TECHNICAL SPECIFICATIONS

EXP.NÚM.IISPV2025-21

DESCRIPTION AND TECHNICAL SPECIFICATIONS OF THE DESIGN, SUPPLY, INSTALLATION AND VALIDATION OF A METABOLIC ROOM FOR THE PERFORMANCE OF WHOLE-BODY INDIRECT CALORIMETRY, FOR THE CAT_SUD CLINICAL RESEARCH UNIT, SUBSIDIZED BY DIPUTACIÓ DE TARRAGONA

The content of these technical prescriptions derives from the project with official file number 2025-0017989: "INCORPORATE A BODY COMPOSITION D'ANÀLISI SYSTEM AND ADVANCED NUTRITIONAL STUDIES INTO THE UNITAT D'INVESTIGACIÓ CLINICA CATALUNYA SUD – IISPV", subsidized by Diputació de Tarragona.

By simply submitting your offer, the bidding company accepts the technical specifications set out in this document.

Any proposal that does not meet the minimum requirements set out in this document will be automatically excluded from the bidding process.

1. CONTEXT

The creation of a Clinical Research Unit (hereinafter, CRU) in Southern Catalonia responds to the urgent need to improve access to clinical research in a territory characterized by a dispersed geographical distribution and variable population density. The region comprises three main health areas: Camp de Tarragona, Terres de l'Ebre, and Baix Penedès, which together cover more than 800,000 inhabitants. These areas present epidemiological and sociodemographic characteristics that require tailored strategies to guarantee equitable access to clinical trials and therapeutic innovations.

Currently, clinical research is highly concentrated in large urban centers, limiting the participation of patients from peripheral or rural areas. This geographical inequality in access to clinical trials prevents a significant portion of the population from benefiting from innovative treatments for highly prevalent diseases, such as cancer, cardiovascular diseases, metabolic disorders, and emerging infections. Furthermore, the progressive aging of the population in the region increases the need for research strategies aimed at improving the prevention and treatment of chronic diseases.

2. SUBJECT OF THE CONTRACT

The purpose of this contract is the design, supply, installation and validation of a metabolic room for the performance of whole-body indirect calorimetry.

This is a high-precision metabolic chamber unit, equipped with the necessary systems for the continuous evaluation of energy expenditure and substrate oxidation in humans using indirect calorimetry, including technical and scientific training for personnel, a comprehensive warranty, and after-sales support. The infrastructure must meet the highest international standards for clinical and biomedical research.

The metabolic room will be located in the UiC (Clinical Research Unit) which will be situated in a new space to be built on Floor -1 of the Hospital Universitari Sant Joan de Reus (HUSJR) as shown in the Annex "Plan of the metabolic room".

3. MINIMUM TECHNICAL SPECIFICATIONS REQUIRED

3.1 GAS ANALYSIS SYSTEM FOR INDIRECT CALORIMETRY

3.1.1 General description

The gas analysis system must allow the precise and continuous quantification of total energy expenditure and macronutrient oxidation (carbohydrates, lipids and proteins) through the measurement of the gas exchanges of oxygen (O_2) and carbon dioxide (CO_2) of the subject under study.

This system must be specially designed for integration into metabolic room environments (whole-body indirect calorimetry), allowing prolonged studies (minimum 24 hours) under controlled conditions, as well as specific applications at rest, during sleep, in postprandial conditions, during exercise and during dietary or pharmacological interventions.

The system must be based on open-loop technology with a modular architecture and complete data traceability from capture to analysis and storage.

3.1.2 Minimum technical requirements

a) Measurement parameters

The system must be able to measure, record, and calculate the following parameters in real time and with high resolution:

- Volume of oxygen consumed (VO_2) [ml/min]
- Volume of carbon dioxide produced (VCO_2) [ml/min]
- Respiratory quotient (RQ or RER)

- Energy expenditure (EE) [kJ or kcal]
- Airflow [L/min]
- Barometric pressure [mbar]
- Air temperature [°C]
- Relative humidity of the air [%]

b) Analytical technology

- **O_2 measurement:**
  - Type: Dual-channel paramagnetic analyzer.
  - Range: 0–25% O_2.
- **CO_2 measurement:**
  - Type: Dual-channel infrared (NDIR) analyzer.
  - Range: 0–3 % CO_2.
- **Reference flowmeter:**
  - Type: Digital unidirectional flow, with automatic calibration.
  - Sample gases must be equalized before entering the analyzers.
  - The system must have a configurable valve block for changing the path of the gases.
- **Gas drying system:**
  - Minimum stages: three (1) Peltier (active dehumidification), (2) Nafion tube with counterflow, (3) solid desiccant.
  - Objective: preparation of gas samples through the efficient removal of moisture, minimizing errors due to condensation or dilution.

