

Application Note- Lightsaber Technology, Fact or Fiction?

Star Wars has taken over the galaxy, and the box office and the toy aisles, and with regular movie installments planned over the next several years, and Disney World opening up Star Wars: Galaxy's Edge in 2019, there seems to be no end in sight. So get out your lightsabers, and let's measure the lasers in these laser swords.



“This is the weapon of a Jedi Knight. Not as clumsy or random as a blaster. An elegant weapon, for a more civilized age.” - Obi-Wan Kenobi, A New Hope, 1977

Unless you've been living in the Outer Rim, you know that a Jedi's weapon is a lightsaber, also known as a laser sword. Good guys tend to have green (Luke Skywalker), blue (Obi-Wan Kenobi) and occasionally other colors like purple, while those who associate with the “Dark Side” of the force have red lightsabers (Darth Vader).

Lightsaber Color	Wielded by...	Meaning
Green	Luke Skywalker	Peace through force, when necessary
Blue	Obi-Wan Kenobi	Justice and protection
Purple	Mace Windu	Moral ambiguity
White	Ahsoka Tano	Calm and clear
Red	Darth Vader, and most Sith	Evil and power
Yellow	Jedi Temple Guards	Strength on the Light side

What gives a lightsaber its color? The color of the lightsaber, according to Jedi lore, is derived from the color of the kyber saber crystal, which is at the heart of the lightsaber. Except, of course, for the case of the red lightsabers, which have been turned red from the dark side.

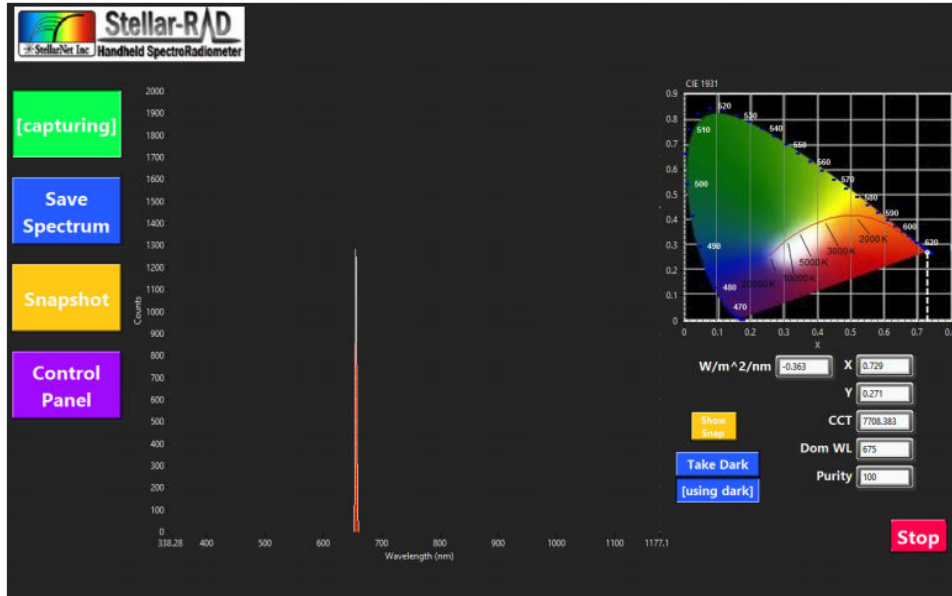
What about your young Padawan's lightsaber? Any trip to a store that sells toys will yield the opportunity to purchase and own your very own lightsaber. There are those that collapse and extend, and those which just stay extended, but from our use of the force (and the [Stellar-RAD Handheld SpectroRadiometer](#)), none seem to actually be laser weapons. How do we know? We sensed it using the force, and also by taking spectra.



