TENDER TECHNICAL SPECIFICATIONS

I - PURPOSE OF THE PURCHASE

Acquisition of a complete superconducting nanowire single photon detection system (SNSPD).

2 - GENERAL DESCRIPTION

The contract covers the acquisition, delivery and installation of a single photon detection system based on superconducting nanowire detectors. The system must include 4 detectors with high quantum efficiency in the wavelength range 770 – 810 nm. These detectors will be placed inside a closed-cycle helium cryocooler capable of accommodating at least 12 detectors. Particular attention will be paid to the response time of the detectors ("time jitter").

3 - TECHNICAL CHARACTERISTICS

The detectors:

The detectors must meet the following specifications:

1. SNSPD technology,
2. Operating spectral band: 770 – 810 nm,
3. Detection efficiency over the spectral band 780 – 800 nm: ≥ 85%,
4. Dark counts at maximum detection efficiency: ≤ 10 Hz,
5. Temporal resolution (jitter at FWHM - full width at half maximum): ≤ 20 ps,
6. Recovery time defined at a recovery duration of 50%: < 20 ns,
7. Maximum counting rate: > 10 MHz,
8. Continuous 24/7 operation > 10000 hours (no dead time),
9. Output pulse signal compatible with standard photon counting and correlation electronics (> 200 mV),
10. Latch-free operation,
11. Detectors connected by single-mode optical fiber.

The cryocooler:

The cryocooler must operate on the principle of a closed helium cycle. The cooling time must be less than 12 hours, and the system operating time without warming up must be able to exceed one month. Furthermore, the operating time without maintenance must be greater than 12 months.

The cryocooler must operate with a water-cooled compressor. The compressor must be able to be positioned up to 15 meters away from the cryostat.

The system:

The system will integrate four (4) detectors and a minimum of twelve (12) slots in total for the subsequent installation (outside this contract) of other detectors. Four (4) of the additional slots must be ready to accommodate detectors optimized for a wavelength around 500 nm. The remaining additional slots must be ready to accommodate detectors of the same type as those described below in the "The detectors" section.

The system will be supplied with a computer control system, and with all software and libraries enabling it to be interfaced with a computer.

4 - FACTORY TESTS TO BE DONE BY THE TENDERER

The equipment will be characterized at the factory before delivery on the following aspects:

1. Measurement of detection efficiency over the 770 – 810 nm band,
2. Measurement of temporal resolution,
3. Measurement of dark counts,
4. Measurement of the maximum counting rate from which the detection efficiency is reduced by 3dB.

The results of these tests will be recorded in a report and must comply with the specifications stated in the submitted technical offer.

5 - DOCUMENTATION

The successful tenderer undertakes to provide, upon delivery, all technical documentation necessary for the use of the delivered equipment. This documentation will include:

1. The user manual.
2. The maintenance guide.
3. The technical drawings.

6 - DELIVERY, INSTALLATION, COMMISSIONING PROCEDURES

6-1 DELIVERY

The equipment will be delivered, installed, commissioned and training will be carried out by the successful tenderer no later than 6 months after notification of the contract.
Shipping and insurance costs will be borne by the successful tenderer.
The equipment is intended to be installed in the S05 experimental room located in the basement of the

CERLA building, on the Cité Scientifique campus of the University of Lille in Villeneuve d'Ascq, France.

The installation site is directly accessible at street level without steps. Unloading of trucks is the responsibility of the successful tenderer. As the building is not equipped with a loading dock, the successful tenderer must provide suitable means.

6-2 INSTALLATION

The equipment will be installed by the successful tenderer in an optics laboratory, on an optical table or on a shelf. The floor space available in the cleanroom for the installation of the compressor is 1m x 1m.

The successful tenderer will interface the equipment with the facilities (interconnections) on the provisions put in place by the PhLAM laboratory using standard electrical connections and standard connections to the chilled water circuit.

7 - TRAINING

On-site training of the personnel using the equipment, included in the sale price, will be provided by the successful tenderer within a maximum of fifteen days following commissioning. The training date will be set by mutual agreement with the PhLAM users. The purpose of this training will be to acquire knowledge relating to the elementary procedures for use and safety of the equipment.

8 - ACCEPTANCE

The final acceptance of the equipment will make it possible to verify the performance of the equipment and its conformity with the specifications at the installation site in the presence of representatives of the PhLAM laboratory.

The factory tests (paragraph 4) will be verified during this acceptance stage. The deadline for carrying out the regular service verification and notifying the decision is one month. An express acceptance decision will be issued at the end of the verification operations if the equipment meets the acceptance criteria.

9 - SAFETY MEASURES/COMPLIANCE WITH CURRENT LEGISLATION

Wearing regulatory PPE is mandatory; the successful tenderer will provide all necessary equipment to all its personnel.

10 - WARRANTY

The delivered equipment must comply with the standards in force on the day of delivery.

The warranty must have a minimum duration of one year. The conditions of this warranty must cover in particular parts, labor, travel of qualified personnel to the site and replacement of the equipment.

11 – ADDITIONAL INFORMATION

1. Electrical power supply at PhLAM: 220V/50Hz single-phase; 380/415 V3, 50 Hz.
2. Cooling water circuit provided by us.