c).
- 26.2 The determination will take into account the Bidder's financial, technical, and production capabilities. It will be based upon an examination of the documentary evidence of the Bidder's qualifications submitted by the Bidder, pursuant to ITB Clause 9.2, as well as such other information as the employer deems necessary and appropriate.
- 26.3 An affirmative determination will be prerequisite for award of the contract to the Bidder. A negative determination will result in rejection of the Bidder's bid, in which event the Employer will proceed to the next lowest evaluated bid to make a similar determination of that Bidder's capabilities to perform satisfactorily.
- 27. Award Criteria**
- 27.1 Subject to ITB Clause 29, the Employer will award the contract to the successful Bidder whose bid has been determined to be substantially responsive and matches the technical criteria set by the Employer and has been determined to be the lowest evaluated bid, provided further that the Bidder is determined to be qualified to perform the contract satisfactorily.
- 28. Employer's Right to Vary Quantities at Time of Award**
- 28.1 The Employer reserves the right at the time of contract award to increase or decrease, the quantity of goods and services originally specified in the Schedule of Requirements without any change in unit price or other terms and conditions.
- 29. Employer's Right to Accept any Bid and to Reject and or All Bids**
- 29.1 The Employer reserves the right to accept or reject any (or all) bid(s), and to annul the bidding process and reject all bids at any time prior to contract award, without incurring any liability to the affected Bidder or bidders or any obligation to inform the affected Bidder or bidders of the grounds for the Employer's action.
- 30. Notification of Award**
- 30.1 Prior to the expiration of the period of bid validity, the Employer will notify the successful Bidder in writing by registered letter or by email or facsimile to be confirmed

- later in writing by registered letter, that its bid has been accepted.
- 30.2 The notification of award will constitute the formation of the Contract.
- 30.3 Upon the successful Bidder's furnishing of the performance security pursuant to ITB Clause 32, the Employer will promptly notify each unsuccessful Bidder and will discharge its bid security, pursuant to ITB Clause 13.
- 31. Signing of Contract**
- 31.1 At the same time as the Employer notifies the successful Bidder that its bid has been accepted, the Employer will send the Bidder the Contract Form provided in the bidding documents incorporating all agreements between the parties.
- 31.2 Immediately on receipt of the Contract Form, the successful Bidder shall sign and date the contract and return it to the Employer.
- 32. Performance Security**
- 32.1 Within seven (07) days of the receipt of notification of award from the Employer, the successful Bidder shall furnish the performance security in accordance with the conditions of contract, in the Performance Security Form provided in the bidding documents, or in another form acceptable to the Employer.
- 32.2 Failure of the successful Bidder to comply with the requirement of ITB Clause 31.2 or ITB Clause 32.1 shall constitute sufficient grounds for the annulment of the award and forfeiture of the bid security, in which event the Employer may make the award to the next lowest evaluated Bidder or call for new bids.
- 33. Corrupt or Fraudulent Practices**
- 33.1 The Employer requires that Bidder/Suppliers/Contractors, observe the highest standard of ethics during the procurement and completion of such contracts, in pursuance of this policy, the Employer: -
- (a) Defines, for the purposes of this provision, the terms set forth below as follows:
- (i) "Corrupt practice" means the offering, giving, receiving or soliciting of any thing of value to influence the action of a public official in the procurement process or in contract execution; and
- (ii) "Fraudulent Practice" means a misrepresentation

of facts in order to influence a procurement process or the execution of contract to the detriment of the Employer, and includes collusive practice among Bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the Employer of the benefits of free and open competition

- (b) Will reject a proposal for award if it determines that the Bidder recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question;
- (c) Will declare a firm ineligible, either indefinitely or for a stated period of time, to be awarded a Government-financed contract if it at any time determines that the firm has engaged in corrupt or fraudulent practices in competing for, or in executing, a Government Financed contract.

33.2 Furthermore, Bidders shall be aware of the provision stated in sub-clause 5.4 and sub-clause 23.1 of the General Conditions of Contract.

SECTION-III

BID DATA SHEET

Bid Data Sheet

The following bid-specific data for the plant and equipment to be procured shall amend and/or supplement the provisions in the Instructions to Bidders (ITB). Whenever there is a conflict, the provisions herein shall prevail over those in the ITB.

INTRODUCTION	
ITB 1.1	Name of the Employer: Frequency Allocation Board Headquarters, Islamabad, Pakistan.
ITB 1.1	Name of Project: Expansion of NFMMS Project
ITB 1.1	Name of Contract: Supply, Installation and Commissioning of Spectrum Monitoring Systems for Expansion of NFMMS Project
ITB 6.1	For <u>Clarification of bid purposes</u> only, the Employer's address is: Attention: Mr. Raheem Sanaullah Ch. (Director Monitoring) Address: FAB Headquarters, Plot No. 112, Sector H-10/4 Islamabad City: Islamabad ZIP Code: 44000 Country: Pakistan Telephone: +92-51-9257705 Facsimile number: 92-051-9257595 Electronic mail address: dirmon@pta.gov.pk
ITB 6.3	Venue, time and date of pre-bid meeting A pre bid meeting will take place at the above address at 1100 hours local time on 02 nd April 2008.
ITB 8.1	Language of bid is: "English
ITB 9.2	Qualification requirements for bidders, including members of joint ventures, Sub contractors or vendors: - Technical: The documentary evidence of the Bidder's qualifications to perform the contract, if its bid is accepted, shall establish to the Employer's satisfaction that the Bidder has at least five (5) years of experience in designing, integrating, supplying, deploying and commissioning systems similar in nature and size to that as required

	<p>by these bidding documents. The documents attached to its bid must also furnish the list of customers and equipment supplied along with evidence of the performance of such systems previously delivered by the Bidder.</p> <p>Financial: The bidder shall include, in its bid, financial statements of the last five (5) years demonstrating its financial capacity to carry out its obligations under the contract and the list of customers to whom such equipment has already been supplied.</p>
BID PRICE AND CURRENCY	
ITB 11.3	<p>a. Maintenance and Operational services for initial 1 (one) year period under warranty (which includes spare parts replacement without any cost to the Employer).</p> <p>b. Maintenance & operational services for the following 2 (two) years will be binding on the bidder as a part of contract, which will be submitted separately.</p>
ITB 11.4	<p>Named place of destination is: FAB Headquarters Islamabad</p> <p>The prices quoted shall be including all foreign & local costs, taxes, duties, freight and insurances. Sales tax should be quoted separately for payment on actual basis.</p>
ITB 11.7	The price shall be fixed
ITB 12.1	Currency: Pak Rupee
BID PREPARATION AND SUBMISSION	
ITB 13.1	Amount of bid security: 5% of total bid value
ITB 14.1	Bid validity period: 60 days
ITB 15.1 & 19.2	Original and 05 number of copies of bids
ITB 16.2 (a)	Same as in ITB 6.1
ITB 16.2 (b)	Supply, Installation and Commissioning of Spectrum Monitoring System for Expansion of NFMMS
ITB 17.1	<p>The deadline for the submission of bids is:</p> <p>Date: 05th May 2008 Time: 1300 hours (local time)</p>

ITB 20.1	Location is same as in ITB6.1 Time and date of bid opening are same as mentioned in ITB 17.1 above
BID EVALUATION	
ITB 24.3	Destination: FAB Headquarters Islamabad
ITB 24.5 (b)	Time schedule: Time for completion is 4 months.
ITB 24.5 (b)	For delays beyond the delivery date, an adjustment of two percent (2%) for each week will be added to bid price for evaluation purpose.
ITB 24.5 (c)	Maintenance Services costs, for the following 2 years after completion of warranty period, including but not limited to repair, replacement, troubleshooting / configuration of hardware & software will also be included and submitted separately.
CONTRACT AWARD	
ITB 32	Amount of performance security: 10% of the contract price to be given in the shape of a Bank Guarantee of a AAA rated bank located in Pakistan, and valid for 60 days beyond the completion of contract period.

SECTION-IV

GENERAL CONDITION OF CONTRACT

GENERAL CONDITIONS OF CONTRACT

Table of Clauses

1.	Definitions	27
2.	Application	28
3.	Country of Origin	28
4.	Standards	28
5.	Use of Contract Documents and Information; Inspection and Audit by the Bank	28
6.	Patent Rights	29
7.	Performance Security	29
8.	Inspections and Tests	29
9.	Packing	30
10.	Delivery and Documents	30
11.	Insurance	30
12.	Transportation	30
13.	Incidental Services	30
14.	Spare Parts	31
15.	Warranty	31
16.	Payment	32
17.	Prices	32
18.	Change Orders	33
19.	Assignment	33
20.	Delays in the Contractor's Performance	33
21.	Subcontracts	34
22.	Liquidated Damages	34
23.	Termination for Default	35
24.	Force Majeure	36
25.	Termination for Insolvency	36
26.	Termination for Convenience	36
27.	Settlement of Disputes	37
28.	Governing Language	38
29.	Applicable Law	38
30.	Notices	38
31.	Taxes and Duties	38

General Conditions of Contract

1. **Definitions**
 - 1.1 In this Contract, the following terms shall be interpreted as indicated;
 - (a) "The Contract" means the agreement entered into between the Employer and the Contractor, as recorded in the Contract Form signed by the parties, including all attachments and appendices thereto and all documents incorporated by reference therein.
 - (b) "The Goods" means all of the equipment, machinery, and/or other materials, which the Contractor is required to supply to the Employer under the Contract.
 - (c) "The Services" means those services ancillary to the supply of the Goods, such as transportation and insurance, and any other incidental services, such as installation, commissioning, provision of technical assistance, training, and other such obligations of the Contractor covered under the Contract.
 - (d) "GCC" means the General Conditions of Contract contained in this section.
 - (e) "SCC" means the Special Conditions of Contract.
 - (f) "The Employer" means the organization purchasing the Goods, as **named in SCC**.
 - (g) "The Employer's country" is the country **named in SCC**.
 - (h) "The Contractor" means the individual or firm supplying the Goods and Services under this Contract and **named in SCC**.
 - (i) "The Project Site," where applicable, means the place or places **named in SCC**.
 - (j) "Day" means calendar day.
2. **Applications**
 - 2.1 These General Conditions shall apply to the extent that they are not superseded by provisions of other parts of the Contract.

- 3. Country of Origin**
- 3.1 All Goods and Services supplied under the Contract shall have their origin in the countries and territories eligible under the rules of the Government of Pakistan, as further elaborated in the SCC.
- 3.2 For purposes of this Clause, "origin" means the place where the Goods were produced, or from which the Services are supplied. Goods are produced when, through manufacturing, processing, or substantial and major assembly of components, a commercially recognized new product results that is substantially different in basic characteristics or in purpose or utility from its components
- 3.3 The origin of Goods and Services is distinct from the nationality of the Contractor.
- 4 Standards**
- 4.1 The Goods supplied under this Contract shall conform to the standards mentioned in the Technical Specifications, and, when no applicable standard is mentioned, to the authoritative standards appropriate to the Goods' country of origin. Such standards shall be the latest issued by the concerned institution.
- 5 Use of Contract Documents and Information; Inspection and Audit by the Bank**
- 5.1 The Contractor shall not, without the Employer's prior written consent, disclose the Contract, or any provision thereof, or any specification, plan, drawing, pattern, sample, or information furnished by or on behalf of the Employer in connection therewith, to any person other than a person employed by the Contractor in the performance of the Contract. Disclosure to any such employed person shall be made in confidence and shall extend only as far as may be necessary for purposes of such performance.
- 5.2 The Contractor shall not, without the Employer's prior written consent, make use of any document or information enumerated in GCC Clause 5.1 except for purposes of performing the Contract.
- 5.3 Any document, other than the Contract itself, enumerated in GCC Clause 5.1 shall remain the property of the Employer and shall be returned

- (all copies) to the Employer on completion of the Contractor's performance under the Contract if so required by the Employer.
- 5.4 The Contractor shall permit the Employer to inspect the Contractor's accounts and records relating to the performance of the Contractor and to have them audited by auditors appointed by the Bank, if so required by the Government
- 6 Patent Rights**
- 6.1 The Contractor shall indemnify the Employer against all third-party claims of infringement of patent, trademark, or industrial design rights arising from use of the Goods or any part thereof in the Employer's country.
- 7 Performance Security**
- 7.1 Within seven (7) days of receipt of the notification of Contract award, the successful Bidder shall furnish to the Employer the performance security in the amount **specified in SCC**.
- 7.2 The proceeds of the performance security shall be payable to the Employer as compensation for any loss resulting from the Contractor's failure to complete its obligations under the Contract.
- 7.3 The performance security shall be denominated in Pakistani Rupees and shall be in one of the following forms:
- (a) a bank guarantee or an irrevocable letter of credit issued by a reputable AAA rated Bank located in Pakistan, in the form provided in the bidding documents or another form acceptable to the Employer; or
- (b) a cashier's or certified check.
- 7.4 The performance security will be discharged by the Employer and returned to the Contractor not later than sixty (60) days following the date of completion of the Contractor's performance obligations under the Contract, including any warranty obligations, unless otherwise **specified in SCC**.
- 8. Inspections & Tests**
- 8.1 The Employer or its representative shall inspect and/or test the Goods to confirm their conformity to the Contract specifications.
- 8.2 The inspections and tests may be conducted indoor or out door during drive testing.

- 8.3 Should any inspected or tested Goods fail to conform to the Specifications, the Employer may reject the Goods, and the Contractor shall either replace the rejected Goods or make alterations necessary to meet specification requirements free of cost to the Employer.
- 8.4 The Employer's right to inspect, test and, where necessary, reject the Goods after the Goods' arrival in the Employer's country shall in no way be limited or waived by reason of the Goods having previously been inspected, tested, and passed by the Employer or its representative prior to the Goods' shipment from the country of origin.
- 8.5 Nothing in GCC Clause 8 shall in any way release the Contractor from any warranty or other obligations under this Contract.
- 9. Packing** 9.1 Should be good enough to avoid any loss or damage.
- 10. Delivery and Documents** 10.1 Delivery of the Goods shall be made by the Contractor in accordance with the terms specified in the Schedule of Requirements. The details of shipping and/or other documents to be furnished by the Contractor are specified in SCC.
- 11. Insurance** 11.1 All insurances upto acceptance and testing of the delivered goods shall be the responsibility of the Contractor.
- 12. Transportation** 12.1 The Contractor is required under the Contract to transport the Goods to the Employer's destination, including insurance and storage, as shall be specified in the Contract, shall be arranged by the Contractor, and related costs shall be included in the Contract Price. All foreign and local transportation costs shall be included in the Bid and born by the Bidder.
- 13. Incidental Services** 13.1 The Contractor shall be required to provide the following services, including additional services, if any, **specified in SCC:**
- (a) performance or supervision of on-site assembly and/or start-up of the supplied Goods;
 - (b) furnishing of tools required for assembly and/or maintenance of the supplied Goods;
 - (c) furnishing of a detailed operations and

- maintenance manual for each appropriate unit of the supplied Goods;
- (d) performance or supervision or maintenance and/or repair of the supplied Goods, for a period of time agreed by the parties, provided that this service shall not relieve the Contractor of any warranty obligations under this Contract; and
 - (e) training of the Employer's personnel, at the Contractor's plant and/or on-site, in assembly, start-up, operation, maintenance, and/or repair of the supplied Goods.
- 14. Spare Parts** 14.1 **As specified in SCC**, the Contractor may be required to provide any or all of the following materials, notifications, and information pertaining to spare parts manufactured, supplied or distributed by the Contractor, separately from the bid price,
- (a) such spare parts as the Employer may elect to purchase from the Contractor, provided that this election shall not relieve the Contractor of any warranty obligations under the Contract; and
 - (b) in the event of termination of production of the spare parts:
 - (i) advance notification to the Employer of the pending termination, in sufficient time to permit the Employer to procure needed requirements; and
 - (i) following such termination, furnishing at no cost to the Employer, the blueprints, drawings, and specifications of the spare parts, if requested.
- 15. Warranty** 15.1 The Contractor warrants that the Goods supplied under the Contract are new, unused, of the most recent or current models, and that they incorporate all recent improvements in design and materials unless provided otherwise in the Contract. The Contractor further warrants that all Goods supplied under this Contract shall have

no defect, arising from design, materials, or workmanship or from any act or omission of the Contractor, that may develop under normal use of the supplied Goods in the conditions prevailing in the country of final destination.

15.2 This warranty shall remain valid for twelve (12) months after the Acceptance Certificate from the Employer.

15.3 The Employer shall promptly notify the Contractor in writing of any claims arising under this warranty.

15.4 Upon receipt of such notice, the Contractor shall, with all reasonable speed, repair or replace the defective Goods or parts thereof, without costs to the Employer.

15.5 If the Contractor, having been notified, fails to remedy the defect(s) within one month, the Employer may proceed to take such remedial action as may be necessary, at the Contractor's risk and expense and without prejudice to any other rights which the Employer may have against the Contractor under the Contract.

16. Payment

16.1 The method and conditions of payment to be made to the Contractor under this Contract shall be **specified in SCC.**

16.2 The Contractor's request(s) for payment shall be made to the Employer in writing, accompanied by an invoice describing, as appropriate, the Goods delivered and Services performed, and by documents submitted pursuant to GCC Clause 10, and upon fulfillment of other obligations stipulated in the Contract.

16.3 Payments shall be made promptly by the Employer, but in no case later than sixty (60) days after submission of an invoice or claim by the Contractor.

16.4 The currency in which payment is made to the Contractor under this Contract shall be **in Pakistan Rupees only.**

17. Prices

17.1 Prices charged by the Contractor for Goods delivered and Services performed under the Contract shall not vary from the prices quoted by the Contractor in its bid, with the exception of any price adjustments **authorized in SCC** or in the

Employer's request for bid validity extension, as the case may be.

