

Annex 1

Specifications of Digital Mobile Radio

Digital Mobile Radio Overview

The Private Digital Mobile Radio System shall be provided for use by in- house management office e.g. Security and Facilities Staff.

The Contractor shall design, supply, install, test and commission the system including labour, superintendence, materials, tools, equipment, storage, permits, certificates, drawings, and all necessities necessary to complete the Contract works in a proper, safe, thorough and skillful manner to the satisfaction of the Architect.

Any equipment not specifically mentioned in the specification nor shown on the drawings, but required for the operation of the system shall be furnished and installed by the Contractor.

The system provided shall be of open radiation type for daily maintenance, security and servicing purpose.

The equipment offered shall comply with Standards and approval by Communication Authorities of Maldives (CAM)

All cable conduit, trunking and other accessories necessary for wiring of the ELV systems shall be provided by others. Trunking and conduit routing must be coordinated with Electrical Contractor.

All equipment, instrument, appliance, control accessories, etc. provided shall be current model for which replacement parts shall be available for at least five years after completion of the Defects Liability Period.

All equipment and materials of the same type shall be the product of the same manufacturer. All similar items of equipment shall be interchangeable.

The Contractor shall, at his own expense, make good, to the satisfaction of Architect any defect on the equipment due to improper workmanship, faulty design, component failure which may arise within a period of one year from the acceptance of the equipment/system. Components which have been replaced during the warranty period shall have a new warranty period for one year commencing from date of replacement.

System Description

The system shall work as a standalone; IP (Internet Protocol) based Digital Mode Mobile Radio System operating in UHF 400-527MHz frequency band conforming open international standards for the management office.

The system shall be a Tier 2 DMR system to allow the radios to share the logical channels, resulting in less waiting time to access the system and increased channel capacity for a given quality of service. The advantage is that the probability of all channels being busy at the same instant is low.

The system shall provide the necessary indoor and outdoor coverage for the operational area.

The system shall comprise the following equipment;

- Main Repeater Station
- RF Antenna Distribution System

The Contractor shall provide sufficient antennae, associated equipment and accessories to ensure the Digital Mode Mobile Radio System shall cover the whole Hospital. The Contractor shall take into the consideration of the building structure which may obstruct the signal. The system shall be compatible with any building structure e.g. reinforced concrete and steel frame.

The system is working in "Time Division Multiple Access (TDMA)" technology, based on ETSI Standard – ETSI DMR TS102 361 protocol.

The standard-based TDMA digital technology can double the voice and data capacity, divide one physical repeater frequency being assigned by the CAM into two time slots to permit two (2) simultaneous voice channels with a single repeater system

With the advantage of digital error-correction and noise rejection technology, the system can give the user a crystal clear voice communication with no loss through the handheld portable transceivers

With the programmable caller identity numbers on each portable transceivers, the system can enable the user to have better call and channel management which allow the user to make one-to-one call, private call, PTT ID display, call alert, radio check, radio enable/disable, remote monitor late entry, emergency to increase productivity.

The solution shall be able to provide Voice Service and Short Data Messaging to radio.

All necessary Accessories shall be included for each Radio Handset provided, including but not limited to, carry clip, battery, desktop single charger.

The Contractor shall provide a minimum of two (2) repeater based voice channels for the system.

REPEATER

The repeater shall meet the following as a minimum;

General:

- Operating frequency: 400-470MHz
- Channel spacing: 12.5kHz
- Channel capacity: 64
- Duty cycle: 100%
- RF output impedance: 50ohm
- V.S.W.R.: 1.5:1
- Processor base frequency of CPU: $\geq 500\text{MHz}$
- ROM: $\geq 2\text{GB}$
- RAM: $\geq 512\text{MB}$
- Battery charger capacity: 12V, 3A
- Dimension: $\leq 44\text{mm} \times 485\text{mm} \times 370\text{mm}$
- Mounting: $\leq 1\text{U}$ standard rack mount

Transmitter:

- Frequency stability: $\pm 0.5\text{ppm}$
- RF power output: 1-50W
- Digital vocoder: AMBE+2
- Rated system deviation: $\pm 2.5\text{kHz}@12.5\text{kHz}$
- Adjacent channel power: $62\text{dB}@12.5\text{kHz}$

Receiver:

- Frequency stability: $\pm 0.5\text{ppm}$
- Sensitivity, 12dB SINAD: $0.22\mu\text{V}$
- Sensitivity, 5 BER: $0.22\mu\text{V}$
- Spurious rejection (TIA603D/ETSI): 90dB

Handheld Portable Transceivers

The handheld portable transceiver shall be designed for both handheld and body worn operations. It shall be incorporated with a built-in microphone, loud-speaker, press-to-talk switch, power ON/OFF and volume control.

