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**APPOINTMENT OF A SERVICE PROVIDER TO SUPPLY, CONFIGURE AND, COMMISSION FOUR TRANSPORTABLE SPECTRUM MONITORING SYSTEMS WITH MOBILE NETWORK SCANNING CAPABILITY AS WELL AS PROVIDE SUPPORT AND MAINTENANCE FOR THE SYSTEMS FOR THREE (3) YEARS.**

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**1. Purpose of submission**

To appoint a service provider that will supply, configure and commission four separate and fully transportable spectrum monitoring systems with mobile network scanning capability as well as provide support and maintenance for a period of three (3) years.

**2. Background**

- 2.1. ICASA's mandate is to perform routine spectrum management to ensure efficient spectrum utilisation and effective spectrum management. Monitoring would be conducted in terms of Section 30 of the Electronic Communications Act No. 36 of 2005 (the ECA).
- 2.2. ICASA intends to expand its spectrum monitoring footprint, capabilities and mobility options by procuring four customised and transportable spectrum monitoring systems with mobile network scanning capability. This will be achieved through the appointment of a qualified service provider to design, supply, install, configure and commission four transportable spectrum monitoring systems as well as the cellular band scanner that can be readily deployed in various parts of the country, as a quick deployable or semi-fixed monitoring station.
- 2.3. For each transportable monitoring systems, the bidder shall demonstrate how the equipment can be stowed in a customised enclosure (with wheels) that would enable the system to be treated and deployed as a quick deployable or semi-fixed monitoring station. The enclosure shall have all necessary cable inputs/outputs and power outlets/inlets as well as earthing kits.

- 2.4. For each transportable system, the antenna systems shall include a magnetic grip and additional brackets for mounting the antenna on a vehicle rooftop and/or to a pole mast.
- 2.5. The spectrum monitoring systems should be compliant with the International Telecommunications Union (ITU) Recommendations and the ITU Handbook on Spectrum Monitoring.
- 2.6. The primary use of the deployed monitoring systems would be for spectrum analysis, occupancy measurements, signal detection and field strength measurements. The system shall be capable of conducting signal strength measurements along a route (drive-test measurement) and honing into the transmitting site location.

### 3. Scope of work

3.1. The Authority invites eligible service providers to supply, configure and commission four separate and fully transportable spectrum monitoring systems with mobile network scanning capability as well as to provide support and maintenance for a period of at least three (3) years. The project shall be undertaken in the following stages:

#### **Stage 1 - Supply and configure:**

3.2. The bidder shall deliver as per the requirement to supply, install, configure<sup>1</sup> and commission<sup>2</sup> the spectrum monitoring systems consisting of the following:

- 3.2.1. Four (4) Transportable RF receivers operating from 20 MHz to 6 GHz, each with direction finding functionality;
- 3.2.2. Appropriate antenna systems that operate from 20 MHz to 6 GHz that is compatible with the receivers in 3.2.1,
- 3.2.3. GPS connectivity for all transportable monitoring systems,

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<sup>1</sup> Configuration involves physical setup and integration of the fixed and transportable systems to a central monitoring control centre. This includes the software interoperability according to the technical specification in Appendix A.

<sup>2</sup> Commissioning involves the end-to-end delivery of each transportable system up to the point of operating each system as an individual monitoring station or as a set of monitoring stations that are able to communicate with each other and a central monitoring server.

- 3.2.4. Four (4) industrial controllers for onsite processing, data acquisition and data retention for the four (4) monitoring systems.
- 3.2.5. Four (4) communications routers/modems for each transportable system,
- 3.2.6. The system shall include an uninterrupted power supply (UPS) unit to allow autonomous operation for at least 4 hours.
- 3.2.7. The bidder shall design<sup>3</sup> and supply four (4) steel enclosures for housing the monitoring systems that consists of the receiver, router, battery or uninterrupted power supply (UPS), GPS and other equipment that forms part of the operational system. Each steel enclosure shall be compact and on wheels, to allow for easy transportation and setup. Each steel enclosures must fit in the loading bay of a 4x4 vehicle (e.g. a 4x4 Ford Ranger) for easy transportation.
- 3.2.8. The four systems shall include the associated brackets or magnetic grip for antenna systems, cabling and accessories and earthing kits for the four (4) systems for future conversion to a semi fixed site,
- 3.2.9. All equipment shall be delivered with a ruggedized and protective case that would prevent damage to the equipment when it is in transit.
- 3.2.10. The appointed service provider shall configure each system to operate as a mobile and semi-fixed monitoring station and shall demonstrate the setup and configuration of each system on delivery to the Authority.
- 3.2.11. The systems shall be able to withstand harsh weather conditions including but not limited to high temperatures, wind and rain.