c) Calibration

The system must include an automated and autonomous calibration module, consisting of:

- Connection to certified standard gases:
  - Zero gas (N_2 or synthetic air).
  - Calibration gas (SPAN): mixture with 0.8% CO_2 and 18% O_2.
- Automated process for purging, analyzing, and adjusting sensors.
- Frequency: at least once every hour, without user intervention.
- Automatic compensation for variations in barometric pressure and ambient temperature.
- Continuous self-diagnosis of system status and generation of calibration logs (logfile).

3.1.3 Acquisition, processing and analysis software

The system must include a complete software package for:

a) Real-time monitoring

- Continuous graphical display of all physiological parameters.
- VO_2, VCO_2, RER, EE, flow and temperature curves.
- The system must include a visual indication of the physical flow for inlet and outlet ambient air samples, as well as for calibration gases.

b) Data recording and storage

- For the data collected, the minimum temporal resolution is: 1 second.
- Capacity for continuous recording.
- Redundant local storage and external export.
- Export formats compatible with scientific software: .csv and equivalents.
- The calculated data must be presented with three time-resolutions: 1, 5, and 30 minutes. All variables and calculation steps used must be stored in an easily accessible format (e.g., .CSV or equivalent) and be fully available to the user for traceability and processing.
- The software must be designed to work with research subjects and allow the input of study and subject codes.

c) Advanced calculations

- Estimated energy expenditure using formulas (Weir, Brouwer, Consolazio, etc.).
- Determination of the oxidation rate of carbohydrates, fats, and proteins:
  - Option 1: Calculation based on VO_2/VCO_2 with user-defined protein oxidation assumptions.
  - Option 2: Calculation from urinary nitrogen analysis (requires integration with sample collection).
- Application of filtering and smoothing algorithms (selectable and user-defined).
- Room volume adjustment (editable parameter).

3.1.4 Additional functionalities required

- **Possible operational applications:**
  - Sleep mode (RMR).
  - Basal mode (BMR).
  - Exercise mode.
  - Sleep mode.
  - Room mode (24-hour monitoring plus).
  - Validation mode (with methanol combustion and gas infusion).
- **Integration with the metabolic room system:**
  - Precise synchronization with environmental control systems, HVAC and integrated sensors (via timestamp or standard protocol).
  - The software must offer options for the following functions: measurement of data generated in the metabolic room, automated validation measurement by methanol combustion, automated validation measurement by gas infusion,

  - The software must allow the reading of external sensors, such as wireless heart rate sensors, ergometers (or other), and must display the status of the configured accessories.
  - The software must display the status of calibration procedures and the real-time visualization of sensor input data.
  - The software must allow the configuration of the calibration gas values used in the calculation of indirect calorimetry results.
  - The supplier must provide the latest software update version throughout the term of this contract.
- **User interface:**
  - Intuitive graphical interface, configurable in Spanish or English.
  - Differentiated access for users (operator, technician, researcher).
  - User activity log (security and traceability).

3.1.5 Traceability, security and validation requirements

- Complete record of all calibrations, system events, and experimental parameters.
- Automatic generation of quality reports and system validation.
- Cross-validation capability by methanol combustion and gas infusion (see sections 2.2 and 2.6).
- Protecting access to advanced settings with passwords.
- Compliance with applicable legal regulations.

3.2 METHANOL COMBUSTION VALIDATION KIT

3.2.1 General description

The methanol combustion validation kit is designed for the periodic verification of the precision and accuracy of the gas analysis system in an open-loop metabolic room. This validation is based on the controlled combustion of pure methanol (CH_3OH), a substance that, when completely oxidized in the presence of oxygen, produces stoichiometrically known quantities of carbon dioxide (CO_2) and water vapor (H_2O), thus allowing for verification of the quality and reliability of VO_2, VCO_2, and respiratory quotient (RER) measurements.

The combustion of methanol is an internationally validated test and widely accepted by the scientific community as a calibration reference for indirect calorimetry systems.

