# DUAL-BAND FILTERS

Measurements and Comparisons

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# DUAL-BAND FILTERS

Introduction

## Intention of this document:

This presentation summarises the spectral characteristics of different dual-narrowband astrophotography filters. All filters have been measured in the lab and tested under real sky conditions to check if each filter is performing to spec and if any halos can be detected. Primarily the following filters were investigated:

- Optolong L-eXtreme
- Antlia ALP-T
- Player One Anti-Halo Pro
- ALTAIR ULTRA 4nm Ha-OIII

The Optolong L-eXtreme is just for reference. I was using this filter for quite some time, but I wasn't really happy with its halo-performance. Therefore, I was looking for a halo-free alternative.

## Intention of this document:

For the sake of completeness:

In chapter 6 there are also measurements of other ALTAIR filters presented, that have been investigated before:

- ALTAIR ULTRA 4nm Ha-OIII (preliminary version)
- ALTAIR ULTRA 6nm Ha-OIII (preliminary version)
- ALTAIR ULTRA 6nm SII-OIII (preliminary version)

Note that there was an issue with those preliminary filters and they did not perform as specified and measured by ALTAIR. Investigations were showing, that the coatings must have changed their characteristics after final inspection at ALTAIR. The new and official version of the ALTAIR ULTRA 4nm Ha-OIII filter was produced slightly differently to overcome those issues.

## Agenda:

1. Mechanical Built Quality
2. Visual Appearance of Coatings
3. Spectral Measurements
   - General Comments
   - Impact of Slit Width
   - Blocking-Range Measurements
   - Band-Pass Measurements
4. Real-Sky Tests
5. Conclusion

## Referenced Emission Lines:

| | |
|---|---|
| OIII (1) | 495.891 nm |
| OIII (2) | 500.684 nm |
| Ha | 656.282 nm |
| SII (1) | 671.644 nm |
| SII (2) | 673.081 nm |

# DUAL-BAND FILTERS

1. Mechanical Built Quality

## Problem with Baader Filter-Drawer System

The threads of most filters are too long! ➔ Not 100% compatible with Baader filter drawer system!

**Measured total thicknesses:**

| | |
|---|---|
| L-eXtreme: | 6.96mm |
| ALP-T: | 7.40mm |
| Anti-Halo Pro: | 7.45mm |
| ALTAIR ULTRA: | 7.50mm |

**Measured threads:**

| | |
|---|---|
| L-eXtreme: | 2.00mm |
| ALP-T: | 2.45mm |
| Anti-Halo Pro: | 2.45mm |
| 4nm Ha-OIII: | 2.50mm |

Compatible Filter


Non-compatible Filter

# DUAL-BAND FILTERS

1. Mechanical Built Quality

## Problem with Baader Filter-Drawer System

- Thread stick out by around 0.3Xmm
- If filter is screwed in properly, the drawer can’t be inserted into the mounting


## Packaging

All but the Antlia ALP-T filter come in a regular-sized and adequate packaging.
The Antlia ALP-T packaging is unnecessarily big. It should probably look “premium”, but in my opinion the standard boxes are way more convenient and the Antlia box is a waste of material.

# DUAL-BAND FILTERS

2. Visual Appearance of Coatings

## Differences in AR-Coating on Backside

- All filters look pretty much the same from the front side
- No haze or fog visible on any of the filters
- Backside appears differently
- Silver AR-Coating on the ALTAIR 4nm Ha-OIII
- Strong gold/yellow on Player One Anti-Halo Pro
- Light gold on Antlia ALP-T

Note that reflection wasn't measured separately.

But probably the back side coating will have impact on halo-performance as well.


# DUAL-BAND FILTERS

3. Spectral Measurements

## General Comments

Devices used:

- PerkinElmer Lambda 1050 Spectrometer
  - Data sampling used here: 0.2nm
  - Slit width used here: 0.2nm
  - AoI for all filters: 0°

- J.A. Woollam RC2 Ellipsometer
  - Data sampling is fixed: 1.0nm
  - Resolution is also fixed: 1.0nm (probably slightly lower)
  - Used for fast AoI measurements: 0° - 14° (corresponds to ∞ - f/2))
  - Wavelength axis calibrated with Holmium sample (±0.2nm)

PerkinElmer Lambda 1050

J.A. Woollam RC2

## Impact of Slit Width

- The data sampling was always set to the same value as the slit width, if not stated otherwise
- Slit width can have impact on the spectral measurement (band-pass location and FWHM)
- However, if the slit width is small compared to the spectral feature, the impact is rather small
- Results from all devices were cross-correlated to check for differences in calibration
- Measurements with different slit widths (resolution) were compared to check the impact on band-pass location and FWHM

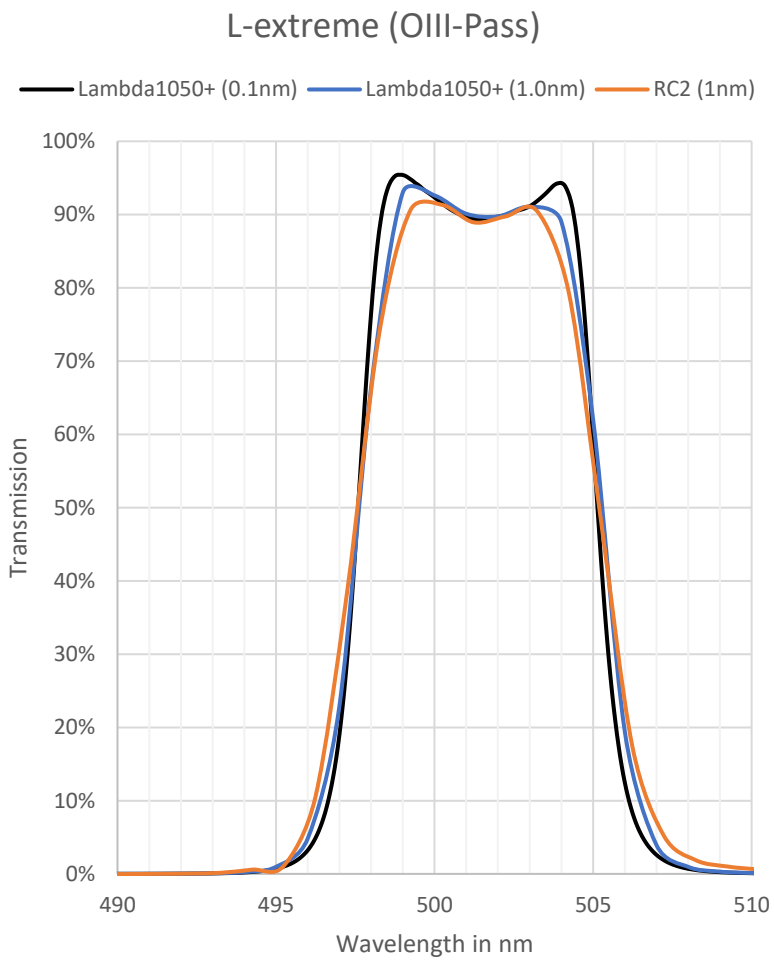
# DUAL-BAND FILTERS

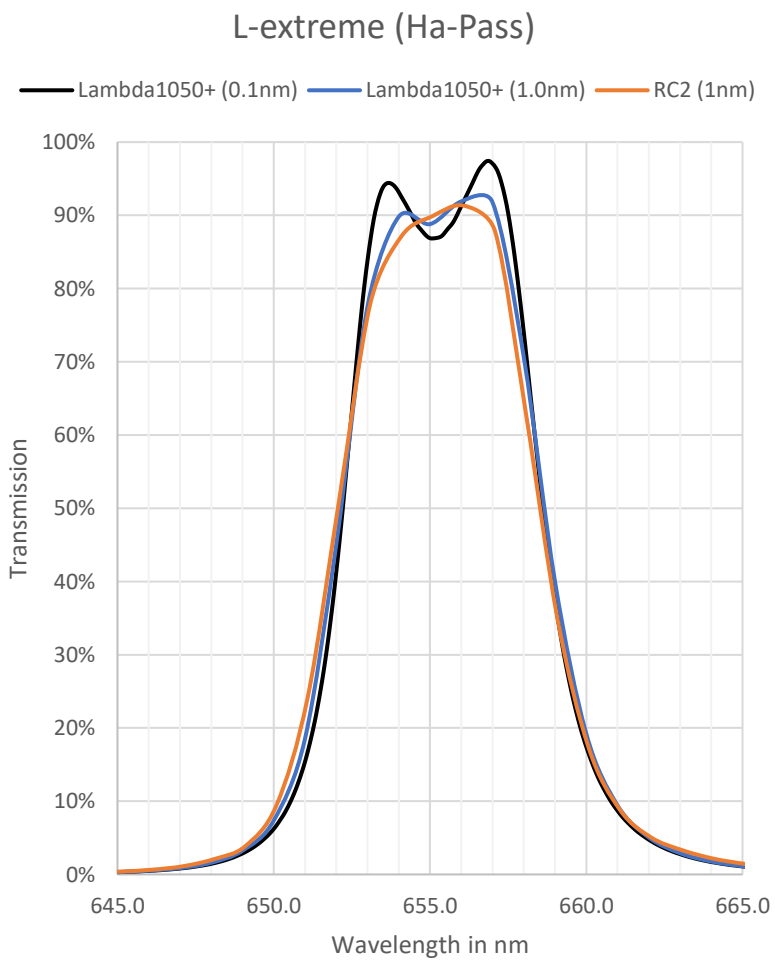
3. Spectral Measurements

## Impact of Slit Width

- RC2 seems to have slightly lower resolution compared to the (1nm) Lambda 1050
- Lower resolution (larger slit) leads to slightly larger foot-area
- Sharp spectral features are only resolved in high-resolution measurements (0.1-0.2nm)
- **However, FWHM and band-pass location are very similar in all three cases**

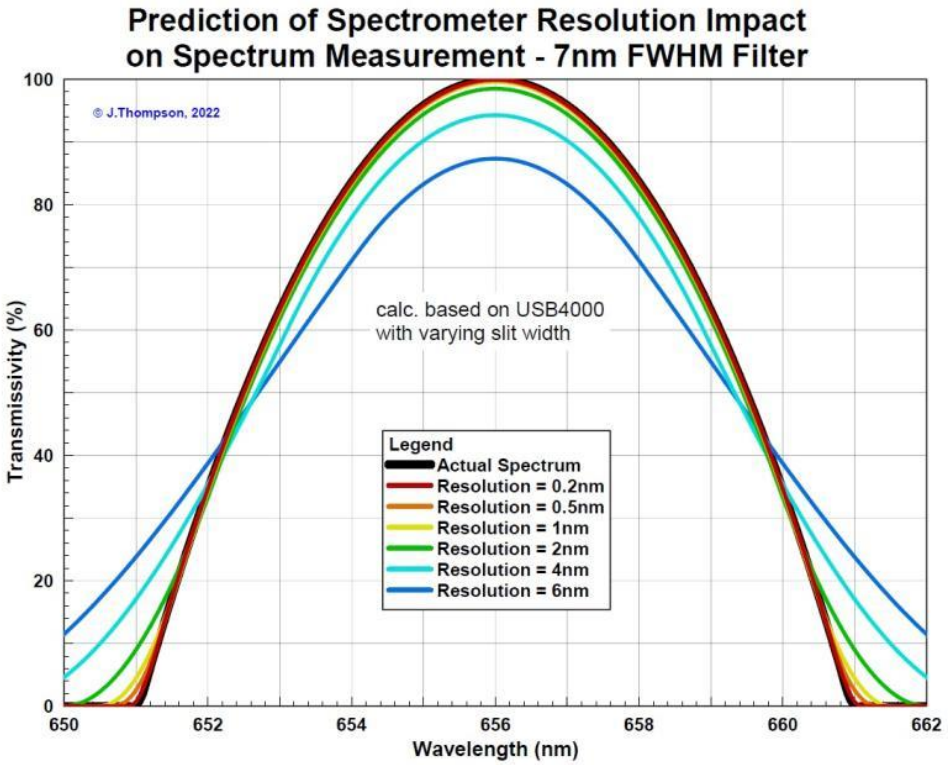
| | | Lambda 1050+ (0.1nm) | Lambda 1050+ (1.0nm) | RC2 (1.0nm) |
|---|---|---|---|---|
| **L-extreme** | OIII | 7.6 | 7.7 | 7.9 |
| | Ha | 6.5 | 6.8 | 6.8 |

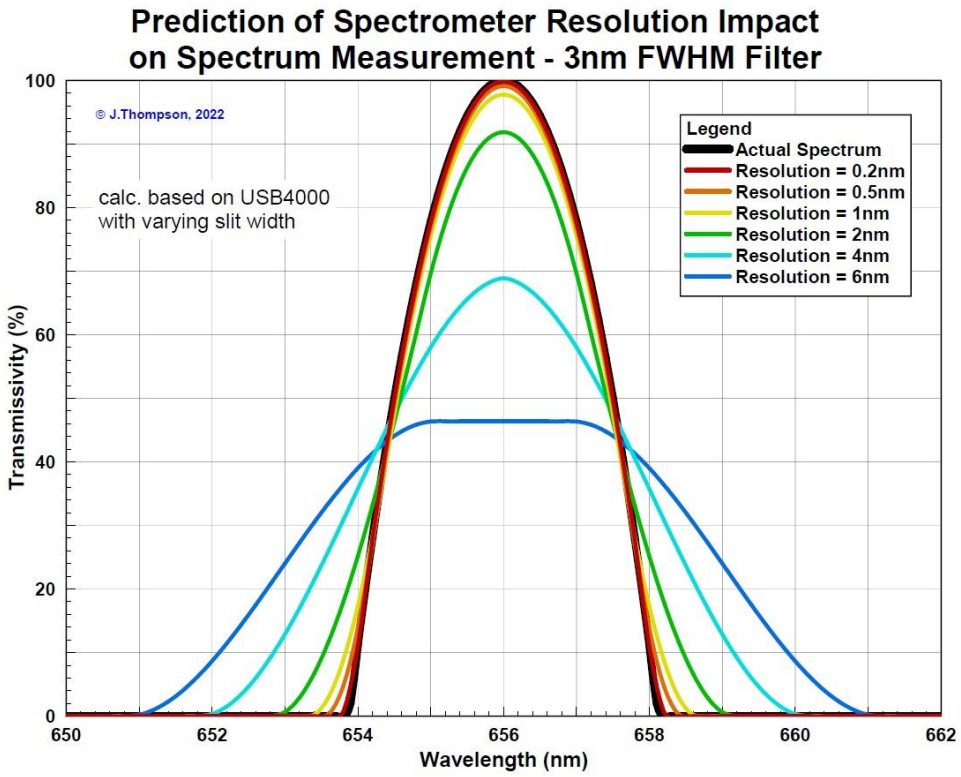


## Impact of Slit Width

Also read the corresponding Cloudy Nights article by J. Thompson (posted 18th of March 2022).
It confirms that even for a 3nm band-pass, the results for slit widths ≤ 1nm are almost identical.



## Blocking-Range Measurements

A special measurement was performed to address out of band blocking in particular.

Therefore, attenuation filters had to be inserted into the reference arm of the spectrograph.

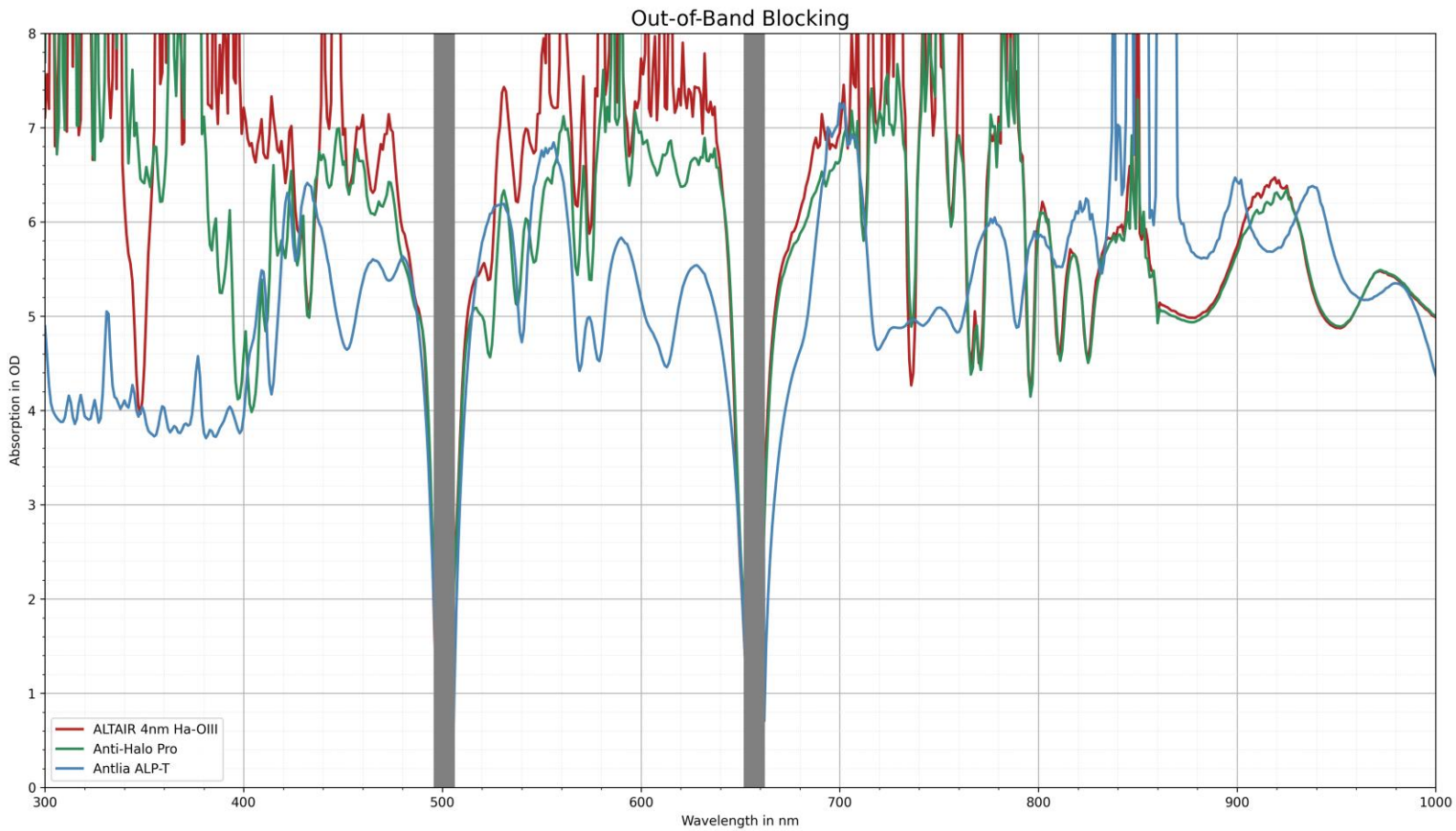
For this particular measurement the band-pass regions are not 100% accurate. Therefore, these regions are greyed out.

