

Selecting Your Laser



Confused About Lasers?

25,000mW!

Patients **FEEL** their treatment

The Most Advanced Pain Relieving Laser

More Power than a Class 4!

Covers the complete light spectrum

The Most Powerful Laser

2 minute treatment times

50 Watts of Super Pulsed Power!

Hands Free!



A lot of healthcare professionals find it difficult to understand all the claims made by laser manufacturers. Confusion is often compounded by statements that seem to be intended to misdirect your attention away from asking the right questions to make a truly informed decision. The following information is intended to shed some light on what you need to know...and what questions you need to ask.

Cellular reaction to photons is very similar to photosynthesis in plants.



HOW DO LASERS WORK?

The effects of Laser therapy are photochemical, not thermal. Photons enter the tissue and are absorbed in the mitochondria and at the cell membrane. The photonic energy is converted to chemical energy within the cell, in the form of ATP. Cell membrane permeability alters, then physiological changes occur. These physiological changes affect macrophages, fibroblasts, endothelial cells, mast cells, bradykinin and nerve conduction rates.

Reported benefits include:

- Rapid cell growth. Laser accelerates cellular reproduction and growth.
- Faster wound healing. Laser stimulates fibroblast development in damaged tissue, reducing recovery time.
- Increases metabolic activity through higher outputs of specific enzymes, greater oxygen and food particle loads on blood cells. Improves immune responses.
- Reduces fibrous tissue, reducing the formation of scar tissue following injury or surgery.
- Anti-inflammatory action for improved joint mobility.
- Increases vascular activity. Laser stimulates lymph and blood circulation.
- Lasers stimulate the process of nerve cell reconnection to bring numb areas back to life. Laser also increases the amplitude of action potentials to optimize muscle action.

WHERE DO I START?

When considering a Laser system for your clinic you should first decide what kind of conditions you plan to treat. Different Laser systems have different specifications which determine how they will perform and therefore how they will impact a patient.

In general, all Laser systems should be evaluated on the basis of how they balance **Output Power** and **Wavelength**. There are other important factors that will help you narrow your choices even farther, but the balance between a Laser's Output Power and the Wavelength produced by the Laser's diodes is the most important fundamental parameter that you need to know.

Some common applications for Laser therapy are:

- Wound Management
- Soft Tissue Injuries
- Inflammation
- Joint Conditions
- Arthritis
- Chronic Pain
- Dermatological Conditions
- Myofascial Trigger Point Therapy
- Acupuncture

TOTAL POWER IS NOT OUTPUT POWER

Total power (or peak power) is irrelevant. It is a Laser's OUTPUT power which you need to know in order to assess a Laser's true capabilities and determine if those capabilities are consistent with the kind of conditions that you plan to treat. Simply put, treatment times are inversely related to the average output power of any Laser. All other things being equal, the more average output power a Laser produces – the faster it can deliver the appropriate dose of energy required to complete a treatment. Output power (in conjunction with Wavelength) is also a major factor when evaluating a system's potential depth of penetration into tissue. Don't confuse a laser's TOTAL power with its true OUTPUT power.

For example, be careful when considering Laser systems that make statements about extremely high power like 25Watts - 50Watts (25,000mW - 50,000mW). These kinds of statements are usually referring to the system's total power, NOT output power, and in reality they are commonly Super Pulsed systems with very low output power.

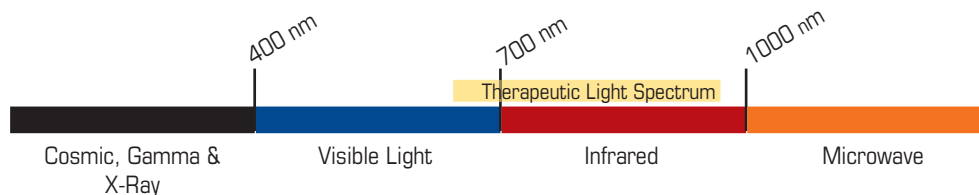
Understanding a Laser's output power is vital. If a supplier can't or won't tell you their Laser's actual output power (preferably broken down by individual laser diode output) – ask them – “Why not?”

WHY IS WAVELENGTH IMPORTANT?

When it comes to wavelengths, the optimum “therapeutic window” for Laser therapy is from about 650nm to 1000nm. Shorter wavelengths are extremely powerful (X-Rays, Ultraviolet, etc.) and can break the bonds of atoms and produce ions. Wavelengths that are longer than 1500nm are ineffective because water has a very high absorption rate at these wavelengths and since water is a major component of muscle tissue - this radiation doesn't penetrate much below the skin. Therefore, we are left with a range of wavelengths that are effective for treatment between 650nm and 1500nm where the radiation doesn't cause any damaging ionization (vs. <650nm) and which are able to penetrate beneath the skin and into the deeper tissues (vs. >1500nm).

