APAA
Associação Portuguesa de Astrónomos Amadores

ASTRONOMIA de Amadores

N.º 61 2025

EVENTOS E OBSERVAÇÕES PÚBLICAS EM 2024 COM A PARTICIPAÇÃO DA APAA
RUI LOURENÇO & PEDRO RÉ

ASTRONOMICAL TELESCOPE MUSEUM - SHIKOKU (JAPAN)
PEDRO RÉ

ZWO SEESTAR S50 SMART TELESCOPE
PEDRO RÉ

QHY POLEMASTER ELECTRONIC POLAR SCOPE
PEDRO RÉ

WIDE FIELD H-ALPHA IMAGING WITH A ZWO ASI2600MM
PEDRO RÉ

APAA

Associação Portuguesa de Astrónomos Amadores

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ASTRONOMIA DE AMADORES

Revista de divulgação astronómica (n.º 61) — 2025
Propriedade: Associação Portuguesa de Astrónomos Amadores (APAA); P.C. n.º 501 213 414.
E-mail: apaadir@gmail.com • Internet: https://www.apaa.co.pt/• Facebook: https://www.facebook.com/APAAweb/

REVISTA ASTRONOMIA DE AMADORES

Equipa redactorial: Pedro Ré
Periodicidade: Anual

Distribuição: a Revista **ASTRONOMIA DE AMADORES** é distribuída gratuitamente a todos os associados que à data da publicação do respectivo número estejam em pleno gozo dos seus direitos, assim como aos sócios honorários e membros do Conselho Técnico e Científico.

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Paginação e arranjo gráfico: Equipa redatorial.

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EVENTOS E OBSERVAÇÕES PÚBLICAS EM 2024 COM A PARTICIPAÇÃO DA APAA

RUI LOURENÇO E PEDRO RÉ (APAA)

Durante o ano de 2024 a APAA- Associação Portuguesa de Astrónomos, encetou todos os esforços para continuar a promover a divulgação da astronomia pela população em geral e incentivou a comunidade de astrónomos amadores a participar em eventos de norte a sul do país, expondo os seus trabalhos e disponibilizando os seus conhecimentos e recursos a todos.

MARATONA MESSIER – MUSEU DA LUZ - 6 DE ABRIL DE 2024.
https://sites.google.com/view/albireo/maratona-messier-2024

15h00 Boas-vindas – Pedro Ré, Nelson Nunes, Diogo Nascimento, Dimas Ferro
15h15 - 17h45 Apresentações
Estrelas Wolf-Rayet - Licínio Almeida (APAA)
O ZWO Seestar S5 Smart Telescope - Pedro Ré (APAA)
Radiografia das galáxias - Davi Barbosa
Breve História da Astronomia - Rui Agostinho
18h00 Quiz
18h30 Plano da Maratona Messier – Pedro Ré (APAA)
19h00 - 21h30 Jantar / Montagem dos telescópios
21h30 – 6h00 Maratona Messier


Estrelas Wolf-Rayet: variações espectrais
Variações espectrais:
WN
WC
WO

VÍDEOS:
https://www.flickr.com/photos/pedro_re/53638435780/play/1080p/305c991c04/
https://www.flickr.com/photos/pedro_re/53638196903/play/1080p/8b29963d9d/
https://www.flickr.com/photos/pedro_re/52822241689/in/album-72177720307542917
https://www.flickr.com/photos/pedro_re/52822242024/in/album-72177720307542917
https://www.flickr.com/photos/pedro_re/52822473280/in/album-72177720307542917

ASTROFESTA 2024

PROGRAMA

SEXTA-FEIRA, 09.AGO.
A partir das 17:30
Acolhimento de participantes e instalação de tendas no Parque de Apoio.
21:30 às 23:30 – Observações astronómicas
22:00 – Sessão de planetário: Perdidos no mar – História da Navegação Astronómica

SÁBADO, 10.AGO.
10:00 às 13:00 – Mini "curso" – Introdução à Astronomia* (Máximo Ferreira, CCVC)
11:00 – Laboratório de Heliofísica – Manchas, protuberâncias e espetro solar (CCVC)
14:30 – Sessão de planetário – Astronomia de "Os Lusíadas"- Viagem de Vasco da Gama (CCVC)

15:30
Sessão oficial de abertura

16:00 – Portugal nos grandes telescópios do Observatório Europeu do Sul (Alexandre Cabral, IA/FCUL)
16:45 – Mergulhos no oceano cósmico (Cédric Pereira, IA/FCUL)
17:00 – Workshop para crianças (Circuitos elétricos, Robótica…) (CCVC)
17:30 – 18 maio 2024 – Dia do Super Bólide Ibérico (Rui Gonçalves, **APAA**/IPT)
18:15 – O estranho caso do Espaço que aumenta (Inês Albuquerque, IA/FCUL)
19:00 – Camões em Constância – Comemorações dos 500 anos do seu nascimento (Ana Maria Dias, Casa – Memória de Camões)

19:30 – Intervalo para jantar

21:00 – Passado, presente e futuro da APAA (Rui Lourenço, **APAA**)
21:00 – Workshop sobre Registos de Imagens Astronómicas (Cédric Pereira, IA/FCUL)
21:30 – Início das observações astronómicas (inclui Perseidas ”estrelas cadentes/meteoros”)
21:45 – *Smart Telescopes* (Pedro Ré, **APAA**/FCUL)
22:00 – Um passeio pelo céu (Máximo Ferreira, CCVC)
22:30 – Concentração de telescópios em Moimenta da Beira (Paulo Sanches, Escola Secundária de Moimenta da Beira)

DOMINGO, 11.AGO.

10:30 – Visita à Casa-Memória de Camões e às exposições evocativas dos 500 anos do nascimento do poeta
11:30 – Atividade: Vida e Obra de Camões

BARRANCOSMOS 2024

O BarranCosmos 2024 decorreu nos dias 14 re 15 de setembro e foi organizado pela Associação ALBIREO, EDIA, Parque de Natureza de Noudar, Museu da Luz e Câmara Municipal de Barrancos, Instituto de Astrofísica e Ciências do Espaço e Associação Portuguesa de Astrónomos Amadores (APAA).

https://sites.google.com/view/albireo/barrancosmos-2024

Sábado, 14 setembro
14h00 – Abertura no Cineteatro de Barrancos
14h15 – Apresentações
Astronomia Cantada n'Os Lusíadas - Carlos Santos (NOVA Math, U. Nova de Lisboa)
Telescópios Digitais - Pedro Ré (APAA)
O complexo astronómico e turístico e-eye: uma janela para o Universo - José Luis Quiñones (e-eye)
15h30 - Intervalo e observação solar
16h00 - Apresentações
O lado escuro da força - Tiago Barreiro (IA, U. Lusófona)
O telescópio Euclid e o Universo invisível - Ana Afonso (IA, CAUP)
História da Astronomia - Rui Agostinho (IA, FCUL)
17h30 – Viagem para o Castelo de Noudar (autocarro disponível para quem não tem viatura própria)
18h00 – Montagem de tendas. Montagem de telescópios. Animação musical.
19h00 – Jantar volante
20h30-6h00 – Observações astronómicas

Domingo, 15 setembro
10h00 – 13h00 – Passeio cultural em Barrancos

VÍDEOS
https://www.flickr.com/photos/pedro_re/53998988111/in/photostream/
https://www.flickr.com/photos/pedro_re/53999311614/in/photostream/
https://www.flickr.com/photos/pedro_re/53999414725/in/photostream/
https://www.flickr.com/photos/pedro_re/53999313059/in/photostream/

A participação da APAA em mais de 15 eventos ao longo do ano de 2024, comprovou que estamos a ser reconhecidos por todos como uma associação que pode ajudar e contribuir para o desenvolvimento da astronomia em Portugal. Essencialmente direcionada para a astronomia amadora, a APAA voltou a relembrar a sociedade portuguesa que está viva e ativa para ajudar a desenvolver as iniciativas locais, conjuntamente com as diversas instituições e grupos de população. Passamos a descrever de seguida os diversos eventos em que a APAA colaborou durante o ano de 2024:

Local : Lisboa, Colégio Pedro Arrupe
Tema: Observação Pública
Data: 15 Março 2024
Participantes: Alunos, pais e funcionários do colégio
Número: 75 participantes
Telescópio: #1 Celestron SCT 8” da APAA e Telescópio refrator do IST
Entidades Envolvidas: APAA, IST
Alvos: Lua (pouco mais conseguimos observar pois o céu fechou e avançámos para uma palestra sobre o funcionamento dos telescópios que estávamos a utilizar)

Local : Lisboa, Agrupamentos de Escolas Filipa de Lencastre
Tema: Observação pública
Data: 8 Maio 2024
Participantes: Alunos, pais e funcionários da escola
Número: 35 participantes
Telescópio: SkyWatcher Newton 8” da O.Colares, #1 Celestron SCT 8” da APAA, SeeStar S50 da APAA
Entidades Envolvidas: O.Colares, APAA
Alvos: Observação solar com o Seestar, passeio pelo céu e explicação das constelações e observação da Lua e outros objetos de céu profundo

