Adventures with a Dwarf 3

George Buckberry

Dwarf 3 - Components Overview

What's included:

- DWARF 3 Smart Telescope x1
- Carrying Bag x 1
- Magnetic Solar Filters x 1
- Pouch for Solar Filters x 1
- USB-C Cable x 1
- Wipe Cloth x 1
- Built-in eMMC Storage: 128 GB (Embedded MultiMediaCard)
- Built-in Battery: 10,000 mAh (with external USB Charging Support)

Dwarf 3 – Solar Filter Installation

- Always use solar filters when imaging the sun.
- The filter is held in place by magnets to protect the sensor and filters when Solar viewing.
- An additional facility of the filter is that it is used when taking darks for DSO imaging and designed to fit in the lens home position to do this.

Dwarf 3 – George's Set up 1

- DWARF 3 is compatible with any tripod that has a standard **1/4"-20UNC thread**, which is common for most camera tripods.
- Here is my set up with the Dwarf 3 mounted on a Manfrotto 290 xtra carbon tripod with Manfrotto MHXPRO-3W Head.
- When I set up the tripod for stable position I adjust the horizontal control to level that axis using the incorporated bubble level. I can do the same for the Vertical control if daylight imaging.

Dwarf 3 – George's Set up 2

- Once levelled horizontally I use an inclinometer to set the Tilt to my latitude prior to achieving Polar Alignment in the Dwarf 3 EQ mode for tracking when imaging objects in the night sky.
- When I go through the EQ Polar Alignment mode I can make any rotational adjustments by loosening the head's Rotation Lock and adjusting the angle against the scale at the top of the rotational control and after adjustment simply tighten up and/or use the **Be More Precise** mode to repeat the PA process.

Dwarf 3 – George's Set up 3

- This is a side view with the Dwarf 3 mounted. Though not exactly over the centre column but the unit is over what is my North facing tripod leg so well balanced.
- I have not found any instability in this arrangement but it is fair to state that in my location I usually only need to extend the bottom two sections of each tripod leg.

Dwarf 3 – Alternate Set up

- This is the Dwarf 3 mounted on a Vixen Plate fixed high on an iOptron Wedge and more over the centre column.
- However, to level the assembly once the tripod legs have been set to required height requires adjustment of one or mor legs and once that is done the tricky part involves rotation of the rig by adjusting 6 bolts to achieve angle (2 bolts) and rotation when going through the PA process (4 bolts).
- I also found that the wedge was rather light and only had one securing bolt to hold the Dwarf 3 and plate in place.
- Daylight shooting requires plate to be lowered then the wedge adjusted for horizontal use.
- By comparison, the three-way head is heavier, contributing to stability and is quick to achieve horizontal level and vertical angle and when Polar Aligning the centre lock is the only bolt to loosen to rotate and then lock. Another benefit is that you do not need to adjust the length of tripod legs to achieve horizontal levelling or to use for daylight shooting.

Dwarf 3 – Three Built in Filters

- **VIS Filter**
  - Spectral Range: 430–650 nm
  - Suitable for everyday photography.
- **Astro Filter**
  - Spectral Range: 430–690 nm
  - Ideal for astrophotography and low-light imaging.
- **Duo-band Filter**
  - Specifically designed to pass two specific wavelengths:
    - **Hα (656.3 nm)**
    - **OIII (500.7 nm)**
  - Reduces moonlight and urban light pollution, making it perfect for capturing emission nebulae.
- **Bandwidth** (FWHM)
    - **OIII**: ~30±3 nm
    - **Hα**: ~15±3 nm

Dwarf 3 – Other Technical Specifications

- Aperture Diameter: 35 mm (Tele) / 3.4 mm (Wide)
- Focal Length: 150 mm (Tele) / 6.7 mm (Wide) *Wide is a fixed lens, no focus function
- Equivalent Focal Length: 737 (Tele) / 45 mm (Wide)
- Sensor: SONY IMX678 - STARVIS 2
- Neural Processing Unit (NPU): 5
- Telephoto Video: 4K @ 30fps / 1080p @ 60fps
- Telephoto Picture: 3840 x 2160
- Wide-Angle Video: 1080p @ 30fps
- Wide-Angle Photo: 1920 x 1080
- Maximum shutter time for telephoto is **120**s and wide-angle is **90** seconds.
- Maximum shutter time for Schedule Captures is **60** seconds.

Dwarf 3 – Battery and Charging 1

- **Charging Equipment & Interface -** Use a **USB-C to USB-C charger** supporting **PD2.0/PD3.0 fast charging** (12V/1.5A, 18W).
- **Charging Power**
  - **Fast Charging:** USB-C to USB-C cable (9V/12V).
    - Battery indicator flashes quickly, and a fast charge symbol appears in the app.
  - **Slow Charging:** USB-A to USB-C cable (5V).
    - Battery indicator flashes slowly, and a slow charge symbol appears in the app.
- **Operating Environment**
  - Charge in temperatures between **0°C and 45°C** (recommended operating range).

Dwarf 3 – Battery and Charging 2

- **Charging & Usage Time**
  - **Standby Mode:** 15h 50min.
  - **Connected to App (Preview Mode):** 6h 42min.
  - **Time-Lapse Mode (Wide-Angle):** 6h 17min.
  - **Astro Mode (Telephoto Tracking):** 5h 38min.
  - **Tracking Video Mode (4K Recording):** 3h 5min.
- **Battery Lifespan**
  - The battery retains **80% capacity after 4 years** of regular use (fully charged/discharged **twice** a week).
  - **Warranty:** 2 years. Tutorials will be available for battery replacement if needed.
- **Special Features**
  - Supports simultaneous use while charging.
  - Can be charged with a power bank.

