Tender

Tender for the Supply and Installation of a Millimetre-Wave Measurement Facility to the University of Birmingham

THE UNIVERSITY OF BIRMINGHAM

F02: Contract notice
Notice identifier: 2022/S 000-035427
Procurement identifier (OCID): ocds-h6vhtk-038d8c
Published 14 December 2022, 4:23pm

Section I: Contracting authority

I.1) Name and addresses

THE UNIVERSITY OF BIRMINGHAM

EDGBASTON

BIRMINGHAM

B152TT

Contact

Rachel Price

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Country

United Kingdom

Region code

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Companies House

RC000645

Internet address(es)

Main address

http://www.birmingham.ac.uk/index.aspx

I.3) Communication

The procurement documents are available for unrestricted and full direct access, free of charge, at

https://in-tendorganiser.co.uk/universityofbirmingham/aspx/Home

Additional information can be obtained from the above-mentioned address

Tenders or requests to participate must be submitted electronically via

https://in-tendorganiser.co.uk/universityofbirmingham/aspx/Home

I.4) Type of the contracting authority

Body governed by public law

I.5) Main activity

Education

Section II: Object

II.1) Scope of the procurement

II.1.1) Title

Tender for the Supply and Installation of a Millimetre-Wave Measurement Facility to the University of Birmingham

Reference number

SC11220/22

II.1.2) Main CPV code

- 42992200 - Anechoic chamber

II.1.3) Type of contract

Supplies

II.1.4) Short description

This project is funded by UK Research and Innovation's Engineering and Physical Sciences Research Council (EPSRC) and the University of Birmingham (UoB).

The University of Birmingham invites tenders for the design, supply and installation of equipment leading to the establishment of a versatile and fully automated electromagnetic (EM) characterisation facility for RF to millimetre wave (mm-wave) frequency measurements in an EM quiet and reflection-free environment. The equipment to be supplied includes, but is not limited to, precision mechanical scanning stages, control electronics, standard gain antennas, near-field probes, RF cabling, rotary joints and control and measurement software. The equipment should have the capability to operate with the University's existing RF equipment, including a 50 GHz vector network analyser (VNA) and millimetre-wave frequency extender heads. All the equipment is to be housed in an existing radio frequency shielded and EM absorber lined anechoic chamber located on the third floor of the School of Engineering building at the UoB.

The measurement facility realised will be designed with versatility at its heart, capable of performing a wide range of measurement types. Specifically, it should be capable of performing three types of measurements from 1 GHz to 330 GHz:

1. Far-field (FF) measurement of antenna radiation patterns

2. Spherical near-field (SNF) measurements of antennas and metamaterials

3. Bistatic electromagnetic scattering measurements

All the equipment (software and hardware) should include warranties and support for a minimum of five years.

This project may be funded by the European Regional Development Fund (ERDF) or;

- European Structural and Investment Fund (ESIF) or;

- Research Councils UK (RCUK), the strategic partnership of the UK's seven Research Councils.

Please note: The University will be closed from 19th December 2022 until 2nd January 2023. All correspondence will be responded to via clarifications from the Tuesday 3rd January 2023.

II.1.6) Information about lots

This contract is divided into lots: No

II.2) Description

II.2.2) Additional CPV code(s)

- 31711422 - Microwave equipment

II.2.3) Place of performance

NUTS codes

- UKG31 - Birmingham

II.2.4) Description of the procurement

Background

The UoB has recently completed construction of a new building for the School of Engineering which includes an anechoic chamber located on the third floor for use by the Communication and Sensing Research Group. The chamber has been outfitted with absorber but currently lacks the hardware (e.g. mechanical stages, RF cables, rotary joints, masts/pedestals etc) and control software required to operate the chamber.

The UoB has recently been awarded funding by the Engineering and Physical Sciences Research Council (EPSRC) to create the Midland's Millimetre-wave Measurement Facility (MMMF). This facility is intended to specialise in free-space measurements across the entire millimetre-wave band, primarily from 1 GHz to 330 GHz. The facility will have a large and varied UK academic and industrial user base and should therefore have versatility and flexibility at its core.

General Facility Characteristics

The measurement facility realised will support three primary modes of measurement

across the frequency range 1 GHz to 330 GHz:

1. Far-field (FF) measurement

2. Spherical near-field (SNF) measurement

3. Variable illumination electromagnetic scattering measurement.

Note that it is accepted that there will be some reduction in mechanical accuracy and precision above 110 GHz due to the reduced wavelength dimensions and mechanical limitations which may impact measurement performance. Appropriate absorber panels/coverings should be supplied to cover equipment when unused for a measurement to maintain the reflection-free environment.

Existing Anechoic Chamber Characteristics

The length, width and height of the anechoic chamber's shielded interior are 10.3m x 6.8m x 3.66m (length, width and height, respectively, not including absorber panels). The chamber has been outfitted with Wavasorb VHP-12 and VHP-18 absorber. There is a 1.2m by 2.1m door on the left side of the front of the chamber. There are access panels located in the middle of the front wall at the bottom and one on the right-bottom side of the front wall.

The chamber is built on a 325 mm thick foundation concrete slab which can be used for attachment of various pedestals and mechanical stages. On top of the concrete slab are 2 mm thick hardboard floor sheets and then a 2 mm thick galvanised steel sheeting. The floor sheets are approximately 1.2 m x 2.1 m and held together with 60 mm wide joining strips.

