

## Re: Long exposure vs. multiple exposure

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**From:** Chris L Peterson (*clp\_at\_alumni.caltech.edu*)

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On Thu, 19 Aug 2004 02:11:26 +0200, Steve Maddison <steve@cosam.org> wrote:

>Hi all,

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>I bought a Canon PowerShot S45 digital camera a year or two ago before I

>got into astronomy. It's a decent camera, I was thinking of rigging it

>up to try my hand at astrophotography.

>

>I've looked through the docs and experimented with long exposures, but

>this model only goes up to a maximum of 15 seconds. I was initially a

>little disappointed, but then got thinking about using multiple

>exposures of 15 seconds (or less) and stacking the images.

>

>Maybe my logic has taken a wrong turn somewhere but, given the accuracy

>of your average, run-of-the-mill mount, wouldn't the use of several

>images allow some manual correction of tracking errors? Surely there is

>some major advantage of a single, longer exposure that I've so far

>overlooked? (Apart from the obvious elimination of the stacking process

>itself.)

There are different sources of noise in digital images. Dark current noise increases with time, and is the same for one image or a stack of equal exposure. Readout noise occurs with every image however, and for short exposures is a significant part of the total noise. The advantage of long exposures is that the readout noise becomes insignificant.

As you note, there is an advantage to using shorter exposures in order to minimize tracking problems. Most serious imagers find a compromise position, using subexposure times ranging from between 5 and 30 minutes, and then stacking as many as required, usually for total exposures of one to several hours.

With a digital camera, your options are much more limited. In most cases, you will simply collect a great many images at the longest possible exposure. Noise will be large compared to what you would have with a cooled, long exposure camera, but that doesn't mean you can't get quite nice results.

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