EASTERN CARIBBEAN TELECOMMUNICATIONS AUTHORITY

REQUEST FOR PROPOSAL

FOR AN INTEGRATED SPECTRUM MONITORING AND MANAGEMENT SYSTEM (ISMMS)

15th July 2015

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1. GENERAL INFORMATION

1.1 INTRODUCTION

ECTEL was established by Treaty signed by the Commonwealth of Dominica, Grenada, St. Kitts and Nevis, Saint Lucia and St. Vincent and the Grenadines on May 4, 2000 in St George's Grenada. ECTEL is a regional regulatory body with a legal mandate to provide recommendations and advice on Telecommunications matters to the National Telecommunications Regulatory Commissions (NTRCs) in the various Contracting States.

ECTEL was also charged with the responsibility to regulate the national spectrum resource. In order to effectively and efficiently perform its function as a Spectrum Manager, specialized tools and systems will be required. The system and tools required can be described as an Integrated Spectrum Monitoring and Management System (ISMMS).

The ISMMS will comprise two (2) main segments: an Advanced Spectrum Monitoring System and an Automated Spectrum Management System (ASMS).

The Automated Spectrum Management component is intended to be a multiuser, multi-function computer application that provides spectrum managers with automated support for management of their license records; frequency assignment and interference calculations; spectrum occupancy, planning and allocation; national and international frequency coordination; licensing and billing procedures; and report generation.

The Spectrum Monitoring component of this system will include the necessary equipment to monitor the frequency spectrum and to locate radio frequency emitters.

This document is a Request for Proposal (RFP) to provide the requisite services in order to fully establish the following sub-systems in ECTEL Member States:

- Automated Spectrum Management System, ASMS, and

- Fixed Monitoring and Direction Finding System, and

- Fully equipped Mobile Monitoring Vehicles, and

- Monitoring and Control Centre.

1.2 MOTIVATION

The **Integrated Spectrum Monitoring and Management System (ISMMS)** will enable ECTEL to better manage its spectrum resource and upgrade its licensing, record keeping and billing capacity. This will allow ECTEL to enjoy the full economic benefit of efficient spectrum management. Service providers and all telecommunications users will benefit from the efficient management of spectrum by ECTEL, since:

- The proper administration of spectrum determines the ease with which users have access to spectrum. This determines the ability of a society to maximize its benefit from the spectrum resource, since increase in the number and variety of radio services can increase the quality of life and efficiency of the economic community.

- A proper administrative procedure allows requested frequencies to be coordinated and licensed within a reasonable amount of time. Access to spectrum would be granted fairly, promoting innovation for service providers to provide the best service possible.

- Effective management of spectrum enables communications users and providers to invest time and finances, secure in the fact that their activities will proceed without unnecessary impediment.

1.3 DEFINITIONS

In this request for proposals –

"Bidder" means an entity submitting a proposal to this Request for Proposals.

"Successful Bidder" means the bidder selected as achieving the highest score in the evaluation process by the evaluation committee.

"Local Contractor" means any company or consultant registered in the OECS and member states of the Caribbean Single Market and Economy (CSME)

2. INSTRUCTIONS TO BIDDERS

Bidders are advised to read all instructions carefully – Failure to comply may result in rejection of their offer

2.1 REQUEST FOR PROPOSALS DOCUMENT

1. The Request for Proposals document issued for the purpose of soliciting proposals includes:

   - Instructions to Bidder.

   - Terms of Reference.

   - Annexes

2. The Bidder is expected to examine carefully all instructions, conditions and forms. Failure to comply with the requirements of proposal submission will be at the Bidder's own risk.

2.2 PREPARATION OF PROPOSAL

The Bidder shall include the following in their proposal:

2.2.1 Company / Consortium Information:

A brief company background, as per ANNEX I, its functions and responsibilities, including evidence of the financial stability of the company/partnership. Audited Financial Statements for the past three (3) years should be included. If the bidder is a wholly owned subsidiary of a parent company, the financial statements of the parent company shall be submitted. In addition, if a consortium is used all partners of the consortium should be identified.

2.2.2 Relevant Company/Consortium Experience:

Specifically in relation to developing spectrum monitoring and spectrum management systems, including a list of similar projects undertaken by the bidder, including relevant project details and contact information of the client(s).

2.2.3 Project Team:

A project team (clearly identifying the Project Manager/Team Leader), providing the qualifications, experience and responsibilities of the personnel to be assigned.

2.2.4 Project Methodology:

A detailed proposal on the approach to project, including project management based on Section 4.

2.2.5 Technical Compliance Checklist:

Compliance table of the features and functionality of the proposed ISMMS should be submitted. All supporting technical descriptions and technical brochures on the proposed system should also be submitted as part of the proposal.

2.2.6 Work Plan:

A Work Plan, including Project Schedule Gantt Chart, based on the Scope of Works identified in Section 4 and any other deliverables proposed by the Bidder.

2.2.7 Financial Proposal:

The fee to be charged for the Project, in accordance with the Functional and Technical Requirements, Scope of Works, expected deliverables and proposed project schedule, in the format detailed in ANNEX II.

Bidders should present the proposals in detail, with clarity and in the format identified above so as to facilitate appraisal.

2.3   COSTS OF PROPOSAL

The Bidder shall bear all costs associated with the preparation and submission of his proposal and ECTEL will in no case be responsible or liable for these costs regardless of the conduct or outcome of the process.

2.4   SUBMISSION OF PROPOSAL

1. Bidders shall note the following when packaging their proposal:

    (a) The full name, office and business address of the Company on the cover page of the Proposal;

    (b) A cover letter containing the signature(s) of the duly authorized officer(s) or employee(s) of the company or partnership making the offer;

    (c) The initials of the person making any offer, must be inserted next to any alterations or erasures made or in the case of a firm or partnership; by duly authorized officer or employee of such company or partnership; and

    (d) In case of any discrepancy between the copies of proposals, the original will govern. An authorized representative of the Company must sign the original and each copy of the proposal.

2. Bidders must provide in their proposal an assurance that prices will remain valid for an initial minimum period of ninety (90) days from the closing date of the letter of invitation or as stated otherwise, during which time Bidders will undertake to maintain, without change, the proposed staffing (including named personnel).

    In exceptional circumstances, prior to expiry of the original offer validity period, ECTEL may ask the Bidder for a specified extension in the period of validity. The request and responses thereto shall be made in writing.

3. Bidders must submit one (1) original and five (5) copies each of the Technical Proposals in English and one (1) original and one (1) copy of the Financial Proposal. Originals shall be clearly identified.

4. Proposals should be submitted as per the following:

    • A first envelope shall contain the Technical Proposal for the procurement of the ISMMS, exclusive of costs; and

    • A second envelope shall contain the Financial Proposal for the procurement of the ISMMS.

    • Both envelopes must then be placed together in a single sealed envelope.

5. The Technical Proposal and Financial Proposal must be completed as separate documents and sealed separately in different envelopes clearly marked as follows:

    • **ENVELOPE 1 – Technical Proposal for an Integrated Spectrum Monitoring and Management System**

    • **ENVELOPE 2 – Financial Proposal for an Integrated Spectrum Monitoring and Management System**

    The completed package must then be sealed and should be clearly marked in bold lettering:

6. The proposals must be deposited at the office of the EASTERN CARIBBEAN TELECOMMUNICATIONS AUTHORITY and addressed to the **Managing Director** at the following address:

> **Eastern Caribbean Telecommunications Authority (ECTEL)**
> **P.O. Box 1886**
> **Vide-Boutielle**
> **Castries**
> **St. Lucia**
> **W.I.**
> **PH: 758-458-1701**
> **Fax: 758-458-1698**

2.5   DEADLINE FOR SUBMISSION OF PROPOSALS

Proposals must be submitted to the office of the EASTERN CARIBBEAN TELECOMMUNICATIONS AUTHORITY **no later than 4:00 pm on September 15th, 2015**. Proposals shall be opened at 9.00am on the following day, September 16th, 2015. Bidders can be present at this opening.

2.6   NEGOTIATION

Based on the results of the evaluation, the company with the best overall technical and financial proposals for the services required will be invited to enter into contract negotiations with ECTEL.

The inability to agree on the detailed costs or compensation for the services or a judgment on the part of ECTEL that such costs or compensation are inappropriate or excessive shall be sufficient cause for notifying the rejection of the proposal and for initiation of negotiation with the firm which follows in order of merit. Once a bidder has been rejected, it will not be recalled for further negotiations on the contract.

2.7   ACCEPTANCE OR REJECTION

ECTEL reserves the right to accept or reject any or all proposals, without limiting the generality of the foregoing.

ECTEL reserves the right to accept or reject any proposal, and to annul this process and reject any proposal at any time prior to award of contract, without thereby incurring any liability to the affected Bidder(s) on the grounds for action.

ECTEL does not bind itself to accept any offer or to reimburse Bidders for any expenses incurred in this Request for Proposals process.

2.8   CANCELLATION OF REQUEST FOR PROPOSAL PROCESS

ECTEL reserves the right to cancel the request for proposals process in its entirety or even partially without defraying any costs incurred by any firm.

2.9   ADDITIONAL INSTRUCTIONS TO PROSPECTIVE BIDDERS

The Successful Bidder shall adopt and adhere to the ITU-R SM Series of Recommendations and other international best practices in the design and engineering of the ISMMS, whether or not listed in the scope of works presented in this request for proposals.

Any factor, item, or supporting article not explicitly stated in this request for proposals that will be required for the successful completion of this scope of works shall be brought to the attention of ECTEL by the Bidder prior to the commencement of this scope of works.

2.9.1   DRAFT FORM OF AGREEMENT

The draft form of agreement will incorporate the Scope of Works, Expected Deliverables and Payment Schedule described in this proposal. This draft form of agreement will serve as the basis of negotiation with the Successful Bidder for an agreement to a final contract to be prepared and provided by ECTEL to the successful bidder prior to the negotiation process.

2.9.2   REQUESTS FOR CLARIFICATION

Any requests for clarification of this request for proposals should be addressed (via email, fax or regular mail) to:

Director of Technical Services
Eastern Caribbean Telecommunications Authority (ECTEL)
P.O. Box 1886
Vide-Boutielle
Castries
St. Lucia
W.I.
PH: 758-458-1701
Fax: 758-458-1698
E-mail : ectel@ectel.int

NOTE: All requests for clarification must be received no later than 4:00 pm on July 31st, 2015. Requests received by the ECTEL after this date may not be entertained. Responses to these requests for clarifications shall be issued on or before August 10th, 2015.