- 18. Change Orders**
- 18.1 The Employer may at any time, by a written order given to the Contractor pursuant to GCC Clause 32, make changes within the general scope of the Contract in any one or more of the following:
- (a) drawings, designs, or specifications, where Goods to be furnished under the Contract are to be specifically manufactured for the Employer;
 - (b) the method of shipment or packing;
 - (c) the place of delivery; and/or
 - (d) the Services to be provided by the Contractor.
- 18.2 If any such change causes an increase or decrease in the cost of, or the time required for, the Contractor's performance of any provisions under the Contract, an equitable adjustment shall be made in the Contract Price or delivery schedule, or both, and the Contract shall accordingly be amended. Any claims by the Contractor for adjustment under this clause must be asserted within thirty (30) days from the date of the Contractor's receipt of the Employer's change order.
- 19. Assignment**
- 19.1 The Contractor shall not assign, in whole or in part, its obligations to perform under this Contract.
- 20. Delays in the Contractor's Performance**
- 20.1 Delivery of the Goods and performance of Services shall be made by the Contractor in accordance with the time schedule prescribed by the Employer in the Schedule of Requirements and the Time for Completion as specified in SCC.
- 20.2 If at any time during performance of the Contract, the Contractor or its subcontractor(s) should encounter conditions impeding timely delivery of the Goods and performance of

Services, the Contractor shall promptly notify the Employer in writing of the fact of the delay, its likely duration and its cause(s). As soon as practicable after receipt of the Contractor's notice, the Employer shall evaluate the situation and may at its discretion extend the Contractor's time for performance, with or without liquidated damages, in which case the extension shall be ratified by the parties by amendment of Contract.

- 20.3 Except as provided under GCC Clause 24, a delay by the Contractor in the performance of its delivery obligations shall render the Contractor liable to the imposition of liquidated damages pursuant to GCC Clause 22, unless an extension of time is agreed upon pursuant to GCC Clause 20.2 without the application of liquidated damages.
- 21. Subcontracts**
- 21.1 The Contractor shall notify the Employer in writing of all subcontracts awarded under this Contract if not already specified in the bid. Such notification, in the original bid or later, shall not relieve the Contractor from any liability or obligation under the Contract.
- 21.2 Subcontracts must comply with the provisions of GCC Clause 3.
- 22. Liquidated Damages**
- 22.1 Subject to GCC Clause 24, if the Contractor fails to deliver any or all of the Goods or to perform the Services within the period(s) specified in the Contract, the Employer shall, without prejudice to its other remedies under the Contract, deduct from the Contract Price, as liquidated damages, a sum equivalent to the percentage specified in SCC of the delivered price of the delayed Goods or unperformed Services for each week or part thereof of delay until actual delivery or performance, up to a maximum deduction of the percentage **specified in SCC**. Once the maximum is reached, the Employer may consider termination of the Contract pursuant to GCC Clause 23.
- 23. Termination for**
- 23.1 The Employer, without prejudice to any other

Default

remedy for breach of Contract, by written notice of default sent to the Contractor, may terminate this Contract in whole or in part:

- (a) If the Contractor fails to deliver any or all of the Goods within the period(s) specified in the Contract, or within any extension thereof granted by the Employer pursuant to GCC Clause 20; or
- (b) If the Contractor fails to perform any other obligation(s) under the Contract.
- (c) if the Contractor, in the judgment of the Employer, has engaged in corrupt or fraudulent practices in competing for or in executing the Contract.

For the purpose of this clause:

"corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value to influence the action of a public official in the procurement process or in contract execution
 "fraudulent practice" means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Employer, and includes collusive practice among Bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the Employer of the benefits of free and open competition.

23.2 In the event the Employer terminates the Contract in whole or in part, pursuant to GCC Clause 23.1, the Employer may procure, upon such terms and in such manner as it deems appropriate, Goods or Services similar to those undelivered, and the Contractor shall be liable to the Employer for any excess costs for such similar Goods or Services. However, the Contractor shall continue performance of the Contract to the extent not terminated.

24. Force Majeure

24.1 Notwithstanding the provisions of GCC Clauses 20,21, 22 and 23, the Contractor shall not be

liable for forfeiture of its performance security, liquidated damages, or termination for default if and to the extent that its delay in performance or other failure to perform its obligations under the Contract is the result of an event of Force Majeure.

24.2 For purposes of this clause, "Force Majeure" means wars, fires, floods, epidemics and quarantine restrictions.

24.3 If a Force Majeure situation arises, the Contractor shall promptly notify the Employer in writing of such condition and the cause thereof. Unless otherwise directed by the Employer in writing, the Contractor shall continue to perform its obligations under the Contract as far as is reasonably practical, and shall seek all reasonable alternative means for performance not prevented by the Force Majeure event.

25. Termination for Insolvency

25.1 The Employer may at any time terminate the Contract by giving written notice to the Contractor if the Contractor becomes bankrupt or otherwise insolvent. In this event, termination will be without compensation to the Contractor, provided that such termination will not prejudice or affect any right of action or remedy which has accrued or will accrue thereafter to the Employer.

26. Termination for Convenience

26.1 The Employer, by written notice sent to the Contractor, may terminate the Contract, in whole or in part, at any time for its convenience. The notice of termination shall specify that termination is for the Employer's convenience, the extent to which performance of the Contractor under the Contract is terminated, and the date upon which such termination becomes effective.

26.2 The Goods that are complete and ready for shipment within seven (07) days after the Contractor's receipt of notice of termination shall be accepted by the Employer at the Contract terms and prices. For the remaining Goods, the Employer may elect:

(a) to have any portion completed and delivered at the Contract terms and prices; and/or

(b) to cancel the remainder and pay to the Contractor an agreed amount for partially completed Goods and Services and for materials and parts previously procured by the Contractor.

27. Settlement of Disputes

27.1 If any dispute or difference of any kind whatsoever shall arise between the Employer and the Contractor in connection with or arising out of the Contract, the parties shall make every effort to resolve amicably such dispute or difference by mutual consultation.

27.2 If, after thirty (30) days, the parties have failed to resolve their dispute or difference by such mutual consultation, then either the Employer or the Contractor may give notice to the other party of its intention to commence arbitration, as hereinafter provided, as to the matter in dispute, and no arbitration in respect of this matter may be commenced unless such notice is given.

27.2.1 Any dispute or difference in respect of which a notice of intention to commence arbitration has been given in accordance with this Clause shall be finally settled by arbitration. Arbitration may be commenced prior to or after delivery of the Goods under the Contract.

27.2.2 Arbitration proceedings shall be conducted in accordance with the rules of procedure **specified in the SCC.**

27.3 Notwithstanding any reference to arbitration herein,

(a) the parties shall continue to perform their respective obligations under the Contract unless they otherwise agree; and

(b) the Employer shall pay the Contractor any monies due the Contractor.

-
- | | | |
|-------------------------------|------|---|
| 28. Governing Language | 28.1 | The Contract, including all the correspondence and other documents pertaining to the Contract shall be written in English language. |
| 29. Applicable Law | 29.1 | The Contract shall be interpreted in accordance with the laws of Pakistan. |
| 30. Notices | 30.1 | Any notice given by one party to the other pursuant to this Contract shall be sent to the other party in writing or through fax or by email, and confirmed in writing to the other party's address specified in SCC. |
| | 30.2 | A notice shall be effective when delivered or on the notice's effective date, whichever is later. |
| 31. Taxes and Duties | 31.1 | Contractor shall be entirely responsible for all taxes, duties, license fees, and other such levies imposed inside and outside the Employer's country. |

SECTION-V

SPECIAL CONDITIONS OF CONTRACT

Special Conditions of Contract

Table of Clauses

1.	Definitions (GCC Clause 1)	40
2.	Country of Origin (GCC Clause 3).....	40
3.	Performance Security (GCC Clause 7)	40
4.	Inspections and Tests (GCC Clause 8).....	40
5.	Packing (GCC Clause 9).....	41
6.	Delivery and Documents (GCC Clause 10)	41
7.	Insurance (GCC Clause 11)	41
8.	Incidental Services (GCC Clause 13).....	41
9.	Spare Parts (GCC Clause 14)	41
10.	Warranty (GCC Clause 15).....	41
11.	Payment (GCC Clause 16).....	42
12.	Prices (GCC Clause 17).....	42
13.	Delays in the Contractor's Performance (GCC Clause 20)	42
14.	Liquidated Damages (GCC Clause 23).....	43
15.	Settlement of Disputes (GCC Clause 28)	43
16.	Applicable Law (GCC Clause 31).....	43
17.	Notices (GCC Clause 32)	43
18.	Schedule of Requirement.....	44

Special Conditions of Contract (SCC)

The following Special Conditions of Contract shall supplement the General Conditions of Contract. Whenever there is a conflict, the provisions herein shall prevail over those in the General Conditions of Contract. The corresponding clause number of the GCC is indicated in parentheses.

1. Definitions (GCC Clause 1)

GCC 1.1 (g)—The Employer is : Frequency Allocation Board, Headquarters

GCC 1.1 (h)—The Employer's country is : Pakistan

GCC 1.1 (i)—The Contractor is: The Company supplying the Goods and Services

GCC 1.1 (j)—The Project Site is: FAB Headquarters, H-10/4, Islamabad

2. Country of Origin (GCC Clause 3)

All countries except Israel

3. Performance Security (GCC Clause 7)

GCC 7.1—The amount of performance security, as a percentage of the Contract Price, shall be: ten percent (10%).

4. Inspections and Tests (GCC Clause 8)

GCC 8.1— Acceptance Tests will be performed by the Contractor, according to the Acceptance Testing plan devised by the Employer, against each essential requirement, indoor and outdoor at the locations planned by the Employer. The Contractor shall provide all necessary equipment and other items of any nature required to carry out the Acceptance Tests. At the conclusion of the acceptance tests, the Employer representatives will issue an acceptance tests report, with remarks. The Contractor shall fix the first ones within one (1) week of the delivery of the report, while he will have three (3) weeks to clear the remarks. Within seven (7) days of the successful completion of the Acceptance Tests, the Employer shall issue a Provisional Acceptance Certificate, which will state the Acceptance Date.

GCC 8.3- The Employer shall appoint an Inspecting Committee to inspect and test the Equipment to be delivered by the Contractor under the Contract. The inspection shall be carried out at the locations planned by the Employer, before the Equipment are finally accepted.

The Inspecting Committee shall have the authority to reject any supplies, which are found to be defective or otherwise not in conformity with the requirements of this Contract.

If the Equipment is rejected Contractor shall be liable to the Employer for any cost of removal, correction or replacement. The Inspecting Committee will issue “Inspection Certificate” to all the Equipment after which those will be processed for acceptance.

5. Packing (GCC Clause 9)

GCC 9.3—Not applicable: no additional requirements.

6. Delivery and Documents (GCC Clause 10)

For Goods supplied from abroad:

The Contractor shall keep the Employer informed regarding all details and dates related to shipment arrival at Pakistan Port and delivery dates, ensuring that these match with Employer’s desired dates.

The Goods must be delivered at the premises of Frequency Allocation Board, HQ or Frequency Monitoring Station, Tarnol Islamabad.

Documents: The following documents must be delivered at the premises of Frequency Allocation Board Headquarters, Plot No. 112 Sector H-10/4 Islamabad.

- (i) Copies of the Contractor’s invoice showing Equipment description, quantity, unit price, and total amount.
- (ii) Receipt issued by the Employer, certifying that the Goods have been received at the delivery point as specified above.
- (iii) Inspection certificate, issued by the nominated inspection agency, and the Contractor’s factory inspection report.
- (iv) Certificate of origin

7. Insurance (GCC Clause 11)

GCC 11.1—The bidder (Contractor) shall be responsible for the equipment insurance upto the successful acceptance testing of the equipment

8. Incidental Services (GCC Clause 13)

GCC 13.1— After sales service for all parts, components, etc (complete functioning) for a period of 3 years.

9. Spare Parts (GCC Clause 14)

GCC 14.1—Contractor shall carry sufficient inventories to assure ex-stock supply of consumable spares for the Goods to ensure unhindered operation/functioning, under the Contractor’s liability for the entire duration of the warranty. Other spare parts and components shall be supplied as promptly as possible, but in any case within six (6) months of placing the order and arrangement of payment modalities.

10. Warranty (GCC Clause 15)

GCC 15.2—The warranty period shall be 12 months from date of acceptance of the Goods. The Contractor shall, in addition, comply with the performance and/or consumption guarantees specified under the Contract. If, for reasons attributable to the Contractor, these guarantees are not attained in whole or in part, the Contractor shall, at its discretion, either:

- (a) make such changes, modifications, and/or additions to the Goods or any part thereof as may be necessary in order to attain the contractual guarantees specified in the Contract at its own cost and expense.

GCC 15.4 & 15.5—The period for correction of defects in the warranty period is thirty (30) days from the return date of the defective equipment in the Contractor's premises. Including transport, the repair time duration shall not exceed forty five (45) days.

11. Payment (GCC Clause 16)

GCC 16.1—The method and conditions of payment to be made to the Contractor under this Contract shall be as follows:

- (i) **Advance Payment:** Nil
- (ii) **Payment on Delivery:** Ten (10) percent of the Contract Price shall be paid within seven (7) days of delivery of equipment and submission of delivery documents specified in GCC-10, and upon submission of claim and in the form provided in the bidding documents or any other form acceptable to the Employer.
- (iii) **On Commissioning:** Seventy (70) percent of the Contract Price shall be paid after issuance of Operational Acceptance Certificate by the Employer, within thirty (30) days of the “Payment Request” received from the contractor, along with signed commissioning report, signed by the Employer based on commissioning plan prepared by the Employer.
- (iv) **On Training:** Ten (10) percent of the Contract Price shall be paid within seven (07) days of “Payment Request” after completion of training, provision of associated manuals by the Contractor and issuance of satisfactory training report by the Employer.
- (v) Remaining 10% will be paid within 30 days after the “Payment Request” received from the contractor. The requirement for this payment shall be initiated after completion of warranty period.

All Payments shall be made in Pakistan Rupee

12. Prices (GCC Clause 17)

Not applicable

13. Delays in the Contractor's Performance (GCC Clause 20)

GCC 20.1 – The time for the completion of the facilities including delivery of Goods and performance of services under the contract shall be Four (4) months from the date of award of contract.

14. Liquidated Damages (GCC Clause 23)

GCC 23.1—Applicable rate: 2% (two percent) of the Contract Price per week will be deducted for liquidated damages, if the Contractor fails to attain completion of facilities or any part thereof, within the time for completion.

Maximum deduction: Ten percent (10 %) of the Contract Price

15. Settlement of Disputes (GCC Clause 27)

GCC 27.2.2—The rules of procedure for arbitration proceedings pursuant to GCC Clause 28.2 shall be as follows:

(a) Contract with foreign Contractor:

GCC 27.2.2 (a)—Any dispute, controversy or claim arising out of the Contract, shall be referred to a sole arbitrator appointed with mutual consent of the parties within ten days of the notice of dispute by either party and that the arbitration proceedings shall be in accordance with the provisions of the Arbitration Act, 1940 and the rules framed thereunder.

16. Applicable Law (GCC Clause 29)

GCC 29.1—The Contract shall be interpreted in accordance with the laws of the Islamic Republic of Pakistan.

17. Notices (GCC Clause 30)

GCC 30.1—Employer address for notice purposes:

Director Monitoring,
FAB Headquarters,
H-10/4,
Islamabad - Pakistan.
Fascimile: +92-51-9257595
Email: dirmon@pta.gov.pk

—Contractor's address for notice purposes:

Schedule of Requirement

The delivery schedule (Lot-wise) expressed as days stipulate hereafter a delivery date, which is the date of delivery, required.

Lot No	Type of Equipment	Qty	Delivery Schedule from the date of award of contract
1.	VHF/UHF Mobile Monitoring System	01	30 days
2.	VHF/UHF Portable / Handheld Monitoring System	07	''
3.	Transportable / Mobile Microwave Monitoring Station	02	''
4.	RF Field Strength Meter	07	''
5.	Mobile Vehicles	03	''

SECTION-VI

TECHNICAL SPECIFICATIONS

TECHNICAL SPECIFICATIONS

Table of Clauses

PART- A

General Information and Requirements

1. Introduction	47
2. PTA and FAB Organization	47
3. Existing NFMMS Architecture	47
4. Principal Tasks of the NFMMS	50
5. Scope of the work and Project Requirements	50
6. Work Program	52
7. Applicable Standards	52
8. Evidence of Compliance	53
9. Maintenance Support and Mandatory Spare Parts	53
10. Monitoring systems General Requirement	54
11. Requirements Applicable to the Project as a Whole	58
12. Acceptance Criteria	60
13. Training	60
14. Operational and Maintenance Manuals	60

PART- B

Details Specifications

1. Introduction	61
2. VHF / UHF Mobile Monitoring & Direction Finding Station	61
3. Mobile/ Transportable Microwave Monitoring Station	78
4. VHF/UHF Portable/Handheld Monitoring System	88
5. RF Field Strength Meter	90

TECHNICAL SPECIFICATIONS

Table of Clauses

TABLE

Table 1

ITU-R Recommendations of Monitoring Functions	52
---	----

FIGURES

Figure 1

Existing NFMMS Architecture	48
-----------------------------	----

Figure 2

Flow Chart of Software tools accessing the database	49
---	----

Figure 3

Network Layout of Existing NFMMS	50
----------------------------------	----

Figure 4

Block Diagram of Direction Finding System	64
---	----

Figure 5

Block Diagram of Omnidirectional Monitoring System	65
--	----

Figure 6

Block Diagram of Mobile Microwave Monitoring System	80
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ATTACHMENTS

Attachment 1

Bill of Quantities (BOQ)	92
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GENERAL REQUIREMENTS AND INFORMATION

