



The Hashemite Kingdom of Jordan
Civil Aviation Regulatory Commission

Microwave Link and Multiplexer Systems

Specifications Tender

Between Radar Head site (RH) and Queen Alia Airport (QAIA)TWR

1. Introduction:

- Jordan Civil Aviation Regulatory Commission (CARC) intends to procure, on a turn-key basis a new microwave link with Multiplexer (MUX). The purchase shall provide, implementation, installation, commissioning, training, and warranty for not less than three years. The microwave link and Multiplexer shall connect the Radar Head site with QAIA ATC Tower site
- The project shall consist of:
 - Microwave Link (1+1) HSB between Radar Head Site & QAIA Tower site
 - Radio equipment in both sites
 - Antenna system
 - Transmission Lines
 - All necessary cabling and accessories
 - Multiplexer that supports TDM between two sites.
 - Local/Remote control and monitoring system.
 - Site survey
 - OJT
 - Warranty
- The new microwave equipment shall handle all types of traffic:
 - Ethernet Interfaces.
 - E1 2Mbps channels.
 - The Multiplexer shall handle :
 - 4 W E&M signaling channels
 - Fxs & Fxo channels
 - Camera

2. General Requirements

- The systems shall be designed, delivered, installed, and commissioned at the designated sites under the total responsibility of the contractor.
- All Offers shall be priced in detail and presented with all local taxes and duties including VAT.
- All Offers shall be itemized (per item quotation), any item quantity could be reduced, increased, or canceled according to CARC needs.
- Statements of compliance matrix with various specification items are required to be included in the offer in a clearly designed table format, the compliance statement shall be fulfilling by the contractor.
- Silence on any part of technical specification will be treated as non-compliance.
- Mux and indoor microwave unit location shall be approved by CARC during site survey.
- The contractor shall provide a detailed project implementation plan and recommendations for site preparation within one month of contract endorsement.
- The tenderer shall submit a project time-framed schedule included in the proposal, which clearly identifies, as a minimum the following project milestones:
 - Technical/ Operational plan for the systems
 - Equipment Design and manufacturing period
 - Site installation
 - Civilworks and any related construction and implementation and ground system
 - Site Acceptance Test (SAT)
 - On- Job Training (OJT)

- Silence on any part of the technical specification will be treated as non-compliance
- The system shall be of a well-known brand name manufacturer. Any other Supplementary, auxiliary equipment or materials shall be well known brand and quality certified by the main system provider.
- All components of the equipment shall comply with cybersecurity requirements.
- Manufacturer's profile including previous relevant experience and projects shall be included in the offer(at least five references).
- English shall be the only language used in the systems applications and documentation as well as the operating system(s).
- Contractors should submit as part of their offer Availability and Mean Time Between Failure (MTBF) figures for Systems. The method of derivation of these figures shall be explained and it shall be highlighted whether the derivation is based on past usage or mathematical model only.
- The contractor shall be responsible for safe movement of equipment and materials to the CARC, as per the delivery schedule.
- If any delivered items found not corresponding to the CARC specification will be rejected, and replacement of the unsatisfactory items will be on the contractor's expenses.
- All equipment installed at Sites shall automatically resume normal operation without intervention of any kind including the need to manually reset, manually reload software programs or change configuration following any event external to the Contractor supplied equipment including inter alias:
 - Loss of power, brownout, or other non-destructive power disturbance;
- Standard industrial interface shall be used for remote monitoring and control within the system wherever suitable. Preferably Ethernet connection with RJ-45 plugs should be used
- It is the contractor's responsibility to include in this proposal all necessary software, licenses, and hardware required for the full and proper performance of the system in accordance with CARC's objectives, without any additional cost to the prices, and without imposing any financial burden on CARC
- Laptop shall be provided and the program for monitoring and controlling the equipment shall be installed in the laptop, the recovery CD/DVD or any portable data devices for the software shall be provided
 - The user license for monitoring and controlling program shall be provided