Local: Lisboa, Agrupamento de Escolas Fernando Namora
Tema: Observação Pública
Data: 12 Junho 2024
Participantes: Alunos, pais e funcionários da escola
Número: 45 participantes
Telescópio: SkyWatcher Newton 8” da O.Colares, #1 Celestron SCT 8” da APAA, SeeStar S50 da APAA
Entidades: O.Colares, APAA

Local: Sintra, Museu de História Natural
Tema: Observação Pública
Data: 14 Junho 2024
Participantes: Público em geral
Número: 15 participantes
Telescópio: SkyWatcher Newton 8” da O.Colares, #1 Celestron SCT 8” da APAA, SeeStar S50 da APAA
Entidades: O.Colares, APAA

Local: Massamá, Associação de moradores de Massamá
Tema: Observação Pública
Data: 15 Junho 2024
Participantes: População em geral
Número: 50 participantes
Telescópio: SkyWatcher Newton 8” da O.Colares, #1 Celestron SCT 8” da APAA, SeeStar S50 da APAA
Entidades: O.Colares, APAA

Local: Sesimbra, Forte do Cavalo
Tema: Observação Pública promovida pela Câmara Municipal de Sesimbra
Data: 12 julho de 2024
Participantes: População em geral
Número: 75 participantes
Telescópio: SkyWatcher Newton 8” da O.Colares, #1 Celestron SCT 8” da APAA, SeeStar S50 da APAA
Entidades: O.Colares, APAA e C. Municipal de Sesimbra

Local: Monsaraz, Praia Fluvial
Tema: Observação Pública
Data: 18 Julho 2024
Participantes: População em geral
Número: 25 participantes (alunos e professores das escolas da região)
Telescópio: #2 Celestron SCT 8” da APAAe da Albireo, SeeStar S50 da APAA
Entidades: Albireo (iniciativa do Prof. Nelson Nunes), APAA

Local: Lisboa, IST
Tema: “Observação visual do céu e principais equipamentos de observação” (Palestra)
Data: 4 setembro de 2024
Participantes: Inscritos na EVA (Escola de Verão de Astronomia)
Número: 25 participantes
Telescópio: n.a.
Entidades: APAA, IST/NFIST

Local: Sesimbra, Castelo
Tema: Observação Pública integrada nas comemorações do Dia Nacional dos Castelos
Data: 5 outubro de 2024
Participantes: População em geral
Número: 20 participantes (a meteorologia não ajudou e tivemos de cancelar a sessão pouco depois de termos iniciado)
Telescópio: #1 Celestron SCT 8” da APAA
Entidades: APAA e C. Municipal de Sesimbra

Local: Amadora, Moinho do Penedo
Tema: Observação pública
Data: 11 outubro de 2024
Participantes: População em geral
Número: 25 participantes
Telescópio: SkyWatcher Newton 8” da O.Colares, #1 Celestron SCT 8” da APAA, SeeStar S50 da APAA
Entidades: O.Colares e APAA

Local: Sta Margarida, Ponte de Sor
Tema: Observação pública inserida no Evento EuroRoc da Agência Espacial Europeia
Data: 12 outubro de 2024
Participantes: População em geral e visitantes do evento
Número: Conseguimos observar o sol com o Seestar mas o céu fechou pouco depois
Telescópio: #1 Celestron SCT 8” da APAA, SeeStar S50 da APAA
Entidades: APAA (iniciativa do sócio Paulo Sanches)

Local: Rio de Mouro, Sintra
Tema: Observação pública
Data: 21 dezembro de 2024
Participantes: População em geral (público da sessão de cinema produzido pela RUGAS – Associação Cultural)
Telescópio: #1 Celestron SCT 8” da APAA, SeeStar S50 da APAA
Entidades: APAA

ASTRONOMICAL TELESCOPE MUSEUM SHIKOKU (JAPAN)

PEDRO RÉ
https://pedroreastrophotography.com/

The Astronomical Telescope Museum[1] was established by its Director, Shosaku Murayama in Sanuki, Kagawa Prefecture, with the help of enthusiasts and the local government. The museum is located about twenty kilometres south of central Sanuki. Its sits near the Okuboji Temple nestled among the mountains in the Tawa area, where it is relatively unaffected by urban light pollution.

S. Murayama previously served as manager of the Takamatsu branch of the Bank of Japan and as president of a pharmaceutical company in the prefecture. A fan of astronomy since an early age, he wanted to establish his own observatory in Shikoku. While collecting equipment to that end, he realized that public facilities for astronomical observation were shuttering across the country due to the nation's declining population.

Starting around 2007, he and a few friends began asking astronomical facilities and individuals to donate telescopes and accessories. To fund the facility, they leveraged Murayama's contacts to raise money from the local business community. At the same time, they scoured Shikoku for a suitable site for the museum, before finally settling on Tawa Elementary School, which the Sanuki city government planned to close in 2012.

The Museum opened in 2016. Modifications included turning the second-floor classrooms into four telescope exhibit rooms and using the indoor pool area to house an exhibition of large telescopes.

Currently, the Museum preserves and displays more than 450 telescopes including a reflector that was made 130 years ago and used by a British astronomer to observe the moon, a giant 12-ton telescope and large Fujinon binoculars used by Yuji Hyakutake, who discovered Comet Hyakutake in 1996.

Most of the equipment housed in the Astronomical Telescope Museum was donated by amateur and professional astronomers from all over Japan. As the name of the Museum of Astronomical Telescopes has been raised, donations have continued to come in. The donated telescopes are maintained and displayed by the Museum staff.

The Museum has about 120 volunteers and it is open on Saturdays and Sundays. These volunteers include experts in astronomical observation and optics who help conduct restoration work on the donated telescopes while the museum is open. Visitors can tour the facility with staff and take part in astronomical observation events[2].

The Museum exhibits Large as well as small astronomical telescopes. It also has a roll-off-roof observatory that houses several large refracting and reflecting telescopes. It is the first museum dedicated to amateur and professional telescopes.

[1] https://www.telescope-museum.com/
[2] https://japannews.yomiuri.co.jp/features/travel-spots/20230213-90226/

Figure 1 – Astronomical Telescope Museum, Sanuki (Japan)

Figure 2- Location of the Astronomical Telescope Museum

Figure 3 – Small telescope Exhibition room - Asahi Kogaku" (Pentax)

Figure 4 - Small telescope Exhibition room – Takahashi/Vixen

Figure 5 - Small telescope Exhibition room – Mizar/Astro/Vixen

Figure 6 - Small telescope Exhibition room –Vixen/Carton

Figure 7 - Large telescope Exhibition room – GOTO Inc.

Figure 8 – Large telescope Exhibition room

Figure 9 – Large telescope Exhibition room. Calver 46 cm reflector installed in 1927, previously located at Kyoto Imperial University's Hanayama Observatory. This telescope was later moved to the private observatory of the late Dr. Issei Yamamoto, who was the father of Japanese astronomy and amateur astronomy.

Figure 10 – Unitron 15 cm refractor and Equatorial mount.

Figure 11 - Astronomical telescope collection of Shigejiro Nishimura, the founder of Nishimura Manufacturing

Figure 12 - Nikon’s large refractor telescope. On the left is Nishimura’s 15cm refracting telescope, used by ‘Kai-hostu’, a pioneer of amateur astronomer.

Figure 13 – 20 cm reflector made by “Jiro Hoshino” one of the pioneers of Japanese amateur telescope making and astrophotography.

Figure 14 – Small telescopes for amateur astronomers (1980/1990).

Figure 15 – Roll-off-roof observatory – 25 cm Goto equatorial refractor.

Figure 16 – Roll-off-roof observatory

ZWO Seestar S50 smart telescope

Pedro Ré
https://pedroreastrophotography.com/

The ZWO Seestar S50[3] is a smart telescope that allows you to view and capture the wonders of the night sky with ease. It is a compact and portable device that integrates a telescope, an electric focuser, an astronomical camera, and a smart system. The Seestar S50 can be easily controlled with a smartphone or tablet.

The Seestar S50 is one of the latest smart telescopes currently on the market. The other smart telescopes that use Electronic Assisted Astronomy[4] are much more expensive[5].

The S50 includes (in the Box): (Figure 1)

- The ZWO Seestar S50
- A Tripod
- A Solar Filter
- A Carrying Case
- A USB Type-C Charging Cable
- A short Manual

Figure 1 – ZWO Seestar S50

[3] https://www.seestar.com/
[4] Electronically Assisted Astronomy (EAA) is a form of observational astronomy with a telescope that uses a camera instead of an eyepiece. The camera captures a sequence of short exposures, then software stacks and processes the images to be displayed in near-Realtime on a smartphone or tablet.
[5] Unistellar eVscope 2, Vaonis Stellina, Unistellar eVscope eQuinox, Vaonis Vespera, Unistellar eVscope.

The tripod has a total length of 274.5 mm (10.8 inches). If needed, its legs can be extended up to 363 mm (14.29 inches).

The ZWO Seestar can be used with several filters:

- Narrowband Dual-Band filter (20 nm H-alpha and 30 nm OIII)
- Solar filter (580-630 nm bandpass)

The **dual-band filter** is a light pollution filter and is **built into** the Seestar. After slewing to the target, the Seestar app will activate or deactivate this filter depending on the object (nebula, cluster, or galaxy). The filter can also be activated or deactivated manually.

