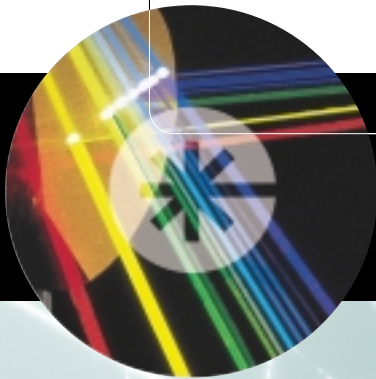




# SABRE

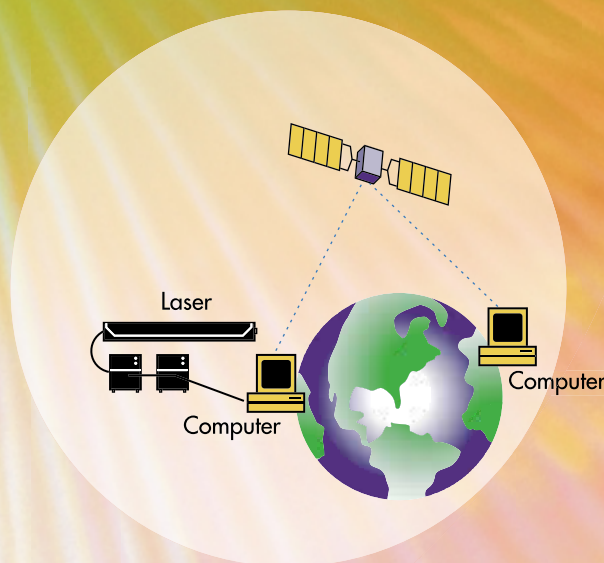
Entertainment Ion Laser Systems

*Serious power for demanding applications.*



People want installations that are bigger, brighter, increasingly complex, and more spectacular. It isn't enough to surprise, excite and delight viewers: You have to leave them breathless and awe-struck. The logistics and implementation of such installations can be mind-boggling, if not monumental. Your reputation and prestige are at stake. These are the challenges and realities of large-scale installations. It's exciting, but at the same time, it's very serious business. There's no room for compromise — least of all on your choice of laser.

It's time for a better laser.  
That laser is Innova Sabre.





# ENGINEERED FOR SUCCESS

## **Search-and-Peak.**

Automated, on-demand mirror alignment produces maximum performance at the touch of a button — even from a non-lasing condition. You'll never have to perform a frustrating manual laser alignment.

## **PowerTrack.**

Extends the capability of Search-and-Peak by continually monitoring and correcting the optical cavity geometry for highest output power and stability, best transverse mode, and lowest optical noise. You're automatically assured of unwavering performance.

## **Compact LCD remote module.**

An exemplary user-friendly interface. Every function is controlled by the touch of a button. Quite simply, laser operation just doesn't get any easier than this.

## **Digital data interface.**

Controls the Sabre via computer from across an arena or half-a-world away. Now you can maintain control and have up-to-the second status on the laser head, regardless of where it is installed.

## **SuperInvar resonator.**

Extremely stable high-thermal-mass SuperInvar resonator provides superb passive stability under both varying environmental conditions and the rigors of transportation.

## **Sealed-mirror Series V Innova plasma tube.**

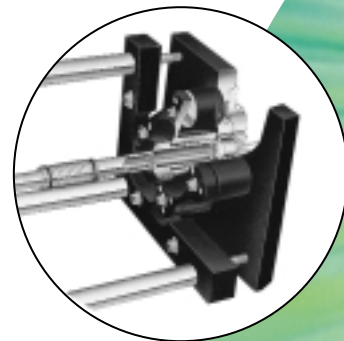
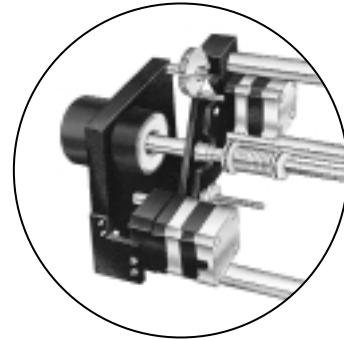
The latest generation of the renowned Innova metal-ceramic technology provides exceptional lifetime and lowest cost of ownership.

## **Integral closed-loop heat exchanger.**

Precisely monitors and controls cooling-water flow, purity and temperature for optimum heat transfer, maximum head stability, and longest tube lifetime.

## **Integral shutter mechanism.**

Prevents light from leaving the laser head without interrupting lasing. Convenient when you want to shut off the beam without altering operating parameters.





