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SHARPSTAR SCA-260 V2

Founded in 2000, Sharpstar Optics (Jiaxing Sharpstar Optical Instrument Co.) specializes in designing, the manufacture, sale of astronomical equipment of means and high-end with all mechanical accessories and dedicated optics. Sharpstar and Askar represent the company's two brands. Qualitative services and price Very competitive sales strategy allowed Sharpstar Optics to quickly establish itself in the global market. Mainly positioned in the deep sky with instruments equipped with a “fast” F/D ratio, these easily transportable optical tubes are now widely represented in the astronomical community. The range is very complete both in terms of refractors (60 to 151mm) and Newton type reflectors (150 to 203mm). In 2021 the company is offering an innovative model with a larger diameter: The SCA-260 (Super Cassegrain Astrograph) which paradoxically bore the CDK acronym! Equipped with a 260mm aspherical primary mirror, a 120mm spherical secondary and a 3-lens corrector this tube has an F/D=5 ratio ideal for deep sky. When we only look at the numerical characteristics, independently of the optical formulas, they are close to competing tubes already present on the market such as the CCA 250, and to a lesser extent the 10"ODK Orion Optics with an F/D of 6.8. This version then evolved into version 2.1. Here I offer you the test of the latest version, the SCA-260 V2 called 2.0* The tube is delivered in a thick double-walled cardboard which protects it from shocks during transport. Two dense foam shells surround the tube. All adapter rings come standard and mounted on the focuser. Two Allen keys, a clip-on digital thermometer (hygrometry and temperature, a collimation eyepiece (Cheshire type), a qualitative control report (cosmetic, mechanical and optical) carried out by Teleskop Service without interferometric testing complete the offer. has no interferometric test delivered as standard.

The tube is an aesthetic success both in terms of the adjustments of the different accessories and the marriage of materials and colors. The tube is carbon with a superb finish. It uses the architecture of competing models, namely a collar attached to the rear barrel in which the tube is housed and a second collar spaced 380mm apart connected by a Losmandy type lower dovetail and a perforated stiffening upper plate with numerous threads and lights for attaching accessories. The whole is therefore inseparable. The inside of the tube is entirely covered with black felt which eliminates reflections. A thick, even varnish protects the tube and the stickers. Frequently these stickers are applied on top and end up deteriorating and peeling off over time. A cap (Mewlon type) in reinforced nylon with an exemplary finish (**Fig.1**) protects the optics from external particles. A very good initiative which avoids any damage during poor handling. Tube weight of 15Kg with a total length with eyepiece of 675mm and a diameter of 281mm, the newborn is doing well!

Fig.1

**The developments of the different versions do not follow the chronological order, the evolution of version 1 should be 1.1 and not 2.1 which sows confusion regarding the latest version called 2.0. Anyway here is the non-exhaustive list of modifications:*
Addition of handles on the rear barrel, smaller secondary diameter and central secondary screw (focal length adjustment with Ronchi test) removed. Corrector, scabbard, rear barrel, fans + grids and redesigned collars, new focuser with rotating collar at the rear, more threads to mount larger diameter motors and knobs.

The primary with a diameter of 260mm is aspherical and has a reflexion rate > 95% (special treatment). The material used is H-PZ23 (equivalent to Pyrex) which has a thermal expansion coefficient of 3.25 x 10-6/C. It is adjustable by 6 collimation screws. The 120mm secondary is spherical with identical surface treatment. The four well-sized branches are firmly fixed on the tube which should guarantee collimation. The obstruction of 0.57 will not be a hindrance for the resolution of the deep sky in view of the services delivered by the CCA 250 From Takahashi (obstruction of 0.58) which comes closest to the specifications of the SCA-260. Three collimation screws (**Fig.2**) make it possible to align the secondary equipped with a central pad. The image circle is given for 80mm with very low vignetting thanks to the oversized corrector with 3 lenses. The central sheath should eliminate stray lights or ghosts, despite its limited length. These parameters will obviously be checked during shooting.

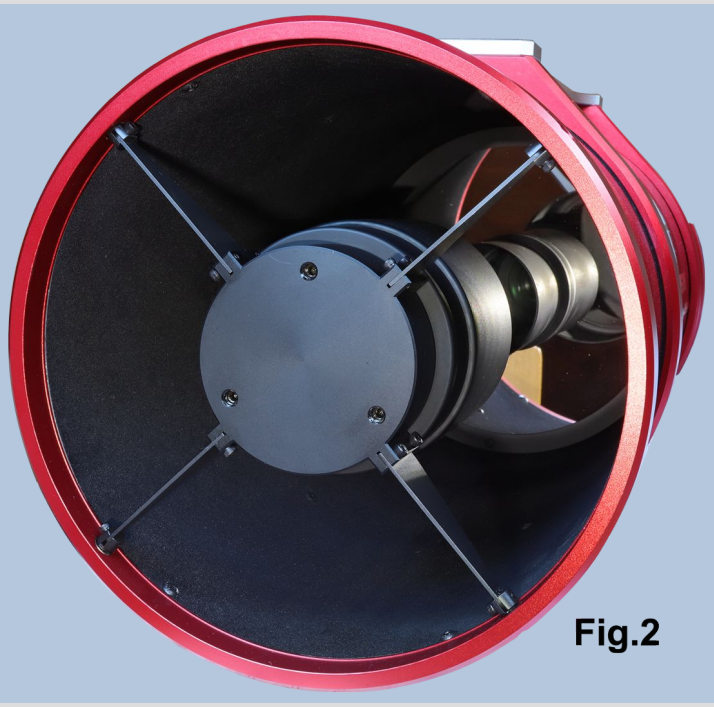


Fig.2

The rear face of the barrel (**Fig.3**) includes:
_ Three fans (1-2-3) of 50mm diameter
_ A removable hygrometer thermometer (4) (2 LR44 batteries)
_ A switch for turning on the fans (5)
_ A DC 12V output (9) to power the fans
_ Six primary collimation screws (7 and 8) pushing and pulling
_ A dummy switch (6) without wiring! We would like to have a 5.5 jack output for connecting a possible accessory, heating resistance for example.
_ Two aesthetic handles which follow the external shape of the barrel allows the tube to be moved with less effort and will facilitate the extraction of the barrel during possible cleaning of primary mirror.