The **solar filter** is a frontal filter that also comes in the box. It can be easily attached to the end of the Seestar's optical tube and should always be used when you image the sun.

A **dark filter** is also built into the Seestar for image calibration (Dark frames).

Specs

The Seestar S50 has a triplet apochromatic lens[6] and includes a Sony IMX462 CMOS sensor with a resolution of 1920 x 1080 pixels (2 MP). (Figure 2).

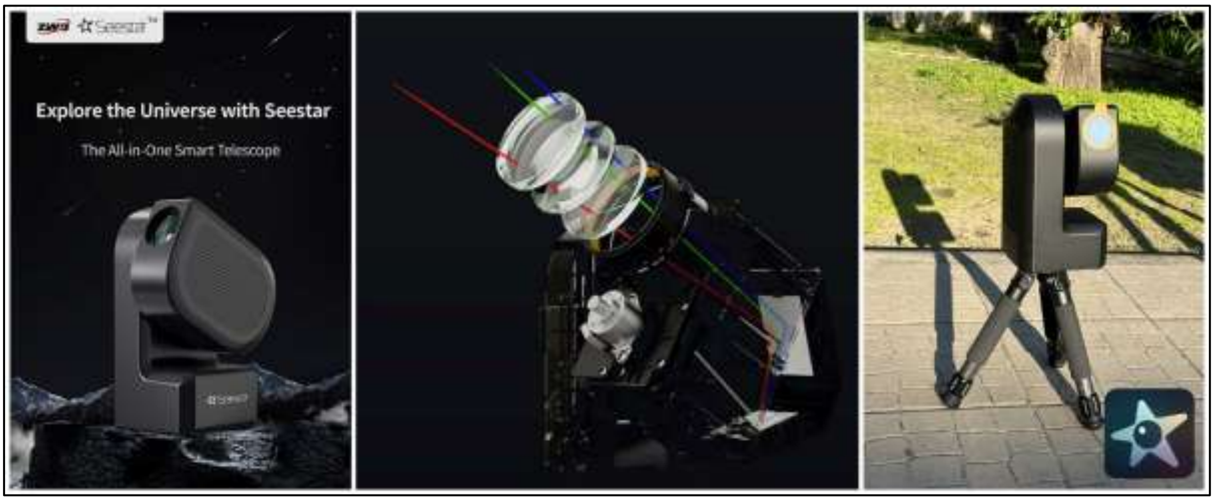

Figure 2 – ZWO Seestar S50 (Specs)

The Seestar can be operated via Bluetooth and Wi-Fi, it has a battery life of approximately 6 hours and can save images as JPG or FITS. I can also save videos (compressed and Raw). Also built into the Seestar are an electronic focuser, a dew heater, and a filter wheel[7].

Other Specs (Figure 3, 4, 5, 6)

- Weight: 2.5 kg (5.5 lb)
- Height: 257 mm (10.12 inches)
- Width: 142.5 mm (5.61 inches)
- Depth: 130 mm (5.12 inches)

[6] The Seestar has an aperture of 50mm (1.97 inches), a focal length of 250 mm, and a focal ratio of f/5.

[7] Prices: $499 US and 690 € in Europe.

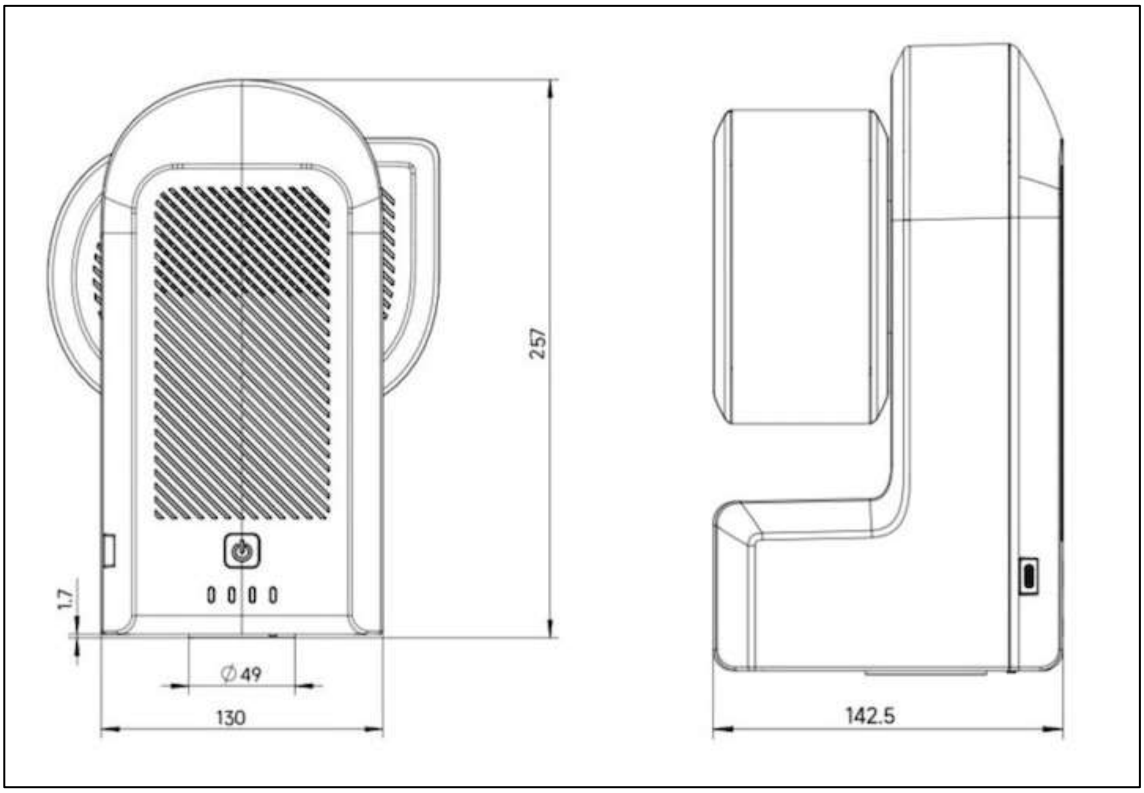

Figure 3 – ZWO Seestar S50 dimensions.

Figure 4 – ZWO Seestar S50 (in the box).

① Charge：Type-C

② Power Button：

Display	Press when power off
Power On	Press and hold for 2s
Power Off	Press and hold for 2s
Forced Shutdown	Press and hold for 6s

③ Power indication: Display the on-off status, Wi-Fi reset status, and working status. Blinking red when the battery is lower than 15%

Scene	Function
Disconnect when power on	Steady yellow
Wi-Fi reset	During the reset process, the power light flashes yellow; End of reset, steady yellow; Reset failed. Blinking red
Low Power（lower than 15%）	Red flashing
Working Status	Steady yellow

④ Wi-Fi Reset Button：Press and hold Wi-Fi Reset Button for 3s until Wi-Fi reset; If you cannot search for Wi-Fi after powering on Seestar S50, you can enable this button

⑤ Tripod connection interface: 3/8" screw thread

⑥ Battery cover: Remove the cover to replace the battery (cover screw specification: M3x8 cross countersunk self-tapping screw）

⑦ Pre-filter interface: If you are observing the sun, make sure to install a solar filter on this interface

Figure 5 – ZWO Seestar S50 (Specs)

2. Performance Paramenters

Product model	Seestar S50
Sensor	IMX462
Resolution	1080 x 1920
Aperture	50mm
Focal ratio	f/5
Focal length	250mm
Optical lens	Apochromatic triplet
Working distance	30m~∞
Storage	64GB
Transmission	Wi-Fi/USB-C/Bluetooth
Wi-Fi	5G/2.4G
WiFi range	≤10m
Bluetooth range	≤5m
Working temperature	-10°C-40°C （Forced shutdown when temperature is over 60°C）
Charging temperature	0-40°C
Mount type	Alt- azimuth
Slew rate	20X- 1440X
Zero position	Mechanical
Battery capacity	6000mAh
Connection port	3/8-20 inch
Net weight	2.5kg
Power input	Type-C
Wi-Fi reset	Yes
Size	142.5 X 130 X 257

Figure 6 – ZWO Seestar S50 (Specs)

Figure 7 – Installing the Solar Filter.

Operation of the Seestar S50

1. Level the tripod using the included bubble level
2. Screw the Seestar on the tripod
3. For solar observation install the solar filter (Figure 7)
4. Power the Seestar (press and hold the power button for 2s)

For better GoTo accuracy the tripod should be levelled using the Seestar app (Figure 8). When the difference is less than 3°, it is adjusted to a reasonable range. The smaller the value, the better[8].

Figure 8 – Levelling the tripod.

Seestar App (Figure 9)

The Seestar App includes five tabs (Seestar, SkyAtlas, Community, Nearby, Me):

The first Tab (Seestar) includes:

1. Connection (main dashboard). Lens Fog removal (anti-Dew), Wi-Fi, Firmware, Device info
2. Weather conditions from your location and moon phase
3. Four imaging modes: Stargazing, Solar, Lunar, Scenery
4. Recommendations of targets that can be imaged on a particular night

The second Tab includes a Sky Atlas. You can use this tab to slew the Seestar to a given object. The GoTo function will aim the smart telescope to target and centre it using plate solving.