3.2.2 Minimum technical requirements

The kit must include, at a minimum, the following components:

a) Controlled combustion system

- Safe combustion chamber, compatible with stable system ventilation conditions.

- Wick and support for homogeneous burning of defined volumes of methanol.
- Temperature-resistant, flame-proof and non-combustible materials (e.g., AISI 304 stainless steel or higher).
- Manual shutdown system and containment measures in case of emergency.
- Thermal insulation at the base and protection against overheating of the environment.

b) Precision balance

- Electronic laboratory balance with direct digital connectivity to the system (USB, Ethernet or equivalent).

c) Auxiliary materials

- Supports for stable positioning within the room.

d) Safety elements

- Safety instructions for handling methanol.
- Recommended use under controlled ventilation conditions, with CO_2 measurements within permitted physiological parameters.

3.2.3 Validation software requirements

The software must be integrated with the calorimetry system and offer specific functionalities for methanol validation:

a) Process control

- Real-time monitoring of combustion and variations in measured metabolic parameters (VO_2, VCO_2, RER).
- Automatic recording of the initial and final weight of methanol (connected to the scale).
- Record of the exact start and end times of the process.

b) Calculation and analysis

- Automatic calculation of:
  - expected and measured VO_2.
  - Expected and measured VCO_2.
  - Theoretical RER (0.667) and observed value.
  - Percentage error and standard deviation for each parameter.
- Generation of comparative graphs (expected value vs. observed value).
- Identification of deviations and recommendations for corrective calibration if necessary.

c) Registration and traceability

- Generation of validation files in .CSV or .TXT format.
- Automatic storage in a folder structured by date, system ID, and user.
- Ability to export reports in PDF format for internal or external audits.
- Historical validation record with search capability by date, operator and results.

3.2.4 Operating requirements and frequency of use

- The kit should be designed for routine operation, with the possibility of performing validation tests on demand.
- The system configuration should minimize operator intervention and facilitate safe startup, data collection, and subsequent cleanup.

3.2.5 Regulatory compliance and documentation

- The system must comply with applicable European and Spanish regulations regarding safety in the handling of flammable substances.
- The following must be submitted:
    - Scale calibration certificates.
    - Recommended Methanol Safety Data Sheet (MSDS).
    - Validation system user manual.
    - Standard operating procedures (SOPs) in Spanish or English.

3.2.6 Complementary applications

- The possibility of using the validation system in combination with gas infusion (N_2 or CO_2) to check the dynamic response of the system under different simulated physiological conditions will be positively valued.
- It will also be valued if the software allows the validation results to be extrapolated to a general evaluation of the calorimetry system's performance, indicating reliability in different flow and concentration ranges.

3.3 HERMETIC METABOLIC ROOM WITH CONTROLLED CLIMATE CONTROL

3.3.1 General description

The metabolic room must be an airtight enclosure designed to house a subject for extended periods (minimum 24 hours), ensuring stable conditions of pressure, temperature, humidity, and air quality. This unit must be constructed with suitable technical materials that guarantee structural integrity, thermal efficiency, and minimal interference with indirect energy expenditure measurements based on gas exchange (VO_2 and VCO_2).

The design must allow for accurate monitoring of respiratory exchanges without the subject being connected to masks or restrictive devices, ensuring a natural and representative experience of living-like conditions.

3.3.2 Dimensions and internal layout

- **Minimum usable volume**: ≥ 13.5 m³.
- **Approximate internal dimensions**:
  - Length: ≥ 2.90 m
  - Width: ≥ 2.10 m
  - Height: ≥ 2.20 m
- **Space distribution:** It must allow the subject to perform basic activities such as sleeping, eating, resting, performing light exercise (e.g., pedaling on an ergometer), and basic hygiene activities.

3.3.3 Structure and construction materials

- **Modular sandwich panels**:
- **Airtight seal**:
  - Joints with triple sealing gasket.
  - Maximum allowable leakage pressure: ≤ 1% of the total volume per hour.
- **Technical floor**:
  - Bottom layer with thermal and acoustic insulation.
  - Non-slip, washable, seamless technical vinyl top covering.
- **Technical ceiling**:
  - Removable false ceiling to house wiring, sensors, air conditioning system and lighting fixtures.

