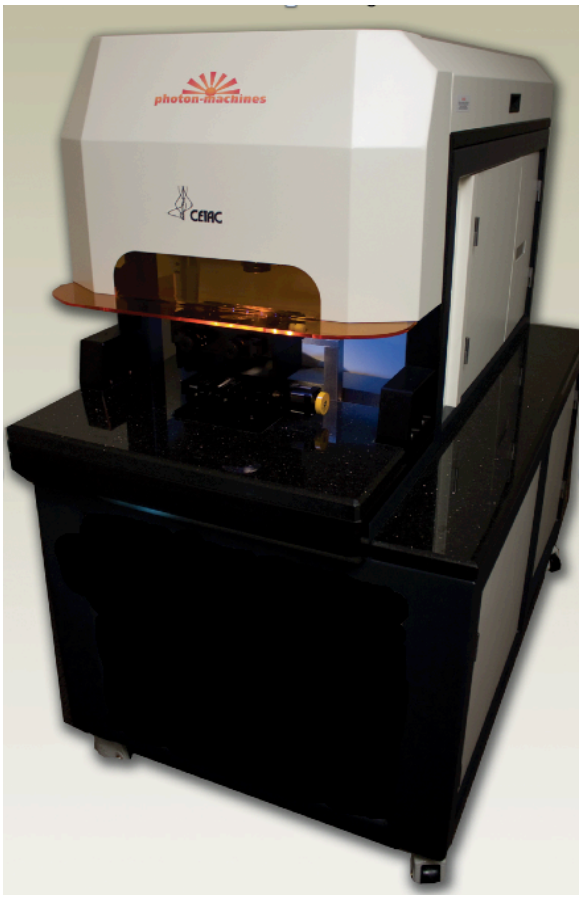
Analyte.Excite
Site Preparation Guide



PHOTON MACHINES INC.
366 Gallatin Park Dr. Bozeman, MT 59715
Tel: 406 586 2667 Fax: 406 587 9024
service@photon-machines.com

Revision 1.2-SS

ANALYTE.EXCITE SITE-PREPARATION GUIDE

The Analyte.Excite is a complete, high performance, excimer laser ablation workstation in a compact package that is designed for high energy density 193nm operation. All materials required for interfacing with an ICP-MS are provided, except for the laser gases, carrier gases and their respective containers with pressure regulators. Please review this document in its entirety and provision for the Analyte.Excite prior to its arrival.

The Analyte.Excite will arrive in a single wooden crate measuring 55" (135) x 35" (90) x 65" (165) that weighs 525 kg gross. A pallet jack or forklift is required. Move the crate to a dry, clean area immediately upon arrival and maintain room temperature. Installation is performed by trained service engineers of Photon Machines.

Contents:

1 SAFETY CONSIDERATIONS

1.1 Overview

It is important to read the following safety precautions in detail to prevent bodily injury and damage to the Analyte.Excite or any interfacing devices. Use only as specified.

 WARNING: The Analyte.Excite contains internal components that present severe electrical and radiation hazards. Improper operation or servicing can result in death, blindness, other injury or material damage. Only qualified personnel should operate or service this equipment.

Potential health and safety hazards are discussed in greater detail in the remainder of this chapter, including but are not limited to:

- Eye Damage from Direct or Reflected Laser Beam Exposure
- Skin Damage, including increased risk of cancer, from Direct or Reflected Laser Beam Exposure
- Fire Danger from Laser Beam and Electrical Components
- Electrical Shock Hazard

Laser light poses safety hazards that are not associated with conventional light sources. Special precautions must be observed when operating, maintaining or servicing the Analyte.Excite. The safe use of high-powered lasers requires that each operator be fully trained and that all personnel working in proximity to the laser are aware of the dangers involved.
Photon Machines Inc. assumes no liability related to use of this product.

1.2 Optical Safety

Lasers are classified by the US Food and Drug Administration according to the health hazards associated with exposure to their emitted beam, based on power and wavelength. Class 1 lasers are considered eye-safe and require no special safety measures during operation or maintenance. Class 4 lasers can

produce instantaneous and permanent blindness or serious injury to the eye or skin and require stringent safety measures during operation and maintenance. The Analyte.Excite falls under both of these categories, depending on the mode in which it is used.