Using the third tab you can share your images with the Seestar Community. The Nearby tab will open a map showing where other “Nearby” Seestar images were taken. The “Me” tab shows your profile and the images you decide to share with the Seestar Community.

Imaging with the Seestar S50

Imaging the Sun[9] and Moon with the Seestar is extremely easy. Choose the Solar or Lunar Tab and chose Find Sun or Find Moon (Figure 10). To image the Deep-Sky choose the Stargazing Tab. The Seestar S50 is not suitable for planetary imaging.

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[8] Modulation level is a necessary condition for GoTo and tracking.
[9] To image the Sun **<u>the solar filter must be attached</u>**.

Figure 9. Seestar App: 1- Device; 2- Weather; 3- Mode; 4- Recommendations; 5- Navigation Bar; Bottom Navigation Tabs.

Figure 10. Solar imaging.

Figure 11. Lunar imaging.

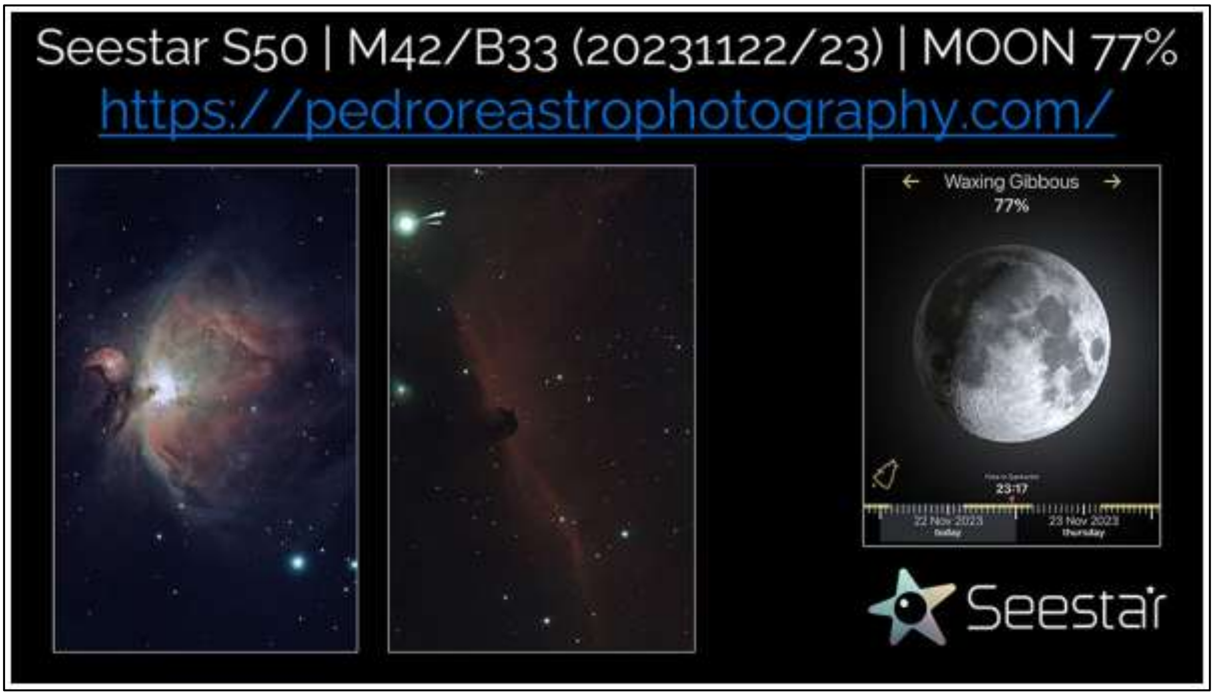
Figure 12- First light with the ZWO Seestar S50, Sun, M71, M15, M45, M42 (20231118).

Youtube Videos

https://youtu.be/4LA2Mdn6QtQ
Seestar S50 | Solar imaging | Pedro RÉ
Pedro RE' (20231118)
https://pedroreastrophotography.com/

https://youtu.be/CVQwySaYqB0
Seestar S50 | First Light (20231118) | Pedro RÉ
https://pedroreastrophotography.com/

https://youtu.be/EfDVvdMLh1E
Seestar S50 | Solar imaging (20231119) | Pedro RÉ
https://pedroreastrophotography.com/



https://youtu.be/tstPFcVlvlk
Seestar S50 | M42/B33 (20231122/23) | MOON 77% | Pedro RÉ
https://pedroreastrophotography.com/

https://youtu.be/hD41dEK5-Cc
Seestar S50 | Lunar imaging (20231122/23) | Pedro RÉ
https://pedroreastrophotography.com/

https://youtu.be/ilGCy1I31F4
Seestar S50 | Solar imaging (20231123) | Pedro RÉ
https://pedroreastrophotography.com/

https://youtu.be/hqgaSoiyt4k
Seestar S50 | Solar imaging (20231124) | Pedro RÉ
https://pedroreastrophotography.com/

PROS

1. Light weight and easy to use
2. Quick setup
3. Not expensive for a smart scope
4. Excellent app

CONS

1. Although it produces nice images (Sun, Moon and Deep sky) it does not compete with other astrophotographic rigs (*e.g.* equatorial mounts)
2. The apochromatic objective is not colour free
3. The dual band filter produces noticeable halos on bright stars
4. Not suitable to image the planets (short focal length and short focal ratio)

QHY POLEMASTER ELECTRONIC POLAR SCOPE

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The QHY PoleMaster allows you to obtain a high precision polar alignment (up to 30 arcseconds). This precise alignment can be achieved in a couple of minutes (Figure 1).

The PoleMaster electronic polar scope uses a CMOS camera to take a picture of sky around Polaris. Considering that the camera is much more sensitive than your eyes, it can record the faint stars that surround Polaris, providing a more exact location of true north. The PoleMaster uses this image to calculate the North Celestial Pole (NCP), and that is the first step in achieving a precise polar alignment.

The Polemaster must be installed in front of the Right Ascension axis of an equatorial mount using a special adapter[10] (Figure 2).

Figure 1 – QYH Polemaster.

[10] Polemaster specific adapters can be bought for most available equatorial mounts.

Specifications

Model	PoleMaster
Field of View	11 degrees x 8 degrees
Sensitivity	9th Magnitude
Coarse Adjustment	5 arc minutes
Fine Adjustment	Up to 30 arc seconds
Computer Interface	Mini USB2.0 Port
Software	QHYCCD PoleMaster Calibration Software
Internal non-volatile memory	Non-volatile internal EEPROM memory capable of storing several small frames for calibration routines, focus, optic analysis, etc.
Weight	106g

How to use the Polemaster

The PoleMaster achieves polar axis alignment following a simple idea: *Finding the position of the pole and then make it coincide with the centre of rotation of the equatorial mount's RA axis, so that the right ascension axis of the equatorial mount is aligned with the axis of the Earth's rotation*.

The PoleMaster must be mounted in front of the Equatorial Mount's RA axis. Its sensitivity is higher than the naked eye, so not only can you see the North Star, but you can also see several dim stars near Polaris. Based on the location of these stars, the software calculates the true north pole position.

The PoleMaster detects the position of the centre of rotation of the right ascension axis and then marks the position of the two points on the screen.

All you must do is adjust the equatorial mount so that the two points overlap, and the polar axis is aligned. Polar alignment is now a simple matter of moving the two centres of rotation, so they overlap.

In comparison with other polar alignment techniques, PoleMaster has the following advantages[11]:

1. Speed and convenience: With PoleMaster you do not need to move the telescope to a specific place just to unblock the polar scope. You do not need to kneel or contort your body to look through the polar scope. You do not need to fully dark adapted just to see the pole star. You do not need to level your mount. You do not need to worry about the entering the date and time in your handset and figure out where to rotate the mount to coincide with the current pole star position.
2. Accuracy: The imaging camera in PoleMaster has a resolution of 30 arc second, so the best polar alignment that can be achieved is also in the order of 30 arc seconds.
3. Wide angle view of the polar region: A wide field of view of 11×8 degree makes it very easy to locate Polaris.
4. Easy to install: The PoleMaster can be easily installed onto any equatorial mount through mount-specific adapters, even on mounts without a polar scope.

[11] https://www.qhyccd.com/polemaster/

5. Real time polar alignment checking / adjustment: Your polar alignment can be monitored in real time. If polar alignment is lost, it is a simple matter to bring it back without having to start from scratch.
6. Three-star alignment no longer needed: Once you are polar aligned, you will only need to perform one star alignment.
7. Perfect companion to single axis mounts: When used with single (RA-only) axis mount, good polar alignment will minimize drift in the DEC axis therefore maximizing the performance of your mount.

Figure 2- Polemaster installed on a Takahashi EM400 mount.

Figure 3- Polemaster camera.

Figure 4- Polemaster adapter (Takahashi EM-400).

Figure 5- Polemaster adapter (Sky-Watcher Eq-6).

Figure 6- Polemaster adapter (Sky Watcher Star Adventurer).