Dwarf 3 – Powering On & Setting up

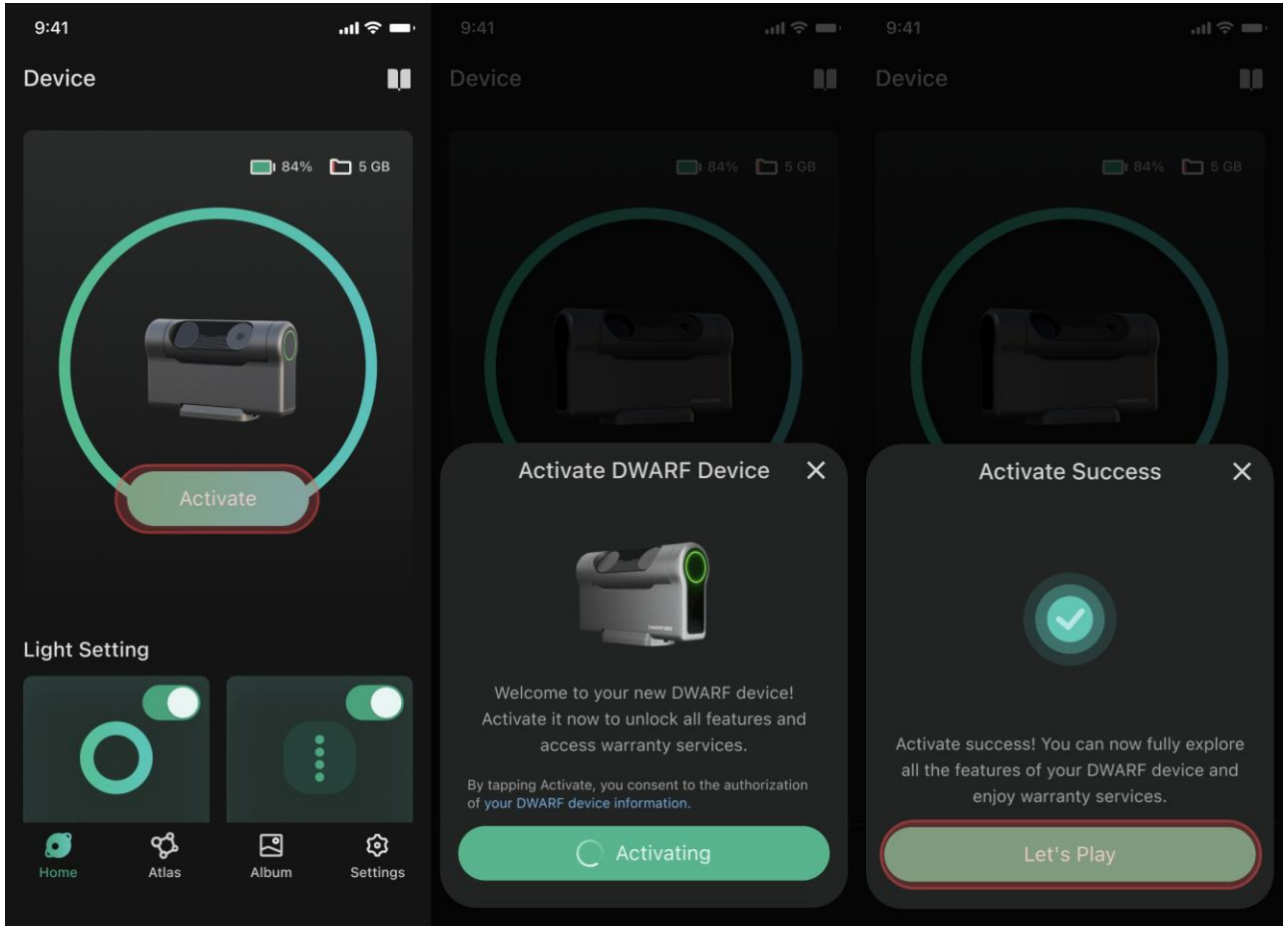
- **Power On:** Short press the power button. You may need to plug in and charge up device.
- Download and Install the DWARFLAB App, open it once installed and follow the instructions to activate the unit.
- **Activate Wi-Fi at Startup**: For direct connection, the phone connects to the DWARF 3 hotspot and controls via this Wi-Fi signal. When DWARF 3 is powered on, it automatically sends a Bluetooth signal for password pairing and commands to activate its Wi-Fi hotspot. Enabling this option bypasses the Bluetooth step, allowing the DWARF 3 to start its hotspot signal upon powering on.
- **STA Mode**: Besides the direct connection, STA mode uses your home router as a relay for signal transmission and control, providing internet access for your phone while operating DWARF 3.
- If you are on a tablet with **no** mobile data but only wifi internet, there will be an extra step to connect: Go to **Settings- Connection Settings-Enable STA Mode.** Then connect to your DWARF, then tap the activate button to proceed with activation as mentioned above.

