TENDER FOR PURCHASE OF
GROUND PENETRATING RADAR SYSTEM WITH 4 ANTENNAE

TECHNICAL SPECIFICATIONS

1. OVERVIEW

1.1. These specifications identify the minimum requirements for the Ground Penetrating Radar System with four antennae intended to be procured.

1.2. Other components, not identified or specified, which are necessary for the system to meet required functionality are understood to be proposed and provided by vendor.

1.3. The vendor has to state clearly those aspects of the products that are not compliant to specifications listed hereunder.

1.4. In the financial bid, costs of all components have to be provided separately.

1.5. Only bids from vendors who have provided systems comparable in terms of the working principles, capacity and scope, and have well-established maintenance and repair services will be considered.

1.6. The technical proposal should contain the following and should be placed in a separate envelope, and should not contain any financial information:

1.6.1. Background of the company and the service offered in India for installation, maintenance and repair.

1.6.2. Duly-filled checklist for the technical specifications.

1.6.3. Details of comparable equipment supplied by the vendor in India, with contact details for possible verification and inspection.

1.6.4. Details of the spare parts and AMCs.

2. SYSTEM FUNCTIONALITY:

2.1. **Compatibility**: Should be a single unit compatible with all antennas of frequency ranges: multiple low frequencies, medium and high frequencies.

2.2. **Number of Channels:** Should be able to record data from at least 4 channels simultaneously; should be upgradable to an 8-channel system in the future.

2.3. **Operation:** Should be able to operate as a standalone configuration and with a peripheral such as a laptop.

2.4. **Data Storage**: Should be standard internal memory of not less than 500 GB; With optional external memory: Any standard PC peripheral using the PC parallel port, USB Port or PCMCIA port.

2.5. **Compatibility with laptop**: The acquisition system should be compatible with any current laptop (any special requirements should be spelt out clearly); If a rugged laptop is part of the proposed system, details of the laptop should be provided separately and the cost of such an item should be specified separately in the financial bid.

2.6. **Display Modes**: Line scan and Oscilloscope, 3D.

2.7. **Operating language** should be ENGLISH.

3. **DATA ACQUISITION SYSTEM:**
   - **3.1. Output Data Format:** Should be ASCII compatible; Should be 8- or 16-bit selectable;
   - **3.2. Scan Rate Interval:** Should be user-selectable;
   - **3.3. Samples per Scan:** Should be 256,512,1024,2048,4096,8192, and a maximum of 16,384; Should be capable of more than 5000 scans per second with 4 channels;
   - **3.4. Operating Modes:** Should operate in continuous or discrete mode**;**
   - **3.5. Time Range:** Should be user-selectable, Manual adjustment of gain;
   - **3.6. Filters :** Should be able to individually filter the scans in the time domain; Low and High Pass, Infinite Impulse Response (UR) Finite Impulse Response (FIR); Boxcar and triangular filter types should be possible
   - **3.7. Automatic System Setups:** Should be able to store an unlimited number of system setup files for different survey conditions and antenna deployment configurations.
   - **3.8. Ports :** Should have 4 antenna inputs, and at least inputs for survey wheel and marker, DC power input, Ethernet, HDMI video and USB
   - **3.9. Battery:** External 12 V DC;
   - **3.10. Transmit rate:** Should be up to 800 KHz
   - **3.11. Electrical:**
     - **3.11.1. Operating temperature:** should be able to operate in temperature range of -10^{o} C to + 50^{o} C;
     - **3.11.2. Relative humidity:** should be less than 95%;
     - **3.11.3. Storage temperature:** should be -40^{o} C to 60^{o} C.