3.3.4 Access, visibility and connectivity

- **Airtight access door**:
  - Minimum dimensions: 90 × 200 cm.
  - Three-point mechanical locking system with emergency release from the inside.
  - Window with safety glass of at least 40 × 70 cm.
  - Circular sample extraction port (pass-through type) of Ø 250 mm.
- **Panoramic window**:
  - Minimum dimensions: 100 × 100 cm.
  - 14 mm insulating glass.
- **Locks for the exchange of objects**:
  - At least two independent, airtight box-type airlocks for the passage of food, clothing, waste, etc.
  - Minimum dimensions: (30x30x30 cm)
  - Made of stainless steel (AISI 304 or higher), with a safety lock.
- **Connectors and bulkheads**:

  - Minimum 45 airtight inlets for passing cables, fluids or sensors.
  - At least 2 circular bulkhead fittings of Ø50 mm with KF type flange or equivalent that allow blood sampling using extenders.
- **Electrical and network connectivity**:
  - Minimum 2 internal electrical outlets type Schuko 16A.
  - Minimum 2 RJ45 sockets for data network, compatible with institutional LAN network.

3.3.6 Minimum interior equipment

The interior must be equipped with:

- Functional sink with faucet
- Dimmable LED lights.
- Folding or modular bed with hypoallergenic mattress.
- Worktable or technical desk.
- Ergonomic seat, if possible.
- Protected electrical outlets.
- Silent ventilation system, if possible.
- Preparation for future integration of security sensors (smoke, CO_2, alarm button, video surveillance).

3.3.7 Cleaning, maintenance and durability requirements

- All materials must be resistant to cleaning with disinfectant products (hypochlorite, ethanol, etc.).
- Smooth surfaces, without pores or visible joints.
- The lifespan of the O2 and CO2 sensors must exceed 5 years.
- Expected useful life of the structure and components: minimum 15 years.

3.3.8 Safety, regulations and documentation

- The design and implementation of the metabolic room must comply with all applicable legal regulations.
- It will be delivered:
  - Complete technical project of the room (plans, report, diagrams).
  - User manual.
  - Maintenance manual.
  - Watertightness and environmental control certificates.
  - Certificates of materials and components.
  - Minimum warranty of 2 years from the date of delivery receipt, after installation and commissioning.

3.4 HVAC SYSTEM AND CLIMATE CONTROL

3.4.1 General description

The heating, ventilation, and air conditioning (HVAC) system must be specifically designed to operate in a sealed, enclosed space within a whole-body indirect calorimetry metabolic room. Its primary function will be to ensure a strictly controlled thermal and air quality microenvironment, with minimal interference to gas exchange measurements, and to maintain the subject's physiological comfort during prolonged exposures (minimum 24 hours).

The stability and accuracy of environmental parameters: temperature, humidity, pressure, flow, and gas mixture, are critical to avoid artifacts in the measurement of VO_2, VCO_2, and RER, and should be considered an integral part of the measurement system.

3.4.2 General functional requirements

The HVAC system must be capable of:

- Precisely control the indoor air temperature, ensuring a uniform distribution without significant thermal gradients.
- Maintain relative humidity within a physiologically acceptable range for the subject, avoiding condensation or excessive dryness.
- Perform continuous and silent air recirculation, avoiding stagnant areas.
- Allow controlled renewal of air volume, without affecting the quality of metabolic data.
- Monitor, record and store all environmental parameters in real time.
- Integrate with the central data acquisition system to synchronize environmental conditions with metabolic variables.

3.4.3 Minimum technical specifications

a) Temperature control

- Operating range: 18°C to 24°C.
- The airflow must be distributed evenly throughout the chamber.

b) Relative humidity (RH) control

- Adjustable range: 30% – 70% RH.
- Accuracy: ± 5% RH.
- Active humidification and dehumidification capacity, without the need for manual intervention.
- Continuous humidity recording, with data export capability.

c) Air distribution and renewal

- Internal recirculation using low flow and low turbulence fans.
- Air renewal rate configurable to the chamber volume.
- HEPA filter (class H13 or higher) at the external air intake.
- Maintaining neutral or slightly positive pressure relative to the environment, to prevent infiltration.
- Air inlets and outlets arranged in a horizontal laminar (front to back) or vertical downward configuration, optimized to avoid thermal stratification and gas concentration.

d) Filtration and purification systems

- Mechanical pre-filter for particles ≥5 µm.
- HEPA filter for fine particles ≥0.3 µm.
- Activated carbon filter for volatile organic compound control (optional).
- Indicators of saturation or need for replacement.

