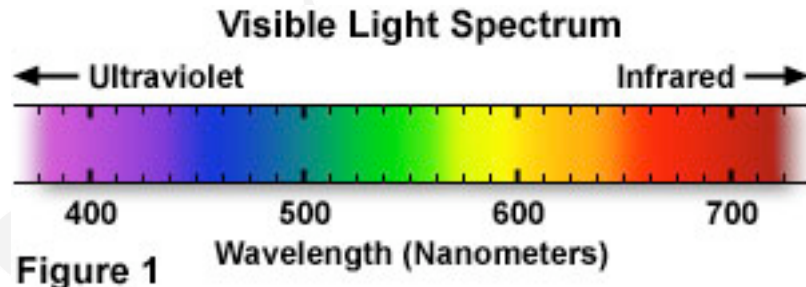




## Explanation of Energy Terms

### Light is Energy

It is easy to disbelieve that light is usable energy. We live among many devices that use radiant energy, that they have become invisible. Radios receive radio frequency waves and translate it into music (sound waves). Televisions receive high frequency waves, either by air or through a cable. We cook our food with microwaves. The list goes on. Not to mention the most important source, our Sun.



The wavelength of light is measured in nm (nanometers). Visible light extends from deep violet (~ 390 nm) to deep red (~ 750nm).

Smaller wavelength light contains more energy than longer wavelength light.

### How big is a nanometer?

From the name, we can imagine that it is very small. Most metric measurements are divided into steps of 1000. A meter, is slightly smaller than a yard. There are 100 centimeters (cm) in a meter (2.5 cm to an inch). There are 1000 millimeters (mm), 1,000,000 micrometers (um) and 1,000,000,000 (a billion) nanometers (nm) to a meter. So the measurements of wavelength used to describe visible light are quite small.

What are the energy measurements for LED light

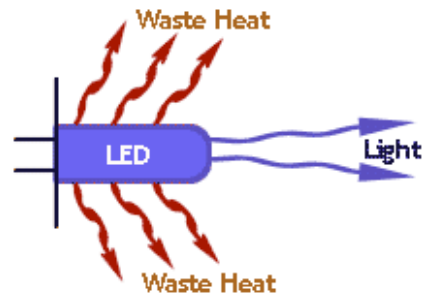
The amount of energy deposited on a surface is measured as Watts. It is made more comparable by specifying the Watts in a unit of area.

For LED light, the common units of phototherapy are mWatt/cm<sup>2</sup>. (There are 1000 mWatts in a Watt).

The effect of energy deposited on a surface also depends on the amount of time, is known as power, measured in Joules. The measurement of power at a surface is a Joule, defined as a Watt deposited in one second for a defined area.

In phototherapy the effective range is 1 – 30 Joules/cm<sup>2</sup>.

## Spectral Power vs. Total Power - which is important?

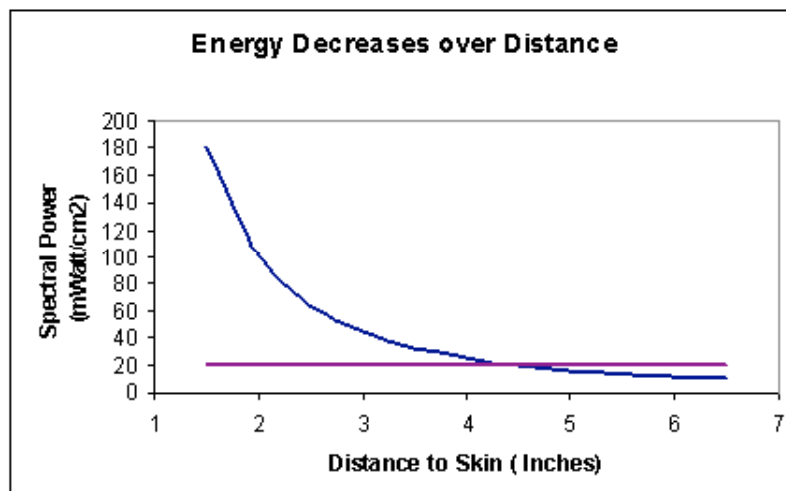


While most manufacturers offer their specifications in total power output, Med-Aesthetic Solutions devices are tested for spectral power output.

