

Service description

**Procurement of a feed system for the S-/X-
band operation of a ground station**

Award No.: BE-26-1-3003164-01-EF-428-ZBT1-1

Client:

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1. BRIEF DESCRIPTION OF THE SERVICE

As part of the in-orbit demonstration mission RACCOON IOD (**Robust And seCure post quantum COmmunication fOr critical iNfrastructure**), the Technical University of Berlin (TU Berlin, hereinafter referred to as the client – AG) intends to procure hardware components for the realization of the project.

During the project period, a ground station for satellite communication is to be set up. The ground station is to be set up at the University of Fairbanks in Alaska in 2027 and will be tested in Berlin beforehand. For the ground station hardware, a feed system is required that supports S-band and X-band reception.

For this purpose, the procurement of this feed will be tendered by lot.

2. REQUIREMENTS (MINIMUM REQUIREMENTS)

The performance characteristics described below as minimum requirements must be met in full. They describe the required application in a functional and product-neutral manner.

The fulfilment of each minimum requirement must be clearly evident from the submitted technical documents. Minimum requirements that are not, not fully or not comprehensibly proven will lead to the exclusion of the tender.

Only brand-new devices from the current series production are to be delivered. Refurbished devices, returns and grey imports are excluded.

2.1 BACKGROUND AND OBJECTIVE

The subject of this tender is the procurement of a feed system for an existing ground station of the TU Berlin as part of the RACCOON IOD mission.

The power supply system must allow simultaneous operation in the S-band (transmitting and receiving) and in the X-band (receiving) on a common prime focus reflector. In both frequency bands, both circular polarizations (LHCP and RHCP) must be available simultaneously and on separate RF ports.

The S-band is used for the telecommand uplink and the telemetry downlink, the X-band for the payload data downlink of the satellite formation. Low-noise preamplifiers (LNA) for both frequency bands must be integrated into the power supply system.

The feed must be designed for permanent, unprotected outdoor use at an antenna system in Alaska (temperatures down to -40 degrees Celsius). The technical and mechanical requirements for the feed system therefore result in particular from the existing components and their interfaces as well as from the S- and X-band functionalities required for the RACCOON IOD mission.

The power supply system must be compatible with the existing reflector and must be able to be mounted within the existing mechanical installation space. A structural modification of the existing reflector is not planned.

The requirements for frequency ranges, polarization, isolation, VSWR, transmission power strength, noise figure and gain result from the requirements of the planned S-/X-band satellite communication and the existing or planned receiving and transmitting electronics.

In addition to the hardware, the delivery includes the accompanying documentation and integration manual.

2.2 SCOPE OF SERVICES

The Contractor (Contractor) shall deliver to the Client (Client):

- One Dual S-/X-Band Feed
- Hardware documentation

2.3 TECHNICAL REQUIREMENTS

The technical requirements of the feed are based on the existing ground station hardware and interfaces. The performance of the ground station is based on the ground station on the roof of the Department of Space Technology at TU Berlin.

ID	Requirement
FD-01	The feed must be dual-band for operation in the S-band and X-band.
FD-02	In the S-band, at least the frequency range 2015 MHz to 2300 MHz must be usable for transmitting and receiving.
FD-03	In the X-band, at least the frequency range 8025 MHz to 8400 MHz must be usable for receiving.
FD-04	Both circular polarizations (LHCP and RHCP) must be available in both bands.
FD-05	The isolation between the RF ports must be at least 30 dB in both frequency bands
FD-06	The standing wave ratio (VSWR) must not exceed 1.8 in the receive paths of both frequency bands. Measurement is carried out with calibrated network analyzer. Unmeasured ports terminated with 50 Ω ; Feed radiates into anechoic environment; 23 °C $\pm$ 5 °C.
FD-07	The transmitting power rating in the S-band must be at least 500 W to be compatible with the transmitting power of the current ground station.
FD-08	The power supply system must contain integrated low-noise preamplifiers (LNA). The gain must be at least 30 dB.
FD-09	The feed must be designed for a reflector with an F/D of 0.35 to 0.42.
FD-10	The installation space of a unit must not exceed an outer diameter of 300 mm and an overall length of 250 mm.
FD-11	The operating temperature must be at least -40°C.

