



PROCESO SELECTIVO PARA INGRESO, POR EL SISTEMA GENERAL DE ACCESO LIBRE, EN LA ESCALA DE TECNÓLOGOS DE LOS ORGANISMOS PÚBLICOS DE INVESTIGACIÓN. Resolución de 21 de febrero de 2023, de la Subsecretaría del Ministerio de Ciencia e Innovación (BOE núm. 47, de 24.02.2023)

Fecha: 05/09/2023

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Área Global 9. Tecnología Aeroespacial, Naval y de Defensa

Especialidad T9: Instrumentación Espacial. INTA

Segundo Ejercicio de la fase de Oposición

PRACTICAL EXERCISE

This exercise has two scenarios based on the same instrument concept.

Please select ONE scenario and respond to the proposed questions in a practical approach.



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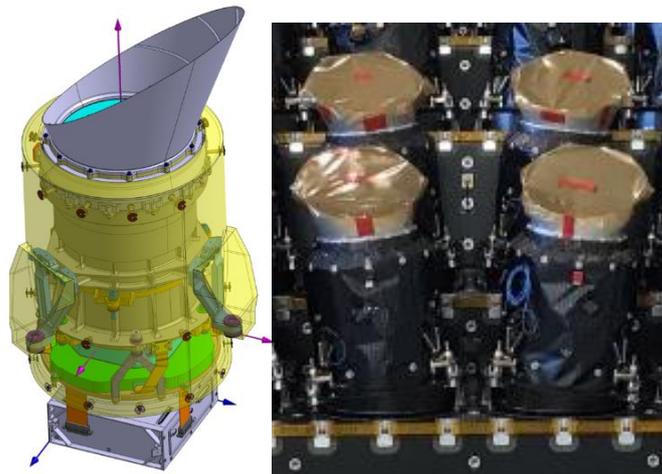
Área Global 9. Tecnología Aeroespacial, Naval y de Defensa

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A space mission involves the use of four optical cameras (telescopes) working in combination to create a composite instrument. The aim is to combine the field of view of each unit (20°) to generate an instrument with a total field of view of 60°. The payload concept is therefore based on combining the performance of each camera to create a multi-camera, which allows the observation of very faint stars with an extended field, the spatial resolution is not a critical parameter in this mission.

The telescope will be based on a fully dioptric (refractive lens) design, working in a wide range of visible light (400-900 nm). A possible schematic of one of the telescopes is shown in the figure below, which includes a proposed configuration of the 4 cameras.





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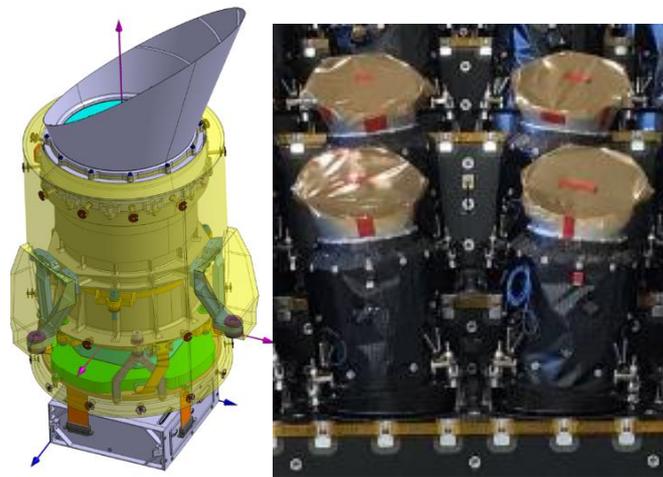
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The telescope will be based on a fully dioptric (refractive lens) design, working in a wide range of visible light (400-900 nm). A possible schematic of one of the telescopes is shown in the figure below, which includes a proposed configuration of the 4 cameras.



The cameras shall be mounted on a common optical bench, which provides structural and thermoelastic stability to ensure that the relative lines of sight (LoS) between each camera do not deviate by more than 0.5°.

Each camera includes a 240mm focal Telescope Optical Unit (TOU), a Focal Plane Assembly (FPA) supporting four large format CCD detectors, the (FEE) unit and the Support Structure. Each camera is equipped with its own passively cooled FPA, consisting of 4 CCDs of 3500 × 3500 pixels each and 20 micron pixels, working in frame transfer mode.

The mechanical enclosure of a complete camera, including baffle and detector stage, is contained in a cylinder of 60 cm diameter by 110 cm length..

Based on the current capacities of the institute (see information above), please answer the following questions of ONE of the following scenarios

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Scenario 1

In this proposal INTA does not develop the instrument but participates as the main contractor imposing its requirements to the possible subcontractor.

1. Define the mission development plan that you would impose on the institution responsible for the delivery of the cameras. Define a reasonable philosophy of models to ensure that the performance is met, both per unit and for the complete system. Configure the human team responsible for each technology, i.e. define the number of engineers and the technological specialisation required to perform the integration, verification and testing tasks at INTA as a minimum.
2. Define a rough AIV plan to ensure the performance of the 4 units in the mission, tests at unit level, at instrument level, etc....
3. Define the cleanliness and contamination control requirements you would employ and how you would ensure they are met. Comment on the use of MOCs, PFO, RGA, QCM or whatever you consider reasonable to ensure the contamination requirements and in which phases of the project you would contemplate them.