Dwarf 3 – Setting up your controlling Device

- Ensure your phone/tablet supports **Bluetooth 4.0** and **WiFi** 5GHz, and turn off VPN.
- The Bluetooth connection on the Dwarf 3 smart telescope is used primarily for the initial activation and setup process, as well as for transferring images and videos from the telescope to your phone. It can also be used to connect the telescope to a laptop for control and functionality, but Wi-Fi is the main method for connecting to the telescope for operation.
- First-time activation and firmware updates require an internet connection. Using your phone is recommended.
- Activation also starts the two-year warranty period.
- After activation follow the prompts to update the Dwarf 3 firmware and to download the star map.

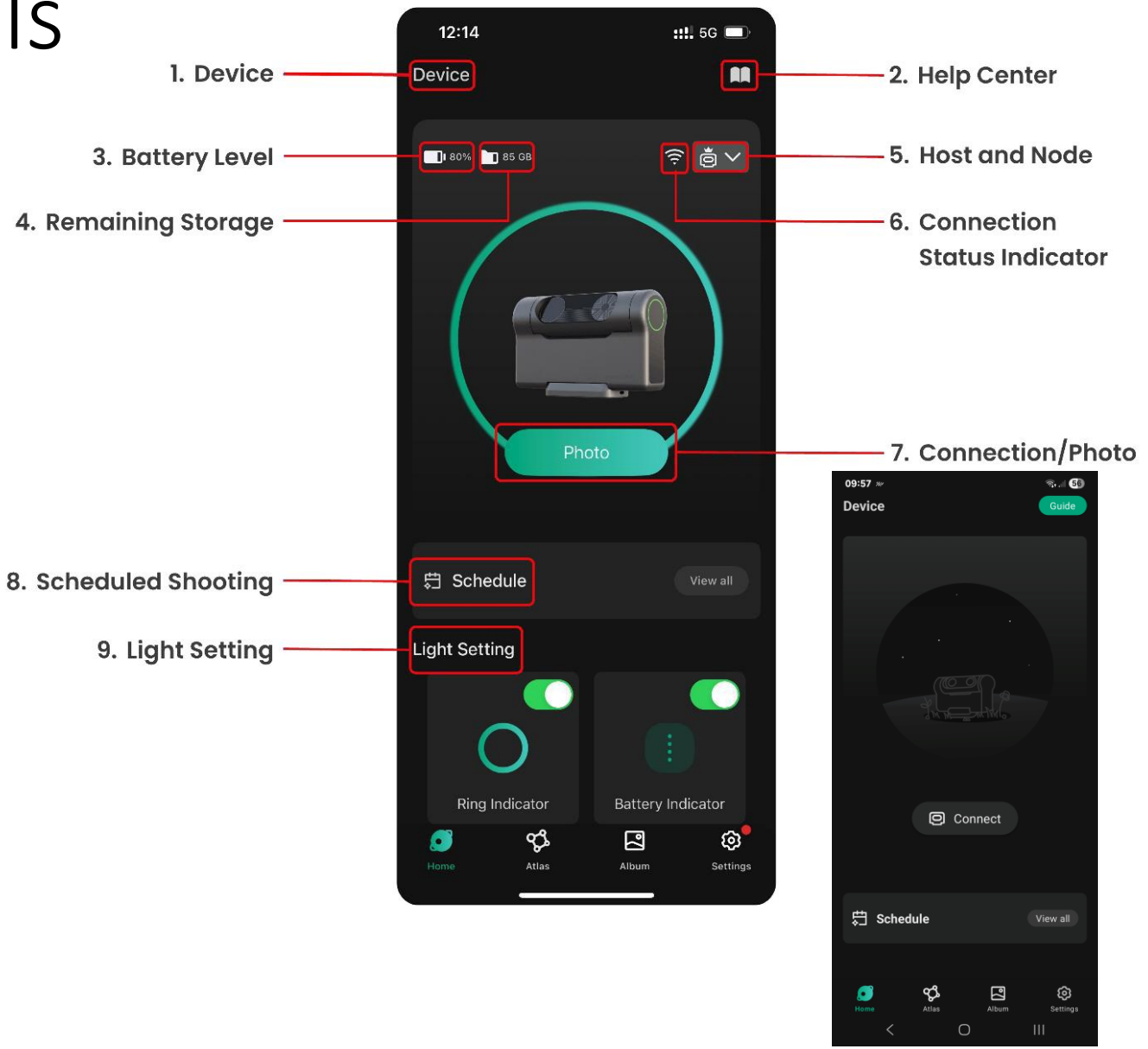
Dwarf 3 – Activation

- Ensure your phone/tablet supports **Bluetooth 4.0** and **WiFi** 5GHz, and turn off VPN.
- First-time activation and firmware updates require an internet connection. Using your phone is recommended.