1. Introduction

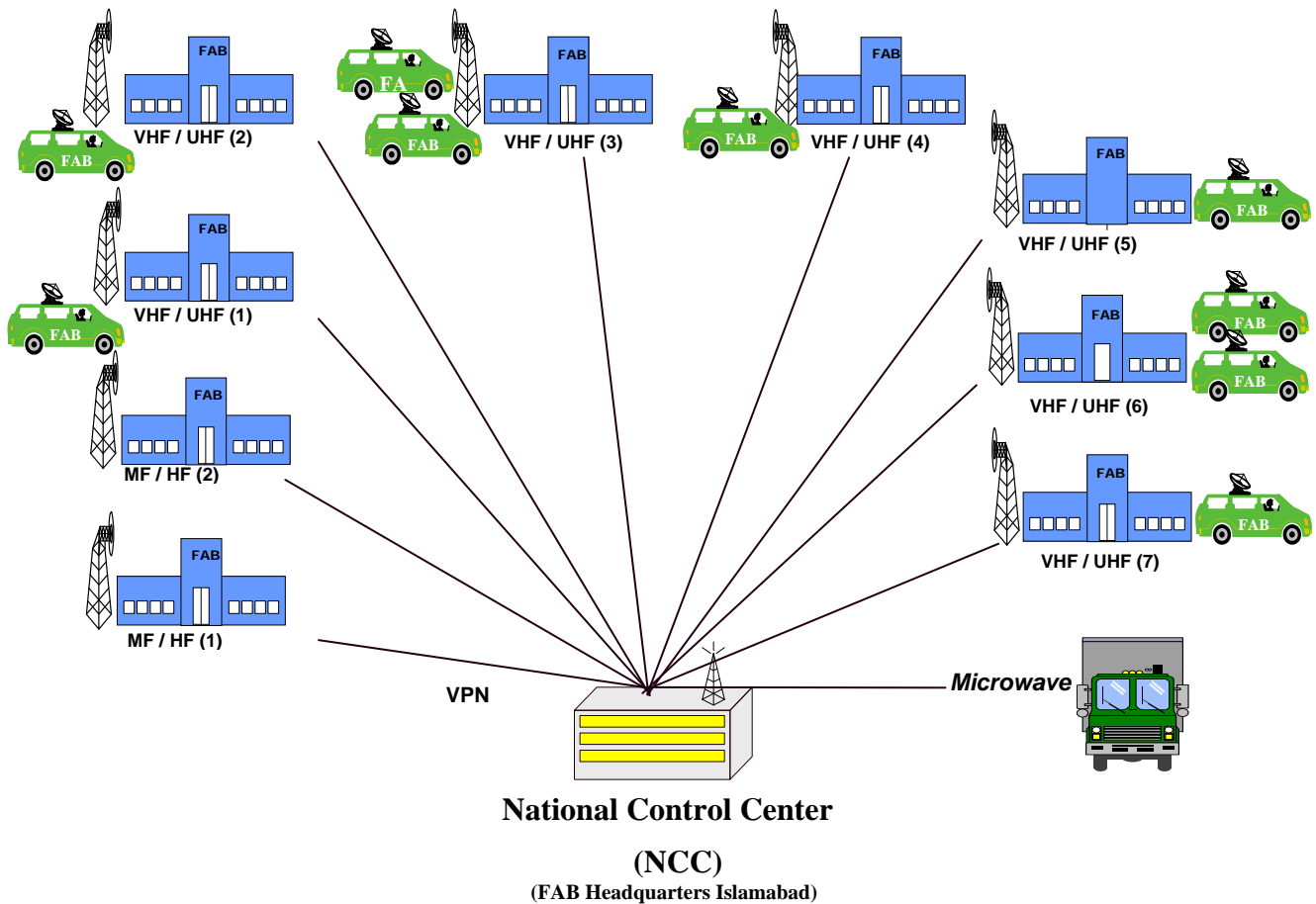
- 1.1 Part A: of this Section describes general information about existing system and requirements for the project. Part B contains detailed specifications for the main system components required under the contract.
- 1.2 The Bidder shall submit a commentary on the Technical Specifications and adequate evidence demonstrating the substantial responsiveness of the facilities to these specifications. Therefore, the Bidder shall provide comments and information on each requirement and specification in this section, preferably in a matrix form

2. PTA and FAB Organization

- 2.1 After passing of Pakistan Telecommunication Re-organization Act, 1996, two separate entities have emerged, namely the Pakistan Telecommunication Authority (PTA) and the Frequency Allocation Board (FAB).
- 2.2 PTA is responsible for regulating the telecommunications sector in Pakistan. In this character, PTA process the requirements for licenses for all kinds of radio stations and operator licenses.
- 2.3 FAB is responsible for spectrum planning/management, allocation/assignment of frequencies and monitoring the radio frequency spectrum. FAB exercises its functions pertaining to the allocation of radio frequency spectrum and operation of the national monitoring system.
- 2.4 In order to fulfill its obligations, FAB desires to extend its capability of frequency monitoring range and the coverage area, expanding the existing National Frequency Management & Monitoring System (NFMMS).

3. Existing National Frequency Management and Monitoring System (NFMMS) Architecture

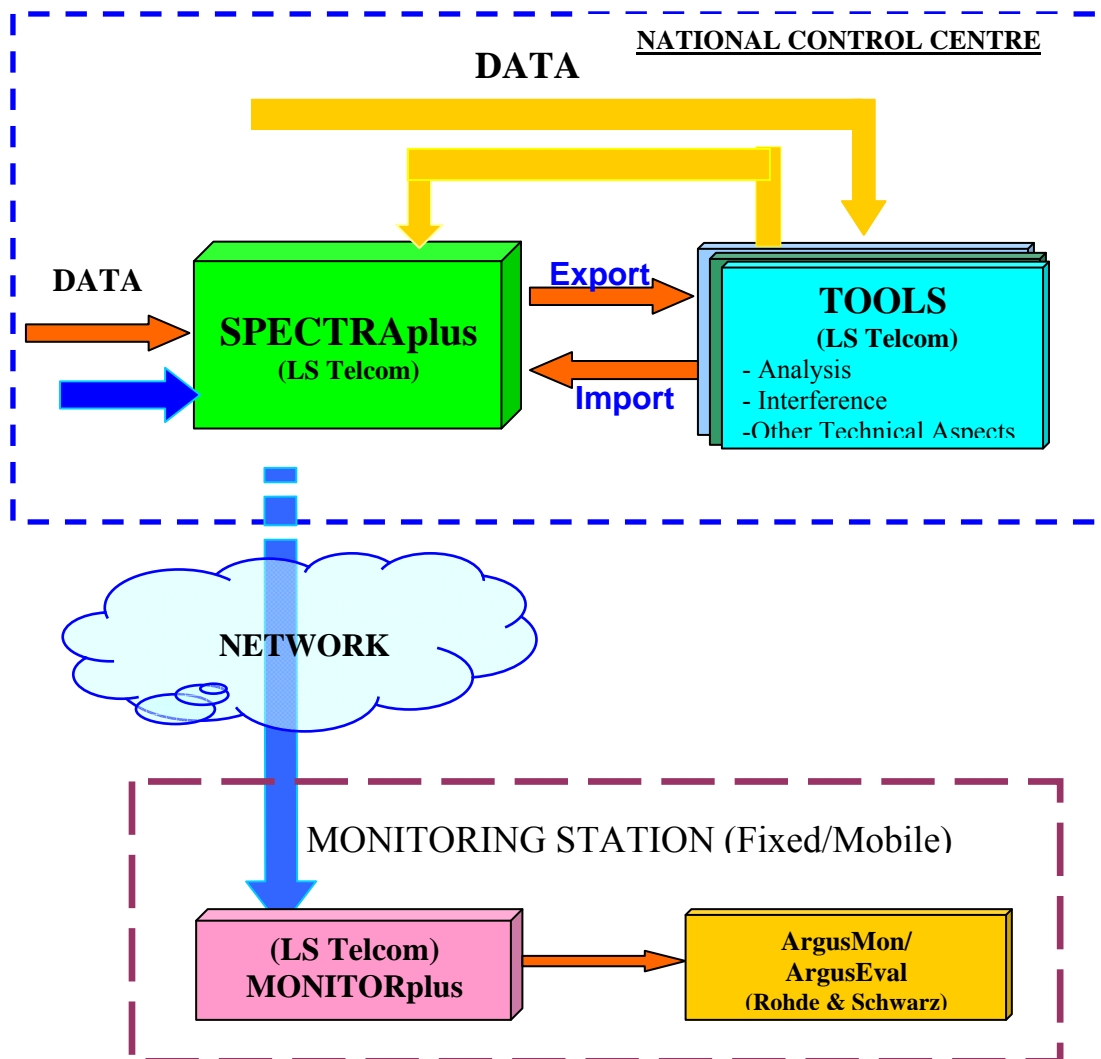
- 3.1 The NFMMS was established in 2001 and was made operational in 2002. FAB is responsible for the operation and maintenance of NFMMS which includes: -
 - a. Two (02) MF/HF Monitoring Stations (10 KHz-30MHz)
 - b. Seven (07) VHF/UHF Fixed Monitoring Stations (20 MHz-3GHz)
 - c. Nine (09) VHF/UHF Mobile Monitoring Stations (20 MHz-3 GHz)
 - d. One (01) Mobile Microwave Monitoring Station (500 MHz-18 GHz)
 - e. National Control Centre (NCC)
- 3.2 The architecture of existing NFMMS is shown in fig-1.



(Figure 1 Existing NFMMS Architecture)

- 3.3 All the Fixed / Mobile Monitoring Stations are fully accessible and controllable through specialized software applications on LAN/WAN from NCC, performing following main functions: -
- Import of transmitter licensee data from NCC to Monitoring Station
 - Export of monitored data from Monitoring Stations to NCC
 - Operate and control Monitoring Station remotely from NCC
- 3.4 Both Fixed and Mobile Monitoring Stations are capable to operate the other way, manually or remotely.
- 3.5 Diagrammatic flowchart of the functioning of software tools for complete integration between Monitoring Stations and Spectrum Management System is shown in Fig-2.

CONFIGURATION BETWEEN SPECTRUM MANAGEMENT / DATABASE AND MONITORING SOFTWARE TOOLS OF NFMMS



(Fig.2 Flowchart of Software tools accessing the database)

- 3.6 The network diagram of existing NFMMS is shown in fig-3. The network layout of each Fixed Station and Mobile Monitoring Station is shown in figure -4 & figure-5.

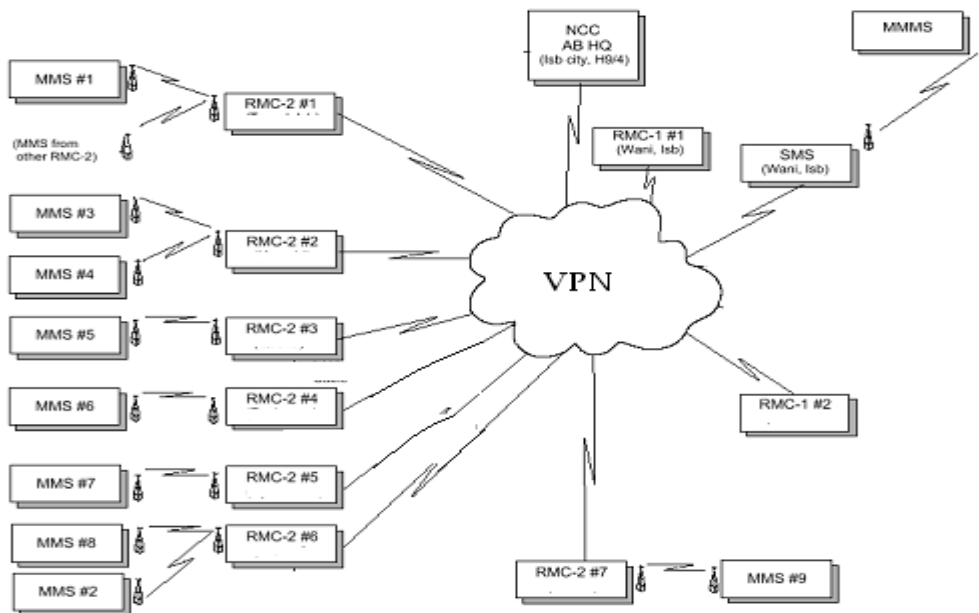


Fig.3: Network Layout of Existing NFMMS

4. **Principal Tasks of the NFMMS**

4.1 In broad terms, the principal tasks of the National Frequency Management and Monitoring System specifically regarding Monitoring part are: -

- a. Supervision of the radio traffic in general
- b. Spectrum Occupancy Measurements
- c. Measurement of technical parameters, such as frequency, modulation, bandwidth, field strength and radiation pattern for compliance with license conditions
- d. Determination of infringements
- e. Triangulation, Homing and location of radio transmitters
- f. Interference analysis and its resolution
- g. Direction Finding
- h. Manual and Automated measurements and scanning
- i. Comparison of measured data with licensed data or parameters in NCC database
- j. Gathering of statistical data for frequency management purposes

5. **Scope of the Work and Project Requirements**

5.1 The main scope of work includes turn key responsibility for the design, supply, installation, operation, testing, support, warranty and maintenance for the Monitoring Systems required under the project.

5.2 The Bidders shall offer following Radio Monitoring Systems including hardware and software for spectrum monitoring and direction finding

according to the principles set forth in Spectrum Monitoring Handbook and relevant ITU-R recommendation and Reports: -

- a. One (01) VHF/UHF Mobile Monitoring System
- b. Seven (07) VHF/UHF Portable Monitoring Systems
- c. Two (02) Transportable / Mobile Microwave Monitoring Systems
- d. Seven (07) RF Field Strength Meters
- e. Associated software/drivers / tools and accessories for operation of equipment.
- f. Installation and operation services for the systems
- g. Commissioning of mobile or transportable systems in mobile vehicles
- h. Operations and maintenance manuals
- i. Staff training on the operations and maintenance of the system
- j. Operations and maintenance assistance during the initial twelve (12) months of operation.
- k. Maintenance/spare parts support for 2 years, following completion of warranty period
- l. Network Connectivity/Integration with existing system
- m. Power Supply Arrangement (UPS, Generator, etc)

5.3 The Bidders shall tender according to the system specifications and configuration described in this Section. A different configuration with only those modifications which will bring improvements to the system's performance will be considered. The bidders shall describe in detail the improvements and capabilities.

5.4 The cost of the following locally available facilities, whose maintenance and spare parts services must be available countrywide, shall be quoted by the Bidders as part of the Expansion of NFMMS Project. The Employer may decide acquiring them locally from different contractors:-

- a. Computers / Laptops and associated accessories (i.e., keyboard, mouse, monitor, printer, etc).
- b. Networking Equipment (i.e, Router, Modems, etc.)
- c. Power supply system including (UPS, Generator, inverter)
- d. Mobile Vehicles (4 x 4) for Mobile Monitoring Stations

5.5 The price quoted by the Bidders for the above mentioned facilities will be included in bid evaluation. The bids shall include detailed information e.g., generator capacity (12.5 KVA), Electric load of the equipment, UPS capacity, computer specifications, and Mobile Vehicle size/capacity, etc required, so that the Employer can acquire compatible equipment locally, that can be fully integrated to the system supplied by the Contractor.

5.4 **Bill of Quantities (BOQ)**

The BOQ included in Attachment-1 indicates the minimum quantities that shall be quoted by the Bidders. Where no quantities have been specified, this attachment is only indicative and the Bidders shall offer the required quantities according to their system design. Furthermore, the Bidders shall provide unit prices in the Price Schedule, which include all the sub-systems, components,

spare parts, accessories, services, etc. required for the Expansion of NFMMS even if they are not mentioned in the BOQ. (See ITB-11: Bid Prices) .

6. **Work Program**

- 6.1 The time to complete the Facilities is specified in the Bid Data Sheet, ITB 24.5 (b). No credit will be given for earlier completion and bids offering a completion date beyond the maximum designated period shall be rejected.
- 6.2 Within fifteen (15) days after the date of signing the Contract, the Contractor shall prepare and submit to the Project Director a detailed program of performance of the Contract. This program shall also identify all the implementation events and activities in such a way that the flow of payments subject to measurement of the work performed can be scheduled with reasonable exactitude.

7. **Applicable Standards**

- 7.1 As stated in ITB-9.2 (d)(iii), the standards for workmanship, materials, and equipment designated in these Technical Specifications are intended to be descriptive (establishing standards of quality and performance) only and not restrictive. The Bidder may substitute standards, provided that it demonstrates in its bid that the substitutions are substantially equivalent or superior to the standards designated herein.
- 7.2 All functions and measurements performed by required monitoring systems shall meet or exceed the recommendations of the ITU set forth in the Spectrum Monitoring Handbook 2002 and the relevant ITU-R Recommendations / Reports. The Bidders shall describe how the proposed systems comply with those recommendations.

Table 1 ITU-R Recommendations for Monitoring Functions

<u>No</u>	<u>Function</u>	<u>ITU-R Recommendations</u>
1.	<u>Signal Parameter Measurement</u>	
1.1	Frequency and Frequency Offset	ITU-R Rec. SM 377 ITU-R Rep. 272
1.2	Field Strength	ITU-R Rec. SM 378 ITU-R Rep. 273-7
1.3	Modulation	ITU-R Rep. 277
1.4	Bandwidth	ITU-R SM 328 ITU-R Rec. 443
1.5	Identification	ITU-R Rep. 978
2.	<u>Spectrum Occupancy</u>	
2.1	Band (Channel) Occupancy	ITU-R Rec. 182 ITU-R Rep. 668-3
3.	<u>Direction Finding and Location</u>	
3.1	Direction Finding and Location	ITU-R Rec. 372-6 ITU SM Hand book

- 7.3 The system shall be designed with a modular architecture and shall use the

latest technology. The Bidders shall describe how the proposed systems anticipate future needs regarding the enhancement in frequency range, growing use of digital modulated signals and new technologies.

8. **Evidence of Compliance**

- 8.1 As specified in ITB-9.2 (d), the documentary evidence to be submitted with the bids shall consist of: -
- a. A certificate of origin of the plant and equipment offered.
 - b. A detailed description of the essential technical and performance characteristics of the facilities.
 - c. A commentary of the Employer's Technical Specifications and adequate evidence demonstrating the substantial responsiveness of the Facilities to those specifications.
 - d. A list giving full particulars, including available sources, of all spare parts, special tools, etc., necessary for the proper and continuing functioning of the Facilities for the period named in the Bid Data Sheet, following completion of facilities.
 - e. The documentary evidence of the conformity of the facilities to the bidding documents may be in the form of literature, drawings and data.

