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Are digital sensors sensitive to UV?

Is there any way, shape, or form that ultraviolet light is recorded by a digital sensor? Ideally, this question is related strictly to the sensor, without even a glass lens in between which could cut or block UV light. But of course I don't take pictures with a bare sensor, I also have a lens, so I'd also like to know how much UV gets to the sensor to begin with.

[digital] [sensor] [uv]

edited Nov 14 '12 at 23:16

asked Aug 9 '10 at 17:23



jfklein13

2,512 4 20 43

3 Answers

Yes, digital sensors are indeed sensitive to UV light, as well as a considerable amount of the infrared spectrum. Most digital sensors are equipped with multi-coated, multi-layered filters that are designed to filter out the extended ranges of UV and IR. Generally speaking, filtered digital sensors are sensitive to a much broader range of light than the human eye, from about 250nm (the near-UV range) through visible light (400nm to 750nm), and down about 780nm (the IR range). Unfiltered, a digital sensor is sensitive to a far greater range, from deep UV (200nm, true UV) down to true IR (as far as 900nm) ^[#1]. It should be noted that sensitivity is not constant throughout this range, and falloff is fairly rapid and becomes significant the farther away from 380nm you go. Same goes for the IR range. Human eyesight ranges on average from about 390nm through 700nm, while some people are more sensitive and able to see from about 380nm through 750nm.

Despite the filtration applied to digital sensors, UV light is still a problem, and can affect color balance. In general, the ability to sense UV light is not a huge problem, as digital sensors have relatively weak sensitivity to blue, and the UV sensitivity is generally captured as blue. However, without proper filtration, UV dispersion can generate disruptive haze that can be captured by a digital sensor, which may result in a rather undesirable result.

It should be noted that optical glass filters out a considerable amount of UV light. Most UV wavelengths up to around 310nm are blocked by the glass of a camera lens, and the remainder from 310nm up through 380nm can be blocked with a UV/Haze filter. If one wishes to create images in the UV light range, special lenses are available. Non-standard materials such as quartz or calcium fluoride have a greater transparency to the UV spectrum. From a camera imaging perspective, most research shows the most interesting UV wavelengths probably lie between 250nm and 310nm ^[#2]. To get a clear UV shot, you may need to remove the UV filter that covers the sensor itself. This is similar to removing the IR filter when modifying a camera for IR work, or may involve removing the entire filter apparatus, which would remove both UV and IR filters at the same time (depends on the camera.)

1. Infrared and ultraviolet imaging with a CMOS sensor having layered photodiodes

- Introduction discusses unfiltered layered CMOS sensitivity range: 200nm - 1100nm
- Layered CMOS (i.e. Foveon) tend to have a greater sensitivity range than bayer CMOS
- Interesting discussion about the individual wavelength sensitivity of each color photosite (graphs included)
- Seems a little out of date (2003/2004 period?), but still useful

2. Digital Reflected-Ultraviolet Imaging

- Older article from several years ago, covers reflected-UV imaging
- Discussed the nature of UV imaging and how it differs from visual/IR imaging

3. The Wratten 18A: A problematic filter for reflected-UV photography

- Interesting article that uses an original Canon Rebel and a Wratten 18A filter to image UV

- The Wratten 18A allows UV from ~290nm through 400nm
- The older Canon Rebel CMOS sensor seems to image this wavelength range well

4. Visible Light CMOS Sensors

- Page 7 has a graph of CMOS vs. Human Eye sensitivity
- Stops at 400nm, but shows that the CMOS sensitivity curve is still quite high at that point, and falls off at a moderate curvature (likely ends around 250nm-290nm)

edited Aug 10 '10 at 19:12

answered Aug 9 '10 at 18:04

 **jrista** ♦
63.3k 10 139 284

Wow, lots of good information here. Do you have any sources to cite? – jfklein13 Aug 9 '10 at 21:11

I do, however they are bookmarked at home. Also, sadly, most of them were PDF scientific papers. The best one had to do with scientific imaging in UV, and discussed alternative lens element materials like quartz and fluoride derivatives. I'll see if I can dig them up. – jrista ♦ Aug 9 '10 at 21:25

I am not sure I actually bookmarked any of the stuff I've read about IR and UV imaging with digital cameras. There is a moderate amount of information available on the subject, but I remember most of it being contained within PDF's, usually some scientific paper or official study of some kind. I will have to redo my searches to get you citeable references. – jrista ♦ Aug 10 '10 at 17:34

The widely accepted view is that they are not. However, see [this description of empirical tests](#) (from 2004) which seems to establish that the digital sensors tested were UV sensitive, albeit much less so than is film.

answered Aug 9 '10 at 17:32

 **vanden**
774 3 7 16

3 This "accepted" view is generally only because most of the published specifications only provide sensor light absorption and sensitivity information from about 400nm through 750nm, the visible light range. Most of this information indicates that the blue photosites on a sensor peak at around 380-400nm, but do not show where they begin. Independent third-party studies show that the UV sensitivity of digital CCD and CMOS sensors starts much higher, from 250nm down to as low as 200nm. – jrista ♦ Aug 9 '10 at 18:30

Yes, they are as pointed out. But I want to add that sensors in digital cameras are not actually digital.

The [Image sensor](#) converts light into an electronic signal. Just because it's electronic, doesn't mean it has to be digital. There are [analog signals](#) and [digital signals](#). both of which are electronic.

After this it goes through an [analog-to-digital converter](#). Well, it actually goes through an amplifier before this but anyhow. This is where it then becomes digital and can be processed, compressed and all what ever else it's been programmed to do.

Just thought I'd put that out there.

answered Oct 31 '12 at 12:47

 **BBking**
2,240 10 25

protected by [John Cavan](#) Apr 24 '13 at 17:30

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