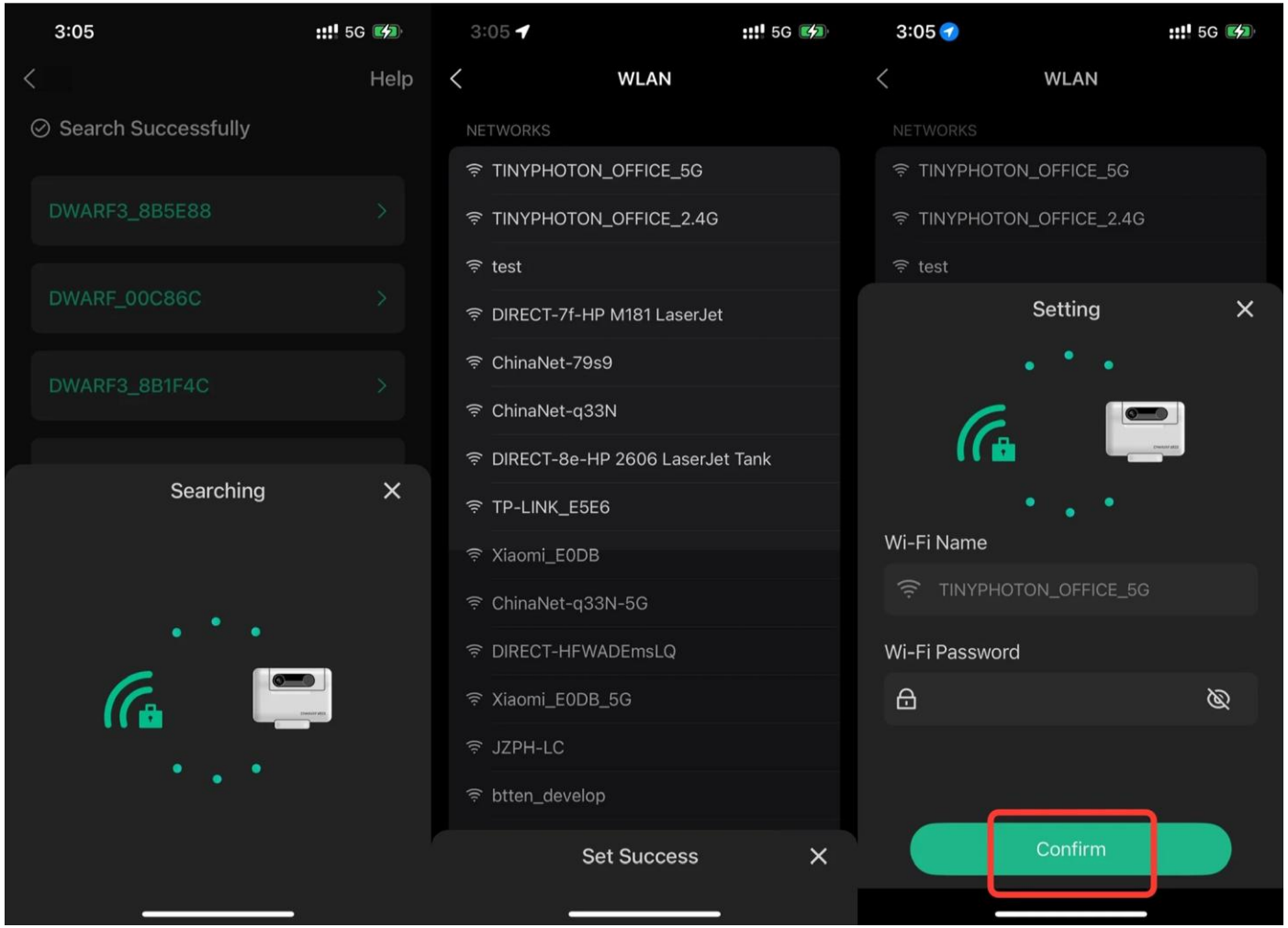
Dwarf 3 - App controls

- This is an image of the Home Screen and shows the various controls and information displays.
- When the App first opens the Photo and Dwarf 3 icon (7) is replaced by a Connect image and button.
- Pressing the Connect button(7) causes the App to search for the Dwarf 3 and when it recognises it you select the device name displayed in the connection screen. That name can also be viewed in the **Settings**, **My Device** screen,
- Once connected set the Host and Node (5) so that the current device is host.
- When using the Dwarf 3 to capture images it is recommended that the connection and power lights are turned off (9).