9. **Maintenance Support And Mandatory Spare Parts**

- 9.1 Maintenance and warranty services for initial 1 year after commissioning and operation shall comprise of replacement / repair of defected hardware elements, components, subsystems or system and configuration / troubleshooting of software. Any spare parts used during the Defect Liability Period due to causes different from: -
- a. Improper operation or maintenance of the Facilities by the Employer, or
 - b. Operation of the Facilities outside specifications provided in the Contract
- Shall be replaced by the Contractor in an amount equal to three (3) times the original quantities specified in the Contract at its own expense.
- 9.2 The bids shall include operation and maintenance assistance to be provided by the Contractor during twelve (12) months after commissioning and successful acceptance testing. This assistance shall include further on-the-job training and specialized training on the system's software that enable the Employer staff to introduce modifications and debug the software if so required in the future. The Bidders shall describe fully the characteristics of the assistance program offered.
- 9.3 The bidder shall include the complete maintenance / spare parts support & services, including but not limited to repair, replacement, troubleshooting of the equipment, installation / configuration and troubleshooting of software, for the period of two (2) years after warranty period (to be submitted separately with complete details and requirements).

10. **Monitoring System General Requirements**

10.1 **Monitoring System Basic content**

- 10.1.1 The Monitoring System (MS) includes hardware and software that shall allow for spectrum monitoring and direction finding according to the principles set forth in Spectrum Monitoring Handbook and relevant ITU-R Recommendations and Reports.
- 10.1.2 The monitoring network shall be led by the NCC that manages the network through specialized application software and set-up monitoring strategy and monitoring task plans.
- 10.1.3 It shall be possible to operate any monitoring station from the NCC.
- 10.1.4 The MS shall perform spectrum monitoring and direction finding activities through monitoring stations. The monitoring stations shall be operated manually as well as remotely.
- 10.1.5 The MS shall allow for getting information from the real environment and constitutes data/reports for further transmission / processing at NCC, which consists of the spectrum management activity.

10.2 **Generic MS features**

- 10.2.1 The monitoring systems shall provide the generic monitoring features including, but not limited to, the following: -
 - a. Monitoring Task plans (activity scheduler).
 - b. Graphical Display formats.
 - c. Remote Control features.
 - d. Local Control features.
 - e. Data and Network Security features.
 - f. Self-Testing and Calibration features.
 - g. Event Reporting

10.3 **MS General Functional requirements:**

- a. Spectrum occupancy scanning
- b. Signal parameter measurement
- c. Direction finding
- d. Triangulation and transmitter location
- e. Demodulation and Analysis of signals
- f. Audio recording
- g. Manual/Automatic measurements/ scan and make comparison of measured data with licensed data or parameter.

10.4 **Detailed Functional Requirements of Monitoring Systems**

- 10.4.1 VHF/UHF Mobile Monitoring System will provide general monitoring features including but not limited to the following: -
 - a. Monitoring and measurement of spectrum from 20 MHz to 6 GHz.
 - b. Fast scanning for Spectrum Occupancy measurement.
 - c. Signal parameters measurement (i.e., frequency, field strength,

- bandwidth, frequency deviation, etc) for comparison with licensed parameters.
 - d. Interference analysis and calculation
 - e. Direction Finding for triangulation identification and homing of transmitter location.
 - f. Spectrum Analysis
 - g. Recording / storage of monitoring data/scans for post processing and analysis.
 - h. Linkup all intercepts information to the central database (NCC)
 - i. Retrieve license record from NCC in tabular form
- 10.4.2 VHF/UHF Portable / Handheld Monitoring System. Portable Monitoring System will consists of compact and handy equipment to perform general functions including but not limited to: -
- a. Monitoring of spectrum in the range 20 MHz to 6 GHz
 - b. Measurement of technical parameters of radio transmission
 - c. Direction Finding / homing of transmitter with the help of handheld antennas.
 - d. Scanning of spectrum for occupancy and interference analysis
 - e. Recording/storage of monitoring data/scans for post processing and analysis
 - f. Linkup all intercepts information to the central database (NCC)
- 10.4.3 Transportable/Mobile Microwave Monitoring System. Mobile Microwave Monitoring System will provide following general monitoring functionalities:
- a. Monitoring of spectrum in the range 1 GHz to 40 GHz
 - b. Scanning of the spectrum/bands for spectrum occupancy measurement
 - c. Interference analysis and calculation
 - d. Measurement of technical parameters of radio transmission
 - e. Checking signals for compliance with license conditions /radio regulation i.e, frequency, bandwidth, field strength, signal level, etc.
 - f. Direction Finding for location identification of illegal / interfering emission/transmitter.
 - g. Spectrum Analysis
 - h. Recording/storage of monitoring data/scans for post processing and analysis

10.5. MS Application Software facilities

10.5.1 General Requirements for Software

- a. The MS application software shall utilize a proven set of basic monitoring system applications.
- b. It is preferable that the software modules be able to provide for customization to a certain extent by the Employer, where necessary, to accommodate the need for particular formats on specific reports and screens.
- c. The MS Application Software shall: -
 - (i) Be fully compatible with existing Database Management Software available at NCC, for import & export of data in standard format
 - (ii) Support Interactive, Manual and Automatic Measurement modes.
 - (iii) Provide adhoc query capabilities to meet a variety of operational requirements.
- d. Display direction finding and triangulation task results on digital maps (available to the Employer).
- e. Reset of the monitoring system / unit computer system.
- f. Capability to convert stored raw measurement data into common formats such as MS Excel, MS Access, ASCII, etc and exported for processing by NCC.
- g. The MS Application Program shall incorporate user-friendly features to enable the staff to utilize the MS easily and without requiring knowledge of the MS application software details.
- h. These user-friendly features shall include or provide for, but not be limited to:
 - (i) Consistent program "look and feel".
 - (ii) Process designed for intuitive navigation between related screens.
 - (iii) Consistent screen layouts in Graphical User Interface (GUI) format with pull down menus and point-and-click selection, designed generally in accordance with the Microsoft User Interface Style Guide or equivalent.
 - (iv) Self-explanatory "Help windows" on screen.
 - (v) Step by step explanation on the most common, typical, measurement tasks possible to perform through spectrum monitoring facilities and how to perform them with the system.
- j. The MS Application Software shall include security features to ensure that only properly authorized personnel may:-
 - (i) Access the MS Application Program.
 - (ii) Utilize the MS Application Program.
 - (iii) Access and / or change data in the (MS, SMS) database.

- k. Local display and storage of results/reports of monitoring activity. Transfer the results / reports to NCC.
- l. The Bidders shall clearly describe the reporting capabilities provided with the MS Application Software.

10.5.2 **Display Format:**

10.5.2.1 The MS application software shall provide graphical display formats which include but are not limited to the following:-

a. Spectrum occupancy:

- (i) Counts (hits) versus signal level,
- (ii) Percent occupancy (in a sampling set) versus time,
- (iii) Percent occupancy (in a sampling set) versus frequency,
- (iv) Percent occupancy (in a sampling set) versus signal level,
- (v) Signal level versus time,
- (vi) Hold time (in seconds) versus time for a limited number of channels.

b. Signal parameter measurement:

- (i) Time domain (e.g. field strength for one frequency, frequency for one station, etc, Direction of Arrival - DOA in azimuth for one radio source, etc),
- (ii) frequency domain (e.g. field strength for a scanned band, etc),
- (iii) waterfall display.

c. Direction finding:

- (i) signal bearing polar plot on digital map,
- (ii) signal bearing triangulation plot on digital map,
- (iii) signal bearing polar plot against vehicle longitudinal axis (only in V/UHF and Microwave Mobile Monitoring System) for homing operations.

d. Virtual instrumentation:

- (i) receiver,
- (ii) direction finder,
- (iii) spectrum analyzer (if provided at the monitoring station),
- (iv) RF switch matrix,
- (v) audio switch matrix and recorder.

10.5.2.2 The displays and graphical representations should be possible to store and export as images. The results, in tabular format, based on which the representations have been built up should be possible to store and export as text files compatible to the existing setup.

11. **Requirements Applicable To The Project As a Whole**

- 11.1 Each system shall be carefully integrated into an optimal configuration at individual station level. Each VHF/UHF and Microwave Mobile Monitoring System shall be provided with uninterrupted power supply (UPS) system for a minimum of one (1) hour backup on full load. The UPS system shall be connected to a backup generator of suitable rating. The primary power supply shall be 220 V(\pm 15%), 50Hz, single phase. Whereas portable battery backup for minimum of three(3) hours, will be provided for portable monitoring system.
- 11.2 The mobile monitoring systems shall be installed on suitable 4 x 4 vehicle of the type used in Pakistan. It will carry UPS on board and a backup generator. The antennae shall be operatable during movement, though at reduced heights, if so required. During movement, the mobile station will be powered by the onboard UPS batteries.
- 11.3 The hardware shall have a high MTBF based on actual running experience of the contractor over a period of not less than 5 years. The numbers shall be indicated in the bids, ISO/ITU-R standards to apply.
- 11.4 The self-diagnostic routine for each system as a whole is mandatory. The system diagnostic routine shall identify the unit, which is experiencing problems and preferably should go even beyond in pinpointing the item in a defective unit, which has failed.
- 11.5 The degree of standardization of parts and components of the entire system shall be as high as possible: -
- (a) The system shall provide optimized results in terms of cost and performance evaluation.
 - (b) All system components, which are designed, procured, implemented and commissioned.
 - (i) State of art production
 - (ii) Off the shelf technology
 - (iii) Fixed Provide
 - (iv) Flexible
 - (v) Expand able
 - (vi) Sufficient
 - (vii) Integrated with each other
- 11.6 Workmanship
Contractor shall offer first class workmanship in every stage and implementation of the system and modification of facilities.
- 11.7 Safety
The system design and equipment layout shall minimize physical hazards to operating and maintenance personnel. Conspicuous warning labels/plates shall be mounted on or adjacent to equipment which pursuant personal

hazard (e.g., high voltage, RF radiation, heat, mechanical leakages, etc). Each Mobile Monitoring facility shall be equipped with & proper lightening protection and Earthing system.

- 11.8 Maintainability
Equipment and rack configuration shall facilitate speedy replacement or modular packages. Check points, adjustment points, cables connectors shall be marked and / or labeled and accessible and visible. Space shall be provided for use of tools and test equipment without difficulty, or hazard.
- 11.9 Conceived AC Power Supply
The power source for all electrical equipment / shall be single phase 220 VAC + 15%, 50 Hz.
- 11.10 Quality Assurance
Each bidder shall provide in its bid a description of the quality, assurance program already in place within the Bidders company, the duration of the time that such program has been active and a certification that the same program will be applicable to the hardware, software and services provided to the Employer in the event of a contract void for this system.
- 11.11 The design and the electrical and mechanical construction, as well as the finishing of all measurement equipment shall conform in all respects with good engineering practice and such equipment shall be suitable for use in regions with atmospheric conditions specific in Pakistan.
- 11.12 All measurement equipment shall be designed and built up based on and utilizing the most recent digital technology. Any system or subsystem should not have limitation placed to meet the requirements of the bidding document i.e, any additive feature of any component should be available as per the normal marketing brochures and user manuals.
- 11.13 The equipment shall be fully maintainable in Pakistan through the supply of spares parts, tools and measuring equipment. All cables, connectors, interfaces, and any other hardware and software required for delivering a fully operational system as per description given herein shall be the responsibility of the Contractor. Lack of identification or definition of any item of hardware or software in this bid document but otherwise necessary for satisfactory working of each of the stations, will not be taken as an excuse or absolve the Contractor of its responsibility to provide fully working stations to meet the operational requirements given herein.
- 11.14 If the system has been integrated from more than one source, then the original manufacturers of the system or subsystems should additionally extend the warranty of the system or subsystems in the name of the Employer.
- 11.15 According to the destination of measurement equipment, mobile transportable or portable, such equipment shall be installed either in appropriate racks or delivered as bench model (s) with all required cables, connectors, adapters, fixtures etc. All the equipment should be modular, easily detachable and configurable for operation at any other location as per specific requirement of task.

- 11.16 Any system or subsystem should not have limitation placed to meet the requirements of the bidding document i.e, any additive feature of any component should be available as per the normal marketing brochures and user manuals.

12. **Acceptance Criteria**

- 12.1 Each system shall be subjected to Acceptance Tests performed according to pre-agreed Criteria. The acceptance tests shall be conducted at the installation site as part of the pre-commissioning process. The purpose of the tests shall be to establish whether the equipment conforms to the specifications as laid down in the bid documents and performs as laid down here to before. As an example, the requirement will be to test one complete system (terminal) of each type, duly integrated with all pieces of equipment, for sensitivity of the receivers, gains of amplifiers and antennae units, noise figures of the amplifiers and receivers, the drift values of the receivers, the accuracy, of bearing measurement, the stability of power supplies, the accuracy' of other measurements such as those of centre frequency, bandwidth, signal reception sensitivity, signal dwell time, software controlled operations and integration with existing systems.
- 12.2 The Bidders are required to submit along with their technical proposals, but as a separate document, the Field Acceptance Procedures describing the testing procedures to ensure the conformance of the all system with the Technical Specifications and performance requirements herein included and the quality of its components. The testing procedures shall be drawn up by the Contractor and submitted to the Employer not later than three (3) weeks after Contract signing. These procedures will be discussed between the engineers designated by the contractor and the Employer to arrive at a final commonly agreed document.
- 12.3 Guarantee testing and operational acceptance procedure shall be conducted as per terms and conditions of the contract.

13. **Training**

- 13.1 Bidders shall include in country training courses, of sufficient duration, for each important operational and maintenance aspect of the Systems. The complete schedule of local training for 15-20 employees at FAB / PTA shall be specifically mentioned in the bids. During the period of operation and maintenance assistance adequate support for further hands-on training and debugging/modification of the software as per requirement by the employer shall be ensured.

14. **Operation and Maintenance Manuals**

- 14.1 High quality Installation Operation & Maintenance manuals in English language for each system shall be provided in two hard copies. Softcopy of each manual shall also be provided on compact disc in Acrobat or Word format.

- 14.2 These manuals shall include the concept of operations of each system, complete with descriptive diagrams, flow charts and other graphical illustrations as required. The role and inter-relationships of each major sub-system shall be discussed in a separate chapter. Each equipment item provided for each complete system shall be addressed in the manual, in the form of a written tabulation of the item name, contractor, vendor or manufacturer name, mailing address, telephone number and fax number for each individual vendor represented by the list of deliverables. Explanations are to be provided regarding the working of each individual piece of equipment, and its relevance to the system and / or network. Written explanations are to be clear and unambiguous.
- 14.3 In addition, the manuals including documentation & circuit diagrams of major components of the system (i.e, Receiver, RF distribution / Amplification Unit, etc) shall be supplied in 2 x master hard copies and 1 set on CD –Rom.
- 14.4 Training documentation and training course material shall be delivered to each trainee in hardcopy. Two (02) soft copies of all type of training documentation shall be delivered to FAB.
- 14.5 Documentation prepared specifically for this project shall not include vendor copyrights or their symbols of ownership, and shall become the property of the Government of Pakistan upon acceptance of such documentation.

PART - B

Detailed Specifications

1. Introduction

- 1.1 The following pages outline the specifications of monitoring systems required for the Expansion of the NFMMS. The units not specifically mentioned in this Chapter but considered necessary for each of the system shall be clearly defined and specified by the Bidders so that they meet the performance requirements described in these bidding documents.
- 1.2 The Bidders shall attach to their bids a block diagram for each type of system (Mobile VHF/UHF, Microwave and Portable) indicating the connections and relationships among the various components or sub-systems such as antennae, receivers, DF sub-system, consoles, communications equipment, power supply and air conditioning systems, and GPS receivers. The description of the offered system shall make reference to the configuration so depicted.

2. VHF/UHF Mobile Monitoring Station (MMS)

- 2.1 The VHF/UHF mobile monitoring station shall perform the monitoring and direction finding measurement functions according to the ITU Recommendations listed in Applicable Standards. The VHF/UHF Mobile Monitoring System shall be compact, completely equipped with all necessary monitoring equipment, monitoring antennas, modem(s), communication antenna(s), GPS and GPS antenna, interconnecting cables, power supplies, cabinets, racks mounting computer hardware, software, interface devices and terminal blocks to form a complete and working stand alone system as well as a reliable component that shall be an integral part of the NFMMS. The integrated system shall be designed and housed in a vehicle to form VHF/UHF Mobile Monitoring Station.
- 2.2 **Monitoring Receiver** (20 MHz to 3 GHz – extended range upto 6 GHz or more offered will be given advantage).
Monitoring Receiver will be used for all radio detections, investigations and radio monitoring tasks in line with ITU-R The receiver shall be installed in a rack for Mobile Monitoring Station to provide following applications: -
 - a. Signal detection
 - b. Signal search in frequency & memory scan mode
 - c. Spectrum occupancy measurement
 - d. RF and IF analysis
 - e. Field strength measurement
 - f. Frequency, bandwidth and type of modulation measurement
 - g. Panoramic display

h. Demodulation and Audio monitoring of CW, AM, FM, SSB and USB transmissions

2.2.1 Monitoring Receiver shall support full remote control as well as manual control via front panel. Full use of performance features shall be made available using a computer/Laptop and monitoring software application, which shall allow control of settings, measurements and scan functions, as well as saving of measured data in both tabular and graphical forms.

2.2.2 **Technical parameters**

Frequency range:	20 MHz to 3 GHz (extended range upto 6 GHz or more offered shall be given advantage)
Frequency setting with terminal knob:	1Hz, 10 Hz, 100 Hz, 1KHz or in selectable increments upto 1 MHz
Frequency Resolution:	1 Hz
Frequency Accuracy	$\leq 0.5 \times 10^{-6}$
Max input level:	Average: +15dBm to +20dBm
Signal level measurement	-30 dB μ V to 110 dB μ V
Dynamic Range:	120 dB
RF input attention (manual and auto)	Upto 30dB (5 to 10 dB steps is preferred)
Sensitivity:	-107dBm or better(Bidder shall present exact system sensitivity for entire range)
Overall Noise Figure:	≤ 12 dB
Demodulation Capabilities:	USB, LSB, AM, FM, CW, Pulse, PM (Decoders shall be provided where necessary)
IF Selection Bandwidth filter:	At least (10) IF filters, from 1 KHz to 2 MHz (upto 10 MHz shall be preferred)
Image frequency Rejection:	≤ 90 dB
IF Rejection:	≥ 90 dB
Oscillation/Low Phase Noise:	≤ 100 dBc/1Hz, at 10 KHz offset
2 nd order intercept:	Better or equal 40 dBm
3 rd order intercept:	Better or equal 20 dBm (Inband)
Channel Scanning Interface	≥ 1000 channels Ethernet, , 10 Base-T,RS 232 C

2.2.3 Bidders must ensure that Receiver specification should be measured according to ITU Recommendations.

2.3 **Antennas**

Following radio monitoring antenna/antennas shall be provided: -

2.3.1 **Omni Directional Antenna** (extended range upto 6 GHz or matching with receiver shall be preferred.)