Within this range between 650nm and 1500nm, it is the 650nm to 900nm range of Wavelengths that is most effective for therapeutic treatment^{4 5}. Wavelengths in the 650nm to 900nm range can penetrate deeper into tissues because the light beam's photons are not heavily absorbed by the hemoglobin and water in the treatment area tissue, and yet will not produce a lot of unwanted heat like Lasers which produce wavelengths over 900nm.

It is widely accepted that longer wavelengths (800nm-900nm) are the optimal treatment range and can penetrate deeper than those at the shorter end of this spectrum (650nm-800nm)^{4 5}. However, it is very important to always remember that output power has a major impact on a Laser's potential depth of penetration. For example, a 2,000mW (2Watt) Laser which produces a 700nm Wavelength will actually deliver a faster and deeper treatment than a 200mW (0.2Watt) Laser producing a 900nm Wavelength. This is why it is most important when evaluating a Laser or LED device to consider the balance between its Wavelength and actual Output Power. So again, if a supplier can't or won't tell you their Laser's actual output power (preferably broken down by individual laser diode output) – ask them – “Why not?”



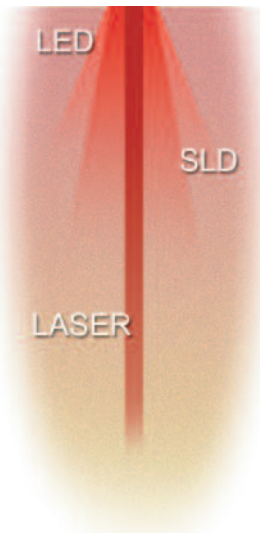
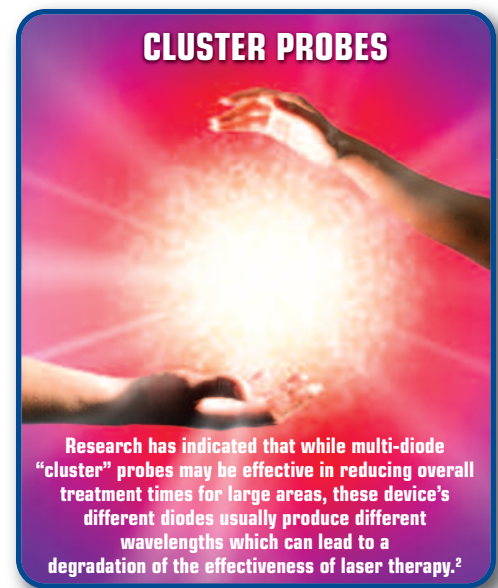
WHAT'S THE DIFFERENCE BETWEEN LASER DIODES AND LEDs OR SLDs?

For therapeutic treatments there are two types of light sources or Diodes which are most commonly used. They are Laser Diodes (LD) and Light Emitting Diodes (LED). Some devices that call themselves Laser systems use another light source called an Super Luminous Diode) SLD. All of these sources usually produce Visible Red (VR) or Infra-Red (IR) light. Most of these Diodes emit light in the 600nm - 900nm Wavelength range.

There are significant differences in how these different light sources function

- **Laser Diodes** are Monochromatic and therefore emit only a single color of light and one Wavelength within a very narrow bandwidth range of .1nm to 1 nm.
- **LEDs** also appear to the naked eye to emit a single light color, however they actually produce light Wavelengths in a narrow bandwidth range of about 30nm to 60nm.
- **SLDs** emit in an even wider range and are therefore not often used, or are used only as a “supplementary” light source to Laser or LEDs and are therefore not critical to this discussion.

Laser Diodes emit light waves that are highly organized, directional and “in-phase” which are called “coherent” light. LEDs emit light waves that are not as organized or directional, and which are “out-of-phase” called “non-coherent” light. Assuming the same Output Power, we can expect the light emitted by a Laser Diode to penetrate deeper than the light emitted by an LED Diode, because the light from a Laser Diode is coherent, brighter and more directional than LEDs. Laser diodes are much more expensive to manufacturer and therefore, cost more than LEDs or SLDs.



BEAM AREA

Average Output Power (Not Total Power) & Wavelengths are necessary information, but is not enough information to accurately define the parameters of the laser system. To do this, one must also know the area of the laser beam (cm²) at the treatment surface to calculate energy density.