The facility should be designed so that the VNA remains in a fixed location for all measurement modes. This may be either inside the chamber beneath absorber panels and operated remotely, or outside in front of the chamber (the latter is preferred).

Existing RF Hardware

The University of Birmingham has a range of RF equipment for the generation, detection and amplification of microwave and millimetre-wave signals. It is expected that the proposed equipment will be compatible with as much of this equipment as possible. As a minimum, any proposed solution for each mode of measurement is expected to be compatible with the listed frequency extender heads to allow measurement above 110 GHz.

Note that there is currently a gap in frequency coverage between 75 GHz and 140 GHz in the listed hardware. The UoB proposes to, independently of this tender, purchase

additional frequency extender heads to partially or fully cover this frequency gap. This is likely to be frequency extender heads offered by suppliers Rohde and Schwarz, Keysight or equivalent. Compatibility with this equipment is important. Any proposed solution should specify compatibility limitations with these proposed RF frequency extender heads.

Building Access

The anechoic chamber is located on the third floor of the School of Engineering building at the University of Birmingham. Access to this floor is provided by an elevator with width, depth and height of 1310 mm, 2600 mm and 1950 mm, respectively. The elevator has a maximum load capacity of 2000 kg.

Specifications

General

The proposed equipment should be compatible with the existing anechoic chamber as described above.

The rails, masts and turntables should be suitably bolted to the concrete foundation slab of the anechoic chamber.

Far-field Measurement

Capability to make automated, polarisation sensitive far-field antenna measurements from 1 GHz to 330 GHz. Below 50 GHz, the measurement will be over 4? steradians and above 50 GHz over 2? steradians.

Motorised azimuthal and polarisation rotation stages for AUT with minimum precision of 0.1 degrees.

Max AUT volume: 55 cm by 55 cm by 55 cm.

Max AUT weight: up to 15 kg (essential) and up to 20 kg (desirable).

Spherical Near-field Measurement (SNF)

Capability to make automated SNF measurement of antennas (co- and cross-pol) from 1 GHz to 110 GHz over 4? steradians. Provision for SNF measurements from 110 to 330 GHz is highly desirable.

Mechanical positioning accuracy of feed/AUT of 0.02? (essential) or 0.01 ? (desirable) up to 110 GHz . Best effort beyond 110 GHz.

Angular accuracy minimum precision of 0.1 degrees.

Max AUT volume: 55 cm by 55 cm by 55 cm.

Max AUT Weight: up to 15 kg (essential) and up to 20 kg (desirable).

Electromagnetic Bistatic Scattering Measurement

Capability to make electromagnetic bistatic far-field scattering measurements. It is understood that meeting the far-field requirement will be dependent on the size of the scatterer, gain of the feed antennas and measuring wavelength.

One of the feeds should be mounted on a motorised curved rail providing scattering angle coverage of up to 180° or beyond, to ensure forward scattering measurement capability.

Motorised azimuthal stage for rotating scatterer over 360 degrees with minimum precision of 0.1 degrees.

Polarisation rotation stages on both antenna feeds with minimum angular precision of 0.1 degrees.

Max scatterer weight: 30 kg.

Scatterer maximum size: 1 m by 1 m by 55 cm.

RF Components

All cabling, rotatory joints and any additional internal mixers/amplifiers required for the RF design should be supplied.

A full set of 1 x open-ended waveguide probes for SNF measurements from 1 GHz to 110 GHz.

A full set of 2 x single linearly-polarised standard gain antennas covering 1 GHz to 110 GHz for antenna measurements and use as a feed for the bistatic scattering measurements. Pyramidal horn antennas are preferred over wideband ridged horn antennas for improved cross-pol performance.

Software Requirements

Software should be supplied for the automated control and measurement in the three different measurement modes.

A PC for running the software is desirable.

The software should be scriptable and customisable for research purposes. Ideally, it would be controllable with Matlab or Python.

The software should be compatible with the existing R&S ZNA50 VNA and, optionally, the existing R&S ZVA67.

The software should come with a perpetual license.

The software should include support and upgrades for at least 5 years.

Warranty and Support

All hardware and software should include warranty and support for 5 years.

II.2.5) Award criteria

Quality criterion - Name: Compliance to the Specification / Weighting: 45

Quality criterion - Name: After Sales and Technical Back up / Weighting: 5

Quality criterion - Name: Delivery, Installation and Training / Weighting: 15

Quality criterion - Name: Sustainability and Environmental / Weighting: 5

Quality criterion - Name: Standard Supplier Questionnaire (SQ) / Weighting: 10

Price - Weighting: 20

II.2.7) Duration of the contract, framework agreement or dynamic purchasing system

End date

1 March 2024

This contract is subject to renewal

No

II.2.10) Information about variants

Variants will be accepted: No

II.2.11) Information about options

Options: No

Section IV. Procedure

IV.1) Description

IV.1.1) Type of procedure

Open procedure

IV.1.8) Information about the Government Procurement Agreement (GPA)

The procurement is covered by the Government Procurement Agreement: Yes

IV.2) Administrative information

IV.2.2) Time limit for receipt of tenders or requests to participate

Date

31 January 2023

Local time

11:59am

IV.2.4) Languages in which tenders or requests to participate may be submitted

English

IV.2.7) Conditions for opening of tenders

Date

31 January 2023

Local time

12:00pm

Section VI. Complementary information

VI.1) Information about recurrence

This is a recurrent procurement: No

VI.4) Procedures for review

VI.4.1) Review body

University of Birmingham

Birmingham

B15 2TT

Country

United Kingdom