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ASTRONOMIK FILTERS

VISUAL ASTRONOMY UNDER THE (LIGHT) DOME

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ASTRONOMIK FILTERS

Visual Astronomy Under the (Light) Dome

By Matt Harmston

Over the years, I've shared the eyepiece with family, friends, and myriad others. Telescopes so often capture the attention of onlookers, don't they? Regardless of attention garnered, interested onlookers often don't consider getting a telescope because they find themselves within the pale confines of light-polluted skies.

While light pollution interferes with visual astronomy, all is not lost. Many outdoor lights glow due to excitement of such elements as mercury, sodium, etc. Effects from such lighting can be blocked in order to reveal deep sky wonders.

This article is going to describe experiences under light-polluted skies using Astronomik's 1.25" UHC, UHC-E, and CLS filters along with the absence of a filter. A follow-up article is being penned that discusses use of these filters as observing tools under dark skies.

Filters and the Passage of Light

Deep sky objects (or, DSOs) emit and/or reflect light along the electromagnetic spectrum. As a result, visible details will vary as a function of wavelengths being allowed to pass to your eye. Filters permit users to emphasize select wavelengths over others, thereby revealing specific details by limiting passage of unwanted light.

To use an analogy, we might enjoy eating a bite of salad - a pleasing blend of tastes arising from a multitude of vegetables and toppings. Deep sky objects are like this salad in that unfiltered views provide a pleasing blend of detail across all visible wavelengths.

Using a filter to isolate wavelengths of light is like pulling an individual tomato or slice of cucumber from that salad: A specific flavor, selected for attention in relative absence of competing options. You might say that filters help us tailor the view to emphasize our desired "flavors".

Technical Details: Astronomik Filters

For this article, I used Astronomik CLS, UHC-E, and UHC filters (**see Image 1**).

The purpose of these filters is to enhance visibility of deep sky objects by increasing their contrast with the background sky. Contrast is enhanced by limiting passage of unwanted wavelengths of light while permitting desirable ones (i.e., your selected "flavor") to pass through nearly unimpeded.

Though a given DSO might appear brighter when using a filter, this is an illusion. Filters do not brighten objects. Rather, improved visibility is due to enhanced contrast between DSOs and the background sky.

Under the dark of night, a typical

Image 1 – From left to right, Astronomik CLS, UHC-E, and UHC 1.25" filters

human eye might detect light with wavelengths ranging from about 400 to around 600 nanometers, a truncated upper range compared to daylight conditions. To illustrate light passage by filters along this spectrum, Astronomik publishes charts for each filter that juxtapose percent of light transmitted with wavelength (see **Images 2 - 4**).

Each graph's elevated regions represent wavelengths where most of the light is allowed to pass. In contrast, the low-lying areas represent wavelengths being blocked by the filters. For instance, sodium vapor lights shine at a wavelength of 589nm, a point where virtually no light passes through any of the three filters.

The CLS filter is a budget-friendly filter intended to block out light from mercury and sodium-vapor lamps while permitting relatively larger por-

tions of the visible spectrum to pass through. The UHC-E filter is also budget-friendly, yet is designed to further enhance contrast of emission nebulae and comets by blocking airglow and common artificial lighting.

With the UHC, blockage of select wavelengths is even more aggressive. Where desired light is passed, the UHC is also the most efficient of the three filters. The UHC is particularly adept at transmitting Hydrogen-beta and Oxygen-III lines while aggressively blocking background sky.

Because progression from the UHC to the CLS filter means passing additional wavelengths of light, overall fields of view will appear brighter with the CLS than the UHC-E and UHC. But, brighter isn't always better with filters: Contrast is key.