The Analyte.Excite utilizes excimer laser sources which can produce high-intensity laser beams in the ultraviolet (UV) portion of the spectrum. The specific wavelengths produced may be 193 or 248nm, depending on the configuration.

The Analyte.Excite meets the requirements for Class I laser device when all panels are closed. Safety interlocks prevent operation with panels opened or removed. To ensure safe operation, the interlocks must never be defeated. With any portion of the housing removed, or the sample chamber removed or disassembled, the Analyte.Excite can emit Class 4 laser radiation.

 Infrared and Ultraviolet radiation are invisible, so the hazard they present is not immediately obvious. Direct or reflected exposure to infrared, visible, or ultraviolet laser beams can cause blindness or vision impairment without warning. Reflected energy can be dangerous whether specular or diffuse. It is extremely important that anyone who might be exposed to direct or reflected Class 4 laser radiation wear suitable safety glasses.

1.3 Skin Exposure Safety

Laser radiation is a high-intensity beam of well-collimated light that can propagate substantial distances without substantial loss of intensity. The radiation emitted is non-ionizing under normal circumstances, but can cause thermal damage to tissue due to radiation absorption. Generally, the maximum permissible radiation exposure for skin is several times greater than for the eye. Safety measures with regard to radiation hazards are therefore based mainly on dangers to the eye, but exposure to the skin should be carefully avoided as well.

Direct or reflected laser radiation can cause burns as well as an increased risk of cancer.

 When operated as designed with the laser enclosure closed, the Analyte.Excite meets **Class 1** laser safety requirements and so requires no special precautions. However, the device contains internal components categorized as **Class 4**. Conformance to Class 1 is maintained by design features and safety systems which normally prevent exposure to these hazards. The Analyte.Excite is a Class 4 device when these features are disabled or inoperative.

1.4 Fire Safety

The energy of the excimer lasers used in the Analyte.Excite at any of the wavelengths involved is sufficient to produce a spark or explosion hazard if directed carelessly. The laser beam or its reflection can ignite combustible and/or volatile substances such as solvents. If non-oxidizing gas purge is used, the purge gases will generally prevent combustion in the sample chamber, and the safety features built into the Analyte.Excite should prevent laser energy from propagating outside the device.

1.5 Electrical Safety

 The Laser Head and Power Supply of the Analyte.Excite contain electrical circuits operating at lethal levels of voltage and current. Do not operate the laser system with either Power Supply or Laser Head covers removed except during maintenance procedures described in this manual.

There are no user-serviceable electrical parts in the Laser Power Supplies or other components of the Analyte.Excite. The manufacturer must carry out service procedures on power supply electronics. General rules of electrical safety should be followed at all times. Most maintenance procedures which require removal of portions of the protective housings, such cleaning optical components, require no operation of the Analyte.Excite laser system(s) and they should be conducted only after the following steps are completed:

1. Turn the laser system(s) off

2. Unplug the AC power cord at both ends and remove it
3. Allow 5 minutes for the internal capacitors to discharge

1.6 Safety Features

The following safety features are incorporated into the Analyte.Excite and conform to government regulations to provide safe laser operation. With any safety issues, please contact Photon Machines™ for resolution of difficulties and/or assistance in repairs.

1.7 System Housings

Beam Delivery Housing

The standard Analyte.Excite excimer laser beam is entirely enclosed by a protective housing which prevents access to radiation in excess of Class I limits and blocks stray radiation. The excimer laser beam exits the laser into the light-tight safety enclosure and is fully contained. The enclosure has redundant interlocks which should not be defeated. If a defect in the enclosure or the interlocks is suspected, operation should not continue until the defect is repaired.

Laser Housing

The electrical components associated with the excimer laser used in Analyte.Excite are enclosed in a protective housing that limits exposure to dangerous electrical hardware. The covers should be removed only by trained personnel performing maintenance.