# Entertainment SABRE:

Want a Better Show? Get a Better Laser.

## **Engineered for demanding applications.**

The Innova® Sabre® is an automated ion laser system engineered for high-power applications such as large concert or theatrical venues, stadiums, arenas, theme parks, architectural lighting, laser sculptures, or any other large-scale installation.

## **Complete automation.**

An entirely new configuration for the entertainment industry, the Sabre incorporates highly advanced features such as Search-and-Peak™ automated alignment and peaking, PowerTrack™ automatic cavity stabilization for highest output power, and a one-touch compact LCD remote module for convenience. A new robust digital (RS-232/422 or optional IEEE-488) interface provides computer-driven remote operation and diagnostics — from virtually anywhere on the planet. The Sabre even features an integral water-to-water heat exchanger for precise control of cooling water to the laser head, better heat management and increased tube lifetime.

## **User-friendly technology.**

On your command, Search-and-Peak automatically adjusts the laser cavity for optimum performance. Tedious manual laser adjustments are a

thing of the past because Search-and-Peak is activated from either the compact remote module or the digital data interface. You never have to touch the head in order to assure peak performance. Even in the unlikely event that lasing ceases due to a handling mishap, Search-and-Peak automatically re-acquires lasing and peaks the system — all in a matter of moments.

Sabre rewrites the book on ease-of-use. A compact LCD remote module controls every function at the touch of a button, from power-up and peaking, to selection of a pre-programmed operating condition, to shutter control and shut-down. Furthermore, an optional cable extension can increase the remote module's operating distance to 300M (1000 ft.) from the standard 4.9M (16 ft.).

You can operate the Sabre via computer with an industry-standard RS-232/422 interface or an optional IEEE-488 interface. The digital interface provides complete control over all operating parameters, and delivers comprehensive diagnostics — from anywhere on the globe. Detailed documentation makes for trouble-free interfacing and programming.

An integral, remotely-controlled shutter mechanism prevents light from leaving the laser head, but does not interrupt lasing like an intracavity

shutter. This is highly desirable when you need to interrupt the beam without altering laser operating parameters.

Sabre's automated features heighten its reliability because the potential for human error is significantly reduced. This puts the Sabre in a class by itself for stable long-term performance and positive return-on-investment.

#### **Comprehensive product line.**

Several models are available to meet both your spectral and output power requirements. Sabre SkyLight™ Argon is specified at 20W or 30W all-lines blue-green output power. Sabre SkyLight Krypton delivers 4.5W or 6W all-lines red, and Sabre PureLight™ mixed-gas models produce 10W or 13W multiline white light.

#### **Superior design.**

From the rigid baseplate up, one look at a Sabre tells you this is an exceptionally rugged design. A high-thermal-mass, low-expansion SuperInvar resonator provides the ultimate in passive fundamental stabilization for unwavering output power and exceptional beam pointing. Where passive stabilization ends, Coherent's exclusive PowerTrack takes over. The PowerTrack active-cavity stabilization system further enhances passive stability by ensuring the highest power, lowest optical noise and best possible transverse mode structure at any given operating current.



#### **Exceptional tube lifetime.**

The heart of each Sabre is the renowned Series-V™ Innova plasma tube — the result of years of continuous refinement in both the design and manufacturing of metal-ceramic technology. Precise gas pressure dynamics in the Series-V extend tube lifetime by eliminating cathode sagging. Series-V mixed-gas tubes also provide superior color balance over the lifetime of the tube. The sealed-mirror design utilized in the SkyLight Argon and PureLight models further extends lifetimes by eliminating anode-end Brewster window degradation and its associated power loss.

#### **Excellent stability and reliability.**

Heat management in the laser head is critical to plasma tube lifetime. The Sabre system features as standard equipment an integral water-to-water heat exchanger that monitors and precisely controls cooling-water flow, purity, and temperature, insuring optimum heat transfer and maximum head stability. The exchanger also guards against both condensation in the head and rapid thermal shocks to the tube, and a shut-down cycle gradually stabilizes the head temperature after shut-down. Also, because the exchanger is a closed-loop, there's never a concern of water contamination and its adverse effects on the plasma tube.

#### **Rapid installation.**

Sabre travels exceptionally well for its size. After arriving on location, lasing occurs immediately. If not, Search-and-Peak re-acquires lasing and peaks the system within a few moments. PowerTrack then locks-in the cavity to ensure that the power you set is delivered.