FD-12	The power supply system must comply with at least protection class IP 67 and be suitable for permanent outdoor use on an antenna system.
FD-13	The unit must be measured before delivery. The protocol must be provided as a PDF.
FD-14	The permissible wind load during operation must be at least 75 km/h.

The feed will be integrated into an existing antenna system that will be installed on the roof of the Alaska Satellite Facility (ASF) in Fairbanks, Alaska. The system will be commissioned and tested in advance in Berlin.

The reflector is a Prime Focus parabolic reflector made of aluminium mesh with an aperture diameter of 3.02 m, a focal length of 1168 mm ($F/D = 0.385$, aperture half angle 66°) and a mass of approx. 57 kg. The feed is attached to the focal point via a four-strut bracket. The reflector is designed for wind speeds of up to 90 km/h in operation and 150 km/h in the event of survival, as well as for temperatures from -50°C to $+60^\circ\text{C}$.

Tracking is carried out via an azimuth elevation rotor with an adjustment range of 360° in azimuth and 180° in elevation, a setting speed of approx. $2.5^\circ/\text{s}$ and a position resolution of 0.1° . The reflector is mounted on the elevation axis via a 50 mm tube and is balanced with a counterweight. Due to the elevation range of 180° , the feed can be operated in any position, including overhead, when crossing the zenith. All cables to the feed are routed via moving cable loops on the rotor.

3. PLACE OF SERVICE AND ACCEPTANCE

Technical University of Berlin, Marchstraße 12-14, 10587 Berlin

Acceptance is carried out by the responsible employees of TU Berlin. Acceptance criteria are the complete fulfilment of the service description.

4. DELIVERY AND DEADLINES

- **Appointment:** Q3 / 2026 (expected September 2026)
- **Delivery:** No later than 15.01.2027

The feed must be delivered by the Contractor to the place of performance. The transport, including the assumption of all costs incurred with the transport, as well as the risks of delivery, shall be borne by the Contractor.

5. MAXIMUM PRICE

The maximum price is **20,500.00 euros net or 24.395 euros gross** and is binding for all bidders/bidding consortia. This means that bidders/bidding consortia who submit a higher bid price will be excluded from the further procedure.

The maximum price of **20,500.00 euros net or 24.395 euros** must already include/calculate any additional services that may be charged. Claims beyond the offer cannot be asserted against TU Berlin.

6. PAYMENT METHODS

Compensation will be paid upon completion of the following milestones:

- **40% of the total order amount** after kick-off meeting for the presentation of the hardware and clarification of the technical requirements
- **40% of the total order amount** after delivery of the hardware
- **20% of the total order amount** after successful functional tests of the hardware

The remuneration is in each case plus the statutory value added tax.

The agreed delivery deadlines are binding. Delays in delivery and performance must be reported to TU Berlin immediately. This applies if, due to significant and unforeseeable circumstances of political and/or economic proportions, there are supply bottlenecks or disruptions in the supply chains that are not within the Contractor's area of responsibility. With the prompt notification of this to TU Berlin, the expected delivery times at this time must be communicated.

7. DOCUMENTS TO BE SUBMITTED

The following evidence must be submitted by the bidder:

- **TUB – Wirt Documents:** Please submit these documents, completed with the offer if necessary.
 - o Host-124

If applicable:

- o Host-235
- o Host-236
- o Host-238

- **TUB - Specification Documents (EK):** The bidder submits the following documents:
 - a technical data sheet of the feed offered
 - Integration documentation
 - Protocol for the measurement
 - Detailed offer including manufacturer, type designation, complete scope of delivery
 - With the delivery, a German or English-language operating manual, technical data sheets, safety and maintenance instructions and the EU declaration of conformity must be handed over digitally or in paper form.

8. AWARD CRITERION AND WEIGHTING

Taking into account all the circumstances, the contract will be awarded to the most economical bid. The evaluation will be based on the bid submitted. Therefore, it is in the interest of the bidder to provide all requested information as detailed and correct as possible.

The award criterion is 100.00% of the total net bid price.