Interlocks

The Analyte.Excite features the following interlocks which prevent operation in specific unsafe conditions:

- Remote Interlock Tripped – This interlock allows the user to disable the system based on some remote triggering event, such as a door opening. The use of this interlock is optional.
- Translucent Safety Shield – Interlock secured to the safety shield will activate whenever the safety shield is opened or removed.

1.8 Applicable Regulations:

Laser Classification

Government standards and regulations specify that laser-based products be classified according to the output power or energy, and laser wavelength. The standard Analyte.Excite is supplied as a Class 1 device, while non-standard configurations are available as Class 4 devices. These non-standard systems are identified by Model Numbers other than those covered by this manual and will be clearly labeled as Class 4 devices.

In either case, the excimer laser incorporated into the Analyte.Excite is classified as Class IV based on 21 CFR, subchapter J, part II, section 1040-10(d) and Class 4 based on EN 60825-1, Clause 9 of the European Community Standards.

Laser Classification documentation for both the United States and the European Community is provided in the Appendix of this manual.

General Laser Safety

Photon Machines, Inc. recommends that laser users become more familiar with laser safety practices and the applicable regulations than is possible by reading this manual. The American National Standards Institute (ANSI) publishes a good overview titled 'American National Standard for the Safe Use of Lasers' (ANSI Z136.1-1993). This publication provides recommendations for the safe use of lasers and laser systems that operating at wavelengths between 180 nm and 10 µm. The publication is available from:

Laser Institute of America
12424 Research Parkway, Suite 125
Orlando, FL 32826
(407) 380-1553
www.laserinstitute.org/publications/ safety_bulletin/laser_safety_info/

2.0 SITE REQUIREMENTS

2.1 Environment

The Analyte.Excite is an analytical instrument intended for use in a laboratory environment. Dust and humidity can result in degradation of the optical components having an adverse affect on the performance of the system. Maintain humidity of < 60%.

For optimal performance room temperature should be kept within 68° to 75° Fahrenheit (20° to 24° Celsius)

2.2 Space

The Analyte.Excite is a self contained mobile workstation on locking roller casters. The premix gas bottle and helium gas bottles (available from Spectra Gases Inc.) are mounted within the cart. Overall dimensions are shown below.

The system operates from the ICP-MS host computer or it can be run from a separate desktop or laptop computer. A support arm is provides (see below) for a laptop computer or keyboard and mouse.

The distance between the Analyte.Excite and ICP-MS should be kept to a minimum to ensure efficient transport of the entrained analyte from the sample chamber to the torch.