Figure 7- Polemaster, EM-400 mount & dedicated software.

Polar alignment Step by Step[12]

1. Before using the Polemaster the equatorial mount should be roughly polar aligned using a compass or a smartphone app
2. Connect your camera to the computer (USB2)
3. The computer will recognize the camera and install the specific driver
4. Launch the Polemaster software[13]
5. Connect camera (Menu)
6. Choose North or South (hemisphere)
7. Adjust the exposure settings (gain & exposure time) to optimize the display[14]
8. Click finish when done
9. Locate your pole star on the screen. Double click on the pole star (Polaris or Sigma Octantis)
10. Once you have double clicked on the pole star, the application will ask you to align the overlay (circles) to match the display
11. Rotate the overlay by either using the keyboard arrow keys or by sliding on the slider tool marked "Rotate"
12. Click "Success" to proceed to next step
13. Determine the centre of rotation
14. Choose a bright star adjacent to the pole star in the next step by double clicking it. To make the process more accurate, it is best to use a star that is not too close to the pole star.
15. The on-screen instruction will prompt you to rotate the mount. In this step the application will try to determine the mechanical axis of rotation of your mount

[12] https://www.qhyccd.com/uploadfile/2018/1225/20181225042450636.pdf

[13] https://www.qhyccd.com/download/

[14] Ideally you should adjust the setting until you can clearly see the pole star (Polaris in Northern hemisphere and Sigma Octantis in Southern hemisphere) plus a number of adjacent stars.

16. Rotate the mount such that the star moves by about 15 degrees. Click “Finished” then double click on the bright star again. Repeat one more time[15]
17. The Application will draw a green circle on the screen with the bright star on it. The centre of the circle is where the Application think the centre of rotation is. To verify this is correct, slew the bright star back to its original position (usually the West button, if you have used the East button in the previous step, or you can use the "Park" function of the mount if you start off from the park position in the previous step)
18. Double click on the pole star again and match up the on-screen overlay as per the earlier step. Click “Success” when done
19. On the screen there is a small green circle. This is where your pole star should be. Use the mount azimuth and altitude adjustors, align the pole star with the green circle. When done, click “Finished”
20. Double click on the pole star again and match up the on-screen overlay as per the earlier step. Click “Success” when done
21. For Precise Polar Alignment Click “Start Monitor”
22. Fine polar alignment is achieved when the small green circle and small red circle become aligned
23. Click “Finished” when done or “Restart” to try again.

YOUTUBE VIDEO

https://youtu.be/o9mGFrlp1b8
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http://pedroreastrophotography.com/

[15] Make sure you are using the handset controller or computer software (like EQMOD, ASCOM etc) to perform the rotation. Don't manually perform the rotation by loosening the RA clutch as it will cause the rotational center to shift and result in large apparent error.

WIDE FIELD H-ALPHA IMAGING WITH A ZWO ASI2600MM

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The ZWO ASI 2600MM Pro[16] uses Sony's latest back-illuminated IMX571 APS-C format native 16-bit ADC sensor. It's one of the most used astronomy cameras (Figure 1). Here is some of the reasons why:

- Ultra-high 14 stops dynamic range.
- Ultra-low 1.0e readout noise.
- Innovative breakthrough design resulting in zero amp-glow.
- 16-bit ADC sensor.

Like the colour version, the ASI2600MM Pro also has a very light weight of just 700 grams.

This 26Mb camera features a small pixel size (3.76 µm) and a large well depth (50 Ke).

The sensor length and width are 23.5 mm x 15.7 mm. The diagonal is 28.3 mm.

The ASI2600MM Pro was conceived having in mind the optimal characteristics for astrophotography. This 16bit ADC is not a CCD 16bit ADC. It can really achieve a dynamic range output of 14 stop, which will significantly improve the image sharpness and contrast, and create smoother and more natural contrast transitions (as well as colour gradients when using different types of filters).

Sony's back-illuminated CMOS image sensor (Figure 2) improves the sensitivity and noise reduction – the key factors to enhancing image quality. It does this by radically realigning the fundamental pixel structure from front-illumination to back-illumination, while still retaining the advantages of CMOS image sensors such as low power consumption and high-speed operation.

With a conventional front-illumination structure, the metal wiring, and transistors on the surface of the silicon substrate that form the sensor's light-sensitive area (photodiode), impede photon-gathering carried out by the on-chip lens. A back-illuminated structure minimizes the degradation of sensitivity to the optical angle response, while also increasing the amount of light that enters each pixel due to the lack of obstacles such as metal wiring and transistors. These components have been moved to the backside of the silicon substrate.

Traditional CMOS sensors produce a weak infrared light source during operation quite often seen in the corner of uncalibrated images. It is the tell-tale signs of 'amp glow'. As the ASI2600MM Pro uses zero-amp glow circuitry, you won't have to worry about amp glow even when using high gain, long exposure imaging.

[16] https://astronomy-imaging-camera.com/product/asi2600mm-pro-mono/

Figure 1 – ZWO ASI2600mm Specs.

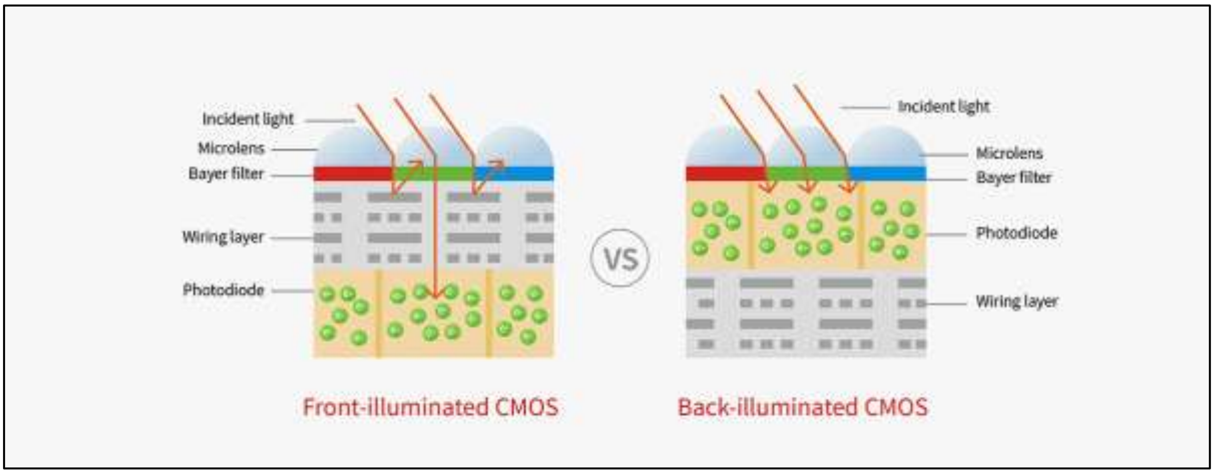

Figure 2- Sony's back-illuminated CMOS image sensor.

The ASI2600MM Pro boasts excellent performance with a dynamic range of up to 14 stops. When the gain value is set to 100, the HCG high gain mode is turned on. With the HCG-mode turned on, the readout noise is greatly reduced, and the dynamic range is basically unchanged. To improve the data quality, it is recommended to set the gain to 0 or gain 100 during deep-sky imaging (Figure 3).

Traditional CMOS sensors produce a weak infrared light source during operation quite often seen in the corner of uncalibrated images. It is the tell-tale signs of 'amp glow'. As the ASI2600MM Pro uses zero-amp glow circuitry, you won't have to worry about amp glow even when using high gain, long exposure imaging (Figure 4).

There is a polyimide heater completely fitting the protective window in the ASI2600MM Pro camera. It can help avoid any potential annoying dew or icing issues depending on the environment in which you capture images (Figure 5).

The power of the heater is around 5W. You are free to turn it off anytime in your photography software if you want to save power.

The QE peak value of the ASI2600MM Pro is 91% (Figure 6).

With a two stage TEC cooling, ASI2600MM Pro can lower the CMOS sensor temperature to more than 35 ° Celsius below ambient temperature, which can significantly reduce dark current generation and sensor noise even during extended exposure times[17].

The unique dark current suppression technology can further reduce dark current noise. At a cooling temperature of 0 °C, the dark current noise is only 0.0022e/s/pixel. This means a 300s exposure will only cause 0.7e dark current noise, which is less than the readout noise. While at a cooling temperature of -20 °, the dark current can even reduce to 0.00012e/s/pixel, which is completely negligible!

The ASI2600MM Pro is equipped with a USB 3.0 transmission interface and a built-in 512MB DDR3 cache to ensure stable and secure data transmission (Figure 7).

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[17] The Delta T 35 °C is tested at 30 °C ambient temperature. It might get down when the cooling system is working for a long time. Also, as the ambient temperature falls, the Delta T would also decrease.

