

***Progetto IRIS***

***Innovative Research Infrastructure on Applied Superconductivity***

Missione 4, Componente 2, Investimento 3.1

# Codice progetto MUR: IR0000003 – CUP UNINA: I43C21000230006

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***OPEN PROCEDURE WITH APPLICATION OF THE CRITERION OF THE MOST ECONOMICALLY ADVANTAGEOUS OFFER IDENTIFIED ON THE BASIS OF THE BEST QUALITY/PRICE RATIO, PURSUANT TO ARTICLES 71 AND 108 OF LEGISLATIVE DECREE NO. 36/2023 AND SUCH AMENDMENTS, HAVING AS ITS OBJECT THE SUPPLY OF A CRYOSTAST FOR THE CHARACTERISATION OF SUPERCONDUCTING DEVICES FOR THE IRIS PROJECT IN THE UNIVERSITY CAMPUS OF MONTE SANT’ANGELO, NAPLES***

***TECHNICAL SPECIFICATIONS RELATING TO THE COMPETITION FOR THE AWARDING OF A CONTRACT HAVING AS ITS OBJECT THE SUPPLY OF A CRYOSTAT FOR THE CHARACTERISATION OF SUPERCONDUCTING DEVICES FOR THE IRIS PROJECT***

**Premise**

*The intervention in question concerns the purchase of high-tech scientific equipment that will be part of the equipment of AIL – Advanced Instrumentation Laboratory of the IRIS project in the Department of Physics "Ettore Pancini" of the University of Naples Federico II, and will be used for the cooling of superconducting devices and their characterization at cryogenic temperatures.*

*This document, attached to the purchase request by the referents for the definition of the technical characteristics, is intended to define the technical-functional characteristics suitable for satisfying the needs of the Department.*

*The instrumentation and materials to be supplied must be free of defects, new and original in all their parts and/or components, of the latest generation, complete with all the accessories necessary for the correct functioning of the equipment, as detailed below for each lot.*

*Used instruments, even in "refurbished" or ex-demo conditions, cannot be offered in the tender.*

*The elements described represent the minimum required configuration of the Object to which the Offeror must comply in its offer. The listed characteristics must be present simultaneously for the requested configuration. Failure to comply with one or more parameters will lead to the exclusion of the offer from the tender. The required characteristics must be demonstrated in a technical report, produced by the economic operator, which must also contain the detailed description of the offered instrumentation.*

***Scope of Supply: Closed-loop Helium Dilution Cryostat***

*Dilution cryostat with a base temperature of approximately 10 mK and a cooling power of approximately 300 microW at around 100 mK, to ensure the cooling and operation of superconducting devices, briefly defined as “Closed loop cryostat” including the operators training .*

*The following services must be an integral part of the requested supply:*

* *Transport, delivery, installation, commissioning of the instrument and verification of conformity.*
* *Warranty service, assistance and a preventive maintenance plan included in the standard 12- month warranty period.*
* *Training of personnel in the use of the acquired instrumentation for a minimum duration of 2 weeks.*

# Technical and functional characteristics

***Specifications:***

***Dilution refrigerator (DR) insert.*** *Cryogen-free dilution refrigerator system, including 1x pulse tube cryocooler PTR.*

***Base temperature*** *:10 mK for basic system;*

***Cooling power*** *> 300* μ*W at 100 mK;* ***Temperature stability****:*

***Cooldown time from RT to 20mK <*** *than 20 hours;*

***Sample space*** *(bottom of the MXC Flange): experimental space beneath the Mixing Chamber Flange at least of 200 mm in diameter and 250 mm in height.*

***System Voltage****: Control Unit with temperature readout and control electronics 220 V, 50 Hz. Single phase power for Gas Handling System and Control Unit 220V, 50 Hz. Standalone Control Unit. Pulse Tube Cryocooler PTR Compressor Voltage: 380/415V 50Hz.*

***13 liters Helium-3,*** *for optimal cryostat performance (chemical purity grade ≥ 99,99%).*

***Standard frame:*** *System support frame adapted to dilution refrigerator, maximum dimensions 1800 mm x 1200 mm, maximum system height 2,6 m.*

***Temperature sensors and heaters:***

* *2x generically calibrated platinum sensors at PT1 (60 K),*
* *2x individually calibrated Cernox sensors at PT2 (4 K),*
* *Generically calibrated RuO2 sensors on the still plate (0.7 K) and cold plate (100 mK),*
* *Individually calibrated RuO2 sensor on the MC plate (10 mK),*
* *Still heater,*
* *MXC heater for closed loop (PID) control.*

## Pulse Tube Cryocooler with compressors

*The Pulse Tube Cryocooler with a remote motor should provide the cryogenic cooling power of the dilution refrigerator measurement system without the need for liquid cryogens. Although the Pulse Tube Cryocooler must be in good thermal contact with the cryostat and radiation shields, it is requested that the Pulse Tube Cryocooler must also be mechanically well decoupled from them to make sure low vibration levels. Nominal cooling power for the second stage is 1.5 W at 4.2 K. Diagnostic thermometry: Cold head equipped with sensors on both the first and second stages.*

***Pulse tube compressor:*** *3-phase 380/415 VAC, 15 kW (max.), water-cooled with max. 15 LPM at 4*‒*30°C.*

***Gas Handling System,*** *vacuum tubes and interconnected pumping lines (built according to the layout of the IRIS laboratory).*

*The Gas handling system for the cooling circuit includes:*

* *Pneumatic valves,*
* *Pumping system (primary + turbo),*
* *Membrane pump for condensing the mixture with an output pressure of up to 3 bara,*
* *To avoid contamination, the turbopump used for circulating the mixture must not be used for evacuating the main vacuum chamber,*
* *Liquid nitrogen trap.*

## System layout:

*Experimental plates for installation and anchoring of experimental services at:*

* *60 K,*
* *4 K,*
* *0,7 K,*
* *100 mK,*
* *10 mK.*

*Minimum experimental port configuration:*

* *2x KF50 LOS (line of sight);*
* *1x KF40 LOS;*
* *1x KF50 non-LOS.*

## It is requested to integrate the following features:

* *Flexible thermal connections to the Pulse Tube Cryocooler to reduce vibrations;*
* *Temperature monitoring with controller, at least 6 sensors, and 2 heaters;*
* *Control of the mixing chamber temperature from 10 mK to 30 K while keeping the PT2 stage temperature below 4.5 K;*
* *Integrated gas-gap heat switches for rapid thermal cycling;*
* *24 VDC UPS battery to support system control unit and gas handling module during power outage (hold time approximately 30 minutes);*
* *Electrical isolation between the cryostat and the frame interface plate;*
* *Connection lines between He compressor and cold head of the PTR at least 20 m long;*
* *Packing ready for AIR/ROAD export;*
* *Commissioning: installation and first testing, including leak tests, full cool-down and a demonstration of the base temperature and cooling powers specified in the test report (typical temperatures 20 mK and 100 mK);*
* *Delivery according to delivery terms, including insurance.*

***Control System and Software features:***

* *Cooldown from room to base temperature should be fully automated;*
* *The control and monitoring software must have an API capable of controlling and reading temperatures without interfering with automation routines;*
* *The software must be WEB BASED to allow system access via LAN;*
* *The software must allow multi-user access.*

***Lifetime remote technical support.***

***System service and maintenance free for the first 2 years.***

***Delivery Time: By October 20, 2025.***