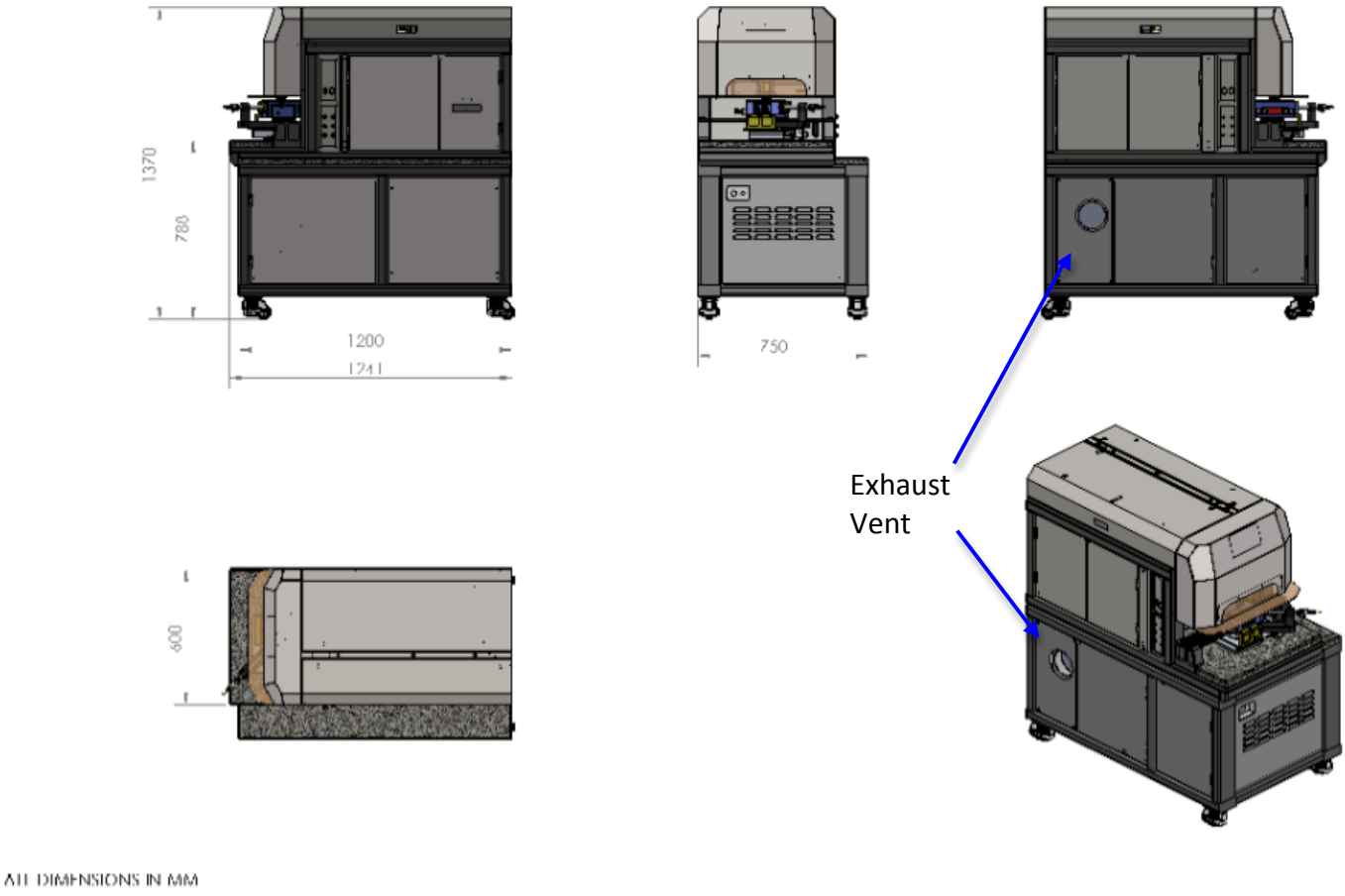


FIGURE 1: OVERALL DIMENSIONS

NOTE: Vent the 150 mm OD exhaust port from the laser to outside of the room.

2.3 Electrical

The Analyte.Excite requires a single power cord. Fused, power distribution to all electronics is internal to the system.

The power outlet should be located within 2 meters of the system.

NOTE: Please indicate the connector type desired as there are various configurations, otherwise the power cable will be sent with the standard connector shown below.

POWER: 208 to 240VAC
50/60 Hz
10A

STANDARD CONNECTOR – 3 pole, L6-20P NEMA (unless specified otherwise)

The Analyte.Excite is designed for use with grounded electrical outlets only. This is an important safety feature. Operating the system ungrounded will result in an increased risk of electrical shock and equipment damage.

2.4 Computer (provided)

2.5 Gas

The ATL SP300I short pulse excimer laser used in the Analyte.Excite requires two gas bottles for operation. Provisioning for the correct gas bottles is an essential part of site preparation.

All required plumbing and regulators are included with the Analyte.Excite for the Laser Gas and Flush Gas only.

LASER GASES

NOTE: INSTALLATION CANNOT BE SCHEDULED UNTIL THE LASER GASES ARE ON-SITE. DELIVERY TIME CAN BE AS LONG AS 4 TO 6 WEEKS

Nova Gas is the recommended, approved premix laser gas supplier for Photon Machines products. Gases provided by other suppliers can result in serious damage to the laser and will may void the warranty. For alternative suppliers contact service@photon-machines.com

Nova Gas Technologies Ltd.
2781 Three Lakes Rd.
N. Charleston, SC 29418 USA
tel: 1-843-747-0956
fax: 1-843-747-0958
www.lasergas.com

Specify the following **exactly as shown**:

1) CERTIFIED LASER GAS – p/n MIX97D-07-1000 (SEE NOTE)
   (the ATL ArF-2 mixture in a 7 liter steel bottle with DIN #14 connector)
2) FLUSH GAS – p/n HE60-07-1000
   (helium (UHP 99.999%) in a 7 liter steel bottle with DIN #6)

   NOVA gases has stocking facilities in:

   - South Carolina
   - Northern Ireland
   - Mumbai
   - Bejing
   - Shanghai
   - Taiwan

NOTE: Contact factory for gas mix of lasers shipped prior to July 1, 2013

OTHER REQUIRED GASES

PURGE GAS

Approximately 2 to 3 LPM of nitrogen gas (UHP ≥99%) is channelled through the optical train to suppress the formation of ozone and minimize absorption of 193nm laser light in air. The N2 pressure must be regulated at the tank down to 30 PSI max.

NOTE: The purge gas supply, regulator and ¼" O.D. 1/8" I.D. Tygon tubing used to connect to the Swagelok connector of the rotometer on the back of the system – **are not provided**. Six (6) mm tubing can be substituted.

Once plumbed, the rotometer is set at 2 LPM.

ICP-MS SAMPLE CARRIER GAS

The convention is to channel helium gas (99.998% purity) into the sample chamber and supplement this with argon make-up gas using a Y junction (provided) after the sample chamber. Both gases should be made available (0.1 to 2 LPM) on site at the time of installation.

Argon carrier gas is used as "make up" gas and routed through or after the sample chamber depending on user preferences. The argon supply used to support the ICP-MS is suitable for this purpose.

If the mass flow controllers used to regulate the helium and argon make-up gases are supplied by Photon-Machines then the pressure from the gas tanks / cylinders to the mass flow controllers must be regulated at the tank down to 30 PSI max.

NOTE: The carrier gas supply, regulator and ¼" O.D. 1/8" I.D. Tygon tubing used to connect to the Swagelok connector on the back of the system – **are not provided**. Six (6) mm tubing can be substituted.

Once plumbed, the rotometer is set at 2 LPM.

2.6 Cooling Air Exhaust

The air used for cooling laser vessel and thyratron is blown out of the laser cabinet. The heat generated by the laser is less than 150 watts. The exhaust air contains small amounts of ozone **(O3-MAK value 0.1 ppm)**, which is produced in all high voltage switching systems. In addition this air can contain corrosive and hazardous gases in the rare event of damage to the laser chamber, laser window/mirror or the gas system. Venting the air to the outdoors or into a filter system

as a safety precaution is recommended. This should be done with flexible hoses having an inner diameter of approx. 125 mm. Should lengths of more than 3 m be necessary, an exhaust fan with a volume of ca. 165 CFM should be mounted at one end of the hose, otherwise the laser may be overheated.

3.0 SUPPORT

CORPORATE

PHOTON MACHINES INC.
15030 N.E. 95th St.
Redmond, WA 98052
USA
Tel. 406 296 6400
Fax. 858 259 2070

www.photon-machines.com
service@photon-machines.com

photon-machines inc.

SITE PREP CHECKLIST &INSTALLATION SCHEDULING FORM

Please ready the items in this check list then fax the completed form to 406 587 9024 for scheduling installation of your Analyte.Excite

For assistance call 858 220 1070.

208 – 240VAC outlet with mating connector readied	
ArF_2 premix gas received from Nova Gas	
Helium flushing gas received from Nova Gas	
Helium carrier gas supply, including 2-stage regulator with 1/4" OD or 6 mm OD to laser ablation system	
N_2 purging gas supply, including 2-stage regulator with 1/4" OD or 6 mm OD to laser ablation system	
Argon make-up gas supply regulated by mass flow controller (if MFC not purchased with the system)	
Crate inspected for damage (notify factory if any)	
Crate moved to the lab or just outside of lab	
Crate top removed, then fours sides	
Mass spectrometer(s) confirmed operational	

LOCATION OF EQUIPMENT :

USER NAME _____
INSTITUTION _____
STREET _____
CITY _____
STATE / COUNTRY _____
POSTAL CODE _____
KEY CONTACT _____
TELEPHONE _____
EMAIL _____
MASS SPEC MAKE / MODEL / YEAR _____