3. TERMS OF REFERENCE

3.1 OBJECTIVE OF REQUEST FOR PROPOSALS

This request for proposals invites companies who have submitted responses to the Request for Information (RFI) issued by ECTEL on the 1st November 2014, to bid for the contract to furnish a turn-key system for an Integrated Spectrum Monitoring and Management System (ISMMS), including the following elements and services: (i) design of the system, (ii) supply of hardware and software (iii) civil works if required, (iv) installation, integration, start-up, acceptance tests and commissioning, (v) supply of tools and test equipment if required, spares, operation and maintenance manuals and as-built documentation, (vi)personnel training, and (vii) support for maintenance, repairs and operational supervision during the initial one-year warranty period. The Bidder will also be responsible to input, with the assistance of ECTEL, all existing spectrum management and monitoring data - frequency and licence data, etc.

This system will facilitate the efficient utilization of radio frequency spectrum by equipping ECTEL with the capacity for:

- Spectrum Monitoring and Direction Finding;

- Record keeping and Data processing;

- Spectrum Planning;

- Spectrum Management;

- License Management and Billing;

- Engineering Analysis; and

- Cartographic Display Functions.

The Integrated Spectrum Monitoring and Management System (ISMMS) comprises two (2) main segments:

- An INTEGRATED SPECTRUM Management System (ASMS);

- A Spectrum Monitoring System consisting of Fixed and Mobile monitoring systems.

The ASMS must therefore provide an orderly method for collecting occupancy data, licensee data, allocating frequency bands, authorizing and recording frequency use by licensees, establishing rules and procedures to govern spectrum use, resolving spectrum conflicts (e.g. harmful interference issues), issuing and cancelling licences, coordinating with regional authorities, collecting fees, performing Electromagnetic Compatibility (EMC) Analysis to prevent harmful interference issues and displaying cartographic information. A central monitoring to be located at ECTEL's Headquarters in Saint Lucia is also part of this project.

The Spectrum Monitoring System must therefore provide the ability to scan and record technical parameters of frequency emitters/transmitters and to locate the source of frequency emissions/transmissions. Provision of spectrum monitoring vehicles for all ECTEL Member States inclusive with this project will facilitate the monitoring of spectrum at remote locations within each island.

The operation of the ISMMS will be guided by specifications and requirements outlined in this section. The requirements of the ASMS have been specified in accordance with the ITU-R recommendation on the design guidelines for an ASMS (ITU-R SM.1370-1). The requirements of the Spectrum Monitoring and Direction Finding System have been specified in accordance with the relevant ITU-R SM recommendations.

TECHNICAL SPECIFICATIONS

RADIO MONITORING AND DIRECTION FINDING SYSTEM

3.2 FUNCTIONAL AND TECHNICAL REQUIREMENTS OF THE SPECTRUM MONITORING SYSTEM

3.2.1 Introduction

To fully support the spectrum management process the Purchaser is seeking a Turn Key Solution to:

- o Survey, install, configure, train and support a Radio Monitoring/Direction Finding System

- o Integrate its existing Anritsu MS2724B Spectrum Master analyzers into the monitoring & control centre (MCC) & Automated Spectrum Management System (ASMS).

The following pages describe the Radio Monitoring Equipment that the Purchaser is interested in acquiring.

3.2.2 Fixed Monitoring Site Selection

Following site surveys and RF predications, the number of fixed sites is to be recommended by the Bidder to fulfill geographic coverage required by the purchaser in each Member State. The purchaser will make the final determination as to sequence of implementation based on priority.

It is the Bidder's responsibility to conduct site surveys at all sites that are being considered to provide best Direction Finding net geometry for signal triangulation and later, in contract execution stage, perform all necessary studies and measurements on suitability of these sites.

Final fixed site selection and confirmation of site suitability shall be the responsibility of the Bidder. A technical and RF Environment Assessment is required and shall be conducted by the Bidder, as a part of the Contract, to validate the suitability of the above or any other potential monitoring sites. Wherever possible, existing structures, towers and facilities shall be utilized and solutions for tower sharing explored. The Purchaser reserves the right to approve the final site selection based on the information submitted by the successful bidder.

Prior to start of installation at each site, the Bidder and Purchaser shall perform an inspection of the site to confirm that the site preparations are completed and the site is ready for installation to begin. Any site preparation work not completed shall be identified and a site readiness date determined. The Contractor shall prepare a report to be signed by both Bidder and Purchaser.

3.2.3 Required New Spectrum Monitoring System Configuration

The new Spectrum Monitoring System must consist of the following elements:

- At minimum two (2) workstations within the NTRC per Member State for monitoring/DF technical measurements and to manage the fixed and mobile monitoring/DF facilities. The software should provide access to all Monitoring Stations and the MMV from any operator workstation on the network within each Member State.

- At minimum two (2) workstations within the NTRC per Member State or software access to existing workstations to access spectrum management software functions including licencing processing.

- Monitoring and Control Centre (MCC) to be located in Saint Lucia. The functionality will mimic capabilities of the workstations within Member States both Management and Monitoring capabilities. The software should also provide access to the system over public Internet service, with appropriate access protection using a VPN channel, to support remote operations.

- At minimum, one (1) Fixed Monitoring Stations (FMS) per ECTEL Member State. Each station shall support radio spectrum monitoring and measurements, Angle-of-Arrival (AOA) measurements (i.e. Direction Finding, DF) and Time-Difference-Of-Arrival (TDOA) radiolocation processing.

- One (1) new Mobile Monitoring Vehicle (MMV) per Member State. Each vehicle shall support radio spectrum monitoring and measurements, Angle-of-Arrival (AOA) measurements (i.e. Direction Finding, DF) and Time-Difference-Of-Arrival (TDOA) radiolocation processing. The hardware and software including a heavy duty laptop within the MMV should provide access to all Monitoring Stations via 3G/4G or any other modern connectivity method that is viable.

3.2.4   MONITORING AND CONTROL CENTRE (MCC)

The MCC shall have remote access capabilities through the communications system to remotely control the Fixed Monitoring Station (FMS), and Mobile Monitoring Vehicles (MMV) facilities when operated in an unmanned situation. Therefore the MCC shall have full spectrum management capabilities and hence have its own database, computer and software. There is a requirement for spectrum monitoring software at ECTEL's MCC.

3.2.5   FIXED MONITORING STATIONS (FMS)

The scope of this order consists of at minimum, five (5) new FMS required to perform radio monitoring, signal measurement, Direction Finding and TDOA covering the radio-frequency spectrum as follows:

- From 20 MHz up to <u>minimum</u> 6 GHz for monitoring, signal measurement and Direction Finding (DF)
- From 20 MHz up to <u>minimum</u> 6 GHz for TDOA.

The scope of this project includes the supply of equipment, antenna, antenna towers, cables, computers, software and installation.

3.2.6   SPECTRUM MONITORING SOFTWARE

- The spectrum monitoring software needs to be provided with the following technical characteristics:

- The integrated spectrum monitoring software shall include the function of Automatic Violation Detection. Automatically scan the spectrum and compare the frequency and bandwidth of active signals against the database of licensed transmitters.

- The software shall be organized in client/server architecture.

- Support TCP/IP based communication

- The vendor should offer minimum 12 Client Software Licenses to access both Management and Monitoring functions. All clients should be able simultaneously to access the DF / TDOA servers and to perform different measurements.

- The system should at specific programmable time intervals check the connection with all monitoring stations and sensors that are its integrated part.

- The system should display graphically (on map) and in tabular form the status of connection to each sensor. Sensors that have no communication must be displayed with different color.

- If the software does not establish connection with the requested measurement device then the integrated monitoring system should continue to be operative except the mentioned functionality.

- The system should be able to display the locations of potential emitters on digital geographic maps (GIS).

- The system must support work with different systems for Internet mapping, such as for example Microsoft Bing® maps or StreetMap®.

- For signal analysis with complex modulations, the system should provide vector signal analysis and constellation diagram view.

- The system should provide expansion possibility for emitters' radiolocation according to TDOA method, AOA method, as well as Hybrid AOA/TDOA.

- When performing multi-site triangulation or radiolocation, the clients should be able to monitor on their display the spectrum from all corresponding processors used in radiolocation.

- The system should provide the remote, real time, audio monitoring of AM/FM demodulated signals minimum up to 200 KHz modulation bandwidth, even over relatively slow connections.

- The complete user documentation must be included in the software delivery. This documentation should include 2 hard copies and 1 soft copy.

- The software delivery must include the system documentation in which the following areas will be explained: installation, setting/commissioning, maintenance and technical description of the system.

- The vendor has the task to make the installation and complete configuration of the system. All needed settings (hardware/software) for system proper functionality should be defined and documented with which the further maintenance of the system will be assured.

- The software installation should be done on all monitoring stations and as well as on all workstations (desktops and laptops) of the system users.

- The vendor is obligated to provide all needed licenses for the correct operation of software (OS, system software, client software, office application software, etc.), including licenses for software from third parties. All licenses should be valid in perpetuity, i.e. not limited to a definite time interval.

3.2.7 Operational Characteristics of FMS

SIGNAL MEASUREMENT

- The FMS must be capable of performing the following signal measurements in frequency range from 20 MHz up to minimum 6 GHz:

- Measurements of frequency and frequency offset in accordance with ITU-R SM 377 or better characteristics.

- The measurements of the electrical field-strength in accordance to the ITU-R SM 378 or better characteristic

- Measurements of occupied bandwidth in given emission in accordance to the recommendation ITU-R SM 443

- Measurement of modulation in accordance to ITU-R SM.328

- Measurement of channel occupancy in given channel size in accordance to ITU-R SM.1880 or better characteristics

The system shall be capable of RF monitoring covering the frequency range 20 MHz to minimum 6 GHz. The receiver shall have a tuning resolution of 10 Hz or better for measuring/recording of the signal characteristics and the storage of date/time stamping. Requirements of parameters to be measured are:

- Frequency modulation to 120 kHz deviation

- Amplitude modulation to 90% or better

- Phase Modulation to 8 radian (max)

- Occupied bandwidth for FM, AM, SSB,CW,PM

- Frequency of the monitored signal to accuracy of 1 PPM

- Monitored traffic recorded in digital form

- Field strength in V/M below 1GHz

- Accuracy: 20 MHz to 1 GHz +/-3dB or better

Signal demodulation shall permit the demodulation of specified RF signals

- to decode their content and characteristics as well as for recording or

- surveying by the operator.

Signal Measurement shall permit the measurement of relative amplitude and frequency parameters of the monitored signals.

- Signal Recording shall permit the recording of demodulated signals, time codes and system audio logs. Listening and audio-recording set-up capabilities should be provided at both the MMV and FMS. The following criteria should apply;

  o A modern digital recording system with high capacity storage on hard disk.

  o Fast retrieval of the recorded event based on date and time tags or content description.

  o Simultaneous recording and playback functions.

- Signal Playback shall permit the reproduction of previously recorded demodulated signals, time codes and audio logs. This function shall be integrated with the record function.

- Post processing of the collected data shall be done to reduce file size and retain only that part of the data that is required for spectrum occupancy, technical measurements and RF identification records.

- Report Generation shall produce reports of system activities and collected data.