4. **DATA PROCESSING SOFTWARE**
   - **4.1. Post-processing software**, which is Windows™, based should be a part of the GPR configuration supplied for visualisation of data and post-processing;
   - **4.2. 3D visualisation capability:** Should have capability of 3D interpretation and visualisation of the collected data;
   - **4.3. Specific modules:** Should contain all additional modules necessary for visualise, interpret and process data, obtained using the different antennae: multiple low frequencies, medium frequencies and high frequencies;
   - **4.4. Adaptability:**
     - **4.4.1.** Should be able to collect data in single-channel and multi-channel mode;
     - **4.4.2.** Should be possible to export data in ASCII format;
     - **4.4.3.** Data should be exportable to CAD interface;
     - **4.4.4.** Should be capable of integration of GPS data and Google Earth ™ images;
   - **4.5. System requirements:** Minimum systems requirements for optimal operation of the processing software should be spelt out clearly;

5. ANTENNAE SPECIFICATIONS:

Number of antennae required: 4 Nos.

5.1. High frequency antenna: 1 no.

Meant for shallow penetration for detecting anomalies in structural members such as concrete, masonry, etc.

5.1.1. **Centre frequency:** should be around 0.9 GHz;
5.1.2. **Depth range:** should be useful for detecting anomalies from 0 - 1 metre;
5.1.3. The **weight** of the antenna should not be more than 2.5 kg;
5.1.4. The antenna should not be larger than 35 x 20 x 10 cm in **dimensions;**
5.1.5. **Distance-measuring device** should be a part of the configuration;
5.1.6. Regular length of **cable** should be provided, with cost specified**.**

5.2. Medium frequency antennae: 1 no.

Suitable for detection of anomalies in foundation soil, foundations (geotechnical) and for cultural layers (in archaeological investigations)

5.2.1. **Centre frequency:** should be around 400 MHz;
5.2.2. **Depth range:** should be useful for detecting anomalies from 0 - 4 metres;
5.2.3. The **weight** of the antenna should not be more than 5 kg;
5.2.4. The antenna should not be larger than 30 x 30 x 20 cm in **dimensions;**
5.2.5. **Distance-measuring device** should be a part of the configuration;
5.2.6. Regular length of **cable** should be provided, with cost specified**.**

5.3. Medium frequency antennae: 1 no.

Suitable for detection of anomalies in foundation soil, foundations (geotechnical) and for cultural layers (in archaeological investigations)

5.3.1. **Centre frequency:** should be around 200 MHz;
5.3.2. **Depth range:** should be useful for detecting anomalies from 0 - 9 metres;
5.3.3. The **weight** of the antenna should not be more than 20 kg;
5.3.4. The antenna should not be larger than 60 x 60 x 30 cm in **dimensions;**
5.3.5. **Distance-measuring device** should be a part of the configuration;
5.3.6. Regular length of **cable** should be provided, with cost specified**.**

5.4. Multiple low frequency antenna: 1 no.

Suitable for deep penetrating particularly geological investigations;

5.4.1. The antennae should consist of inter changeable elements, permitting change of length of antennae and hence transmission frequency;
5.4.2. Should be possible to deploy antenna in either discrete measurements or continuous profile data collection modes;
5.4.3. **Centre frequency:** should be around 15-80 MHz;
5.4.4. **Depth range:** should be useful for detecting anomalies up to 50 m;
5.4.5. The weight of the antennae should not be more than 25 kgs;
5.4.6. The antenna should not be larger than 6.0 m in dimensions;
5.4.7. **Distance-measuring device** should be a part of the configuration;
5.4.8. Regular length of **cable** should be provided, with cost specified**.**

CHECKLIST FOR TECHNICAL SPECIACATIONS

2. SYSTEM FUNCTIONALITY

Parameter	Description	Availability	
		Yes	No
1. Compatibility:	Single unit compatible with all antennas		
2. Number of Channels:	(1) Records data from at least 4 channels simultaneously		
	(2) Upgradable to an 8-channel system		
3. Operation:	Standalone configuration and with laptop		
4. Data Storage:	Standard internal memory: not less than 500 GB		
5. Compatibility with laptop:	Compatible with any current laptop		
6. Display Modes:	Line scan and Oscilloscope, 3D		
7. Operating language:	English		