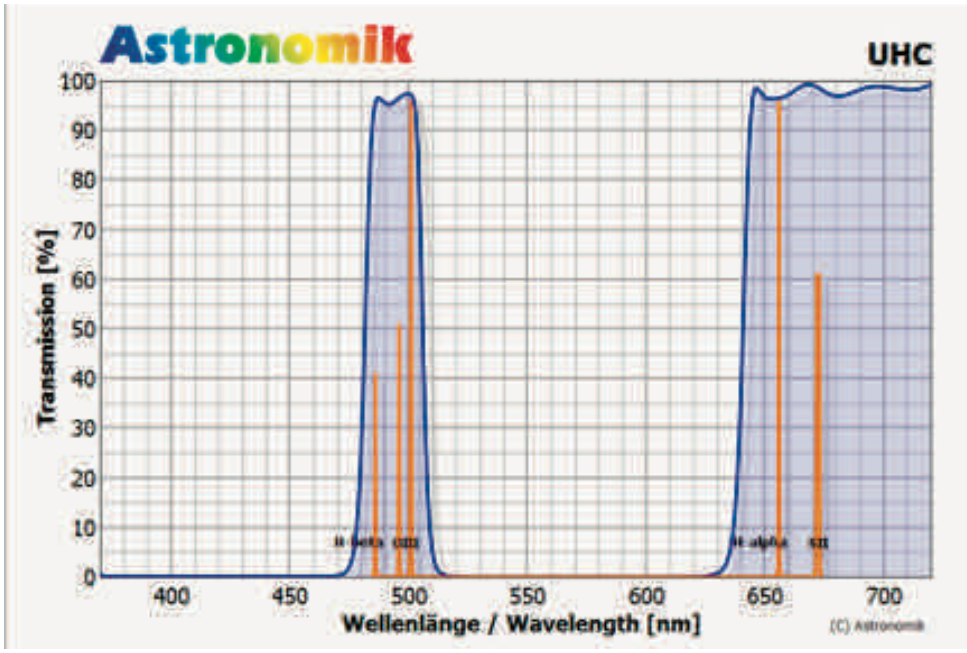

Image 2 - Light transmission by wavelength plot for the Astronomik UHC filter

Technical Details: Observing Site and Gear

Light-pollution testing was conducted at a friend's suburban home under smoke-filled skies, ample man-made light pollution, and on one of the nights, a 31% illuminated moon.

Judging by the faintest visible naked-eye stars (my night vision is excellent, and corrected acuity is better than 20/20), lower altitudes were limited to roughly magnitude 2.9 and brighter stars. At zenith, I couldn't make out stars fainter than roughly magnitude 3.9. The 3.9 estimate was obtained after the moon had set on the first night, and replicated under no moon the second night. Direct light from street lamps was blocked by homes, but neighboring lights cast some illumination across the yard.

I wanted to use a telescope and mount fairly typical of what might be found in the amateur community, thus my SkyWatcher Pro 100ED refractor (100mm aperture) and Celestron AVX mount went out for a night on the town. Though the AVX is a GoTo mount, I did not use that functionality so as to more readily use star-hopping and sky panning in my testing of the filters.

In spite of keeping mechanics and aperture fairly basic, I wanted to avoid eyepiece aberrations while testing. Thus, the f/9 telescope was paired with two quality eyepieces: An Orion 22mm Lanthenum Superwide and a 13mm Tele Vue DeLite. These eyepieces were chosen because they are good quality, have comparable apparent fields of view, long eye-relief, and their disparate focal lengths enabled brightness-impacting differences in magnification.

Targets for the testing included Messiers 8, 13, 17, 20, and 57, along with NGC 869/884. These were chosen for several reasons. They could all be detected with the small scope without a filter under my bright skies. And, they represented varied ratios of emission nebulosity- and stellar-sourced light output. Finally, their altitudes resulted in piercing varied levels of light pollution.

The View: Light-Polluted, Smoky, (Sometimes) Moonlit Skies

To test each filter, I alternated between the unfiltered and filtered conditions and then, in some cases, across eyepieces. For those seeking fine details, I've included some (edited) observing notes in an appendix at the end of this article. For high-level details, a summary of observations follows:

- All three filters enhanced contrast to varying degrees, thus detection of and detail within deep sky objects was enhanced by using the filters in most cases.
- The already sharp focus of the unfiltered ED refractor was maintained or improved upon by use of each filter. The UHC rendered stars sharper than any other condition.

