ICFO

Funded by the European Union

SPECIFICATION SHEET

SUPPLY, INSTALLATION AND STARTING-UP OF AN ULTRAFAST HIGH REPETITION RATE MID-WAVE INFRARED SYSTEM WITH AUXILIARY OPTICAL OUTPUTS FOR ICFO'S LABORATORY THROUGH AN OPEN PROCEDURE NOT SUBJECT TO HARMONIZED REGULATION

FILE NUMBER: 2023.SU.017

Contents

CLAUSE 1. Object of the contract 1
CLAUSE 2. Needs to satisfy 1
CLAUSE 3. Machine / Process overview 1
CLAUSE 4. Power distribution and safety 2
CLAUSE 5. System layout and services 2
CLAUSE 6. Transport, installation and start-up 2
CLAUSE 7. Delivery time 2
CLAUSE 8. Target price 2

CLAUSE 1. Object of the contract

The purpose of this contract is the supply, installation and commissioning of AN ULTRAFAST HIGH REPETITION RATE MID-WAVE INFRARED SYSTEM WITH AUXILIARY OPTICAL OUTPUTS for ICFO's laboratory.

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

One critical showstopper for realizing the prospects promised by quantum technology is upscaling the number of massively entangled quantum states of light. The scaling problem arises from the intrinsic probabilistic nature of quantum mechanics and the usual strategy to manipulate arduously isolated quantum systems with weakly interacting optical and electric fields. Contrary to existing attempts, we employ a different and opposing strategy based on ultrafast, strongly laser-driven solid-state systems to produce high-photon-number massively entangled states of light.

Our pioneering results in attosecond spectroscopy in quantum materials show that the quantum state of a correlated quantum material can survive strong laser fields and result in large emitted photon numbers. To investigate the quantum properties such as correlations and entanglement, we need to tailor the laser parameters to the properties of such materials. Unfortunately, such a laser system does not exist commercially needs to be tailor-made with very specific combined (!) properties. Specifically, we need a center wavelength of 3 micron with the possibility to extend to 4.65-micron, high pulse energy of 100 nJ, ultrashort pulse duration of 150 fs, the possibility to stabilize the electric field of the lightwave (CEP), ultra-low noise of 0.5% rms and ultra-high repetition rate above 10 MHz. The system further needs to provide synchronized optical outputs at 1 and 1.6 micron with energy of 100 nJ. Such a system does not exist and needs to be developed as prototype. We also note that the usefulness of the system ceases after the parameters and application has been demonstrated.

CLAUSE 3. Machine / Process overview

The laser system needs to fulfill all of the below criteria in combination:

- Pulse Repetition Rate: 10 - 12 MHz
- Pulse duration: < 120 fs at 3 µm
- Pulse energy: 120 nJ at 3 µm
- Spectral range: 1400 nm - 4000 nm extendable to 4650 nm (no tunability).
- RMS / noise: < 0.5% at 1700 nm
- Free-running center wavelength stability: < 0.5 nm per h at 3 µm, no active stabilization
- Spectral power density variation: < 2% per h
- Relative intensity noise: < 150 dBc/Hz at 500 kHz measured at 1.5 µm
- Beam pointing stability: < 20 µrad per h
- Possibility to stabilize the CEP of the main output.
- Turnkey operation of the laser with web interface or likewise.
- Fully automated wavelength control and performance monitoring, system status and parameters.
- Electronic repetition rate synchronization signal output.
- Installation and proven performance test at AUO ICFO.
- Simultaneous third- party API control (Python, LabVIEW, etc)

CLAUSE 4. Power distribution and safety

- Power system compatible with standard Spanish voltages, frequencies and configurations and with all Spanish laws and regulations.
- CE marking.
- Component wiring routed to a centralized power distribution panel.
- EMO protection.
- Appropriate hardware and software safety interlocks. Extended error diagnostics

CLAUSE 5. System layout and services

- The proposal will include a complete set of pictures, drawings and layouts of the system, including dimensions, location and details of the different components.
- The proposal will include full installation and start-up requirements of power, and the specific environmental configuration of the offered system.

CLAUSE 6. Transport, installation and start-up

- The proposal will include transportation to ICFO's facilities and all export/import and customs duties. **DAP incoterms will apply.**
- The machine 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 system unloading and transportation inside the building, following the route specified by ICFO.
- Depending on the size, machine crate may need to be disassembled outside ICFO building. 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.
  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. 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.
- Installation and start-up of the system, including system checking, functional tests and process qualification.
- 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.

CLAUSE 7. Delivery time

The system should be delivered within less than 8 months starting from tender assignment.

CLAUSE 8. Target price

- The target price for the system is 214.000,00 € (VAT excluded).
- Payment terms:
  - 50% upon order,
  - 50% after installation training and acceptance.

The contract to be awarded in the framework of a prototype with 100% depreciation due to ceasing end of life with the project duration.

Castelldefels, on the date of its digital signature

Prof. Dr. Jens Biegert
Attoscience and Ultrafast Optics GL