

PLIEGO DE PRESCRIPCIONES TÉCNICAS

SUPPLY, INSTALLATION AND STARTING-UP OF A TIME SYNCHRONIZATION FREE SPACE OPTICAL SYSTEM FOR THE OPTOELECTRONICS GROUP

NÚMERO D'EXPEDIENT: ICFO-2026-016

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1. Need to satisfy

ICFO Optoelectronics Group (OptoGroup) has a deployed free-space link between ICFO facilities and the Collserola tower, covering an approximated distance of 19 km. In order to perform quantum communication protocols between these two locations, the group needs a time synchronization system working altogether with encoded photons. Therefore, we aim a free-space optical system that can support link losses and fulfil the airport regulations. The system also needs to have a low time deviation in the order of ps, and an internal clock with MHz repeating rate. This type of synchronization system is widely used in satellite communications, and will help us to the developed single-photon protocols such as BB84, and B92 as well as entanglement-based protocols in horizontal links, and later, in vertical ones.

2. System overview

The time synchronization system will be used to synchronize two distant locations, and needs to employ the free space link between them. The system must provide a reliable and fully equipped platform, having:

1. Performance
2. Operation
3. Power distribution and safety
4. Transportation, installation and start-up
5. Documentation
6. Warranty and support
7. Delivery time

3. Performance

List of essential requirements:

- 3.1. One sender and one receiver apparatus.
- 3.2. The sender generates a square-wave signal with 0-1 V and a repetition rate in the range of MHz
- 3.3. The sender needs to be compatible and connected to a time-tagging module.
- 3.4. The sender encodes the time information using photons around 635 nm for the free space propagation.
- 3.5. The maximum power of the optical signal has to be in agreement with AENA regulations.
- 3.6. The optical signal needs to be resilient to an attenuation of 24 dB.
- 3.7. The receiver needs to be compatible and connected to a time-tagging module.
- 3.8. The receiver needs to have a FPGA-based phase locked loop running synchronously with the sender.
- 3.9. The combine system has to have a low jitter.
- 3.10. The system's time deviation needs to be in the order of ps.
- 3.11. The system must have a hold-over time of hundreds of ms, i.e. it still works in the limits stated above after a link loss (provided it was well synchronized before the link loss).

4. Operation

- 4.1. Communication with a PC station must be provided through standard ports (USB and/or Ethernet).
- 4.2. The optical emission can be switched off by hardware switch or software command.
- 4.3. An initial report with the characterization of the optimal values for all relevant parameters needs to be prepared and delivered by the awarded company.

5. Power distribution and safety

List of essential requirements:

- 5.1 Power system compatible with standard Spanish voltages, frequencies and configurations and with all Spanish laws and regulations.
- 5.2 Appropriate hardware and software safety interlocks.
- 5.3 The equipment must be protected in case of unexpected power cuts.
- 5.4 The equipment must provide diagnostic tools to verify the proper functioning after power cuts.

6. Transportation, installation and start-up

- 6.1 The proposal will include transportation to ICFO's facilities and all export/import and customs duties.
- 6.2 The equipment will be placed in the selected location by ICFO. Contract winner will cover all costs, organization and coordination of machine placement, including any required specialized equipment or vehicle, and any required component dis-assembly and re-assembly for systems unloading and transportation inside the building, following the route specified by ICFO. Depending on the size and weight of the equipment, disassembly of the system might be needed for better transportation before installation. If that is not possible, transportation route inside ICFO building will be established according to the indications given by ICFO. The contract winner will be responsible for taking accurate measurements of the route and plan in advance any required component dis-assembly and re-assembly.
- 6.3 The contract winner will be responsible for checking the selected location and for taking any required measurements to guarantee the suitability of it for the offered system, for instance in terms of temperature dissipation from the cryostat/compressor system. The compatibility with the operation of the systems already installed in the lab and the mobility of users will have to be guaranteed as well.
- 6.4 Installation and start-up of the system, including system checking, functional tests and process qualification.
- 6.5 The contract winner 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.

7. Documentation

- 7.1 Complete set of manuals, drawings, schematics and layouts about system assembly and configuration.
- 7.2 Complete systems user manual, including routine servicing and troubleshooting.
- 7.3 All the above documentation will be supplied in English, in electronic format (USB drive) and in paper copy.

8. Warranty and support

- 8.1 A 1-year full warranty, starting at system acceptance. The warranty will include the replacement of any faulty or damaged part(s) during the 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.
- 8.2 System lifetime support:
 - By phone and e-mail with a response within 48 hours (within warranty period).

- During the warranty period, upon a system breakdown, Service visits can be arranged upon mutual agreement with the Engineers team: warranty repair of broken components will be provided within 60 days, unless the issue was caused by system misuse, which could require a more sophisticated maintenance/repair.

9. Delivery time

The entire equipment must be delivered within 3 months.

10. Target price

123.000 euros (VAT excluded)

Castelldefels, a fecha de su firma digital

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