ICFO

Finançat per la Unió Europea

Generalitat de Catalunya

SPECIFICATION SHEET

Supply, installation and commissioning of an *Automatic System for Fiber and Micro-Optics Packaging* for the ICFO, financed by FEDER Catalunya 2021-2027

FILE NUMBER: ICFO-2026-027

CLAUSE 1. Object of the contract

The purpose of this contract is the supply, installation and commissioning of a "***Automatic System for Fiber and micro-optics packaging***" for the ICFO, financed by FEDER Catalunya 2021-2027.

The types of items supplied are linked to the CPV (Common Public Procurement Vocabulary) **38000000-5** 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 an ***Automatic system for fiber and micro-optics packaging*****.** The purpose of the system is to provide the ICFO Packaging line of the core technologies required to provide the PIC of optical interfaces.

The ***Automatic system for fiber and micro-optics packaging*** will be able to perform automatically the following key packaging processes:

- alignment and attachment of multiple fibers (or fiber arrays) to Photonics Integrated Circuits (PIC), known as pigtailing process.
- the alignment and attachment of micro-lenses for focusing or collimating the light into or outcoming the PIC.

CLAUSE 3. Technical requirements

Technical proposal structure - minimum mandatory equipment characteristics

For this purpose, the system shall include, at minimum, the following **functionalities**:

1. Sub-micron precision active alignment operations, including:
    a. Optical alignment using active alignment algorithms based on optical feedback mechanisms (e.g. optical power meter).
    b. Optical alignment using active alignment algorithms based on electrical feedback mechanisms (e.g. integrated photodiodes).
    c. Optical alignment using active alignment algorithms based on beam analysis systems (e.g. infrared camera.)

2. Automatic preliminary passive alignment through pattern recognition and camera monitoring.

3. Fiber Arrays pigtailing processes supporting
    a. edge coupling,
    b. and grating coupling mechanisms.

4. C-band wavelength-sweeping measurements (wavelengths vs. optical power)

5. Micro-lens integration, for focusing or collimating the light into or out of a PIC.

6. Capability to pick up and manipulate fiber arrays and microlenses of different dimensions.

7. Epoxy dispensing and UV curing, integrated into the process workflow.

8. Control of lens-to-substrate or fiber-to-chip spacing or bond-line thickness.

9. Real-time alignment optimization during epoxy curing.

10. It shall support automatic, semi-automatic and manual modes for process development activities.

11. Both fibers and lenses alignment and attachment shall be performed in a standalone generic platform, adaptable to the specific alignment requirements of the device.

To ensure the implementation of the above-mentioned functionalities, the system shall include, at minimum, the following **components**:

12. Granite basement and isolation frame to provide planarity, mechanical stability and vibration isolation.

13. Integrated vision system and cameras. High-resolution cameras and optics required for pattern recognition, alignment monitoring, system referencing.

14. Gantry motion system with the capability to integrate the required fixtures
    a. Three degrees of freedom
    b. Minimum axis resolution 1µm

15. Central station with substrate (packages, PCB) holding chuck.
    a. Minimum chuck dimension: 10x10cm
    b. Vacuum based
    c. Temperature control: via integrated Peltier (TEC)
    d. Interchangeable chuck.

16. Two sub-micron precision positioners to handle fiber array and microlenses, meeting at minimum:
    a. 6 Degrees of Freedom, including linear and rotatory movements (X, Y, Z, Rx, Ry, Rz)
    b. Encoder resolution of 5nm
    c. Rotational travel range ±3 º
    d. Capability to adjust the pivot point according to the geometry and position of the part being held.