Research indicates that Energy Densities in the range 0.5 to 4 Joules/cm² are most effective in triggering a photobiological response in tissue.³ Again, if a supplier can't or won't tell you it's Laser's beam area (cm²) – ask them – “Why not?”

$$\text{Energy Density} = \frac{\text{Laser Output Power (Watts)} \times \text{Time (seconds)}}{\text{Beam Area (cm}^2\text{)}} \\ \text{(Joules/cm}^2\text{)}$$

CONTINUOUS, PULSED & SUPER PULSED

Again, don't be confused by these terminologies. As the words suggest; “Continuous” simply refers to a Laser capable of delivering a continuous beam of light energy, while the terms “Pulsed” and “Super Pulsed” simply mean the Laser beam is repeatedly turned on and off in order to reduce thermal responses in surface tissue. These different delivery methods are used to achieve different therapeutic objectives but cannot and do not increase or “boost” a Laser's output power.

HOW DO I CHOOSE THE RIGHT LASER SYSTEM (OR PROBE) FOR MY PRACTICE?

If a supplier is not being forthcoming with their laser's true specifications, you can turn to their international safety rating to get a basic understanding. Every laser on the market is tested for its hazard and risk level. In general, Class I Laser systems use VERY LOW Output Power and are therefore very safe, even for direct exposure to eyes and are sometimes marketed for patients to use at home. At the other end of the scale are Class IV Laser devices that use very HIGH Output Power (more than 500mW or 0.5 Watts) and require the use of strict Safety Protocols.

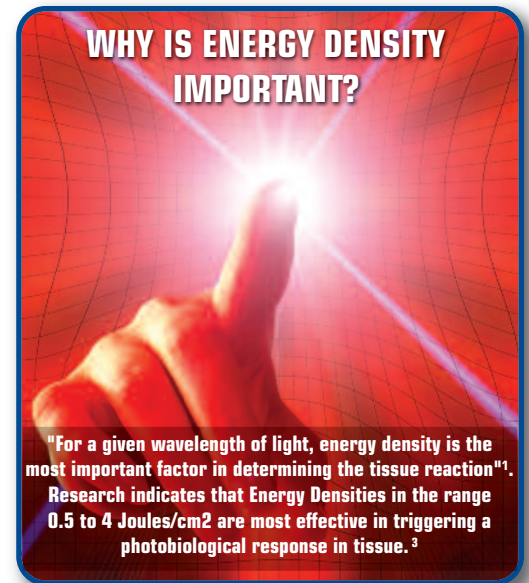


General Treatment Guidelines

- If your focus is deep tissue and musculoskeletal conditions and occasionally treat superficial conditions (wounds, etc.) – It makes sense to choose a device with true InfraRed (IR) Laser diodes in a cluster probe with at least 500 mW of Output power or more.
- If you prefer short treatment times of 1 - 2 minutes and still want to be able to treat deep tissue conditions – You should choose a device with true Laser diodes and with output power of 1,000 mW – 5,000 mW (1Watt - 5Watts).
- If you do NOT want to treat deep tissue conditions and your focus is primarily treating peripheral neuropathy and/or superficial wounds and skin conditions – You might consider an inexpensive LED device since deep penetration is not needed and true Laser Diodes are very expensive. Keep in mind though that true InfraRed (IR) Lasers also work very well for superficial conditions, they are just more expensive and difficult to cost-justify unless you also do deep tissue treatments.
- If you want to treat acupuncture points or practice auriculotherapy – Consider choosing a small IR or Red Laser “point probe” with at least 50 mW to 500 mW of Output Power.
- For analgesic treatments you will require a true Laser probe with 5,000 mW – 10,000 mW of output power, or a 2,000 mW – 4,000 mW probe with slightly longer treatment times.

MY LASER SHOPPING LIST

- ✓ The minimum “Output” power of the probe that I need is _____ Watts
- ✓ I am comfortable with wavelengths within the range of _____nm to _____nm
- ✓ I have decided to use laser diodes _____ OR inexpensive LEDs _____
- ✓ I have assured the Energy Density of my probe is at least 0.5 Joules/cm²





Treatment Time Comparison for Different Output Powers Using Internationally Recognized Standard Formula

Using a common dosage of 400 Joules to treat a 100 cm² area for deep lying lumbar pain as an example, below are some examples of treatment time calculations for different output powers. Please note, these examples assume the wavelengths are in the therapeutic window and that all other parameters are sufficient for therapy.

$$\text{Treatment Time} = \frac{\text{Joules (dosage)}}{\text{Output Power in Watts}}$$

Example 1
Laser with diodes totaling 4 Watts

$$\frac{400 \text{ Joules}}{4 \text{ Watts}} = \text{Treatment Time is } \mathbf{100 \text{ seconds}}$$