Fig.3

The 3.35-inch focuser (**Fig.4**), with a 50mm travel and graduated vernier, has all the features for photography. Gear reduction of 1/10 (without backlash) with large diameter knobs, camera rotator with locking screw in position. A focus locking screw is provided by a knurled screw. The rotation of the camera rotator is quite firm and without play. In order to mount the different imaging trains, the output is equipped with 4 removable rings M90-M68-M54-M48. Although it is exclusively dedicated to photography, there is no M48/31.75 ring, which is essential for mounting the collimation eyepiece supplied as standard. This ring can be purchased from various retailers but if you have a 2 inch elbow, the 50.8/31.75 reducing ring generally has an M48x0.75 female thread. Another small detail, there is no angular marker on the rotating collar, which is very practical for finding the framing (we're getting demanding!). The non-reduced wheel is easily removed and the threads on the body of the rack allow motors to be fitted for focusing (**Fig.5**). Two imaging trains will be used, one of which will be used to test the load that this focuser can withstand.

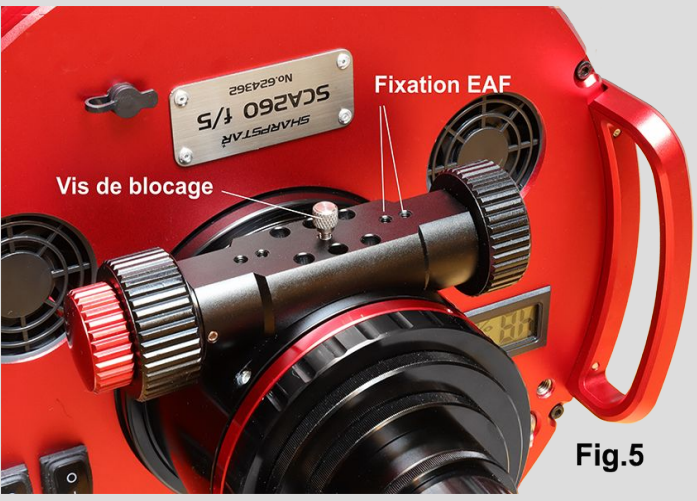


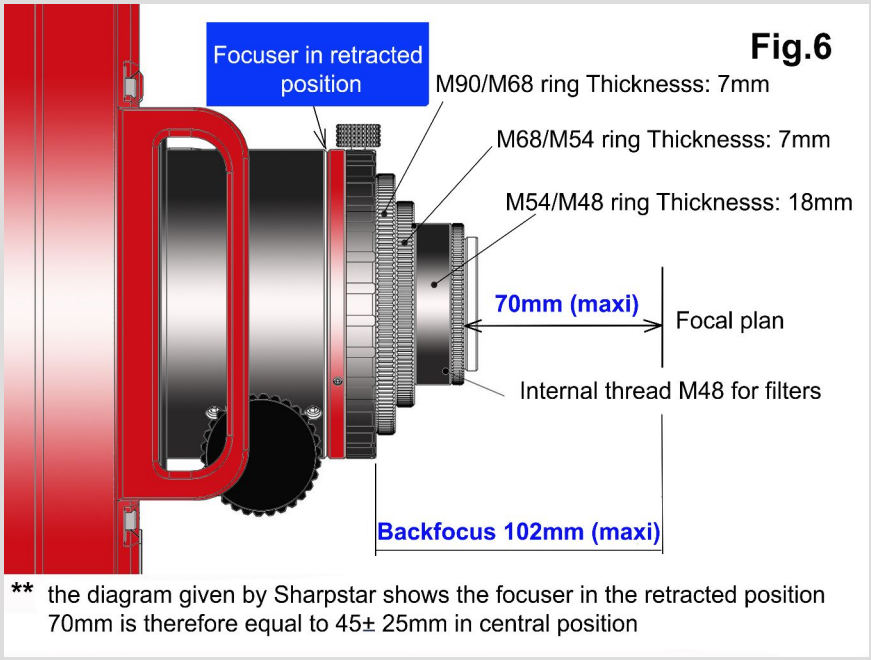
Fig.5

Fig.4

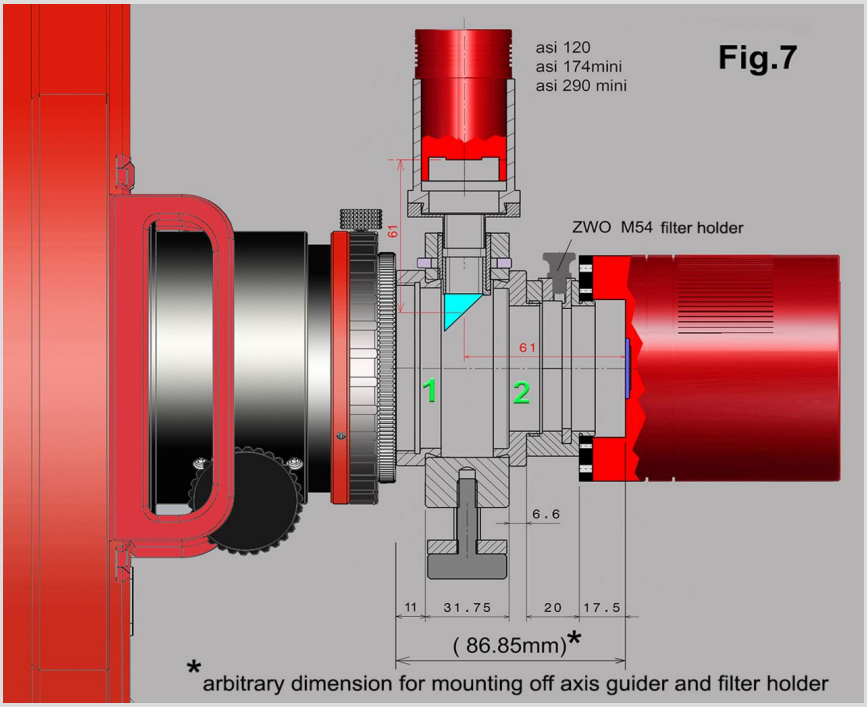
In Fig.6 we find the complete assembly at the level of the focuser with the draw (Backfocus): 70mm** with the 3 removable rings (M90-M68-M54). Without these 3 rings the draw increases to 102mm. Note that this draw of 102mm corresponds to the maximum distance when the focuser is at the stop. So that there is no ambiguity, the backfocus is: 45mm±25mm and 77±25mm without the rings. For the test, it was calculated to integrate the off axis guider and the filter holder with the focuser holder 8mm from the rear stop. In order to eliminate any vignetting and make room for the installation of a 2.5" Skyméca off axis guider, the 2 rings M68/M54 and M54/M48 have been removed. Two arrangements have been planned (**Fig.7 and 8**):

_ A ZWO Asi 6200 MC Pro Camera, off axis guiding with M54 filter holder drawer which allows me to mount an M48 filter as close as possible to the sensor to reduce vignetting. Two rings (1 and 2), mounted on either side of the OAG, were made for this test. This configuration will give the correct sampling (see next page).

