OPTOLONG “L-Pro” pollution filter testing

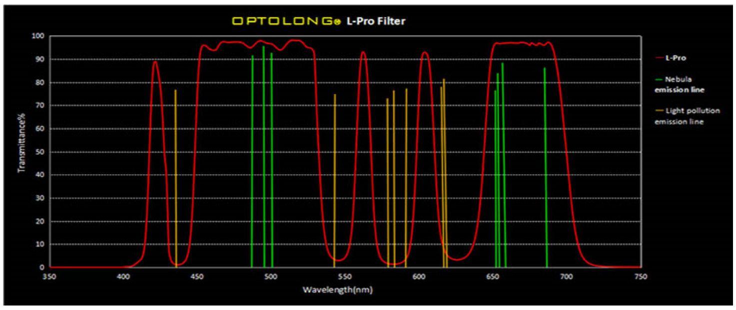
The Chinese filter manufacturer OPTOLONG based in Kunming city in the southern province of Yunnan contacted me to test their light pollution premium filter, the “L-Pro”.

This company has a lot of experience manufacturing filters in general and also on filters for astronomy use. Their catalogue includes Fluorescent filters for the biochemical industry, Optical filters, other filters for several industrial purposes and Astronomy filters. In this field, Optolong is producing light pollution, deep sky and planetary filters. Optolong filters are coming in standard 1.25” & 2” and 36mm & 77mm unmounted sizes; I had tested the standard 2” version that suits the nosepiece of my ccd camera.

Standard 2” mount

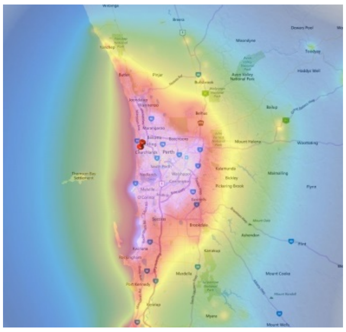
Optolong claims that the L-Pro (L-Professional) filter is designed to improve the visibility of various deep sky objects. By selectively reducing the transmission of wavelengths of light pollutants, specifically those produced by artificial lightings including mercury vapour lamps, both high & low pressure sodium vapour lights and the unwanted natural light caused by neutral oxygen emission in the atmosphere (i.e. sky glow). Together with the highly transparent in main nebula emission lines at OIII (496nm and 500nm), H-beta (486nm), NII (654nm and 658nm), H-alpha (656nm) as well as SII (672nm), the filter is suitable for enhancing the contrast and details for both visual and photographic purpose at sub-rural area with heavy light pollution.

Optical spectrum diagram by Optolong



Optolong shipped me a set of LRGB 36mm unmounted filters (that is not part of this review) with the standard 2” mounted L-Pro filter. The filters were received by end of December 2017 in a very good protecting packaging presentation. I live in City Beach, a Perth city suburb in Western Australia. As it can be noticed in the light pollution map here under, my backyard observatory is located in very light polluted area; I have measured the night sky brightness at ~17.50 SQM mag/arcsec^{2}, in other words classified as “city sky” per the Bortle scale.

Perth Light Pollution map (denotes my observatory)



So, I guess that testing a light pollution filter under these conditions will be a good test. I order to push the filter to its limit; I choose to add another contributing factor, the Moon. Tests had been performed during the 2nd and 3rd January under a 92% and 98% Moon illumination respectively.

The equipment involved in the test was my William Optics GTF-81 refractor at f/5.9 on top of a HEQ5 mount, my SBIG STF-8300C 'one-shot-color' CCD camera, the L-Pro filter was threaded into the 2" camera nosepiece.

Selected targets were:

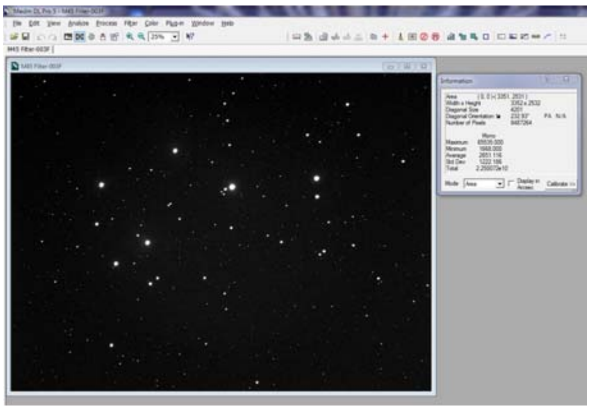
- Messier 45 (The Pleiades) pointing north and only 77º apart from the Moon, I shot 6 frames of 300" each with and without the filter,
- NCG 2070 (Tarantula Nebula) pointing South, this time, I shot 3 frames of 600" each with and without the filter.

Both targets chosen as per their position into the heavy city glow. In order to have the same sky conditions for the comparison, the images were taken at the maximum altitude, say at each side of the Meridian.