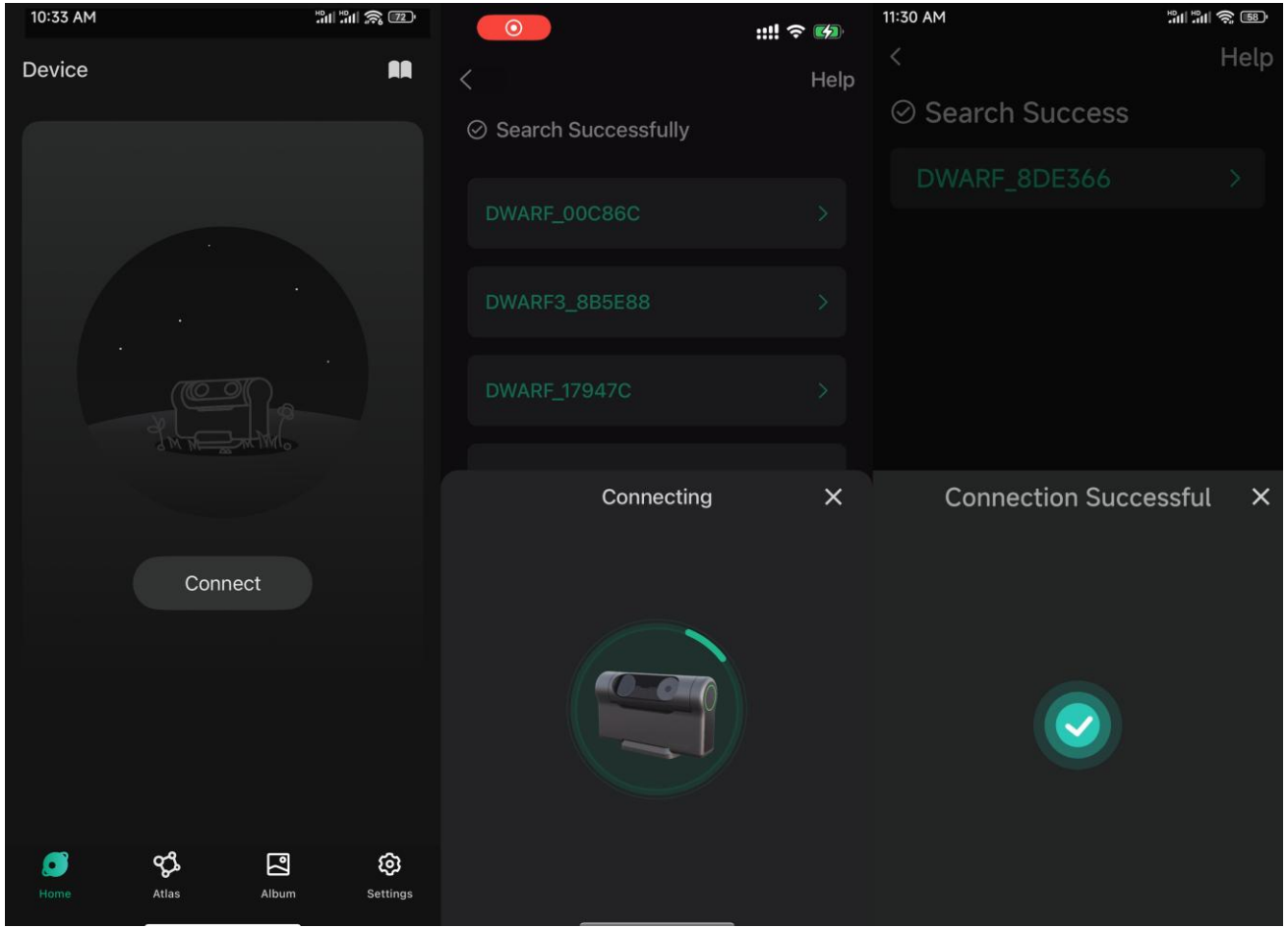
Dwarf 3 - Selecting Home Wifi

- This is an image of the Settings Screens where you:
  - Select your device.
  - Select your wifi connection and enter the password and confirm.
  - Use the Connect button on the home page once the network connections have been established.



