



Forensic Light Source Applications: Wavelengths and Uses

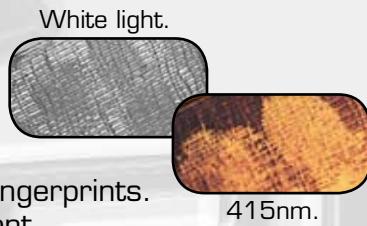
The Who, What, Where, and When of Wavelengths

A Forensic Light Source is made up of a powerful lamp containing the ultra-violet, visible and infrared components of light. It then filters down the light into individual color bands (wavelengths) that enhance the visualization of evidence by light interaction techniques including fluorescence (evidence glows), absorption (evidence darkens), and oblique lighting (small particle evidence revealed).



Latent Fingerprint Detection

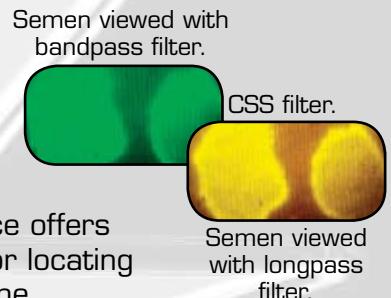
The primary application of a Forensic Light Source is for enhancing the detection of latent fingerprints. The use of fluorescent enhancement processes that compliment a light source greatly increases the types of surfaces from which a latent fingerprint can be detected. Consider the difficulties of dusting and lifting a print off of the following surfaces: thin plastic bags, rigid duct tape, thin aluminum foil, heavily grained wood, concrete wall, brick, printed glossy magazine pages, paper products, etc. Using traditional methods, fingerprint evidence on these and other types of surfaces may go undetected or even dismissed because they could not be detected with enough detail. Forensic Light Source techniques have been successfully utilized for revealing latent prints on these and many other types of textured surfaces, backgrounds which mask ridge detail, fragile surfaces, and contaminated surfaces. Different wavelengths are required for processing different types of surfaces making a Forensic Light Source with tunable or multiple wavelengths a coveted tool for



any crime scene investigator. In many cases, the background surface will also glow under light source illumination. In these cases it is necessary to tune to a wavelength of light that causes the print to glow and not the background.

Body fluids

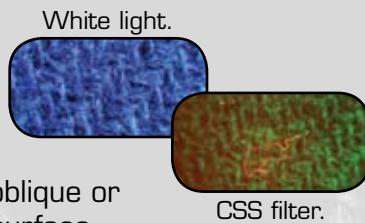
Since body fluids like semen, saliva, and vaginal fluids are naturally fluorescent, the use of a light source offers a unique method for locating them. A crime scene investigator can narrow down the specific locations of stains for collection instead of testing entire, large pieces of evidence such as a mattress, a carpet, a sheet, an article of clothing, etc. The dried body fluids will actually glow under the light source illumination. Although the body fluids will fluoresce under an ordinary UV black light, many articles on which you would find them including clothing and sheets will also glow and hinder the evidence detection. It is therefore necessary to tune to longer wavelengths to eliminate the background interference (background rejection). Considering you may be searching for body fluids on high profile, capital crime cases, and with the advent and availability of DNA typing systems, the more body fluid evidence you can reveal the better. The more powerful your light source and the more wavelengths you have, the more evidence you will uncover. Although blood does not glow in the visible range, it has a unique wavelength under which the bloodstain will darken to enhance its contrast by approximately 4 times. This is most effective in photographing blood prints because more of the detail of the blood print will be revealed by the enhanced contrast.



Hair and Fibers

Two light illumination methods can be employed to locate hair and fibers with a Forensic Light Source. First, oblique or parallel lighting of a surface such as a floor or carpet with a strong white light (the more powerful the better) will reveal, small particles like hair and fibers for collection.

Second, some hair and fibers will also glow under UV or Blue light and will stand out strongly for collection.



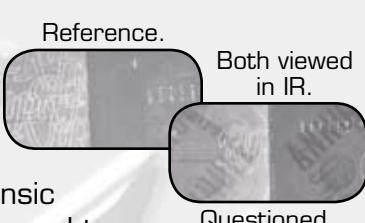
Bruises/Bite Marks/Pattern Wounds

Forensic Light Sources may reveal bruise and patterned wound details that are invisible under normal white light illumination. Details of a bruise pattern in a suspect's palm can link a suspect to a weapon. Furthermore, details of a bruise on a victim, for instance, a bite mark or a shoe mark, can link a suspect to the victim. Multiple wavelengths are necessary because different colors penetrate to different depths within the skin and therefore depending on the depth of the bruise or wound you will need to vary the wavelength of the instrument. Deep wounds may require infrared illumination to get enough skin penetration.



Questioned Documents

Inks have different formulations, even within the same apparent, visible, color type. A tunable Forensic Light Source can be used to identify slight variations in ink type by viewing ink responses as the color of the light is tuned through the visible and infrared regions. Regardless of the skill of the forger, this examination would reveal that 2 different pens were used on the document. Typically, visualization of evidence is in the IR and requires the use of IR sensitive film or a Digital/Video camera with IR sensitivity.