- Setup CD/DVD for the MW/MUX shall be provide
- Access level shall be provided
- The contractor shall be responsible for cleaning the site after the completion of the Site Acceptance Tests. Care shall be taken during the cleaning process.
- Block diagrams, including interconnecting cable diagrams between different equipment.
- All cables shall be marked and labelled on each end, each label shall identify with source, destination, conductor assignments, the termination points of both ends of cables
- The contractor free of charge shall replace any spare parts used to replace faulty items during the installation and checkout phases, and up to the final acceptance of the equipment. This includes all insurance and freight costs to and from the factory, and must be completed within 15 days from the commissioning date
- At least 30 days prior to installation, the contractor shall submit a detailed Site Installation Plan to CARC for approval. The Plan shall include all necessary information required for the correct installation of the equipment and the initiation of operation
- The tenderer shall be responsible for obtaining work permits or visas for all of their personnel
- The tenderer shall provide details of all installation personnel, including their qualifications, experience, and designation. Individual names are not required at the tender stage
- The tenderer shall provide all installation materials, services, personnel teams, test equipment, and tools required for the installation of the equipment
- The contractor shall supply all necessary ironworks, cabling, and installation materials. It is the contractor's responsibility to provide all parts and accessories required to make the system operational.
- The contractor shall be held responsible for any delays in the installation and testing of the equipment caused by a shortage of delivered materials or by inadequate installation diagrams, documents, instructions, etc., required for the installation.
- The contractor shall adhere to all instructions issued by the CARC supervisory team during the installation and SAT phases.

3. Environmental Requirement :

- All equipment supplied shall operate at the following conditions:
 - For indoor unit (IDU):
 - Minimum Temperature: -10⁰ C
 - Maximum Temperature: 55⁰ C
 - Maximum Relative Humidity: 95% non-condensing
 - For outdoor unit (ODU):
 - Minimum Temperature: -20⁰C
 - Maximum Temperature: 60⁰ C
 - Maximum Relative Humidity: 100%. all- weather operation
- Dual power supply modules for the equipment shall be individually supplied.
- An electrical distribution panel with circuit breakers shall be provided by the contractor
- **Standby power:**
 - The standby batteries shall supply DC input for standby power.
 - The backup battery and charger for the equipment shall be provided.
 - The backup battery shall have sufficient capacity to operate for at least three (3) hours in the event of an AC mains failure
 - Maintenance free batteries
 - The Dual Power supply modules for the equipment shall be individually supplied
 - The systems and equipment shall be capable of automatic start-up upon power-on and automatic recovery following a power failure (blackout or brownout).
 - Battery protection: Automatic protection against battery overcharging shall be incorporated into the power supply through a constant voltage circuit.

4. Site survey

- The site survey will be conducted for those who bought the invitation of the tender
- The date for the site survey will be coordinated and determined by the CARC.
- The bidder shall carry out a site survey to obtain detailed information about the site location (Radar head, INDRA site, and QAIA Tower building), including all specific site requirements and any associated civil works and cabling, in order to prepare their offer.
- RF Horizon study (with Fresnel zone) shall be provided for the direct path between QAIA TWR site & Radar Head site.

5. Lightning protection, surge protection & grounding system

- Lightning protection, surge protection, and grounding systems shall be provided with the shelter/antenna mast and shall comply with the relevant international standards.
- The contractor shall provide the lightning protection system adequately protect Antenna in the event of the lightning strike.
- The contractor shall provide RF coaxial cable surge protection.
- The contractor shall provide a grounding system with total resistance $\leq 5 \Omega$.

6. Old system dismantling (Harris + SAFN)

- The dismantling of the old system shall be the contractor's responsibility if requested by CARC.
- Transfer of dismantled equipment to the CARC store is contractor responsibility which will be used as spare parts in the future.
- The contractor shall be responsible for safe movement of equipment and materials to the CARC Store as per the delivery schedule.

7. Microwave Specifications:

- Link Type: Packet Data MW Number of Nodes: 2 Minimum Capacity: 150Mbps Current Frequency Band: 23GHz
(note :the contractor advice is required if a higher frequency band can be used as a best solution)
- Microwave links shall be (1+1) HSB protection.
- The new equipment shall handle all types of traffic (voice, data packets, management data...).
- MW and MUX shall be collocated in same rack 19" cabinet , and shall be mounted and installed at each site. The cabinet framework shall be constructed from galvanized steel or anodized aluminum with Cooling inside the cabinet shall be provided exclusively by convection and shall ensure that all components operate within their individual temperature ratings, within the specified equipment ambient temperature range

- The details necessary to demonstrate that the proposed solution meets the requirements of this specifications. The details shall include schematics, mechanical assemblies, drawings ... etc.
- The equipment shall be ready (with licenses) to handle the following scenarios of traffic configurations Hybrid mixed mode transport of and Packet traffic.
- The current frequency band shall be used for link calculations; the final assigned frequency will be submitted before contract signing.
- Adequate calculations shall be provided for the link based on supplied coordinates of the related sites.
- Modulation (Fixed/Adaptive) – QPSK, 16,...,4096 QAM.
- Bidder shall state all the modulation schemes the offered equipment support.
- The offered equipment shall provide high availability and reliability according to ITU recommendations G821, G826 and R530-98 with appropriate fading margin (not less than 25 dB) for all links.
- The link shall designed to provide a minimum two-way path availability (99.999% @ BER threshold 1E-6) , maximum TX power, RSSI threshold and capacities by the different modulations schemes for the requested sites.
- Site's Coordinates and frequency band information:

	QAIA TWR Site	Radar Head
Site Coordinates	3°°°'34.80" E 31°4'2.01" N	36°00'46.80" E 31°45'03.60" N
Frequency Band	23 GHz	23 GHz
Bandwidth	28 MHz	28 MHz

- The links shall be equipped with the following traffic interfaces:
 Ethernet interface - Minimum 8 ports 10/100/Base-T
 - Two ports Gig Ethernet
 Tributary Interface 16 E1 , 120 ohm balanced interfaces for Links
 Note: E1 interfaces will be finalized during site survey

- The equipment shall be “split type”
- The equipment shall support transparent transmission of IEEE 802.1Q VLAN tagged frames
- The equipment shall support Ethernet transport.
- Shall support payload encryption AES 128,129,256
- MW shall support XPIC protocol
- MW link shall include forward error correction (FEC) & ATPC.
- **Antenna Specifications**
 - Supplied antenna shall meet a high performance requirements for the link, shall meet class 3.
 - Cross-polarization discrimination(XPD) equal or better than 30 dB.
 - The mechanical design of antenna feeders shall withstand without distortion or damage at a wind speed of **150km/h**.
 - Antenna shall be designed for ease of installation and maintenance.
 - The bidder shall specify the height of each antenna on the tower, so that performance objectives are met.
 - All antenna accessories are needed (i.e. grounding kits, mounting kits, transmission lines clips, cable trays, etc.) shall be provided.
 - The antenna shall be fully protected against the effects of destructive ambient conditions and shall be designed for continuous operation throughout the expected life cycle under the following environmental conditions:
Wind : up to 160 km/h for operation
- **Mechanical Design**
 - The equipment shall be designed for fixed installation and comply with international recognized standards.
 - Attention should be paid to ensure dissipation of the generated heat.
 - The separate units of the equipment shall be designed to be easily handled.
- **Management Interfaces :**
 - Equipment shall support NMS and LCT.
 - NMS interface shall be Ethernet RJ-45 and shall support IPv4

- The Local Craft Terminal software shall be executable on portable laptop PC equipped with Microsoft Windows operating system.
- **Operation and Maintenance**
 - The equipment shall have the capability of creating all type of traffic loops towards network side and remote side.
 - It shall be possible to download software to equipment centralized from the Management System and locally from the LCT without affecting the traffic.
 - Activating new software shall not affect any transport traffic.
 - It shall be possible to download and upload data (shelf, alarm and traffic configuration) between the equipment and the Management System or the LCT without affecting the traffic.
- **Link Availability and Reliability :**
 - Availability and reliability calculations according to ITU recommendations
 - The availability of the links shall not be less than 99.999%.
 - Availability and fading margin calculations for the link shall be provided by different modulation configurations.
 - All measurements of bit-error ratio (BER) shall be done in accordance with ITU-R recommendations. RFC tests for latency and throughput.
 - The manufacturer shall present m-curves and C/I curves (carrier to interference ratio).
 - The manufacturer shall provide calculations to estimate the improvement of the service reliability of the system with:
 - Automatic Transmit Power Control (ATPC)
 - Adaptive Modulation.
 - Antenna diversity if needed.
 - Any additional methods to improve performance and reliability
 - Path performance calculations for microwave link shall be provided.

- **Alarms events & System parameters :**

- The equipment shall be provided with the measurements and control devices that are necessary for supervision, adjustment and quick fault location. By means of software using a PC or any kind of device, it shall be possible to measure at least the following operating values:
 - Transmit output power.
 - Received signal level.
- Other measurements such as BER, ES, SES and DM at both local and remote sites.
- By means of local alarms it shall be possible to locate the faulty units and at least the following alarms should be identified:
 - Power Supply unit failure.
 - Low transmitted power.
 - Low received signal.
 - BER exceeding pre-set threshold.
 - Others specified by the manufacturer.
- These alarms should be identified and displayed remotely through the internal digital supervisory system of the proposed digital radio that also should give information about switching status, quality measurements and alarm history.
- The Bidder shall list all functional blocks and all alarms submitted by these in the following areas:
 - Connection & Protection
 - Equipment and Software
 - Generic Support Functions
 - Overhead Access/ User Channels
- Performance Management
- Security
- Test & Diagnostics
- Transmission

- The alarms shall have following associated severity levels (ITU-T X.733):
 - Critical
 - Major
 - Minor
 - Warning
 - None
- **Power Supply and Power Consumption**
 - Offered equipment shall operate on nominally -48 VDC.
 - Each indoor unit shall have its own redundant power supply and to be connected to a designated circuit breaker panel.
 - The bidder shall state the power consumption of all relevant equipment boards and average power consumption for all offered equipment.
- **Transmission Lines**

Transmission lines shall be provided according to proposed antenna height.
- **Size and Density**

Offered equipment shall be rack mounted on 19”.