3. DATA ACQUISITION SYSTEM

Parameter	Description	Availability	
		Yes	No
1. Output data format:	ASCII compatible; 8- or 16- bit selectable		
2. Scan Rate Interval:	User selectable		
3. Samples per scan:	256,512,1024,2048,4096,8192; 16,384; Capable of more than 5000 scans/sec with 4 channels		
4. Operating Modes:	Continuous or discrete mode		
5. Time Range:	User selectable; Manual adjustment of gain		
6. Filters:	Able to individually filter the scans In the time domain; Low and High Pass, Infinite Impulse Response (RU) Finite Impulse Response (FIR); Boxcar and triangular filter types		
7. Automatic system setup:	Unlimited number of system setup files for different survey conditions and antenna deployment configurations		
8. Ports:	4 Antenna inputs, Survey wheel and marker, DC power input, Ethernet, HDMI video and USB		
9. Battery:	An external 12V DC battery		
10. Transmit rate:	Up to 800 KHz		

11. Electrical: Operating Temp. Relative humidity Storage Temperature	 Range of -10^{o} C to + 50^{o} C Less than 95% -10^{o} C to + 50^{o} C		

4. DATA PROCESSING SOFTWARE:

Parameter	Description	Availability	
		Yes	No
4.1 Post-processing software	Windows ™ based; Part of the GPR configuration supplied		
4.2 3D visualisation capability	3D interpretation/visualization of data		
4.3 Specific Modules	Contains additional modules necessary for visualise, interpret and process data, obtained using the different antennae: multiple low frequencies, medium frequencies and high frequencies		
4.4 Adaptability	4.4.1 Collects data in single-channel and multi-channel mode;		
	4.4.2 Possible to export data in ASCII format;		
	4.4.3 Data exportable to CAD interface;		
	4.4.4 Capable of integration of GPS data and Google Earth ™ images		
4.5 System requirements	Minimum system requirements for optimal operation of the processing software should be spelt out clearly		

5. ANTENNAE SPECIFICATIONS:

Parameter	Description	Availability	
		Yes	No
5.1 High Frequency: 900 MHz			
5.1.1 Centre Frequency	0.9 GHz		
5.1.2 Depth Range	Useful for detecting anomalies from 0 - 1 m.		
5.1.3 Weight	Not more than 2.5 kg		
5.1.4 Dimension	Not more than 35 x 20 x 10 cm		
5.1.5 Distance device	Should be a part of configuration		
5.1.6 Cable	Regular Length		
5.2 Medium Frequency: 400 MHz			
5.2.1 Centre Frequency	400 MHz		
5.2.2 Depth Range	Useful for detecting anomalies from 0 - 4 m.		
5.2.3 Weight	Not more than 5 kg		
5.2.4 Dimension	Not more than 30 x 30 x 20 cm		
5.2.5 Distance device	Should be a part of configuration		
5.2.6 Cable	Regular Length		
5.3 Medium Frequency: 200 MHz			
5.3.1 Centre Frequency	200 MHz		
5.3.2 Depth Range	Useful for detecting anomalies from 0 - 9 m.		
5.3.3 Weight	Not more than 20 kg		
5.3.4 Dimension	Not more than 60 x 60 x 30 cm		
5.3.5 Distance device	Should be a part of configuration		
5.3.6 Cable	Regular Length		
5.4. Multiple Low Frequency: 15 to 80 MHz			
5.4.1 Versatility	Inter changeable elements, permitting change of length of antennae		
5.4.2 Mode	Possible to deploy antenna in either discrete measurements or continuous profile data collection modes		
5.4.3 Centre Frequency	15 - 80 MHz		
5.4.4 Depth Range	Useful for detecting anomalies up 50 m.		
5.4.5 Weight	Not more than 25 kg		
5.4.6 Dimension	Not more than 6.0m		
5.4.7 Distance device	Should be a part of configuration		
5.4.8 Cable	Regular Length		