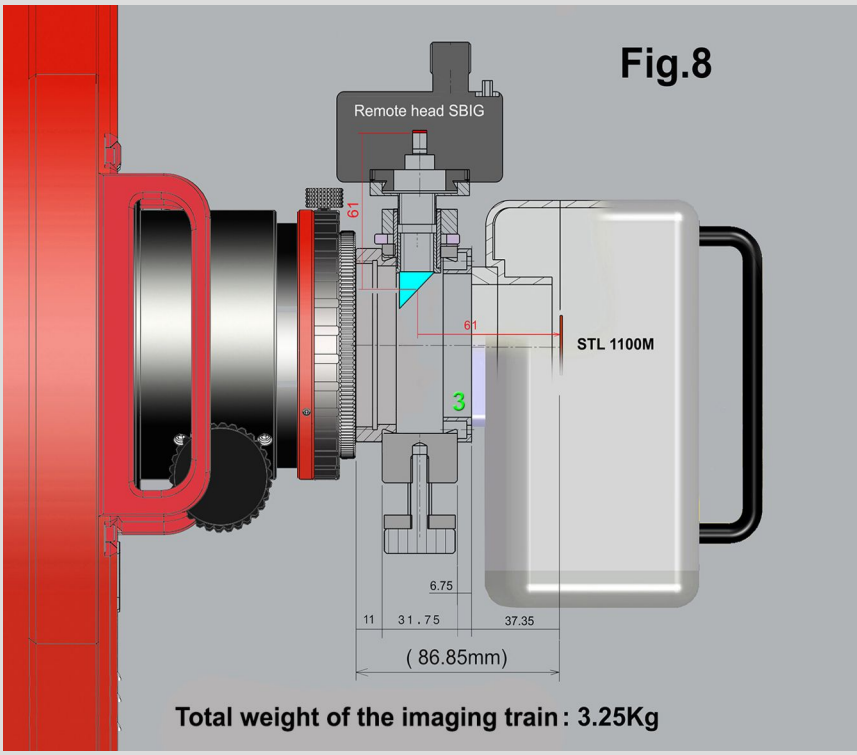
_ An SBIG STL 11000M Camera which will allow the focuser to be tested with a heavy load. Two rings were again made for this configuration with a total weight of 3.45Kg. A 1/100mm comparator with a 3D support will be mounted on the body of the focuser in order to highlight a possible variation in the focus (1/100mm) depending on the ambient temperature. As indicated on the previous page, the ZWO EAF (Electronic Automatic Focuser) was mounted for the occasion (**Fig.9**) without difficulty, unlike version 1. The knurled locking screw of the focuser can also be used as a screw fixation for the EAF. The motor body moves 2mm from the handle without causing any particular discomfort.



** the diagram given by Sharpstar shows the focuser in the retracted position 70mm is therefore equal to 45± 25mm in central position



* arbitrary dimension for mounting off axis guider and filter holder



Total weight of the imaging train : 3.25Kg

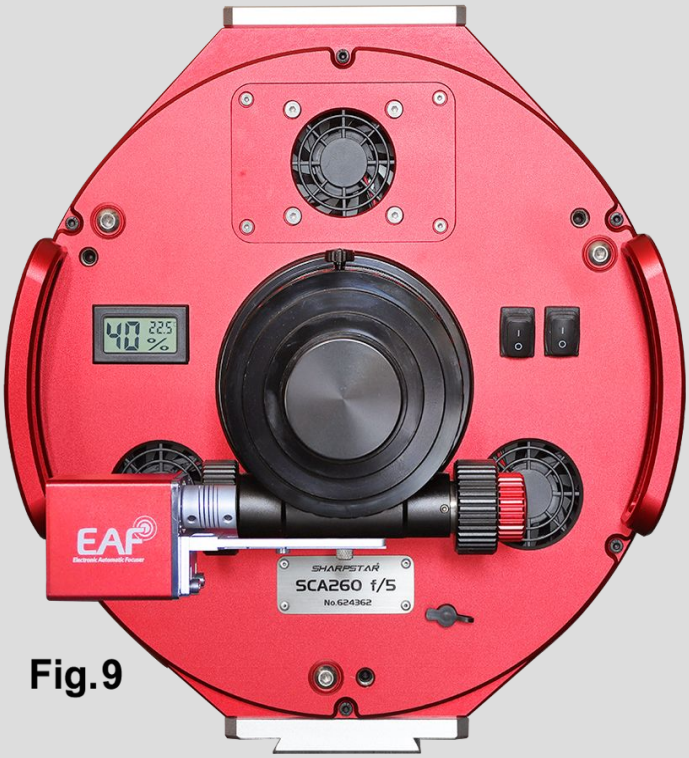
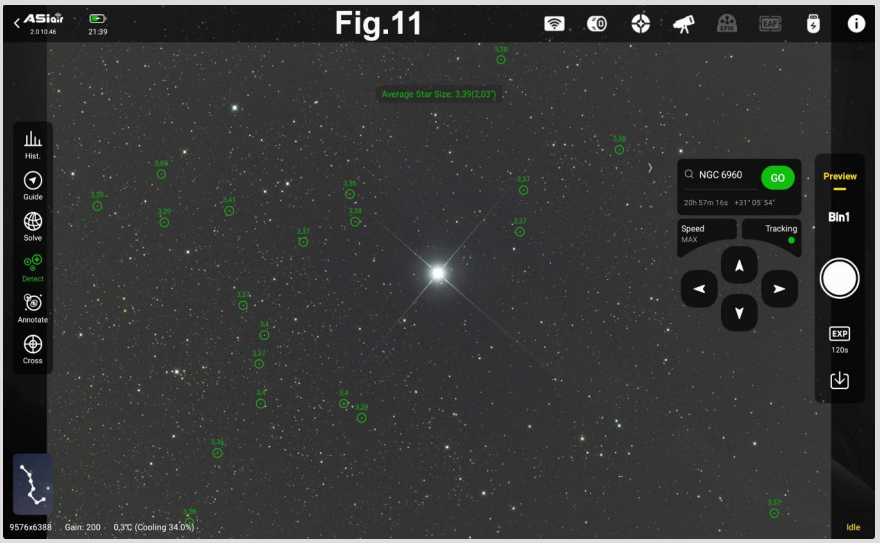