- Operational Tasks and Field Report Generation, Import, Edit and Automatic Execution function shall provide a convenient means for the monitoring operator to create, import from MCC and modify.

- Sequences of commands, which detail a spectrum surveillance procedure and parameters for both automatic and manual execution, shall be provided.

- As an option to be included within the proposal;

  o Recording and Monitoring of TV broadcasting programs capability should be included on both the FMS and MMV. The system shall be able to oversee the sound and image contents of TV

programming and shall include at minimum six simultaneous, recording channels for image content and six for sound content. The related equipment will be installed at each of the NTRCs and will include a TV-receive antenna, 24" TV monitor, and a six-channel video recorder for recording in each location. The set-up shall provide the capability of retrieving any recording event given the corresponding TV channel, time and date entered by the operator. The system will be fully operated from the workstation terminals at the NTRC. Storage media may be optical or other form of high capacity storage media.

DIRECTION FINDING

The FMS must be capable of performing Direction Finding measurements in accordance to ITU-R SM854 (AOA) in the frequency range 20 MHz up to minimum 6 GHz or better charactheristics.

TDOA

The FMS must be capable of performing TDOA measurements in the frequency range 20 MHz up to minimum 6 GHz or better characteristics.

3.2.8   Technical Characteristics of FMS

Besides the above-mentioned measurements the fixed stations should adhere to any of the relevant specifications as recommended by the ITU;

ITU-R Recommendations	Title
Rec. ITU-R SM.328	Spectra and bandwidth of emissions
Rec. ITU-R SM.377	Accuracy of frequency measurements at stations for international monitoring
Rec. ITU-R SM.378	Field-strength measurements at monitoring stations
Rec. ITU-R SM.443	Bandwidth measurement at monitoring stations
Rec. ITU-R SM.575	Protection of fixed monitoring stations against interference
Rec. ITU-R SM.854	Direction finding and location determination at monitoring stations
Rec. ITU-R SM.1050	Tasks of a monitoring service
Rec. ITU-R SM.1051	Priority of identifying and eliminating radio interference in the band 406 – 406.1 MHz
Rec. ITU-R SM.1054	Monitoring of radio emissions from spacecraft at monitoring stations
Rec. ITU-R SM.1135	SINPO and SINPFEMO codes
Rec. ITU-R SM.1139	International monitoring system
Rec. ITU-R SM.1268	Method of measuring the maximum frequency deviation of FM broadcast emissions at monitoring stations
Rec. ITU-R SM.1270	Additional information for monitoring purposes related to classification and designation of emission
Rec. ITU-R SM.1392	Essential requirements for a spectrum monitoring station for developing countries
Rec. ITU-R SM.1393	Common formats for the exchange of information between monitoring stations
Rec. ITU-R SM.1394	Common format for memorandum of understanding between the agreeing countries regarding cooperation in spectrum monitoring matters
Rec. ITU-R SM. 1447	Monitoring of the radio coverage of land mobile networks to verify compliance with a given license
Rec. ITU-R SM.1537	Automation and integration of spectrum monitoring systems with automated spectrum management

RFP FOR INTEGRATED SPECTRUM MONITORING AND MANAGEMENT SYSTEM

Rec. ITU-R SM.1598	Methods of radio direction finding and location on time division multiple access and code division multiple access signals
Rec. ITU-R SM.1600	Technical identification of digital signals
Rec. ITU-R SM.1681	Measuring of low-level emissions from space stations at monitoring earth stations using noise reduction techniques
Rec. ITU-R SM.1682	Methods for measurements on digital broadcasting signals
Rec. ITU-R SM.1708	Field-strength measurements along a route with geographical coordinate registrations
Rec. ITU-R SM.1723	Mobile spectrum monitoring unit
Rec. ITU-R SM.1753	Method for measurements of radio noise
Rec. ITU-R SM.1792	Measuring sideband emissions of T-DAB and DVB-T transmitters for monitoring purposes
Rec. ITU-R SM.1794	Wideband instantaneous bandwidth spectrum monitoring systems
Rec. ITU-R SM.1809	Standard data exchange format for frequency band registrations and measurements at monitoring stations
Rec. ITU-R SM.1836	Test procedure for measuring the properties of the IF filter of radio monitoring receivers
Rec. ITU-R SM.1837	Test procedure for measuring the 3rd order intercept point (IP3) level of radio monitoring receivers
Rec. ITU-R SM.1838	Test procedure for measuring the noise figure of radio monitoring receivers
ReC. ITU-R SM.1839	Test procedure for measuring the scanning speed of radio monitoring receivers
Rec. ITU-R SM.1840	Test procedure for measuring the sensitivity of radio monitoring receivers using analogue-modulated signals
Rec. ITU-R SM.1880	Spectrum occupancy measurement
Rec. ITU-R SM.2211-1 (2014)	Comparison of Time-Difference-of-Arrival and Angle-of-Arrival Methods of signal geolocation

3.2.9   TDOA Specifications

The Fixed monitoring stations must be capable of performing TDOA measurements in frequency range from 20 MHz up to minimum 6 GHz. This includes processing of received signal in time and frequency domain and streaming the signal to the central location, for both direct demodulation and TDOA measurements. The maximum timing uncertainty through the entire processing chain shall not exceed 500 nanoseconds.

3.2.10   Antenna System for Fixed Stations

The frequent range of the antenna system must be in accordance to the frequency range of the measurement equipment. The antenna system should cover the full frequency range from 20 MHz up to minimum 6 GHz for DF, monitoring and signal measurement.

3.2.11   Required Antenna Structure for FMS

The monitoring antenna and the direction finding antenna shall be fully integrated into one common antenna structure covered by a protective dome.

Each antenna element (omnidirectional or directional) must be available to be used for either signal monitoring, signal measurement, Direction Finding or TDOA. The operator should have the possibility to select the desired antenna element for signal monitoring, from his workstation via software control.

3.2.12   Antenna Tower

Each FMS needs to include an antenna support structure that is to be supplied and installed by the successful bidder. The antenna structure shall be mounted to achieve maximum/required coverage for Monitoring, DF and TDOA. The entire structure must be designed to withstand hurricane-sustained winds and other harsh weather conditions in the Caribbean. Conformance to this condition must be detailed in the proposal.

3.2.13   Computer Configuration of FMS or Monitoring Station

A desktop computer will be provided for the operator workstation at each Fixed Monitoring, DF and TDOA Station or at the remote monitoring location. Computer must be of the latest generation, with required performance for managing the full equipment and software in the station. The computer must be provided with a compatible operating system, office and automation software, spectrum monitoring application software, keyboard, mouse, and 27-inch monitor.

3.2.14   Installation of FMS

The antenna system shall be supplied with a complete set of cables (coaxial and control cables) to be installed between the antenna and the equipment building.

A cable entry panel shall be supplied and installed by the Bidder. The panel shall be equipped with appropriate feed-through connector for each antenna cable, as well as surge arresters for each antenna cable, to protect the inside of the equipment building from atmospheric discharges captured by the antenna.

The equipment for spectrum monitoring shall be supplied in a standard equipment rack, with easy access to the front and rear of the equipment. Weatherproof outdoor electronics enclosures with climate-control accessories should be provided if the equipment is to be mounted outdoors.

3.2.15   Lightning Protection

The antenna shall be supplied with adequate lightning protection. This includes lightning rod with electrostatic charge dissipater, grounding connection and surge arresters on all cables connected to equipment.

TECHNICAL SPECIFICATIONS

MOBILE MONITORING VEHICLES (MMV)

3.2.16   MOBILE MONITORING VEHICLES (MMV)

The scope of this order consists of five (5) new MMVs required to perform radio monitoring, signal measurement, Direction Finding and TDOA covering the radio-frequency spectrum as follows:

- From 20 MHz up to minimum 6 GHz for monitoring, signal measurement and Direction Finding (DF)
- From 20 MHz up to minimum 6 GHz for TDOA.

The scope of this project includes the supply of vehicle, equipment, antenna, cables, computers, software and installation. Specifications should comply with relevant ITU-R recommendations including SM.1723-2.

3.2.17   Operational Characteristics of MMV

SIGNAL MEASUREMENT

The MMV must be capable of performing the following signal measurements in frequency range from 20 MHz up to minimum 6 GHz:

- Measurements of frequency and frequency offset in accordance with ITU-R SM 377 or better charactheristics.
- The measurements of the electrical field-strength in accordance to the ITU-R SM 378 or better charactheristis
- Measurements of occupied bandwidth in given emission in accordance to the recommendation ITU-R SM 443
- Measurement of modulation in accordance to ITU-R SM.328
- Measurement of channel occupancy in given channel size in accordance to ITU-R SM.1880 or better charactheristics
- Measurements of the magnetic field strengths in accrodance to ITU-R BS 1698 or better.

DIRECTION FINDING (DF)

The MMV must be capable of performing Direction Finding measurements in accordance to ITU-R SM854 (AOA) in the frequency range 20 MHz up to minimum 6 GHz or better charactheristics.   DF determinations shall be capable of being performed while on movement on the road whilst in constant communications with the FMS via 3G/4G or any other modern connectivity method that is viable. The vehicle shall include a heavy-duty laptop.

TDOA

The FMS must be capable of performing TDOA measurements in the frequency range 20 MHz up to minimum 6 GHz or better charactheristics.

3.2.18   Technical Characteristics of MMV

Besides the above-mentioned measurements the mobile vehicles should have the following characteristics:

- The real time, instantaneous bandwidth must be operator selectable for the rapid intercept of short duration, spread spectrum signals, or for the detection of weak signals in a crowded spectrum
- Direction Finding technique must be multi-channel, correlative interferometry in accordance with ITU Recommendation (minimum two channels required).
- Display the spectrum of the monitored signal.
- Recording and playback of I/Q data, with vector analysis of signals.
- Every processor should be provided with the possibility for remote self-test, as well as a built-in Watchdog timer.

3.2.19   Performance Specifications of MMV

The equipment in the Mobile Vehicle must meet the following performance specifications:

- System Sensitivity: 12 dB or better
- Tuning Resolution: 1 Hz
- Tuning error: < 1 part per billion (0.001 ppm)
- Tuning speed: < 5 milliseconds
- Frequency stability: $< 1 \times 10^{-9}$
- Inband Dynamic Range: 85 dB
- AGC Range: >120 dB
- Second Order Intercept: +50 dBm
- Third Order Intercept: +10 dBm
- DF System Accuracy: 2 deg. RMS
- Timing Uncertainty: < 500 nanoseconds

3.2.20   TDOA Measurements

The MMS must be capable of performing TDOA measurements in frequency range from 20 MHz up to minimum 6 GHz. This includes processing of received signal in time and frequency domain and streaming the signal to the central location, for both direct demodulation and TDOA measurements. The maximum timing uncertainty through the entire processing chain shall not exceed 500 nanoseconds.