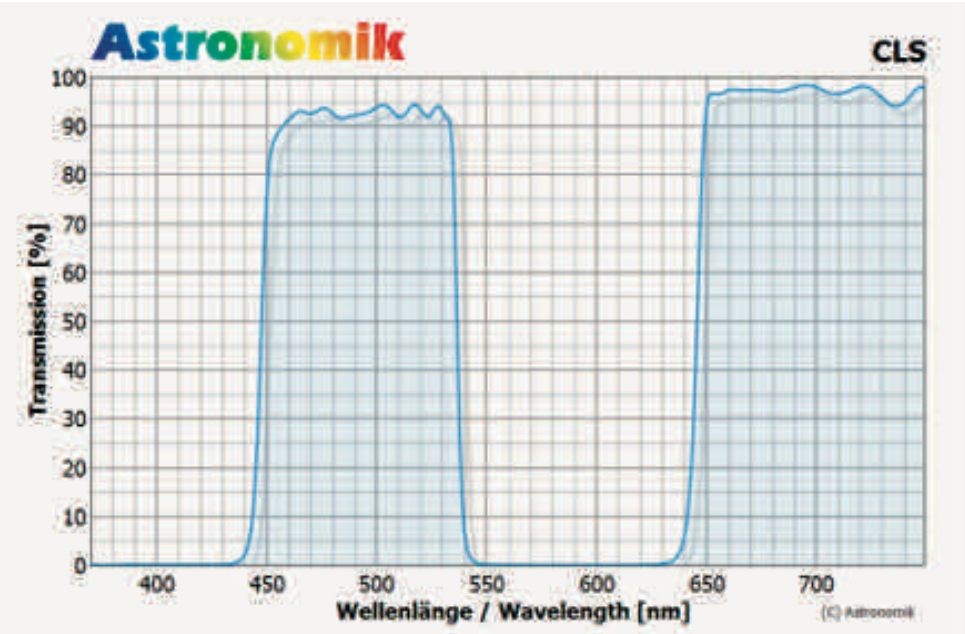

Image 3 - Light transmission by wavelength plot for the Astronomik UHC-E filter

• When viewing bright emission regions of nebulae, increased filter contrast progressively enhanced detection and detail regardless of eyepiece or object elevation. In order of most emission detail to least: UHC, UHC-E, CLS, and finally, no filter.

• The UHC filter provided a particularly pleasing 3-d effect when viewing emission portions of M8. And, it revealed far more nebular detail than any of the other filters, eliciting a muttered, "Wow!". M17 was quite remarkable due to dramatic improvement in observable detail with the UHC.

• If you are panning light-polluted skies in search of targets, the use of any of these filters would be beneficial. M17 was difficult to distinguish from the unfiltered background sky, and was more obvious against the darker background from the CLS. However, the UHC-E and UHC filters more readily extracted emission nebulae from the sky's soup when star-hopping toward it.

• If you want to star-hop to emission nebulae with a small telescope, the UHC-E gets highest kudos because it markedly increases contrast

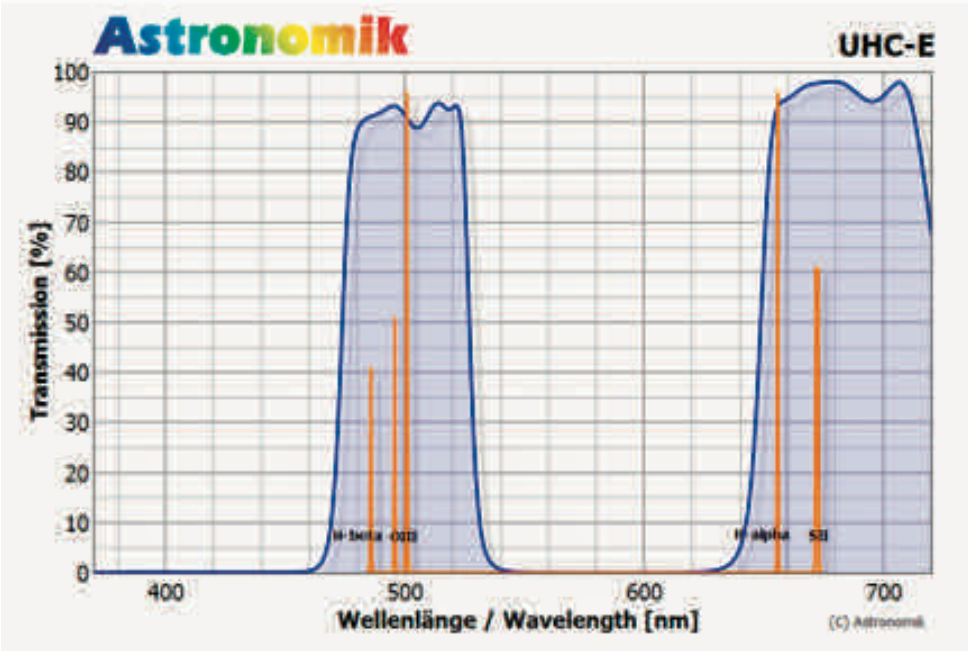

Image 4 -Light transmission by wavelength plot for the Astronomik CLS filter

yet cuts less starlight than the UHC.