Fig.9

Test photographique

Monture :10 micron GM 200 HPS
Imageurs: ZWO Asi 6200 MC Pro, CCD SBIG STL 11000M
Logiciels:Siril, Photoshop, CCD Inspector



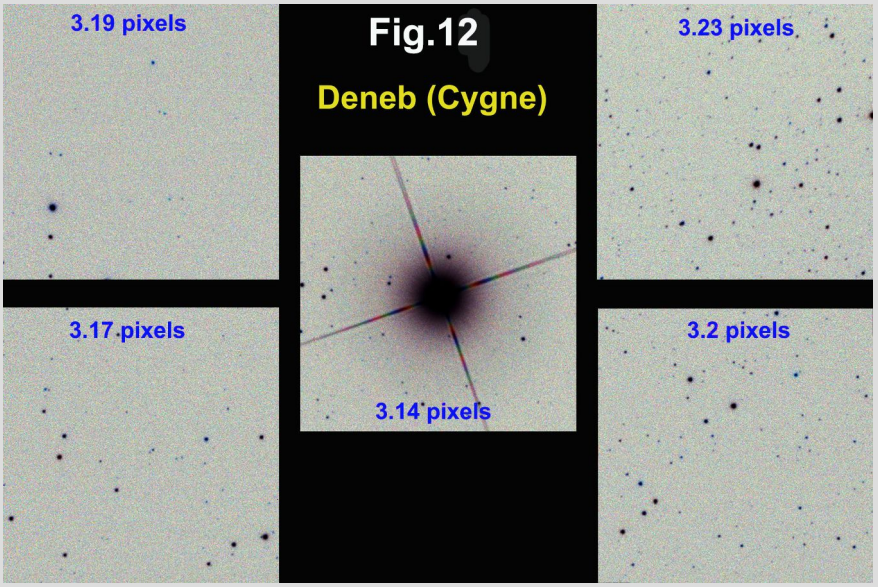
The tube retained good collimation despite the hardships of transport, which is a guarantee of robustness. Sharpstar recommends adjusting the secondary then the primary and other manufacturers the opposite. The second solution gave me a better result. This makes it possible to overcome concentricity defects of the different elements which come into account. Concerning the primary I only adjusted two screws for the simple reason of limiting the movement of the focal plane. In fact, we quickly shift the focal plane by several mm even though we have a large adjustment range.

First setup

ZWO Asi 6200 MC Pro with Asiair plus case and tablet. The three fans have been running for 45 minutes, it's time to point a star to check field.

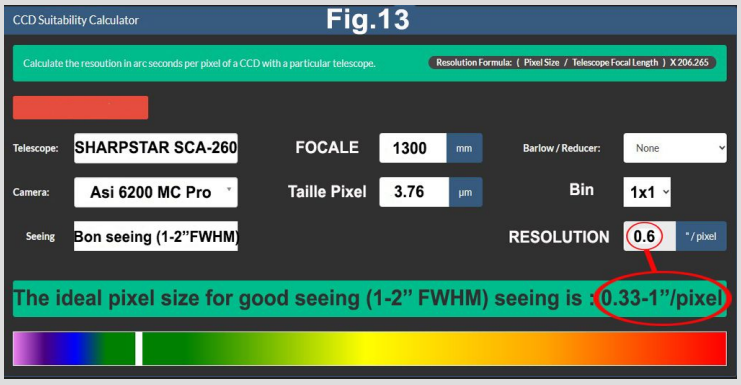
First night of testing, pointing to the star Deneb in Cygnus. The seeing is very good I use Bin1x1** mode. The star size obtained (**Fig.11**) is very fine, around 3.39 pixels (2.03"). This is qualitatively very good because for comparison the Takahashi BRC-250 gives 1.5" and the CCA-250: 1.7 to 1.9".

I try to further refine the focus and I find even lower values 3.2 pixels (1.92"). In (**Fig.12**) zoomed to 250% a slight coma is visible in the upper right corner. The collimation could be further refined but the best being the enemy of the good I decide not to touch anything because the general result is excellent, the stars have an identical size across the entire field.



Chromatism

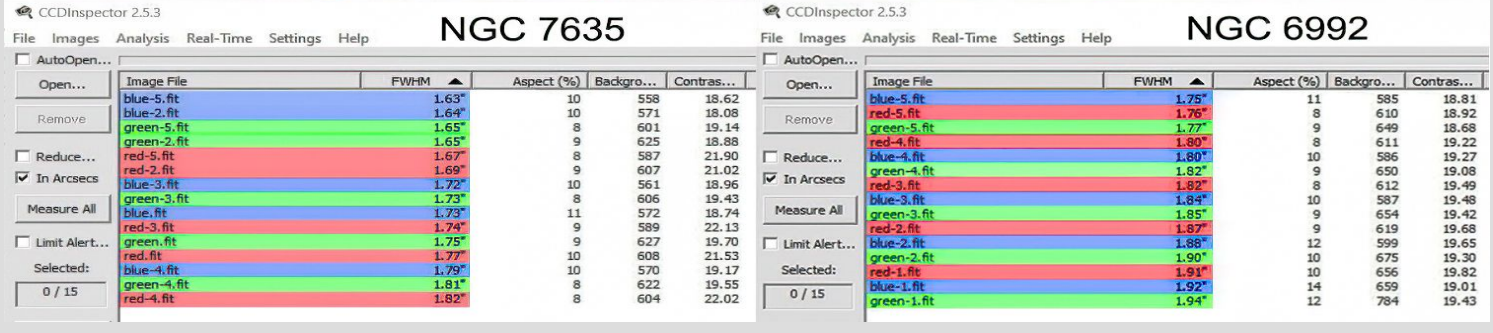
by visually assessing the photos taken on a uniform star field, I do not distinguish any chromatism, particularly at the edges of the field. I decide to test the chromatism on several deep sky objects: ngc 6992 (Swan Lace) and ngc 7635 (Bubble Nebula). The star size is very fine and identical at different wavelengths (analysis under CCD Inspector (**Fig.14**), chromatism is absent (**Fig.15**). The optical correction of the corrector is perfectly suited to the small size of the pixels. It is important to note that the constant evolution of modern sensors with increasingly smaller pixels forces engineers to recalculate the optics so that they provide the necessary sharpness. This observation is also valid for all the photo lenses of the major photo camera brands which have evolved their ranges. optics. Which clearly means that our elders correctors and reducers, which gave excellent results before using these new sensors, see their corrections weaken!