Gun Shot Residues/Explosive Residues

There are several different types of residues found both in ammunition and explosives, which fluoresce. By using a tunable Forensic Light Source, observations can be made on items without touching the surface, to see if fluorescent residues are present. In addition, the scanning of any observer's clothing after a shooting can help in identifying where the shot came from and who is the shooter due to the ejecta that comes from the barrel of the gun when it is fired. The same ejecta residue would also appear on the hands of the shooter linking them to the fired gun.



Human Bone Fragments, Tire Tracks, Shoe Prints, Drugs, etc...

Forensic Light Sources can be used for many different applications.

Those listed here are only a few of the compounds that will fluoresce in the environment. Users are encouraged to experiment, trying different wavelengths on different surfaces. You may be surprised by what you find.



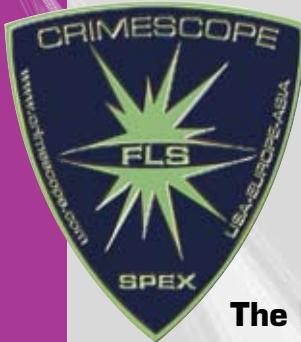
CSS filter.

These are only the main applications for Forensic Light Sources. There are others, like Arson Investigations, that people have only begun exploring. The use of these instruments are limited only by the user's imagination.

Always wear protective goggles in conjunction with any light source.

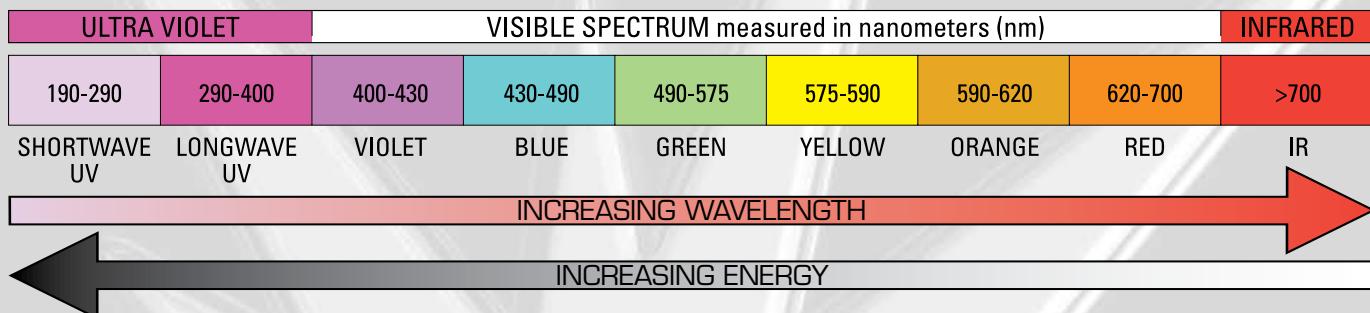


Please illuminate responsibly.



Spectrum and Applications at a Glance

The Portion of the Electromagnetic Spectrum that Matters to Forensics



In general, Forensic and Alternate Light Sources emit high-intensity ultraviolet, visible, and infrared light. Exposure to these types of radiation, even reflected or diffuse, can result in serious, and sometimes irreversible, eye and skin injuries. Never aim the light-guide at anyone. Never look directly into the light-guide or the optical ports of an instrument. Always wear appropriate eye and skin protection when using ANY Forensic or Alternate Light Source.

ITEM	SEARCH	GOGGLE	CAMERA FILTER
SHOEPRINTS	WHITE (OBLIQUE ANGLE)	CLEAR OR YELLOW	NONE
TREATED MUD SHOEPRINTS POROUS SURFACE	535, TREAT WITH DFO	RED	RED BP/LP BP600
TREATED MUD SHOEPRINTS NON-POROUS SURFACE	TREAT W/Safranin O OR 455/CSS – Basic Yellow	ORANGE	ORANGE BP550
HAIR (UNTREATED – BLACK)	WHITE (OBLIQUE ANGLE)	CLEAR	NONE
HAIR (TREATED OR RED/BLONDE)	415/CSS	YELLOW ORANGE	YELLOW ORANGE
BONE	455/CSS/515	ORANGE	ORANGE
TEETH	455/CSS/515	ORANGE	ORANGE
FINGERNAILS	455/CSS/515	ORANGE	ORANGE
BODY FLUIDS (START)	CSS	ORANGE	1-2 ORANGE
(Dark surfaces and for saliva)	UV	CLEAR/YELLOW	YELLOW
(Dark surfaces show 'crusty' spot)	WHITE (OBLIQUE ANGLE)	CLEAR	NONE
BITE MARK/BRUISE (FRESH)	415/445	YELLOW	1-2 YELLOW
TO	455/CSS/515	ORANGE	1-2 ORANGE
(OLDER)	535/555/575	RED	RED BP600
GSR: GUN SHOT RES.	455/CSS	ORANGE	2 ORANGE/BP550
	CSS	ORANGE	2 ORANGE/BP550
BLOOD (UNTREATED)	415	CLEAR OR YELLOW	NONE/BP415
BLOOD (TREATED) W/FLUORESCIN	455	ORANGE	ORANGE/BP550
DFO PRINTS	455	ORANGE	2 ORANGE/BP550
(ON FLUORESCING BACKGROUNDS)	535/555	RED	1-2 RED BP600
(ON NON-FLUORESCING BACKGROUNDS)	SP575	RED	1-2 RED BP600
NINHYDRIN	555/575/600/630 OR WHITE	CLEAR	NONE
NINHYDRIN/ZnCl	515/CSS	CLEAR	NONE/BP515
BASIC YELLOW	445 455/CSS	YELLOW ORANGE	2 YELLOW 2 ORANGE
RHODAMINE-6G	515	ORANGE	2 ORANGE/BP550
ARDROX	UV 415	CLEAR YELLOW	UV Blocking 1-2 YELLOW/BP500

