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Sub: Corrigendum-2 **Date: 16-07-2022**

Ref: R&D/SDR/EOI/01 Dt:04-05-2022

With reference to the above EOI Ref: R&D/SDR/EOI/01 Dt:04-05-2022 for "Design and Development of Software Defined Radio (SDR) and Solutions" the following amendments have been made and it is applicable to the complete EOI document.

Sl. No	Particulars of amendments in the EOI Document	Existing	Amended
1	Specifications	Specifications of Manpack SDR Sl.No.(i) of (B) RF Specifications, Frequency: HF: 3 MHz to 30 MHz (Typical) (Page No:15 of RFP)	Additional Specifications in addition to the existing specifications of Sl.No.(i) of (B) RF Specifications, Frequency; is herewith attached.

HF Man-Pack SDR Specifications

S.No.	Description	Specification	Remarks
1	Frequency Range	1.5-30 MHz; Vendor to specify the Freq. range	
2	Power Output.	20W or Higher; Power Output shall be selectable by a Selector switch for at least 2 lower values; Vendor to specify these 2 or more values	
3	Weight	<5.5Kg including Battery excluding accessories); Vendor to indicate the weight	
4	Physical Dimensions (HxWxD) in mm	360x255x100 or less with Battery	
5	Communication Ranges:		
	a) Ground Wave:	≥30 Kms (Using Rod Antenna)	
	b) Sky Wave:	≥300 Kms (Using Dipole Antenna)	
	c) NVIS:	NVIS Antenna to provide communications in the skip zone.	
6.	Interoperability.	The Vendor shall clarify / resolve the any technical issue with respect to interoperability and waveform development during the entire service life of the HF Man-Pack SDR (of around 12 to 15 years)	
7.	Modes of Operation	(a) Squelch (b)Whisper (c) Sulk(no transmission in this mode)	
8.	Data Capabilities:		
	(a) Narrowband Data	To support for data transmission at data rates as per : MIL-STD-188-110A, MIL-STD-188-110B Appendix-C & MIL-STD 188-110B Appendix F or better	
	(b) Wideband data:	To support for data transmission at data rates as per: MIL-STD-188-110C and MIL-STD-188-110D or better.	
	(c) Data protocols:	Shall be able to transmit voice, data Video and messaging in HF band with peer protocols that operate above an HF modem and below the application level. Supporting data link layer capability for TCP/IP applications as per STANAG 5066 or better. It should be capable of transmitting data in the Network Mode of operation (one to one / one to many / one to all).	
9.	ECCM (Anti Jamming and Anti Detection)	HFSDR Manpack shall provide Frequency Hopping (FH) as per MIL-STD-188-148 (Interoperability	

		Standard for Anti-Jam (AJ) Communications in the HF Band) or better. The AJ mode shall have hop rate of 10 hops per second or more in the entire HF band. The radio set shall have capability to have user selectable and configurable frequency table for setting frequencies for AJ mode.	
10.	**Antenna**		
	a)GROUND WAVE COMMUNICATION	(i)Man-Pack Radio set to be provided with Tape /whip antenna of 3.1m or less and rod / long whip antenna of length not more than 5 metres. (ii) The Rod or Long whip antenna shall have coating of non conducting material so that even if it comes in contact with high voltage overhead transmission lines, the equipment is not damaged and the operator does not get electric shock. (iii)All aerials/antenna shall be variable height flexible mount.	
	(b)sky wave communication:	The following antennas shall be provided: (i)Dipole antenna(working in HF band) (ii)NVIS Antenna: To cover communication in the skip zone created due to sky wave communication using Dipole antenna	
	(c)Any other Antenna :	Any other antenna including GNSS antenna to be suitably integrated into HF SDR Manpack.	
11.	Interfaces, accessories (excluding DTE), cables, cords, switches and displays	To be ruggedized in accordance with latest version of JSS 55555 Class L3 as applicable	
12.	**Positioning, Navigation and Timing.**		
	(a) GNSS and IRNSS	HF Man-Pack SDR shall have an inbuilt GNSS receiver catering to multiple GNSS services like GLONASS and GPS. To cater for IRNSS Services (SPS). The GNSS Receiver shall be capable of working in dual frequency or better and compatible with Satellite Based Augmentation Systems like WAAS/GAGAN or better.	
	(b) Synchronization	HF Man-Pack SDR shall support synchronization by both internal timing source and by time signal from GNSS receiver including IRNSS.	

