When it comes to ultraviolet (UV) imaging, it's important to distinguish between UV light and UV-fluorescence imaging. Although they both use UV lighting, they're entirely different. UV imaging starts with passing the emission of a UV-emitting LED, lamp or diode, or looking at a subject illuminated with UV light that's reflected off the item being inspected. The reflected UV light is then captured by the camera. The wavelength of the UV light is not converted or shifted in this process.

In contrast, UV-fluorescence imaging also requires illuminating a surface with UV light, but the fluorescent material absorbs the UV light and electrons are released, causing the material to radiate light at a longer wavelength. The light emitted during this process is usually in the visible range and, in industrial applications, it will usually be blue light. In this type of reaction, light energy in will always exceed light energy out.

True ultraviolet (UV) imaging inspection isn't used often in machine vision. However, as UV-sensitive cameras and UV-emitting light sources, particularly LED lighting, have become widely available and less costly, new applications are emerging. Monochromatic UV sources, such as lasers and LEDs, are desirable in machine vision applications because when paired with appropriate Bandpass Filters, camera optics don't need to be achromatic, significantly lowering cost.

Images formed with monochromatic illumination are always sharper than images made with broader UV sources, and capability naturally increases as the wavelength used to image the item being inspected is shortened. When using UV illumination, smaller features can often be formed and detected easier and more accurately. This is why monochromatic UV (excimer) lasers and optical imaging are used in producing almost all integrated circuits today.

The UV band is broad, spanning a wavelength range from 10 nm (below this are x-ray wavelengths) to 400 nm (above this are visible wavelengths). A system's cameras, optics, filtering and illumination must be carefully selected according to the UV range being imaged. Otherwise, because of internal camera filtering and the optical lenses being used, most visibly-optimized charge-coupled device (CCD) and complimentary metal oxide semiconductor (CCD) cameras and lens systems will block all of the deep-UV and most of the near-UV spectrum.