Total power output includes the large amount of waste heat that is created by energizing the LEDs. Usually 3/4 of total power is wasted as heat.

It is the spectral power (the light) that makes changes in the skin.

## Loss of Energy over Distance



Many manufacturers list the energy emitted at the face of the device, rather than at the surface of the skin. It is important to know that the energy declines as the inverse square of the distance ( $1/d^2$ ), which is an exponential lessening of strength.

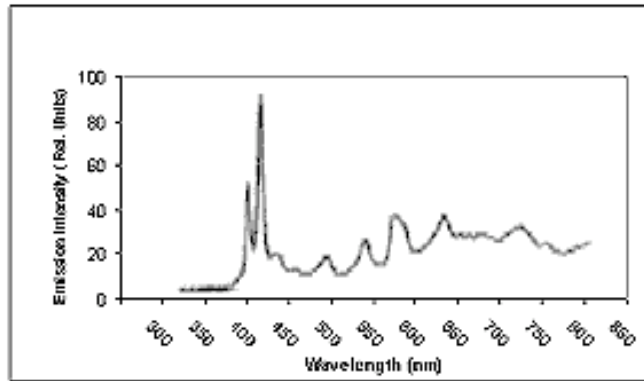
This means that at 4.5 inches from the surface, the spectral energy intensity has decreased 130-fold!

Therefore, The *MAStique Light Skin Rejuvenation System* requires 2612 mWatt/cm<sup>2</sup> blue light at the device surface to yield 20 mWatts/cm<sup>2</sup> to the skin surface.

## What is Precision Light Therapy

Light sufficient in intensity for phototherapy. Lasers, LEDs or an older technology based on fluorescent tubes, generate this. What is the difference?

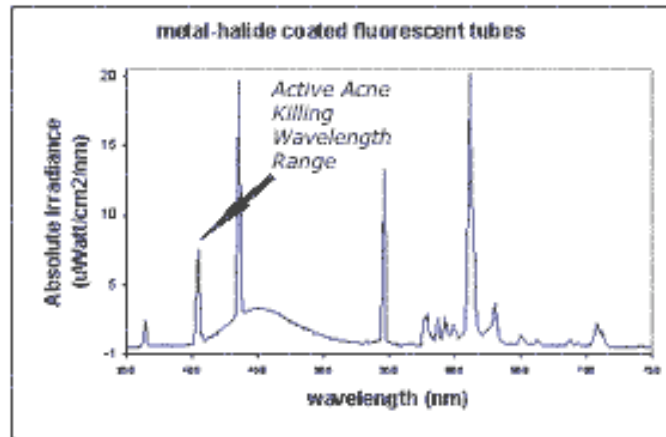
### Fluorescent Tubes



A figure taken from Shalita et al shows that the light generated from fluorescent tubes is very mixed.

There are several wavelengths in the blue range, as well as additional small components in the green-red ranges.

The UV range is not assessed in this figure.



We analyzed the output of a metal halide-coated fluorescent lamp, similar to ClearLight.

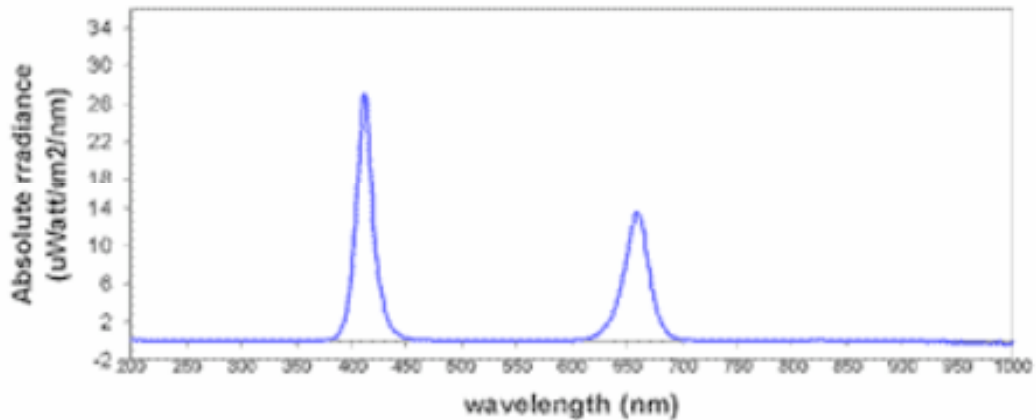
The spectrum shows that the blue light content in the FDA-accepted wavelength range of 405 – 420 nm is a small portion of the entire output - < 5%

The technology used to make metal-halide coated fluorescent tubes cannot produce uniform coatings. Therefore these devices vary tremendously in output and composition.