Frequency range:	20 MHz – 3 GHz
Polarization:	Vertical

Type of Antenna:	Active
Gain:	Shall be quoted
VSWR:	Equal / less than + 2.5:1
Impedance:	50 Ω

2.3.2 Yagi/Log periodic Broadband Directional Antennas (extended range upto 6 GHz or matching with receiver shall be preferred)

Frequency range:	20 MHz – 3 GHz
Polarization:	Linear Horizontal, Vertical
Gain:	≥ 6.5 dBi
Front to back ratio	High (shall be quoted)
VSWR	Equal / less than 2.5:1
Directivity:	60° at 3 dB (half powers beam with) or better
Impedance:	50 Ω

2.4 **Direction Finding System**

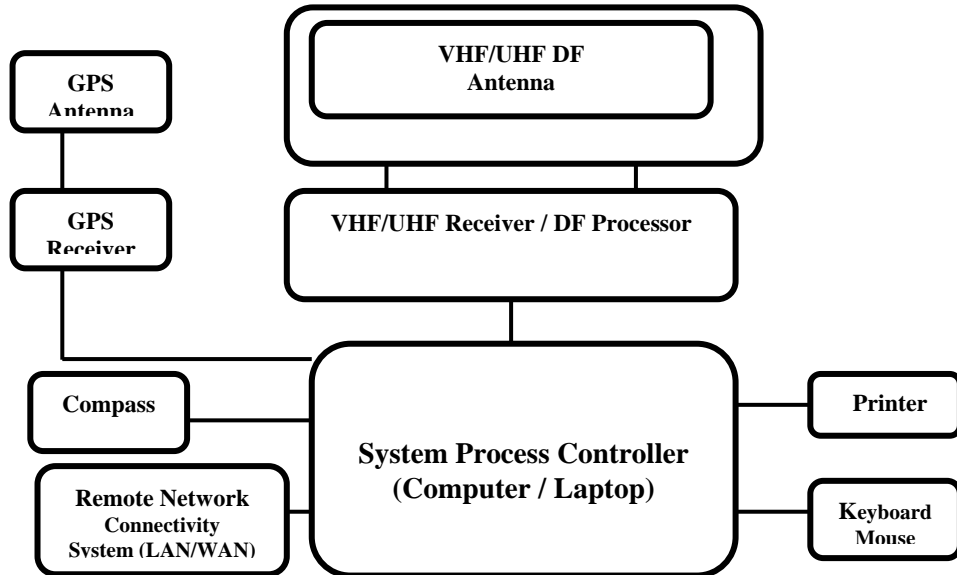
The System should have high accuracy and sensitivity and be capable of direction finding of signals with all types of modulations. The monitoring and DF performance shall comply with the minimum technical specific requirement mentioned below in 2.4.1.

2.4.1 Technical Specifications

Frequency range:	20 MHz –3 GHz (extendable upto 6 GHz will be given preference.)
Antenna System:	Specifications to be separately given by the bidder
Sensitivity:	1 to 10 μ V/m or better in the entire freq range
DF method:	Correlative / Interferometer or Wattson-Watt (Others should be defined with advantage)
Image rejection:	Equal or better than 80dB
Scanning:	High DF scan speed to be preferred (frequency/channel scanning)
DF accuracy:	Equal or better than 2 deg (RMS)
Bandwidth (Internal)	8 KHz, 25 KHz, 100 KHz, 500 KHz, 2 MHz or more in steps
Signal Dwell time	≤ 10 ms
Azimuth:	60 deg sector suppression selectable
Polarization:	Vertical/Horizontal

2.4.2 General architecture of the Direction Finding Console and Omni/directional monitoring console is as under.

VHF/UHF Mobile Monitoring System
(1) Direction Finding Console



(Fig.4:Block Diagram for Direction Finding System)

VHF/UHF Mobile Monitoring System
(2) Omni/Directional Monitoring Console

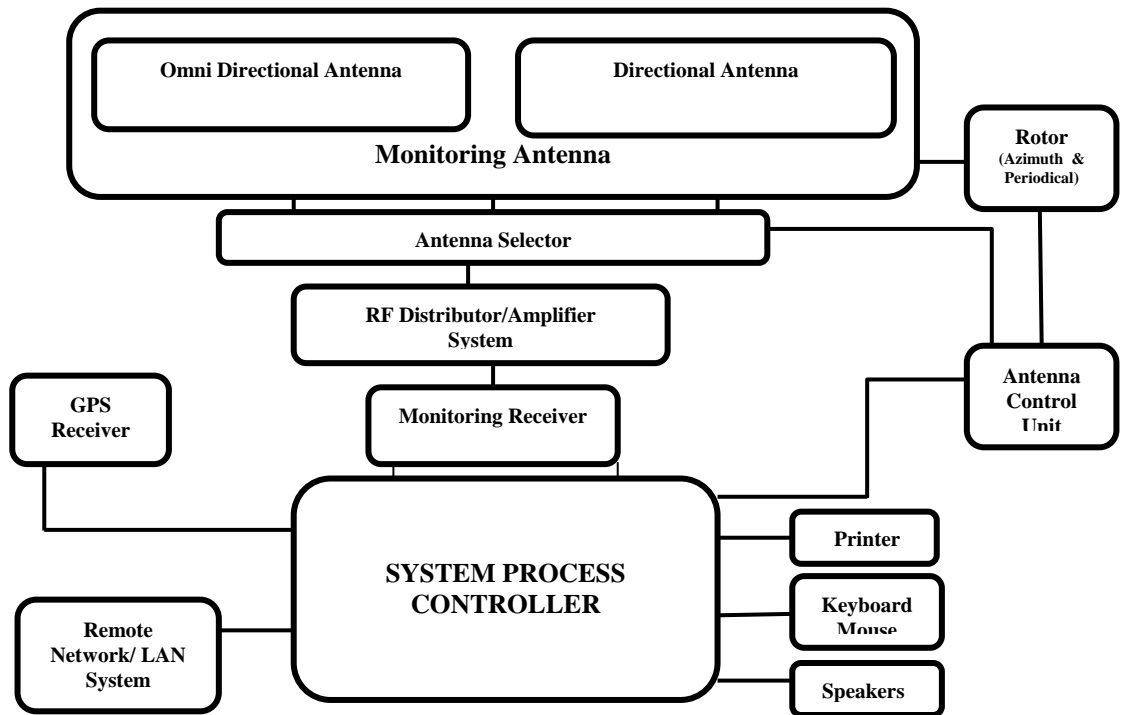


Fig.5 Block Diagram for Omni/Directional Monitoring System

2.5 **Operation and Function Requirements**

2.5.1 **Monitoring Receiver**

2.5.1.1 Monitoring Receiver 20 MHz to 3 GHz (extended range upto 6 GHz or more) in one box unit will be preferred.

2.5.1.2 The receiver range must be extendable keeping in view the future requirements. This extension can be integrated with new plug in modules, without additional hardware at minimum cost. Bidder must provide the details in this regard upto the satisfaction of the Employer.

2.5.2 **Direction Finding**

2.5.2-1 The system must have monitoring, DF and homing capabilities. To achieve this capability, each DF system shall be equipped with an integrated monitoring receiver, Electronic Compass and GPS receiver. Automatic digital DF processing related to the magnetic North is favoured.

2.5.2.2 One box unit, integrated with monitoring receiver and DF processor, will be preferred for the compactness of the system to be installed in a vehicle.

2.5.2.3 The V /UHF monitoring station shall be capable of acquiring, tracking and locating the source of emissions in the VHF and UHF bands. The performance and response time shall be independent of modulation type (analogue as well as digital modulated signals).

2.5.2.4 For the homing operations (DF in motion and tracking) a homing device shall be installed visible for the front seats, including driver seat. The representation of DOA for homing operations shall be suggestive and clearly to see and process by driver while in motion (represented as DOA line against the vehicle's longitudinal axis).

2.5.2-5 The mobile DF system shall have capabilities for simultaneous DF and homing operations while the vehicle is in motion.

2.5.3 **Antenna Configuration**

2.5.3.1 The bidders shall propose for the VHF/UHF mobile monitoring station, an antenna configuration that shall cover the required frequency band for monitoring and direction finding and achieve the specified system performance. Bidders may propose an antenna configuration that may be composed from several, but minimum and optimal quantity will be favoured. The performance parameters for the antennas to fulfill the system performances shall be completely described by the bidder.

2.5.3.2 The antenna shall be mounted in the most suitable way on hydraulic or mechanically erected / lowered masts at minimum

10 m from the ground. The system shall include an antenna control system to accurately establish the Directional Antenna position along the axes of azimuth and polarization. The positioning precision shall be ± 1.0 degree in complete rotation of 360° in Azimuth and of 90° in Polarization plane.

2.5.3.3 The VHF/UHF mobile antennas shall be designed to withstand the environmental conditions specific in Pakistan. The antennas shall be either installed permanently on the vehicle roof or mounted temporarily on a mast as referred above. The mast shall have a computer controlled powered rotator, attachable on top.

2.5.3.4 The Bidder shall provide complete drawings and pictures showing the physical layout for the antenna(s) configurations proposed. The drawings shall reveal both stages that is possible antennas to be envisaged in, working position (installed on the mast) and storage position (packed for transportation).

2.5.3.4 The Bidder shall completely describe performance parameters' for the antennas proposed to fulfil the system performance.

2.5.3.6 Include a control system to accurately establish the directional antenna(s) position along the axes of azimuth and polarization. The positioning precision shall be of ± 1.0 degree. The control system shall fully cover the possibility of rotation of 360° in azimuth and of 90° in polarization plane. The rotator both for azimuth and polarization shall be electrically controllable and shall be acted electrically.

2.5.3.7 The V /UHF antennas shall meet the following requirements:-

- a. A compact and lightweight design shall be considered for easy transport and installation without any degradation of performance.
- b. The operating temperature shall be within the range from -15 to +50 Celsius.
- c. The antennas shall be capable of operating in regions with high atmospheric salt water content.
- d. The antenna shall survive without any damage to wind speed of above 100 km/h, preferable above 120 km/h.

2.5.4 **Software and Function**

2.5.4.1 Full use of the performance features of the monitoring equipment (i.e., receivers, antennas, etc) will be made available in computer control mode using an available PC and spectrum Monitoring software. Monitoring software will be able to control all the equipment interactively to monitor, measure and identify the emissions in an efficient manner.

2.5.4.2 The Laptop / computer system shall be equipped with latest specifications of hardware devices (i.e., Hard Disk, CPU, RAM, Modem, LAN Cards, etc) with interfaces as required to control the monitoring equipment. All the devices installed in the

system shall be fixed in a manner that they can absorb shocks, vibration during mobile monitoring operations. The bidders must specify with evidence the shock/vibration absorption capabilities of monitoring systems, as per the international standards.

- 2.5.4.3 The System shall be equipped with a GIS software and digital maps (available to the employer), which shall be integrated with GPS and electronic compass to display and evaluate, site of mobile monitoring system and direction bearing, combining the results for evaluating triangulation results. The software shall have the options for zooming, distance measurement, etc.
- 2.5.4.4 Monitoring software should be compatible and integrated with existing spectrum management tools (available to the Employee at NCC) for import of licensed transmitter data and export of monitoring measurement data.
- 2.5.4.5 The Monitoring System software shall allow for execution and display of interactive measurements with following characteristics in tabular as well as graphical forms to rapidly investigate signals fix: -
 - a. Centre frequency
 - b. Field strength / signal level
 - c. Occupied bandwidth
 - d. Spectra scan and water full display to show variation of signals over a frequency range.
 - e. Display of field strength vs frequency over a selected band. (2D) and display of field strength vs frequency vs time over a selected band over a time period (3D).
 - f. System calibration with built in test
 - g. Offline procuring of stock data
 - h. Line of bearing results form DF unit with possibility of combining stored results for offline analysis.
- 2.5.4.6 Monitoring software should have the following, but not limited to functions:
 - a. Scanning of spectrum in graphical view with labeling markers (Frequency vs Level, Frequency vs Level vs Time)
 - b. Measurement modes:
 - Automatic monitoring and measurement
 - Manual measurement
 - Interactive measurement
 - c. Polar diagrammatic view for the analysis of maximum level of signal, utilizing directional antenna and rotation.
 - d. Bearing display.
 - e. Convenient documentation of results as hardcopy or file in PC compatible formats.
 - f. Offline processing/evaluation of stored data(to be used for off line analysis and presentation on a PC at a control center or

other location, without requirement to have the rest of the hardware.

2.5.5 **Auxiliary Equipment and Other Requirements**

2.5.5.1 The V/UHF mobile station equipment shall be provided with a high quality GPS frequency reference with the parameters as specified in the Table 5 below.

Table 5 Parameters required for GPS frequency reference

No.	Parameters	Required Performance
1.	Frequency reference stability (free running) Temperature Stability: Aging Stability (per year):	Internal stability $\pm 1 \times 10^{-10}$ $\pm 1 \times 10^{-8}$
2.	Frequency reference stability (disciplined): Temperature Stability: Aging Stability (per year):	External GPS-disciplined $\pm 5 \times 10^{-12}$ $\pm 5 \times 10^{-12}$
3.	Maximum output signal level	TTL Level
4.	Phase Noise @ 10 MHz	< - 100dBc / 1 Hz @ 10 Hz offset < - 125dBc / 1 Hz @ 10 kHz offset

2.5.5.2 The GIS software shall be integrated with the DF software allowing positions of interfering transmitters to be located in real-time.

2.5.5.3 The equipment will be operated in rough and mountainous terrain. Therefore, the mounting of the racks and of the equipment shall be designed to support excessive shocks to the equipment, as per standard recommendations.

2.5.5.4 Two (02) consoles shall be provided for the two main areas of operation. One (01) for VHF/UHF monitoring (omni & directional) and other for direction finding. Both shall be independent of each other, however it shall be possible that the results from one operation (i.e., signal detection) may determine the launch of another operation (i.e. DF).

2.5.5.5 All cable entry fixtures shall be weather proof.

2.5.5.6 RF Blocking Filter Unit

Blocking filters are to be used to keep strong adjacent signals away from the receiver inputs, if necessary. The contractor must ensure for the provision of appropriate filters/attenuation for the safe operation of equipment. Commonly, the filters shall be installed close to the receiver equipment. However, in case of long feeder cables, the filters need to be remotely controllable.

2.5.5.7 RF Distribution and Antenna Amplifier Unit

- a. The Contractor shall supply RF switches or distributor of other similar devices that are required to interface the antennas with monitoring and direction finding equipment. The referred switches and devices shall be computer controlled and allow for automatic configuration of the station, to the most possible extent, for the specific task to be executed.
- b. If at some sites the feeder attenuation is unfavourably high, switch able inter-modulation free antenna amplifiers shall be installed. Their need must be determined case by case in co-ordination with the employer.

2.5.5.8 Feeder Cable

Generally, feeder cables must maintain minimal attenuation values. The type of feeder cable offered shall be clearly mentioned.

2.5.5.9 Global Positioning System (GPS)

MMS shall be equipped with appropriate GPS equipment including appropriate interface for mobile environment to: -

- a. Determine the precise position (longitude; latitude, altitude) of the station with an accuracy of positioning of 10m or better (in all dimensions).
- b. Provide instant and continuous position and bearing information to the DF system.
- c. Provide standard time for the monitoring system.

The device shall be install in the DF control system and allow for the automatic processing of positioning and time data in DF applications.

2.6 Power Supply System.

2.6.1 The Mobile Monitoring Station shall include a power supply distribution system to separate from each of the following power sources, which shall be provided by the Contractor: -

- a. External mains power supply (via an isolating transformer mounted in the station)

Voltage:	220 V (\pm 15%)AC
Frequency:	50 Hz
- b. DC Generator

Voltage:	28 VDC
Main Current:	110 A
Engine:	Diesel Unit
- c. Battery

Voltage:	24 V
Backup time:	1 hours

d. Inverter

Input Voltage:	24 V DC
Output Voltage:	230 AC, 50 Hz
Inverter capacity:	1800 VA (or as specified by the bidder according to system requirement)

2.6.2 The Mobile Monitoring Station shall have a built in power supply unit and shall be capable of switching over from mains AC to battery feeding in case of AC main failure and from battery to AC on restoration. The said switching functionality shall be fully automatic without interception.

2.6.3 The capacity of AC power supply unit shall be adequate for feeding the monitoring system as well as recharging of batteries.

2.6.4 The Air-conditioning System shall be operate able from following sources: -

- a. Directly Powered by integrated DG Unit
- b. Mains AC supply

2.6.5 The AC power supply unit shall be provided with following protections and signed indications: -

a. Protection

- (1) Over Voltage
- (2) Over Current
- (3) Short circuit
- (4) Polarity reversal
- (5) Complete Discharge of batteries

b. Visual Indications

- (1) Supply ON/OFF
- (2) Battery is being charged, float, equalizing

2.6.6 Proper grounding/cabing of the system and accessories required in this regard will be made available by the contractor.

2.6.7 The bidder must specify the detailed power supply requirements. If any alteration in the power supply system is required, the bidder will provide the detailed specifications, as per the load requirement of the monitoring system and final solution will be provided by the bidder.

2.7 **Common Technical Parameters**

Power Supply:	220 V \pm 15%, 50 Hz \pm 10% AC
Power connection:	Power plugs according to IEC 884-1 (2 poles plug with side earthing contacts connector)
Operating temperature:	- 15 ⁰ to + 50 ⁰ Celsius
Relative humidity:	95% at 40° Celsius
Impedance:	50 Ohm, BNC

2.8. **Vehicles** .