3.2.21   Antenna System for MMV

The frequent range of the antenna system must be in accordance to the frequency range of the measurement equipment. The antenna system should cover the full frequency range from 20 MHz up to minimum 6 GHz for DF, monitoring and signal measurement.

3.2.22   Required Antenna Structure for MMV

The monitoring antenna and the direction finding antenna shall be fully integrated into one common antenna structure covered by a protective dome.

Each antenna element (omnidirectional or directional) must be available to be used for either signal monitoring, signal measurement, Direction Finding or TDOA. The operator should have the possibility to select the desired antenna element for signal monitoring, from his workstation via software control.

3.2.23   Antenna Mast

The integrated Monitoring/DF/TDOA antenna structure shall be mounted on a pneumatic telescopic mast, and be able to operate in the lowered position while the vehicle is in motion or stationary, and also be able when the vehicle is stationary to operate with the mast in extended position to achieve maximum coverage for Monitoring, DF and TDOA.

3.2.24   Computer Configuration of MMV

A laptop computer will be provided for the operator workstation in the MMS. Computer must be of the latest generation, with required performance for managing the full equipment and software in the station. The computer must be provided with a compatible operating system, office and automation software, and spectrum monitoring application software.

3.2.25 Vehicle for MMV

The Bidder will deliver one MMV per ECTEL Member State. The MMV's, which shall be capable of operating from all terrain and off-road, shall be 4x4, reinforced standard-roof van-type, heavy-duty suspension, air-conditioned, right hand drive vehicle, with its roof-mounted or protruding elements, shall not exceed 10 feet.

The vehicles for MMS shall have the following features and characteristics:

VEHICLE DESCRIPTION

Make and Model	Toyota Prado or Land Cruiser or equivalent.
Production date:	Current production year.
Bodywork form	Full Size, Sport Utility Vehicle
Steering Wheel Position	On Right Hand Side of vehicle
Number of seats	Driver + 1 Operator in Front; 1 Operator in Back
Number of doors	Four on the sides, one in back

ENGINE AND TRANSMISSION

Engine Type	Diesel (Turbo)
Drivetrain	4 x 4
Transmission	Manual

COMPULSORY EQUIPMENT FOR THE VEHICLE

Braking system:	ABS
Power steering	YES
Door Locks:	Remote/central locking
Airbags	YES
A/C system	Operated by engine, heavy duty, separate front and rear
Intrusion Alarm	YES
Halogen fog lights	YES
Tinted windows	YES
Radio CD with front speakers	YES
Spare wheel	Easily accessible
Applicable standards:	Vehicle should comply with all standards applicable in OECS for its full functionality;
Flashing light (orange)	To be fitted on roof
Lightning protection	The external structures and electronic equipment

shall be protected against lightning by means of passive circuits.

Fire extinguisher   YES

The vehicle should be adjusted for its special purpose and be fully and independently functional. The vehicle drivetrain alternator should provide uninterrupted operation of the spectrum measuring equipment at full capacity.

The system shall be capable of operating from internal vehicle supplied power or external (240 VAC) shore power. The vehicle power system shall allow hot switching between shore power and vehicle power (and vice versa) with no interruptions in equipment operation. The system shall operate without limit (time or load) while the vehicle engine is running, without need for an auxiliary generator. The vehicle should be equipped with additional batteries in order to provide power for at least 2 hours of uninterrupted operation of the overall equipment.

The antenna shall be deployed from the MMV on a self-powered mast which can be raised to at least 7.5 meters high without requiring the operator to exit the vehicle to set-up or deploy an mast/antenna hardware or cabling. The operator shall not be required to manually set up or crank up the mask, nor to manually attached or connect the antenna. It shall be possible to raise and lower the antenna mast without running the vehicle engine or any auxiliary motor generator.

All system functions shall be usable while the vehicle is stationary or moving. While moving with the mask down, the antenna system must be functional and provide both DF and monitoring service, but may operate with degraded performance compared to stationary operation with the mask up.

3.2.26   Installation of MMV

The antenna system shall be supplied with a complete set of coaxial and control cables, to allow for the complete extension of the telescopic mast. The cables must be installed in a special flexible conduit, in such a way that will prevent their interweaving and tearing during the raising and lowering down of the mast.

A cable entry panel shall be supplied and installed by the vendor. The panel shall be equipped with appropriate feed-through connectors for each antenna cable, as well as surge arresters for each antenna cable, to protect the inside of the vehicle from atmospheric discharges captured by the antenna.

The equipment for spectrum monitoring shall be supplied in a standard equipment rack, with easy access to the front and rear of the equipment. The rack must be provided with shock-absorbing mounts for installation in the vehicle.

TECHNICAL SPECIFICATIONS

COMMUNICATIONS NETWORKS

3.3   COMMUNICATIONS NETWORK

ECTEL will be responsible for supplying data communications links on advice from the Bidder between the FMS and Control Center within each ECTEL Member State. The links will support data rates required to support hybrid radiolocation processing using AOA and TDOA measurements. The data links shall support data rates of at least 512 kbps or higher. Wire and wireless options should be provided.

ECTEL will also be responsible on advice of the Bidder for communications links between islands to facilitate the operation of the Central Control Centre located at ECTEL Headquarters in St. Lucia.

The Bidder should be cognizant of cost implications of requested communications links and therefore recommend systems that exhibit good use of bandwidth.

3.3.1   Mobile Communications

Data communications between the MMV and the corresponding FMS will be implemented over wireless 3G or 4G broadband mobile communications network.   The wireless communication equipment must be supplied and installed by the Bidder. Because of the need for data protection, the connection over public Internet service must be done via VPN channel. The VPN channel should be provided by the embedded controller in the equipment or by an additional router without the need of fix IP address except at the central location.

ECTEL is responsible for providing the SIM cards and wireless service for the mobile communication equipment.

3.3.2   Remote Access to the Spectrum Monitoring Network

Authorized ECTEL / NTRC personnel with appropriate password access must be able to connect to the ECTEL Spectrum Monitoring network and operate the equipment remotely over the public internet service, using a VPN channel as described in the previous paragraph.

TECHNICAL SPECIFICATIONS

AUTOMATED SPECTRUM MANAGEMENT SYSTEM (ASMS)

3.4 FUNCTIONAL AND TECHNICAL REQUIREMENTS OF THE SPECTRUM MANAGEMENT SYSTEM (ASMS)

3.4.1 ASMS Organization

This management system is designed for use by ECTEL and five national regulatory administrations, called National Telecommunications Regulatory Commissions (NTRCs):

1. NTRC St. Lucia,

2. NTRC St. Vincent and the Grenadines,

3. NTRC Grenada,

4. NTRC Dominica

5. NTRC St. Kitts and Nevis,

The ASMS must be able to provide all required services described below for all five administrations and ECTEL, using one centralized database located at ECTEL Headquarters in St. Lucia and or cloud solution database. It is imperative that high security measures are designed within the network to ensure the safety of the data and access to it.

The software must permit the automated routing of applications from NTRC to ECTEL and back to NTRC for processing. The software must also permit some applications to remain within the NTRC, but traverse between NTRC officers for processing and authorization. This workflow mapping may change with changes in business processes and as such the software must permit with ease the remapping of workflow processes. Tracking of applications online by authorized personnel together with duration of each application must be permitted. Typical processing of an Individual licence is shown below;

INDIVIDUAL LICENCE CYCLE
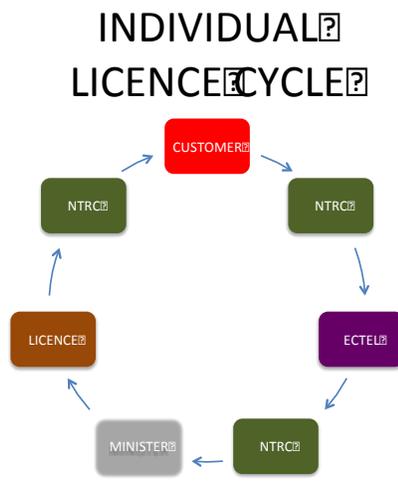
A high-speed Internet network interconnects all five administrations and ECTEL. This network will provide easy access for operator workstations from all five administrations and to connect to the centralized ASMS database at ECTEL.

Qualified personnel with proper credentials from each administration shall be able to perform the following tasks in ASMS:

o Enter applications for stations located within its area of administration

o Approve or reject applications within its area of administration

- o Assign frequencies to stations within its area of administration following consultation with ECTEL
- o Modify licenses within its area of administration
- o Calculate certain invoices within its area of administration
- o Issue and print licenses within its area of administration
- o Enter payments from within its area of administration
- o Issue and print notices and ITU notifications within its area of administration

However, personnel from any administration should not be allowed access to perform any of these tasks outside their area of administration.

Qualified personnel with proper credentials from any administration shall be able to review applications and license records from any other administrative area, without the possibility of making changes or deletions. They also shall have access to Engineering Analysis tools and GIS, to perform propagation studies independently of administrative area.

In addition, ASMS must provide the following customized features to each administrative area:

- o Logo and format of Licenses and reports specific to each administrative area
- o Classes of Service specific to each administrative area
- o Call Signs specific to each administrative area
- o Fee calculation algorithms specific to each administrative area
- o License approval requirements specific to each administrative area

In summary, ASMS must be able to provide all required features and services described above for all five administrations and for ECTEL. Workflow processes will be provided by ECTEL and the system must be flexible to easily permit changes in processes.

3.4.2 WEB Portal

For the convenience of radio spectrum users (Clients), the ASMS system must be provided with a Web portal that allows qualified Clients to enter a license application on-line, make modifications as desired and when satisfied, submit the application to the corresponding administration for processing. The system should also allow payments via credit cards.

3.4.3 Record Keeping and Data Processing Requirements

The ASMS should use an appropriate database management language, chosen for its suitability to spectrum management requirements. It should include a high-performance, Database Management System (DBMS). ECTEL prefers a centralized DBMS configuration. The appropriate database should accommodate a minimum of 100,000 Licenses. It should use friendly graphical user interface screens and forms to enter information and generate queries and reports for each process (core and additional) defined in this scope. The DBMS should also address and therefore enable ECTEL's authorization, spectrum management, administrative and engineering procedures.

ECTEL is currently in the process of updating its licensing records in electronic format. However, the appropriate database should implement the data content recommended by the ITU and based on the latest revision of Annex 1 of the ITU-R Handbook on computer-aided techniques for spectrum management. The following summarizes these:

- National Frequency Allocation data
- Frequency assignment and notification data
- Block Assignments for licences

- Licence holder data

- Equipment characteristics data (includes appropriate descriptions for transmitter, receiver and antenna characteristics)

- Frequency Monitoring data

- Data elements for monitoring

- Automated monitoring of licensed frequencies data

- Fee and Application data

- Spectrum Occupancy Statistics

- Complaints and Violations

- Cancelled licenses

- Site geographical data

The DBMS software should provide the following features as a minimum:

- Security – The successful bidder should, and enable ECTEL's database administrator to, define the operations (read, write, modify) that each user can perform on each database object. When a user attempts to perform an operation that he is not allowed, the database should reject that attempt, and a suitable log should be created.