• A general point to mention: All other things equal, higher magnification can help with detecting fine details under filtered and unfiltered conditions - to a point. Too much magnification relative to aperture can be counterproductive due to dimming the field of view, among other factors.

• Heavily populated star fields such as the Perseus Double Cluster (i.e., NGC 869/NGC 884) most benefited from the CLS filter. It's moderate background darkening, combined with greater maintenance of star illumination, made for an eye-catching view.

When considering which filter would get the gold star as a general-purpose accessory, I found myself in a quandary. I kept coming back to the phrase, "different filters for different flavors".

As a general-purpose filter, I most often found myself preferring the UHC-E - plenty of starlight for the small aperture, darkened background, and enhanced views of more targets of most interest to me. However, if my interest had been specifically in emphasizing views of brighter emission nebulae with this small 'scope, the UHC would have been my preferred accessory.

Note, "brighter emission nebulae" is a relative label, as larger apertures will reveal increasingly fainter objects and detail than my little refractor. Had my interest been specifically in star fields/clusters, the CLS would have been my choice. In short, each filter had its own application where it stood above the rest, making selection of the best filter a personal choice based on conditions, equipment, and interests.

There are two important limitations to this article. First, the combi-

nation of aperture, sky, and location pushed accessible galactic targets below my visibility threshold and/or behind the neighbor's trees. The second limitation was that there were few examples of accessible reflection nebulae, and even the most obvious (a portion of M20) was barely visible in direct vision. Thus, evaluation of use with galaxies and more thorough study of reflection nebulae will have to take place under darker, more open skies.

Other Filter Characteristics Beyond the Eyepiece

Though the emphasis in this article is on the eyepiece view, there are some important observations to consider beyond contrasty views:

• The filters are accurately advertised as being parfocal.

• All three filters threaded into the Orion and Tele Vue 1.25" eyepieces, permitting full, secure seating in all cases.

• The filters had secure lenses within their respective housings. No tightening of set rings was needed before, during, nor after use in temperatures ranging from 60F to 83F.

• Astronomik website references coating and construction durability. I can embarrassingly attest to this, as one dark sky session saw sweaty fingers drop the UHC filter lens-down on a coarse gravel driveway. Short of my bruised ego and utterance of something best left unprinted, no apparent harm came from the drop. Suffice to say, the filters must be cared for just as any other fine optics, but this (un)happy accident underscored the durability claim.

In the End

Viewing under light-polluted skies may not be ideal, but for many, doing so cannot be easily avoided. Testing these filters reinforced my opinion that light pollution need not preclude exploring the heavens. Instead, we can successfully seek out a wide range of celestial targets.

So, are filters for you? If so, which one(s)? Arriving at this decision involves personal tastes, interests, gear, and settings. But, like myriad eyepieces in their cases, there are filters to suit most needs and interests.

I encourage you to take the plunge and counter light pollution with filtered viewing. These filters from Astronomik put a smile on my face, each in their own way. You just might have the same experience. ATT