In some ranges the performance of the ALTAIR 4nm Ha-OIII filter and the Anti-Halo Pro are **almost identical**! Especially at the longer end.

Except one dip at around 350nm where the ALTAIR filter goes down to OD 4, it outperforms the Anti-Halo Pro.

Except for some parts at the longer end, the blocking of the Antlia ALP-T is not as good as for the other filters.

However, all filters provide >OD4 blocking (T < 0.01%) which is already quite good.



## Blocking-Range Measurements

For the L-eXtreme no particular measurement of the blocking range was performed.

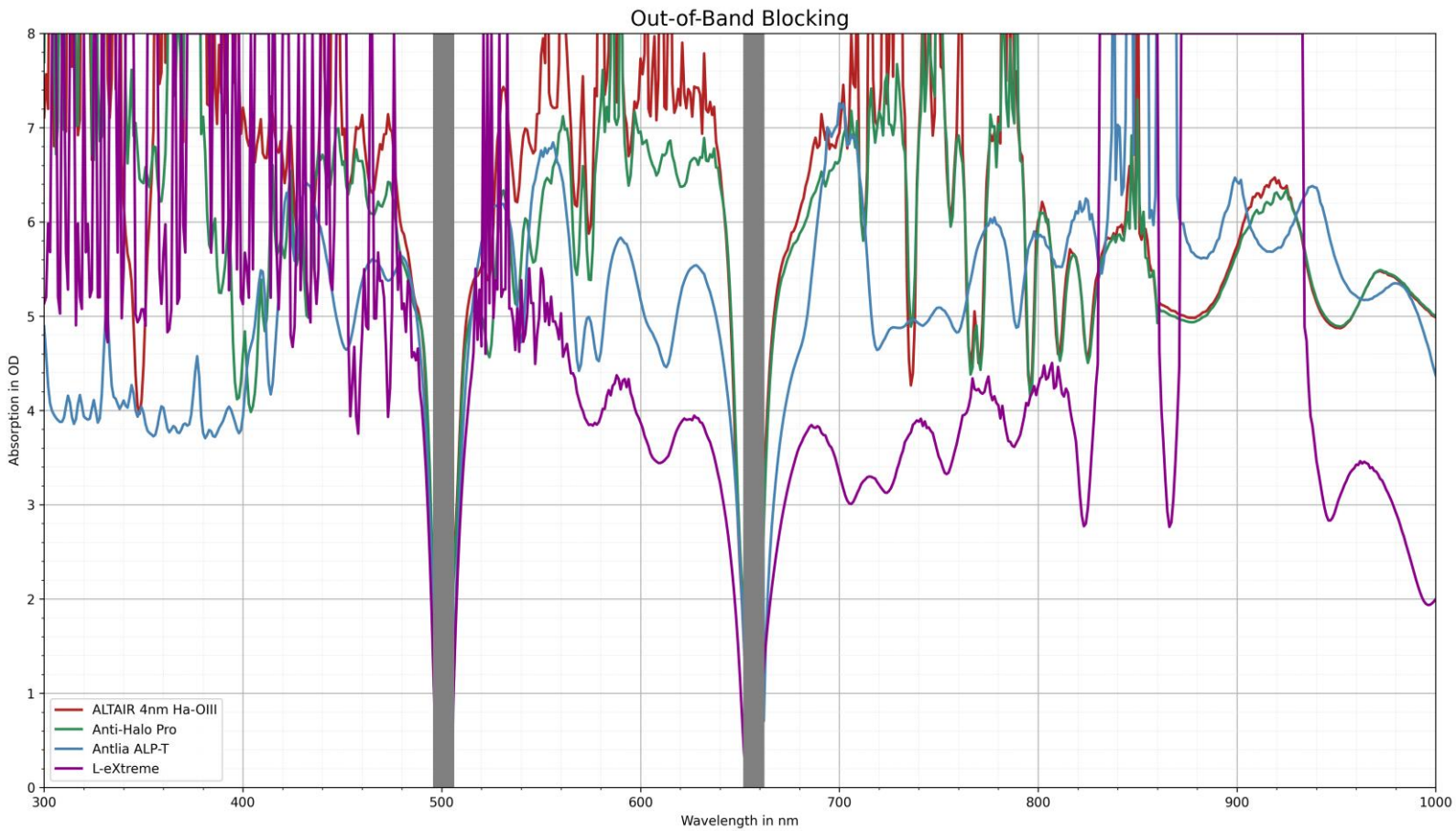
Transmission can be translated to OD by:

$$OD = -log_{10}(T)$$

Note that below 550nm the OD curve of the L-eXtreme filter is not very accurate.

However, on the long end, the curve can be resolved without too much noise.
Here you can see that the performance of the L-eXtreme is roughly 1 to 1.5 orders of magnitudes below the performance of the Antlia ALP-T.

In many areas it goes down to OD3 (T = 0.1%) or even OD2 (T = 1%). Since the detector will have higher reflectivity at the long end, this is definitely causing some strong halos.



## Band-Pass Measurements

In this section, the results of the band-pass measurements and calculations are shown. Note that the recorded curves have been measured with two different devices (see General Comments).

Each filter was measured using the Perkin Elmer Lambda 1050 under 0° AoI to record a **high-resolution** spectrum with 0.2nm resolution/sampling.

Additionally, each filter was measured using the J. A. Woollam RC2 Ellipsometer. Despite the **lower resolution** and sampling, this device has the main advantage of performing a quick and easy measurement of the AoI-dependency (automatic and precise sample rotation).

In total 7-8 measurements (from 0°-12° or even 14° in 2° steps) were performed for each filter. The AoI shown on the right are only present at the outer edge of the optical aperture. This means, that a telescope (or lens) at e.g. f/2 is also sending rays with lower AoI through the filter, which experience a lower shift in wavelength.

| AoI in ° | f-number |
|---|---|
| 0 | inf |
| 2 | 14.3 |
| 4 | 7.2 |
| 6 | 4.8 |
| 8 | 3.6 |
| 10 | 2.8 |
| 12 | 2.4 |
| 14 | 2.0 |

# DUAL-BAND FILTERS

3. Spectral Measurements

## Band-Pass Measurements

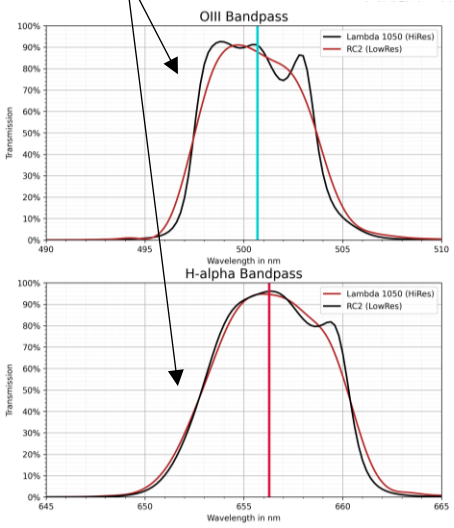
On the following slides you will find eight diagrams on two separate pages for each filter tested. Here is a short explanation of what they are showing:

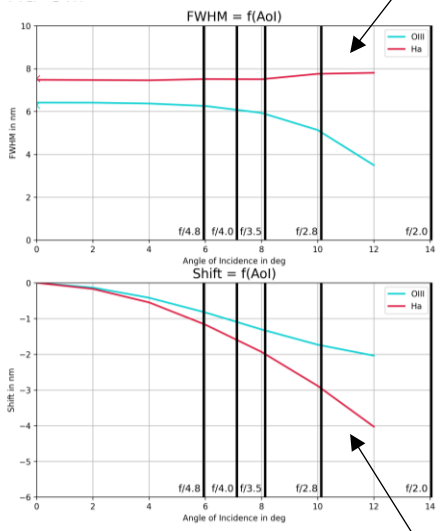
Comparison between high and low resolution measurement at 0° AoI for both band-passes (note that FWHM is almost not affected, even if sharp features are not visible).

FWHM plotted over AoI for both band-passes. Note that the FWHM values from the high-res measurement at 0° are marked by crosses on the left.

All available low-res AoI measurements of both band-passes. The dots show the actual data points, while the lines are interpolated.

Transmission at a given AoI. Note that this corresponds only to the outermost rays in your system and doesn't correspond to the total transmission over all AoI.



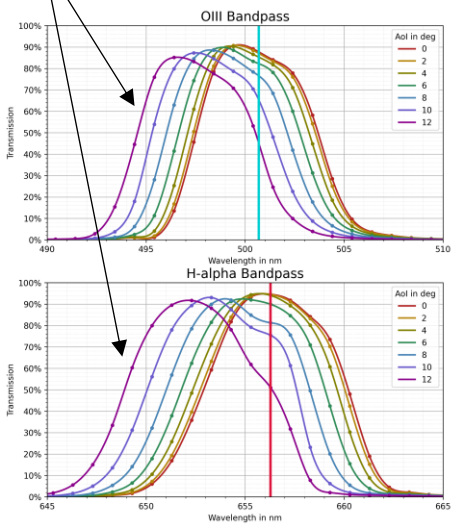







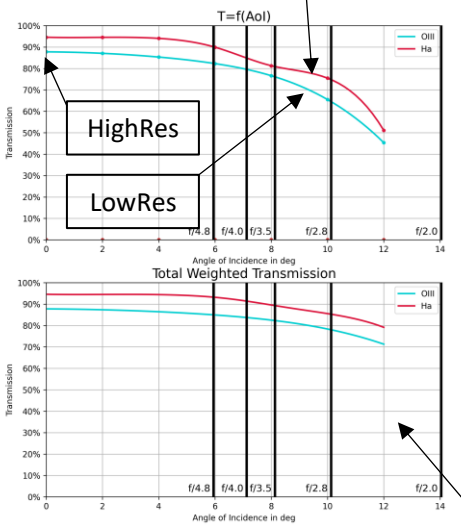



Band-pass shift in nm over AoI for both band-passes taken from the left slope at 50% peak transmission.











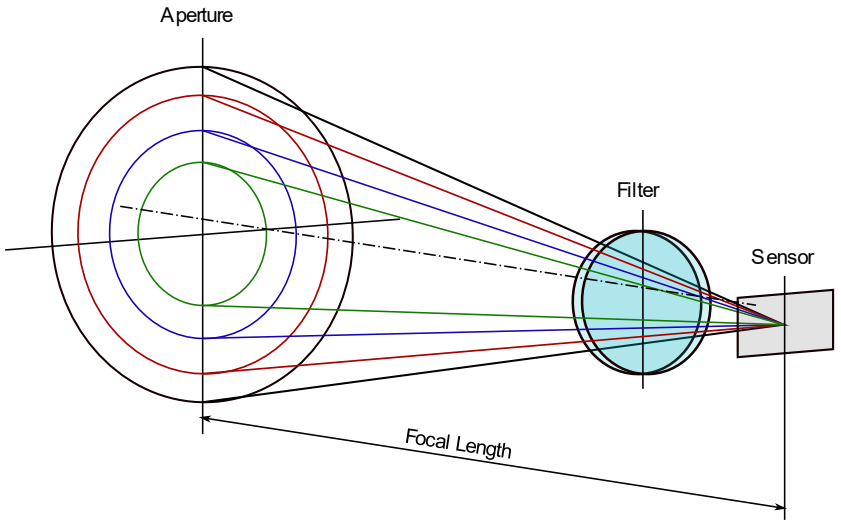


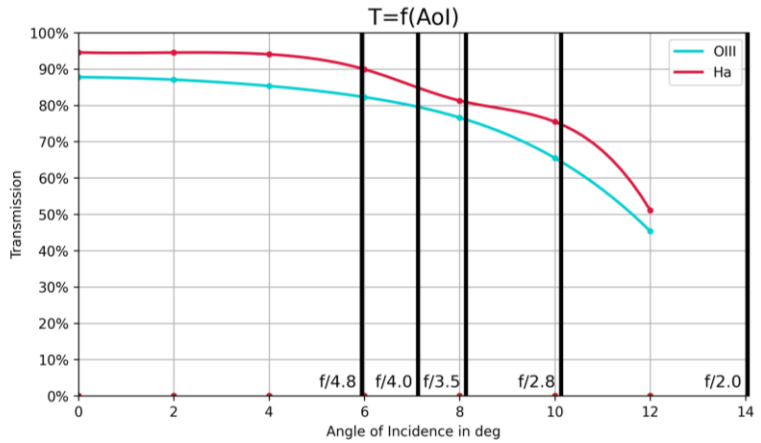
Total transmission that is caused by the filter (not other optics) if all AoI that your system produces are taken into account until the (displayed) maximum f-number/AoI.

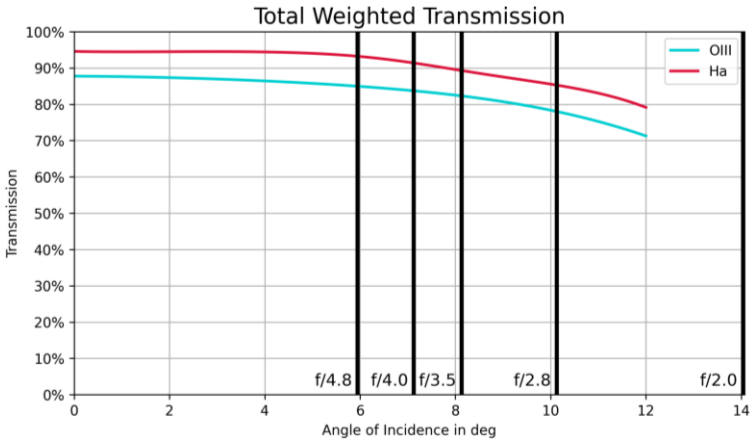
## Band-Pass Measurements

Just to explain the last two graphs a little bit more in detail, I'll give you a short example.

Let's assume you have a telescope with 1000mm focal length and 250mm aperture. So, the f-number corresponds to k = f/D = 1000/250 = 4 and the maximum AoI that passes your filter towards the sensor is around 7.2° (black circle/rays). In the T=f(AoI) graph you can read the filter transmission for every arbitrary AoI. The lowest transmission can be found at the edge of the aperture (7.2°) with is around 80% for OIII and about 85% for Ha. However, your system also sends rays with smaller AoI through the filter that might experience a higher transmission. This is where the graph on the right comes in. Here the transmission for all AoI are taken into account up to the given f-number/AoI on the abscissa. Therefore, the curves to the right don't look as drastic as they do in the middle. This filter would provide a total (weighted) transmission for your specific system of around 84% for OIII and 91% for Ha.



## Band-Pass Measurements

PLEASE NOTE!

The following curves belong to the measurements of the specific samples that I was testing!

Due to manufacturing tolerances each filter of a certain kind might have slightly different characteristics!

Even due to inhomogeneities the curves may vary a little when testing another location on the same filter!

Your copy of a specific filter might perform slightly differently!

If you have concerns about the performance of your filter, please find someone to measure it or contact the supplier.

Filters with a larger FWHM tend to have higher transmission, however, in this case, out-of-band light might reduce the SNR.

# DUAL-BAND FILTERS

3. Spectral Measurements

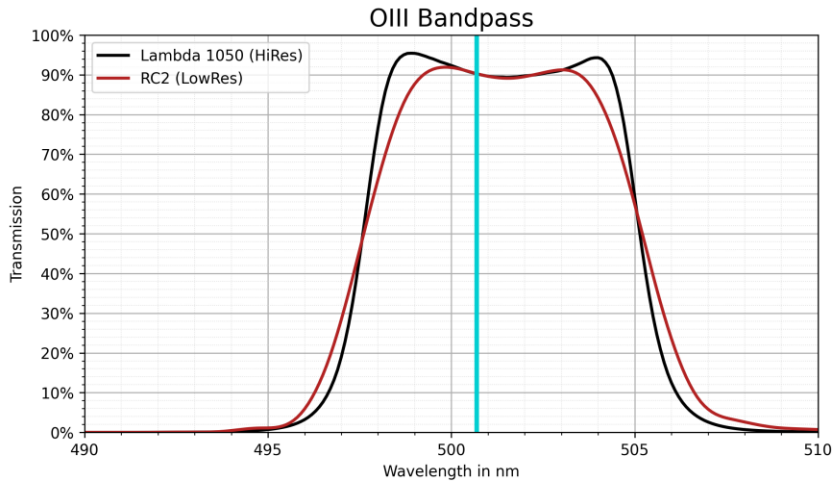
## Band-Pass Measurements

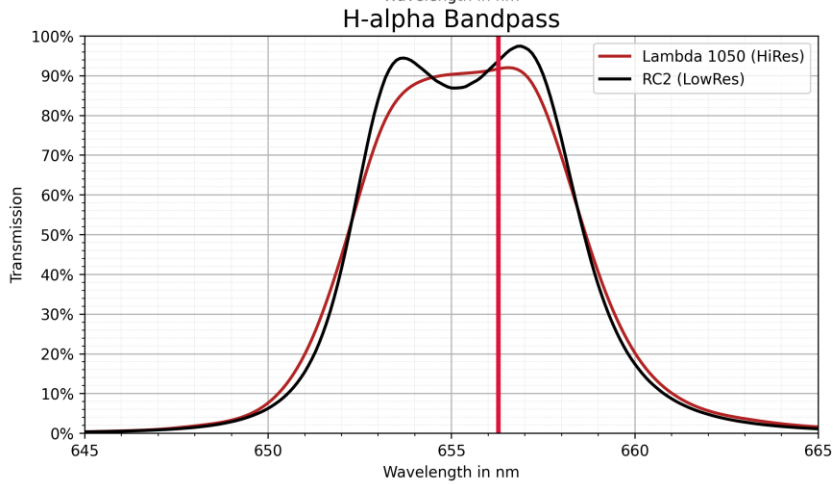
Optolong L-eXtreme

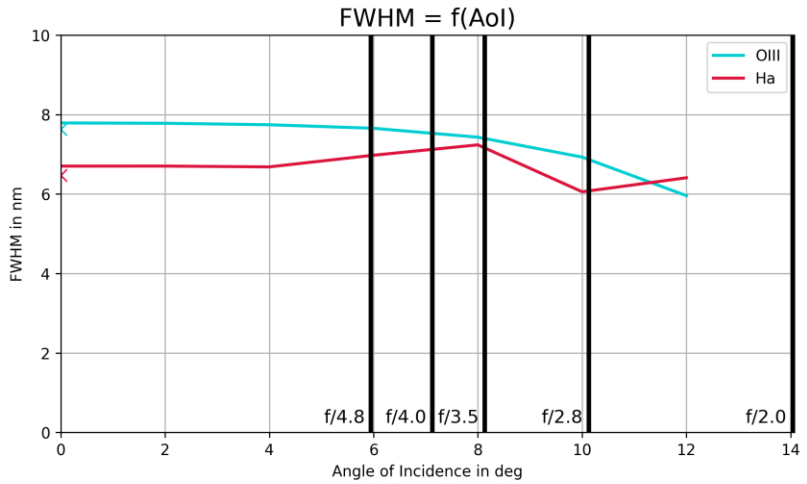
**Comments:**

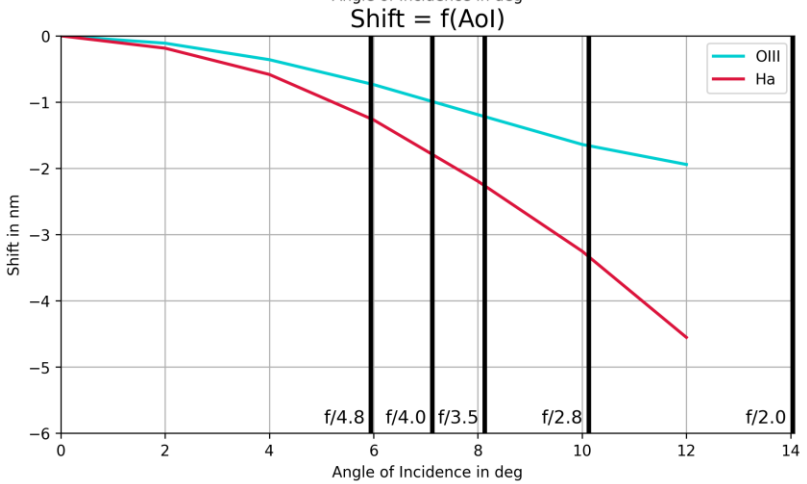
- OIII FWHM slightly out of spec
- Quite good transmission
- Ha could be positioned slightly better