	(c) Navigation	HF Man-Pack SDR shall support integrating a Defence Series Map (DSM) based navigation system, in the form of a suitable application to be supplied with the Data Terminal Equipment (DTE).	
	Technical Parameters:		
13.	**Power Source:**		
	(a) **Rechargeable Batteries.**	i. HF Man-Pack SDR shall be supplied with rechargeable batteries by the manufacturer. These shall fit into the battery compartment of the HF Man-Pack SDR. ii. The rechargeable batteries shall be of the latest technology and shall be capable of high speed charging. iii. The SDR shall be capable of working continuously for 8 hours or more at a 1:9 Transmit to receive ratio with the rechargeable battery without change. iv. HF Man-Pack SDR shall be supplied with rechargeable and non-rechargeable battery pack which is compatible and interchangeable with V/UHF Man-Pack SDR that is being procured by IA.	
	(b) Non Rechargeable (Disposable) batteries	i. HF Man-Pack SDR will be supplied with disposable, non rechargeable batteries by the manufacturer. These will fit into the battery compartment of the HF Man-Pack SDR. ii. The SDR will be capable of working continuously for 8 hours or more at a 1:9 Transmit to receive ratio with the non-rechargeable battery without change.	
	(c) 12 V Secondary Rechargeable Batteries:	HF Man-Pack SDR will work continuously for 12 hours or more at 1:9 Transmit to Receive ratio when powered with in service 12 V 75 AHC secondary batteries.	
	(d) AC Mains.	HF Man-Pack SDR will be capable of working off 230 ±20% v AC mains at 50 Hz ±10%.	
14	**Battery Charging:** Suitable battery chargers with connectors		

	shall be provided for charging the rechargeable batteries that fit into the integral battery compartment of the HF Man-Pack SDR. The battery chargers shall be supplied with the equipment as accessories as per the details below:		
	(a) **Solar Charger.** A compact, foldable &man portable solar battery charger shall be provided. The solar battery charger shall be provided with charging leads. An indicator to display battery charge status shall be provided. The solar battery charger shall have inbuilt protection against low voltage, short circuiting, over charge and deep discharge of battery. Detailed specifications are as under:-		
	i. Type Solar Panel.	Foldable.	
	ii. Charging Voltage.	As per design of battery	
	iii. Nominal Peak Power	60W or higher	
	iv. Maximum Size while folded	400x400x100(in mm)	
	v. Weight	≤6 Kg	
	(b) Mains Supply Charger: A mains supply charger shall be provided with capability to work off 230 ±20% volt AC at 50Hz ±10%. It shall have the facility of fast charging to reduce charging time of batteries. The mains supply charger shall have all standard protections, like DC input reverse polarity and overcharging. It should be capable charging at least two batteries at a time with an option to charge a single battery as per user requirement. Display of charger shall indicate battery type in use and charging/ or discharging status. Physical characteristics shall be as under:-		
	i. Max Dimensions (LxBxM)	Less than 350x260 x150 (in mm).	
	ii. Max Weight.	Less than 6 kg	
15	**Waveforms:**		
	HF Man-Pack SDR will support all waveforms required to exploit the full functionality desired for all the modes of operation. The		

	waveforms to be provided are indicated below:		
	(a) voice: This will provide voice communication for ground to ground applications.	The waveform will support MEL Pe voice coding feature in accordance with STANAG 4591 or better.	
	(b) Data.	i. Narrowband Data. HF Man-Pack SDR will support data transmission as per MIL-STD-188-110A, MIL-STD-188-110B Appendix C and MIL-STD-188-110B Appendix F or better. ii. Wideband Data. The HF Man-Pack SDR will support data transmission as per MIL-STD-188-110D or better. The HF Man-Pack SDR will also be capable of supporting data transmission as per MIL STD-188-110C/STANAG 4539 or better.	
	(c) HF Man-Pack SDR will support the following ALE protocols	i. ALE 2G as per MIL-STD-188-141B or better. ii. ALE 3G as per STANAG 4538 or better. iii. ALE 4G as per MIL-STD-188-141D appendix G or better.	
	(d) **Value Addition.** In addition, HF Man-Pack SDR should support technologies, that increase reliability of communication.	(i) Link Quality Analysis (LQA). (ii) Automatic Channel Selection (ACS). (iii) Advanced Forward Error Correction (FEC). (iv) Interleaving. (v) Adaptive Equalization to counter effects of multi-path propagation (vi) Adaptation of receiver with respect to received signals.	
16	Additional Waveform Loading Capability	HF Man-Pack SDR will have capability to load additional waveform. The man-pack form factor will be capable of storing at least 15 waveforms. Over and above the initially provided waveform. It should be possible to load the desired waveform and operate HF Man-Pack SDR without requirement switching off or rebooting the radio set.	
17	Waveform Loading and waveform Development Tool	The HF Man -Pack SDR will be provided with a waveform loading and a waveform development tool or fill gun. The waveform loading tool will enable loading of new waveforms into	