Which Goggle to use?	
WAVELENGTH	GOOGLES
300 – 400 nm	CLEAR
415 – 445 nm	YELLOW
455 – 515 nm	ORANGE
CSS	ORANGE
535 – SP575 nm	RED

Nomenclature	
ABBREVIATION	DEFINITION
nm	NANOMETER
BP	BAND PASS
LP	LONG PASS
SP	SHORT PASS
CSS	SP540

Please illuminate responsibly.

What are Forensic Light Sources?

...and how do they compare to other alternate light sources?

Forensic Light Source (fō-rēn'sīk) (līt) (sōrs) abbr: FLS, n. A high intensity, multiple wavelength, bulb based, alternate light source designed specifically for use in Forensic Applications.

Of all the classes of alternate light sources:

Laboratory lasers are high power but also have the highest price and they lack versatility.

LEDs are lowest in price but also lowest in power and they lack versatility.

Forensic Light Sources are high power, moderately priced and are extremely versatile.

Lasers

Traditionally Lasers were used primarily for lab work due to the large footprint and cooling requirements. While lasers have become more portable with higher powers, they are still not versatile since they are only one wavelength. Bringing a green laser to the crime scene is nice if you are going to use Rhodamine or DFO for every surface. Background rejection is not possible and many fingerprints, body fluids, and trace samples will remain obscured on variously colored backgrounds if you have only one wavelength available.

LED based ALS

LED's offer portability but require you to carry many parts to the crime scene. In their lowest cost configuration they forgo versatility for compactness. However, a single wavelength LED is for all intents and purposes an expensive blue light. They suffer from the same problems the blue lights and lasers encounter, lack of wavelengths. Again, this prevents adequate background subtraction. When properly configured with optional wavelengths, they are no longer cheap. They approach the price, and many times exceed the price of a better equipped FLS! So configured, the LED's become more cumbersome to use, requiring the swapping of parts or units.

Additionally, LED units suffer from diffuse illumination spots. A large wide spot is nice for searching a room, but when it comes to photography, the diffuse spot wastes light.

Forensic Light Sources

FLS are the perfect mix of power, price, and versatility.

For the price of one portable laser, a department could purchase 2 or 3 better equipped FLS. For the

price of one "complete" LED kit, a department could purchase 1 better equipped, Higher Power, battery powered FLS.

New portable lasers may deliver on their promise of high power in the green, but, cannot deliver any power in the rest of the spectrum. Portable or Lab based FLS can deliver high power across the spectrum, allowing for the use of a wide range of powders and chemicals. The ability to use many chemicals and powders is necessary as evidence is found on a wide range of colored surfaces.

An FLS can provide versatility unmatched by any other class of instrument. With multiple integrated wavelengths, an FLS provides the ability to change wavelengths to find the optimal wavelength for causing evidence to fluoresce and backgrounds to fade. This is background rejection. A concept not discussed by other classes of instruments.

Simplest of all, a multiple wavelength FLS provides unparalleled ease of use. No light source offering multiple wavelengths is as easy to use. With integrated, one hand control, changing wavelengths is as easy as "flicking your thumb". No components to swap, no slides to switch, no separate remote controls.

As with all of our products, we suggest you compare. We can provide a loaner unit of any of our FLS, at no cost, to compare side by side to any other unit on the market. We are confident that when you try our units you will be satisfied it is everything we said it would be.

Wavelength Availability by Class of Instrument

	UV	Blue	Green	Red	IR
Laser	-	-	✓	-	-
LED	-	✓	✓	✓	-
FLS	✓	✓	✓	✓	✓

UV = 300nm to 400nm

Overall Value

	Versatility	Cost	Power
Laser	-	-	✓
LED	-	✓	-
FLS	✓	✓	✓