Optolong L-eXtreme



# DUAL-BAND FILTERS

3. Spectral Measurements

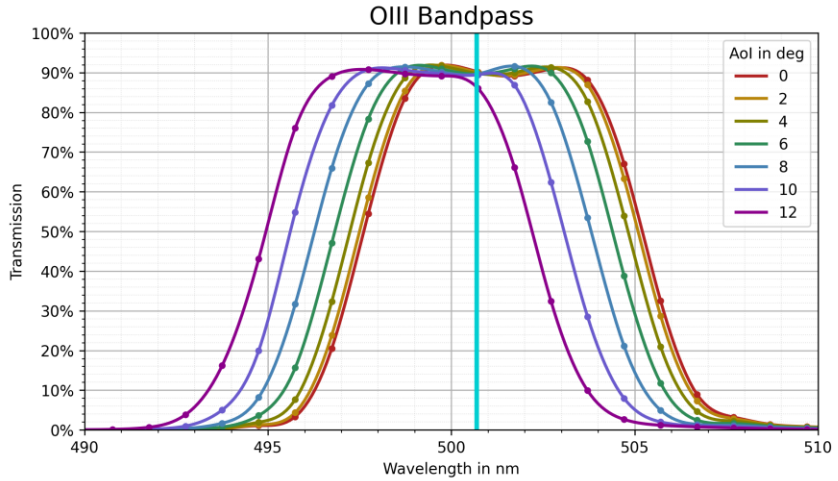
## Band-Pass Measurements

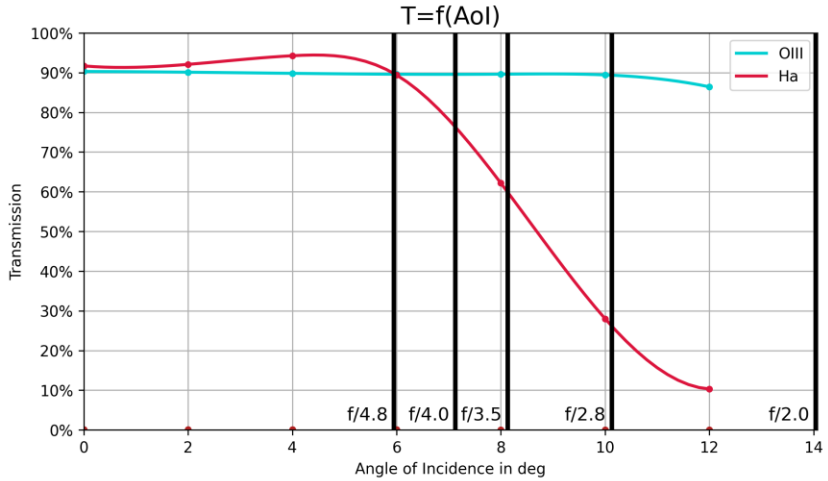
Optolong L-eXtreme

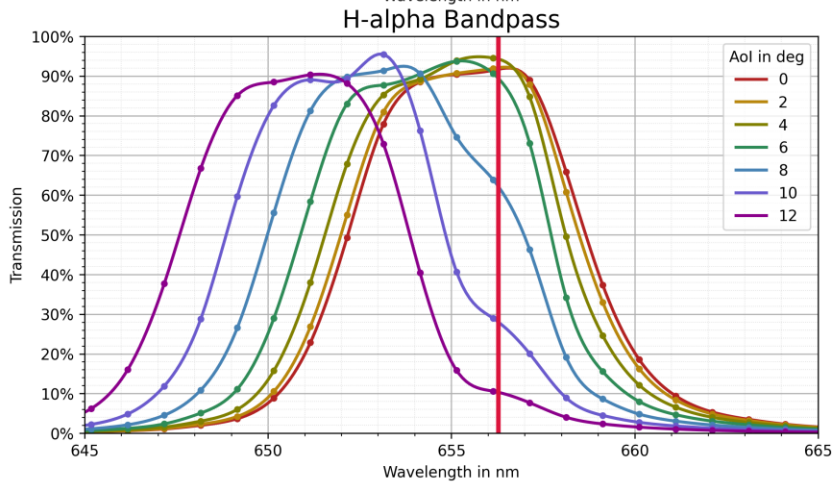
**Comments:**

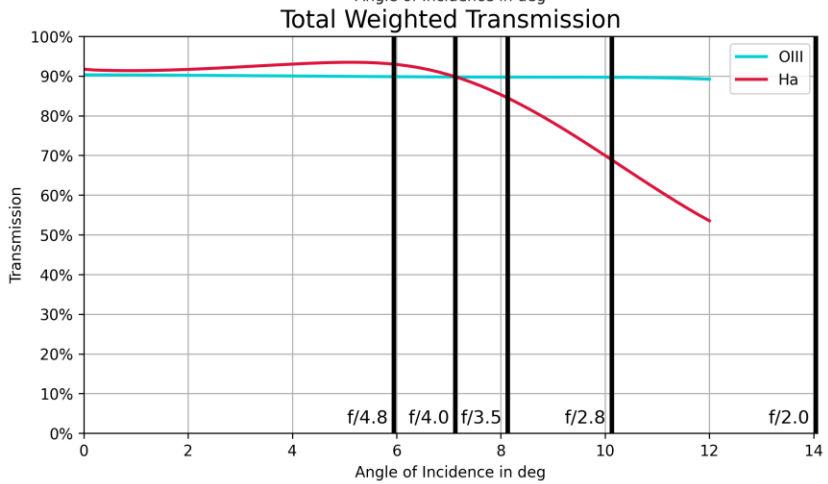
- OIII FWHM slightly out of spec
- Quite good transmission
- Ha could be positioned slightly better
- OIII curve progression over AoI looks perfect
- Ha curve progression looks rather “shaky” above 6° (f/4)
- Best performance up to f/4.8…f/4 (ok for f/3.5)

Optolong L-eXtreme



# DUAL-BAND FILTERS

3. Spectral Measurements

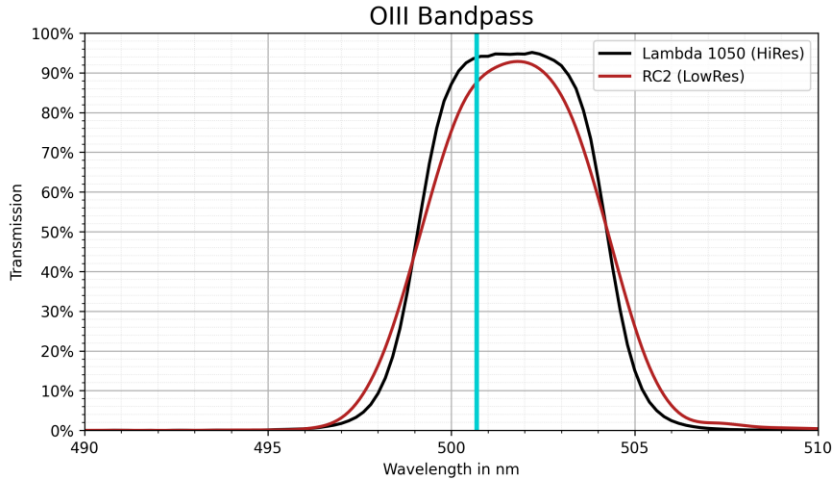
## Band-Pass Measurements

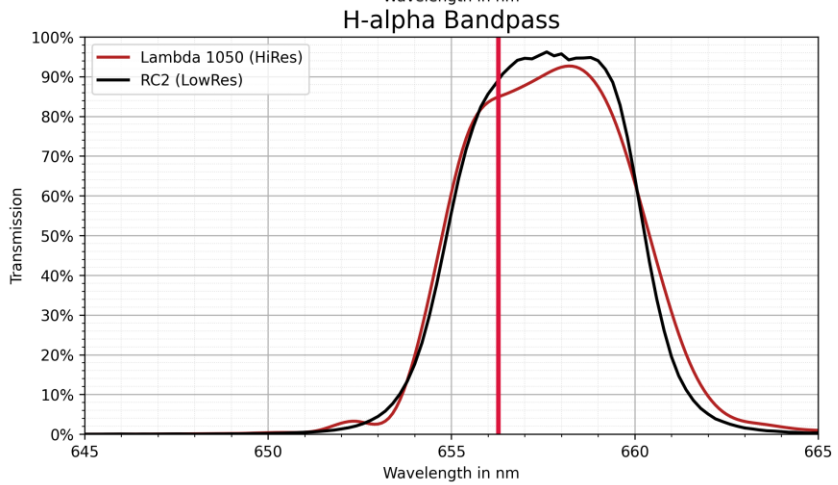
Antlia ALP-T

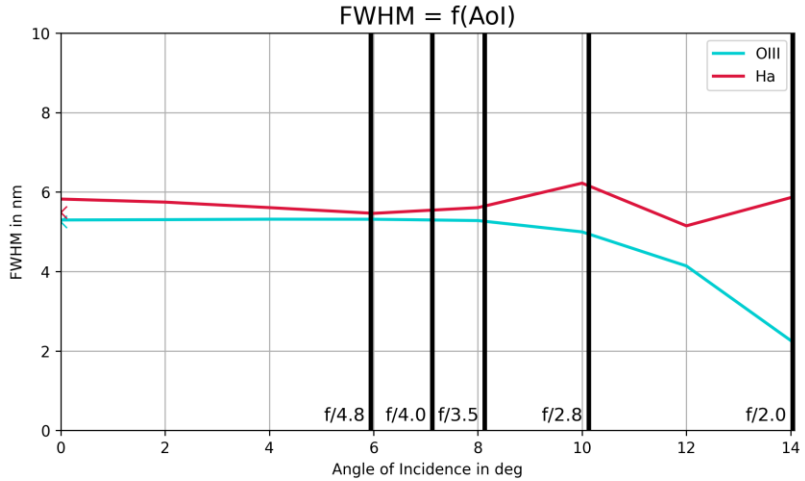
**Comments:**

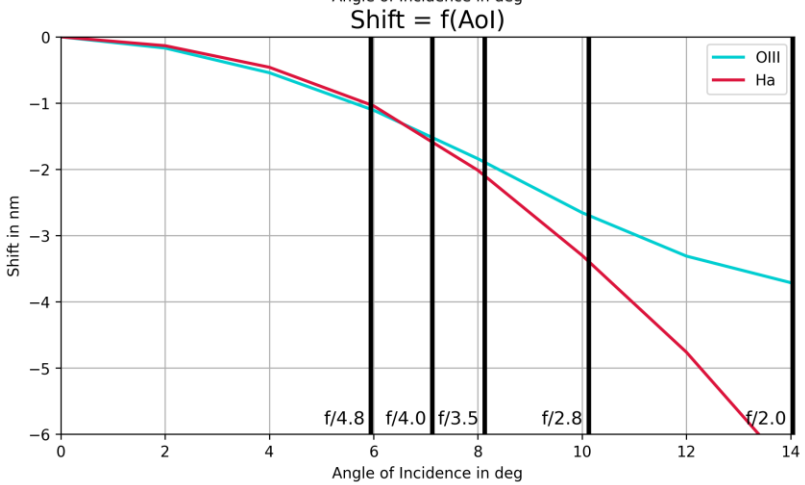
- Very good bandpass location
- High transmission for Ha and OIII

Antlia ALP-T



# DUAL-BAND FILTERS

3. Spectral Measurements

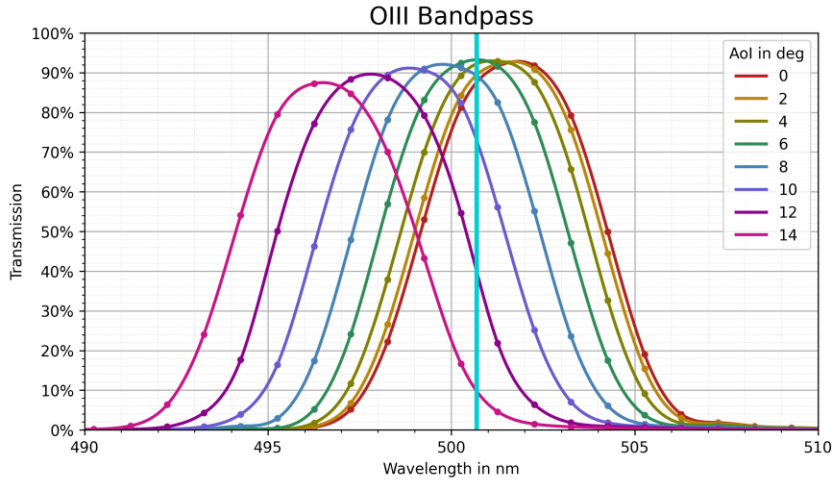
## Band-Pass Measurements

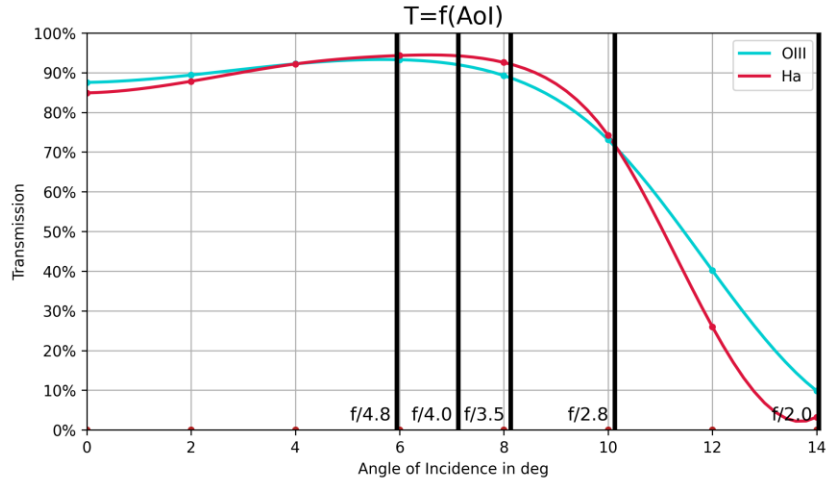
Antlia ALP-T

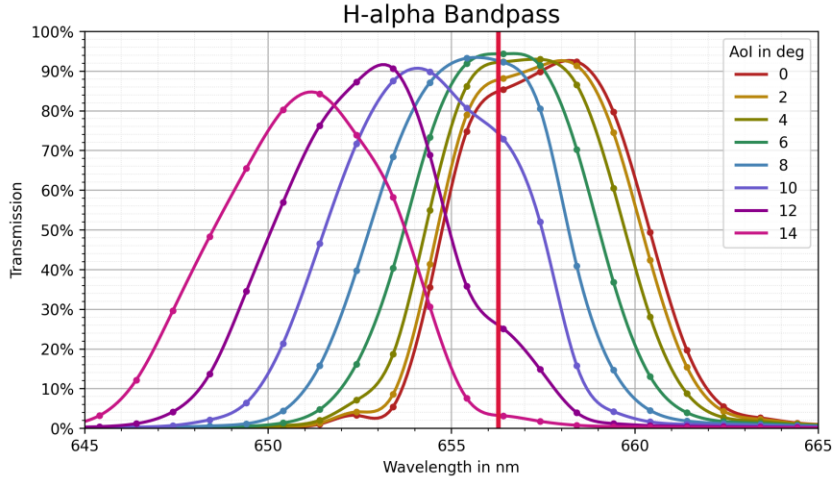
**Comments:**

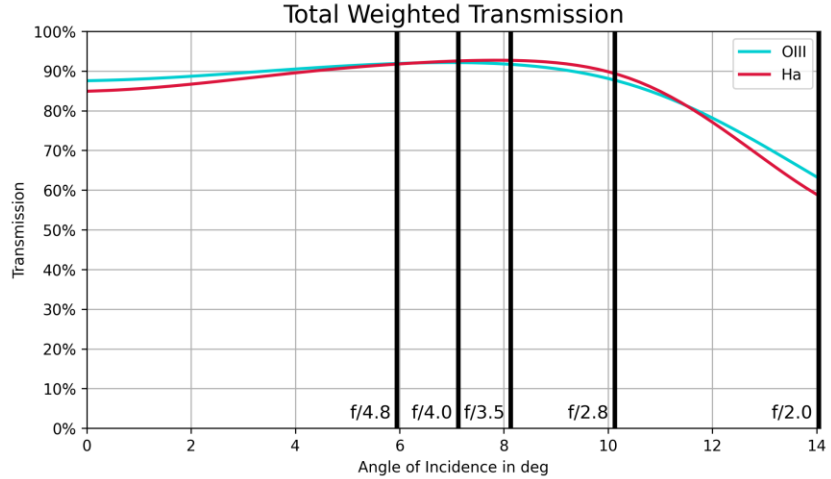
- Very good bandpass location
- High transmission for Ha and OIII
- Stable OIII curve progression
- Ha curve progression starts shaking for AoI > 8° (f/3.5)
- Best performance up to f/3.5 or even f/2.8