## **Stage 2 - Delivery and commissioning:**

- 3.3. The appointed service provider shall commission the sites and provide:
  - 3.3.1. On-site Acceptance Test (OSAT) report for each configured system;
  - 3.3.2. Measurements results for each site as part of the OSAT and produce a typical report from the system example is a spectrum occupancy report according

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<sup>3</sup> Design entails the technical designs and drawings for a modular and transportable encasing for each of the monitoring systems.

to the ITU-R Recommendation SM.328 and ITU Spectrum Monitoring Handbook. The system requirements are listed in Table 2 of Annexure A.

3.3.3. In addition to the four spectrum monitoring systems, the service provider shall deliver and demonstrate that the system is capable of scanning the mobile network bands in both modes of operations, i.e., mobile and fixed monitoring. The integrated scanner (for the mobile network bands) shall be used mainly for cellular and digital radio network signals in the range 10 MHz to 6 GHz. The mobile network scanning requirements are listed in Table 3 of Annexure A.

### **Stage 3 - Support and maintenance**

3.4. The service provider shall provide support and maintenance on the supplied systems for a period of three years commencing after the systems are fully commissioned.

3.5. The service provider shall provide all related product manuals and technical description documents. This includes but is not limited to manuals on the proposed system that guide on how to operate and setup the system, conduct basic troubleshooting, and basic service maintenance of the system shall be provided in soft and hard copy at the time of delivery of the solution and shall be in English.

3.6. The service provider shall provide all related technical description (schematics and system architecture designs) for the proposed solution and it shall be included in the response to this bid.

### **Stage 4 – Training**

3.7. Within the context of this procurement, the service provider shall provide full training to a minimum of five ICASA personnel.

3.7.1. The training shall cover the functionality and maintenance of the system with practical hands-on sessions.

3.7.2. The training shall be done on the actual system being supplied under this bid.

#### 4. Support of equipment

Warranties will apply for the supplied hardware, software and workmanship for twelve (12) months following complete delivery, commissioning and site acceptance tests.

#### 5. Briefing Session

There will be a non-compulsory briefing session on Microsoft Teams. All enquiries shall be coordinated through supply chain email.

#### 6. Bid evaluation

The bid will be advertised for a period of 30 calendar days in the e-tender portal, and ICASA's website on an 80/20 procurement principle.

Bidders will be evaluated on; a) submission of the required documents, b) functionality and live demonstration and c) price and specific goals. Only bidders who meet the cut-off score of 70 points out of 100 points for functionality will be considered further for price evaluation. All bid proposals submitted will be evaluated in accordance with the 80/20 procurement principle as prescribed by National Treasury Regulations.

**Table 1 Bid evaluation criteria and weights**

No.	Weight	Functionality Criteria per Category
<b>A.</b>	<b>80</b>	<b>Price</b>
<b>B.</b>	<b>20</b>	<b>Specific goals</b>
<b>TOTAL</b>	<b>100</b>	
<b>C.</b>		<b>Functionality: Pre-qualification criteria</b>
<b>1. Completeness of project plan covering the entire scope of work as defined in Section 3</b>	<b>20</b>	5 = Project plan covers all 5 requirements 3 = Project plan covers any 4 of the requirements 1 = Project plan covers less than 4 of the requirements or no submission.

<p>The Service Provider shall provide a detailed project plan showing the following:</p> <ul style="list-style-type: none"> <li>(1) Work breakdown structure,</li> <li>(2) Milestones,</li> <li>(3) Timing,</li> <li>(4) Resources, and</li> <li>(5) Project risks management</li> </ul>		
<p><b>2. Capability to Supply, install, commission, and configure all items in the scope of work in Section 3</b></p> <p>The Service Provider shall provide the following plans:</p> <ul style="list-style-type: none"> <li><b>a. Integration plan</b> (i.e., schematics and technical drawings showing how all components integrate with each other);</li> <li><b>b. Technical design and schematics for the transportable system enclosure (rack, trolley and antenna fixtures)</b></li> <li><b>c. Logistical plan</b> (i.e., delivery schedule);</li> <li><b>d. Training plan</b></li> </ul>	<b>30</b>	<p>5 = Supply, install, commission and configure all items in the scope including: integration plan, technical design and schematics, logistics plan and training plan.</p> <p>3= Supply, install, commission and configure all items in the scope including the integration plan, and relevant technical designs and schematics.</p> <p>1= Supply, install, commission and configure all items in the scope without logistics plan and Integration plan provided; or supply, install, commission and configure less than the items specified in the scope.</p>
<p><b>3. Proof of three-year support from the Original Equipment</b></p>	<b>10</b>	<p>5= Proof of Support includes all listed requirements.</p>