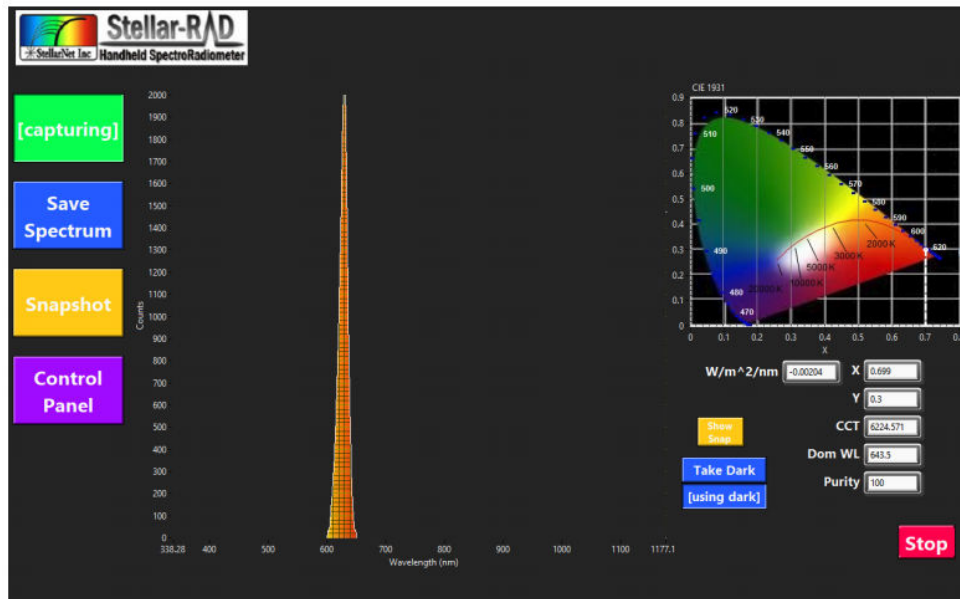


Technical Application Note

Below is a spectra taken of a red laser, using a common red laser pointer. Expectedly, the single wavelength of the solid-state coherent emission is evident in the singular peak.



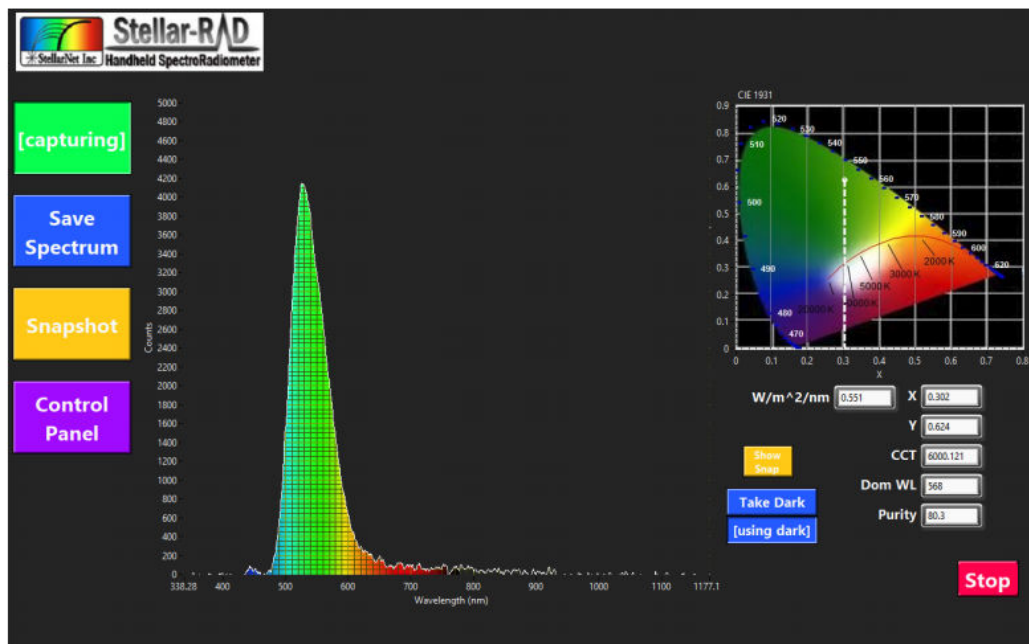
The next spectra below, taken from a red lightsaber, borrowed from a resident Sith-Lord-in-Training, emits a very different spectra. Noting that the spectrum is broader, clearly this padawan is not yet truly taken to the dark side... the plastic casing diffuses its LED sufficiently.





Technical Application Note

For the young Jedi in the house, wielding a green lightsaber, the video shows the real-time capture of the spectra when the lightsaber is engaged and disengaged. Viewing the spectra, one can see that, while green, the saber does reveal a tail into the red range. Does this mean our young padawan learner is conflicted, possibly leaning to the Dark Side? Only time will tell.



Watch the video here!

"The heart of the lightsaber, the crystal is."—Yoda

Kyber crystals were used by the Jedi and the Sith in the construction of their lightsabers.

According to the canon, "Crystals lacked color before they were chosen by a Jedi. Once chosen, most lightsabers became blue or green, though other shades were created in rare instances, most notably Mace Windu's purple blade, the yellow blades of the Jedi Temple Guards, the black Darksaber, and Ahsoka Tano's white lightsabers.

So if Kyber crystals were made of laser diodes, could this be their laser heritage?

-Happy International Day of Light
from the StellarNet Team

Star Wars	Visible Light Laser Diodes		
Lightsaber Wielder (if these laser crystals were used for kyber crystals)	Color	Crystal	Output wavelength
Mace Windu	Violet	Gallium Nitride	405 nm
Luke Skywalker	Blue	Indium Gallium Nitride	447 nm plus/minus 5 nm
Obi-Wan Kenobi	Green (diode-pumped solid-state laser, because laser diodes are not commonly available in this wavelength range)	Aluminium gallium arsenide (AlGaAs) Neodymium-doped yttrium aluminium garnet (Nd:YAG) Potassium titanyl phosphate (KTP)	808 nm 1064 nm Outputs 532 nm
Kylo Ren	Red	Aluminium gallium indium phosphide	635 nm
Darth Vader	Red	Indium gallium phosphide	650-660