Antlia ALP-T



# DUAL-BAND FILTERS

3. Spectral Measurements

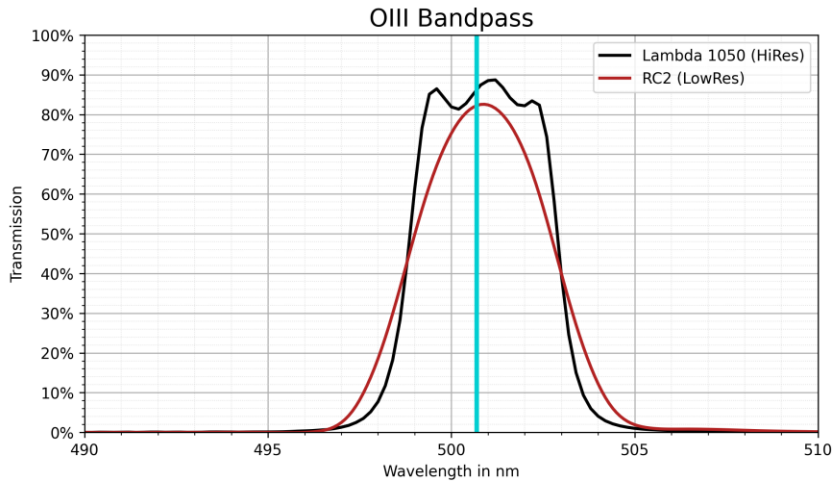
## Band-Pass Measurements

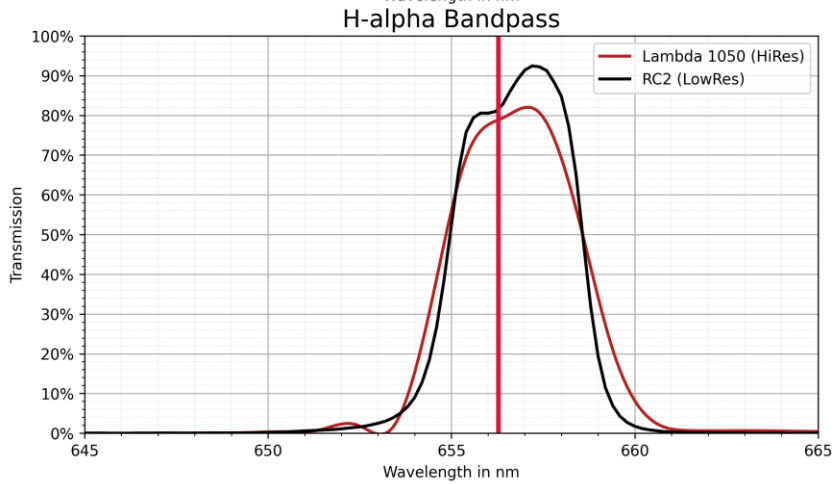
Player One Anti-Halo PRO

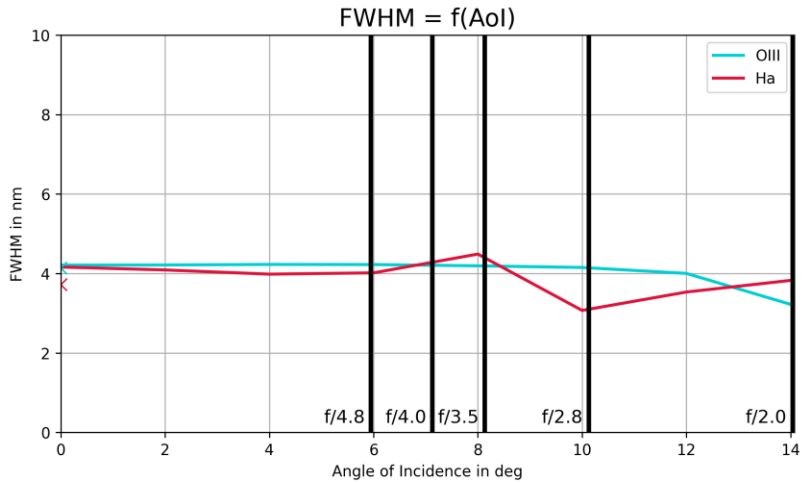
**Comments:**

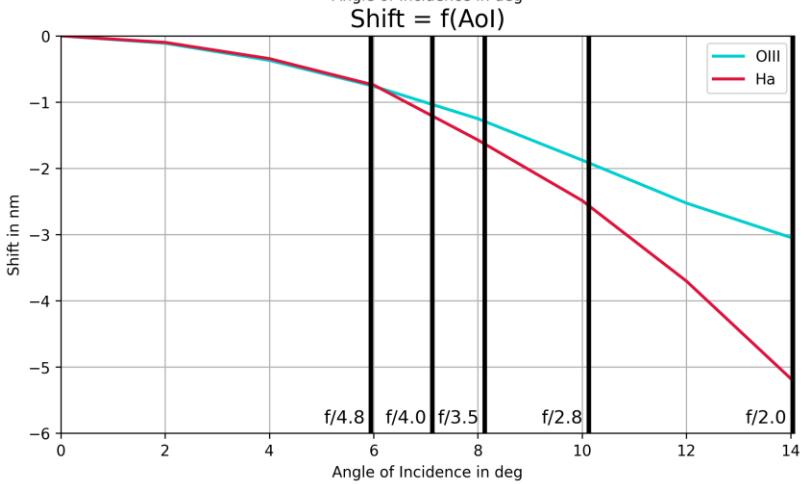
- Very low FWHM
- Transmission slightly lower than its competitors

PlayerOne Anti-Halo PRO



# DUAL-BAND FILTERS

3. Spectral Measurements

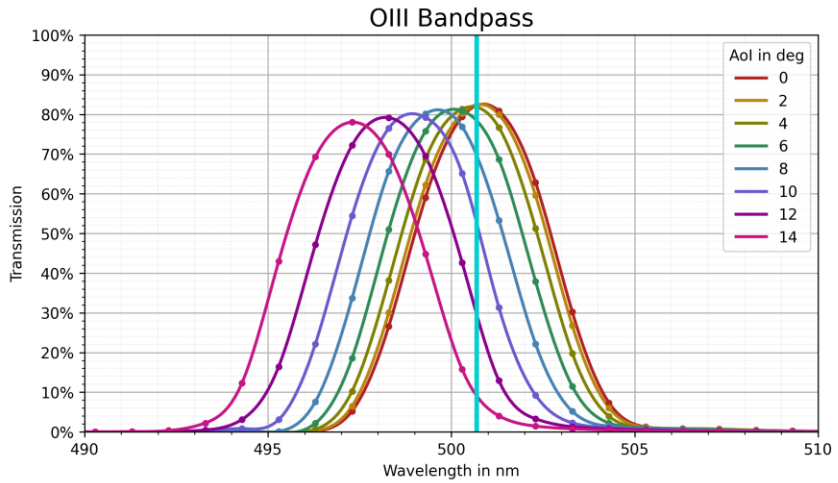
## Band-Pass Measurements

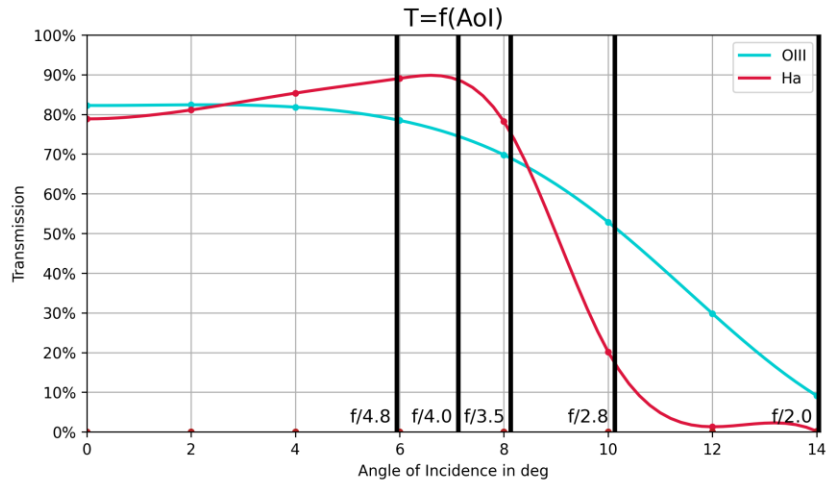
Player One Anti-Halo PRO

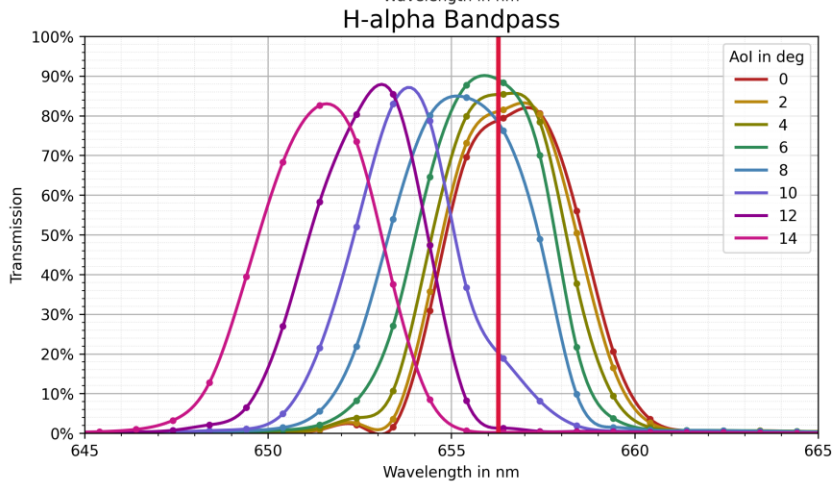
**Comments:**

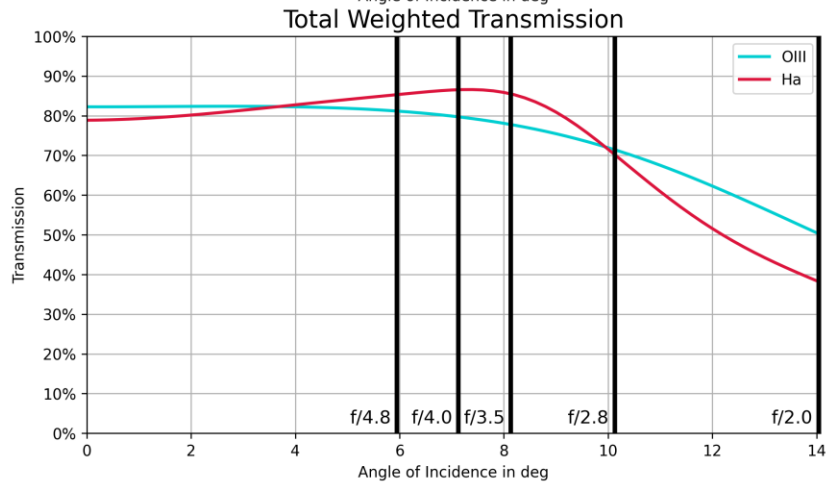
- Very low FWHM
- Transmission slightly lower than its competitors
- Very stable curve progression for OIII (ok for Ha)
- Best performance up to f/4 or even f/3.5

PlayerOne Anti-Halo PRO



# DUAL-BAND FILTERS

3. Spectral Measurements

## Band-Pass Measurements

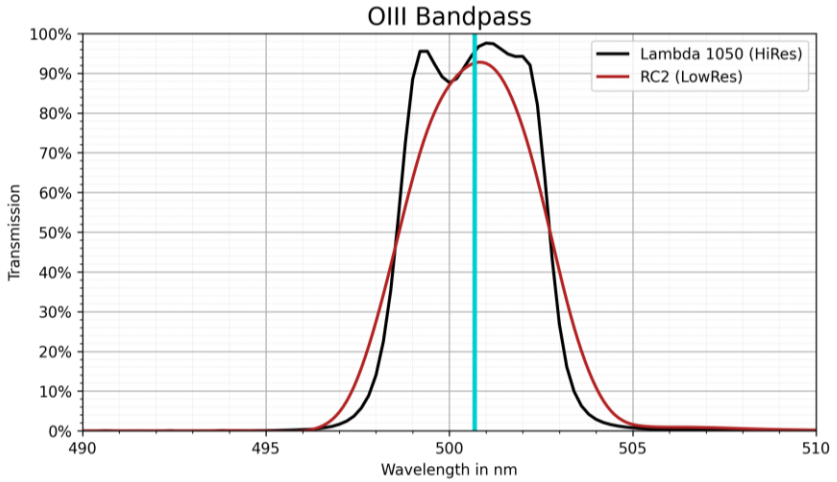
### ALTAIR 4nm Ha-OIII**

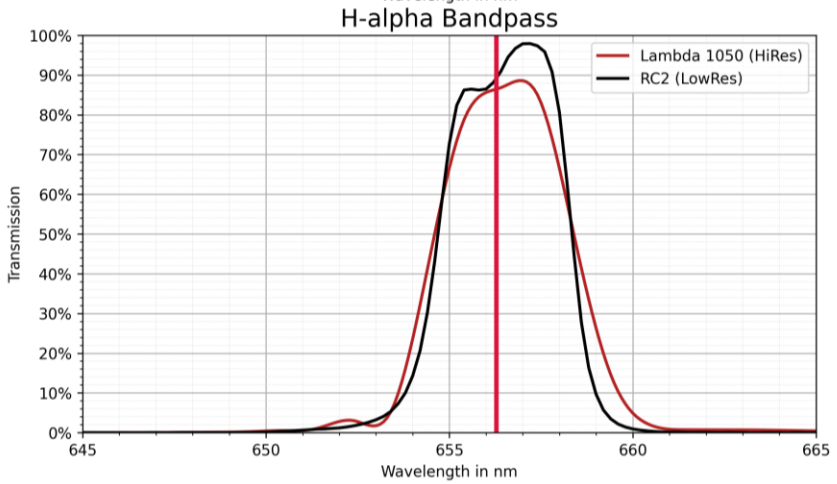
**current version

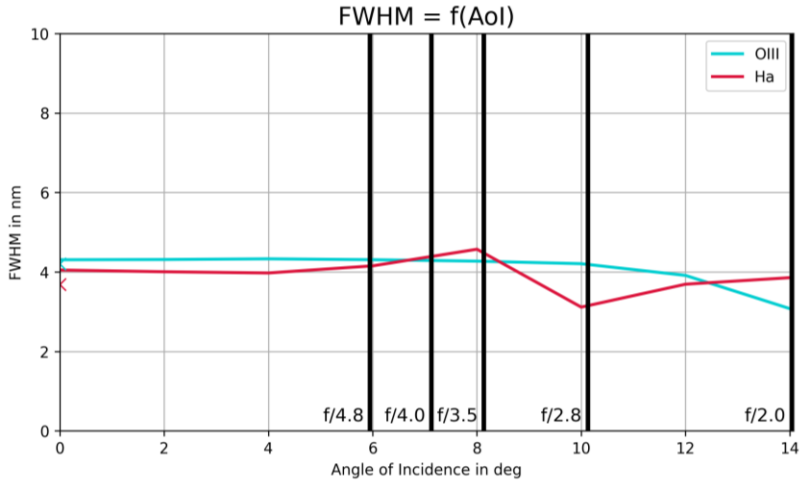
**Comments:**

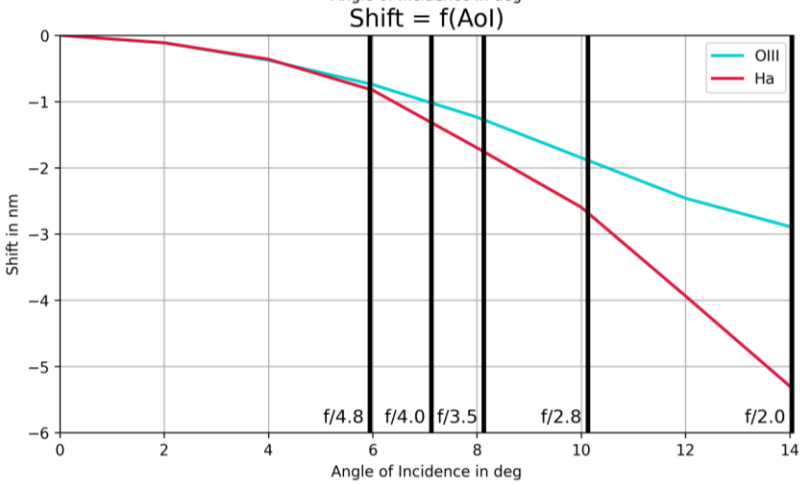
- Very low FWHM
- Very high transmission
- Band-passes quite centred (slight pre-shift possible)