(1.66 minutes)

Example 2
Laser with diodes totaling 200 mW

$$\frac{400 \text{ Joules}}{0.2 \text{ Watts}} = \text{Treatment Time is } \mathbf{2,000 \text{ seconds}}$$

(33.33 minutes)

Example 3
Laser with diodes totaling 20 mW

$$\frac{400 \text{ Joules}}{0.02 \text{ Watts}} = \text{Treatment Time is } \mathbf{20,000 \text{ seconds}}$$

(333.33 minutes)

We have created this comparison based on the available information for each of these lasers. We have consistently used the highest power version (probe) of the unit for each brand and its price. We welcome the feedback and updated technical specifications from any manufacturer that believes their true output power varies significantly from the chart below.

Name / Model	Approximate Price	FDA Safety Classification	Output Watts	Classification Description Details	Comments
K-LASER™	\$21,500	CLASS 4	12 Watts	High Power Laser Over 500 mW Protective Eyewear & Full Safety Requirements must be followed.	Full Therapeutic Laser with Low Treatment Times
LiteCure®	\$20,000	CLASS 4	10 Watts		
APOLLO	\$7,300	CLASS 4	4 Watts (x 2 channels for 8 Watts)		
Vectra Genisys®	\$5,300	Class 3B	1040 mw	Medium Power Laser 5 mW - 500 mW Protective Eyewear & Full Safety Requirements must be followed	Therapeutic Laser. Longer treatment times required due to lower output power. In units closer to the 5mW total output power range, treatment times will be dramatically increased.
Theralase®	\$15,000	Class 3B	600 mW		
Rich-Mar® LaserPrism	\$4000* *with electrotherapy unit	Class 3B	200 mW		
MedX®	\$3800	Class 3B	200 mW		
BioFlex®	\$13,000 Therapist \$27,300 Professional	Class 3B	200 mW		
Erchonia®	\$9,900	Class 3B	20 mW		
Multi Radiance Medical®	\$5,800	Class 1M (provided by the manufacturer)	Not provided on website	Very Low Power Laser Total output power is below Class 3B Class 1M are exempt from all beam-hazard control measures like protective eyewear	For precise specifications on this laser safety class refer to International Electrotechnical Commission IEC 60825-1 and ANSI Z136.1 available for purchase online from their websites

We used the FDA Laser Safety Classification because they offer more classification levels than Health Canada. We believe this makes understanding the output power of the various brands available in the Canadian market easier.

- Baxter, G.D. (1994) Therapeutic Lasers: Theory and Practice. Churchill Livingstone: Edinburgh
- Kuru, T. (1198) The Science of Low-Power Laser Therapy. Gordon & Breach Science Publishers, p.xv
- Mester & Mester, (1989) Wound Healing. Laser Therapy 1: 7-15
- Anderson, RR, Parrish JA (1981): "The Optics of Human Skin"; The Journal of Investigative Dermatology
- Zhao ZQ, Fairchild PW (1998): "Dependence of light transmission through human skin on incident beam diameter at different wavelengths"



**Now that you are comparing Apples to Apples,
Choose the Best Laser Value in Canada for
Deep Tissue, Musculoskeletal Work.**



Aerospace grade aluminum probe. Not Plastic.



**Expert
Corner**

"The Apollo Laser is by far the best piece of therapy equipment I've bought in my 25 years of practice.

It's extremely effective, easy to operate, and allows for quick treatment times. We've had great results with both acute and chronic conditions. Patients have been so pleased with results that we get direct referrals for Laser Therapy regularly. I am very happy with the unit."

Dr. Robert Kunisch

The Apollo PowerMAX™ has 2 independent channels for 2 separate treatments!
Deliver up to 240 Joules per minute, per probe!

Apollo has over 20 years of collaborative research and data to solidify the effectiveness of this 8W laser (2 probes at 4 Watt each). This well established product line features both a portable laser as well as the PowerMAX desktop.

Apollo uses premium medical grade Class 4 (Class IIIb in Canada) laser diodes that provide extra long life and reliability.