- Scalability – The DBMS should be scalable in order to handle future growth.

- Customizability – the system must to customizable. "As-is" solutions are to be avoided. Each NTRC's requirements are different and so specific workflows and forms are required. The NTRC should have the possibility to adjust the technical processes, as well as the templates for the generation of customized reports.

- Reliability/ Integrity – there should be the guarantee that every transaction that is executed successfully will not be lost despite a system failure;

- Transaction based operations - guarantees that operations will be done in a discrete fashion. This capability guarantees semantic integrity in the database. Database definition languages also include the ability to impose constraints in order to assure referential integrity in the data;

- Multi-User - The DBMS engine should allow a minimum of twenty (20) users to be connected to the database and handle concurrent access to the information;

- Contention Management - The database should handle the contentions of users trying to access the same piece of data and appropriately lock data that is being updated.

3.4.4   User Interface Requirements

The User Interfaces should operate in the English language and should be graphical with extensive use of help features, menus, etc.

For the ease of use of users, the following features would be desirable:

- Database and System implementation must follow a simple structure that mirrors the business processes;

- The system should use graphical user interface forms that are easy to learn and intuitive to use;

- Data entry fields should be defined by titles to prevent confusion of the user over what quantity to enter;

- The display cursor should point automatically to the field where the next data needs to be entered so users do not miss an entry;

- Data entries should be checked for type of data and range of values;

- Invalid data should be rejected by the system. Operators should be given a warning message giving a description of the mistake and the correct range of values;

- System should utilize client-server computing system architecture;

- System should support multiple office operation in the event that it may be required by ECTEL in the future;

- Record level data access security control;

- Audit trail upon data record status change and provide such information as identification of records being changed, identification of user causing the change, time and date, from status, to status;

- Self-explanatory instructions for the user available in the form of "help windows" on screen;

- All data entered by users should be validated upon entry to ensure that the data being entered is valid and within desired range;

- The system should provide ad hoc query capabilities to meet a variety of operational requirements;

- To ease data input, the user should be allowed to choose the element from predetermined tables by using pop-up menus;

- Should be capable of using defaults for most inputs;

- For ITU notifications, where possible the definitions of the fields should be in accordance with the preface to the BR International Frequency Information Circular (BR IFIC) and the radio communication data dictionary (Recommendation ITU-R SM.1413).

3.4.5 System Administration Requirements

The INTEGRATED SPECTRUM Management System (ASMS) should:

- Have utilities to perform all necessary user administration;

- Maintain user access control through predefined user roles;

- Provide capabilities for reference table maintenance;

- Have extensive automatic housekeeping functions, e.g. record purging;

- Provide automated procedures for routine backup, database integrity validation, and recovery;

- Have query functions for on-line on screen viewing of system administration data;

- Have extensive management report capabilities.

3.4.6 Spectrum Management Operational Requirements

The operation of the ASMS should be designed around the business process for the administration of licences. The following tools should be provided:

RFP FOR INTEGRATED SPECTRUM MONITORING AND MANAGEMENT SYSTEM

1. **Monitoring Occupancy Record Keeping Process.** This process should support data management and storage of occupancy data and other monitoring data elements acquired by the Spectrum Monitoring System, including the following functions:

   - Schedule data capture from Spectrum Monitoring System;

   - Remote capture and local storage of spectrum occupancy data at Command and Control station;

   - Correlation of spectrum monitoring occupancy data and recorded licensee data information in database.

2. **Application Process.** This process should support the data entry of application form, application validation and processing for any authorisation requests (i.e. for licence), including the following functions:

   - Data entry of application information;

   - Automation of update of large data files in MS Excel format

   - Control and Track the processing of license/ concession applications;

   - Data validation.

3. **Frequency Planning Provisioning Process.** This process should support the processing and analyses required to approve a requested frequency assignment, or to respond to a request for international coordination from a neighbouring administration. This process may also be used to investigate the availability of available assignments in the spectrum. Such functions include:

   - A utility for maintaining the national frequency allocation table and associated Spectrum Band Plans and Frequency Channel Plans;

   - Ability to retrieve frequency channel pairs and applicable footnotes confirming with user specified parameters for new assignment purposes;

   - Maintenance of equipment characteristics data;

   - Exportation of data elements as input data into the engineering analysis and cartographic mapping display tools.

4. **Authorization Process.** This process manages the administrative functions involved in issuing, renewing and modifying licences,. This process should support the following activities:

   - Issue a licence that has been indicated as ready;

   - Renew an existing licence for which all conditions of renewal have been satisfied;

   - Increase the fee for an existing licence;

   - Amend Licence information;

   - Suspend and re-instate Licence;

   - Terminate a licence for non-compliance with existing requirements for operation;

   - Cancel licences;

   - Query the database to locate one or a group of licences;

   - Data collection for existing licences;

- Support data entry of new license applications;

- Printing of licences in specified format;

- Detect licenses due for renewal, and generate renewal notices and invoices prior to renewal date.

The system should also support **as a minimum** a licensing process for:

- stations in aeronautical services;

- stations in maritime mobile services;

- land fixed and mobile stations in the fixed and land-mobile services;

- terrestrial fixed microwave stations above 1 GHz;

- earth stations in the space services;

- stations in broadcasting service;

- amateur radio stations;

- citizen band radio stations.

- In addition, the system should:

- support assigning sets of recognized, pre-allocated frequencies for Radio-Communications Services including the aeronautical, amateur, citizen band and maritime mobile services;

- support data collection for existing licenses (data conversion);

- support data entry of new license applications;

- provide a convenient manner for printing of licenses conforming to ECTEL's specified formats;

- support License replacement procedure to handle loss of licenses and apply appropriate fees whenever applicable;

- support license amendment processes which allow the existing license to remain in force, and maintain the availability of all existing license details until the amendment is approved;

- support license cancellation and cancelled license re-instatement and automatically calculate the appropriate fees whenever applicable;

- enable on-line queries capability to permit perusal of technical and license information contained in the database;

- provide extensive management reporting capabilities including but not limited to application status and time to process applications;

- Number licences to be renewed within a given period, reports on number of licences actually renewed.

- Control and track the processing of license applications to ensure that the correct applications are available at each stage of the application cycle, and those applications are automatically progressed to the next stage as each process is completed.

5. **Transmitter Site Approval Collocation Feasibility Processing.** This function should support the feasibility study and approval process for the erection of a new transmitter site (e.g. tower) in respect of applications for ECTEL's non-objections for the Town and Country Planning Division's tower approval process; or the collocation of new transmitting equipment on an existing transmitter site (e.g. tower) in respect of licence applications for the operation of a radiocommunications system.

6. **Report Processing.** The ASMS should be capable of producing a number of built-in standard notices, invoices, correspondence, engineering analysis results, text format reports, and graphic reports, available to the operator via the report processing function. In addition, the system should be equipped with all the tools required to produce custom reports, using only simple operator commands. Typical reports would include:

Format Reports

ASMS should be capable of producing the following reports in text format:

1. Frequency Allocation Report. This report includes the following data items: Lower band limit, Upper band limit, Service name, Service category, Function, Class of Station, ITU Region.

2. Licensed Station Report. This report includes the following data items for each license:
   a. License holder data, Including reference No., Type of license, Name of legal license holder, Address of legal license holder, Name and address of point of contact, Telephone Number of point of contact.

3. Frequency Assignment Report, including the following data items: Frequency, Preferred band, Assigned band, Frequency offset, Schedule of operation, hours of operation, Seasonal periods, Class of station, Nature of service, Experimental station, Effective height above average terrain, Country, Latitude and longitude of transmitter, Nominal radius of transmitting area, standard defined area of transmission, Ground conductivity code, Height above sea level, Call sign Emission designator, Class of operation, Designation of TV system, Power delivered to antenna, Radiated power, Height of antenna above ground, Type of antenna, Polarization of TX antenna, Characteristics of TX antenna, Azimuth of maximum radiation, Horizontal beamwidth, Elevation angle of main lobe, Gain of TX antenna, Name of receiving station, Longitude and Latitude of receiving site.

4. *License General Report*. This report includes the license holder data from the previous report, plus the following additional data items:

   a. Date application received;

   b. Validity period of license

   c. Date license issued;

   d. Date of expiration;

   e. Class of license fees applicable (spectrum & regulatory or only one);

   f. Amount of fee for each category (i.e. spectrum license & regulatory fees)

   g. Partial payment made to date

   h. Outstanding balance on fees

   i. Date of next payment;

   j. Type and date of violation;

   k. Reason and date of termination

5. *Custom Reports.* The operator should have the capability to specify custom reports, either based on the above reports with only selected information included in the report, or different reports based on selected sets of data from the database. The following custom reports are required:

   a. Report on number of applications, pending resolution, approved, rejected, or incomplete and processing times for application;

   b. Report on number of licenses, valid, terminated, or due to expire;

   c. Financial reports of amount invoiced and amount collected;

   d. Report of number of complaints, received, rejected, solved and the length of time taken to resolve complaints.

6. *Database Records.* Print outs of license information, equipment information, site information, fee information, complaint information, monitoring task information, and frequency allocation information.

Graphic Format Reports

The ASMS should be able to produce the following reports in graphic format:

1. *Licensed Transmitter Plot.* This plot shows a geographic map background, the location of the licensed transmitter, its call sign, frequency, ERP, field strength coverage contour, interference contour. This plot can show one single transmitter or multiple transmitters on the same channel, on adjacent channels, or on different channels.

2. *Shadow Plot.* This plot shows the color-coded field strength values around a transmitter site.

3. *Terrain Profile Plot.* This plot shows the terrain elevation as function of distance on the path between two sites. This plot is calculated as a cross section through the topographic map data.

4. *Monitored Signal Plot.* This plot shows on a map background the locations of remote monitoring stations; the locations of intercepted signals; and if applicable, the locations of licensed transmitters from the database.

5. *Band Allocation Plots.* This plot shows in graphic format the allocation of the radio spectrum to different services, as a function of frequency.

6. *Engineering Analysis Results.* Graphic plots of field strength threshold contour, shadow plot, interference plots, and terrain profile for given path, interference computation report, and EMC computation report.

   ➢ **Transaction Activity Reports**

   Provide periodic reports of transaction activity at the spectrum manager's request; such reports to include, but not necessarily be limited to: number of applications in process (total, by service, by band); total number of applications and the time taken to process transactions.

   ➢ **Summary Status Reports**

   Provide summary statistics and specific record summaries for records in each processing status category.

➢ **Status Reports**

Provide a list of all records in any user-designated status category (such as pending, incomplete, etc.).

