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## SPECIFICATION SHEET

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**Supply, installation and commissioning of a *Prism Coupler System*  
for the ICFO, financed by FEDER Catalunya 2021 - 2027**

**FILE NUMBER: ICFO-2026-013**

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## CLAUSE 1. Object of the contract

The purpose of this contract is the supply, installation and commissioning of a **Prism Coupler System** for the ICFO, financed by FEDER Catalunya 2021 - 2027.

The types of items supplied are linked to the CPV (Common Public Procurement Vocabulary) **3800000-5** Laboratory, optical and precision equipment (except glasses).

## CLAUSE 2. Needs to satisfy

PhotonChip is a platform project that will help bring photonic technologies, in particular integrated photonics and photonic chips, from scientific feasibility to prototype stage to be applied in, for instance, communications as 6G transceivers, sensors, quantum computing and technology platforms.

Once operational, PhotonChip will cover the whole photonic chip value chain (design, packaging, testing) and train new experts thanks to dedicated programs.

As part of the Institute of Photonic Sciences (ICFO), PhotonChip will use advanced technologies as quantum technologies for cybersecurity, virtual and augmented reality, artificial intelligence, and machine learning.

In the development of the project, ICFO needs to acquire the supply of a **Prism Coupler System**, to characterize the optical properties different materials used in the fabrication Interposer devices, which are key component in the Packaging of *Photonic Integrated Circuits (PIC)*.

A Prism Coupler System is an optical characterization instrument used to measure refractive index and film thickness of bulk and thin-film materials, as well as optical waveguide losses. The system can characterize a wide range of materials commonly employed in the PIC field, including quartz, optical glasses, polymers, silicon nitride, photoresist, electro-optic polymers, LiNbO<sub>3</sub>, etc.

Unlike conventional refractometers or ellipsometers, the Prism Coupler does not require an advanced knowledge of the of the optical properties of the material to be measured, which make it a key advantage during the early stages of a waveguide formation process development.

## CLAUSE 3. Technical requirements

### Technical proposal structure - minimum mandatory equipment characteristics

In this system, the sample will be placed in contact with a prism and illuminated by a laser set up to provide TE or S-polarization to the prism. The angles at which guided TE modes are excited are used to extract the material's optical properties and thickness. Accordingly, the system must include:

1. One or several prisms allowing Refractive Index (RI) measurements from 1.0 to 2.45 and thickness calculation.
  - a. Absolute error on RI measurement below  $\pm 0.0005$
  - b. RI delta resolution below  $\pm 0.0003$
  - c. Thickness accuracy below  $\pm(0.5\% + 5 \text{ nm})$
  - d. Thickness delta resolution below  $\pm 0.3\%$

- e. Possibility to change or add prisms without requiring the intervention of the manufacturer.
2. Multiple laser sources to enable optical characterization in the C band, O band and Visible (red, green and blue) spectral ranges.
    - a. Accordingly, the system shall include the following diode lasers, specified by emission wavelength:
      - i. 1550nm
      - ii. 1310nm
      - iii. 635nm
      - iv. 515nm
      - v. 450nm
    - b. The system software must perform all data fitting and/or mathematical calculations and automatically provide index as a function of the wavelength data over the mentioned spectral ranges.
  3. Option to measure TM modes or film birefringence at the above-mentioned wavelengths, here reported for clarification:
    - i. 1550nm
    - ii. 1310nm
    - iii. 635nm
    - iv. 515nm
    - v. 450nm
  4. Waveguide propagation loss measurement option for wavelengths from 515 to 1600nm.
    - a. In this measurement, the light coupled from the waveguide must be collected by means of a fibre bundle.

This approach eliminates the need for index matching-oil, preventing sample contamination and ensuring the sample remains suitable for sub-sequent postprocessing.
    - b. The system software must perform all data fitting and/or mathematical calculations and automatically provide the resulting propagation loss data.
  5. Measurement option for graded index films and waveguides, enabling the possibility to calculate refractive index as a function of the depth into the material with smooth changes in index.
    - a. For the reconstruction of the index-profile from the measured guided-mode data, the Wentzel-Kramers-Brillouin (WKB) method must be used.
    - b. The system software must perform all data fitting and/or mathematical calculations and automatically provide the resulting refractive index vs depth data.
  6. The machine should allow to measure different sample sizes; ranging from 3mm x 3mm up to 200mm x 200mm samples.
  7. A Bulk Index Standard and the calibration procedure must be provided for periodic in-house calibration.