8.**Multiplexers Specifications:**

- **Number of Nodes :2**
- **FXO interfaces towards telephony :8**
- **FXS interfaces towards telephony: 8**
- **4W E&M interfaces towards VHF: 16**
- **E1 Interfaces to be connected to MW**
- **System operating Power supply: -48VDC**
- **Power supply redundancy:1+1**
- **Technical requirement**
 - 1) System can be deployed in Point-to-Point, Point-to-Multi point, Add-Drop (drop-insert), Tree and Star topology.
 - 2) Management interfaces must be GUI (Graphical User Interface) based with dedicated server and client architecture
 - 3) Must be manageable using Telnet, SSH for secured access or SNMP.
 - 4) System must maintain Access Security Log.

9.**Installation Requirements**

- The contractor shall perform all the configuration, installation & alignment work for the Microwave & MUX systems at two sites.
- The Manufacturer installation team shall be proficient in the English Language and experience in the installation and supervision of equipment and materials supplied.
- The contractor shall provide details of pre-installation works to be carried out in the installation sites before delivery of the equipment.
- Provision of necessary materials required for full installation shall be the contractor's responsibility.
- The contractor shall be held responsible for any delay in installation and testing of the equipment due to a shortage of materials delivered or due to inadequate installation diagrams, documents, instructions etc. required for the installation of the equipment.

- It is the responsibility of the contractor to include in this proposal all software, license, and hardware requirements that are manifestly necessary for the full and faithful performance of the system's requirements in accordance with the objectives of the CARC without any financial addition to the prices and does not bear the CARC any financial burden as a result.
- Loose wiring or cabling shall not be permitted. All wiring and cabling shall be secured in a neat and tidy manner and adequately protected against accidental damage or the possibility of damage during the removal or insertion of any unit.
- Termination of connectors at ODU and IDU ends, with assurance of connectivity, strain relief, taped/waterproofed/tie wrapped
- Labeling shall be done in English, and symbols used shall be internationally recognized
- All units shall be labeled clearly so that identification, without ambiguity, is possible from the front of the rack
- Adhesive labels that can be removed or easily defaced are not acceptable. Neat, permanent marking which will not be removed by normal cleaning of the equipment is required.
- It shall be possible to locate all components in the equipment by reference to the relevant drawings or handbooks; therefore, all component positions shall be clearly marked on assemblies or sub-assemblies in an easily readable fashion
- The insertion or removal of a unit while power is switched on to the equipment shall not cause any damage to the unit or equipment

10. **Warranty**

- Warranty period shall be for 3 years from final SAT acceptance
- Warranty shall cover all equipment including Technical & software
- All software updates during warranty period shall be provided to CARC free of charge
- During the warranty period, defective units or modules shall be replaced immediately by the contractor's responsibility.
- The faulty unit or module will be return back to manufacture by the contractor.
- Repair & Return policy shall include both equipment and software bugs .
- The contractor shall provide maintenance policy after the warranty period

11. **On- Job Training**

- on-the-job training sessions shall be conducted for all CARC technical personnel, each lasting five (5) working days as CARC request
- The training course shall be organized to be intensive, imparting the necessary knowledge for installation, operation, and maintenance

12. **Site acceptance Test (SAT)**

- The contractor shall provide the Site Acceptance Test (SAT) procedures to CARC at least 30 days before the start of SAT.
- The contractor, along with the installation expert, shall perform the SAT procedures in the presence of the CARC representative
- Two hard copies of the Site Acceptance Test (SAT) report shall be provided at the site after the completion of the commissioning

13. **Delivery**

- Delivery period of the equipment shall be during 150 days after awarding notification

14. **Backup images :**

The contractor shall provide backup images for all software and setup for related to all part of the system (Microwave & multiplexrs)

15. **Documentation**

- Two hard copies of Site Acceptance Test (SAT) report shall be provided at the site
- Two set of documents hard copy and soft copy covering in details:
 - as built drawing –electrical manual
 - installation manual
 - operating & maintenance manuals.
- One set of software copy shall be provided
- All Test equipment and necessary tools that required for
- installation and maintenance shall be provided by the contractor

16. spare parts

- A list of recommended spare parts shall be proposed and shall be 10% of the system.
- Spare parts quotation shall be itemized
- Spare parts provision shall be guaranteed for 10 years minimum

17. Proposed Payment plan

Down Payment : 40%

Delivery : 40 %

After Final SAT : 20%