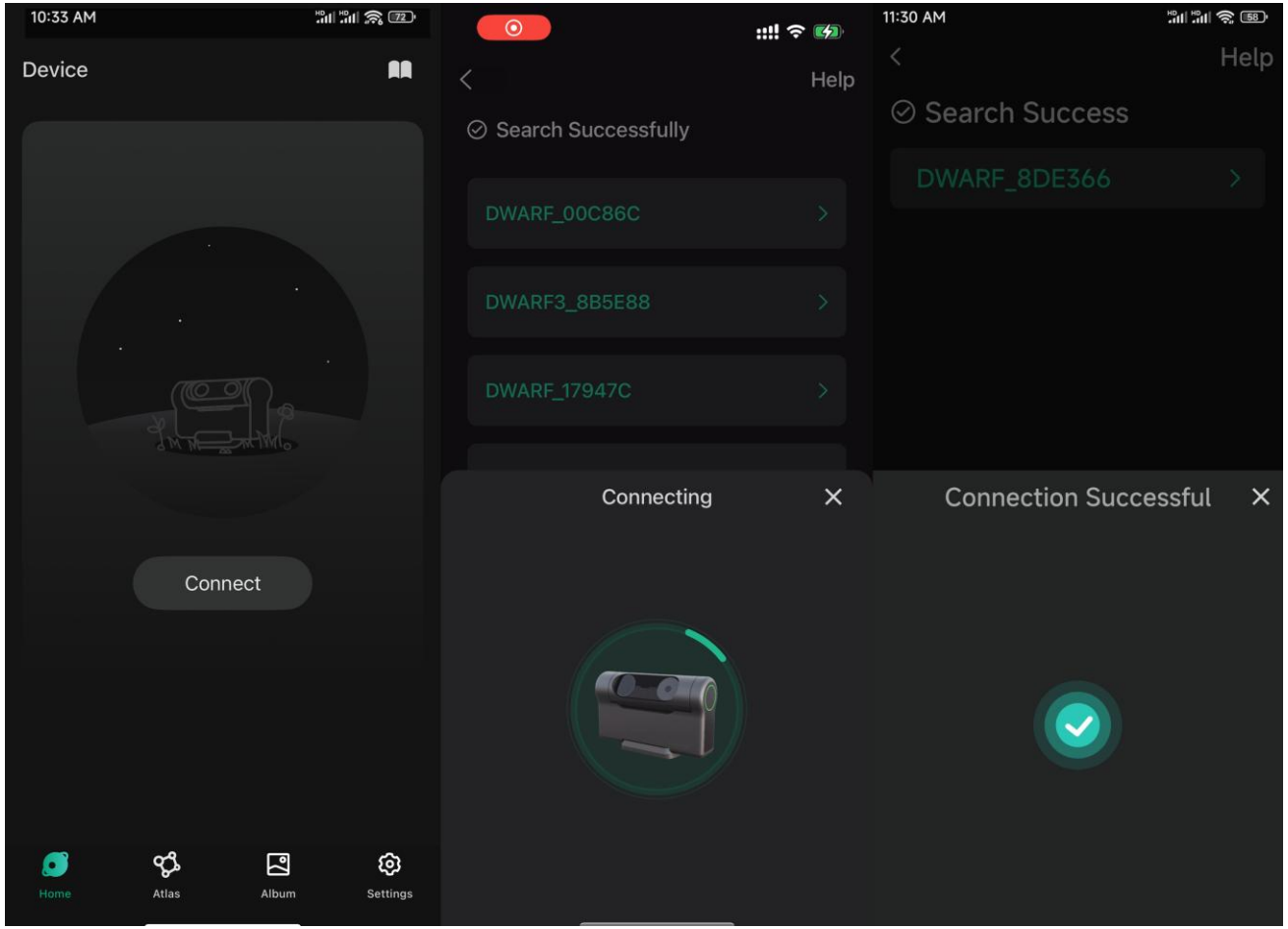
Dwarf 3 – Connecting 1

- This is an image of the Home Screens during connection:
  - Press Connect for your selected device.
- In STA mode, both DWARF 3 and your phone will connect to your home Wi-Fi, so DWARF 3's Wi-Fi won't activate. For those who frequently use STA mode, it's advisable not to enable Active Wi-Fi at Startup and vice versa. If you feeling messed up with all the signal explanations, just remember this one line.



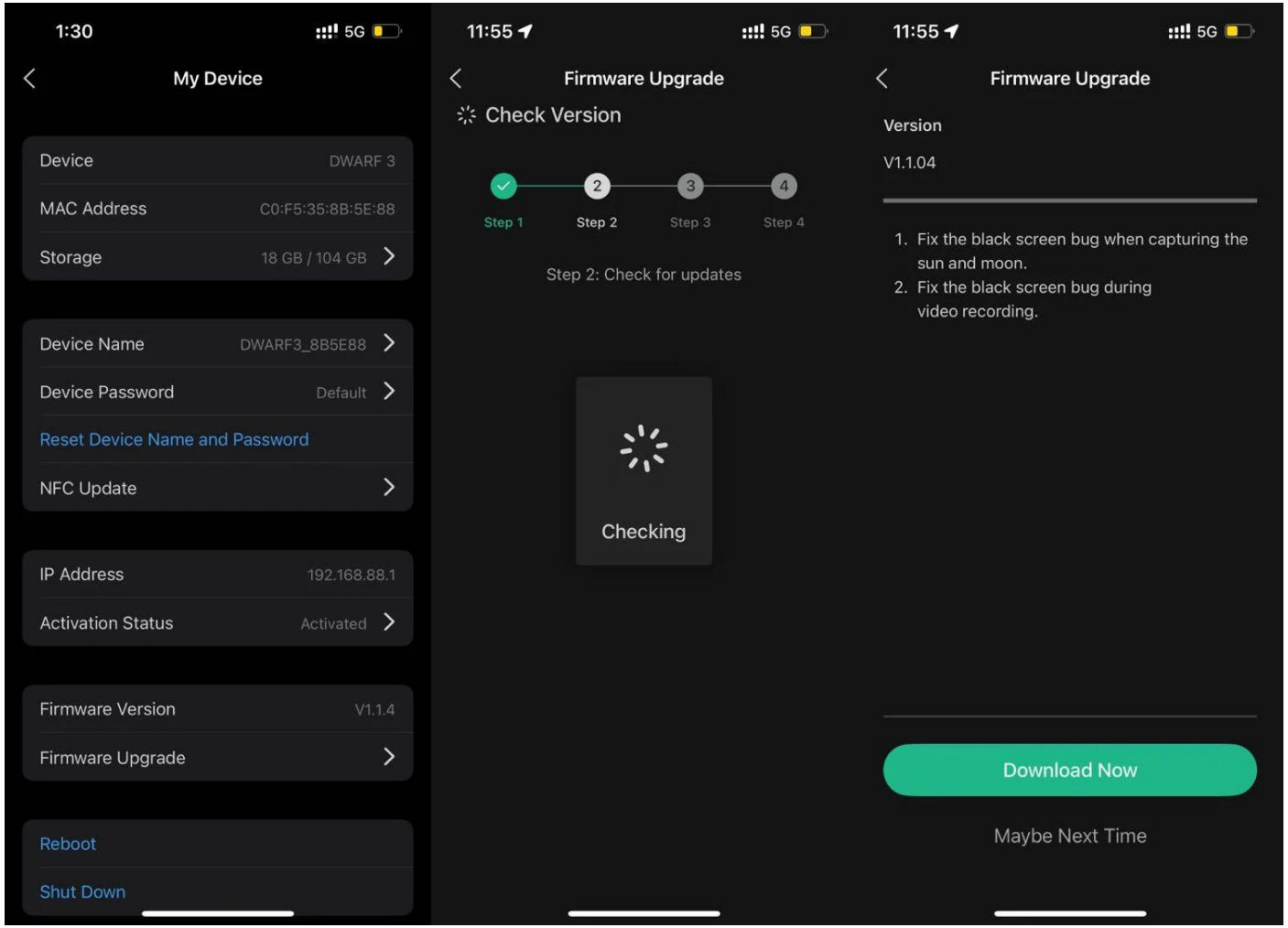
Dwarf 3 – Connecting 2

- For networks that have been previously configured, DWARF 3 will remember the password, so you won't need to re-enter it. Also, remember to **turn off STA** mode if you take DWARF 3 to a new place.
- Remember to use this mode occasionally, as DWARF 3 will only in this mode get a connection to the Internet. If there are any updates, you'll receive a red dot notification for updates in the '**Firmware Update**' and '**About**' sections.
- STA mode allows for a longer control distance, approximately 10 meters.