➢ *Notices, Invoices, Correspondence*

The automated spectrum management system should be capable of producing the following outputs, although not limited to those listed:

➢ *Notices*

Notice of application incomplete, notice of application rejected, notice of license approval, notice of license modification, notice of license renewal, notice of license termination, notice of fee increase, notice of warning, notice of violation.

➢ **Invoices**

Request for fee payment and request for fine payment.

➢ **Expiration and renewal notice**

Automatically create a list of applications due to expire at some user-specified future date. Optionally generate hard-copy expiration notices in summary format on a per month basis.

➢ **Others**

Operating license, complaint acknowledgement, complaint resolution report, request for international coordination, and response to international coordination.

➢ **License Printing**

Printing license at the spectrum manager's request. Licenses should follow a format determined by ECTEL. In addition, the system should facilitate the reconfiguration of the license format in the future.

➢ **Complaint Processing.**

This function should support the efficient processing of interference complaints. This function should support the efficient processing of interference complaints through the following steps:

- record the complaint;
- check the complaint for administrative merit;
- analyze the complaint for technical merit (use engineering analysis tools).
- track complaint through to resolution
- issue resolution closure report

7. **Reference Tables Processing.** This function should support the review, update and printing of all reference tables used by the system.

8. **Security Processing.** This function should restrict update access to specific data records or to certain types of transactions to only those operators who have the proper security access role.

9. **Transaction Processing.** This function creates a record in the database, registering the date, time and identity of the operator who performs each transaction. The system should also ensure that the operator attempting the transaction meets the security access criteria, and that all necessary preceding transactions have been completed.

10. **Environmental Search.** Identification of radio stations in the licensed station database with parameters specified by the user; enables the user to specify the interested area of study on a displayed map, and display search results on the map; display details of selected station and associated frequency information identified by the search function.

11. **Equipment Type Approval.** The application should provide for the authorization, certification, type acceptance, or type approval processes of the administration. Such a computer-aided tool could be used to ensure that new applications entered into the system for approval are using approved or acceptable equipment.

The following procedures should be taken into consideration when processing Type Approval Certificates:

- data collection of existing certificates;

- data entry of new certificate applications;

- facility to issue application refusal letters;

- provide fee schedule maintenance. Should support current fee structure. Should include the capability of entering new fee schedules into the system while the existing schedule remains in force, and switching over to a user specified new schedule on a user selected date;

- provide automatic fee calculations for all transactions with charges and automatic interface to Invoice Generation. Fee calculation should be capable of applying and accounting for sales taxes or value added taxes;

- provide for printing of certificates conforming with specified formats;

- support certificate replacement procedure to handle loss of certificates and apply appropriate fees whenever applicable;

- provide for detecting certificates due for renewal, and generate renewal invoices;

- support certificate amendment process which allows the existing certificate to remain in force, and maintain the availability of all existing certificate details until the amendment is approved;

- support certificate cancellation and cancelled certificate re-instatement and automatically calculate the appropriate fees whenever applicable;

- on-line queries capability should be provided to allow perusal of technical and certificate information contained in the database.

12. **Border Coordination and Notification.** The application should identify licence applications requiring border coordination and automatically create a coordination document to be used for coordination with

bordering administrations. The system should automatically identify whether stations under evaluation are located in a coordination zone using the GIS-based map. It should also provide a query function to enable viewing of coordination data and status of selected coordination records using user specified parameters.

The system should automatically identify applications requiring BR notification and create appropriate notification forms suitable for submission to the BR. The system should print on request the notification for ITU-R and draw the notice to the attention of the spectrum manager if the request is inappropriate. It should create appropriate entries in the application for tracking notification progress.

As a minimum, the following frequency assignments should be supported:

√ HF/VHF/UHF
√ Terrestrial Microwave
√ Geostationary satellite earth station

System should generate the appropriate Radio-communication Bureau forms with filled-in data (e.g. T11, T12). Alternatively, an electronic interface to the systems of the ITU-R should be established for notification purposes.

3.4.7 Fee Processing Requirements

This function should allow the setting and changing of fee rates. It should also support the management of financial tasks, such as recording of fee payments, payment transactions, payment status associated with licensing and certification functions, production of invoices, and production of financial statements in statistical or individual format. The fee processing function should use the standard double-entry accounting method to record and report all transactions.

The fee processing function shall also support the exportation of financial data to an external commercial accounting package used by ECTEL and the five administrations to manage finances.

3.4.8 Engineering Analysis Requirements

Engineering Analysis Requirements

The ASMS should assist identifying interference-free frequencies for an applicant if such a frequency is available; if not, it should help identifying the acceptable interference case.

Automated techniques should be included where practicable. The process is to use appropriate functions or tables that allow for the user specification of minimum acceptable distance separations for co- and adjacent channels for each service in each band. It should also be possible to analyze a specific proposed frequency assignment using the same models to determine its interference potential. An option to calculate the power density from a transmitter should be provided.

Additional tools to be included are as follows:

Environmental Search:

- Identifies radio stations in the licensed station database with parameters specified by the user. This function should allow user to specify interested area of study on a displayed map, and display search results on the map;

- displays details of selected station and associated frequency information identified by the search function;

- allows production of a report identifying the search results and the parameters used.

General Characteristic of all EMC Analysis Tools Supplied:

- frequency plan look-up function to assist in the selection of candidate frequencies based on user-given national frequency allotment plans, planned types of services/operations, user categories;

- facility for spectrum management officers to produce lists of several candidate frequencies for a more detailed analysis, if needed;

- automated validation of user selected candidate frequencies against frequency plan;

- facilities to retrieve occupancy data held in Monitoring database;

- all EMC Analysis tools provided should be an integral part of the ASMS and be available for a station to station analysis;

- EMC Analysis tools should be operating in a temporary system database allowing the user to experiment with different technical parameters without affecting actual records in the system;

- utilities should be provided to the user to update actual system records upon completion of analysis;

- EMC tools should allow the analysis of candidate frequency assignments requested by applicants or incoming coordination requests against existing license records and coordination records in the database using predetermined criteria which are user-changeable at execution time;

- user should be able to enter into the temporary area an arbitrary frequency record and perform analysis against another user entered frequency record in the temporary area, or perform analysis against license records and coordination records in the database using predetermined criterion which are user changeable at execution time;

- all EMC tools should have the capability to be executed on-line or at a user specified time;

- utilities should be provided to allow retrieval of analysis results;

- all modules should analyze both existing and proposed transmitters/receivers as potential offenders and victims;

- all modules should provide the following levels of reporting:

- detailed report identifying the relevant administrative, technical and operational details for each interference case;

- report identifying all stations/frequency assignments involved in each interference case;

- generate summary histogram of number of potential interference cases involved.

The ASMS should include a set of Engineering Analysis tools to assist in the assignment of frequencies in accordance with the recommendations of ITU, as well as national frequency plans, and the local policies established by the Spectrum Management Authority. The following analysis tools should be provided: Broadcast Analysis tools, VHF/UHF Analysis tools, and Microwave Analysis tools. Where applicable, Engineering and EMC Analysis tools should be provided.

Broadcast Analysis Tools

This function supports the assignment of frequency channels based on a search of the database. The frequency of the new transmitter is compared to the transmitters already licensed in the area. The checks for geographic proximity with co-channel and adjacent channel frequencies when assigning new frequencies. This method is based on the calculation of interference levels or on minimum frequency-distance rules, which must take into account the type of service under consideration, the operating frequency, and the maximum transmitter power. The operator, with an appropriate security access code should be able to override the parameters of the frequency-distance rule or interference calculation.

Results of analysis should be displayed on screen with user selectable map background.

System should support printing of analysis results as displayed on screen together with parameters used in the analysis. The following functions should be provided:

- station coverage zone prediction;
- station interference zone prediction.
- cross border coordination.

The ASMS should provide for both analogue and digital broadcasting and shall have the following capabilities:

- Search. Support the assignment of frequency channels based on a search of the database and display of search results on a user selectable map background.
- Analysis. The following analysis shall be available:
  - Coverage zone prediction
  - Interference prediction including intermodulation analysis.

Interference Analysis

EMC analysis must include frequency interference analysis(C/I and T/I) for fixed and mobile stations. The following calculations and functions shall be included:

- Inter-Service Calculations for shared Frequency Bands
- C/I, T/I and Threshold Degradation Calculations
- Service independent Co- and Adjacent Channel Calculations based on Convolution of Spectral Density of Transmitter and Frequency Response of Receiver
- Default Calculation of Spectral
- Density of Transmitter and Frequency Response of Receiver based on Bandwidth
- Active and Passive Interference
- Tx/Rx ETSI and HCM Filters for Fixed Service

Additionally, the interference analysis shall offer the possibility to select different propagation models for the wanted and unwanted signal(s). Furthermore, it must be possible to change the associated maps for the calculation.

As a consequence, the user must be able to select maps with a different resolution for the same propagation model and compare the results without loading a different scenario.

EMC of Broadcasting Services with Other Services

Analyses to ensure compatibility, following the Recommendations ITU-R IS.1009 "Compatibility between the sound-broadcasting service in the band of about 88-108 MHz and the aeronautical services in the band 108-137 MHz" and ITU-R IS.851 "Sharing between the Broadcasting service and the fixed and/or mobile services in the VHF and UHF bands", should be available.

VHF/UHF Analysis Tools

These tools should use an appropriate propagation model to compute propagation loss and field strength in the VHF/UHF frequency range. A selection of propagation models may also be offered for user choice. The models should take into account transmitter characteristics, antenna characteristics, antenna heights above average terrain, topographic terrain profile, and average soil and climate conditions. The VHF/UHF Analysis Tools should include the following:

- VHF/UHF Link Analysis

- VHF/UHF Path Propagation Loss

- VHF/UHF Field Strength Contour

- Service Area Analysis

- VHF/UHF Interference Analysis

Land-Mobile, Maritime Mobile And Fixed Services (point-to-point and Point to Multi point)

General

- Analysis tools provided should utilize propagation models which consider the effects of terrain (using digital terrain elevation and surface cover data), and should be consistent with the procedures discussed in Recommendation ITU-R P.1144 "Guide to the application of the propagation methods of Study Group 3".

- The supplied analysis tools should be able to function in the absence of digital terrain elevation and surface cover data.

- Potential interference cases identified after an analysis run should be displayed on screen with user selectable map background.

- Analysis results should also be available in the form of reports.

EMC Analysis Tools:

The EMC analysis tools could include the following interference mechanisms:

- Receiver Desensitization analysis;

- Transmitter Noise analysis;

- Frequency Interference (Co, Interstitial and Adjacent Channel or distant channel) analyses;

- Multi-signal third order Intermodulation analysis. Intermodulation analysis module shall provide frequency combination reports identifying all combinations of existing frequency assignments within search limits which combine to produce a given intermodulation frequency product;

- Co-site analysis.

System engineering tools should be provided to:

- Calculate the Base station coverage for base station to mobile and pager applications;

- Calculate the mobile talk-back range.