At the telescope feet, I had quickly checked the ADU values, here are the results:

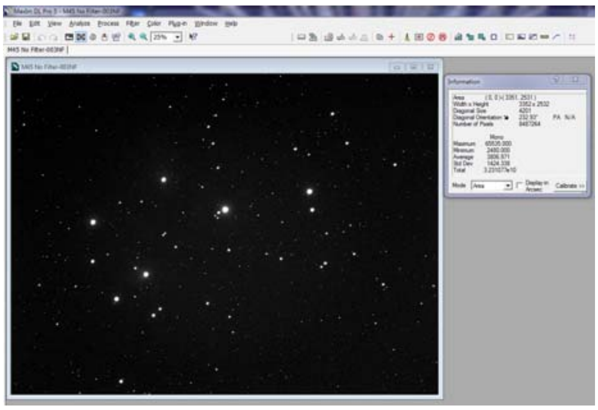
M45 - With L-Pro filter

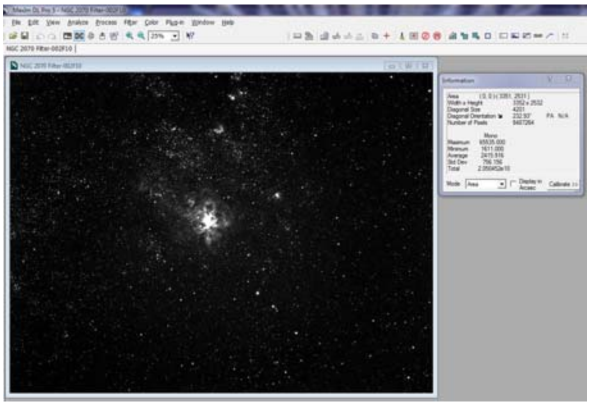
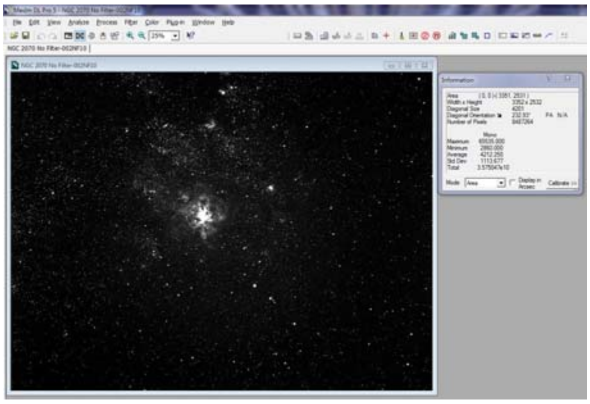
Min 1668 Max 65535 Avg 2651



M45 - Without filter

Min 2480 Max 65535 Avg 3807



NGC2070 - With L-Pro filter	**NGC2070 - Without filter**
Min 1611 Max 65535 Avg 2416	Min 2860 Max 65535 Avg 4212
	

Based on the above, I found that for M45 the minimum ADU (or the sky background level of brightness) has been reduced by 49% by using the filter and 78% in the case of NGC 2070. In terms of average image ADU, the results are similar, 44% reduction for M45 using the filter and 74% for NGC 2070.

Images were after calibrated with bias, darks and flats frames and then stacked together. Now into Photoshop for very little, and only necessary, processing. I chose to make two comparisons: ‘linear’ (using only Levels) and ‘non-linear’ (using Curves) processing. For both methods, exactly the same stretching values were applied. Here the results:

M45 - With L-Pro filter	**M45 - Without filter**
Linear Processing	Linear Processing
	

M45 - With L-Pro filter
Non Linear Processing

M45 - Without filter
Non Linear Processing

NGC2070 - With L-Pro filter
Linear Processing

NGC2070 - Without filter
Linear Processing

NGC2070 - With L-Pro filter
Non Linear Processing

NGC2070 - Without filter
Non Linear Processing

Conclusion

Having seen the images coming out from the telescope, it was already quite evident that the value readings for the sky background were far lower using the filter than without it. Those unwanted light pollutant wavelengths coming for the city lights were already blocked.

A linear stretching has been used in Photoshop for the first comparison (applying only Levels to both sets of images), the result was far less to almost non-gradients on the images obtained with L-Pro filter.

A non-linear stretching has been used as a second comparison method (applying Curves with identical values to both sets of images, this time), the results in this case were more evident with sky background values three times higher observed in the images obtained without L-Pro filter.

The final process of the data acquired using Optolong L-Pro filter was much easier and less time consuming as dealing with difficult light pollution gradients was not required and background values being lower. In the other hand, nebulosity data was also weaker; so, when using the filter, longer exposures will be necessary.

NGC2070 - With Optolong L-Pro filter – 3x600”