** With good seeing (FWHM between 1-2 arc seconds) the sampling is respected with the pixel size of the Asi 6200 MC Pro camera (simulation with Astronomy tools (**Fig.13**)

CHROMATISM	FWHM	Pixels	Asi 6200 MC Pro pixel size	Star size in microns
RED	1.83	3.05	3,76	11.5
BLUE	1.84	3.07		11.5
GREEN	1.86	3.1		11.6

Fig 14: Analyse sous CCD Inspector



During photographic exposures, reflexions are present on the images. I decide to carry out different tests by placing a bright star in each of the angles and off-camera. Each time more or less pronounced reflections appear. To ensure that the OAG optical prism is not the cause I decide to dismantle the Off Axis guider by replacing it with a spacer and to achieve autoguiding with a guide bezel but the problem persists. I mentioned it on page 2 where the limited length of the relatively short sheath could create reflections. This phenomenon is not present on the swan's lace because there is in fact no bright star in it. and outside the field. A little disappointed, I went to take a look on the Web to see if the problem was identified and it was on: https://www.cloudynights.com where a forum is devoted to this subject. A full report was therefore sent to Teleskop-Service who contacted Sharpstar informing us that the problem has now been resolved by fitting a new baffle with a cone at its end (**Fig.16**). The parts concerned have been sent directly by Sharpstar after-sales service and delivered four days later. The original baffle is cylindrical with a length of 150mm and does not have diaphragms. the new baffle has a total length of 200mm, with five diaphragms, including a conical baffle 50mm long. The walls of this deflector are entirely fluted. All is inserted into the original baffle and secured in position by an M92 thread on the end of the original baffle. The assembly is clever and superbly machined, the whole thing is matte black anodized

Fig.16

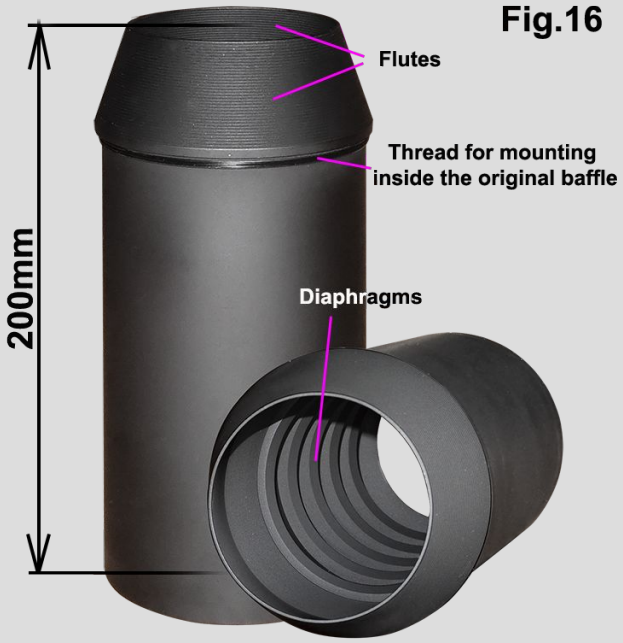


Fig.17

Fitting the new baffle required dismantling the entire rear barrel assembly. The operation consists of positioning the tube vertically, removing the 6 fixing screws to extract everything with the two side handles. When carrying out my tests I never dismantle an instrument entrusted to me and it is true that without this manipulation we could not see the care taken in the mechanical construction. The rear barrel is rigid, the collimation screws are well sized with strong section springs for the three pushing screws. In (**Fig.17**) we see:

_ The pulling screws 1 and the pushing screws 2. During collimation, you must loosen the pulling screws to adjust the primary.

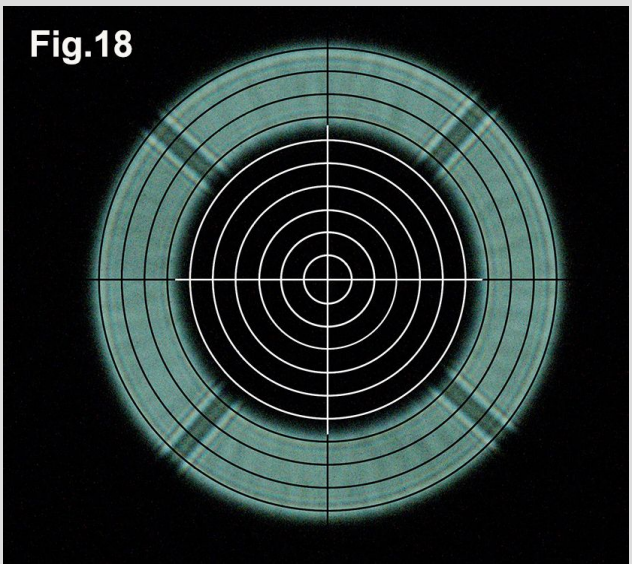
_ 6 lateral screws (3) which ensure the centering of the primary

_ A black deflector (4) which is mounted in front of the primary avoiding reflexions which could be generated by the outer edge of the mirror.

_ The original baffle (5) into which the new baffle (6) is inserted When reassembling, there is no centering diameter, positioning is simply ensured by the 6 fixing screws. This latitude does not allow the assembly to be returned to the original position.

The collimation was redone (Fig.18). I repeated the complete test on Alphératz by placing the star in the center and in each of the angles, which clearly confirmed the **absence of reflexions**.