		the HF Man-Pack SDR in the field. All software, development suite, tools, hardware, training documents and necessary information for developing and loading waveforms into the HF Man-Pack SDR will be provided.	
18	**Interfaces:**		
	The equipment shall have the interfaces as mentioned here:	(a) Two Ethernet interfaces (Electrical & Optical) (b) One Serial interface (RS-232). (c) Two 5 Pin Audio interfaces. (d) Antenna RF Socket. (e) Any other interface required for exploiting full functionality of the equipment may be specified	
19	**Accessories:**		
	(a)Handset.	HF Man-Pack SDR will have a handset with an alphanumeric keypad and display to change radio parameters along with communication facility. The number of Keys may be specified by the vendor	
	(b) Headgear	A suitable headgear will be provided with the radio set. The headgear will be ventilated, light, and comfortable and will have a small microphone in front of the mouth (for use in hand free mode) along with ANR, i.e. built Active Noise reduction (Binaural type) conforming to the following standards: I. JSS-55430:2015 for Head Set II. JSS-55320/55321 for Microphone III. JSS-55400/55401 for Ear Phone	
	(c) VoX	A Voice Activated Switch (Vox will be provided with either a throat, bone or ear microphone for hands free operation of radio. During VoX operation, the audio input from the identified microphone shall be activated.	
	(d)Loud Speaker.	A loud speaker for field combat use with a facility to attach to the belt or harness will be provided	
	(e) Remote Control Unit	The Remote Control Unit will be operable from a distance of 100 m or more when connected to the HF Man-Pack SDR on field cable or UTP cable. It should be possible to operate the main equipment on voice and data in all modes of operation	
	(f) Carrying Harness.	The weight of carrying harness will be ≤2.5 Kg. Harness must be made of strong material and the frame must be	

		comfortable to wear during long marches. The carrying harness for parachute dropping and man-pack role will be provided.	
	(g) Environmental tests	The manufacturer will supply any other accessories that facilitate in the efficient functioning of the HF Man-Pack SDR, conforming to latest JSS 55555 as applicable.	
20	**Booting Time.**	The equipment should be able to boot up from a power off state and be ready for transmission and reception in all modes, with the last used waveform loaded, in ≤90 seconds on powering up; the HF Man-Pack SDR shall by default load the last used frequency and the last operated waveform. It shall offer selection of all other waveforms residing in the radio set.	
21	**Waveform Switching Time**	The SDR should be able to switch between one operating waveform to any other operating waveform and transmit and receive Information in all modes of operation without switching off of the system in ≤10 seconds.	
22	**Preset Frequency Channels.**	HF Man-Pack SDR shall have at least 99 Preset Frequency Channels	
23	**Data Format**	Suitable applications shall be provided to exploit the HF Man-Pack SDR data Capability. The HF Man-Pack SDR shall have provision for user defined and free message formats.	
24	**Data Terminal Equipment (DTE).**		
	(a) Ruggedized DTE shall be supplied with the Man-Pack and shall have the following features:	(i) MIL Std 810 F compliant or better. (ii) It should support and facilitate sending of voice, video, short messages and data. (iii) It should support Defence Series Map (DSM) based GUI giving geographical location of radio sets in the network (iv) It should support GUI based management of radio network. (v) Applications shall be provided for exploitation of the functions given above.	
	(b) The DTE should have the following minimum specifications:-		
	i) Processor.	64 bit or more, dual core or better, cache memory of 4MB or better, Clock	