The handheld portable transceiver shall be operated in UHF digital mode, able to operate in both analogue and digital platform.

The operating frequency band shall be in a range of UHF (403-527MHz) frequency band approved by CAM and the mode of operation shall be dual frequency duplex automatic repeater mode. The operating frequency band and the mode of operation shall be finally approved by the CAM.

The handheld portable transceiver shall be designed for supervisory grade user with light weight in not more than 300g and compact in size with dimension not greater than 122 X 56 X 41mm.

The handheld portable transceiver shall be powered by a rechargeable lithium ion battery unit of minimum 1600mAH capacity which shall be attached and firmly connected to the transceiver by a locking mechanism.

The handheld portable transceiver shall be of robust construction and water resistance to meet IP67 specifications. The portable transceivers shall be of the most compact type available by the same manufacturer of major system. The selection of the final type shall be subject to the approval by Architect and all cost shall deem to be included.

The transceiver shall equip with dual capacity direct mode to benefit the user by providing 6.25kHz spectrum efficiency from an original 12.5kHz frequency. It can support two simultaneous transmissions within a 12.5kHz allocation of spectrum, the radio can yield 6.25e (2:1TDMA) operation for Direct Mode transmission. Instantly, the user can support more radio users taking on the same radio frequency at the same time.

Every handheld portable transceivers shall have a unique RAS key which shall be in the range of 6 to 24 characters as determined by the engineer. The repeater shall check and validate the RAS key of a handheld portable transceivers before the repeating the bursts of voice/data signal from the handheld portable transceivers.

The handheld portable transceivers must be equipped with an emergency button that is easy to locate for activation of emergency talk group call. When in emergency talk group call, the handheld portable transceivers must be able to be in Live Microphone mode, where it transmit without the user pressing PTT.

The handheld portable transceiver shall be combined unit of transmitter and receiver unit of solid-state technology design.

The handheld transceiver shall be equipped with indicators of some form to indicate the transmit mode and a LED battery indicator to indicate the state of charge of the battery. The indicators shall be located for easy viewing by the operator.

The handheld portable transceivers specifications are including but not limited to the following:

Operating Temperature	-20 to 60 degree Celsius
Protection Class	IEC 60529 – IP67
Standard	MIL standard 810 C/D/E/F for Shock, Drop & Vibration
Battery	Not less than 1600 mAH A life of up to 400 charge/recharge cycles The battery shall have a hard protective enclosure with surface
Normal operating frequency	403-527MHz
Display	Shatterproof Active View display uses a matrix of LED's behind the radio housing to communicate radio information and shuts off when not in use to conserve battery life.
Voice	Half-duplex calls (individual and group) Emergency call Talking party identity Calling line identity presentation
Transmitter	RF power output: 4W Output impedance: 50ohms
Receiver	Digital sensitivity: 0.14uV Audio distortion: 3% Rated audio: 0.5W (Internal)

Documents needed;

- System Specification data sheet
- Hand Held portables radio data sheet
- Authorization Letter from the Manufacture

GENERAL SPECIFICATIONS * REPEATER DIGITAL (1 Number)

UHF

Supports two simultaneous voice or data paths in digital Time-Division Multiple- Access (TDMA) mode

Channel Capacity	16
Frequencies	450-512 MHz
Dimension (H x W x L)	132.6 x 482.6 x 296.5 mm 5.22 x 19 x 11.67 in
Voltage requirements	100 - 240 VAC, 50/60Hz
Weight	14 kg (31 lbs)
Current Drain	Standby 1.0A (100 VAC), 0.5A (240 VAC)
	Transmit 4.0A (100 VAC), 1.8A (240 VAC)
Operating Temperature Range	-30°C to +60°C
Max Duty Cycle	100%
FCC Description	1-40W: ABZ99FT4027

