One-Shot Color Astrophotography in the City: Beating Light Pollution

By Lee PullenPublished: Oct 22, 2021

Dual-band filters aren't suitable for every target, but there are still plenty to choose from. Credit: Lee Pullen.

If you're an astrophotographer in a city, you will have additional light pollution challenges to consider when looking to get a new camera to image faint deep sky objects like galaxies and nebulas. Perhaps you've used a DSLR for a while and want a dedicated astrocam, or maybe you're diving straight in at the deep end. At this level, you need to make a decision between the two main camera types: OSC and Mono.

OSC stands for One Shot Color. This type of camera allows you to capture full-color images in single shots — hence the name. They're convenient and relatively simple to use.

Mono cameras work differently. To get color images from them, you need to take photos with a red, a green, and a blue filter in front of your sensor, then digitally combine them all to make an RGB image.

Getting good images of them from a city is a real challenge, regardless of whether you're using an OSC or Mono camera. Your best bet is to aim for very long exposure times to help combat light pollution.

Until quite recently, Mono was really the only valid choice for city-based astroimagers. But the times, they are a-changin', and now OSC has a secret weapon: dual-band filters. Let's explore both camera types below.

The author's OSC astrophotography rig, which he uses from the light-polluted city center of Bristol, UK. Credit: Lee Pullen.

Which is most popular?

Most astrophotographers choose Mono. In principle you can get a higher quality final image in the end. OSC cameras inefficiently record lots of green light (simulating how our eyes work), but there's not that much green in space. Mono also lets you shoot Luminance data, which adds to image quality and creates LRGB images (Luminance + RGB).

Perhaps the biggest benefit of Mono is that you can use special narrowband filters that only allow very specific wavelengths of light through to your sensor. Prime examples are filters for Sulfur-II, Hydrogen-alpha, and Oxygen-III, often abbreviated to SHO. This is the Holy Trinity for astrophotographers, because lots of objects like nebulas are almost invisible in RGB, but shine brightly in SHO.

Critically for astrophotographers in cities, those SHO narrowband wavelengths are in different part of the spectrum to light pollution, so in effect our SHO filters allow us to see right through bright urban skies. It's like flicking a switch and turning off all the streetlights.

Is this photo, taken from a city center, OSC or Mono? Hard to tell. ? It's OSC with a dual-band filter, edited to look like it was taken with a Mono camera and SHO filters. Credit: Lee Pullen.

Enter dual-band filters to help level the playing field

Just as Mono imagers have access to lots of excellent narrowband filters, recently-released dual-band filters offer similar for OSC. An example is the Optolong Optics L-eXtreme. (Other dual-band, and even tri-band filters are available too).

These dual-band filters are game-changers for OSC astrophotographers, especially those in cities. They allow us to keep the simpler approach of OSC, while mitigating the main drawback, i.e. not being able to take narrowband images. Here's how you do that.

Place the L-eXtreme filter in front of your OSC and you will see only two narrowband wavelengths of light. H and O. That's two of the three Holy Trinity narrowband wavelengths used by Mono imagers. It's certainly enough to make great bi-colour images. During processing, you can even merge the data you've captured to create a synthetic "S" image to throw into the mix. The result isn't as scientifically accurate as you'd get with Mono plus SHO filters, but it can look great — and for many of us, that's what counts.

To be clear, Mono is still superior to OSC in many cases, and dual-band filters aren't effective for every telescope or every target. But for the first time, OSC can be a good option even from a light-polluted city.

An Optolong Optics L-eXtreme filter. Credit: Optolong Optics.

What to choose?!

There's not an easy answer here. Price alone may push you into the OSC camp. A Mono camera complete with a full set of filters and electronic filter wheel can cost in excess of 150 percent of what'd you pay for an equivalent OSC camera and dual-band filter. Consider the following set-ups, both with same-generation cameras sensors and suitable for city use:

The costs of Monochrome and One-Shot Color astrophography gear compared.

Mono	MSRP
ZWO ASI 2600MM Pro	$2,460
Optolong Optics L-RGB Deep Sky Imaging Filters 2"	$359
Optolong Optics SHO Narrowband Deep Sky Imaging Filters 2"	$720
ZWO 7x 2" Electronic Filter Wheel	$399
	$3,938

OSC	MSRP
ZWO ASI 2600MC Pro	$1,999
Optolong Optics L-eXtreme 2"	$309
ZWO 2" Filter Drawer (MM2 / MM8)	$79
	$2,387

If you've got a big budget, lots of clear skies, plenty of free time, and want the greatest versatility, then Mono is probably the right choice for you. But if you fall down in any of those categories, then it's worth at least considering OSC. This is thanks to the development of those wonderful dual-band filters. Before they came along, I'd be saying that from a city, Mono was the only real choice. Now, OSC with a dual-band filter can work really well.

Also remember that your interests and circumstances may change in the future, and you're not making a decision that you have to stick with forever. Personally, I used to shoot Mono, and now use OSC. Maybe I'll go back to Mono in the future. Most of us are into this hobby for fun, so don't lose sight of that. Which camera type would you find more fun to use? That's the one that you'll use the most.

In the end, whatever you use, the most important thing is to get your camera out there collecting photons.

Read more on Urban Astrophotography's website: OSC vs Mono from a city

About Lee Pullen

http://urbanastrophotography.com

Lee Pullen is a science writer and communicator from the city of Bristol, UK. He has a degree in Astronomy and a master's in Science Communication. He began his career writing for organisations including the Hubble European Space Agency information Centre and the European Southern Observatory, as well as becoming Staff Writer for the International Year of Astronomy 2009, the world's largest ever science outreach initiative. Lee runs the website UrbanAstrophotography.com

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