

Specifications for Carbon Nanotube Laser Manufacturing System

The requirements listed below are for the design and installation of a carbon nanotube laser manufacturing system. Offerors shall submit a design showing how all the parts of the laser system are to be integrated. The objective of the system is to produce carbon nanotubes (CNT) by the laser ablation technique. The hardware required for CNT fabrication are listed in item #1 below. The laser system needs to be enclosed for safe operation. The enclosure shall be designed to fit in an existing laboratory space. Utilities provided for the enclosure are power, water and inert gases.

1. The contractor shall design, fabricate, deliver, and install a carbon nanotube laser manufacturing system integrating the following components that currently reside and will remain at NASA Langley Research Center.
 - a. Spectra Physics PRO 290-60 Pulsed Nd:YAG laser, 60 Hz, SHG and THG
 - b. Spectra Physics PRO-290-60 Pulsed Nd:YAG laser, 60 Hz, SHG
 - c. Quantronix EAGLE-1064-120-CW CW Nd:YAG laser, 120W
 - d. Lecroy transient recording system
 - e. Stanford SR530 lock-in amplifier
 - f. BNC 565 Pulse generator
 - g. Ophir Laser Star Laser Power meter, w/2 heads
 - h. Newport XPS motion control system
 - i. Lindberg tube furnace, 1200°C maximum temperature
 - j. Tektronix 2465B oscilloscope
 - k. MKS 146 gas flow system (3)
 - l. MKS baratron (2)
 - m. MKS mass flow controller (2)
 - n. HP 6237B DC power supply
 - o. Spex spectrometer
 - p. Princeton ICCD
 - q. Princeton ICCD pulser
 - r. Princeton ICCD controller
 - s. Spiricon LBA-300PC beam profiler
 - t. Trivac D84 roughing pump
 - u. Computers (4)
 - v. Required optics, optical mounts and accessories
 - w. Required electronics and cables
2. The manufacturing system shall have the following system attributes:
 - a. Be accommodated in a space not to exceed 18' x 23'.
 - b. Consume no more than 60kW and operate on voltages of 208-240 VAC 3 phase.
 - c. Require no more than 20 GPM of facility cooling water.
 - d. Accept 2 gas tanks - one nitrogen and one argon.
3. Operation of the manufacturing system shall have the following attributes:
 - a. System shall be operable at full capacity on preset recipes without constant monitoring by personnel.

- b. System shall provide full interlocking of all system components.
 - c. System shall provide status and health monitoring capability at both local and remote work stations.
 - d. System shall support experimental spectroscopy set-ups and different production arrangements.
 - e. Extraction of nanomaterial shall be straightforward and be designed to mitigate any exposure to produced materials.
 - f. System shall be protected from unauthorized usage.
4. System component services shall include the following
 - a. System shall provide protected filtered power, deionized cooling water and nitrogen purge gas to internal components. These shall include multiple 120VAC connections, 60A 3 phase circuits and purge connections as appropriate.
 - b. The system shall provide HEPA filtered, HVAC and humidity controlled environment for all components.
 - c. The components requiring housing in this system shall have adequate shielding from one another to prevent damage or otherwise cross contamination by any means.
 - d. System shall be designed to provide easy access to maintenance items.
5. The system shall have the following safety attributes:
 - a. The system shall be compliant with Class 1 laser enclosure requirements as described by 21CFR1040, (The Federal Laser Product Performance Standard).
 - b. All pressure and vacuum systems shall meet NASA STD 8719.17(NASA Requirements for Ground-Based Pressure Vessels and Pressurized Systems), and LaRC LPR 1710.40 (Safety Program for the Maintenance of Ground-Based Pressure Vessels and Pressurized Systems).
6. Documentation accompanying the installed system shall include:
 - a. Certification of compliance with safety requirements found in LaRC LPR 1710.40.
 - b. Operating manual
 - c. Maintenance manual
7. Training on appropriate operation of the laser manufacturing system shall be provided.
8. Installation, delivery, and training shall be completed no later than September 30, 2010.
9. Internal Fire Suppression
 - a. Offerors are encouraged to propose an Internal Fire Suppression System as an option.
 - b. This should be quoted as a separate line item.