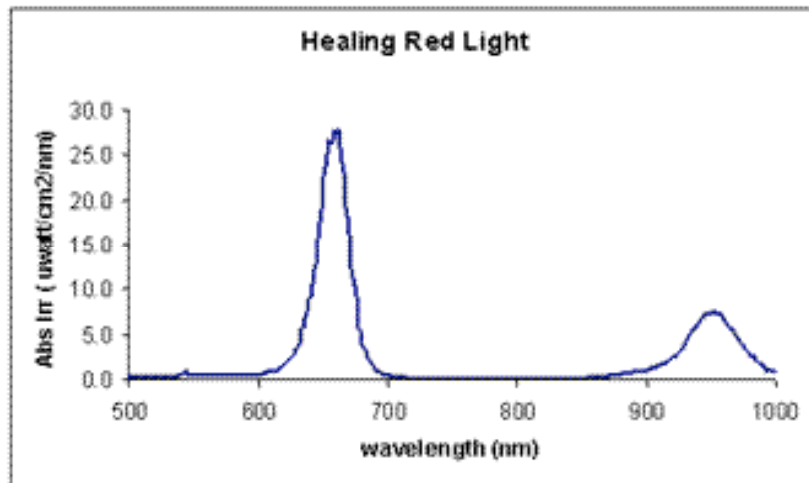
## The *MAStique Light* Difference

The technology used to make LEDs produces a very uniform product from batch to batch, so that every *MAStique Light Rejuvenation System* will deliver the same wavelengths and intensities. Each device is measured to certify the output before release for use.

### *MAStique Light*



However, 100% of the output of the *MAStique Light* for the treatment of Acne is focused into the two wavelengths known to kill acne bacteria (414 nm) and promote skin repair (660 nm). No other wavelengths are emitted



Similarly, 100% of the output of the Skin Rejuvenation/Healing Red mode is focused into two active wavelengths that pertain to anti-aging treatments.

Red light at 660 nm (left hand peak) stimulates skin cell growth and improves collagen networks.

Near Infrared light at 940 (right hand peak) expands capillaries causing better tissue oxygenation and improved access to nutrients, growth factors and the immune system.

**The *MAStique Light Skin Rejuvenation System*, is the only system on the market today to offer four wavelengths in one treatment head:**

**The 4 light settings are:**

- **Blue** for *Acne* (kills sub-surface bacteria that causes pimples) / 9-minute program
- **Red & Blue** for *Acne, Acne scars & pigment* / 20-minute program
- **Red & Amber** for *Skin Rejuvenation* (i.e. superficial reds & browns on the skin) / 20-minute program
- **Red & Near Infra-Red (NIR)** for pigment and collagen stimulation (skin tightening) / 20-minute program

### **How is LED Phototherapy Different from Laser Therapies?**

LEDs are manufactured to give a very narrow range of high intensity light. Unlike lasers a large number of types are available, with different wavelengths, intensities and optical properties.

#### **Laser Equipment**

- Laser energy output is much more powerful than LED, requiring substantial time and commitment to training.
- Lasers are available in a limited number of wavelengths and configurations.
- Generally laser output devices are small, comparable to wands in coverage.
- Many laser treatments depend on some form of partial or permanent thermal energy to the underlying tissue.
- Many laser treatments must use pulse control to avoid serious damage to skin tissue.

#### **LED Equipment**

- LED phototherapies depend on changing the function of molecules used in critical cellular functions by virtue of their unique light absorbance signatures.
- LED equipment generates 1 - 20 joules/cm<sup>2</sup>.
- There are no known side effects on skin tissue due to over exposure.
- LED phototherapies employing lower wavelengths (<500 nm) should be used in conjunction with eye protection for both client and operator.
- Do not require extensive cooling, or electronic control
- Are more compact and portable
- Require less training to use
- Safer for client and operator
- More affordable