# PureLight

## Output Power Specifications<sup>1</sup> and Typical Beam Parameters

	Wavelength Range	Output Power	Beam Diameter	Beam Divergence
Argon (SM)	(nm)	(W)	(mm) <sup>2</sup>	(mrad) <sup>3</sup>
Sabre SkyLight Argon 20	457.9 – 514.5	<b>20.0</b>	2.6	0.70
Sabre SkyLight Argon 30	457.9 – 514.5	<b>30.0</b>	2.6	0.70
Sabre SkyLight Argon Low Divergence	457.9 – 514.5	<b>25.0</b>	2.7	0.50
<b>Krypton (DBW)</b>				
Sabre SkyLight Krypton	647.1 – 676.4	<b>6.0</b>	2.7	1.20
Sabre SkyLight Krypton Low Divergence	647.1 – 676.4	<b>4.5</b>	2.3	0.60
<b>Mixed-Gas (SM)</b>				
Sabre PureLight	457.9 – 647.1	<b>13.0</b>		
Sabre PureLight Low Divergence	457.9 – 647.1	<b>10.0</b>		

SkyLight

## Typical Output Power Distribution and Beam Parameters, Mixed-Gas Models<sup>4</sup>

Wavelength (nm)	Relative Power (% of total output)	Sabre PureLight		Sabre PureLight Low-Divergence	
		Beam Diameter (mm) <sup>2</sup>	Beam Divergence (mrad) <sup>3</sup>	Beam Diameter (mm)	Beam Divergence (mrad)
Red 647.1	31.0	3.4	1.30	2.2	0.70
Yellow 575.3	1.5	3.0	1.25	1.7	0.50
Green 520.8-496.5	35.0	3.4	1.45	2.3	0.75
Blue 488.0-476.2	30.0	3.5	1.50	2.6	0.80
Deep Blue 457.9	2.5	3.4	1.45	2.5	0.80

## Outdoor Usage Information<sup>5</sup>

	Output Power (W) <sup>6</sup>	Beam Divergence (determined with 1/e <sup>2</sup> values) (mrad) <sup>7</sup>	Nominal Ocular Hazard Distance <sup>8, 10</sup> (mi/km)	Sensitive Zone Exposure Distance <sup>9, 10</sup> (mi/km)
Sabre SkyLight A 20	20.0	0.50	1.23/1.98	6.29/10.12
Sabre SkyLight A 30	30.0	0.50	1.52/2.44	7.69/12.37
Sabre SkyLight A LD	25.0	0.35	1.97/3.17	10.02/16.12
Sabre SkyLight K	6.0	0.85	0.40/0.64	2.03/3.26
Sabre SkyLight K LD	4.5	0.42	0.70/1.13	3.54/5.70
Sabre PureLight	13.0	1.00	0.51/0.82	2.54/4.08
Sabre PureLight LD	10.0	0.50	0.87/1.40	4.45/7.16

<sup>1</sup> Numbers in bold are guaranteed output. All other figures are typical performance. SM = Sealed Mirror. DBW = Dual Brewster Window.

<sup>2</sup> Beam diameter at the 1/e<sup>2</sup> points measured at the output coupler.

<sup>3</sup> Full angle, determined with 1/e<sup>2</sup> values.

<sup>4</sup> Not warranted specifications.

<sup>5</sup> Based on U.S. FAA documentation 7400.2D Chapter 34, Outdoor Laser/High Intensity Light Demonstrations, and CDRH Laser Notice 47, as they appear at the time of printing.

The distances represented are based on unobstructed beams projected above the horizon. No corrections have been made for atmospheric effects. Consult your local, state, or federal regulatory authorities for details and permits relating to your installation. This table is intended only as a guideline. Coherent assumes no responsibility for the accuracy of the table, or damages or legal action resulting from the use thereof.

<sup>6</sup> All-lines specified output power. Distances are calculated on specified power only.

<sup>7</sup> Divergence value for 1/e points approximated by dividing average 1/e<sup>2</sup> value by 1.414. Measured values may differ.

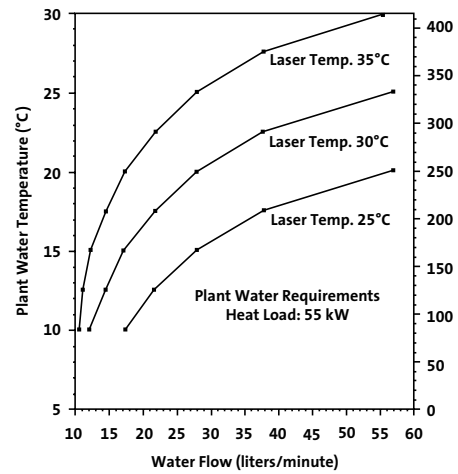
<sup>8</sup> The distance along the axis of the unobstructed beam from the laser to the eye, beyond which the irradiance is not expected to exceed that which would cause hazardous or adverse biological changes in the eye or skin. Maximum Permissible Exposure (MPE) is 2.6 mW/cm<sup>2</sup>.