<b>Manufacturer (OEM) for the following requirements;</b>  1. Troubleshooting 2. Licenses, 3. Software upgrades, and 4. Installation of software patches		3= Proof of Support includes any three of the listed requirements.  1 = Proof of support includes 2 or less of the listed requirements/ No Proof of Support provided
<b>4. Provide contactable (email and telephone) reference letters, with company letter heads, of similar work done in the past/current in relation to radio frequency spectrum monitoring (any work related to the design, supply, installation, commissioning, and/or support and maintenance).</b>	<b>10</b>	5 = Provide more than three (>3) testimonial reference letters  4 = Provide three (3) testimonial reference letters  3 = Provide two (2) testimonial reference letters  2 = Provide one (1) testimonial reference letter  1 = No submission of testimonial reference letters
<b>5. Comply with the requirements for the transportable spectrum monitoring systems as shown in Table 2 of Annexure A.</b>	<b>10</b>	5 = Complies with all 17 requirements  3 = Complies with 15-16 requirements  1 = Complies with 14 or less requirements; does not comply
<b>6. Comply with the requirements for the mobile network scanning as shown in Table 3 of Annexure A.</b>	<b>10</b>	5 = Complies with all 6 requirements  3 = Complies with 4-5 requirements  1 = Complies with 3 or less requirements; does not comply
<b>7. Live Demonstration of the system, showing the spectrum</b>	<b>10</b>	5 = Complies with 16-19 requirements

<b>monitoring and mobile network scanning operations as detailed in Annexure B.</b>		3 = Complies with 12-15 requirements  1 = Complies with 11 or less requirements; does not comply
<b>TOTAL FOR FUNCTIONAL PRE-QUALIFICATION CRITERIA.</b>	<b>100</b>	

## Annexure A

This section defines the configuration and functionality requirements which are imperative in order to fulfil the requirements as set out in this document. Bidders are thus required to indicate whether they comply or do not comply with the below listed functionality. Please provide a response to these requirements, by indicating whether you comply or not.

Table 2: Compliance checklist for the transportable monitoring systems

			<b>Comply</b>	<b>Not Comply</b>
<b>No.</b>	<b>Feature</b>	<b>Detail</b>		
1.	Configuration and operation	Suitable for fixed and mobile use with direction finding operation		
2.	Network Connectivity	Should be capable of operating with mobile connectivity or other suitable technology such as 3G, LTE, 5G, Wifi, LAN		
3.	Frequency range	20 MHz up to 6 GHz		
4.	Instantaneous bandwidth	≥20 MHz		
5.	Frequency accuracy	2 ppb, best case with GPS lock (10 ppb typical)		
6.	Power Supply consumption	12 V to 32 V DC; 220 V AC. Max 300 W		
7.	Operating modes	Spectrum occupancy; Signal detection; Power Measurements; Field Strength Measurements;		

		Power Flux Density Measurements;  Coverage footprint measurements;  Signal strength level measurements along route measurements; and  Signal homing.		
8.	Signal Strength modes	Linear average;  Log Average;  Peak; and  RMS.		
9.	Reporting & operator history	Activity Logs Exported to *.csv, HTML & Excel file formats		
10.	GPS	Integrated		
11.	Measurement Settings	Attenuation;  Bandwidth;  Scan rate;  Centre frequency;  Start and Stop frequencies;  Channel numbers;  Antenna configuration;  Antenna orientation;  Noise floor levels; and  Time and Date of measurements.		

12.	Types of Modulation	Unmodulated Signals; Amplitude Modulation; Double Side Band (DSB); Single Side Band, Full Carrier (SSB-FC); Single Side Band, Reduced Carrier (SSBRC); Single Side Band, Suppressed Carrier (SSB-SC); Independent Side Bands; Frequency Modulation; Angle Modulation; Phase Modulation; Code Modulation; Amplitude & Phase Modulation; Pulse Modulation; and Combinations of Angle, Amplitude & Pulse.		
13.	Measurement Configuration	Site Identification; Antenna & Receiver; Antenna Height; Receiver Attenuation; Frequency Scan Range; Measurement Bandwidth; Calibration; and Date & Time.		

