ICFO

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SPECIFICATION SHEET

PURCHASE AND INSTALLATION OF A “HIGH-POWER, TUNABLE, FREQUENCY-QUADRUPLED 253.7 NM DIODE LASER SYSTEM” FOR THE LABORATORY OF THE INSTITUT DE CIÈNCIES PHOTONIQUES, THROUGH AN OPEN PROCEDURE NO SUBJECT TO HARMONIZED REGULATION

FILE NUMBER: 2024.SU.013

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CLAUSE 1. Object of the contract

The purpose of this contract is the purchase and installation of "high-power, tunable, frequency-doubled 253.7 nm diode laser system" for the ICFO laboratory (group of Morgan Mitchell, Atomic Quantum Optics).

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

We request a high-power, tunable, frequency-doubled 253.7 nm diode laser system. We are looking for grating-stabilized external-cavity diode laser (ECDL) operating at 1014.8 nm (fundamental wavelength), optically isolated, amplified in a tapered semiconductor chip (TA), beam shaped, optically isolated again, and coupled into a resonant second harmonic generation (SHG) stage, where a selected non-linear crystal generates CW laser light at half the wavelength of the fundamental laser. The SHG output is then coupled into a second resonant second harmonic generation stage to generate the fourth harmonic of the fundamental wavelength (FHG).

The requested laser system will be used for spectroscopy and atomic sensor development with neutral Hg (mercury) atoms. This requires a high quality laser, which detailed specification is characterized in CLAUSE 3 – Technical requirements.

The system will be installed in the laboratory of the research group: Atomic Quantum Optics (prof. Morgan Mitchell).

We list below the requirements for the requested laser system.

CLAUSE 3. Technical requirements

Main specifications on the laser diode and optics:

1. Wavelength range (in vacuum): 253.7 nm +/- 0.5 nm
2. Output power: 60 mW
3. Linewidth (5 μs): < 200 kHz
4. Frequency stability: < 400 MHz/K
5. Mode hop-free tuning: > 20 GHz
6. Automatic relocking of SHG and FHG cavities
7. Digital control via touchscreen, PC GUI, or command language
8. Analog remote control and monitoring
9. Output power stabilization, including noise reduction below 100 Hz
10. Output beam shaping to produce nearly diffraction-limited beam profile
11. Unmodulated, fiber-coupled probe output at fundamental wavelength
12. Unmodulated, fiber-coupled TA beam output at fundamental wavelength
13. SHG beam output at SHG wavelength available through flip mirror
14. Beam shaping of FHG output with nearly diffraction limited beam profile.
15. Probe beam output at fundamental wavelength.
16. TA beam output at fundamental wavelength available through flip mirror.
17. SHG beam output at SHG wavelength available through flip mirror.
18. Optical isolators to protect the master laser and the tapered amplifier.
19. Beam steering adjustable without opening the laser head.
20. Air sealed frequency doubling resonators with temperature controlled, AR coated crystals.

21. Crystals and resonator mirrors adjustable without opening the air sealed resonator.
22. Resonator leak rate < 10e-3 mbar l/s
23. Automatic optimization via digital control of motorized mirror mounts of coupling of fundamental laser beam into tapered amplifier
24. Automatic optimization via digital control of motorized mirror mounts of coupling of fundamental laser beam into first SHG resonator
25. Automatic optimization via digital control of motorized mirror mounts of coupling of SH laser beam into second FHG resonator.
26. Beam shaping optics for frequency converted output.
27. Suitable Electro-Optic Modulators for each SHG stage

Main specifications on the electronics and control systems:

1. Current, temperature and piezo drivers
2. Up to 5 A driving current for amplifier chip,
3. Digital control of: scanning, signal display, locking, relocking, power stabilization etc.
4. Wide scan mode with synchronized data recording for spectroscopy and component testing
5. Graphical PC user interface
6. Command based (USB+TCP/IP) interface for remote control
7. All required connector cables
8.
9.
10. Stabilisation of SHG resonator length and automatic relocking to the correct resonator mode.
11. System of automatic optimization of input beam steering into TA, SHG and FHG cavities.
12. Frequency locking system (to an external reference). PIDs for each connected laser to address e.g. piezo and current.
13. Low noise current, temperature and piezo drivers (4 A driving current for amplifier chip). Current noise density: at the order of 300 pA / $\sqrt{}$ (Hz) @ 1 kHz.
14. Control systems (by integrated CPU & FPGAs) for scanning, signal display, locking, etc.
15. No need for water cooling.

Other:

16. On-site Installation and Training.
17. Warranty on laser diode and amplifier chip in NLO systems: 3000 h or 1 year (whatever comes first)
18. Warranty on NLO crystals in SHG stage: f3000 h or 1 year (whatever comes first)

CLAUSE 4. Power distributions and safety

The system should be configured for EU (Spain) power grid (voltage, sockets, etc.) and be CE marked.
The system will be fully protected against unexpected power cuts and, in that case, will be fully safe for the operators. A quick and easy turning on of the system has to be possible after a power cut.

CLAUSE 5. System layout and services

The contract winner will include in the proposal:

A) a complete set of pictures, drawings and layouts of the system, including dimensions, location and details of the different components,
B) full installation and start-up requirements,

C) transportation to ICFO's facilities including insurance and all export/import and customs duties,
D) onsite installation of all the system, and will install it in a way to guarantee the optimal requested specifications here listed
E) lifetime free remote service to be requested whenever needed by ICFO personnel in order to optimize any part of the requested system, whenever optimization of the setup is possible and does not require a service visit in person by the contract winning company.
F) a full warranty valid 12 months on all parts and components of the system. The warranty will include the replacement of any faulty or damaged part(s) during normal use of the system. 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).
G) lifetime free follow-on support and updates on all the provided software packages for the whole laser system, when software intrinsic bugs are influencing the usage or there are updated versions with better performance available for the purchased hardware.

The laser system will be placed in the selected location by ICFO in Spain. Contract winner will cover all costs, organization and coordination of laser system placement, including any required specialized equipment or vehicle, and any required component disassembly and reassembly for system unloading and transportation inside the building.

The contract winner will give training to ICFO personnel to operate the full system, to run daily maintenance and to re-align the system in order to obtain optimal performance of the system. The number of training days and approximate schedule will be specified in the proposal.

Spare parts, components and subsystems will be available during, at least, 10 years after system supply.

CLAUSE 6. Delivery and installation time

The system must be delivered and installed at ICFO in no more than 12 weeks. Delivery time is defined as the time elapsed since the signature of the contract until the system delivery at ICFO facilities. It includes the manufacture of the system, the transportation, the installation and the acceptance test at ICFO's premises.

CLAUSE 7. Technical proposal structure

The proposal has to follow as much as possible the structure of this technical requirements document to facilitate evaluation. Any optional accessories not included in the proposal will have to be put in a separate section, and not mixed with the included items.

CLAUSE 8. Target price and payment terms

The target price for the system is 165.000,00 € (VAT excluded).
Payment terms:
100% after installation training and acceptance.

Castelldefels, on the date of its digital signature

Prof. Dr. Morgan Mitchell
GL Atomic Quantum Optics