Microwave Analysis Tools

These tools should use the Free Space (Recommendation ITU-R P.525) or other appropriate propagation models to compute propagation loss and field strength at frequencies up to minimum of 50 GHz or higher. The tools should permit both terrestrial and satellite stations to be analyzed. The following Microwave Analysis Tools should be provided, but not necessarily be limited to:

- Microwave Link Analysis

- Microwave Path Propagation Loss

- Microwave Field Strength Computation

- Microwave Interference Analysis

- Antenna Height Analysis (Fresnel Zone clearance)

- Microwave Frequency Planning

General

- The propagation model provided should be implemented specifically for the purpose of interference analysis and should consider the effects of terrain (use of digital terrain elevation and surface cover data).

- The supplied analysis tools should be able to function in the absence of digital terrain elevation and surface cover data.

- Analysis results after an analysis run should be displayed on screen with user selectable map background.

- Analysis results should also be available in the form of reports.

The EMC analysis tools should consider the following interference mechanisms:

Terrestrial Microwave Networks

- This tool enables the user to evaluate the potential interference of a selected candidate fixed terrestrial microwave network against other fixed terrestrial microwave stations.

- Provide analysis of potential interference between Terrestrial Microwave assignments and Geostationary Satellite Earth Stations.

- Orbit avoidance verification and power limits calculations.

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- Health safety distance calculations for terrestrial antennae.

Earth Station

- This tool provides Coordination Contour calculation for Geostationary Satellite Earth Station as per Radio Regulations Appendix 7.

- The tool provided should utilize GIS-based terrain information to perform automatic horizontal elevation angle calculation.

- Provides analysis of potential interference between Geostationary Satellite Earth Station and Terrestrial Microwave assignments.

Intermodulation Analysis Tool

Intermodulation calculations up to three signals and fifth order shall be available, based on the predicted field strength and frequency values.

3.4.9   Cartographic Map Display Functions

The ASMS should include the software for the storage, processing and display of geographic data and terrain/topography data.

The successful bidder will provide ECTEL with a high quality topographical and terrain mapping data for all ECTEL Member States and neighboring islands including the capital city to facilitate cross border interference analysis, which should be integrated into the ASMS. For visualization purposes detailed raster based country maps shall be provided.

The minimum first layer is the Digital Terrain Map as detailed in Recommendation ITU-R P.1058: "Digital topographic databases for propagation studies". All maps that are available in the system shall be combinable. For example it must be possible to overlay different map layers, such as topographical maps with road/street maps in order to provide a better orientation. Additionally, the system must contain advanced 3D display functions, which takes into account the earth curvature. In this mode the user shall also see all stations and links within a pre-defined area and have direct access to the related object properties

Regarding map resolution (pixel size) appropriate specifications for raster maps are as follows:

- 100 m – 200 m resolution for countrywide DTM and land use classification map.

- With regards to major cities more precise data with a resolution of 20 m – 50 m is recommended.

An additional set of maps may be used for border coordination.

The spectrum management system should be capable of storing, processing and displaying of the digital map data with no degradation in accuracy. These maps will be used as digital topographic databases for propagation studies.

The GIS software to be supplied should preferably be from a well-proven leading market vendor, and should have the following characteristics:

- Full topological data structure (nodes, arcs and features both implicit and explicit topology), feature object oriented design;

- Support for the operating system platform as a minimum;

- Windowed display of the data associated with a chosen object depicted on a map background on the screen should be possible;

- Facilities should be provided to display that information in user-definable scales and projections;

- Facilities should be available to display positions of specific points, lines, and areas over the map background with associated descriptive texts;

- Facilities should be provided to make hard copy of the screen (including graphics) produced by the application modules.

Due to the not sufficient information load and resolution of the currently available maps of free providers (like Google Maps, Bing Maps, OpenStreet maps), it is not necessary to have the possibility to work with them direct. However, an export of the calculation results to Google Maps / Google Earth should be provided.

Since the quality of the digital mapping database depends among others heavily on the mapping sources used for the production of the digital mapping database, the BIDDER has to clearly indicate the date and specification of the mapping sources the BIDDER'S quoted digital mapping database is based on.

3.4.10   Hardware and Software Environment

The ASMS should include the latest technological computer equipment and computer peripheral devices that best satisfy ECTEL's needs. The network for the ASMS should be robust with redundant equipment configuration to operate in hot standby mode. The Bidder shall supply the frequency of software and hardware updates and associated costs.

Specifications for the Operating System, Central Processing Unit, Memory, Hard Drive Unit, Network Communications Controller, Display, External Storage and Printer should be supplied. Additional software packages required for the Server are:

- Remote Access Software

- Firewall

- Antivirus

Hardware Requirements

The ASMS shall be designed for high performance operation on the latest, proven computer equipment and computer peripheral devices available on the market. Number of users and their locations, number of licenses and system architecture, nor any other hardware parameter shall not affect performance of the ASMS.

- ASMS supplier shall propose a system architecture closely meeting user's requirements.

Software Requirements

The ASMS shall run on the latest selected software platform and shall use a high performance relational or non rational DBMS. ASMS supplier shall propose configuration of the operational software based on system architecture and user's requirements. The DBMS engine shall provide the following features:

- Performance. Highly integrated with the operating system to provide the highest throughput for the platform selected.

- Scalability. Support future growth

- Reliability. Every transaction executed successfully will not be lost despite a system failure.

- Multi-user. Allow multiple users to connect to the database and handle concurrent access to the information

- Security. Define the operations (read, write, modify) that each user can perform on each database object.

Auto-diagnostics

The IT hardware and software environment should be equipped with tools for auto-diagnostics and verification of system status.

ECTEL Network

ECTEL is responsible for providing and maintaining the ECTEL network, which provides high speed, secure data communication between all five NTRC administrations and ECTEL. The ECTEL network provides easy access for operator workstations from all five administrations and ECTEL to the centralized ASMS database. Qualified personnel with proper credentials from any administration shall be able to access the ASMS database.

3.5   Warranty

The bidders shall offer a minimum 24 months warranty period for the equipment and software that are part of this project. The warranty starts from the day of signing of the Acceptance Protocol between the vendor and ECTEL.

The vendor will correct all hardware and software failures identified during the warranty period without any additional cost including shipping, insurance and handing charges.

The vendor should guarantee availability of spare parts for the system for a period of 10 years following the date of acceptance of the system.

3.6   Documentation and Training

Full technical documentation, including user manual and maintenance manuals should be supplied as part of the performance of the contract. The manual should include descriptions of all operating features of the system sufficient to allow a user to operate the system.

Training requirements should be estimated according to the number of staff to be trained on each subject. Training requirements listed below are minimum requirements. Each proposal must include a detailed description of the training plan offered, including training schedule, curriculum outline, description of each course and student prerequisites.

- Understanding the project;

- Understanding the project implementation schedule;

- Spectrum Management Applications;

- Understanding the spectrum management system structure;

- Understanding and using the spectrum management subsystems;

- Radio Licensing subsystem;

- Understanding/ Performing the Technical Analysis Process;

- Understanding/ Performing International Coordination;

- Understanding the user management process;

- Understanding the Equipment Type Acceptance Process;

- System Administration;

- Database Administration Tools;

- Maintaining and using licensing system reference tables and codes;

- Understanding Spectrum Monitoring:

    o Presentation of overall system architecture;

    o General operational functions and technical characteristics of the system;

    o Detailed subsystems and equipment layout;

    o Detailed operational procedures and performance of equipment;

    o Setting and measurement applications of equipment: purpose of activity, deployment time, site selection, required resources, reference materials, limitations and possible obstacles;

- DF Techniques;

- DF System Performance;

- Understanding Interference & Direction findings analysis and Emitter Location Methods;

- Monitoring System.

The requirements listed here should be facilitated both on a "hands-on" and classroom setting and may be delivered both at the office of the EASTERN CARIBBEAN TELECOMMUNICATIONS AUTHORITY and/or at the Bidder's premises. The vendor must provide to ECTEL for review and approval training materials and manuals in soft and hard copies at least 45 days prior to the start of training.

Training should be facilitated for up to fifteen (15) persons.

SCOPE OF WORKS

RFP FOR INTEGRATED SPECTRUM MONITORING AND MANAGEMENT SYSTEM

4. SCOPE OF WORKS

4.1 Request for Proposal Schedule

ECTEL aims to conclude the RFP phase of procurement by the 31st September 2015. The various activities and associated dates are as follows.

No	Event	Deadline
1	RFP released to Bidders	15th July 2015
2	Bidder to confirm intention to submit a response by e-mail to the Primary Contact	22nd July 2015
3	Bidder questions – Bidders may submit any questions by e-mail to the Primary Contact.	31st July 2015
4	Responses to Bidder questions – ECTEL will provide a response to all Bidder questions.	10th August 2015
5	Submission of Proposals – All responses must be received by 4.00pm on this date to be considered valid.	31th Aug 2015
6	Bidders' presentations – ECTEL may require Bidders to present their responses to the Project Team. If needed, the location and/or method of these presentations will be decided later.	14th – 18th Sept. 2015
7	ECTEL evaluation: Bidder will be notified if they have been successful.	31st Sept. 2015

4.2 Project Schedule

It is expected that this project will be completed in 12 months based on the proposed scope of works. A proposed plan for the project implementation is as follows;

TABLE OF MILESTONE AND DELIVERIES

Milestone / Delivery	From Date of Contract Month
Design Review Meeting • Automated Spectrum Management System • Radio Monitoring & Direction Finding System	 1 1

Factory Acceptance Test
• Automated Spectrum Management System
  – Test Plan
  – Test Procedure
	
	2
	3

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• Radio Monitoring & Direction Finding System
    – Test Plan
    – Test Procedure
	
	5
	6

Shipment of the Equipment • Automated Spectrum Management System • Radio Monitoring and Direction Finding System	 4 8
Installation • Automated Spectrum Management System • Radio Monitoring & Direction Finding System	 5 9

Installation Check-up
• Automated Spectrum Management System
    – Check-up Plan
    – Check-up Procedure
• Radio Monitoring & Direction Finding System
    – Check-up Plan
    – Check-up Procedure
	
	6
	6
	
	10
	10

Training • Automated Spectrum Management • Radio Monitoring & Direction Finding System	 4 – 6 7 – 9
Initial Tests • Automated Spectrum Management System • Radio Monitoring & Direction Finding System	 6 10

Acceptance Tests
• Automated Spectrum Management System
    – Test Plan
    – Test Procedure
• Radio Monitoring & Direction Finding System
    – Test Plan
    – Test Procedure
	
	6
	6
	
	10
	10

Commissioning • Automated Spectrum Management System • Radio Monitoring & Direction Finding System	 7 11
Final Report (including Failure Analysis and Spare Parts Stock Status) Parts Stock Status • Automated Spectrum Management System • Radio Monitoring & Direction Finding System	 8 12

NOTE: The final project schedule shall be determined in negotiation with the Successful Bidder.