17. Fixtures to grip different fiber array and microlenses:

    a. One gripper for vertical fiber arrays coupling.
        i. Compatible with 8-degrees coupling angle.
        ii. Compatible with fiber array width ranging (minimum) from 2 to 6 mm.
        iii. With strain relief mechanism to prevent fiber stress.

    e. Two grippers for horizontal fiber arrays for or edge coupling.
        i. Designed for 0-degrees angle
        ii. Compatible with fiber array width ranging (minimum) from 2 to 6 mm.
        iii. With strain relief mechanism to prevent fiber stress.

    f. Two grippers compatible with micro-optics, piezo based.

    g. One gripper compatible with micro-optics, vacuum based.

18. Module dedicated to the alignment of free space microlenses based on collimated beam measurements, including beam position, pointing angles, and near and far field divergence.
    a. Operating over a spectral range of 900-1700nm
    b. Integrated IR camera with periscope for accessing reduced areas.
    c. Upgrade option for incorporating power and spectral measurement capability.

19. UV curing module equipped with two UV heads

20. Time pressure dispenser

21. Vacuum pick up tool for small parts handling and vacuum release tray holder.

22. Probe station with 3 axes.

23. Instrumentation required to realize active alignment (item 1) and automated wavelength-sweeping measurements (item 4). The instrumentation shall be programmable and integrated into the system and it shall comprise, at minimum:

    a. C band tuneable laser

i. Minimum wavelength coverage 1530 – 1580 nm
ii. Compatible with FC/PC or FC/APC connectors

b. Optical power meter
   i. Suitable for monitoring optical power during wavelength-sweep and alignment procedures.
   ii. Minimum detectable optical power (sensitivity): -50 dBm
   iii. Compatible with FC/PC or FC/APC connectors

c. Automated polarization controller.
   i. Device capable of automatically adjusting the state of polarization in order to maximize the received optical signal during active-alignment and wavelength-sweep operations.
   ii. Compatible with FC/PC or FC/APC connectors

d. Two channels precision source/ measure unit SMU
   i. Suitable for supplying and reading electrical signals from integrated photodiodes
   ii. Minimum current detection capability 5nA

Software requirements

24. The system must include the software required to manage all required functionalities described above and shall be supplied with a permanent (non-expiring) license.

25. The software shall be installed on an industrial grade system PC.

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, routine servicing and troubleshooting.

CLAUSE 4. Power distributions and safety

The system shall include:

- Electrical Operation: 230V ±10%, 50 Hz (per UNE-EN 61010-1, Spanish adoption of IEC 61010-1)
- Laser safety: Appropriate enclosure to guarantee compliant laser protection requirements according to European Standards, without requiring specific laser safety area.
- 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, drawings 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 the 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

Factory Acceptance Test (FAT) and Site Acceptance Test (SAT) will be required as part of the delivery and acceptance process of the equipment.

It shall include, at minimum, the following:

a) Fiber array to PIC pigtailing test in edge coupling:
   a. The test shall be performed using a fiber array with at least 8 channels.
   b. Alignment repeatability, minimum of 10 repetitions.
   c. Automated wavelength sweeps and export of final measurement results.
   d. Epoxy dispensing and fiber array attachment, demonstration using minimum one sample (mandatory only during SAT)
   e. Parts required for the test shall be provided by the manufacturer (epoxy may be supplied by ICFO if required)

b) Machine parameters verification, including but not limited to motion accuracy, vision system repeatability, dispensing, and any other relevant specifications demonstrating compliance with the specification.

c) Documentation. All test results, reports and data generated shall be included in the documentation delivered to ICFO.

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 **8 days** of training to the equipment users, scheduled on a mutually agreed date, to ensure proper and safe operation of the system. It shall include:

- Basic and advanced uses of the machine, including process development, programming and automation.
- The training shall also include an overview of basic maintenance procedures, covering routine preventive tasks and essential troubleshooting.

CLAUSE 9. Delivery and Installation Time

The machine should be delivered within **10 months starting from the formalization of the contract.**

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.

The purchase order will be issued upon contract formalization or within the immediately following days.

CLAUSE 10. Target price

- The target price for the system is **650.000 €** (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

Prof. Dr. Valerio Pruneri
Optolectronics