### Software requirements

8. PC with at least one monitor and windows 11 must be included.

9. The system must include the software required to manage all required functionalities described above (note points 2-b, 4-b and 5-a) and shall be supplied with a permanent (non-expiring) license.
10. The software shall be installed on the system PC, and it shall be also possible to install on offline PCs for data review and export.

### Technical documentation or manuals to be delivered

A set of documentation shall be provided, covering the following topics:

- Comprehensive system user manual, including both hardware and software descriptions.
- Application notes for Refractive Index, thickness, waveguide-loss measurements, as well as any other relevant application for thin-films or bulk/substrate materials.

All documentation will ideally be supplied in Català.

### CLAUSE 4. Power distributions and safety

The system shall include:

- Electrical Operation: 230V  $\pm$ 10%, 50 Hz (per UNE-EN 61010-1, Spanish adoption of IEC 61010-1)
- Laser safety: Appropriate hardware and/or software safety interlocks to guarantee compliant laser protection requirements.
- CE-certification

### CLAUSE 5. System layout and services

The proposal shall include a set of “system layout and services documentation”, containing the following information:

- System layout, including overall footprint, weight, and detailed description of the different system components.
- Installation and start-up requirements, including required utilities, service connections, and any applicable environmental specification.

### CLAUSE 6. Transportation, installation, start-up

- Contract includes the installation and start-up of the system, including system checking, functional tests and the supply of all those elements necessary for its correct operation
- The proposal will include transportation to ICFO’s facilities including insurance and all export/import and customs duties.

- Any other customs or miscellaneous expenses, unexpected and not covered in the tender, which may arise until the equipment arrives at ICFO, must initially be borne by the Supplier and will be reimbursed by ICFO upon submission of supporting documentation proving the actual incurrence of such expenses.
- The machine will be placed in the designated location by ICFO. The contractor shall cover all costs, organization, and coordination related to the placement, including the provision of any required specialized equipment or vehicles, as well as any necessary component disassembly and reassembly for unloading and transportation inside the building, strictly following the route specified by ICFO.
- The contractor will be responsible for ensuring the environmental implementation of the contract. Such as, removal and proper disposal of the packaging when the machine is delivered and unpacked, or its storage during the warranty period in case the original packaging needs to be kept.

### **Process qualification**

The system shall be calibrated by the manufacturer prior to shipment. The supplier shall deliver *Internal Acceptance Test (IAT)* report, documenting the tests and calibrations performed, prior to shipment.

### **CLAUSE 7. Warranty and Follow-on Support**

- 1-year Full Warranty on all parts and components of the system irrespective of the manufacturer. The warranty will include the replacement of any faulty or damaged part(s) during normal use of the system, no matter the manufacturer of the component(s). It will cover any cost related with the disassembly, transportation, reparation and re-assembly of the damaged component(s), including all travelling and living costs of the required service engineer(s). An on-site repair, or a justified alternative to reduce the system down time to the minimum, will always be the first service option. A team of properly qualified and skilled service engineers will have to be available.
- System lifetime support.
- Spare parts will be available during, at least, 10 years after system supply.

### **CLAUSE 8. Training**

- The contractor shall provide at least one full day of training to the equipment users, scheduled on a mutually agreed date, to ensure proper and safe operation of the system.
- The training shall also include an overview of basic maintenance procedures, covering routine preventive tasks and essential troubleshooting.
- Training will take place at the ICFO facilities.

### **CLAUSE 9. Delivery and Installation Time**

The machine should be delivered within **3 months starting from tender assignment.**

For the purpose of this tender, delivery time is defined as the period from the purchase order (PO) issuance until system delivery at ICFO facilities, including manufacturing, transportation, installation, and acceptance tests.

**CLAUSE 10. Target price**

- The target price for the system is 80.000 € (VAT excluded).
- Payment terms: Full payment will be made once the final receipt of supply, installation and commissioning is issued.

Castelldefels, on the date of its digital signature

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