4.3   Delays in Bidder's Performance

Delivery of the Goods and performance of Services shall be made by the Bidder in accordance with the time schedule agreed by both the Bidder and ECTEL.

If at any time during performance of the Contract, the Bidder or its sub-Bidder(s) should encounter conditions impeding timely delivery of the Goods and performance of Services, the Bidder shall promptly notify ECTEL in writing of the fact of the delay, its likely duration and its cause(s). As soon as practicable after receipt of the Bidder's notice, ECTEL shall evaluate the situation and may at its discretion extend the Bidder's time for performance, with or without liquidated damages, in which case the extension shall be ratified by the parties by amendment of Contract.

4.4   Work Breakdown Structure

The successful Bidder will be expected to perform, at minimum, the following activities and tasks in order to produce the deliverables / outputs identified:

NOTE:

The Bidder shall be required to quote for all aspects of the installation for the preparation of the monitoring and direction finding sites with the exception of utilities such as water, electricity and communications.

A list of project items in the form shown below should be provided for discussion and agreement.

ITEM	ACTIVITY	TASK	EXPECTED DELIVERABLES
1.0		1.	1.
1.1		1.	1.
1.2		1.	1.
1.3		1.	1.
1.4		1.	1.

4.5   Inspections and Test

ECTEL or its representative shall have the right to inspect and/or to test the Goods to confirm their conformity to the Contract specifications at no extra cost. ECTEL shall specify what inspections and tests are required and where they are to be conducted. ECTEL shall notify the Bidder in writing, in a timely manner, of the identity of any representatives retained for these purposes.

4.6   Testing

The bidder shall propose a test plan for the entire ASMS. The bidder shall, no later than 30 working days after signing of the Contract Agreement, submit a detail test plan for the ASMS and its major components. The plan shall contain description of test procedures and benchmark data for the system acceptance. As a minimum the ASMS, and its major components, shall meet the operational parameters specified in this document.

4.7 Acceptance of Deliverables

An authorized representative of ECTEL and a representative of the Successful Bidder using the Acceptance Test document shall sign off each deliverable/milestone of the project.

4.8 Acceptance and Commissioning

The acceptance Program starts with a Design review Meeting scheduled to occur early in the Project development and before the shipment of the equipment. The sequence of acceptance events is:

- Design Review Meeting
- Factory Acceptance Testing (FAT)
- Shipment of Equipment
- Installation check-up
- Initial Tests
- Provisional Acceptance
- Final Acceptance

The Design Review Package shall be submitted to ECTEL two weeks before the Meeting. The purpose of the meeting is to demonstrate by means of design reports, analyses and prototype tests, that the system has been conceived to satisfy every requirement of the specification.

The FAT include production tests, as well as tests on a factory system mock-up that includes, as a minimum, the main Control Centre at ECTEL, two NTRCs working configuration and two mobile vehicle stations. The Bidder shall demonstrate compliance with the equipment and system functional and performance specifications. The FAT Test Plan shall be proposed by the Bidder for acceptance by ECTEL. The Test Procedure shall be delivered to ECTEL two weeks before the test and shall include the witness and conformance sheets to be signed by ECTEL.

The installation check-up consists of the verification of the security and the integrity of the installations. The successful bidder shall carry out these verifications in the presence of ECTEL, who may request additional visual examinations.

The initial tests are part of the practices that the successful bidder will carry out to its discretion for controlling the development and adequate progress of the work towards start-up. Notwithstanding, ECTEL will be allowed to observe these tests.

The provisional Acceptance Test (PAT) follows the system start-up event and allows ECTEL to verify the compliance with the standards and the technical requirements. Technical compliance shall be verified in detail on the wholly integrated, multiple-Island system, encompassing all its mobile stations, its MCC and FMS and shall cover the point-by-point monitoring and management requirements. The successful bidder shall submit the PAT Plan three weeks before the test for ECTEL's approval. The Test Procedure shall be delivered to ECTEL one week before the test and shall include the witness and conformance sheets to be signed by ECTEL.

ECTEL will not issue partial provisional acceptance certificates (PAC), nor make partial payments against partial conformity claims.

4.9 SPARES

The successful bidder shall supply a stock of spares adequate for operating over a period of two years. These spares will be held centrally by ECTEL for its Member States. The stock quantities to be included and priced shall be

based on calculations based on the following input data; failure rates, time to repair, local or factory repair cycle, and delay to repair/recover a faulty part removed from service.

4.10 Tools and instruments

The bidder shall include in its offer the tools and instruments that are required in order to properly maintain and operate the system and that hence must be part of the mandatory proposal items.

4.11 OPERATIONS AND MAINTENANCE

The manuals will include all information required to operate and support the system after the warranty period. As built system drawings and diagrams, reflecting the installation up-dates in order to record any discrepancies between the original documents and the actual implementation should be provided.

The Bidder will detail all aspects of the maintenance support offered including any regional support within the English speaking Caribbean.

4.12 REPORTS AND PAYMENT SCHEDULE

The payment stage shall coincide with the completion of the agreed milestones / deliverables, in accordance with the agreed payment schedule in the contract agreement. At each payment stage, a report shall be submitted by the Successful Bidder and reviewed by ECTEL's Project Manager before payment is authorized for that payment stage. These reports, where applicable, shall include the signed Acceptance Test document. ECTEL proposed the following payment schedule illustrated in the table below for this project:

NOTE: This payment schedule will be finalized in negotiations with the Successful Bidder

Item	Milestone	Payment
1	CONTRACT AWARD	30%
2	SHIPMENT OF GOODS	20%
3	COMPLETE INSTALLATION, TESTING, COMMISONING AND TRAINING.	50%

4.13 PROFILE OF COMPANY/PARTNERSHIP

Company/Partnership with sufficient experience in developing spectrum monitoring and spectrum management systems, meeting at minimum the relevant ITU-R SM series of Recommendations.

Qualifications of specialists in the system specification, design, implementation and successful management of spectrum management systems and spectrum monitoring systems are required.

The services required and consultations must be conducted in English. All documents, reports and deliverables must be in English

4.14 PROJECT METHODOLOGY

Companies/Partnerships are requested to outline the approach proposed to be undertaken in the execution of this project with specific regard to the Functional and Technical Requirements and Scope of Works as identified under Section 3.

Details on the approach to be taken concerning the following are required: -

4.14.1   Working Relationship

A very close working relationship between the Successful Bidder's team and the staff from ECTEL will be required. The Bidder is expected to identify how this working relationship will be realized.

4.14.2   Project Management

The Bidder will be expected to identify a Project Manager who will report to ECTEL's Project Manager.

The Bidder shall propose the project management structure for the team identified to execute this project, and details regarding the project management approach to be used.

4.14.3   Knowledge and Skills Transfer

An important element of this project will involve the transfer of Knowledge and Skills to staff of ECTEL.

The specific approach proposed by the Bidder, which will be taken to ensure this transfer, will need to be outlined.

4.15 EVALUATION PROCESS

4.15.1   Evaluation Committee

An evaluation committee will be established to conduct the evaluation process of submitted proposals. This committee will objectively evaluate all proposals based on the stated evaluation criteria in part 4.11.2.

4.15.2   Evaluation Criteria

All proposals shall be evaluated against the criteria and the weightings stated below:

ITEM	CRITERIA	WEIGHTING %
1	Compliance with Functional and Technical Specifications (100% compliance with requirements in section 3)	35
2	Experience of Bidder in the successful supply and implementation of Integrated Spectrum Monitoring and Management Systems (Largest number of projects)	5
3	Project Implementation Schedule (Shortest implementation schedule)	5
4	Duration of Warranty Period (Longest warranty period offered)	5

ITEM	CRITERIA	WEIGHTING %
5	Financial Proposal (Lowest overall price)	35
6	Operational Support Cost (includes hardware and software upgrade costs)	15

Table 1 – Evaluation Criteria and associated weighs

ANNEX I – GENERAL INFORMATION

1. Company Information

    a.   Company information is required about the applicant, including:

    b.   Date and place of incorporation.

    c.   Size of company (including number of staff, company locations, etc.).

    d.   Disclosure of any criminal record or personal bankruptcy of any person listed in proposed project team.

    e.   Description of principal business activity and principal place of business.

    f.   Copy of the audited annual financial report for the last three years (or audited financial reports of the parent company, if the applicant is a wholly owned subsidiary of the parent company and does not file separate financial reports)

    g.   List of any affiliations / relationships with other corporations.

    h.   The name of a nominated contact person involved in the request for proposal including email, telephone, facsimile and postal contact details.

    i.   Any other information that the disclosure or non-disclosure of which may materially affect the application in the evaluation process.

2. Consortium / Partners Information

The following additional information is required where an applicant is a consortium or joint venture:

- The role and contribution of each consortium member in terms of resources, experience or expertise

Note: The use of local sub-contractors will be used as a criterion for evaluation.

ANNEX II – COST SCHEDULE

Cost Schedule – Automated Spectrum Management System

Item	Qty	Description	Unit Price	Price
1		Hardware Equipment ▫ CPU ▫ Monitor ▫ Keyboard & accessories ▫ Etc.		
2		Software – Modules & Users Licences ▫ Engineering ▫ Licence Administration ▫ Accounting ▫ Monitoring & Control ▫ General Administration & Database ▫ Geographic Information System, GIS Integrating and upgrading of MMV		
3		Spare Parts (list)		
3		Insurance & Freight Sub total CIF, ECTEL Member States		
4		Inland Transportation		
5		Installation		
6		Documentation		
7		Training ECTEL / NTRC Staff		
8		Any other cost		
9		Total		

Cost Schedule – Monitoring &Direction Finding System

Item	Qty	Description	Unit Price	Price

1		Hardware Equipment
		  □ Antennas
		  □ Broadband Receiver
		  □ Direction Finder
		  □ Global Positioning System (GPS)		

2		Software & Users Licences		
3		Spare Parts (list)		
4		Insurance & Freight		
		Sub-Total CIF, ECTEL Member States		
5		Inland Transportation		
6		Installation		
7		Documentation		
8		Training ECTEL / NTRC Staff		
9		Any other cost		
		Total		

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Cost Schedule – Mobile Spectrum Monitoring Vehicles

Item	Qty	Description	Unit Price	Price
1		Toyota Land Cruiser		
1		Hardware Equipment ▫ Antennas ▫ Broadband Receiver ▫ Direction Finder ▫ Global Positioning System (GPS)		
2		Software & Users Licences		
3		Spare Parts (list)		
4		Insurance & Freight		
		Sub-Total CIF, ECTEL Member States		
5		Inland Transportation		
6		Installation		
7		Documentation		
8		Training ECTEL / NTRC Staff		
9		Any other cost		
		Total		

RFP FOR INTEGRATED SPECTRUM MONITORING AND MANAGEMENT SYSTEM