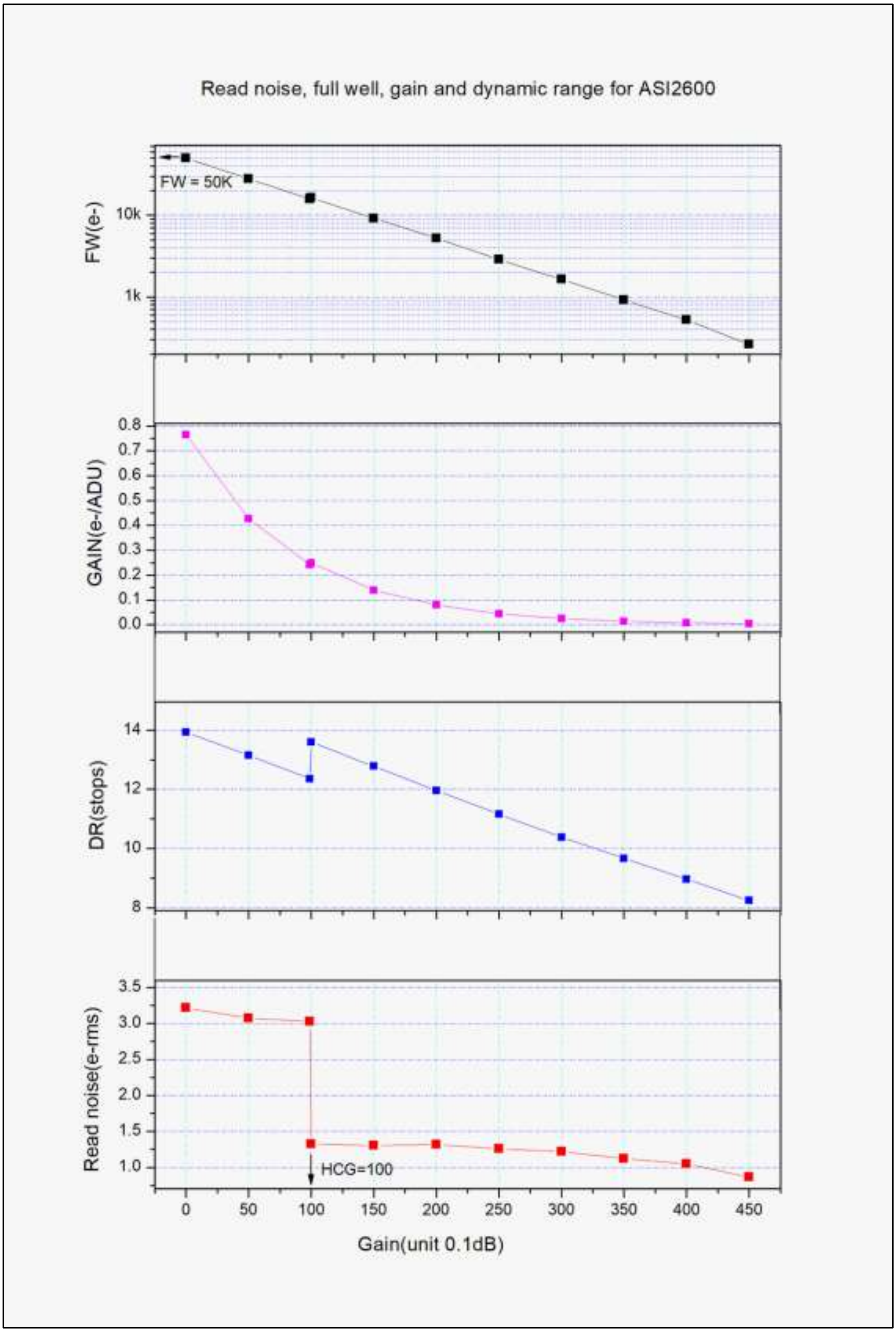


Figure 3- Read noise, full well, gain and dynamic range of the ZWO ASI2600MM.

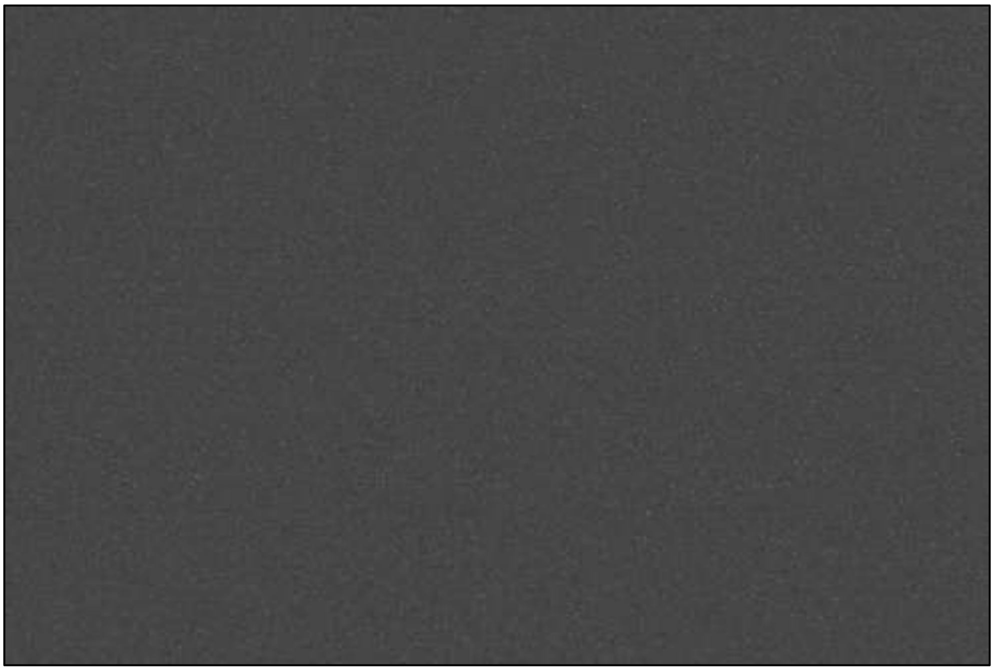


Figure 4- Dark frame from ASI2600 without any amp glow (300 s exposure).

Figure 5- Polyimide heater completely fitting the protective window
in the ASI2600MM Pro camera.

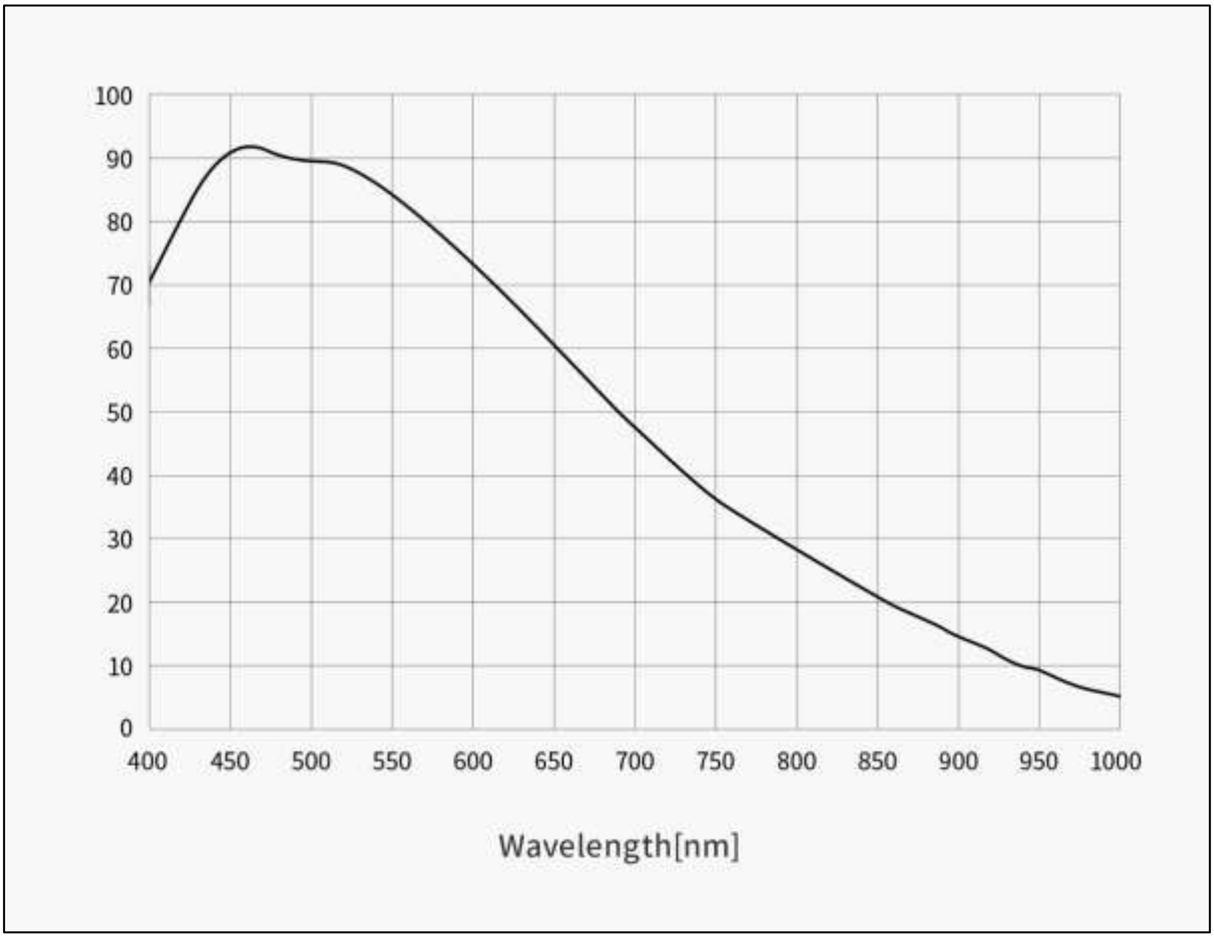


Figure 6- Quantum Efficiency of the ZWO ASI2600MM.