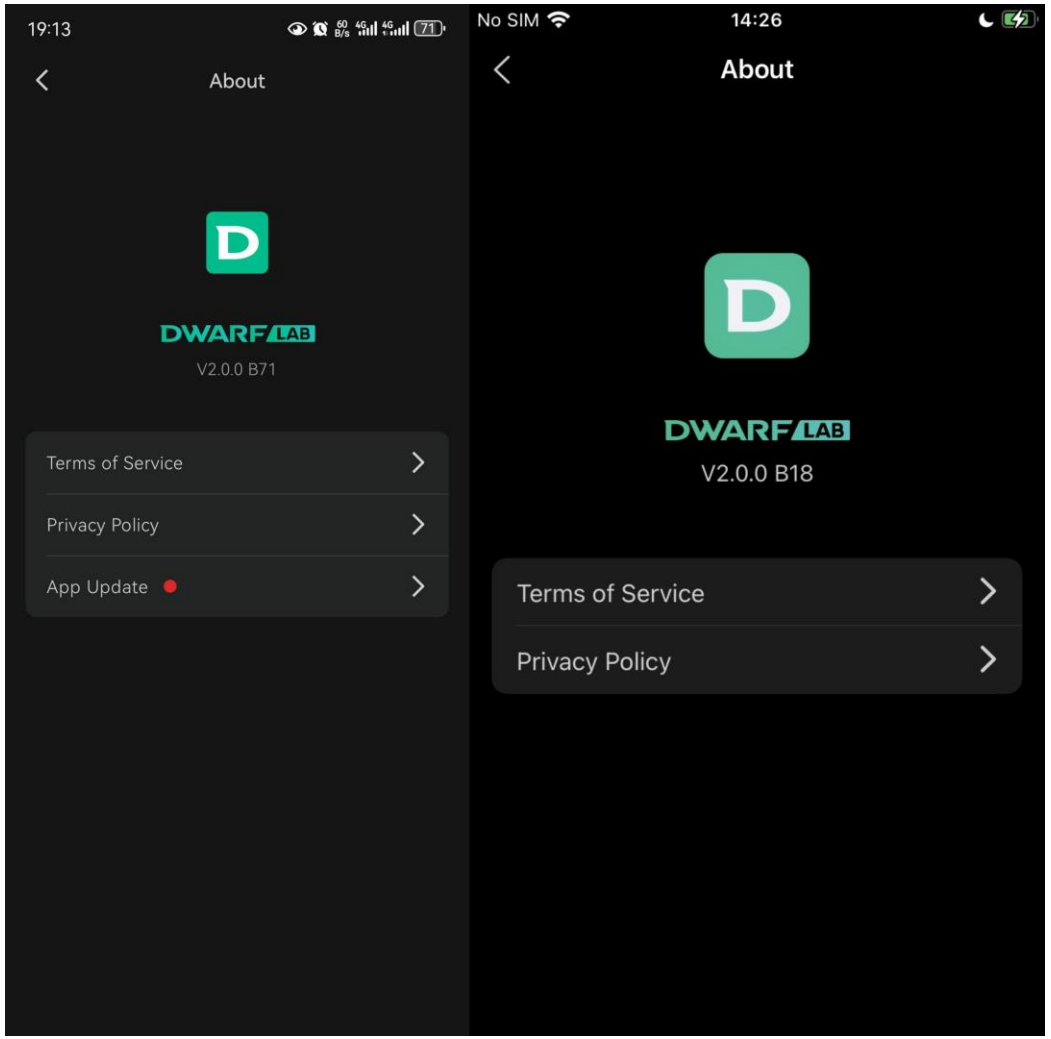
Dwarf 3 - Updating Firmware

- Power up your Dwarf 3 and open the Dwarf App on your controlling device.
- Once connected select the **Settings** icon and then **My Device** then **Firmware Upgrade**.
- If there is an upgrade available follow the prompts to download and install to the upgrade on the Dwarf 3.
- Version at time of writing was V1.3.38.3 (5/9/2025 – replacing a Beta version to overcome early problems using Stellar Studio).



Dwarf 3 - Updating the Dwarf App

- Power up your Dwarf 3 and open the Dwarf App on your controlling device.
- Once connected select the **Settings** icon and then **About** then **App Update**.
- This opens your App playstore and if there is an update for the App follow the prompts to install it on your controlling device.
- Version at time of writing was V3.2.3.B473 (5/9/2025).
- There were serious problems getting the above update from Playstore as it installed a retrograde version so the DL team sent the link for the APK file.



Dwarf 3 – App & Firmware latest changes 1

Android v3.2.4 B480：iOS v3.2.3 B40：
What's new:

- **Brand New Equatorial Mode Guidance** - Experience **3D animated tutorials** that make understanding and setting up EQ Mode incredibly intuitive. Even beginners can master it with ease.
- **Auto Focus Position** - allows you to manually set your auto focus position so you'd have this feature to save your preferred number that you found was the most useful setting.
- **Automatic Target Alignment in Tracking Mode for Both Telephoto & Wide-Angle (DWARF 3 Only)** - Targets are now **locked simultaneously in both lenses**, ensuring more efficient and stable shooting, and a superior tracking experience.
- **Atlas Tracking & Live Preview Now Available Concurrently** - You can now **display the live preview frame while Atlas tracking is active**, giving you a more intuitive grasp of your shooting status.
- D**irectly Initiate Mega Stack & Pano Weave During Astro Tracking** - Start multi-frame stacking or panorama stitching **without manually ending tracking**. This saves time by eliminating the need to return to the main shooting interface.
- **More Specific Failure Prompts for Scheduled Shots** - We've added some **missing reasons for sched failures**, making it easier to diagnose issues and adjust your shooting schedule.
- **Bug Fixes & Stability Improvements** - Addressed several known issues to **enhance overall operational stability and smoothness**.