- 2.8.1 The contractor shall also offer the mobile vehicle facilities for VHF/UHF Mobile Monitoring System to accommodate the whole monitoring system, antenna and accessories along with onboard UPS and DG set. However, Employer may choose the best suitable vehicle option or arrange at own through other contractor. Whereas design & integration services will be offered by the Contractor.
- 2.8.2 Only those vehicles shall be offered which have countrywide maintenance service and spare parts facilities in Pakistan. The noise originating from the air conditioning unit and generator units to be provided shall not exceed 65 dBa with adverse target of 55dBa
- 2.8.3 The vehicles for the MMS shall have the following features: -
- Heavy-duty body, suspension, and chassis for rough and mountainous terrain.
 - Loading space to board the complete Radio Monitoring, DF, Computers and other allied equipment in addition to space for operators
 - Diesel engine.
 - 4-wheel drive.
 - Heavy-duty off-road tyres.
- 2.8.4 The vehicles shall be equipped with a good air conditioning system. Batteries/ alternators/ inverters to switch on and to run all systems simultaneously shall be provided. A transportable 220 V/50 Hz power generator delivering sufficient power supply continuously to all equipment shall be supplied and accommodated on the vehicle.
- 2.8.5 Body and engine size of the vehicle depends on the weight and size of the overall system and shall be determined by the Bidder. Special attention shall be given to ease loading/unloading of the system. The bid shall include a detailed description of the system configuration.
- 2.8.6 The vehicles accommodating the Mobile Monitoring Systems shall be suitable for off –road operations and field conditions in Pakistan and shall comply with the following requirements.
- The vehicle shall be diesel powered all terrain-4 wheel drive step van equipped with heavy duty off road tires.
 - An air-conditioning facility shall be provided in order to control the interior cabin/ monitoring system temperature, even while in motion, and to maintain it between + 10° and +20° Celsius. Air Condition must be able to operate on vehicle engine in addition to main AC supply and Generator.
 - The vehicle shall provide sufficient room to accommodate safely all necessary equipment as well as two (2) operators and one driver.
- 2.8.7 Each Mobile Monitoring Station vehicle shall be equipped with

auxiliary equipment according to the requirements listed below: -

- All cable entry fixtures shall be weather water proof.
- The vehicles shall be equipped with a mast of a minimum 10m height, from the ground level.
- The mast shall be automatically erected, preferably acted electrically, and have a computer controlled powered rotator, attachable on top.
- The mast together with the rotator and the antenna installed on top of it shall be self-supported (shall not require anchoring by guy wires) while operating in normal/regular conditions.
- A working position for one operator shall be provided with keyboard, mouse/trackball, display unit, colour printer and writing area.
- The vehicle shall provide for another chair for second operator transportation and a separate chair for driver. It should be possible for the second operator to assist the operations seating close to the main operator chair utilizing a separate folding chair if the case may be (only while the vehicle is stationary). It is preferably that the second operator be provided with a chair that allows for this to assist the operation even while the vehicle is in motion.
- The chair for the operator shall be securely fastened to the floor and shall be positioned ergonomically for easy operations, preferably positioned with the operator face to the vehicle front. The operator shall have visibility outside the vehicle through dark windows.
- The vehicle shall contain a storage cabinet for cables, auxiliary tools, and other miscellaneous items.
- The means for secure storage of the antennas inside the vehicle while in motion shall be provided. The bidder shall describe the fixtures and any relevant devices for meeting above requirement.
- The vehicle shall allow for installation and operation of the communication system, including an interface to a GSM mobile phone for data transmission to allow access to NCC.

2.8.8 The MMS design shall provide for the following maximum dimensions.

- Station height: 3.5 meters, including permanently mounted antenna(s)
- Station length: Preferable less than 5 meters

2.8.9 The bidder shall ensure that the mobile unit is properly equipped to operate safely over all reasonable terrain, in all reasonable conditions in Pakistan. The Bidder shall describe the normal conditions for operations as well as any restrictions and / or forbidden actions.

- 2.8.10 The bidders shall describe in their proposals the vehicle's type and the exact dimensions (interior and exterior) and present colour pictures of the model recommended.
- 2.8.11 The vehicle shall be provided with two (2) fire extinguishers, one for vehicle usage and one for electrical equipment usage if the case maybe.
- 2.8.12 It is preferable that any relative measuring auxiliary equipment, including antenna(s), probes, etc to be installed in water proof suitcase, capable to be used in rugged outdoor field operations.
- 2.8.13 No parts of the V/UHF MMS design shall introduce any limitations to the vehicle speed.
- 2.8.14 The vehicle shall have windows both in the front and the side. The vehicle shall have side windows covered by film (coated) in order to allow the supervision outside, without revealing the interior.

2.9 **LAN/WAN Hardware & Software Connectivity with NFMMS**

- 2.9.1 The Computers / Laptops provided by the contractor, must incorporate the latest technology applicable to a fully automated network monitoring system, integrated with existing NFMMS.
- 2.9.2 The operating systems shall be user friendly and easy to configure for operation of monitoring system software and network connectivity (i.e., Window 2000 / XP) and/or latest.
- 2.9.3 The bidders shall propose the appropriate mechanism for establishing communication network from mobile monitoring station for accessing the database at NCC. All necessary hardware equipment (i.e., router, modem, Radio communication sets, etc) shall be specified and provided by the bidders in this regard.
- 2.9.4 VHF/UHF Mobile Monitoring System will consist of two consoles with computer controlled monitoring equipment. Both consoles shall be networked on LAN and shall be provided remote connectivity.
- 2.9.5 The remote communication network shall include, but not limited to the following main elements: -
 - a. Communication link (to be provided by employer)
 - a. Routers at mobile monitoring station to be configured with Routers already available at NCC.
 - b. Dial Up connectivity via GSM / WLL networks.
- 2.9.6 LAN wiring shall be IEEE 802.3 (Ethernet) at 100Mbps among computer / consoles, hub and switches.

- 2.9.7 Connectivity requirements such as API, protocols to maintain stable and error free communication shall be specified.
- 2.9.8 All computer / laptops shall be delivered with: -
- MS Office automation software package
 - Multimedia capabilities (audio capture, audio playback, recording)
 - A read / write CD-Rom Drive
 - USB
 - Keyboard
 - Mouse
 - Printer

2.10 **Radio Network Analyzer for Monitoring of GSM/CDMA Networks**

- 2.10.1 The Bidder shall offer monitoring equipment for GSM/CDMA networks that can provide for functions such as coverage and interference analysis as well as the evaluation of parameters for quality of service of the referred networks. As a minimum the GSM (850/900/1700/1800) and CDMA 2000 (450MHz/1900 MHz) standards shall be supported. These analyzers shall be standalone as well as possible to integrate in the VHF/UHF mobile monitoring stations.
- 2.10.2 The general characteristics of the functions for the coverage and interference analysis for CDMA networks are the following:
- a. Provision of fully automatic measurements. Include application software for automatic measurement as well as for data processing and storage.
 - b. Execution of measurement in motion (mobile) at normal driving speed or as portable operations.
 - c. Evaluation of coverage by CDMA networks, including channel utilization.
 - d. Measurements and evaluation of the CDMA channels, the pseudorandom noise (PN) codes along with the power, scrambling code and quality parameters.
 - e. Graphical representation of the measurement results, including map representation
 - f. Identification of noise level, co-channel interference, adjacent channel interference, and interference due to external networks.
 - g. Assessment of utilized spectrum in CDMA bands, identification of all CDMA channels utilized in a specific area and their association with the operator they belong to.
 - h. Identification of CDMA base stations.
 - j. Automatic measurement and calculation of parameters of quality of service for CDMA network
- 2.10.3 Specifications of analyzer for monitoring of CDMA Network:

Bands

1900, 450 MHz

Pilot scan		up to 512 pilot channels
Input bandwidth		1.22 MHz
Scan length		12288 chips (10 ms)
Power measurement dynamic range	P total F- PICH	-12 dBm to -131 dBm
Measurement accuracy	without fading with fading	Ec/Io > -10 dB, or better Ec/Io > -10 dB, or better
Sync level Ec/Io	CDMA2000® interference, fast mode.	<-16.5 dB (F-PICH) or better <-25.5 dB (F-SYNC) or better
	white Gaussian noise, fast mode	<-20.2 dB (F-PICH) or better <-29.2 dB (F-SYNC) or better
Synchronization speed	single mode, Ec/Io > -15 dB single mode, Ec/Io ≤ -15 dB	100 ms 200 ms
Demodulation	synchronous channel demodulation fast synchronous channel demodulation	<0.5 s <0.1 s
Dynamic range Ec/Io		typ. 30 dB
Number of rake receivers	5000 multipath measurement	max. 2500
Time base for synchronization	internal	GPS PPS/GSM, CDMA network
RF power		
Measurement modes		single frequency, multichannel
Frequency entry		single frequency, frequency list, frequency band
Bandwidth (3 dB)	single frequency mode multichannel mode	12.5 kHz to 4000 kHz 200 kHz to 4000 kHz
<i>Channel power measurement dynamic range</i>	WCDMA	-95 dBm to -20 dBm
Sample acquisition time	multichannel mode	100 μs to 650 μs
Measurement time		0.1 ms to 1000 ms
Adjacent channel rejection	WCDMA	60 dB
Detectors		peak, average, RMS

IF attenuation	0 dB, 10 dB, 15 dB
Preamplifier	10 dB, automatic/manual

2.10.4 The general characteristics of the functions for the coverage and interference analysis for GSM networks are the following:

- a. Automatic measurement and demodulation of all GSM channels, off-the-air decodes system information types 1 to 4, including ARFCN, RF level, BCC, CI, MNC, MCC, base station name and position.
- b. Evaluation of area coverage by GSM networks, including channel utilization.
- c. All bands (GSM 850/900/1800/1900) multi channel capability within one measurement setup.
- d. Detection of roaming problems and interference by operators in neighbouring countries.

2.10.5 Specifications of analyzer for monitoring of GSM Network:

Bands GSM 4	20/450/750/850/900/1700/1800/1900, GSM-E, GSM-R
Measurement modes	SCH code power measurement TCH total in-band power measurement demodulation of BCCH system information type 3 up to 80 channels/s with SCH demodulation
Measurement rate	typ. 1.2 s; max. 1.9 s for GSM 900 band typ. 3.8 s; max. 5.3 s for GSM 1800 band
Power measurement	dynamic range -112 dBm to -20 dBm
Power measurement accuracy	typ. ± 1 dB
BSIC detection after first decoding	versus co-channel first C/I > -11 dB
Minimum C/I for SCH code power measurement	after first BSIC decoding C/I > -11 dB
Minimum C/I for first demodulation	CI, MNC, MCC, LAC C/I > 2.5 dB
Time base for synchronization	internal GPS pulse per second (PPS) signal GSM (sync channel)
Adjacent Channel Rejection	GSM 30 dB
Channel power measurement dynamic range	GSM -110 dBm to -20 dBm or better

Bands GSM 4	20/450/750/850/900/1700/1800/1900, GSM-E, GSM-R
Measurement modes	SCH code power measurement TCH total in-band power measurement demodulation of BCCH system information type 3
Measurement rate	up to 80 channels/s with SCH demodulation typ. 1.2 s; max. 1.9 s for GSM 900 band typ. 3.8 s; max. 5.3 s for GSM 1800 band
Power measurement	dynamic range -112 dBm to -20 dBm
Power measurement accuracy	typ. ± 1 dB
BSIC detection after first decoding	versus co- channel $C/I > -11$ dB
Minimum C/I for SCH code power measurement	after first BSIC decoding $C/I > -11$ dB
Minimum C/I for first demodulation	CI, MNC, C/I > 2.5 dB BCCH MCC, LAC
Time base for synchronization	internal GPS pulse per second (PPS) signal GSM (sync channel)
Adjacent Channel Rejection	GSM 30 dB
Channel power measurement dynamic range	GSM -110 dBm to -20 dBm or better

- 2.10.6 The system shall be easily portable and detachable from the mobile monitoring system to work as stand-alone. One unit system shall be preferred.
- 2.10.7 The Bidder shall provide all accessories, auxiliary equipment (e.g. test mobile phone, GPS etc.) along with software for optimized functioning of the system.
- 2.10.8 The Bidder shall completely describe the solution with all the accessories required for functioning of the system.

3. **Mobile/Transportable Microwave Monitoring System**

3.1 **Complete Systems**

The Mobile/Transportable Microwave Monitoring System shall perform the monitoring and measurements functions according to ITU Recommendation. System shall be completely equipped with all necessary monitoring equipment, monitoring antenna, modem (s), communication antenna (s), GPS and GPS antenna, interconnecting cables, power supplies, cabinets, racks, mounting hardware, software's, interface devices and terminal blocks to form a complete and working stand alone system as well as reliable component that shall an integral part of the NFMMS. The integrated system shall be housed in a vehicle to form Mobile Microwave Monitoring Station. Following main specification are applicable for the complete system.

- a. Working Frequency Range: **1GHz – 40GHz**
- b. System should be extendable upto higher frequencies by integrating new modules with minimum additional cost. Bidders must satisfy the Employer with complete justification in this regard. System must cater for low cable losses on higher frequencies and the bidder must provide detailed description, upto the satisfaction of the Employee along with cable lengths.

- 3.2 **Spectrum Analyzer.** The Mobile Microwave Monitoring System shall be equipped with a high quality (transportable) spectrum analyzer (mountable in vehicle's rack). The spectrum analyzer shall comply with the minimal technical specific requirements as mentioned below: -

Resolution bandwidth:	10 Hz to 10 MHz in 1/2/3/5/10 sequence
Max. Input Signal:	a. Average +20 dBm b. Impulsive + 30dBm for 1mins
Sweep time:	2.5 ms min sweep time in frequency domain (span >10 Hz), 1ms sweep time in time domain
Video bandwidth:	1 Hz to 10 MHz in 1/2/3/5/10 sequence
Display Average Noise level: (0dB input attention, 10Hz RBW)	-120 dBm to -140 dBm (for the complete band) or better
Phase Noise @ 15 GHz	≤ -75dBc to -110dbc (1Hz @ 100 Hz to 1Mhz offset)
Level Measurement uncertainty (at 150 MHz, -10 dBm input, 10dB RF-Attenuation, 10 KHz RBW, Req. level – 20 dBm)	≤ 0.5 dB
Image freq Reject	> 70 dB
IF Rejection	> 70 dB

Logarithmic level axis:	1 dB to 200 dB in 1/2/5/10 steps sequence
Max dynamic range	120-150 dB
1dB compression to DANL (1Hz)	
Display range	DANL upto +30 dBm
Freq reference stability:	Internal stability, external by 10 MHz Ref input
Aging Stability (per year)	$\pm 1 \times 10^{-7}$
Temperature Stability	$\pm 1 \times 10^{-8}$
RF Input Attenuation:	0dB to 40 dB 2 to 5dB steps will be preferred)
Third harmonic Dist. (Mixer level at -30dBm)	≤ 75 dBc
1 GHz to 40 GHz	
Display range:	DANL upto + 30 dBm or better
Remote interface:	100 Base-T (Ethernet), GPIB and Parallel(or as specified by the bidder)

3.3 Antennas

Antenna Type:	Directional Log periodic antenna and / or Omni Directional Horn Antenna (with pre amplifier)
Polarization:	Linear
VSWR:	≤ 2.5
Gain:	4.5 dBi to 8dBi (or better)
Amplifier Gain	> 24 dB
Nominal Impedance:	50Ω
Amplifier Noise figure	< 4 dB
Amplifier Gain flatness	± 2 dB

3.4 Auxiliary equipment

- 3.4.1 The Global Positioning system (GPS) provided with the mobile station shall be able to: -
- Determine the position of the station (longitude, latitude and altitude) with an accuracy of positioning of 10m, or better (in all dimensions).
 - Provide standard time for the monitoring system.
 - Provide a highly stabilized frequency reference signal of 10.0 MHz for use inside the mobile monitoring station.
- 3.4.2 Electronic compass, which shall be utilized for determination of the azimuth direction and directional antenna orientation and shall be possible to inter work with the measurement equipment, if required by such equipment.

Mobile Microwave Monitoring System

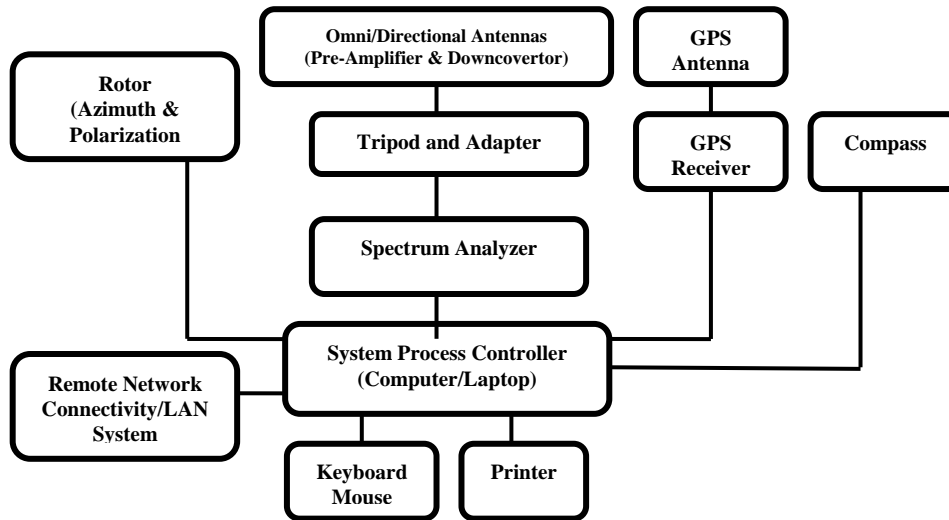


Fig 6. Block Diagram for Mobile/Transportable Microwave Monitoring System

3.5 Antenna Configuration

- 3.5.1 The bidder shall propose for the Mobile Microwave Monitoring Stations an antenna configuration that shall cover the required frequency band for monitoring, finding the direction and achieve the specified system performance. Bidders may propose an antenna configuration that may be composed at minimum of two specified and different antennas.
- 3.5.2 The bidder shall provide complete drawings and pictures showing the physical layout for the antenna (s) configurations proposed. The drawings shall show both mode of operation of the antennas, working position (installed on the mast) and storage position (packed for transportation).
- 3.5.3 The bidder shall completely describe performance parameters for the antennas proposed to fulfill the system performance.
- 3.5.4 The antenna configuration for Mobile Microwave Monitoring Station equipment (mobile) shall include the following, but not limited to, and shall comply with the following requirements as the case may be: -
- a. Include operational directional antenna to fully cover the working band from 1.0 GHz to 40.0 GHz, inclusive, and having a gain of average 6 dBi in full band. The directional antenna (s) preferably should have a directivity of 40° at 3 dB (half-power beam width), or better.
 - b. Include appropriate operational Low Noise Amplifiers (LNAs)
 - c. Include required wave-guides, RF coaxial cables, RF connectors, etc.