Figure 7- Built-in 512MB DDR3.

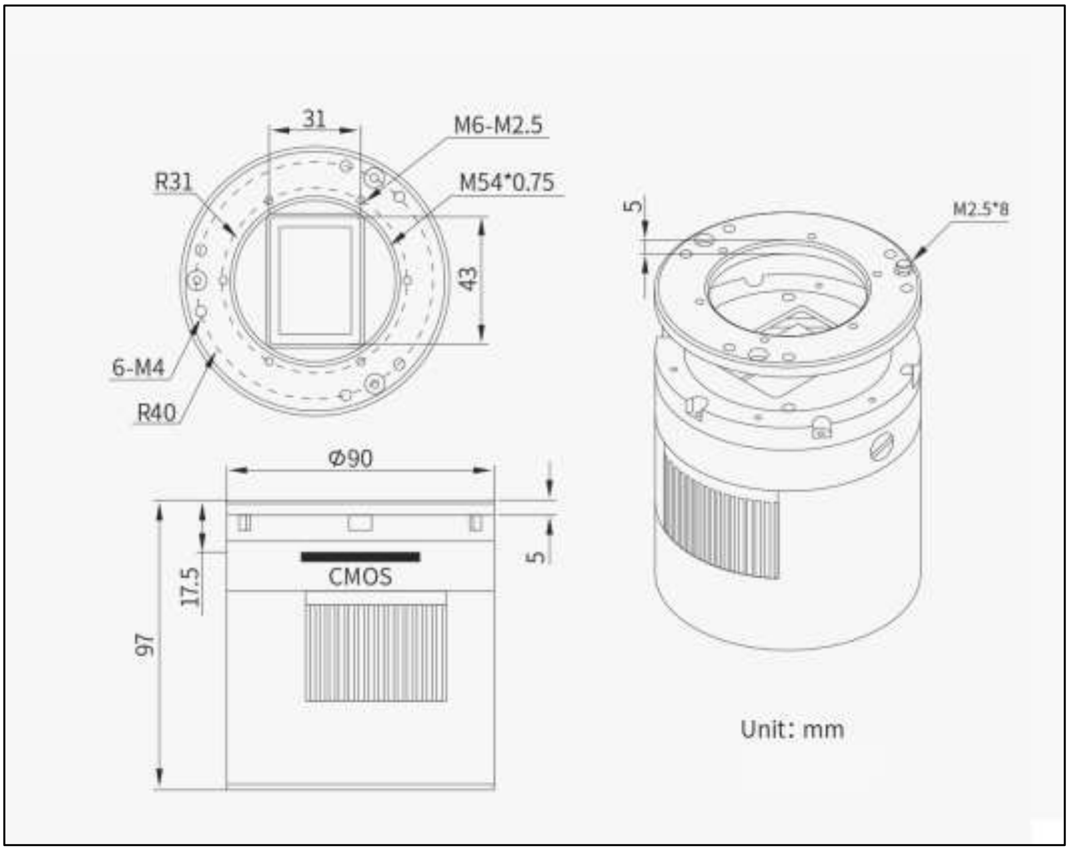


Figure 8- Mechanical diagram.

Figure 9- In the Box.

For Wide Field imaging the ZWO 2600Mm can be adapted to several objectives (Figure 10).

Figure 10- Connection diagram. 1- Nikon T2 adapter, Canon EOS T2 adapter, 3- filter (*e.g.* H-alpha), 4- Nikon lens, 5- Canon Lens.

The ZWO 2600MM should be connected to an external DC 12V @3A~5A power supply adapter for use (connector 5.5 x 2.1mm, centre pole positive) for deep-sky imaging (long integration times).
The Samyang/Rokinon 135mm f/2 is a great lens for wide-field deep sky imaging (Figure 11, 12). This lens features:

- Full frame compatible with an 18.8 ^{o} angle of view on full frame cameras and a 12.4 ^{o} angle of view on APS-C cameras.
- Ultra Multi-Coated (UMC) Optics. Compatible with both full frame and APS-C format mirrorless E mount cameras.
- Minimum Focusing Distance of 2.6 ft. with fast apertures of f/2.0 – f/22.
- 9 diaphragm blades and includes a removable lens hood. One extra-low dispersion (ED) lens element reduces chromatic aberrations.

This objective lens delivers images with incredible clarity, even at its widest aperture (f2). It is a manual focus lens. It delivers images with excellent contrast and sharpness on a high resolution, even with the aperture opened to f2.0[18].

The Samyang 135mm f/2 ED UMC is a medium telephoto lens with a large aperture for full-frame bodies. The relatively low-price tag (about 500 €) makes it relatively affordable especially compared to the similarly spec Zeiss Apo Sonnar.

The Samyang is available for Canon EF, Nikon F (AE), Sony E and A mounts, Fujifilm X, and MFT. The Nikon version is the only one with a chip and an automatic aperture. With the other versions you must stop down manually before shooting and no EXIF data will be transferred to the camera. The Samyang is also available under the Rokinon and Walimex brands in other regions.

[18] https://www.cameralabs.com/samyang-rokinon-135mm-f2-ed-umc-review/2/

Figure 11- ZWO 2600MM & Samyamg 135 mm f/2.

1. *Size* (diameter x length): 82 x 120 mm. The lens-hood adds another 44 mm to the length of the lens.
2. *Weight*: 815 g. The plastic lens hood adds another 60 g to the Samyang.
3. *Optics*: 11 elements in 7 groups. 7 groups have 14 glass/air surfaces which is low for a modern design and reduces the risk of reflections inside the lens. The lens contains one special dispersion elements, hence the “ED” moniker. The Samyang has no aspheric elements.
4. *Closest focus distance* is 0.80 m which gives you a maximum magnification of 1:4.7.
5. *Filter-thread*: 77 mm, the professional standard.
6. *Auto focus*: Manual-focus only.
7. Covers full frame/FX or smaller.
8. *Price*: around 500 EUR new.

Figure 12- ZWO 2600MM & Samyamg 135 mm f/2.

Figure 13- Imaging setup. First light with the ZWO ASI2600MM & Samyang 135 mm f/2 (20231004).

Figure 14- NGC7000. 205min (41x5 min). Samyang 135 mm F/2 (@F/2.8), ZWO ASI 2600MM PRO, Baader 7 nm H-alpha filter, Median, Paramount ME (protrack enabled). Processed with PixInsigth.