Apollo Portable Laser Features:

- Custom, Quality Carrying Case
- External battery with NiMH Rechargeable Cells
- Battery charge circuitry: Fast charge 3 hours; Trickle charge overnight;
- Battery Life: Based on probe used:
 - 500 mW probe ~ 60 four minute treatments
 - 3000 mW probe ~ 40 one minute and 20 second treatments

Apollo 2-Channel PowerMAX™ Desktop Laser Features:

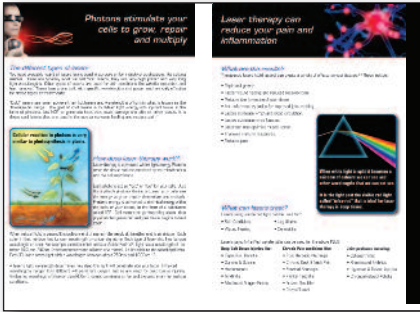
- Heavy-duty construction for office and clinic environments
- Cold laser with 2 independent channels and two timers so 2 treatments can occur at once.
- Allows practitioners to treat two patients at the same time or treat one patient with 2 probes
- Choice of 500 mW, 3000 mW or 4000 mW probes
- Custom, Quality Carrying Case



**Get 100 Patient Booklets
Free with any unit**



These 8 page booklets “teach” your patients about laser therapy, treatment times and what to expect in an easy-to-understand format.



Diode testing done in clinic!



Built-in Probe Tester

Allows you to conduct your equipment testing free with no downtime, if so mandated by your governing body.

Our Fully Disclosed Specifications

4000mW Cluster Probe: (only available with Desktop version)

- Emitter Wavelength: 810nm
- Beam Divergence: 9° x 38°
- Total Power Output: 4000mW
- Polarization: Linear
- NOHD: 80cm
- Total Energy delivery per minute: 240 Joules, 91 J/cm2
- Treatment Time for 4 J/cm2: 2.65 seconds
- No. of Emitters: 4
- Optical Output Power per emitter: 1000mW
- Aperture: 25mm
- Spot Size: 2.7 x 21mm, 0.567cm2
- 1/e2 Power Density (Irradiance): 1.51W/cm2

3000mW Cluster Probe:

- Emitter Wavelength: 810nm
- Beam Divergence: 9° x 38°
- Total Power Output: 3000mW
- Polarization: Linear
- NOHD: 80cm
- Total Energy delivery per minute: 180 Joules, 72 J/cm2
- Treatment Time for 4 J/cm2: 3.51 seconds
- No. of Emitters: 4
- Optical Output Power per emitter: 750mW
- Aperture: 25mm
- Spot Size: 2.7 x 21mm, 0.567cm2
- 1/e2 Power Density (Irradiance): 1.19W/cm2

500mW Single Diode Point Probe (For hands and small areas):

- Applicator Type: 500-S
- Emitter Wavelength: 810nm
- Beam Divergence: 9° x 38°
- Aperture: 9.5mm
- Spot Size: 1.7 x 9.5mm, 0.161cm2
- NOHD: 80cm
- Total Energy delivery/min: 30 Joules, 167.4 J/cm2
- Emitter Type: GaAlAs Semiconductor Laser
- No. of Emitters: 1
- Total Power Output: 500mW
- Polarization: Linear
- 1/e2 Power Density (Irradiance): 2.79W/cm2
- Treatment Time for 4 J/cm2: 1.43 seconds

All Apollo Laser Systems Feature:

- LCD display that provides probe status and treatment times
- User controlled treatment times
- Built-in safety and fault detection software
- Built-in power test for assessing probe output
- Durable aerospace quality aluminum assembly
- 2-year warranty on main system and 1 year on battery and cables

All Apollo Laser Systems Include:

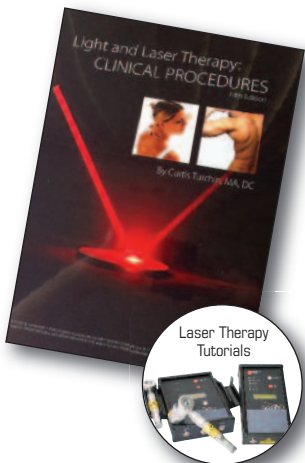
- Apollo Control Unit, Desktop or Portable
- Choice of laser probes: 3000mW, 500mW or 4000mW/desktop only
- Power Adapter
- Probe Cable
- 1 pair of Safety Eye Wear
- Laser Carrying Case
- Book: Light & Laser Therapy: Clinical Procedures
- Laser tutorial DVD with systems overview



500mW Probe for hands and small areas

Training & Support

- 3 months support from Dr. Turchin, world renowned, published laser expert
- Laser Tutorial DVD
- Laser Guide “Light and Laser Therapy: Clinical Procedures”



Platinum Warranty Protection

Your Apollo laser is covered by our Platinum Service Warranty Program.





*Vitality Depot offers a variety of laser systems.
We look forward to assisting you in your laser selection.
We are Canada's leading therapy product provider.*

Everyday, Reliable Value

 **VITALITY DEPOT**

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