<sup>9</sup> The distance along the axis of the unobstructed beam from the laser to the eye, beyond which the irradiance is not expected to exceed 100 µW/cm<sup>2</sup>. This is equivalent to 25 µW/cm<sup>2</sup> maximum radiant exposure in one-quarter second or less. Will begin to produce after-image flash-blinding effects if short duration. May affect flight crews. Not allowable for navigable airspace at horizontal ranges in excess of the reasonable range of effectiveness for the means used to detect possible aircraft intrusion in the projection space.

<sup>10</sup> Distances represent the minimum airspace to be protected both horizontally and vertically from the laser source. However, when the beam is projected or reflected above horizontal, but less than 90 degrees vertically, the minimum altitude and horizontal distance requiring protection will actually be less than the distance shown. The minimum altitude can be found by: Altitude = Laser Distance x Sine (maximum) Elevation Angle. The minimum horizontal distance is given by Horizontal Distance = Laser Distance x Cosine (minimum) Elevation Angle.



## Minimum plant water requirements for Heat Exchanger



## Utility Requirements

Input Power	3-phase with ground
Voltage	480 vac $\pm 10\%$ , 50 or 60 Hz
Max. Current Draw	70 amp/phase @ 480 vac

Recommended plant water parameters:

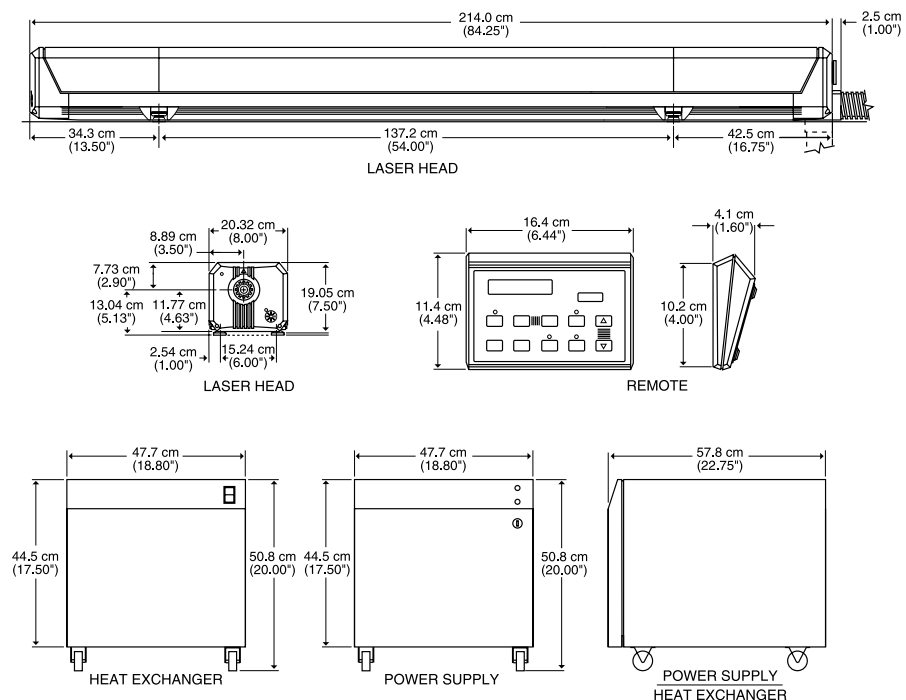
Temperature	$\geq 25^{\circ}\text{C}$
Pressure	$\geq 150\text{ kPa}$ (22 psi)

(Exact facility water requirements are specified in the pre-installation guide.)

## System Weights

	Crated
Laser Head	195 kg (430 lb)
Power Supply	134 kg (295 lb)
Heat Exchanger	102 kg (225 lb)
	Uncrated
Laser Head	109 kg (240 lb)
Power Supply	107 kg (235 lb)
Heat Exchanger	75 kg (165 lb)

## Dimensions



### Coherent as your partner.

To compete and succeed in today's fast-paced entertainment and display environments, you need a laser partner who understands your needs. A partner who can provide a wide range of technology solutions, and the support that goes with them.

Since 1966, Coherent has been helping customers by providing complete, laser-based solutions to a wide range of entertainment applications.

With a heritage of innovation and an uncompromising position on quality, Coherent is the most forward-thinking and diversified manufacturer of light show and display lasers.



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