14.	Measurement Bandwidth	Minimum Bandwidth: 500 Hz; Maximum Bandwidth: 50 MHz; Amplitude accuracy better than $\pm 0.5\text{dB}$ ; and Dynamic Range greater than 70 dB.		
15.	Required Types of Information	Carrier Frequency; Field Strength; Power Density; Occupied Bandwidth; and Video Waveform (aligned to ITU recommendations).		
16.	Control centre software	Remote control software		
17.	Data signal decoding	Digital Signal Processing (DSP) Techniques (New Signal types simply added by modifying system software)		

Table 3: Compliance checklist for the mobile network scanning module

			Comply	Not Comply
No.	Feature	Detail		
1	Interoperability	Connected to the integrated monitoring/DF antenna with no additional antennas required		
2	Software	Software client integrated with the monitoring client.		

3	Scanning	For network search where prior knowledge of active signals is incomplete or unknown		
4		To identify all signals present by technology, frequency, bandwidth, including graphical display of all bands scanned. Tabular scan report of detected channels		
5		Decoding of Layer 3 information, including identifying multiple signals from a single network identified by a base station or cell ID		
6	Standards	Conform to the 3GPP standards including 5G NR, FD-LTE, TD-LTE, NB-IoT, WCDMA, GSM, CDMA and EV-DO		

## Annexure B

This section evaluates the user interface and system functionality from the evaluator's perspective of the live demonstration provided by the bidder. The bidder will demonstrate the different operations as outlined below and the evaluators will base their positive or negative response based on user experience as if they were using the system.

Service Provider to demonstrate the following	Question that BEC member needs to ask themselves and score accordingly	Response	
		Positive	Negative
Bidder shall show how the monitoring station will be accessed through a remote connection	1. There is a central monitoring control application (software) that allows the operator to remotely access each monitoring station and the details of that station		
Bidder shall show how the measurement tasks are created.	2. Measurement tasks can be setup for each of the stations from the spectrum monitoring and control application (software) for frequencies up to 6GHz		
	3. Perform a live measurement for a specific frequency range, showing the power vs frequency waterfall graphs		
	4. Set signal thresholds and show how the system creates alerts when the signal thresholds are measured or exceeded		
	5. Setup and run a scheduled measurement task for multiple frequency ranges		
	6. Perform a mobile monitoring measurement task and display the results on a map.		
Bidder shall show how the system can perform spectrum calculations	7. The monitoring software allows the operator to import a list of transmitters and perform spectrum calculations		

	for the expected receive signal levels for the transmitters.		
Bidder shall show how the system can perform interference measurements	8. The monitoring can be performed for long periods, up to 24 hours, and is able to record and alerts the operator of signal violations. (N.B. Violations are determined by the reference signals and parameters as set by the operator.)		
Bidder shall show how the system saves or records the measurement data	9. The measured data shall be stored and easily accessible through the monitoring control application (software)		
	10. Show how the measurement data is analyzed for occupancy results of the specific frequency bands and frequency channels.		
Bidder shall show how the system performs direction finding and geolocation measurement	11. Show how the system performs direction finding for the measurement data.		
	12. Show the system's ability to plot the line of bearing (LOB) for a specific signal that is selected from the measurement data.		
Bidder shall show the mobile network scanning operation	13. Demonstrate the mobile network scanning to display the cell network country code, network code, base station ID and any other network info of the measured signal/s. Shows the system is able to extract GSM and TETRA parameters		
Bidder shall show the reporting functionality	14. Show the monitoring software has reporting templates that are based on ITU signal parameter measurements		

	15.Show how the reports are generated for the measurement data and how it can be exported to Microsoft excel and/or Microsoft word		
Bidder shall show that the software has mapping functionality	16. Shows that the system is compatible with Google Earth software or similar mapping/GIS software		
Bidder shall show that the software records operator logs	17.Operator activity logs and system errors are stored and easily accessed via the control software		
The bidder shall demonstrate the ways in which the system can be setup	18.Shows that the system can be easily transported to the monitoring location/s, setup for semi-fixed station operations and operated remotely.		
	19.Shows that the system can be easily installed as a mobile station with the antenna attached to the rooftop of a vehicle		
<b>Total Score (19)</b>			