ANA Belen

¿? - Control proceso ensayos fuera de INTA

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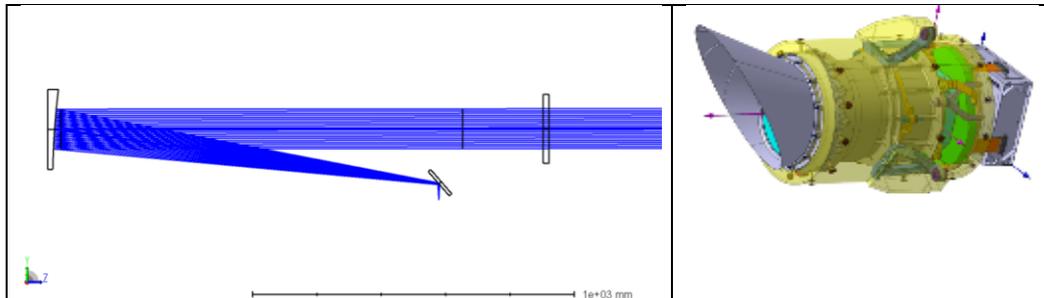
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Scenario 2

INTA is responsible for the characterisation in operational conditions of each camera and is also responsible for the integration of the four units into the aforementioned platform, ensuring the alignment requirements between them.

1. The operating temperature (where performance is to be verified) must be -80°C . Describe the vacuum tests you would propose, number of cycles, vacuum levels you envisage, etc... both at unit and complete instrument level. Define in which of the facilities provided you would carry it out.
2. The optical stimulus to be used in the characterisation of each camera is based on an off-axis parabolic mirror of 1m focal length that must include a wheel of 8 different optical density filters and 6 pin-holes of different diameters. Performance must be ensured over the entire field of the instrument, but the camera must be in its nominal position (horizontal position) during the test. Define how you would develop the OGSE and the EGSE necessary to control it.



3. If the system were to meet planetary protection requirements, how would you implement this need? Consider the overall integration process, focal plane, optics, external parts, etc. Consider the necessary infrastructures and define them according to the processes involved to ensure that these conditions are met.



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Principales características de las instalaciones

Main facility characteristics

Regarding facilities for thermal Balance/Thermal Vacuum tests, INTA has the following facilities with their main technical characteristics:

Thermal Vacuum testing facilities							
Name	Width	Height	Length	Min. T	Max. T	Min. Vac.	Max. Spec. weight
TVC-04	4 m	4 m	4 m	-180°C	+160°C	10-4 Pa	2000 kg
TVC-01	Diam. 1,3 m		1,5 m	-150°C	+150°C	10-4 Pa	250 kg
TVC-02	Diam. 0,8 m		1 m	-150°C	+150°C	10-4 Pa	20 kg

Additionally, INTA have a thermal balance and thermal vacuum testing, providing up to 25 power lines (20 lines 300 W each, 5 lines 1500 W each) and 80 thermocouple channels, with the following main features:
Up to three thermocouples per channel (monitor or control); Manual heater temperature and PID control modes; Automatic Report Generation; Heater short circuit, open circuit and temperature protection; PLC controlled sequential power up; Emergency local and remote stop; Real time, acoustic and visual alarms.



Additional climatic testing equipment to carry out test of temperature/humidity/altitude, fast cycling and thermal shocks with the following main characteristics:

Test	Main Characteristics
Temperature and Temperature/Humidity	Maximum dimensions : 1000 mm x 1000 mm x 1500 mm T. range: - 80 °C to + 180 °C; RH%: 10% to 95 %
	Maximum dimensions : 5600 mm x 3000 mm x 3000 mm T. range: - 60 °C to + 110 °C; RH%: 10% to 95 %
Temperature and Temperature/Humidity	Maximum useful dimensions: 1000 mm x 1000 mm x 1500 mm (2 chambers of different sizes) T. range: - 70 °C to + 130 °C; RH%: 10 % to 95 % Altitude: from 1013 mbar to 5 mbar
Fast Cycling (> 2°C/min)	Maximum useful dimensions: 1500 mm x 1500 mm x 1500 mm (2 chambers of different size) Temperature range:- 180 °C to + 180 °C Maximum temperature change rate: 20 °C/min
Thermal Shocks	Thermal shock chambers on air • Usable dimensions: 470 mm x 650 mm x 600 mm • Temperature range: -80 °C to 220 °C



In the same way, in order to check thermoelastic deformations in space systems under vacuum thermal cycling conditions performed in space simulators, INTA owns the next capability in combination with TVC-04:

Additional testing capabilities	
Photogrammetry Testing	Thermoelastic deformations calculations by means of photogrammetry tests. Uncertainty: ±25µm, NIST traceability.