Fig.18



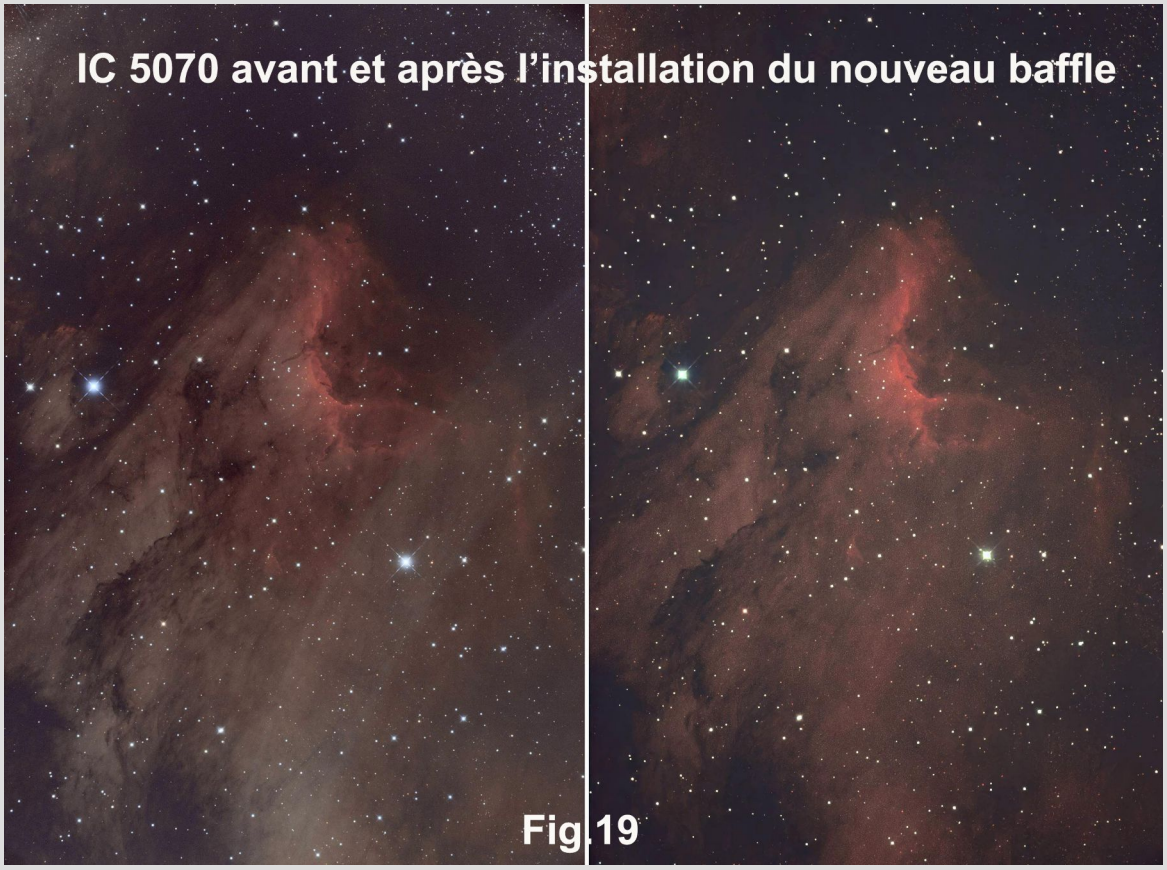
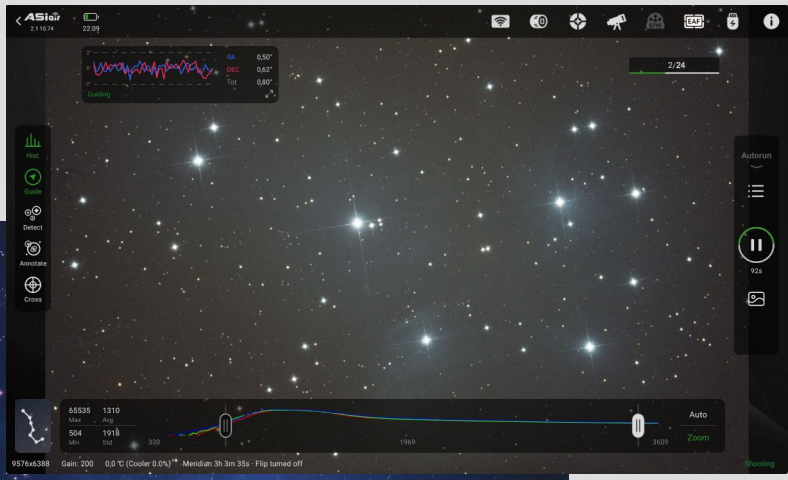
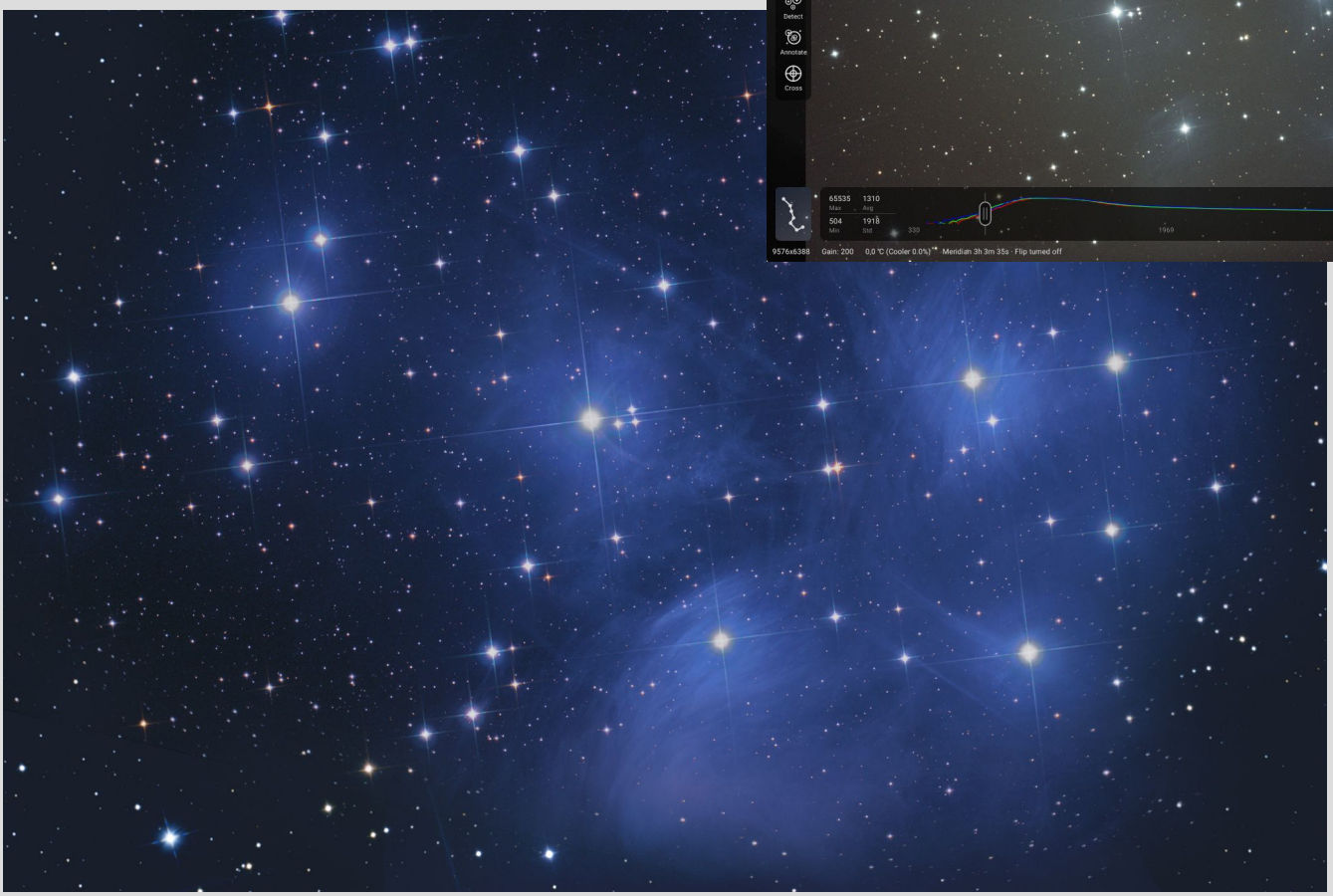