Appendix A: Semi-Rough Observing Notes

Target/Eyepiece	No Filter	CL
M8/22mm Lanthenum Superwide	The nebula appears as two separate star clusters under direct vision, with averted vision revealing a faint fog in the core. This nebulosity would be very easy to overlook.	Improvement upon no filter though slight. The core is a groups of stars remain the are sharpened.
M8/13mm DeLite	It is a beautiful star field against a bright sky, though the background is darker due to increased magnification. Core nebulosity is obvious, nebulosity on the other side of the lagoon is a suggestion…if you know to look for it and use averted vision, you might see something.	Surprisingly, views doesn't background hasn't change stars dimmed slightly and s still visible, but not across t visible only with averted vis
M13/13mm DeLite	Easily visible, with very fine stars flickering in/out of visibility. The best view came from using no filter.	The cluster is more obviou background, but it looks lik ual stars have dimmed too with averted vision.
M17/22mm Lanthenum Superwide	Barely visible, a faint patch of fog. Oval in shape, no off-axis extensions. Easy to miss if you didn't know where to look.	More obvious elliptical obje again no structure, no prot looked, but no hint as to its shape.
M17/13mm DeLite	More visible than in the 22mm, but still just an illuminated oval.	The view didn't markedly in ter. The nebula appears to background.
M20/13mm DeLite	The star field is plainly visible, though reflection nebulosity is not apparent with direct nor averted vision.	The background sky is dar three filters, and detection with averted vision. Neithe portions are markedly more
M57/13mm DeLite	Visible, but beyond circular shape, this was nothing remarkable.	Not evaluated due to time ings in other sessions.
Perseus Double Cluster/22mm Lanthenum Superwide	Varied intensity pinpricks of light emerge from a dusky, bright background. Magnitude 8 HD 14330 has slightly different color than nearby stars, suggestive of ruddy color.	The most appealing view o counts, star brightness dro ter, but star counts remain slightly dimmer than with n HD 14330 color difference not as ruddy as with no filte

LS	UHC-E	UHC
r in terms of nebulosity, a distinct fog, but the two primary details. Stars	Improve upon the CLS, background markedly darker but the core did not diminish. Not a "WOW!" factor, but still more obvious. With a little imagination, there might be nebulosity near both star groups. Stars are further sharpened.	The background is really dark and the lagoon becomes quite obvious between two sharp, star-studded regions of haze/nebulosity. Wow. This filter was the best view in the 100mm scope/22mm eyepiece combination.
improve much. The d appreciably, but the sharpened. The core is the lagoon. The lagoon is sion.	A distinct improvement upon the CLS, nebulosity is visible on both sides of a murky lagoon. The core is quite obvious, the other side is more subtle…yet imagination is not required. The nebula looks like a colorless, dense cloud of fine, spark-filled smoke.	Forget any imagination…wow. The background darkened quite a bit, and the stars sharpened in focus just like the other filters. In addition, the increased contrast has brought on a 3-d impression of stars being superimposed upon a dynamic nebula. This view has the most pleasing detail.
s against a darkened e a nebula. Most individ- much for detection even	The cluster is even more obvious than with the CLS, but here, too, it looks like a nebula due to absence of fine stardust.	And again…an obvious object against the darkened background, but it takes on a nebular appearance.
ect than no filter, but rusions. Not easily over- s namesake omega/swan	Darker background than CLS, body more prominent. Still a rough oval absent other details. If starhopping, navigation to the nebula would be easier with the UHC-E than the other three conditions.	The head and neck of the swan take shape. Faint nebulosity off the tail begins to emerge. Background is very dark. This view has the most pleasing detail.
mprove relative to no fil- dim in concert with its	The nebula is more obvious than with no filter and CLS. Still, it is just a visible patch of oval-shaped fog. No details emerged. This is the best option for star-hoppers.	The swan's neck and top of the head becomes clearly visible along with more obvious detail beyond the tail. The nebula appears like a fat, funny L, and stands out starkly against a dark background. Faint surrounding stars nearly disappear. This is the best nebular view.
kened the least of the requires lengthy study er emission nor reflection e distinct than the other.	The background sky is darkened slightly compared to CLS, and emission nebulosity is still a faint fog with direct vision, less obvious than UHC. Reflection nebulosity is a suggestion with averted vision. Aside from telltale star patterns, it would otherwise easy to overlook the nebula if panning the area.	The background sky is darkened slightly compared to UHC-E, emission nebulosity most obvious. But, it is little more than a featureless, faint fog with direct vision. The Reflection nebula is extremely faint with averted vision.
running short and find-	The nebula is more obvious than with no filter, but still not a ring…just a circular patch of fog.	The ring structure is obvious. Pronounced contrast between the dark background, illuminated ring, and darkened center of the nebula. This filter provides the best view.
lue to highest star ps a little relative to no fil- high. Background sky is o filter. The Magnitude 8 is still as obvious, though er.	A beautiful view in terms of contrasting background sky and star field, yet noticeably fewer faint stars visible in the core of NGC 869 (my point of reference for star population) compared to the CLS.	Sharp pinprick stars in the field, but even more slipped below the visible threshold than with the UHC-E. It is still a pleasing view, but the sparser starfield makes this view the least interesting.