		Speed of 2.5 GHz or better with hyper threading.	
	ii) RAM:	8GB or more.	
	iii) Internal Memory.	64 GB or more.	
	iv) Battery Life	12 hours or more on a single charge with maximum data rate video streaming for 4 Hours with full screen brightness and 2 hour GPS navigation. DTE in switched on state for rest of the time with message transmission at 1:9 transmit receive ratio.	
	v) Display.	The display unit of the DTE shall have a full HD display of (at least) 7" LED screen which is anti-glare, sunlight readable, touchScreen operable with finger and stylus.	
	(vi) Security Encryption.	DTE will be supplied with full volume encryption feature. It should be provided with Antivirus, Firewall and configurable biometric authentication feature. It should also have the feature to encrypt desired files or folders using preloaded commercial cryptographic algorithms.	
	(vii) Camera	DTE will be provided with inbuilt camera with resolution of 8 Mega Pixel or better	
	(viii) Recording Facility	The DTE will be capable of recording and transmitting voice messages.	
	(ix) Updates	Support for security updates or operating system updates will be provided.	
	(c) The weight of the DTE	The weight of the DTE including battery will not exceed 1 kg. A suitable carrying case will be provided for the DTE.	
	(d) Networking:	The networking protocol suite will employ Internet Protocol (IP). Both IPV4 and IPV6 will be supported.	
	(e) Interface	All ancillaries and accessories required to interface with the HF Man Pack SDR will be provided.	
25	Software Communication Architecture (SCA).	The HF Man-Pack SDR system architecture will be in accordance with the SC version 2.2.2 / equivalent or better. Vendor shall provide how this compliance will be verified	
26	**Security**:		
	(a) **Commercial Grade Secrecy:** The HF Man-Pack SDR shall be providedwith three or more commercial grade secrecy algorithms as under:	(i) AES 256 (ii) Triple DES (iii) Triple blowfish	
	(b)**SAG Grade Secrecy.**	The HF Man-Pack SDR should have a	

		slot with a suitable Interface wherein an additional SAG graded secrecy hardware module can be inserted. Security module shall be hardware based. The security module shall be internal to the radio and placed in between the plaintext and cipher text processing. Bypass of security module should not be possible.	
	(c) Algorithm	The cryptographic algorithm provided with the security module shall provide security cover of minimum 1 week to confidential communications being made on the HF Man-Pack SDR. It should be possible to load other algorithms Into the security module. Three cryptographic algorithms (including reserves) shall be provided with the security module.	
	(d) Security	The HF Man-Pack SDR shall provide security at transmission and message level.	
	(i) Transmission level (TRANSEC)	The SDR will support cryptographically controlled frequency hopping.	
	(ii) Message level (COMSEC)	At the message level the SDR will be capable of embedding CPC approved user specific cryptographic security.	
27	**Emergency Erasure**	Facility for emergency erasure shall be inbuilt to erase all the keys and algorithm. Tamper detection and response mechanism shall be inbuilt in the radio set automatically erase algorithms, secrecy keys and any other operational parameters to make the equipment redundant.	
28	**Key Management, Handling and storage**	(a) The HF Man-Pack SDR shall support loading of cryptographic algorithms and keys into the security module in the field through a handheld device. (b) The HF Man-Pack SDR shall support loading the waveform and data from one set to other over a cable. (c) The HF Man-Pack SDR shall be capable of secure storage of key material for duration as specified by user. The HF Man-Pack SDR shall provide positive confirmation following each key loaded from the key loading device and shall notify	

		in the ever of key load failures. (d) Tamper proofing and emergency key erasure facility shall be provided.	
29	**User Authentication.**	The HF Man-Pack SDR shall have an operator level password protection for usage. There shall be another administrator password protection to restrict access for Waveform and mission parameter programming.	
30	**Remote Management.**	The HF Man-Pack SDR shall have the capability of remote programming management of the radio set over the network as an alternative of manual programming of the radio set. This feature shall allow the radio set to programmed and managed without need physical presence of the radio set with the network manager and shall Save time and effort.	
31	Interoperability with Legacy Waveforms.		
	(a) Clear and Secure Mode. HF Man-Pack SDR shall have waveforms for interoperability with legacy radios sets, namely:	(i) RS HX 20 W(PRC-6020). (ii) RS HX 100 W(VRC-6100M). (iii) All Digital Mobile Radio (DMR) compliant radios.	
	(b) Clear Mode. (ELMER).	The HF Man-Pack SDR shall have waveforms for interoperability with RS HF 1 KW (ELMER)	
32	The set shall have following electrical characteristics:-		
	(a) **Transmitter**:		
	i) Frequency Accuracy	≤± 1ppm	
	ii) Harmonics	As per MIL-STD-461E	
	iii) Spurious Emission	As per MIL-STD-461E	
	iv) Tuning Resolution	1Hz	
	(b) Receiver:		
	i) Sensitivity	10dB SINAD(min) for RF input Level of 0.7 micro volt	
	ii) Image Rejection	≥ 60dB	
	iii) IF Rejection	≥ 90dB	
	iv) Adjacent Channel Rejection (Selectivity)	≥ 50dB	
	v) FEC	To detect and correct channel BER of 10^{-3} or higher	
	vi) Tuning Resolution	1HZ	
32	The set shall have following electrical characteristics:-	(a) **Transmitter**. Ser | Characteristic | values	