## Altair 4nm Ha-OIII



# DUAL-BAND FILTERS

3. Spectral Measurements

## Band-Pass Measurements

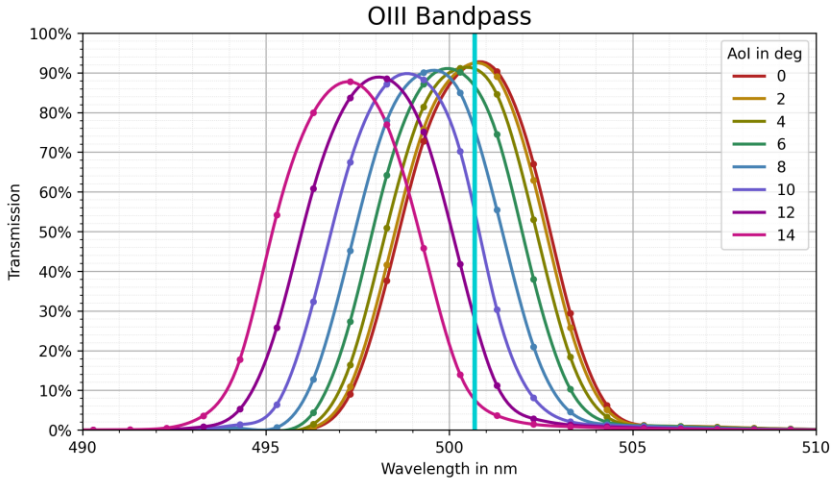
### ALTAIR 4nm Ha-OIII**

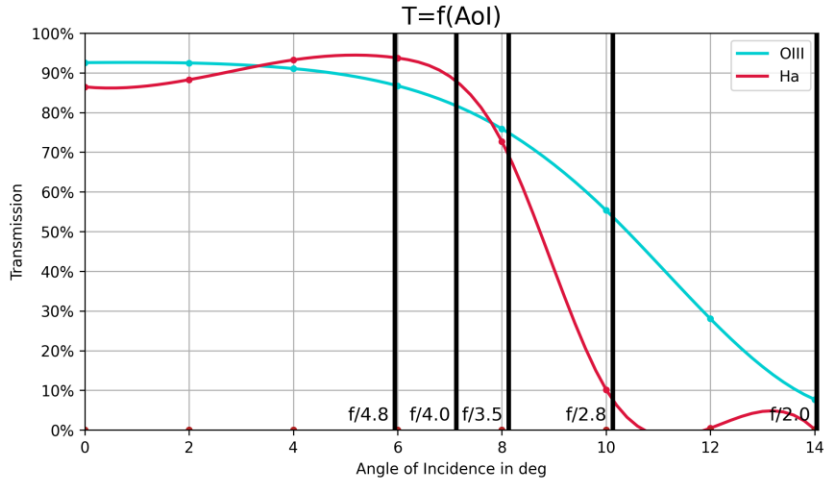
**current version

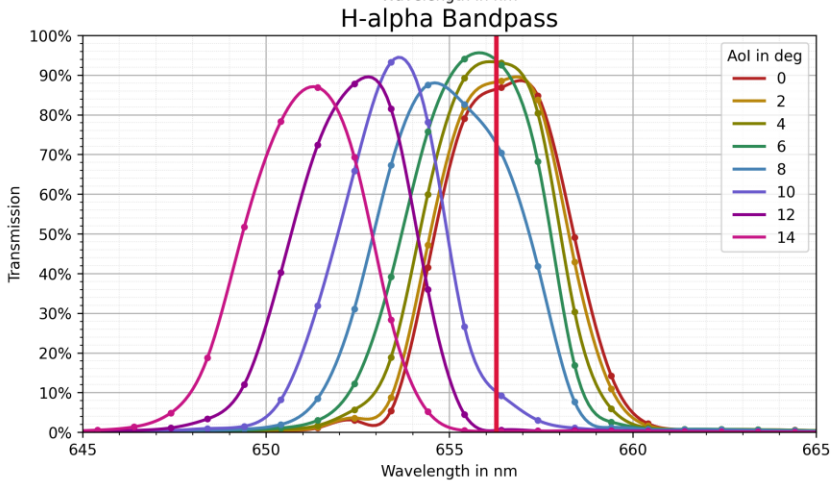
**Comments:**

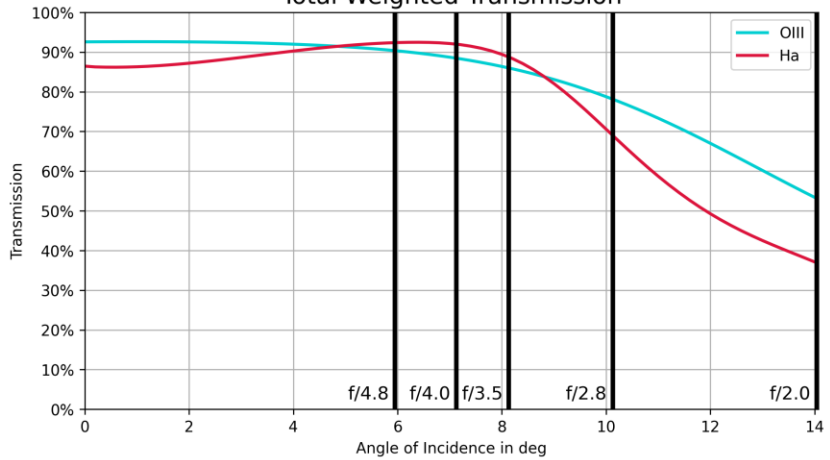
- Very low FWHM
- Very high transmission
- Band-passes quite centred (slight pre-shift possible)
- Very stable curve progression for OIII (ok for Ha)
- Best performance up to f/4.8…f/4 (still ok for f/3.5)

## Altair 4nm Ha-OIII



# DUAL-BAND FILTERS

3. Spectral Measurements

## Band-Pass Measurements

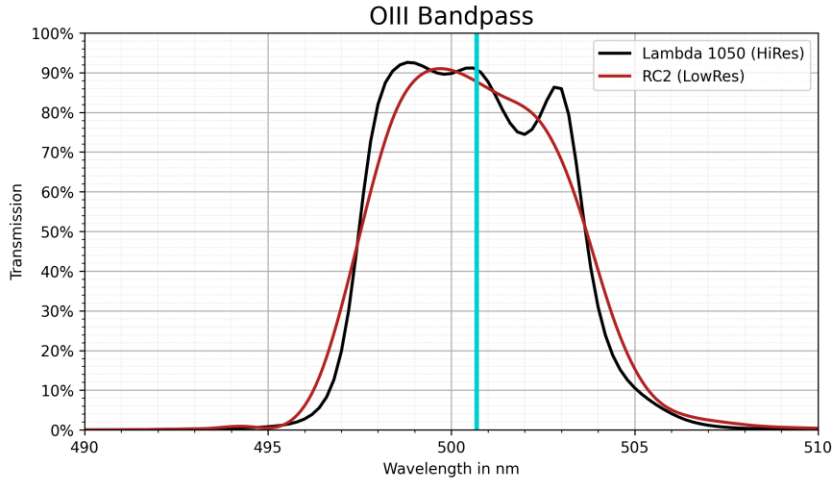
### ALTAIR 4nm Ha-OIII*

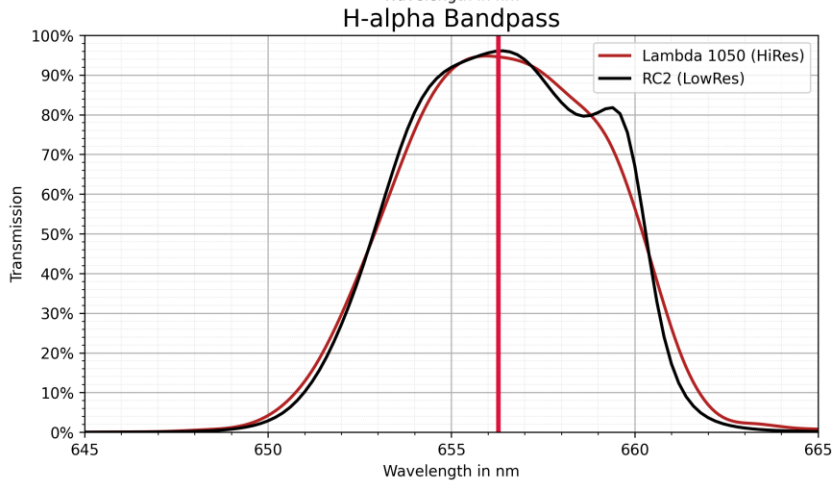
*preliminary version

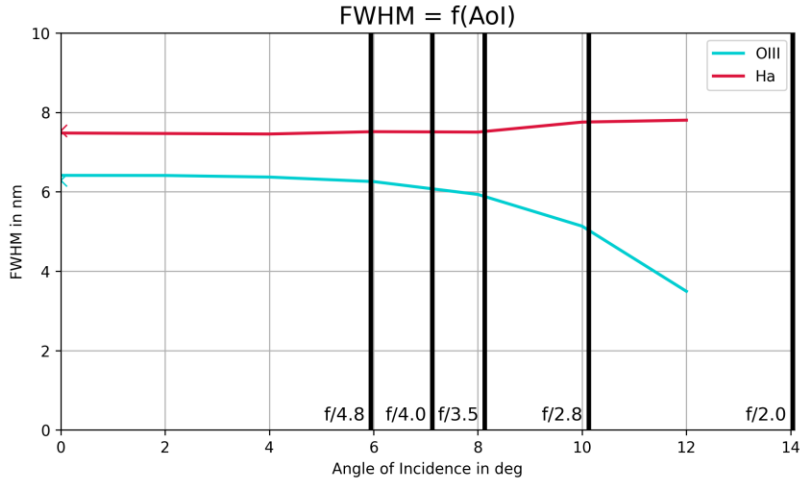
**Comments:**

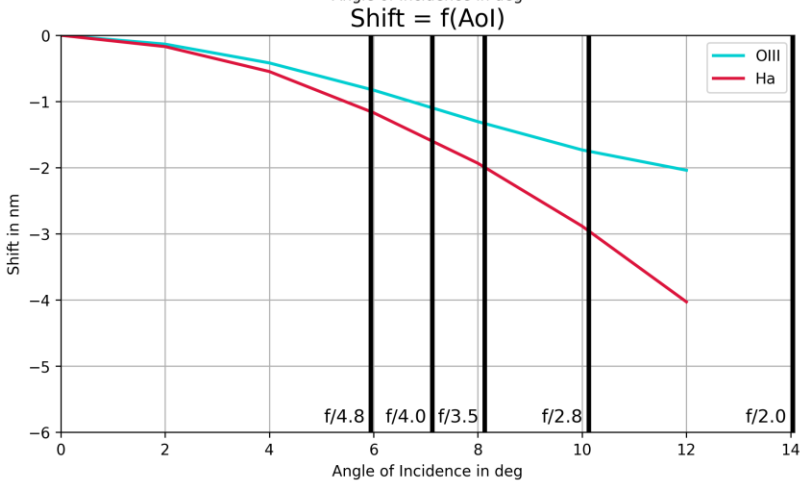
- FWHM out of spec!
- Very good transmission

## Altair 4nm Ha-OIII



# DUAL-BAND FILTERS

3. Spectral Measurements

## Band-Pass Measurements

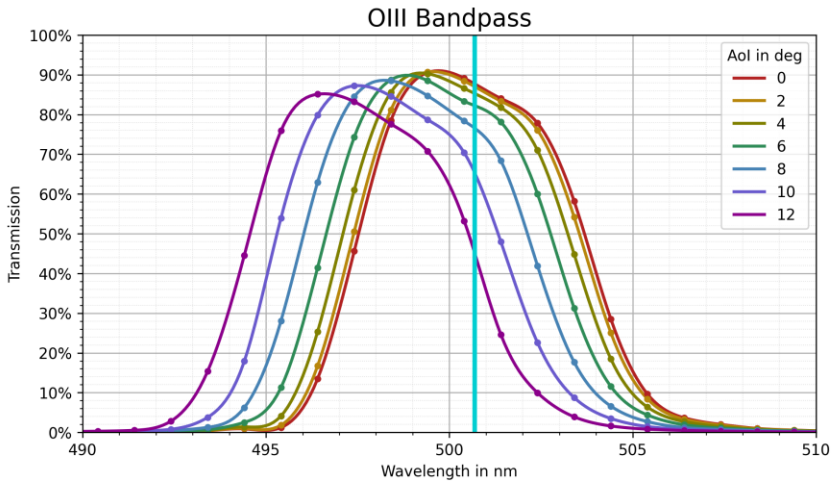
### ALTAIR 4nm Ha-OIII*

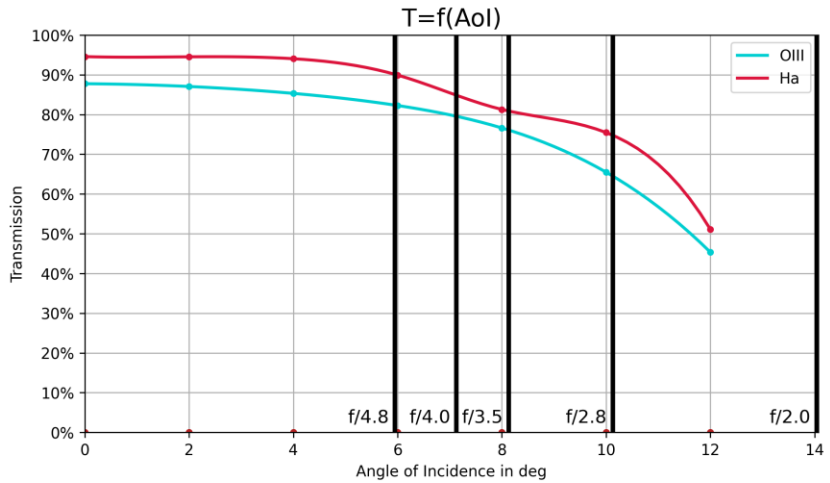
*preliminary version

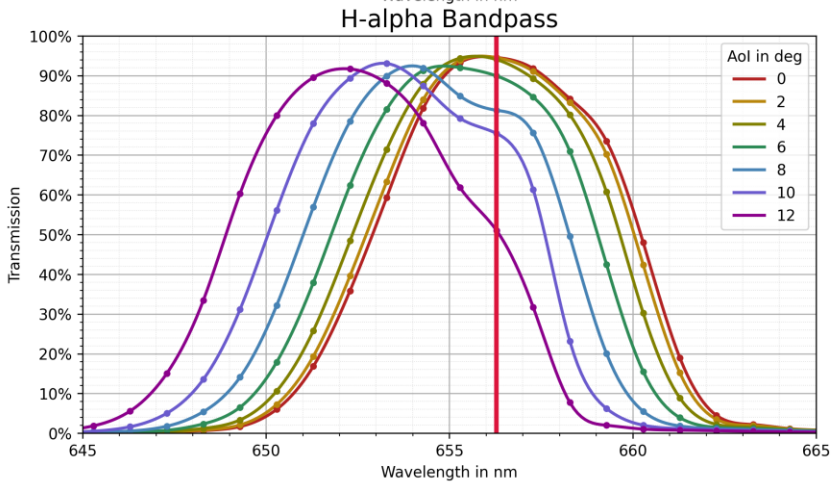
**Comments:**

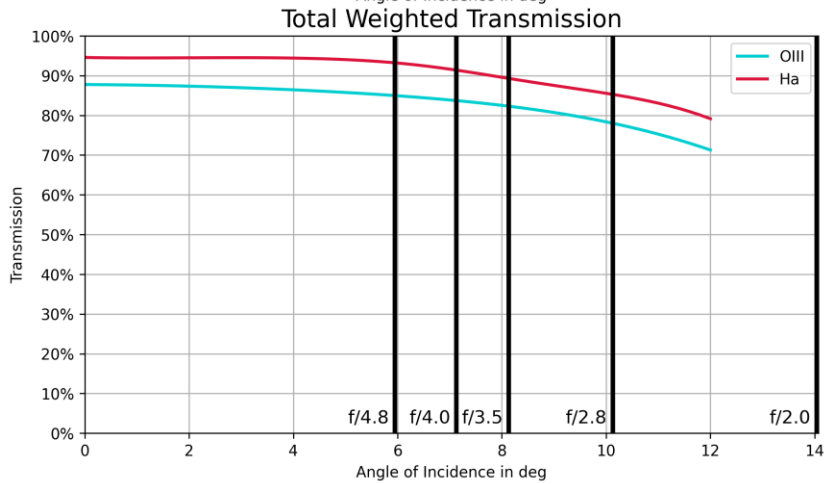
- FWHM out of spec!
- Very good transmission
- Very stable curve progression for OIII (ok for Ha)
- Best performance up to f/4 (still good for f/3.5)

## Altair 4nm Ha-OIII



# DUAL-BAND FILTERS

3. Spectral Measurements

## Band-Pass Measurements

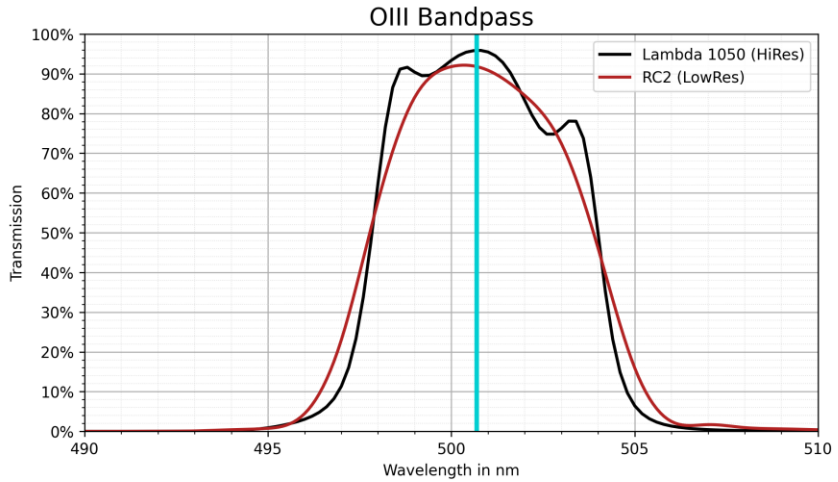
### ALTAIR 6nm Ha-OIII*

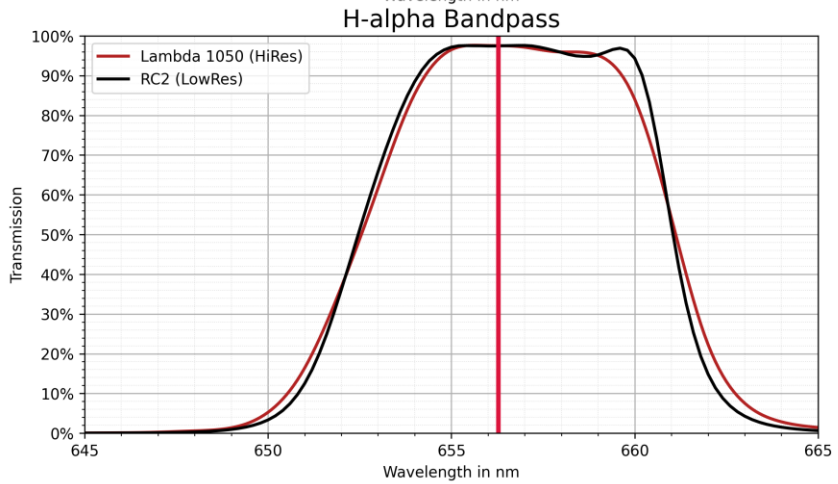
*preliminary version

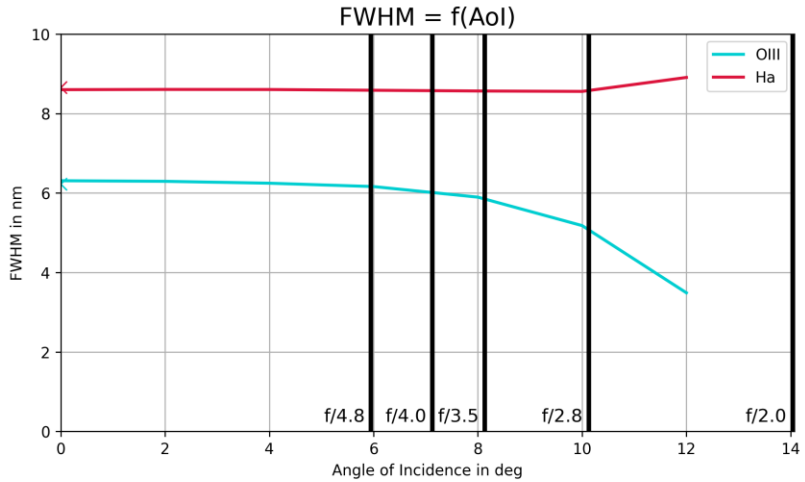
**Comments:**

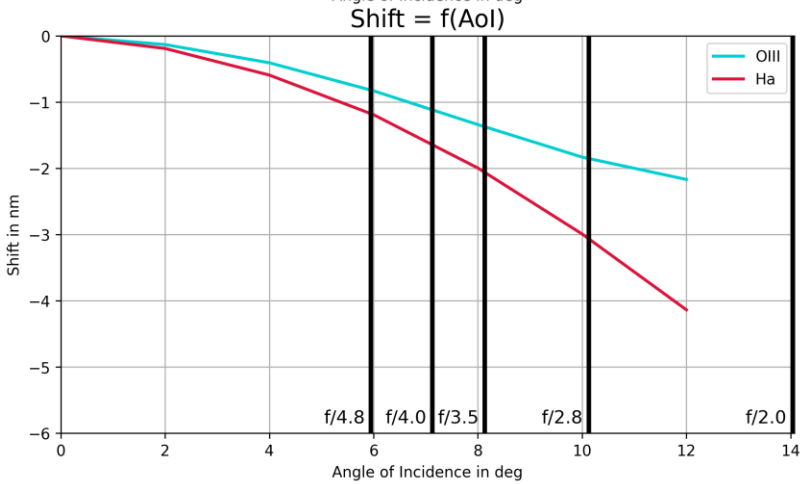
- FWHM for Ha out of spec!
- Very good transmission
- Quite good band-pass location

