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## SPECIFICATION SHEET

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**SUPPLY, INSTALLATION AND COMMISSIONING OF A HIGH BANDWIDTH 4-CHANNEL OSCILLOSCOPE FOR THE OPTOELECTRONICS LABORATORY AT ICFO, WITHIN THE "RECOVERY, TRANSFORMATION AND RESILIENCE PLAN - FUNDED BY THE EUROPEAN UNION - NEXTGENERATIONEU".**

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## CLAUSE 1. Object of the contract

The purpose of this procurement is the supply, installation, calibration, and commissioning of a high-bandwidth, four-channel oscilloscope intended for the characterization of analogue and digital electrical signals. The system shall comply with a defined set of minimum technical requirements for its core specifications, and provisions for future upgrades will be regarded as an added value.

## CLAUSE 2. Needs to satisfy

ICFO does not currently have an oscilloscope at such a frequency bandwidth that allows us to measure high-frequency signals.

We currently have an oscilloscope of limited bandwidth (up to 2.5 GHz), and the current setups operate at frequencies in the order of 10 GHz.

This new system will enable us to characterize our current experiments needed for the LEO-QKD project.

## CLAUSE 3. Technical requirements

The system must consist of a real time high bandwidth oscilloscope with the following characteristics:

- **Interface specifications**
  - 4-analog inputs
  - External trigger extra input
  - Ruggedized 3.5 mm connectors with SMA adapters
  - 50  $\Omega$ ,  $\pm$  5% analog input impedance for each channel
  - DC analog input coupling
  - Network connectivity for remote control and data transfer
  - USB mouse and keyboard for external control
  - Touchscreen display
- **General Performance Characteristics:**
  - A minimum real-time bandwidth of 13 GHz for each of the four analog inputs, independently.
  - Memory depth of 500 Mpts per input channel.
  - Sampling rate minimum 40 Gsps in real-time acquisition mode for each of the four analog inputs, independently.
  - Digital vertical resolution of at least 10 bits (with an effective Number of Bits (ENOB) at the 40 mV scale and 13GHz bandwidth of at least 5 bits) in real time acquisition mode for each of the four analog inputs, independently.
- **Addons**
  - Should include eye diagram analysis in real-time function
  - Should include real-time spectrum analyser function

Improvements to the mandatory technical requirements will be positively scored, as indicated in Annex 2

## CLAUSE 4. Power Supply

- Power supply: 230 V AC  $\pm$ 10%, 50 Hz; compliant with UNE-EN 61010-1 (Spanish adoption of IEC 61010-1). CE-certified power integration with overvoltage protection

## CLAUSE 5. Transportation, installation, start-up and training

- Delivery: Delivered at Place (**DAP**) to ICFO Facilities, Castelldefels, Spain
- Full delivery with insurance and customs clearance
- Includes shipment, customs, calibration, installation, and initial training
- Installation: Functional verification and ISO 17025, or equivalent, calibration
- **Minimum one-day training**, covering:
  - Equipment setup and configuration
  - Measurement modes
  - Software usage and data export
  - Remote control and data acquisition
  - Preventive maintenance and diagnostics
- Acceptance report signed by vendor and end-user upon completion

## CLAUSE 6. Acceptance test

Acceptance shall be conducted onsite post-installation and shall include comprehensive benchmarking using certified reference devices and standard test methodologies.. The full test report must be signed off by both the vendor and ICFO.

### 1.General inspection:

- **Mechanical integrity:** Verify chassis, connectors, and controls are free of defects or damage.
- **Display functionality:** Confirm proper operation of the display, brightness, and readability.
- **Front panel controls:** Ensure all buttons, knobs, and indicators function correctly.
- **Accessories and documentation:** Check that all required probes, cables, manuals, and certificates are delivered.

### 2. Performance Verification

- **Bandwidth check:** Verify that each analogue channel meets the specified bandwidth.
- **Rise time measurement:** Confirm compliance with rise time specifications for each channel.
- **Noise floor measurement and ENOB:** Assess effective resolution under defined test conditions and evaluate input noise levels and verify they meet requirements.
- **Input impedance and coupling:** Confirm correct 50  $\Omega$  impedance and AC/DC coupling options.
- **Channel-to-channel isolation:** Measure crosstalk between channels.
- **Memory depth:** Verify the memory availability per input channel.

### 3. External Control and Data Transfer

- **Remote control interface:** Verify connectivity and functionality via LAN/USB.
- **Data transfer:** Verify that waveform data can be transmitted to an external PC.
- **Software integration:** Validate compatibility with provided software and drivers.

#### 4. Calibration and Accuracy

- **Vertical accuracy:** Verify amplitude measurements against reference standards.
- **Time base accuracy:** Assess clock precision and jitter performance.
- **Trigger accuracy and stability:** Confirm trigger delay and timing accuracy.
- **Calibration certificate:** Ensure valid calibration certificate from manufacturer or accredited lab is provided.

All acceptance results must be delivered in both digital and printed form, with graphs, tabulated metrics, traceability records, and device identifiers clearly labelled.

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

- A **minimum Two-year** Full Warranty on all parts and components irrespective of the manufacturer. The warranty will include the replacement of any faulty or damaged part(s) during normal use of the part(s) or component(s). It will cover any cost related with the disassembly, transportation, reparation and re-assembly of the damaged parts or component(s), including all shipping costs. **Additional years of warranty will be evaluated positively as stated in Annex 2.**
- The scope shall include an initial calibration and an end-of-warranty calibration, if requested.
- Service support:
  - Remote diagnosis ≤48 h
  - On-site intervention ≤10 business days
  - 10-year spare part availability
- The technical service team must be based in Europe and ideally in Spain.

#### CLAUSE 8. CE MARKING

All components must be Conformité Européenne (CE) marked, and compliant with:

- International Electrotechnical Commission (IEC) 61010-1 – Safety requirements for electrical equipment
- IEC 61326-1 – Electromagnetic compatibility requirements
- Restriction of Hazardous Substances (RoHS) Directive 2011/65/EU
- International Organization for Standardization (ISO) 17025 – Calibration and testing laboratory competence

#### CLAUSE 9. Delivery time

The entire equipment must be delivered by 27<sup>th</sup> February 2026.

#### CLAUSE 10. Target price

220.000,00 euros (VAT excluded)

Castelldefels, on the date of its digital signature

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