3.4.4 Regulation and supervision system

- Programmable electronic control unit with display and graphical user interface.
- Local control outside the room and possibility of remote access (via secure IP network).
- Continuous recording of environmental parameters (temperature, RH, flow, pressure).
- Visual and audible alarm system in case of:
  - Deviations > ±1 °C or ±10 % RH.
  - Pressure drops.
  - Ventilation or filtration system failure.
- Possibility of connection with the building's general technical monitoring system.

3.4.5 Integration with the metabolic measurement system

- Time synchronization between HVAC system and gas analysis system.
- Automated export of environmental condition records to synchronized files.
- Data interface compatible with the main acquisition and analysis software.
- Validated operating conditions to not interfere with the reading of VO_2 and VCO_2 (<1% variation attributable to the ventilation system).

3.4.6 Construction design and installation

- All HVAC system components must be installed:
  - In the false ceiling or technical spaces adjacent to the room.
  - In an accessible configuration for inspection, maintenance or replacement without affecting the room.

- The following must be included:
  - Technical plans for air distribution.
  - Electrical and control installation diagrams.
  - Start-up and validation protocols.

3.4.7 Safety and regulations

The system must comply with the following technical, safety and energy efficiency regulations:

- **Regulation of Thermal Installations in Buildings (RITE)**.
- **Ecodesign Directive 2009/125/EC** for HVAC equipment.
- **Regulations for the prevention of occupational risks and noise emissions**.
- Equipment certified with CE marking.

3.4.8 Required documentation

- Complete technical documentation of the installed HVAC system.
- Electrical diagrams, airflow diagrams, and control points.
- Operation and maintenance manual in Spanish or English.
- Initial validation protocols (commissioning) and performance testing.
- Certificates of conformity, energy efficiency and safety.
- Sensor calibration history and initial commissioning logs.

3.5 SENSOR INTEGRATION SYSTEM

3.5.1 General description

The sensor integration system shall consist of a dedicated, robust architecture computing unit intended for the acquisition, synchronization, storage and joint analysis of physiological and biomechanical data from multiple peripheral devices during metabolic studies conducted in the indirect calorimetry room.

This system must function as a multi-sensor signal capture hub, capable of managing heterogeneous data flows in real time and consolidating them into a single output file that is fully compatible with the gas analysis software of the indirect calorimetry system.

Automatic integration of this data will reduce manual operator intervention, minimize synchronization errors, and ensure complete scientific traceability.

3.5.2 Minimum technical requirements

a) Architecture and hardware

- Industrial computer or dedicated equipment with the following minimum characteristics:
  - Multi-core CPU (>4 threads).
  - RAM memory ≥ 8 GB.
  - SSD drive ≥ 500 GB.
  - Operating system compatible with the main software (preferably Linux or Windows 10/11 Pro).
  - Connection ports:
    - Minimum 4 USB 3.0 ports.
    - 2 Ethernet RJ45 interfaces (one dedicated to internal sensor network).
    - Bluetooth 5.0 or higher connectivity.
    - Wi-Fi compatible for future expansion.

b) Main functionality

- Ability to connect simultaneously with physiological sensors, ergometers, weighing devices and other external equipment.
- Recording and storage of digital signals in real time with a minimum resolution of 1 Hz per channel.
- Automatic time synchronization with the main system's metabolic data using a unified timestamp.
- Generation of unique output files, with embedded metadata (date, subject ID, experiment settings, etc.).
- Graphical user interface for live monitoring of the connection status and operation of each sensor.

3.5.3 Functional compatibility with specific devices

The system must be compatible, at least, with the following types of sensors:

a) Heart rate sensor

- Clinically validated device.
- Transmission technology: Bluetooth or ANT+.
- Captured parameters:
  - Heart rate (bpm).
  - Heart rate variability (HRV) if available.

b) Physical activity sensor

- Scientifically validated device, preferably triaxial, with the ability to identify body posture and movement patterns.

c) Ergometers

- Compatibility with laboratory ergometers

d) Precision balances

- Integration with laboratory scales with digital output (RS232, USB or Ethernet).
- Automated capture of the weight of the subject or objects (e.g., food ingested, urine collected, etc.).

e) Optional additional sensors

(The possibility of integrating the following devices will be positively valued):

- Respiration sensor (respiratory rate at rest or exertion).
- Skin or body core temperature sensor.
- Portable ECG devices or SpO_2 sensors.
- Thermal or infrared cameras with automated capture.
- Environmental sensors (light, noise, temperature and humidity in the room).

