Managing IR in Video Astronomy
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Test Report #1 – August 16th, 2011

Objectives:

My objective in last night's test was to visually compare how blocking the infrared portion of the spectrum affects the view produced by a Mallincam astro-video camera. The following filter combinations were tested:

1. no filters
2. Mallincam IR cut filter alone
3. Baader Planetarium UV/IR cut filter alone
4. Astronomik UHC filter alone
5. Astronomik UHC + MC IR cut (UHC then IR)
6. Astronomik UHC + BP IR cut (UHC then IR, IR then UHC)
7. 680nm Pass filter alone (for fun)

I was not able to test the configuration of UHC + MC IR cut with the UHC on the camera side of the IR as my UHC is 2" and the MC IR is 1.25".

Methodology:

I used a single deep-sky object as my target: IC1318. This is a large nebulous region surrounding the star Sadr (γ Cygni). It has a bright star (Sadr), dense star field, faint nebulousity, and an open cluster all in the same field of view, making it an excellent sample target. I used my Maxvision ED80 with MFR5 (no spacers) to give approximately f/2.4 (192mm focal length). The scope was mounted to my Orion Atlas mount, and remotely controlled through my laptop from inside the house.

I used my Mallincam Xtreme to capture all image data. The camera and capture device were running with the following settings:

- AGC 6
- gamma 1
- APC vert & horz 4
- white balance ATW
- contrast 65 (full)
- brightness 0
- hue 62
- saturation 45
- sharpness 1

- DVE off unless noted…see results
- TEC set to "on" initially, but turned "off" later…see results

Results:

Note that a Moon three days past full was up during these tests, contributing to the light pollution and so making for an even more strenuous test of the filters. First I compared the view with an IR cut filter alone. From the images below you can see there is a significant reduction in star intensity as well as background brightness level when an IR cut filter is added. Only minor differences were noted between the two brands of IR cut filter tested, with the MC being perhaps slightly tighter on the brighter stars.


No Filter (9sec)

MC IR Cut (9sec)

BP UV/IR Cut (9sec)

The next step was to add the UHC filter to see how it worked together with the IR cut filter. The amount of light being cut by the IR filters is amazing. To get a comparible exposure I had to reduce the UHC alone to 25sec integration from 40sec. The tighter band on the MC is more apparent now, as I had to reduce the integration to 35sec on the BP to get a comparable exposure. Views between MC+UHC and BP+UHC are very obviously different, but which looks better I think is a little subjective; I like aspects in both. Switching the order of the filters when using the BP IR cut made practically no change in the image, at least none that could be clearly identified as not due to slight differences in my focusing. I had no loss of colour (esp. red) for any filter combination. Note that TEC was "ON" for the MC IR images below, but "OFF" for the others so there are a large number of warm pixels in the MC IR image.
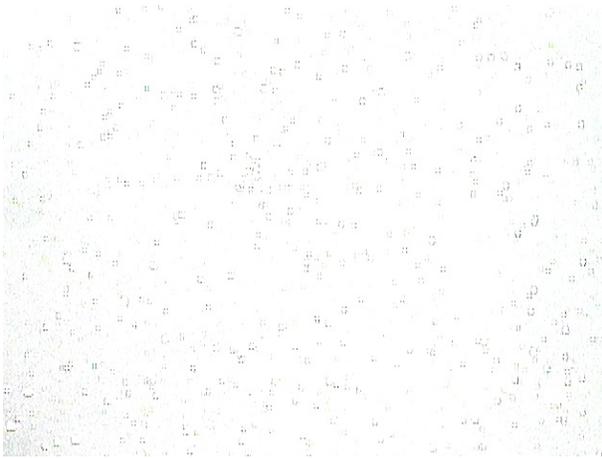
UHC (40sec)   UHC(25sec)

UHC + MC IR (40sec) – note TEC "ON" here

UHC + BP IR (40sec)   UHC + BP IR (35sec)

It was very clear from my short amount of testing last night that the Mallincam is able to pick up a lot of energy in the infrared band. To make it even clearer, I put my 680nm Pass filter on, allowing only infrared to get to the camera detector. Below is the resulting image…holy moly that's a lot of stars! There is no nebulousity to speak of, but that's a lot of stars. Note also how dark the background sky is. Hmmmm.

680nm Pass (40sec)

Call me curious, I decided to do a bit more investigation after this. Below are images comparing UHC + MC IR to 680nm Pass. The targets are M31 and the double cluster in Perseus. Surprisingly, the IR pass images are way better. The IR pass images have much darker backgrounds and better contrast. Finally I took an image of the Moon through the IR pass. You can not tell that the image is not from the visual band, it looks just as clear and detailed. The M31 and double cluster images below are 40sec INT and have DVE set to "darken", but all other settings the same as rest of test.

UHC + MC IR	680nm Pass
UHC + MC IR	680nm Pass

Future Work:

My plan at this point is to do some more testing on the MC IR cut filter, this time in my workshop. My hope is to get an idea of what its spectral response curve is, and compare it to other IR cut filters on the market. I also want to test the impact of using these fancy interference type filters on short focal lengths.

680nm Pass

If you have any questions, please feel free to contact me.

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