Receiver

Frequencies	450-512 MHz
Channel Spacing	12.5 kHz/ 25 kHz
Frequency Stability (-30° C, +60° C, +25° C)	+/- 0.5 ppm
Analog Sensitivity	0.3 uV (12 dB SINAD) 0.4 uV (20 dB SINAD) 0.22 uV (typical)
Digital Sensitivity	5% BER: 0.3 uV
Intermodulation TIA603C ETS	75 dB 70 dB
Adjacent Channel Selectivity	60 dB @ 12.5 kHz 70 dB @ 25 kHz
Spurious Rejection	TIA603C 80 dB ETS 70 dB
Audio Distortion @ Rated Audio	3% (typical)
Hum and Noise	-40 dB @ 12.5 kHz -45 dB @ 25 kHz
Audio Response	+ 1, -3 dB
Conducted Spurious Emission	-57 dBm

Transmitter

Frequencies	450-512 MHz
Channel Spacing	12.5 kHz/ 25 kHz
Frequency Stability (-30° C, +60° C, +25° C)	+/- 0.5 ppm
Power Output	Low Power 1-40 W High Power
Modulation Limiting	+/- 2.5 kHz @ 12.5 kHz +/- 5.0 kHz @ 25 kHz
FM Hum and Noise	-40 dB @ 12.5 kHz -45 dB @ 25 kHz
Conducted / Radiated Emission	-36 dBm < 1 GHz -30 dBm > 1 GHz
Adjacent Channel Power	-60 dB @ 12.5 kHz -70 dB @ 25 kHz
Audio Response	+1, -3 dB
Audio Distortion	3%
FM Modulation	12.5 kHz : 11K0F3E 25 kHz: 16K0F3E
4FSK Digital Modulation	12.5 kHz Data Only: 7K60FXD 12.5 kHz Data & Voice: 7K60FXE
Digital Vocoder Type	AMBE+2TM
Digital Protocol	ETSI-TS102 361-1

GENERAL SPECIFICATIONS DIGITAL TWO-WAY PORTABLE RADIO (20 Numbers)

UHF

Channel Capacity	256
Frequency	403-527 MHz
Dimensions	122 x 56 x 35 mm
Weight	285g
Power Supply	7.5 V (Nominal)
Operating Temperature	-20 ~ +60 °C ¹
Battery Life (Digital/Analog)	20 / 15.5 hrs

RECEIVER

UHF

Frequencies	403-527 MHz
Channel Spacing	12.5/25kHz
Frequency Stability	(-30°C, +60°C, +25°C Ref) ± .5 ppm
Analog Sensitivity	(12dB SINAD) 0.3uV (0.22uV typical)
Digital Sensitivity	0.25 uV (0.19 uV typical)
Intermodulation (TIA603D)	70 dB
Adjacent Channel Selectivity	(TIA603A)-1T 60dB @ 12.5 kHz / 70dB @ 25 kHz ³
Spurious Rejection (TIA603D)	70 dB
Rated Audio	0.5W
Audio Distortion @ Rated Audio	5% (3% typical)
Hum and Noise	-40dB @ 12.5 kHz / -45dB @ 25 kHz ³
Audio Response	TIA603D
Conducted Spurious Emission	(TIA603D) -57dBm

TRANSMITTER

UHF

Frequencies	403-527 MHz
Channel Spacing	12.5/25 kHz
Frequency Stability	± .5 ppm
Low Power Output	1W
High Power Output	4W
Modulation Limiting	± 2.5kHz @ 12.5 kHz / ± 5.0kHz @ 25 kHz ³
FM Hum and Noise	-40dB @ 12.5 kHz / -45dB @ 25 kHz ³
Conducted/Radiated Emission	-36 dBm < 1GHz / -30 dBm > 1GHz
Adjacent Channel Power	60dB @ 12.5 kHz / 70dB @ 25 kHz ³
Audio Response	TIA603D
Audio Distortion	3%
Digital Modulation	4FSK
	12.5 kHz Data: 7K60F1D & 7K60FXD
	12.5 kHz Voice: 7K60F1E & 7K60FXE
	Combination of 12.5 kHz Voice & Data: 7K60F1W
Digital Vocoder Type	AMBE+2™
Digital Protocol	ETSI TS 102 361-1, -2, -3

BATTERY PACK (20 Numbers)

(Extra Battery for the Portables) Battery Pack	
IMPRES Hi-Cap Li-ion	2200 mAh,
Dimensions (H x W x L)	130.3 mm / 55.2 mm / 41.1 mm
MPRES	Yes
Minimum rated capacity (mAh)	2200
Physical Characteristics	Chemistry Li-ion
Charger required	IMPRES
Recycling	Recommended
Operating temperature range	-20 to +60 C