- d. Include a control system to accurately establish the antenna position along the axes of azimuth and polarization. The positioning precision shall be of ± 1.0 degree, preferable less.
 - e. The control system referred above shall fully cover the possibility of rotation of 360° in azimuth and of 90° in polarization plane.
 - f. The antennas shall be possible to install on a tripod or on a stack mast (above 4 to 5 meter height) and rotate with a precision of ± 1 deg (azimuth).
- 3.5.5 It is preferable that the Bidder propose an antenna configuration for Mobile Microwave Monitoring Station, comprised of high performance Log periodic antenna(s) to cover the band 1 to 26 GHz (± 5 GHz) and very good performance Horn antenna covering the band 26 (± 5) to 40 GHz.
- 3.5.6 The Mobile Microwave antennas shall be designed to withstand the environmental conditions specific in Pakistan.
- 3.5.7 The Mobile Microwave antennas shall meet the following requirements:-
- a. A compact and lightweight design shall be considered for easy transport and installation without any degradation of performance.
 - b. The operating temperature shall be within the range from -15 to $+50^\circ$ Celsius.
 - c. The antennas shall be capable of operating in regions with high atmospheric salt water content.
 - d. The antenna shall survive without any damage to wind speed of above 100 km/h preferable above 140 km/h.
- 3.5.8 The Mobile Microwave Monitoring Station antennas shall be mounted easily on a tripod / mast, that shall capable to be handled and deployed by two persons at most, preferably by one single person.
- 3.5.9 In order to protect the equipment, the mobile monitoring system must be equipped with appropriate automatic protection against any excessive input signals.
- 3.6 **Software and Functional requirements**
- 3.6.1. The Spectrum analyzer (transportable) for Mobile Microwave Station shall display and provide features as follows: -
- a. Special display of amplitude vs. frequency, over a selectable band.
 - b. Display of maximum, minimum and average signal levels at each location.
 - c. Spectrogram display to show variation of signals over a range of frequency.
 - d. User defined limit lines, alarm generation event logging with time and date stamp and position.
 - e. Split screen with different settings.
 - f. System calibration with built in test source.

- g. Convenient documentations of results as a hardcopy or file in PC compatible formats.
 - h. Off line processing of stored data. (To be used for off line analysis and presentation on a PC at a control center or other location, without requirement to have the rest of the hardware).
 - j. Measurement capabilities, Tune Gated spectrum analysis measurement, AM / FM / PM / GSM / CDMA, PSK, QPSK flexible/variable demodulation, adjacent channel power, occupied bandwidth, split screen display for zooming in on signal of interest, limit lines and maximum storage of data, waveform etc with built-in floppy disc drive capabilities.
- 3.6.2 Full use of the performance features of the monitoring equipment (i.e., antennas, analyzer, amplifier, etc) will be made available in computer control mode using a PC and Spectrum Monitoring software. Monitoring software will be able to control all the equipment interactively to monitor, measure and identify the emissions in an efficient manner.
- 3.6.3 The system software shall allow for execution of interactive measurements with the following characteristics: -
- a. Interactive measurements shall allow the operator to rapidly investigate signals.
 - b. Interactive measurements shall include observation of multiple bands in multiple formats, hand off signals to carrier measurements and control of the spectrum analyzer, printer and plotter.
- 3.6.4 The received carrier measurements shall include but not limited to the measurement of and display results of: -
- b. Centre frequency
 - c. Peak power (calibrated)
 - d. Average power
 - e. Signal to Noise Ratio (SNR)
 - f. Occupied band width
 - g. Field strength at antenna (calibrated)
 - h. Spectrum scan with Average, Manhold and clear/write tracers
- 3.6.5 The Laptop / computer system shall be equipped with latest specifications of hardware devices (i.e., Hard Disk, CPU, RAM, Modem, LAN Cards, etc) with interfaces as required to control the monitoring equipment. All the devices installed in the system shall be fixed in a manner that they can absorb shocks, vibration during mobile monitoring operations.
- 3.6.6 The VHF/UHF Mobile Monitoring System shall be equipped with a GIS software and digital maps (available to the employer), which shall be integrated with GPS and electronic compass to display and evaluate, site of monitoring system and axis of directional antenna

combining the results for evaluating triangulation results. The software shall have the options for zooming, distance measurement, etc).

3.7 **General Functional Requirements.**

- 3.7.1 The monitoring equipment & antenna system provided for mobile / transportable microwave monitoring shall be modular and easily transportable, detachable from the vehicle, to be able to respond to different monitoring requirements i.e., optimized for monitoring at rapidly changing locations/sites/buildings.
- 3.7.2 Monitoring System shall be installed in a 4 x 4 vehicle which shall house all the monitoring equipment, Computer System, UPS, Generator, Antenna System and accessories.
- 3.7.3 Any additional equipment and / or software that may be required for normal operations of the mobile / transportable microwave monitoring equipment (e.g., cables, connectors, RF switches, probes, software, etc) shall be proposed by the bidder to be included.

3.8 **Power Supply System.**

The Mobile Monitoring Station shall include a power supply distribution system to separate from each of the following power sources, which shall be provided by the bidder: -

- a. External main power supply (via an isolating transformer mounted in the station)

Voltage:	230 V AC
Frequency:	50 Hz
- b. DC Generator

Voltage:	28 VDC
Main Current:	110 A
Engine:	Diesel Unit
- c. Battery

Voltage:	24 V
Backup time:	1 hours
- d. Inverter

Input Voltage:	24 V DC
Output Voltage:	230 AC, 50 Hz
Inverter capacity:	1800 VA

- 3.8.1 The Mobile Monitoring Station shall have a built in power supply unit and shall be capable of switching over from mains AC to battery feeding in case of AC main failure and from battery to AC on restoration. The said switching functionality shall be fully automatic without interception.
- 3.8.2 The capacity of AC power supply unit shall be adequate for feeding the monitoring system as well as recharging of batteries.

- 3.8.3 The Air-conditioning System shall operate able from following sources: -
- a. Direct Powered by integrated DG Unit
 - b. Mains AC supply
- 3.8.4 The AC power supply unit shall be provided with following protections and signed indications: -
- a. Protection
 - (1) Over Voltage
 - (2) Over Current
 - (3) Short circuit
 - (4) Polarity reversal
 - (5) Complete Discharge of batteries
 - b. Visual Indications
 - (1) Supply ON/OFF
 - (2) Battery is being charged, float, equalizing
- 3.8.5 The conceptional diagrams of power supply system to be provided shown in figure 5: -
- 3.8.6 The bidder must specify the detailed power requirements. If any alteration in the power supply system is required, the bidder may provide the detail specifications, as per the requirement of the monitoring system.

3.9 Vehicles

- 3.9.1 The contractor shall also offer the transport facility / facilities for Mobile/Transportable Microwave System to accommodate the whole monitoring system, antenna and accessories along with power supply system. However, employer may choose the best suitable vehicle option or arrange the vehicle at its own resources. Whereas design & integration services will be offered by the contractor.
- 3.9.2 Only those vehicles shall be offered which have countrywide maintenance service and spare parts facilities in Pakistan. The noise originating from the air conditioning unit and generator units to be provided shall not exceed 65 dBa with adverse target of 55dBa
- 3.9.3 The vehicles for the MMS shall have the following features: -
- Heavy-duty body, suspension, and chassis for rough and mountainous terrain.
 - Loading space to board the complete Radio Monitoring, DF, Computers and other allied equipment in addition to space for operators
 - Diesel engine.
 - 4-wheel drive.
 - Heavy-duty off-road tyres.

- 3.9.4 The vehicles shall be equipped with a good air conditioning system to maintain the internal temperature from + 10°C to +30°C. This facility will be separated than the normal Air-condition available in vehicle. Batteries/alternators to switch on and to run all systems simultaneously shall be provided. A transportable 220 V/50 Hz power generator delivering sufficient power supply continuously to all equipment shall be supplied and accommodated on the vehicle. The vehicle shall be equipped with service tools, two fire extinguishers, and a first aid kit.
- 3.9.5 Body and engine size of the vehicle depend on the weight and size of the overall system and shall be determined by the Bidder. Special attention shall be given to ease loading/unloading of the system. The bid shall include a detailed description of the system configuration.
- 3.9.6 The vehicles accommodating the Mobile Microwave Monitoring Systems shall be suitable for off –road operations and field conditions in Pakistan and shall comply with the following requirements.
- The vehicle shall be diesel powered all terrain-4 wheel drive step van equipped with heavy duty off road tires.
 - An air-conditioning facility shall be provided in order to control the interior cabin/system temperature, even while in motion, and to maintain it between + 10° and +20° Celsius. Air Condition must be able to operate on vehicle engine in addition to main AC supply and Generator.
 - The vehicle shall provide sufficient room to accommodate safely all necessary equipment as well as two (2) operators and one driver.
 - The vehicles shall be equipped with a mast of minimum 6m height, from the ground level.
 - The mast shall be automatically erected, preferably acted electrically, and have a computer controlled powered rotator, attachable on top.
 - The mast together with the rotator and the antenna installed on top of it shall be self-supported (shall not request and anchoring by guy wires) while operating in normal/regular conditions.
 - An electronic compass shall be integrated into the monitoring vehicle for determination of the azimuth (reference direction).
- 3.9.7 Each Mobile Monitoring Station vehicle shall be equipped with auxiliary equipment according to the requirements listed below: -
- All cable entry fixtures shall be weather water proof
 - A working position for one operator shall be provided with keyboard, mouse/trackball, display unit, colour printer and writing area.
 - The vehicle shall provide for another chair for second operator transportation and a separate chair for driver. It should be possible for the second operator to assist the operations seating close to the main operator chair utilizing a separate folding chair

if the case may be (only while the vehicle is stationary). It is preferably that the second operator be provided with a chair that allows for this to assist the operation even while the vehicle is in motion.

- The chair for the operator shall be securely fastened to the floor and shall be positioned ergonomically for easy operations, preferably positioned with the operator face to the vehicle front. The operator shall have visibility outside the vehicle through dark windows.
- The vehicle shall contain a storage cabinet for cables, auxiliary tools, and other miscellaneous items.
- The means for secure storage of the antennas inside the vehicle while in motion shall be provided. The bidder shall describe the fixtures and any relevant devices for meeting above requirement.
- The vehicle shall allow for installation and operation of the communication system, including an interface to a GSM mobile phone for data transmission to allow access to Fixed Station.

3.9.8 The MMS design shall provide for the following maximum dimensions.

- Station height: 3.5 meters, including permanently mounted antenna(s)
- Station length: Preferable less than 5 meters

3.9.9 The bidder shall ensure that the mobile unit is properly equipped to operate safely over all reasonable terrain, in all reasonable conditions in Pakistan. The Bidder shall describe the normal conditions for operations as well as any restrictions and / or forbidden actions.

3.9.10 The bidders shall describe in their proposals the vehicle's type and the exact dimensions (interior and exterior) and present colour pictures of the model recommended.

3.10 **LAN/WAN Hardware & Software Connectivity with NFMMS**

3.10.1 The Computers / Laptops procured under this project, must incorporate the latest technology applicable to a fully automated network monitoring system, integrated with existing NFMMS.

3.10.2 The operating systems shall be user friendly and easy to configure for operation of monitoring system software and network connectivity (i.e., Windows 2000 / XP) and / or latest.

3.10.3 The bidders shall propose the appropriate mechanism for establishing communication network from each mobile monitoring station provided to fixed stations for accessing the database at NCC. All necessary hardware equipment (i.e., router, modem, Radio communication sets, etc) shall be specified and provided by the bidders in this regard.

3.10.4 Mobile Microwave Monitoring System will consist of one console with computer controlled monitoring equipment. The console shall

be provided remote connectivity with NCC for import/export of monitoring and licensed transmitter data.

- 3.10.5 The remote communication network shall include, but not limited to the following main elements: -
- a. Communication link (to be provided by employer)
 - b. Routers at mobile monitoring station to be configured with Routers already available at Fixed Monitoring Stations.
Dial Up connectivity via GSM / WLL networks.
- 3.10.6 Mobile Microwave Monitoring Station shall be equipped with one console. Network hardware / software system (i.e., routers, modem, hub, etc) will be provided and configured to provide connectivity as referred above.
- 3.10.7 The System shall be integrated with existing NFMMS. In this regard, the appropriate compatible software to access the transmitter / licensee database from NCC shall be provided.
- 3.10.8 LAN wiring shall be IEEE 802.3 (Ethernet) at 100Mbps among computer / consoles, hub and switches.
- 3.10.9 Connectivity requirements such as API, protocols to maintain stable and error free communication shall be specified.
- 3.10.10 All computer / laptops shall be delivered with: -
- MS Office automation software package
 - Multimedia capabilities (audio capture, audio playback, recording)
 - A read / write CD-Rom Drive
 - USB
 - Keyboard
 - Mouse
 - Printer

4. **VHF / UHF Portable / Handheld Monitoring Systems**

4.1 The handheld monitoring system shall perform all the monitoring & measurement tasks in which mobility and cost efficiency are of top priority. The system shall be compact, handy and rugged design for portable use. Each Portable Monitoring System shall be provided with a complete set of portable equipment comprising of: -

- a. Portable Monitoring Receiver (20 MHz to 6 GHz)
- b. Directional Antennas

4.2 **Monitoring Receiver**

The compact handheld monitoring receiver shall perform following functions, but not limited to:-

- a. Monitoring of emissions and signal detection
- b. Detecting interference
- c. Freq Scan & memory scan
- c. Settable measurement time to safely locate interference sources
- d. Tracing location of emissions with the help of Directional Antenna
- e. Spectrum Scanning with user definable frequency range.
- d. Demodulation and audio monitoring of emissions
- e. Spectrum and waterfall display

Technical specifications

Frequency range:	20 MHz to 6GHz (extended range can be included)
Frequency setting via key pad roll key	1 Hz, 10 Hz, 100 Hz, 1 KHz in selectable increments upto 1 MHz
Antenna input:	50 Ω
IF rejection	≥ 80 dB
Max. Signal at input (non destructive)	Average + 20 dBm
Receiver Noise Figure:	≤ 15 dB
Selectivity-IF	Selectable IF filters (0.5 KHz to 500 KHz) at least 10
Bandwidth filters	least 10
Dynamic Range:	120 dB (MGC)
2 nd order intercept Point	≥ 40 dBm
3 rd order intercept Point	≥ 10 dBm
Interface:	Ethernet RS232C
Image rejection	≥ 70 dB
Sensitivity:	2 μ V/m to 15 μ V/m or better
Frequency level axis:	0dB μ V to 100 dB μ V
Demodulation:	AM,FM,LSB,UB,CW, Pulse
Frequency resolution	1 Hz
Phase Noise	< 90 dBc/Hz
Start/stop scan freq	User selectable
RF Input Attenuation:	10 dB (2 to 5 dB steps will be preferred)
Weight:	≤ 10 Kg (without battery Pack) ≤ 15 Kg (with battery Pack)

4.3 **Antennas**

The portable monitoring receiver for VHF/UHF monitoring shall be provided with handled Omnidirectional and directional antenna(s) of complete frequency range for portable location identification (homing) of radio sources. Directional Antennas shall have following specifications: -

Frequency range:	20 MHz to 6 GHz
Polarization:	Vertical, Horizontal by turning the longitudinal axis by 90°
Normal impedance:	50 Ω
VSWR:	< 2.5
Gain:	≥ 6.5 dBi (higher will be preferred)
Directivity:	60 at 3 dB (half power beam width) or better

- 4.4 The handheld monitoring receivers should be equipped with effective pre-selectors to yield best results even in area with high signal levels. Preferable tuned band pass filter and / or with combination of high pass /low pass filters.
- 4.5 Portable Monitoring Receiver shall include a portable (built-in) battery pack for at least 2 hours (or better) independent working. It shall also be possible to supply the equipment from AC mains (universal of 110 Vac 220 Vac, 50 Hz ± 10% .
- 4.6 A separate set of directional antennas shall be provided to work with the equipment of the portable set. The Bidder shall completely describe the antenna configurations and include drawings, pictures, diagrams and performance parameters for the antennas proposed to fulfill the system performance as mentioned in relevant requirements in this section.
- 4.7 The spectrum analyzer equipment (portable) shall be easy transportable and shall have a flexible, configurable, modular and scalable architecture for adaptability to the various measurement applications that may be required by the field investigations.
- 4.8 The portable equipment set shall include all needed adapters, probes, connectors, tripod(s) or preferable stack mast of four meters height, RF cables, power supply cables and nay other cables required by the operations, as well as any additional device required to have a fully portable/transportable operation during spot monitoring. The RF cable length shall be 6 m.
- 4.9 Each set of portable equipment shall include but not limited to the following additional equipment:-
- a. Portable GPS receiver and GPS antenna that shall be inter-working with

the measurement portable equipment if requested by such equipment.

- b. Digital compass, which shall be possible to utilize for determination of the azimuth zero direction and directional antenna orientation and shall be possible to inter-work with the measurement portable equipment if requested by such equipment.
- 4.10 Portable equipment / system shall be light weight, and shall be properly shielded for protection against rough field, rains, resistance etc Transit covers (hard for transportation), safety carrying cases, custom back pack and front panel cover to be provided for the equipment including handheld antenna.
- 4.11 Adequate signal carrying case for portable receiver and antenna should be provided. Each such antenna shall be possible to easily carry by one person.
- 4.12 Portable Monitoring System should have the capability to store data for real time / subsequent processing and analysis of measurement data in graphical and /or tabular form using laptop through Monitoring Software applications.

