SUNPULSE®

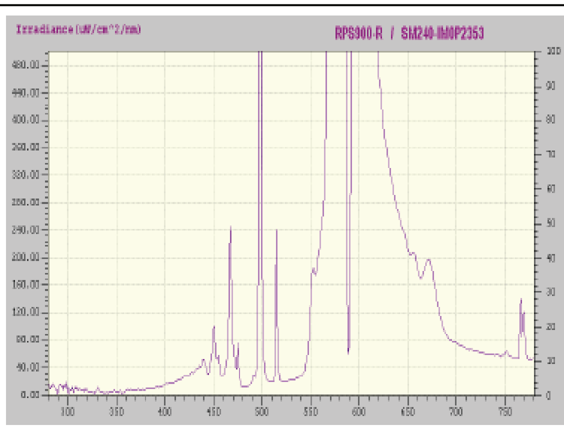
White Paper
2009

Sun Pulse Vs. High Pressure Sodium

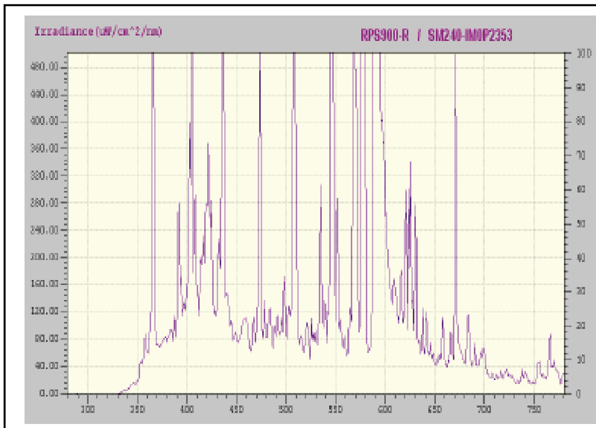
Sun Pulse Lamps are specially formulated for plants and living things and are designed for use on certified electronic and digital electronic HID ballasts. High frequency HID electronic ballasts (22 kHz+), are very different than the traditional 60Hz core and coil magnetic ballasts that have been in horticulture for over 30 years. High frequency ballasts need high frequency lamps. Using a 60Hz lamp on a 22kHz or higher ballast will result in the premature failure of the 60Hz lamp. High frequency acoustic and magnetic resonances cause 60 hertz parts failures in the lamps, and a major 60 hertz lamp manufacturer has stated for the record that their lamps & others cannot be used on electronic ballasts and get proper performance.

HPS Light (**pictured below left**) is missing spectral information in the left portion of the graph, which the Sun would normally provide. You can also see the wide, bandwidth narrowed portion of the HPS graph which represents the reds and oranges we see in the sodium lamps. Too much light clips the photo-receptors in the leaf, and causes "photo-inhibition", that will stop the photosynthetic process in the leaf.

Sun Pulse Lamps, (**pictured below righ**t), shows a spectral graph that has "wave form linearity", or a shape that is more like the Sun's graph as it hits the Earth. (see back page for the Sun Graph). The Sun provides all the colors, all the time, that's evolution. The Sun is high frequency, full spectrum light, and that's what Sun Pulse provides digitally, light more like the Sun.



High Pressure Sodium Lamps



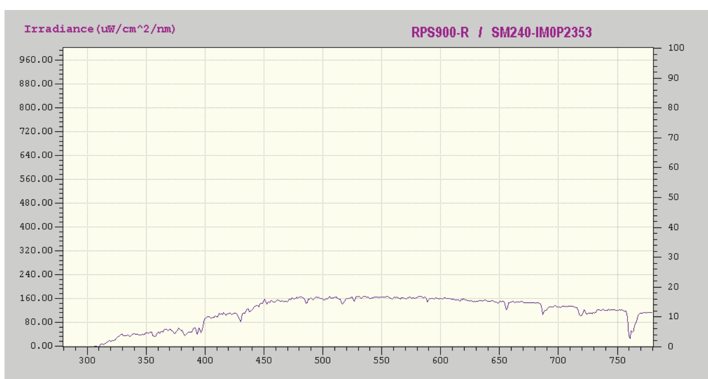
Sun Pulse Lamps

The spectral graphs above show three HPS lamps (left) and three Sun Pulse lamps (right) in a 30"x30"x26.75" Hood w/ glass at a 30" Distance
Horizontal axis expresses wavelength and vertical axis is measured in watts per centimeter squared. Independent testing by Elite Engineering Inc., IL

Spectral Energy Graph

Wavelength *(nm)*	Color	*J / mol*	Energy *kcal / mol*	*eV / photon*
700	**Red**	**17.10×10^4**	**40.87**	**1.77**
650	**Orange-red**	**18.40×10^4**	**43.98**	**1.91**
600	**Yellow**	**19.95×10^4**	**47.68**	**2.07**
500	**Blue**	**23.95×10^4**	**57.24**	**2.48**
400	**Violet**	**23.93×10^4**	**71.53**	**3.10**

The chart above expresses the energy of each of the colors of the spectrum. Red Light has the fewest electron volts per photon. Electron volts per photon = Incident energy for the plant leaves. Plants require these electron volts, but you can't light a solar panel with a red light only; it has the least amount of energy of any color. A violet light will light a solar panel because it has twice the electron volts per photon.



(Pictured above: The Sun – 30° Lat. – 12:00PM – June 20, 2008)
Plants just want the Sun, (**Pictured above**). This is what evolution has provided them for millions of years, and we can't re-invent what the plant requires. The graph shows a maximum irradiance of 160 watts per centimeter squared. Plants have never evolved to receive more than that amount of Sunlight. Looking at the HPS chart
(side A), you'll see that a majority of that light is being delivered over the 160 watts per centimeter squared mark. All that excess light is being converted to heat by the plants, and isn't used at all.