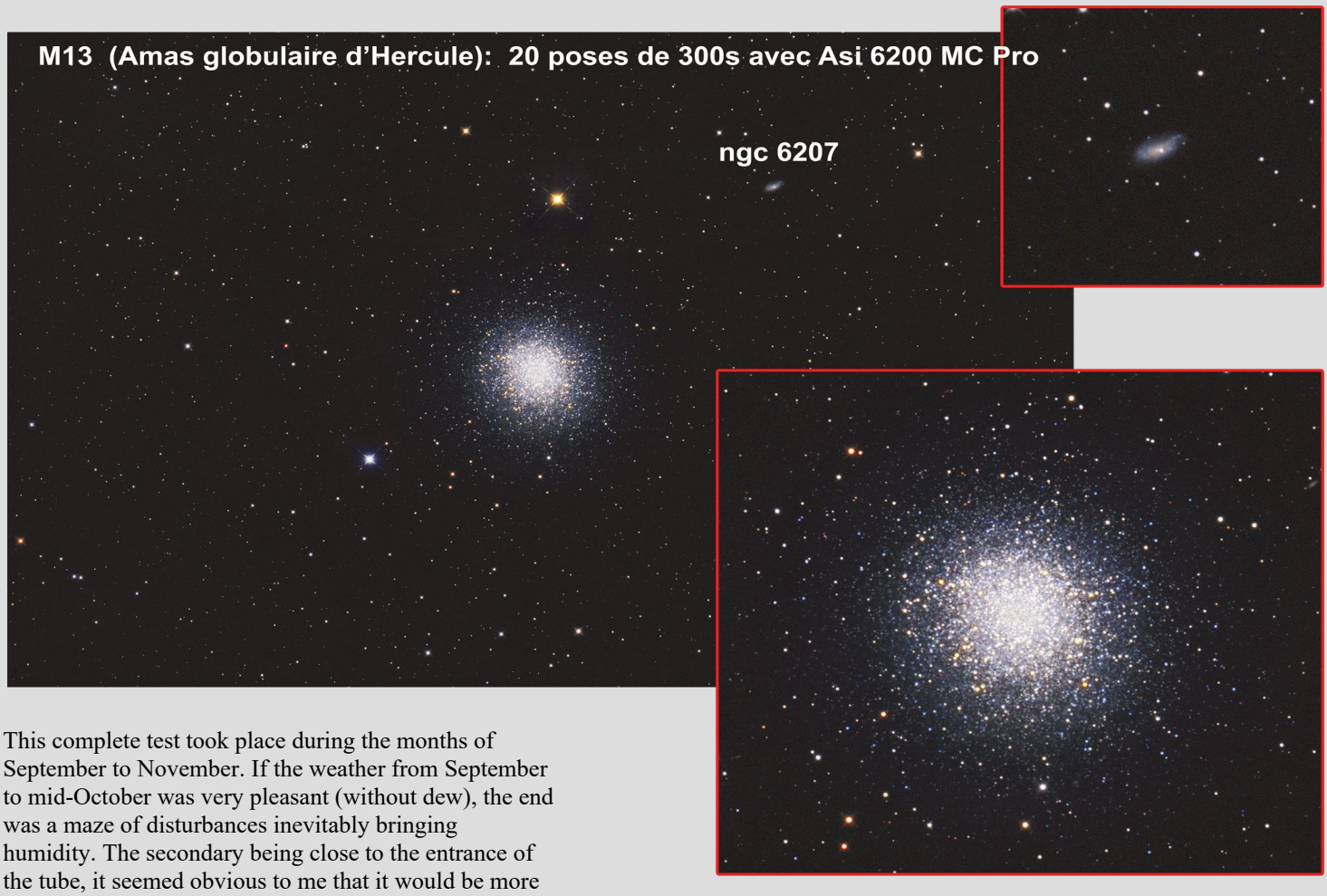
Fig.19

The tube is pointed again at my first targets M13- IC 5070 and ngc 7635 (The bubble) making an identical photographic exposure each time. The results obtained are also very satisfactory. We can see the result obtained on IC 5070 (The Pelican) in the Cygnus constellation (Fig.19).

The setup being ready the tube is pointed at M45 (Les Pléiades)
At the start of the night the conditions are not the best but then the turbulence is less pronounced.
The clarity of the seven main stars is a good test for assessing diffusion and reflections. The result is very good.