5. **RF Field Strength Meter**

General Description

- 5.1 The RF Field Strength meter shall be used to evaluate and measure the RF radiation levels of all RF transmissions to ensure compliance with health safety standards in practice.
- 5.2 The RF Field Strength Detector should be capable of directly measuring the Electric Field Strength in V/m and power density level of an RF signal in mW/cm^2 and $\mu\text{W}/\text{cm}^2$.
- 5.3 It should be able to carry out RF radiation / field strength / power density measurements for all RF transmissions, specifically mobile and portable wireless phones, cellular Base Stations (GSM, CDMA, Wimax etc.) and other transmitter sites.
- 5.4 It will be preferred that the device is capable of measuring electromagnetic fields in the ELF range such as fields emitted by power lines, TV's, computer monitors and home appliances.
- 5.5 The device should be compact, integrated, hand-held and robust for applications in field. It should be a one unit system.
- 5.6 This device shall be used as standalone. Carrying case must be provided for the device and other accessories.
- 5.7 Bidder shall describe complete specifications and working of the device, mentioning all the precautionary measures required for safe operation.
- 5.8 The device should be user-friendly and easy-functioning with respect to frequency settings and reading the measurements.

Technical Specifications

Frequency range:	0 to 3 GHz (Extended range up to 6GHz will be preferred)
Input Impedance:	50 Ω
Maximum Sensitivity:	0.001 $\mu\text{W}/\text{cm}^2$
Maximum Reading:	2000 $\mu\text{W}/\text{cm}^2$
Display:	LCD
Antenna type:	Internal / External
Batteries:	Rechargeable DC Batteries
Operating Temperature Range	10°C to 50°C

Attachment-1**BILL OF QUANTITIES (BOQ)**

The items listed in Bill of Quantities are proposed by the Employer, estimated on main system. Bidders must prepare & includes the detailed subsystem, parts, components, software, devices, etc as per appropriate requirement in accordance with Section VI Technical specifications. The list includes but not limited to the following is: -

S#	Description	Qty/ System	Qty Total
1.	VHF/UHF Mobile Monitoring Station (20 MHz to 3 GHz, Extended range upto 6 GHz or more offered will be preferred)	01	01
	• Monitoring Receiver	-	02
	• Direction finding system (Including Antenna, DF Processor and other accessories, etc)	01	01 set
	• Control Console, Racks and other Accessories	02	02
	• RF distributors/switches/attenuators, Amplifier	-	As per requirement
	• Antenna Equipment for Monitoring		01set
	• Omni-directional Antenna	01 set	01 set
	• Directional Antenna	01 set	01 set
	• Antenna Control unit (Including Azimuth / Pol rotator)	01 set	01 set
	• RF Cables, connectors and other accessories		01 set As per requirement
	• Radio Network Analyzer for GSM/CDMA Monitoring & Measurements (including all accessories)	01 set	01 set
	• Power supply system including UPS and Diesel Generator system	01	01 set
	• Process controller / Computer /Laptop, including other system elements, software and peripherals (i.e. keyboard, printers)	02 set	02 set
	• Auxiliary equipment (GPS, compass, etc)	01 set	01set
	• Monitoring System Application software (for Monitoring and DF)	02	02
	• GIS software to display and evaluate DF on digital maps	01	01
	• Networking equipment (i.e. router modem Radio set etc)	-	As per requirement
	• Operating system along with application software		02 set
2.	Mobile/Transportable Microwave Monitoring System (1GHz to 40 GHz)	02	02
	• Spectrum Analyzer	01	02
	• Antenna Equipment for Monitoring		02 sets
	• Omni-directional Antenna	01 set	02 sets
	• Directional Antenna	01 set	02 sets
	• Antenna Control unit (Including Azimuth / Pol rotator)	01 set	02 sets

	<ul style="list-style-type: none"> RF switches, cable, connectors and other accessories 	-	02 sets As per requirement
	<ul style="list-style-type: none"> Antenna tripod /Mast 	01 set	02 sets
	<ul style="list-style-type: none"> Auxiliary equipment, (including GPS, compass etc) 	01 set	02 sets
	<ul style="list-style-type: none"> Networking equipment (i.e. router, modem, Radio set etc) 	01 set As per requirement	02 sets As per requirement
	<ul style="list-style-type: none"> Monitoring System Application software (for Monitoring and DF) 	01	02 sets
	<ul style="list-style-type: none"> Operating system alongwith application software 	01	02 sets
	<ul style="list-style-type: none"> Control Console, Racks and other Accessories 	01	02 sets
	<ul style="list-style-type: none"> Power supply system including UPS and Diesel Generator system 	01	02 sets
	<ul style="list-style-type: none"> Process controller / Computer /Laptop, including other system elements, software and peripherals (i.e. keyboard, printers,etc) 	01 set	02 sets
3.	VHF/UHF Portable / Handheld Monitoring System (20MHz to 6 GHz)		07
	<ul style="list-style-type: none"> Portable Monitoring Receiver 	01 set	07 sets
	<ul style="list-style-type: none"> Handheld Antennas 	01 set	07 sets
	<ul style="list-style-type: none"> Soft carry casing for receiver, Antenna and accessories 	01 set	07 sets
	<ul style="list-style-type: none"> RF Cables, Adapters, Connectors, accessories 	As per requirement	07 sets
	<ul style="list-style-type: none"> Portable Battery Pack 	01 set	07 sets
	<ul style="list-style-type: none"> Auxiliary equipment GPS, Digital Compass, etc 	01 set	07 sets
	<ul style="list-style-type: none"> Laptop including software applications and peripherals (i.e. keyboard, printers, etc) 	01 set	07 sets
4.	RF Field Strength Meter (including all accessories)	-	07 sets
5.	Mobile Monitoring Vehicles		03
	Vehicles 4 x 4	01	03
	Air-Conditioning system	01	03
	Antenna Mast system	01	03

SECTION-VII

SAMPLE FORMS AND PROCEDURES

Table of Sample Forms and Procedures

1.	Bid Forms and Price Schedules	95
2.	Bid Security Form	103
3.	Bank Guarantee Form for Advance Payment	104
4.	Manufacturer's Authorization Form.....	105
5.	Performance Security Forms.....	106
6.	Contract Form	107
7.	Form of Completion Certificate.....	108
8.	Form of Operational Acceptance Certificate	109

1. Bid Forms and Price Schedules

1.1 Bid Form—Single Stage Bidding

Date: _____
 Loan/Credit N^o: _____
 IFB N^o: _____

Expansion of NFMMS

To: The Project Director
 Pakistan Telecommunication Authority
 Headquarters, F-5/1
 Islamabad

Dear Sir,

Having examined the bidding documents, including Addendum Nos. *[insert numbers]*, the receipt of which is hereby acknowledged, we, the undersigned, offer to design, manufacture, test, deliver, install, pre-commissioning and commission the Facilities under the above-named Contract in full conformity with the said bidding documents for the sum of *[amount of local currency in words]*, *[amount in figures]* or such other sums as may be determined in accordance with the terms and conditions of the Contract. The above amounts are in accordance with the Price Schedules attached herewith and are made part of this bid.

We undertake, if our bid is accepted, to commence the Facilities and to achieve Completion within the respective times stated in the bidding documents.

If our bid is accepted, we undertake to provide an advance payment security and a performance security in the form, in the amounts, and within the times specified in the bidding documents.

We agree to abide by this bid, which consists of this letter and Attachments 1 through *[number]* hereto, for a period of *[number]* days from the date fixed for submission of bids as stipulated in the bidding documents, and it shall remain binding upon us and may be accepted by you at any time before the expiration of that period.

Commissions or gratuities, if any, paid or to be paid by us to agents relating to this Bid, and to contract execution if we are awarded the contract, are listed below

Name and address of agent	Amount and Currency	Purpose of Commission or gratuity
_____	_____	_____
_____	_____	_____
_____	_____	_____

(if none, state “none”).

Until a formal contract is prepared and executed between us, this bid, together with your written acceptance thereof and your notification of award, shall constitute a binding contract between us.

We understand that you are not bound to accept the lowest or any bid you may receive.

Dated this _____ day of _____, 2008_____

[signature]

In the capacity of _____
[position]

Duly authorized to sign this bid for and on behalf of _____
[name of Bidder]

Schedules of Rates and Prices

Schedule No. 1. Plant and Equipment (including all the main systems, subsystems, software, firmware, components and accessories)

a. VHF/UHF Mobile Monitoring System

Item	Description	Code	Qty.	Unit Price	Total Price DDP per item
				DDP	
Total (to Schedule No. 5 Grand Summary)					

Code	Country

Name of Bidder

Signature of Bidder

Schedule No. 1. Plant and Equipment (including all the main systems, subsystems, software, firmware, components and accessories)

b. VHF/UHF Portable Monitoring System

Item	Description	Qty.	Unit Price EXW	Total Price
TOTAL (to Schedule No. 5. Grand Summary)				
			Name of Bidder _____ Signature of Bidder _____	

Schedule No. 1. Plant and Equipment (including all the main systems, subsystems, software, firmware, components and accessories)

c. Mobile / Transportable Microwave Monitoring System

Item	Description	Qty.	Unit Price ¹ EXW	Total Price ¹
TOTAL (to Schedule No. 5. Grand Summary)				
			Name of Bidder _____ Signature of Bidder _____	

Schedule No. 2. Incidental / Installation & Integration Services

Item	Description	Qty.	Unit Price	Total Price
			Local Currency Portion	Local
TOTAL (to Schedule No. 5. Grand Summary)				
			Name of Bidder _____ Signature of Bidder _____	

Schedule No. 3. Maintenance Services / Contract

Item	Description	Qty.	Unit Price	Total Price
			(local parts)	

Name of Bidder _____

Signature of Bidder _____

Schedule No. 4. Grand Summary

Item	Description	Total Price	
		Foreign	Local
	Total Schedule No. 1. Plant and Equipment (including all the main systems, subsystems, software, firmware, components and accessories) Total Schedule No. 2 Incidental / Installation & Integration Services Total Schedule No. 3 Maintenance Services / Contract		
TOTAL (to Bid Form)			
		Name of Bidder _____ Signature of Bidder _____	

2. Bid Security Form

Whereas (Name of the Bidder) (hereinafter called “the Bidder”) has submitted its bid dated (dated of submission of bid) for the supply of (Name and/or description of the Equipment) (hereinafter called “the Bid”).

KNOW ALL PEOPLE by these present that WE (name of bank) of (name of country), having our registered office at (address of bank) (hereinafter called “the Bank”), are bound into (name of Purchaser) (hereinafter called “the Purchaser”) in the sum of for which payment well and truly to be made to the said Purchaser, the Bank binds itself, its successors, and assigns by these present. Sealed with the Common Seal of the said Bank this ____ day of _____ 2008.

THE CONDITIONS of this obligation are:

1. If the Bidder withdraws its Bid during the period of bid validity specified by the Bidder on the Bid Form; or
2. If the Bidder, having been notified of the acceptance of its Bid by the Purchaser during the period of bid validity:
 - (a) Fails or refuses to execute the Contract Form, if required; or
 - (b) Fails or refuses to furnish the performance security, in accordance with the Instructions to Bidders;

we undertake to pay to the Purchaser up to the above amount upon receipt of its first written demand, without the Purchaser having to substantiate its demand, provided that in its demand the Purchaser will note that the amount claimed by it is due to it, owing to the occurrence of one or both of the two conditions, specifying the occurred condition or conditions.

This guarantee will remain in force up to and including thirty (30) days after the period of bid validity, and any demand in respect thereof should reach the Bank not later than the above date.

(signature of the bank)

3. Bank Guarantee for Advance Payment

To: Frequency Allocation Board Headquarters, Islamabad.

Purchase of Equipment

Gentlemen:

In accordance with the payment provision included in the Special Conditions of Contract, which amends clause 16 of the General Conditions of Contract to provide for advance payment, (name and address of supplier) (hereinafter called "the Supplier") shall deposit with the Purchaser a bank guarantee to guarantee its proper and faithful performance under the said Clause of the Contract in an amount of (amount of guarantee in figures and words).

We, the (bank or financial institution), as instructed by the Supplier, agree unconditionally and irrevocably to guarantee as primary obligator and not as surety merely, the payment to the Purchaser on its first demand without whatsoever right of object on our part and without its first claim to the Supplier, in the amount not exceeding (amount of guarantee in figures and words).

We further agree that no change or addition to or other modification of the terms of the Contract to be performed there under or of any of the Contract documents which may be made between the Purchaser and the Supplier, shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition, or modification.

This guarantee shall remain valid and in full effect from the date of the advance payment received by the Supplier under the Contract until (date).

Yours truly,

Signature and seal of the Guarantors

(name of bank or financial institution)

(address)

(date)

4. **Manufacturer's Authorization Form**

(see Clause 13.3 (a) of the Instructions to Bidders)

To: Director (Monitoring) Frequency Allocation Board Headquarters, Islamabad

WHEREAS (name of the Manufacturer) Who are established and reputable manufacturers of (name and/or description of the Equipment) having factories at (address of factory)

Do hereby authorize (name and address of Agent) to submit a bid, and subsequently negotiate and sign the contract with you against IFB No. (reference of the Invitation to Bid) for the above Equipment manufactured by us.

We hereby extend our full guarantee and warranty as per clause 15 of the General Conditions of Contract for the Equipment offered for supply by the above firm against this invitation for Bids.

(Signature for and on behalf of Manufacturer)

Note: This letter of authority should be on the letterhead of the Manufacturer and should be signed by a person competent and having the power of attorney to bind the Manufacturer. It should be included by the Bidder in its bid

5. Performance Security Form

To: Frequency Allocation Board Headquarters, Islamabad.

WHEREAS (name of Supplier) (hereinafter called "the Supplier") has undertaken, in pursuance of Contract No. (reference number of the contract) dated _____2008 to supply (description of Equipment) (hereinafter called "the Contract").

AND WHEREAS it has been stipulated by you in the said contract that the supplier shall furnish you with a bank guarantee by a reputable bank for the sum specified therein as security for compliance with the Supplier's performance obligations in accordance with the contract.

AND WHEREAS we have agreed to give the Supplier a guarantee:

THEREFORE WE hereby affirm that we Guarantee and responsible to you, on behalf of the Supplier, up to a total of (amount of the guarantee in words and figures) and we undertake to pay you, upon your first written demand declaring the Supplier to in default under the Contract and without civil or argument, any sum or sums within the limits of (amount of guarantee) as aforesaid, without your needing to prove or to show grounds or reasons for your demand or the sum specified therein.

This guarantee is valid until the _____day of _____ 2008.

Signature and seal of the Guarantee

(name of bank or financial institution)

(address)

(date)

6. Contract Form

THIS AGREEMENT made the _____ day of _____ 2008 between (name of Purchaser) of (country of Purchaser) (hereinafter called “ the Purchaser”) of the one part and (name of Supplier) of (city and country of supplier) (hereinafter called “the Supplier”) of the other part:

WHEREAS the Purchaser invited bids for certain Equipment, viz., (brief description of Equipment) and has accepted a bid by the supplier for the supply of those Equipment in the sum of (contract price in words and figures) (hereinafter called “the Contract Price”).

NOW THIS AGREEMENT WITNESSED AS FOLLOWS:

1. In this agreement words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract referred to.
2. The following documents shall be deemed to form and be read and constructed as part of this Agreement, viz:
 - (a) The Bid Form and the Price Schedule submitted by the Bidder;
 - (b) The schedule of Requirement;
 - (c) The Technical Specifications;
 - (d) The General Conditions of Contract;
 - (e) The Special Conditions of Contract; and
 - (f) The Purchaser’s Notification of Award
3. In consideration of the payments to be made by the Purchaser to the Supplier as hereinafter mentioned, the Supplier hereby covenants with the Purchaser to provide the Equipment and to remedy defects therein in conformity in all respects with the provisions of the contract.
4. The Purchaser hereby covenants to pay the Supplier in consideration of the provision of the Equipment and the remedying of defects therein, the contract price or such other sum as may become payable under the provisions of the contract at the times and in the manner prescribed by the contract.

IN Witness whereof the parties hereto have caused this Agreement to be executed in accordance with their respective laws the day and year first above written.

Signed, sealed, delivered by _____ the _____ (for the Purchaser)

Signed, sealed, delivered by _____ the _____ (for the supplier)

7. Form of Completion Certificate

Date: _____
Loan/Credit No: _____
IFB No: _____

[Name of Contract]

To: *[Name and address of Contractor]*

Dear Ladies and/or Gentlemen,

Pursuant to GCC Clause 24 (Completion of the Facilities) of the General Conditions of the Contract entered into between yourselves and the Employer dated *[date]*, relating to the *[brief description of the Facilities]*, we hereby notify you that the following part(s) of the Facilities was (were) complete on the date specified below, and that, in accordance with the terms of the Contract, the Employer hereby takes over the said part(s) of the Facilities, together with the responsibility for care and custody and the risk of loss thereof on the date mentioned below.

1. Description of the Facilities or part thereof: *[description]*
2. Date of Completion: *[date]*

However, you are required to complete the outstanding items listed in the attachment hereto as soon as practicable.

This letter does not relieve you of your obligation to complete the execution of the Facilities in accordance with the Contract nor of your obligations during the Defect Liability Period.

Very truly yours,

Title
(Project Manager)

8. Form of Operational Acceptance Certificate

Date: _____
Loan/Credit No: _____
IFB No: _____

[Name of Contract]

To: *[Name and address of Contractor]*

Dear Ladies and/or Gentlemen,

Pursuant to GCC Sub-Clause 25.3 (Operational Acceptance) of the General Conditions of the Contract entered into between yourselves and the Employer dated *[date]*, relating to the *[brief description of the Facilities]*, we hereby notify you that the Functional Guarantees of the following part(s) of the Facilities were satisfactorily attained on the date specified below.

1. Description of the Facilities or part thereof: *[description]*
2. Date of Operational Acceptance: *[date]*

This letter does not relieve you of your obligation to complete the execution of the Facilities in accordance with the Contract nor of your obligations during the Defect Liability Period.

Very truly yours,

Title
(Project Manager)