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<tr><td>(i)</td><td>Frequency Accuracy</td><td>± 1ppm</td></tr>
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(b)Receiver:-

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<tr><td>Ser No</td><td>Characteristic</td><td>Values</td></tr>
<tr><td>(i)</td><td>Sensitivity</td><td>10dB SINAD(min) for RF input Level of 0.7 micro volt</td></tr>
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</td><td></td></tr>
<tr><td>33</td><td>Connectors.</td><td>HF Man-Pack SDR shall provide interface connectors for connecting data terminal and other accessories and parts of the equipment.</td><td></td></tr>
<tr><td>34</td><td>Controls.</td><td>(a) The HF Man-Pack SDR shall have a front panel with control and selector knobs including sulk mode, display and keypad for HF Man-Pack SDR functioning and Programming of parameters.

(b) Selective entry of key and other data should be possible with bothkeypad and fill-gun.

(c) The display shall have antiglare feature for daytime function and be such that it is visible at night also.</td><td></td></tr>
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		It shall display all parameters including battery status necessary for efficient functioning. The display should be scratch resistant and ruggedized. (d) The data and radio parameters shall not be lost when the radio is switched off and the battery is being changed.	
35	**EMI/EMC Specifications**:	The HF Man-Pack SDR shall comply with EMI/EMCStandards as per Mil Std 461E or better and ESD test (Mil Std 464). There shall be no interference when radio systems are co-located and being used concurrently.	
36	**Field Operating Temperature.** The equipment shall be capable of meeting all performance parameters under all prevailing Field Operating Temperature conditions. Details of Field Operating Temperature conditions are given below:	(a) **Minimum Temperature.**: -30 C. (b)**Maximum Temperature**. 50 C	
37	**Environmental Standards:**	The HF Man-pack SDR and all accessories supplied with it, including, but not limited to the interfaces, cables, cords, switches and displays shall be ruggedized to military, switches specifications in accordance with latest version of JSS 55555 Class L3, All the environment tests including temperature shall be carried out in accordance with the latest version of JSS 55555 Class L3	
38	**Environmental Stress Screening (ESS).**	The HF Man-Pack SDR and all accessories supplied with the set shall conform to Environmental Stress Screening (ESS) as per MIL-STD-341 A to identify latent defects which may lead to early failure of radio set.	
	<u>Maintainability and Ergonomic Parameters</u>		
39	**Safety**: The equipment shall have safeguards against the following:	(a) Reverse polarity. (b) Power and line surge spikes. (c) Short /open circuit antenna connection. (d) RF socket lightning protection.	

		(e) Over voltage / under voltage protection.	
40	**Repair and Maintenance.**	Equipment shall be modular in construction. Essential spare parts, SMT/STE/TJs, Training Aggregate, Technical Literature and ancillaries for carrying out repairs and maintenance of HF Man-Pack SDR shall be provided.	
41	**BITE**.	Built in Test (BITE) supporting diagnostics shall be provided. It shall be able to diagnose a fault down to card level.	
42	**POST**.	The HF Man-Pack SDR shall perform Power on Self Test (POST) functions to determine the health status of the equipment.	
43	**Visual and Aural Alarm Features.**	Visual and Aural alarm features shall be provided for self-test failure.	
44	**Reliability**.	The equipment shall be capable of continuous operation for at least 72 hours on a single set basis without breakdown. MTBF shall be at least 6000 hours and MTTR not more than 12 hours.	
45	**Diagnostic Facility**.	HF Man-Pack SDR shall have the facility of carrying out diagnostics. It shall be possible to initiate the diagnostics feature after an authentication password. Complete software of the HF Man-Pack SDR shall be restorable in field conditions during maintenance with manual intervention.	