## Altair 6nm Ha-OIII



# DUAL-BAND FILTERS

## 3. Spectral Measurements

### Band-Pass Measurements

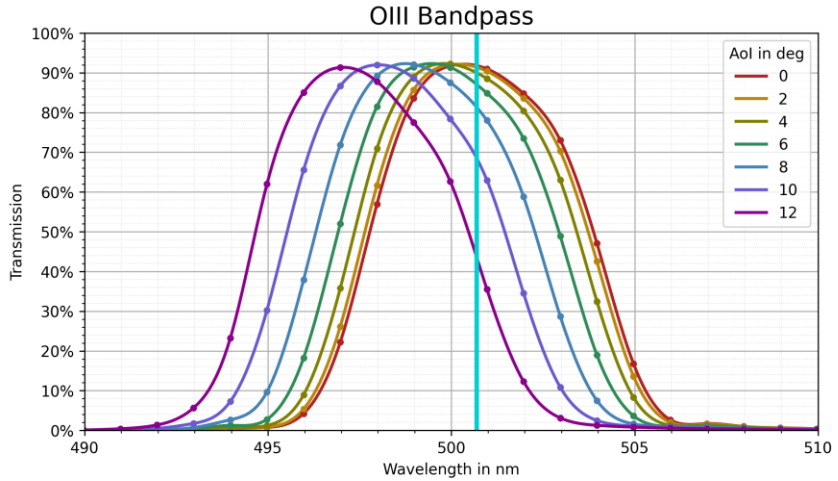
ALTAIR 6nm Ha-OIII*

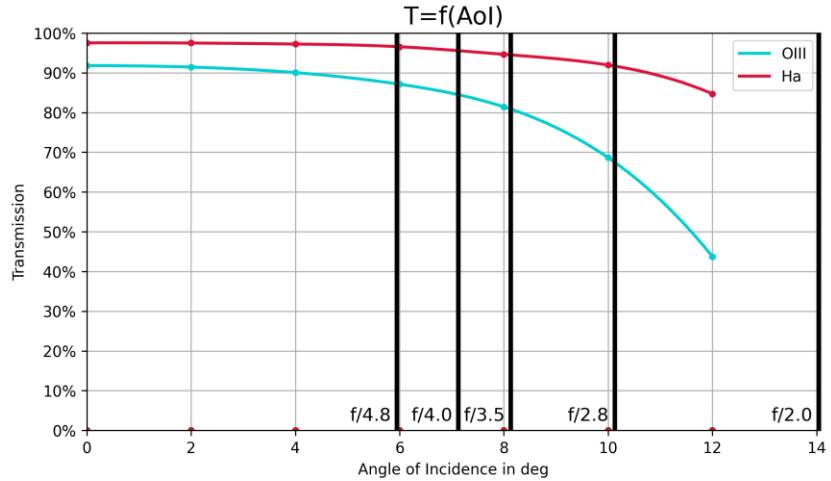
*preliminary version

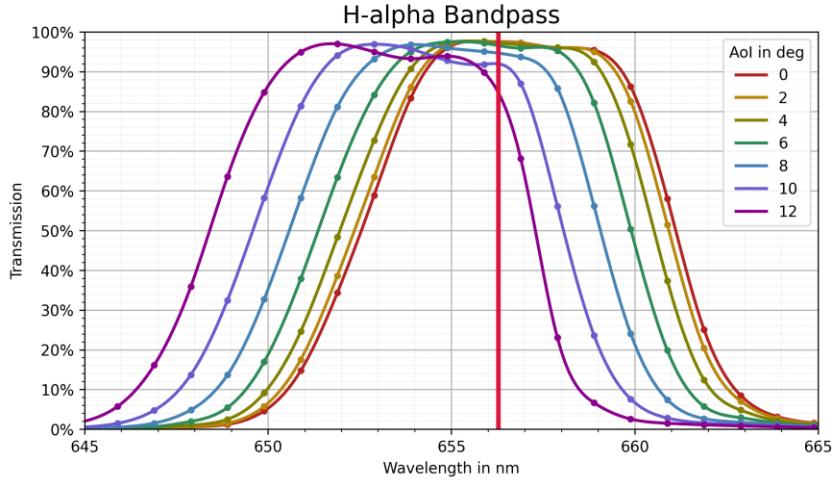
**Comments:**

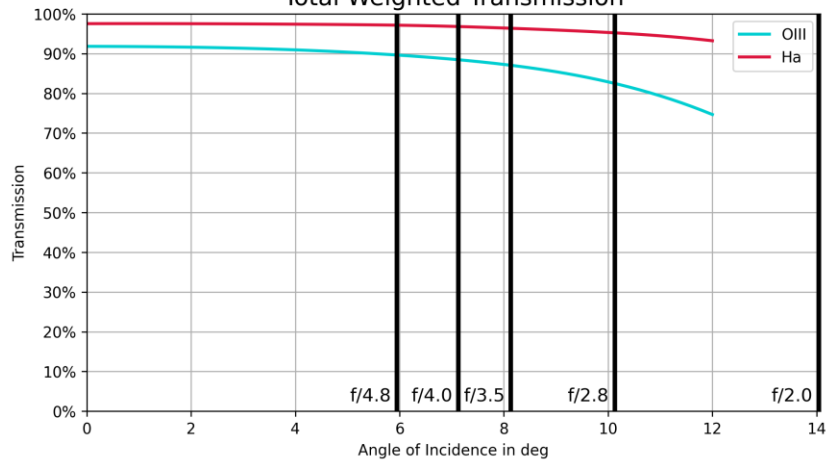
- FWHM for Ha out of spec!
- Very good transmission
- Quite good band-pass location
- Very stable curve progression for both Ha and OIII
- Best performance up to f/3.5 or even f/2.8

Altair 6nm Ha-OIII



# DUAL-BAND FILTERS

3. Spectral Measurements

## Band-Pass Measurements

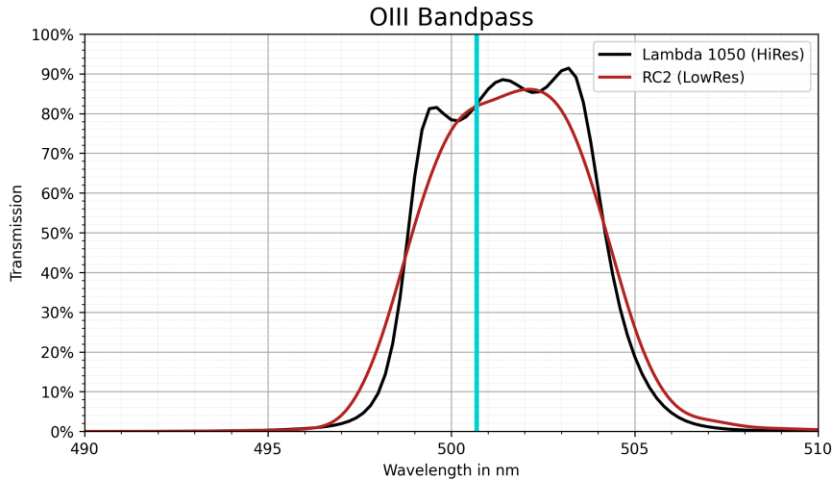
### ALTAIR 6nm SII-OIII*

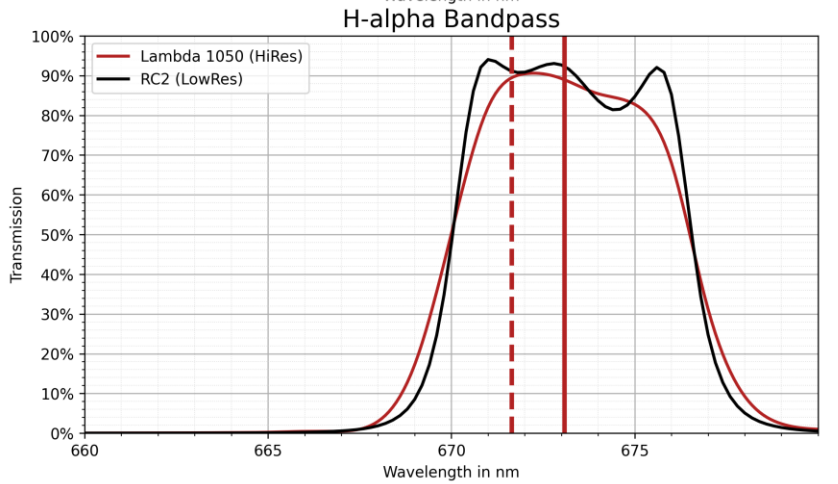
*preliminary version

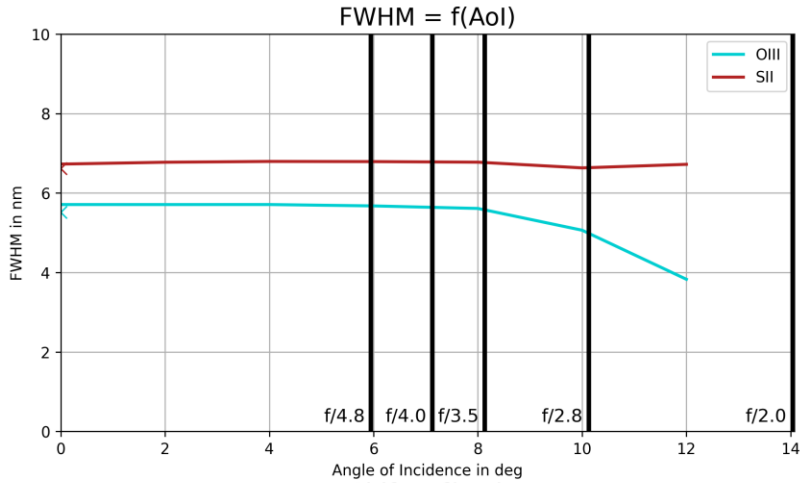
**Comments:**

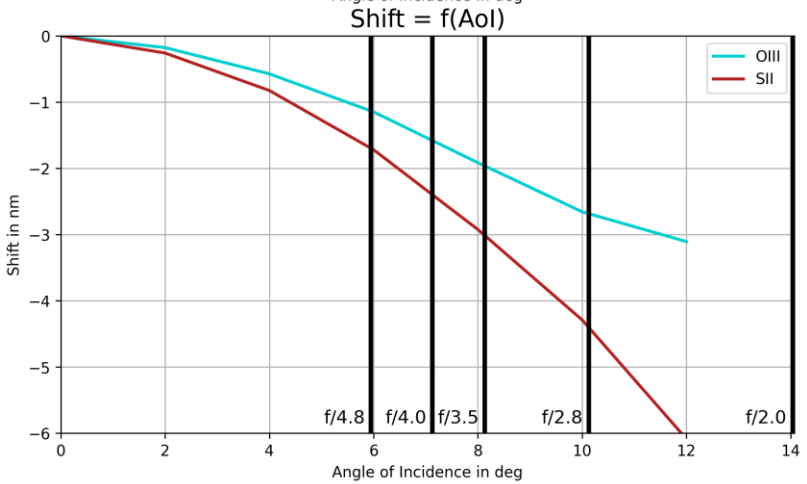
- FWHM for Ha slightly out of spec!
- Good transmission
- Quite good band-pass location

## Altair 6nm SII-OIII



# DUAL-BAND FILTERS

## 3. Spectral Measurements

### Band-Pass Measurements

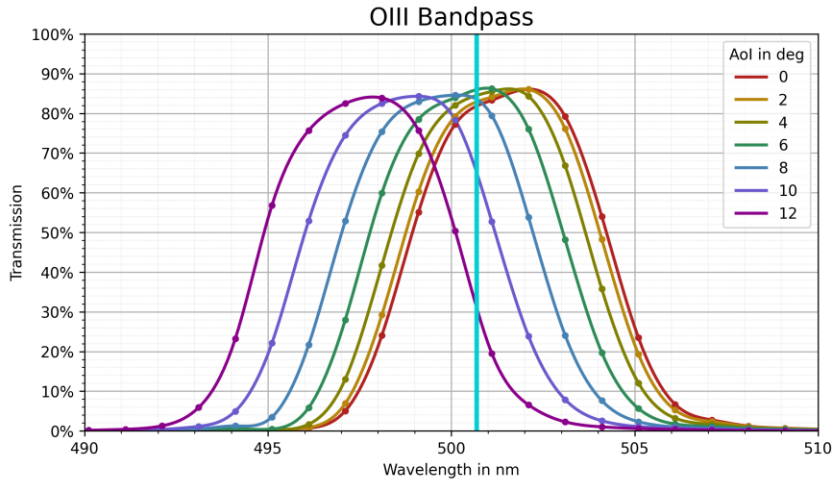
ALTAIR 6nm SII-OIII*

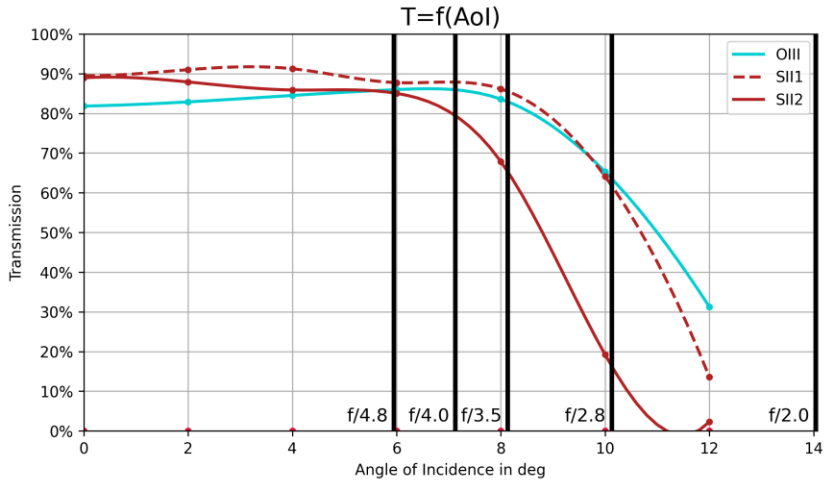
*preliminary version

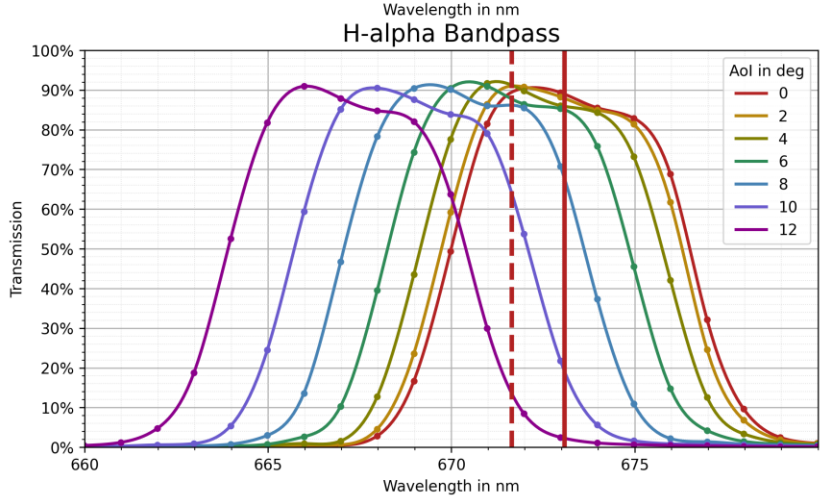
**Comments:**

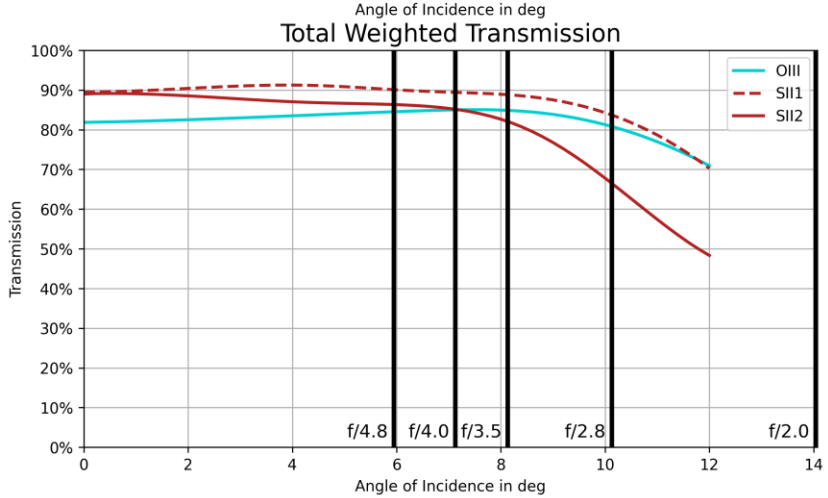
- FWHM for Ha slightly out of spec!
- Good transmission
- Quite good band-pass location
- Very stable curve progression for both Ha and OIII
- Best performance up to f/4…f/3.5

Altair 6nm SII-OIII



# DUAL-BAND FILTERS

4. Real-Sky Tests

## General comments

- Not all filters were available at all times
  - First, I had the following filters simultaneously:
    - ALTAIR ULTRA 4nm Ha-OIII
    - ALTAIR ULTRA 6nm Ha-OIII
    - ALTAIR ULTRA 6nm SII-OIII

    } preliminary versions
    - Optolong L-eXtreme
  - When the ALTAIR filters from above were gone already, I received:
    - Antlia ALP-T
    - Player One Anti Halo Pro

    } Unfortunately, IC434 was already too low for testing
  - At last, I got:
    - ALTAIR ULTRA 4nm Ha-OIII (current version)