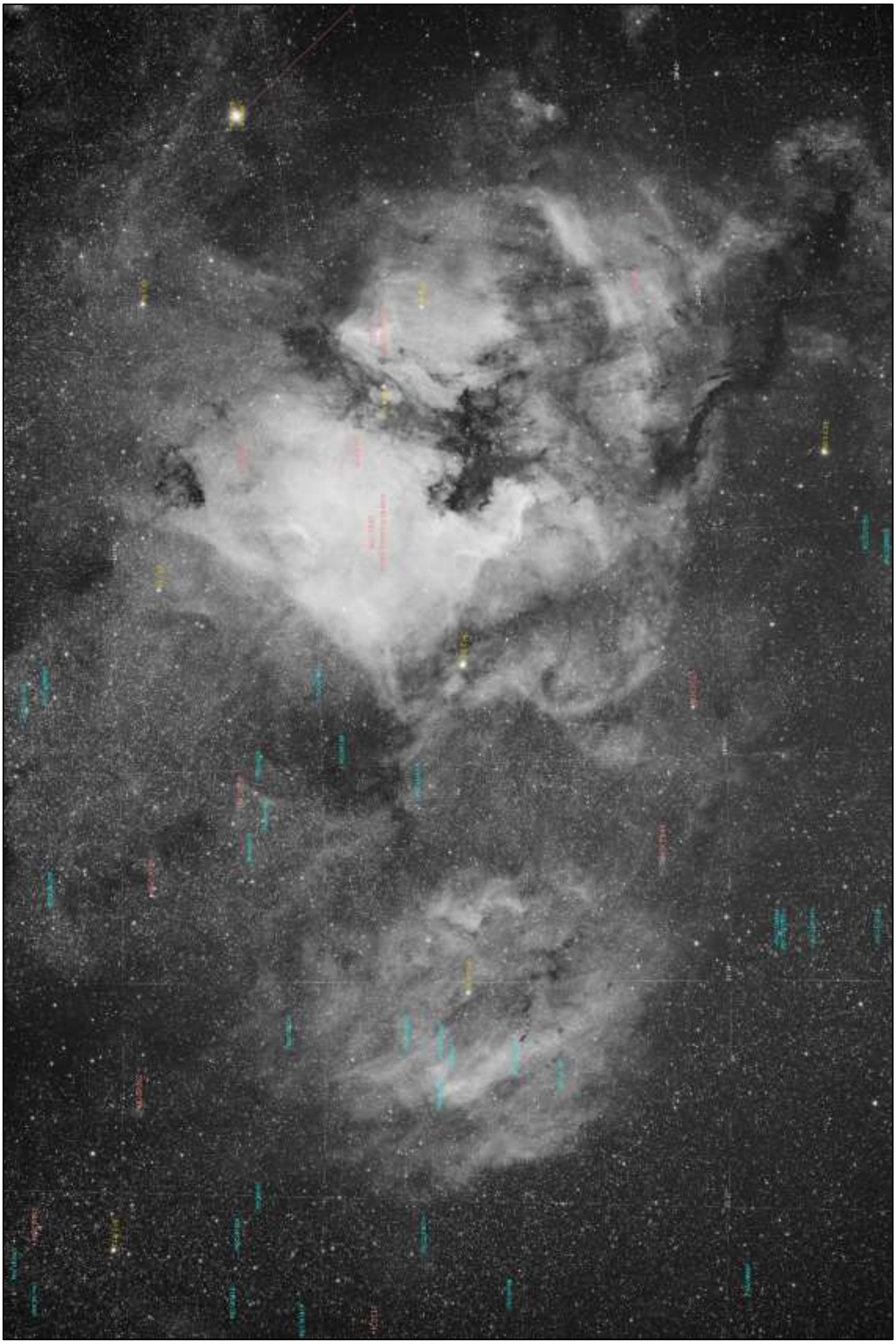


Figure 15- NGC7000. 205 min (41x5 min). Samyang 135 mm F/2 (@F/2.8), ZWO ASI 2600MM PRO, Baader 7 nm H-alpha filter, Median, Paramount ME (protrack enabled). Processed with PixInsigth (annotated).

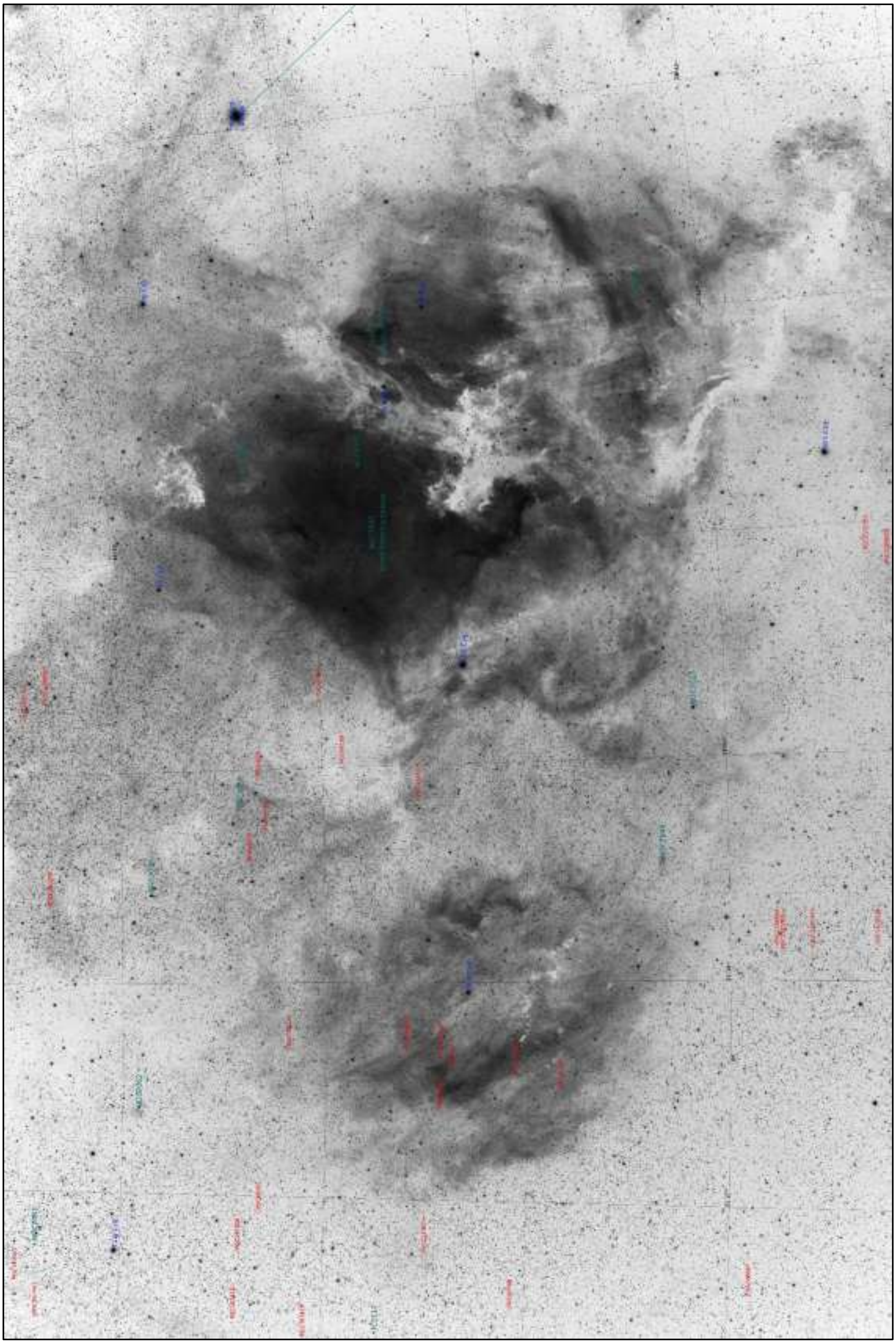
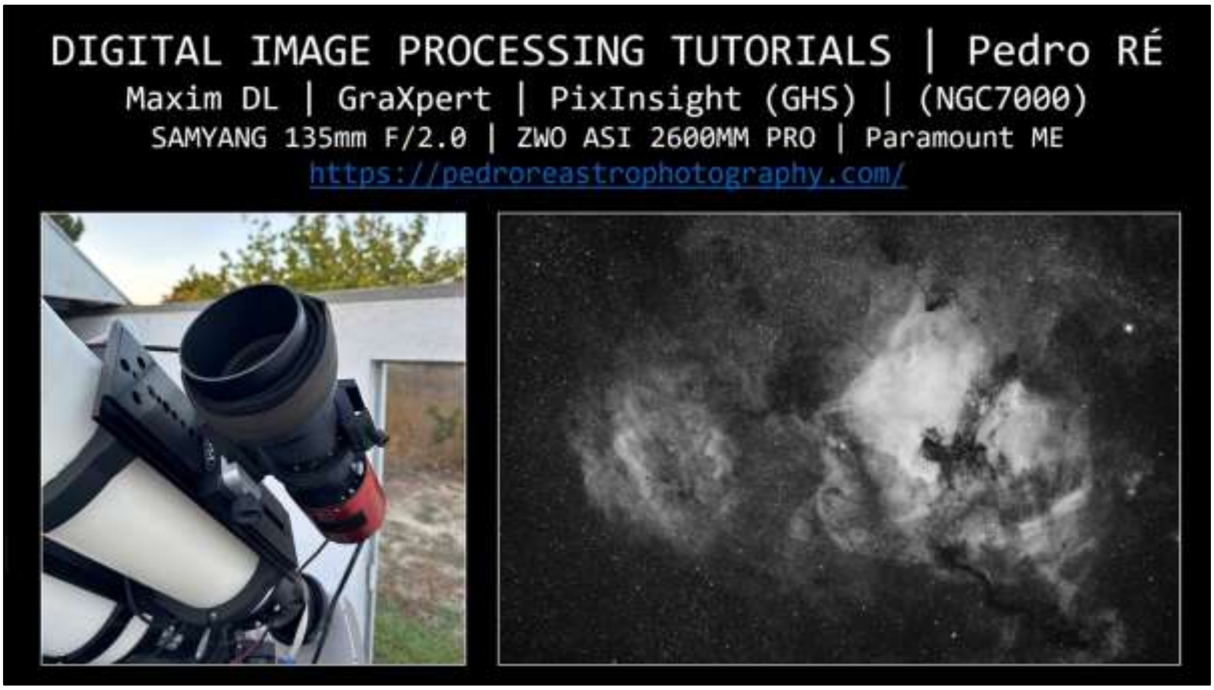


Figure 16- NGC7000. 205 min (41x5 min). Samyang 135 mm F/2 (@F/2.8), ZWO ASI 2600MM PRO, Baader 7 nm H-alpha filter, Median, Paramount ME (protrack enabled). Processed with PixInsigth (negative annotated).

https://youtu.be/av6tLDh5u-k
WIDE-FIELD CMOS IMAGING | NGC7000 | Pedro RÉ
SAMYANG 135mm F/2.0 | ZWO ASI 2600MM PRO | Paramount ME
https://pedroreastrophotography.com/



https://youtu.be/WgyBnTtMaJQ
DIGITAL IMAGE PROCESSING TUTORIALS | Pedro RE'
Maxim DL | GraXpert | PixInsight (GHS) | (NGC7000)
SAMYANG 135mm F/2.0 | ZWO ASI 2600MM PRO | Paramount ME
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