3.5.4 Software integration and data export

- The software must generate a single consolidated data file, with timestamps common to the metabolic data.
- Export in universal formats: .CSV or equivalent.
- Compatible with scientific analysis platforms.
- Ability to visually review signals and export custom time segments.
- Automatic backup system on local server or external drive.

3.5.5 Security, traceability and control

- All sensors must be digitally identified, and the data must include device authentication codes.
- Protection through a user/password system for access to the integration software.
- Session log recording, including date, time, operator, and configuration changes.
- Possibility of performing periodic calibration and sensor operation validations.

3.5.6 Scalability and future growth

- The platform must be modular and allow the addition of new sensors without needing to replace the central system.
- Compatibility with future versions of calorimetry software or with collaborative scientific platforms.

4. TRAINING OF USER AND TECHNICAL STAFF

4.1 Purpose and scope of training

The successful bidder will be obliged to provide comprehensive training, of a technical-operational and scientific nature, aimed at the staff designated by the Pere Virgili Health Research Institute (IISPV), with the objective of guaranteeing the autonomous, safe, efficient and scientifically valid use of the metabolic room and all the systems that comprise it.

The training must cover all the necessary phases to achieve optimal unit performance from the first day of operation: installation, validation, operation, maintenance, and data analysis. It must include both practical aspects and conceptual foundations applicable to clinical and metabolic research.

The bidder must justify, in their technical offer, **the design, duration, content, and modality** of training proposal**.** The evaluation of the proposed training will be based on experience in similar projects, the complexity of the systems offered, and the operational requirements established in this document. The quality of the training proposal and its suitability to the IISPV clinical research environment will be considered a differentiating factor.

4.2 MINIMUM STRUCTURE OF THE REQUIRED TRAINING

The training program must be organized into at least two mandatory training modules, with clearly defined functional competencies. The voluntary incorporation of a third training block focused on the scientific and research application of the system will also be considered a technical improvement.

4.2.1 Block I: Technical and maintenance training

Addressed to: IISPV technical support and maintenance staff.

Minimum expected content:

- Detailed identification of the modules that make up the system (calorimetry, sensors, HVAC, etc.).
- Pre-use inspection protocol and routine functional verification.
- System calibration and validation procedures.
- Preventive maintenance: replacement of consumables, technical cleaning, periodic inspection.
- Basic error diagnosis, initial corrective measures and incident reporting.
- Safety standards for handling electrical and mechanical devices and flammable substances.

4.2.2 Block II: Operational and session management training

Addressed to: laboratory technicians and operators responsible for daily use.

Minimum expected content:

- Configuration and execution of metabolic measurement sessions.
- Monitoring of internal environmental conditions (temperature, humidity, pressure).
- Proficiency in using software for data acquisition, visualization, and storage.
- Integration and synchronization with external sensors (heart rate, accelerometer, weighing).
- Exporting and organizing data for subsequent analysis.
- Logout, cleanup, and secure storage procedures.

4.2.3 Block III (Optional – Improvement): Scientific and research training

Addressed to: principal investigators, clinicians, and research staff.

This block may be included by the bidder as a voluntary training improvement, without mandatory character, with the objective of increasing the scientific and analytical capacity of the IISPV staff.

Suggested content:

- Physiological and bioenergetic foundations of indirect calorimetry.
- Experimental design with metabolic rooms: strategies, controls, analysis.
- Advanced data interpretation: energy expenditure, macronutrient oxidation, RER.
- Integration of metabolic data with clinical, molecular, or nutritional variables.
- Applications in translational research and scientific publications.
- Good practices for data analysis, storage, and traceability.

This section will be positively valued in the technical evaluation of the offer, especially if it includes content adapted to the biomedical research environment, access to academic resources, or possibilities for scientific collaboration.

5. CONNECTIONS

The winning company will be responsible for connecting all the services offered by HUSJR. Likewise, the winning company will be responsible for providing the necessary tools and trained personnel to carry out this contract, at no additional cost to the contracting entity. However, the winning company will be responsible for the complete installation.