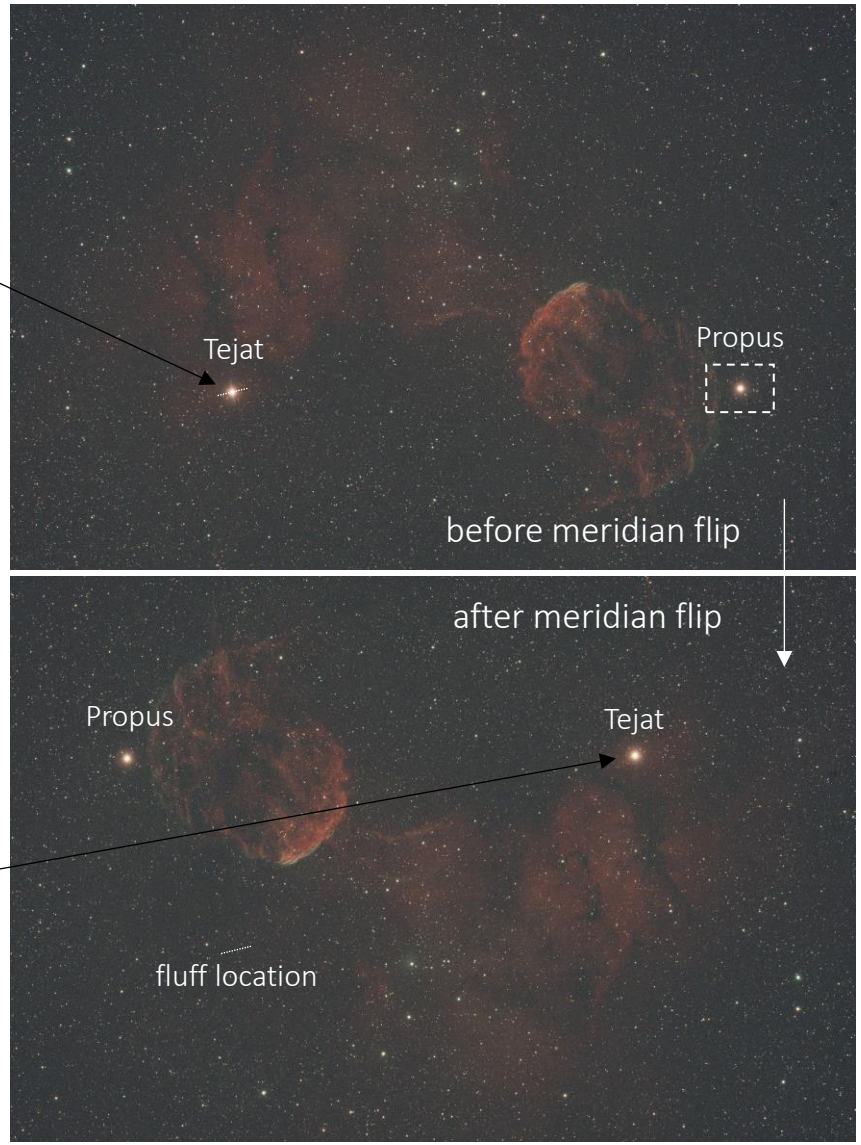
- Images were taken during different moon-phases
- Halo rating only based on my visual impression
- Some filters couldn't be tested on IC434 (bad weather or target already too low)
- Equipment used for this test:
  - TS CF-Apo 90 + 0.8x reducer (432mm f/4.8)
  - QHY268c (Sony IMX571)

# DUAL-BAND FILTERS

4. Real-Sky Tests

## Halo – Jellyfish Nebula IC443

- On some (earlier) test shots there is a diffraction spike visible on Tejat
- **Please note!**
  Unfortunately, I discovered a small fluff on the cameras cover glass, located directly in the light path of Tejat towards the sensor, causing a small little diffraction spike.
- This spike is **NOT** caused by any of the filters!
- Comparing images before and after the meridian flip revealed that the spike must have been caused by a local defect close to the camera (**NOT** by the filter).
- The fluff was removed and the spike does not occur in later test shots



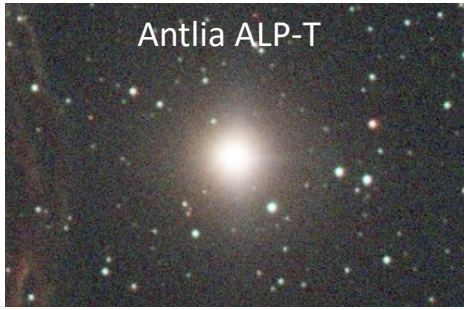
# DUAL-BAND FILTERS

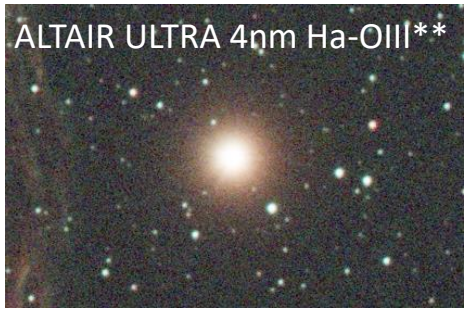
4. Real-Sky Tests

## Halo – Jellyfish Nebula IC443

- Close-up on **Propus**
- Images have been taken during three nights:
  - 8% Moon
    - ALTAIR ULTRA 4nm Ha-OIII (6x600s – 1h)
    - ALTAIR ULTRA 6nm Ha-OIII (6x600s – 1h)
    - ALTAIR ULTRA 6nm SII-OIII (6x600s – 1h)
    - Optolong L-eXtreme (3x600s – 0.5h)
  - 27% Moon
    - Antlia ALP-T (3x600s – 0.5h)
    - Player One Anti Halo Pro (3x600s – 0.5h)
  - 87% Moon
    - ALTAIR ULTRA 4nm Ha-OIII* (3x600s – 0.5h)
- Halo-Ranking from worst to best
  - Optolong L-eXtreme ➔ strong halo - almost unusable
  - ALTAIR ULTRA 4nm Ha-OIII* ➔ medium halo
  - ALTAIR ULTRA 6nm Ha-OIII* ➔ weak halo
  - Antlia ALP-T ➔ no disc/circle but cross shape
  - ALTAIR ULTRA 6nm SII-OIII* ➔ almost no halo
  - Player One Anti Halo Pro ➔ tight star, but very faint halo
  - ALTAIR ULTRA 4nm Ha-OIII** ➔ no visible halo






*preliminary version

**current version

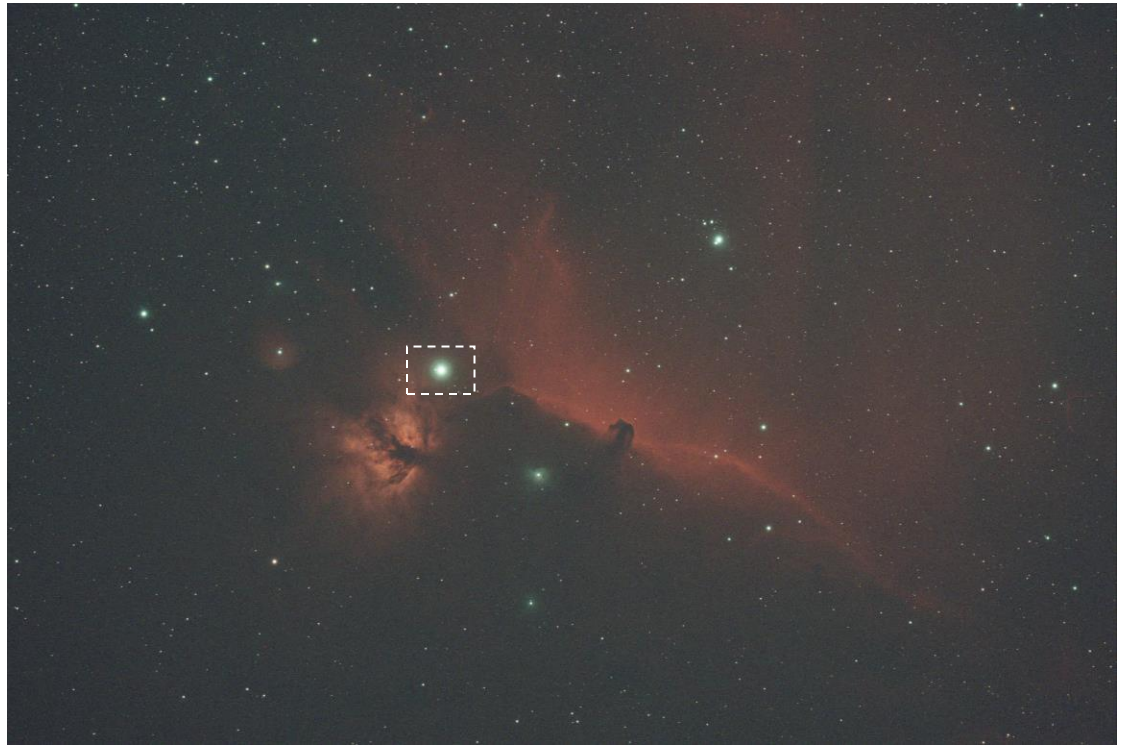
## Halo – Horsehead Nebula IC434 (Alnitak)

- Images have been taken in the same night:
  - 4% Moon
    - ALTAIR ULTRA 4nm Ha-OIII (1x600s )
    - ALTAIR ULTRA 6nm Ha-OIII (1x600s)
    - ALTAIR ULTRA 6nm SII-OIII (1x600s )
    - Optolong L-eXtreme (1x600s)

- I received the filters too late in the season
  - Antlia ALP-T
  - Player One Anti Halo Pro
  - ALTAIR ULTRA 4nm Ha-OIII**

  **current version

} Therefore, not test shots available



# DUAL-BAND FILTERS

4. Real-Sky Tests

## Halo – Horsehead Nebula IC434 (Alnitak)

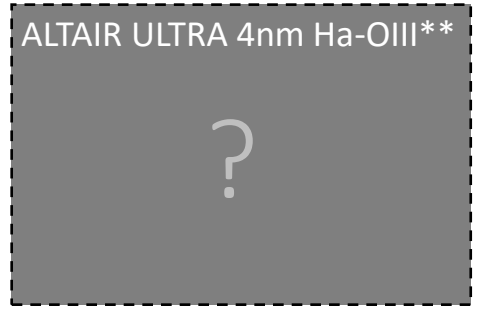
- Images have been taken in the same nights:
  - 4% Moon
    - ALTAIR ULTRA 4nm Ha-OIII (1x600s )
    - ALTAIR ULTRA 6nm Ha-OIII (1x600s)
    - ALTAIR ULTRA 6nm SII-OIII (1x600s )
    - Optolong L-eXtreme (1x600s)

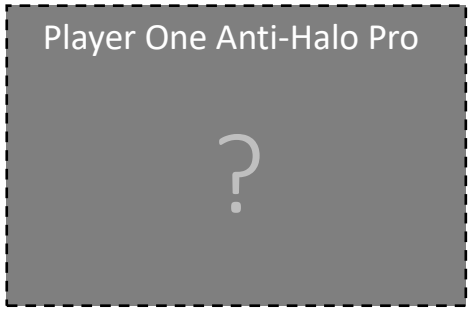
- I received the filters too late in the season
  - Antlia ALP-T
  - Player One Anti Halo Pro
  - ALTAIR ULTRA 4nm Ha-OIII**

- Halo-Ranking from worst to best
  - Optolong L-eXtreme ➔ strong halo - almost unusable
  - Very similar:
    - ALTAIR ULTRA 4nm Ha-OIII* ➔ medium halo
    - ALTAIR ULTRA 6nm Ha-OIII* ➔ slightly weaker than above
    - Antlia ALP-T ➔ ?
    - ALTAIR ULTRA 6nm SII-OIII* ➔ halo still prominent
  - Player One Anti Halo Pro ➔ ?
  - ALTAIR ULTRA 4nm Ha-OIII** ➔ ?









*preliminary version

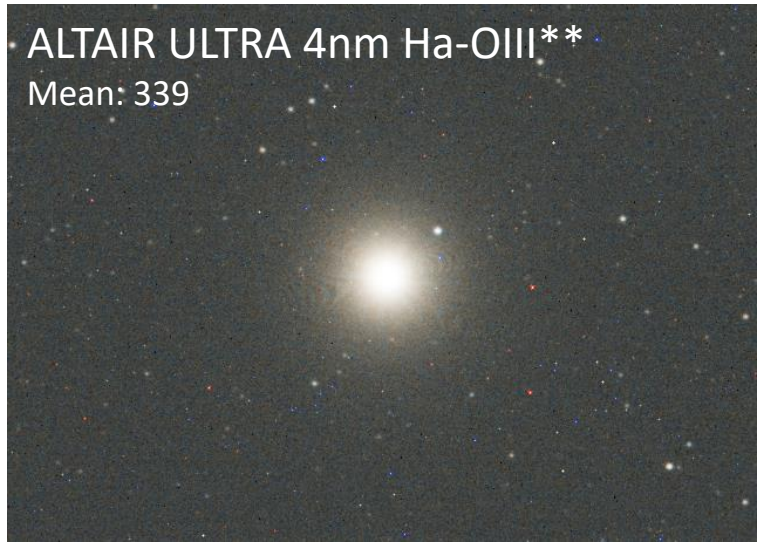
**current version

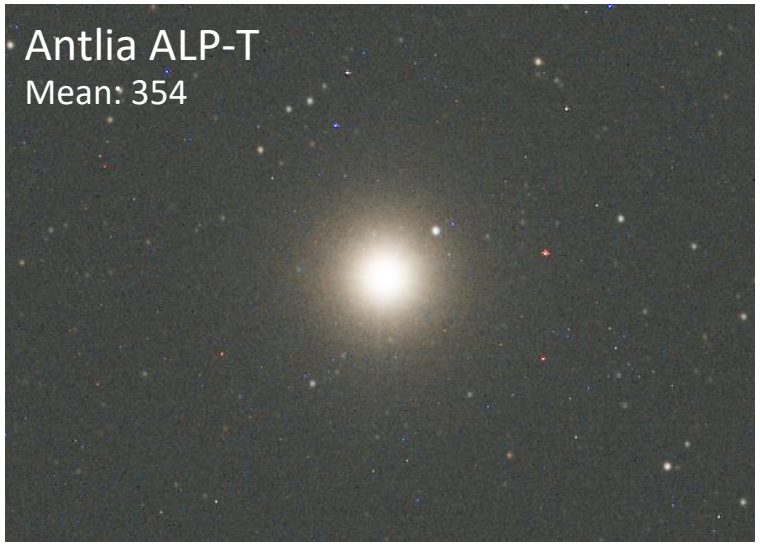
# DUAL-BAND FILTERS

4. Real-Sky Tests

## Halo – Capella ("Alnitak replacement")

- 5min single subs of Capella (centred)
- All shots from the same night, right after another with identical settings
- ALTAIR 4nm* filter delivers the lowest mean value upon all filters, no halo
- Player One filter has just a slightly higher mean value, but is showing a distinct halo, even on a single sub
- Antlia ALP-T looks very similar to the ALTAIR filter, but has a slightly higher background (maybe a hint of a halo)
- Worst halo performance and highest background for the L-eXtreme
- Background (mean) values correspond to absorption performance






**current version

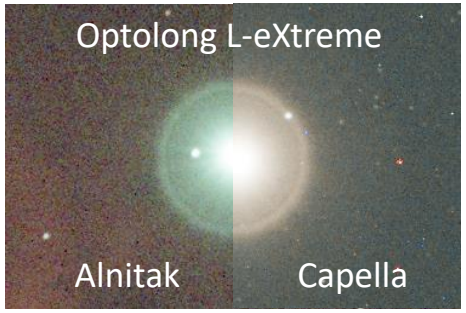
# DUAL-BAND FILTERS

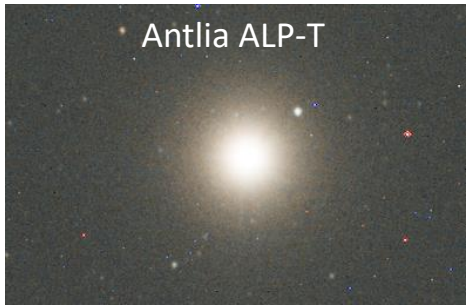
4. Real-Sky Tests

## Halo – Conclusion

- Even if not all filters could be compared using the same target, the results are still very consistent
- Capella seems to be a reasonable replacement for Alnitak
- There are only two filters that show no ring or disc shaped halo:
  - Antlia ALP-T
  - ALTAIR ULTRA 4nm Ha-OIII**
- However, higher background for ALP-T







- Halo-Ranking from worst to best
  - Optolong L-eXtreme ➔ strong halo - almost unusable
  - ALTAIR ULTRA 4nm Ha-OIII* ➔ medium halo
  - ALTAIR ULTRA 6nm Ha-OIII* ➔ slightly weaker than above
  - ALTAIR ULTRA 6nm SII-OIII* ➔ tiny bit weaker
  - Player One Anti Halo Pro ➔ weak ring/circle visible
  - Antlia ALP-T ➔ no ring/circle visible, higher BG
  - ALTAIR ULTRA 4nm Ha-OIII** ➔ best halo performance



*preliminary version

**current version

## Halo – Conclusion

- Halo performance depends a little bit on the star (spectrum)
- If you are looking for a filter without any ring-shaped halo, these ones might be for you:
  - Antlia ALP-T
  - ALTAIR ULTRA 4nm Ha-OIII (current version was up to spec and didn’t show any halo)
- The Player One Anti-Halo Pro was quite good, but had a faint circular halo on bright stars

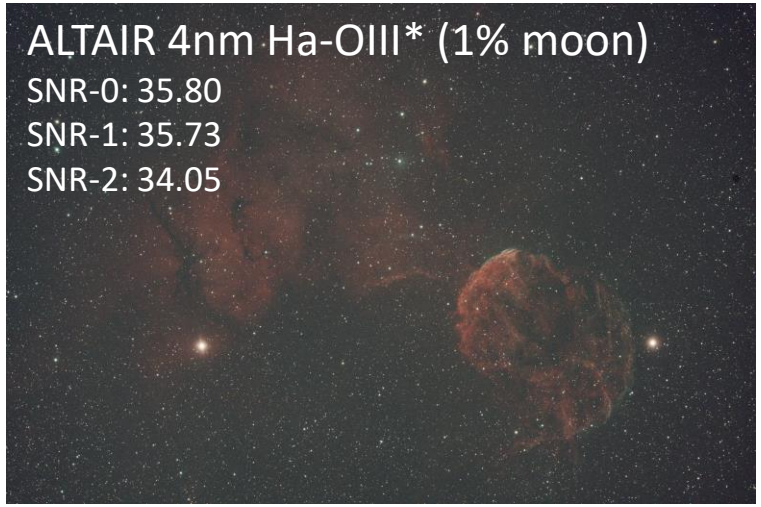
# DUAL-BAND FILTERS

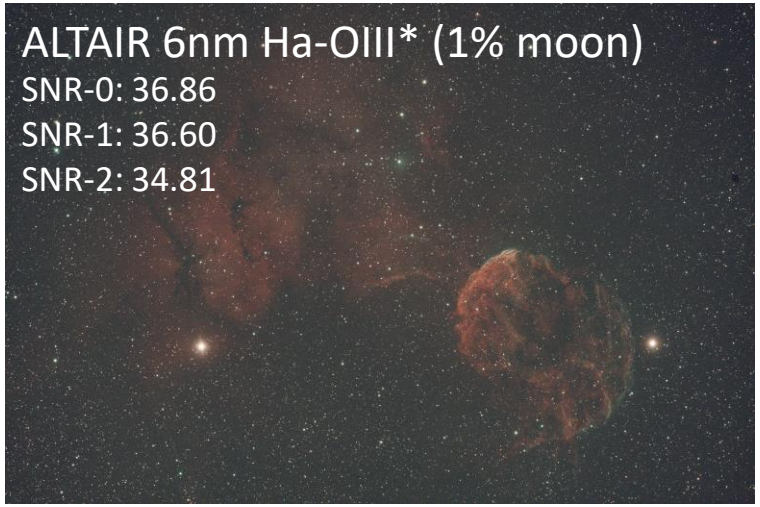
4. Real-Sky Tests

## SNR – Jellyfish Nebula IC443

- **Question:**
  How big is the difference in SNR between a 4nm and a 6nm filter
- Comparing only the ALTAIR ULTRA 4nm* vs. 6nm* Ha-OIII filters
  - At 1% moon
  - At 69% moon
  - Later: at 87% moon with the 4nm**
- Images taken during the same night
- Only automatic STF applied

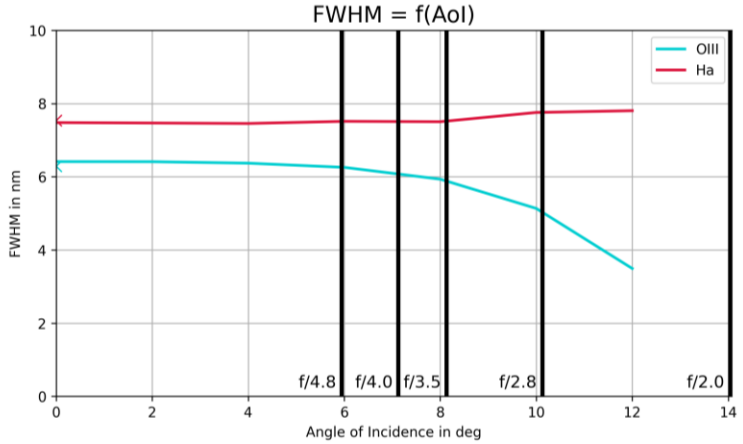
  *preliminary version!