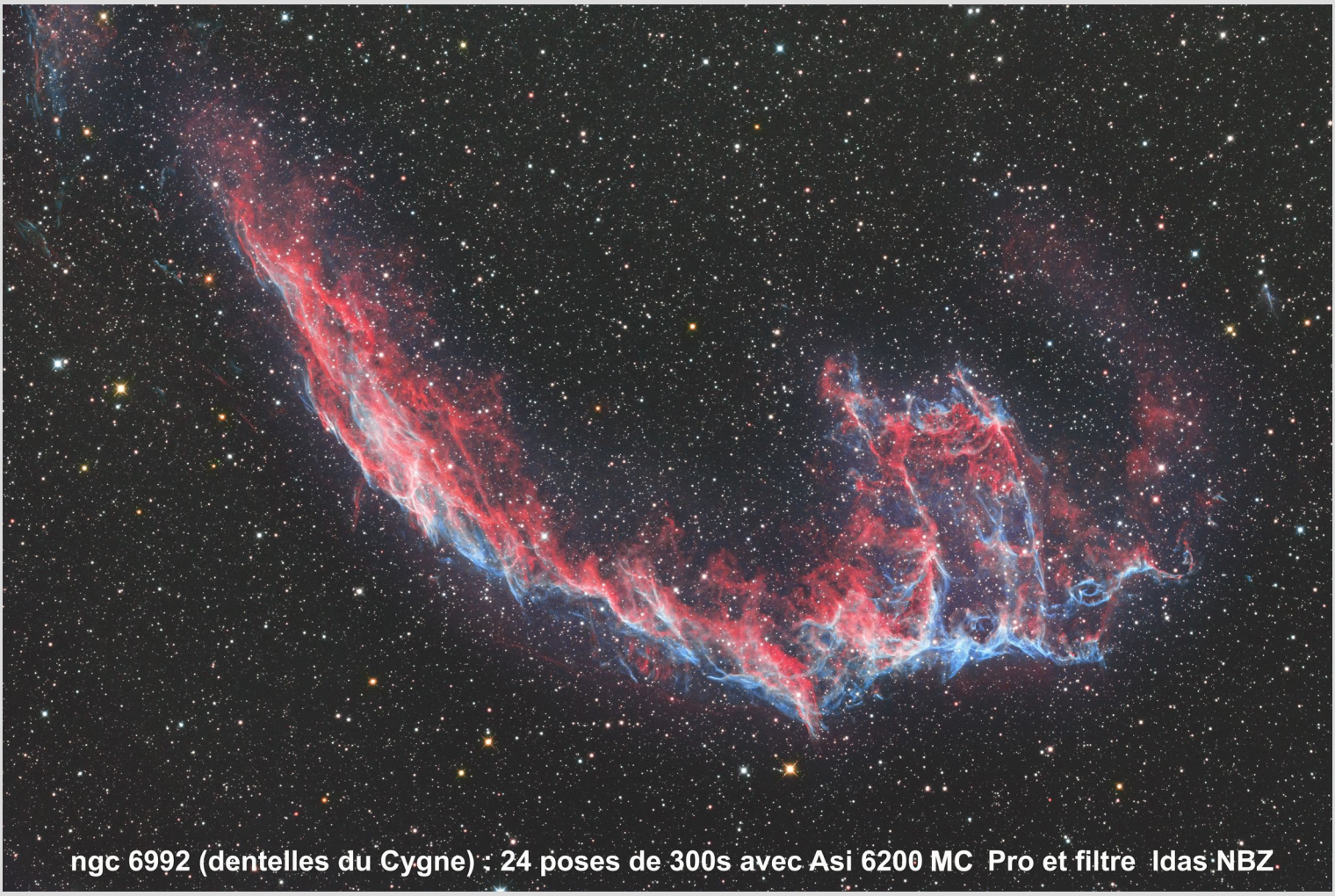




This complete test took place during the months of September to November. If the weather from September to mid-October was very pleasant (without dew), the end was a maze of disturbances inevitably bringing humidity. The secondary being close to the entrance of the tube, it seemed obvious to me that it would be more sensitive to humidity than the primary especially since, for the latter, the internal flocking of the tube gave the impression of retaining it well. . It was the opposite, I did not have a deposit on secondary but slightly on primary. Leaving the fans permanently on or off had no influence on the phenomenon. Note that these do not induce harmful vibrations when shooting. They are relatively noisy and can be replaced by quieter models. To prevent the deposition of dew, a dew shield will be the essential accessory. Sharpstar does not currently offer any but this feedback has been provided to them.

Caractéristiques techniques

Diamètre:	260 mm
Focale:	1300 mm
F/D:	5
Type miroir primaire:	Asphérique
Matériau miroir primaire	PZ33 (similaire au Pyrex)
Miroir secondaire:	Sphérique
Diamètre Miroir secondaire:	135 mm
Diamètre support Miroir secondaire:	150 mm
Réflection:	95,00 %
Correcteur:	Trois éléments "airspace"
Cercle image:	80 mm
Magnitude limite visuelle:	13.8 mg
Matériau du tube:	Fibre de carbone
Diamètre du tube:	304 mm
Diamètre du tube avec les colliers:	322 mm
Longueur du tube:	738 mm
Poids du tube:	14.5 kg
Resolution:	0.46"
Porte oculaire:	3.35" course de 50 mm
Plan focal avec bague M48:	70 mm
Plan focal avec bague M54:	88 mm
Plan focal avec bague M68:	95 mm
Plan focal avec bague M90:	102 mm
Platine de fixation:	Losmandy
Ventilateurs:	3 ventilateurs avec alimentation 12V
Piles pour thermomètre digital:	2 piles x LR 44 (non incluses)



ngc 6992 (dentelles du Cygne) : 24 poses de 300s avec Asi 6200 MC Pro et filtre Idas NBZ.

Conclusions

This tube is a pure astrograph so we forgive the fact that there are no visual accessories. However, an M68 screw adapter with 50.8mm output would be welcome for collimation. This time-consuming test gave me the satisfaction of trying to meet the expectations of readers wanting to know more about this fabulous instrument. This optical tube is a serious competitor due to its optical and mechanical qualities but also due to its extremely aggressive price compared to the competition. Certainly its price of 5038 euros is not affordable for everyone but it leaves its competitors far behind whose prices are much higher for this type of service. I repeat it often: For an optical tube to gain a reputation in the restricted world of very high-level astrographs, consistent manufacturing quality is required. I believe that this consistency, which is necessarily a constraint in terms of cost, has been integrated by many manufacturers including Sharpstar in particular with its renowned range of refractors that it offers. The fact of recognizing a defect and doing everything possible to eliminate it proves the professionalism of a manufacturer and this is valid for many other sectors such as, in particular, the automobile industry.

NB: On certain reseller websites, you should pay attention to the photos and characteristics mentioned (version 1/version 2) which are confusing due to lack of updating. During the writing of this test Sharpstar added to its catalog a new tube called SCA 310 F/3.8, a direct competitor to the CDK 14, Veloce RH Officina Stellare and the late RH 305 Riccardi Honders from Astro-physics

NB: for those who are interested in this optical tube, you will need to check when ordering that this new baffle is integrated. According to my information this is version 2.2

_ Excellent optical quality
_ Mechanical concept
_ Absent chromatism
_ Flat field on full format
_ Very weak vignetting
_ Finishing
_ Price
_ Sharpstar after-sales service
_ Very low sensitivity to temperature differences
_ Rigid eyepiece holder capable of carry heavy loads

_Digital gadget thermometer (no wiring with fans and mirror)
_ No ring at the 31.75 slide for mount the collimation eyepiece
_ Fictitious switch: a DC output would be appreciated
_ No interferometric test
_ Sensitivity to humidity

Thanks to Teleskop-Service for providing the material