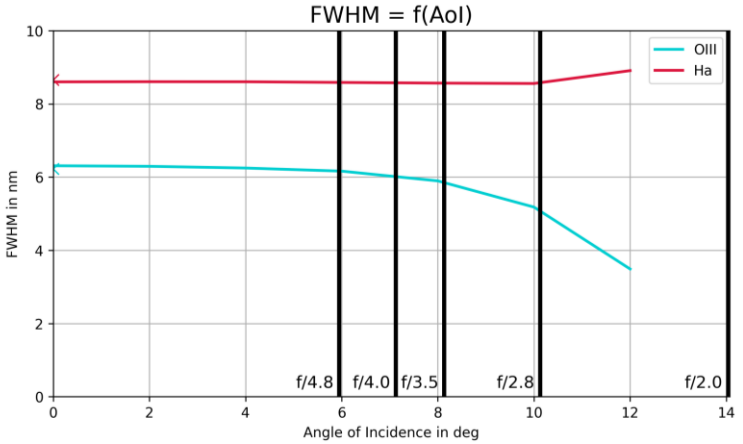



### Results

- Quite similar SNR
- 6nm filter seems to perform a little better (despite slightly larger FWHM in Ha)
- However, FWHM of 4nm filter is out of spec and halo performance was slightly worse



# DUAL-BAND FILTERS

4. Real-Sky Tests

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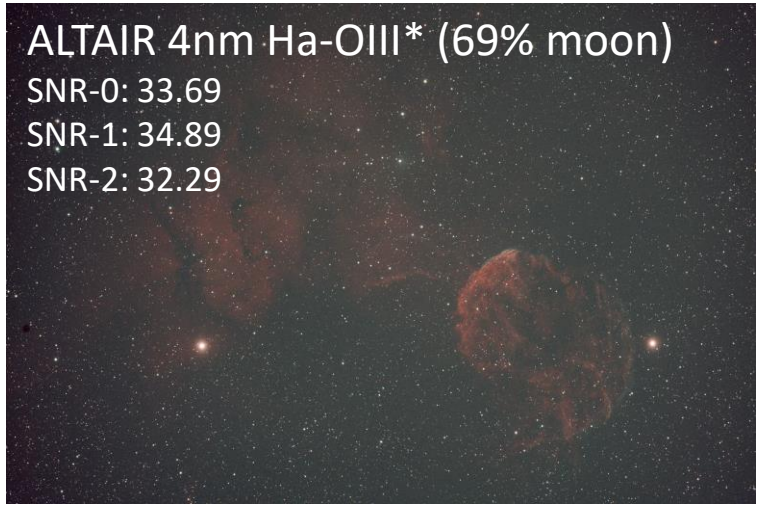
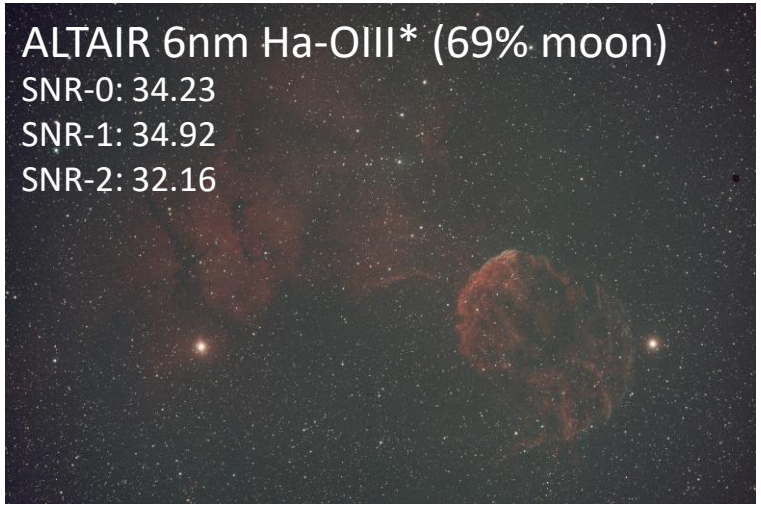
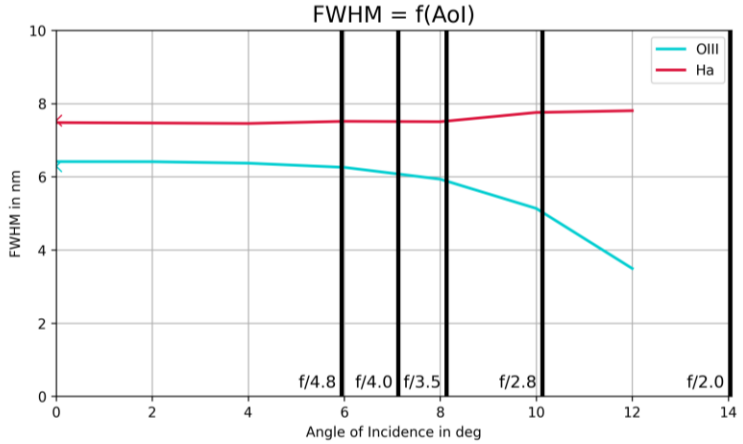
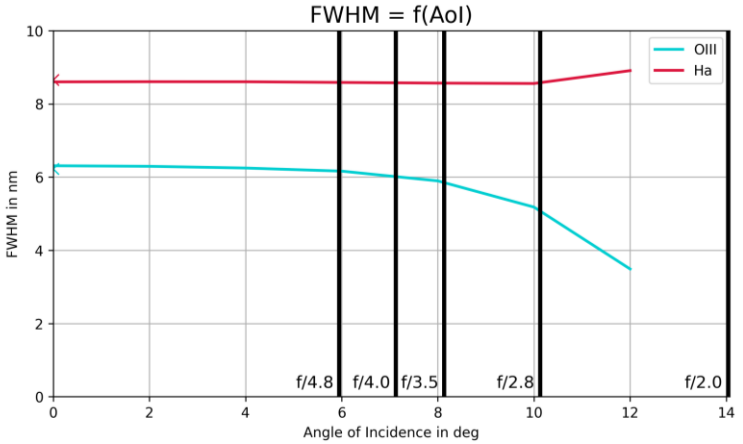



### Results

- Quite similar SNR (but of course lower)
- 6nm filter seems to perform a little better (despite slightly larger FWHM in Ha)
- However, FWHM of 4nm filter is out of spec and halo performance was slightly worse



# DUAL-BAND FILTERS

4. Real-Sky Tests

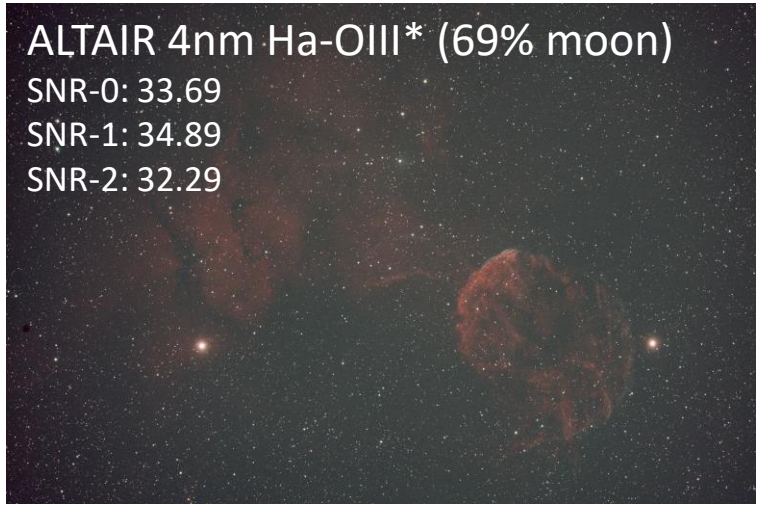
## SNR – Jellyfish Nebula IC443

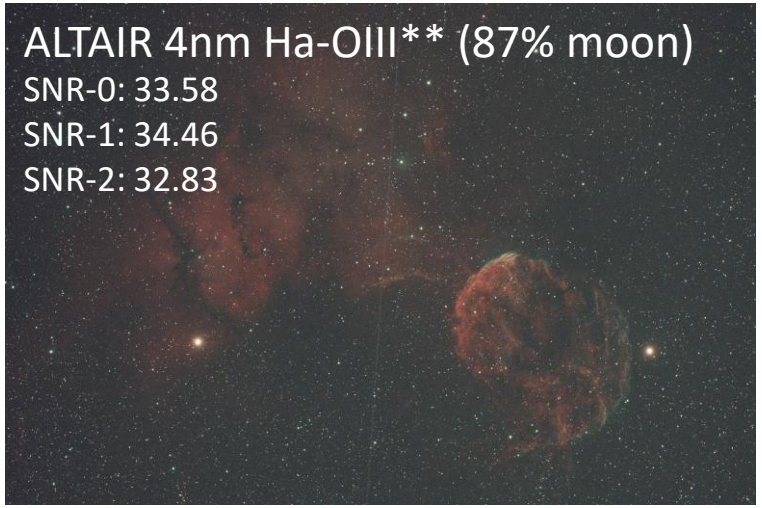
- Question:
  How big is the difference in SNR between a 4nm and a 6nm filter
- Comparing only the ALTAIR ULTRA 4nm** vs. 6nm* Ha-OIII filters
  - At 1% moon
  - At 69% moon
  - Later: at 87% moon with the 4nm**
- Images taken during the same night
- Only automatic STF applied

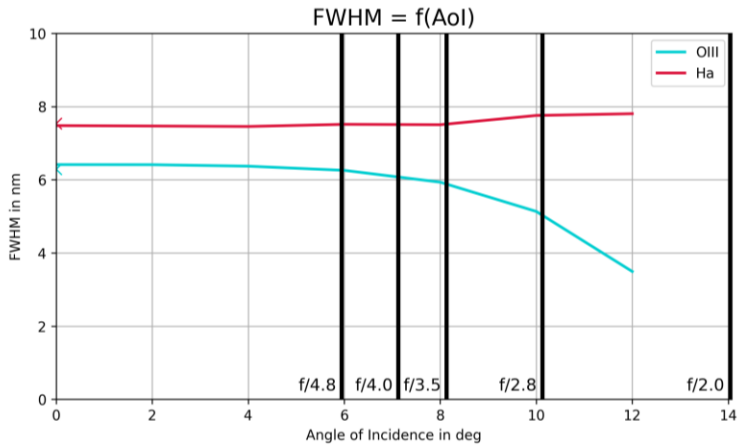
*preliminary version! **current version

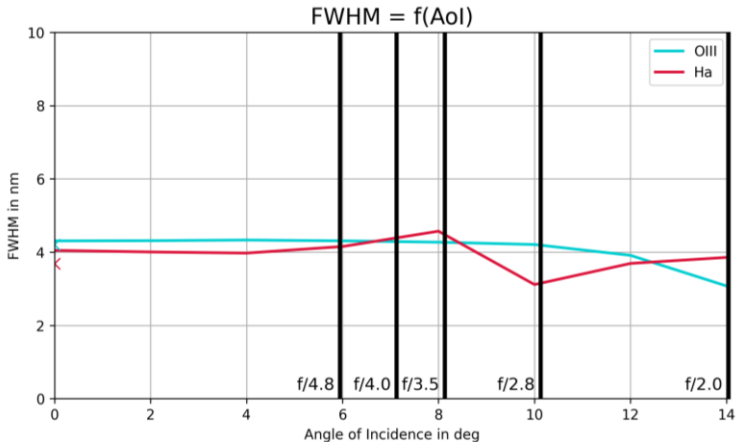
### Results

- Image with 4nm** filter looks way better even with more moon present
- Gradient/vignetting is almost gone
- However, SNR not significantly better (reliable calculation of SNR?!)



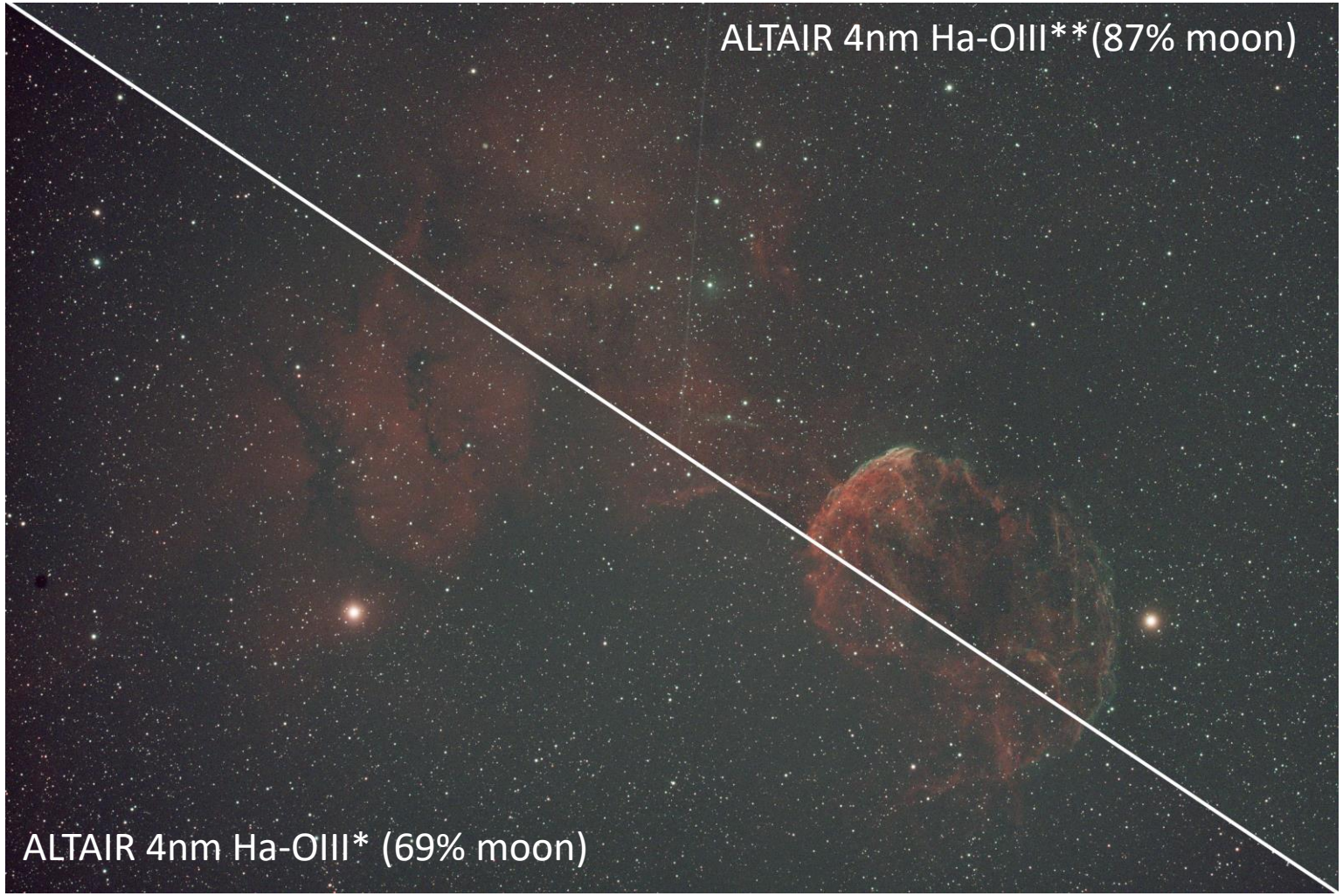



## SNR – Conclusion

- In my opinion the SNR calculation might not be 100% useful (don’t care too much about it)
- Difference between 4nm und 6nm bandwidth are probably small, if the moon is not present
- If moonlight is strong, the differences between 4nm and 6nm bandwidth are clearly visible
  - Vignetting reduced
  - Gradient reduced
  - More contrast

*preliminary version!  **current version



## Final Thoughts

- It’s very interesting how the individual filters perform on paper and in real life
- I had some issues with the first (preliminary) generation of ALTAIR ULTRA filters (4nm and 6nm)
- The current generation of ALTAIR ULTRA filters seem to perform perfectly (best filter in the test)
- Best halo performance for ALTAIR ULTRA 4nm Ha-OIII** filter followed by Antlia ALP-T
- Player One Anti-Halo Pro doesn't quite live up to its name

**current version