Dwarf 3 – App & Firmware latest changes 2

Android v3.2.3 B473 : iOS v3.2.3 B45 : Firmware 1.3.37. 47
What's new:
New Feature: Follow Focus (issued late August 2025)
In simple terms, it means the device continuously adjusts focus as it tracks a target, keeping the image sharp. In the film industry, this is usually the job of a “focus puller” — now your DWARF 3 can handle it for you.

When is Follow Focus useful?
Important note: Follow Focus is not needed for astronomy.
Stars are at infinity, so once focus is set, it stays sharp.
Where this feature really shines is in near-field tracking:

- Birds, animals, people, or vehicles just a few meters to a few dozen meters away.
- When the target’s distance keeps changing, the focus also needs constant adjustment.
- If you’re only shooting objects hundreds of meters away, follow focus won’t really be necessary.

Dwarf 3 – Atlas new additions 19/9/2025

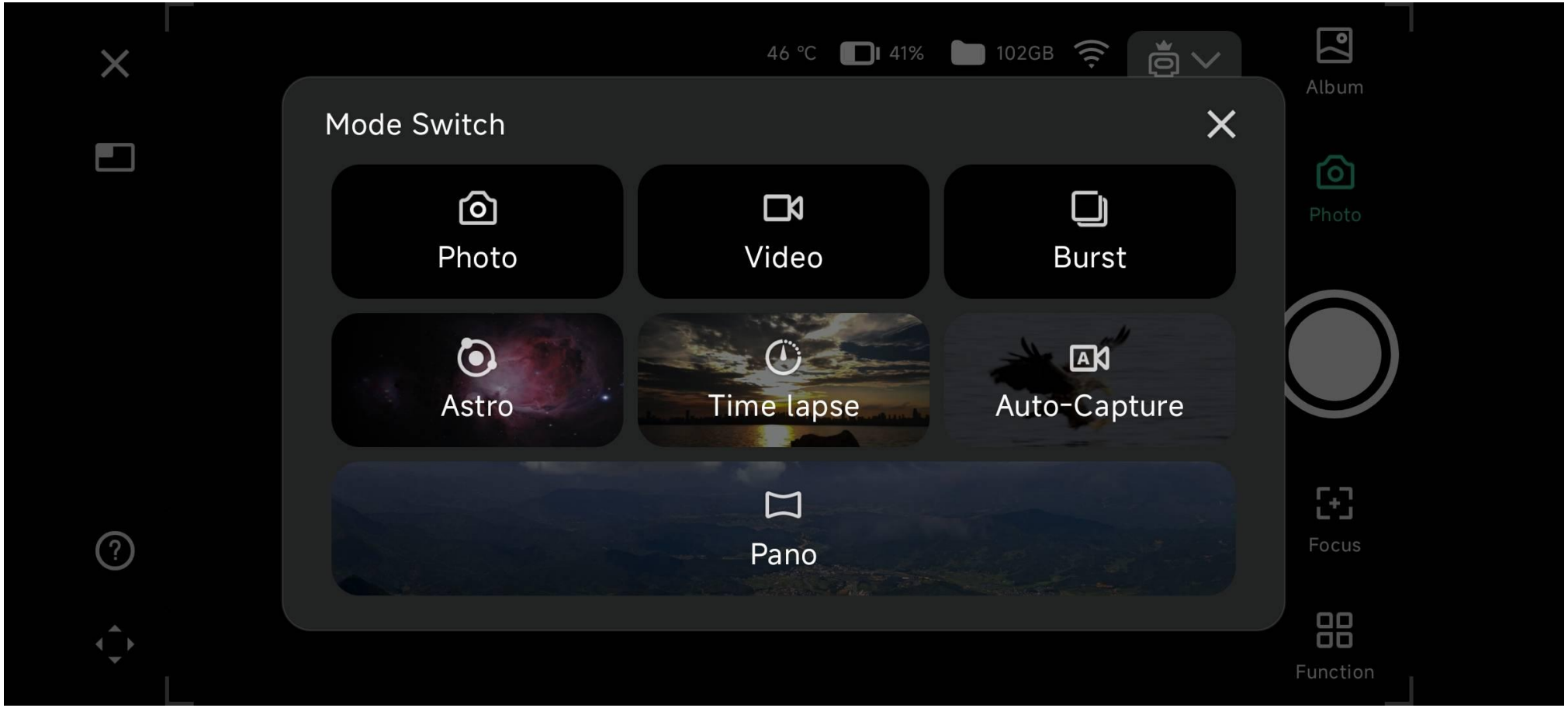
On 19/9/2025 the DwarfLab team updated the Atlas for the Dwarf 3 to include the additional targets in the table.

The comet inclusions is nice timing as that was the same date that Nick James gave us his talk on Interesting Comets.

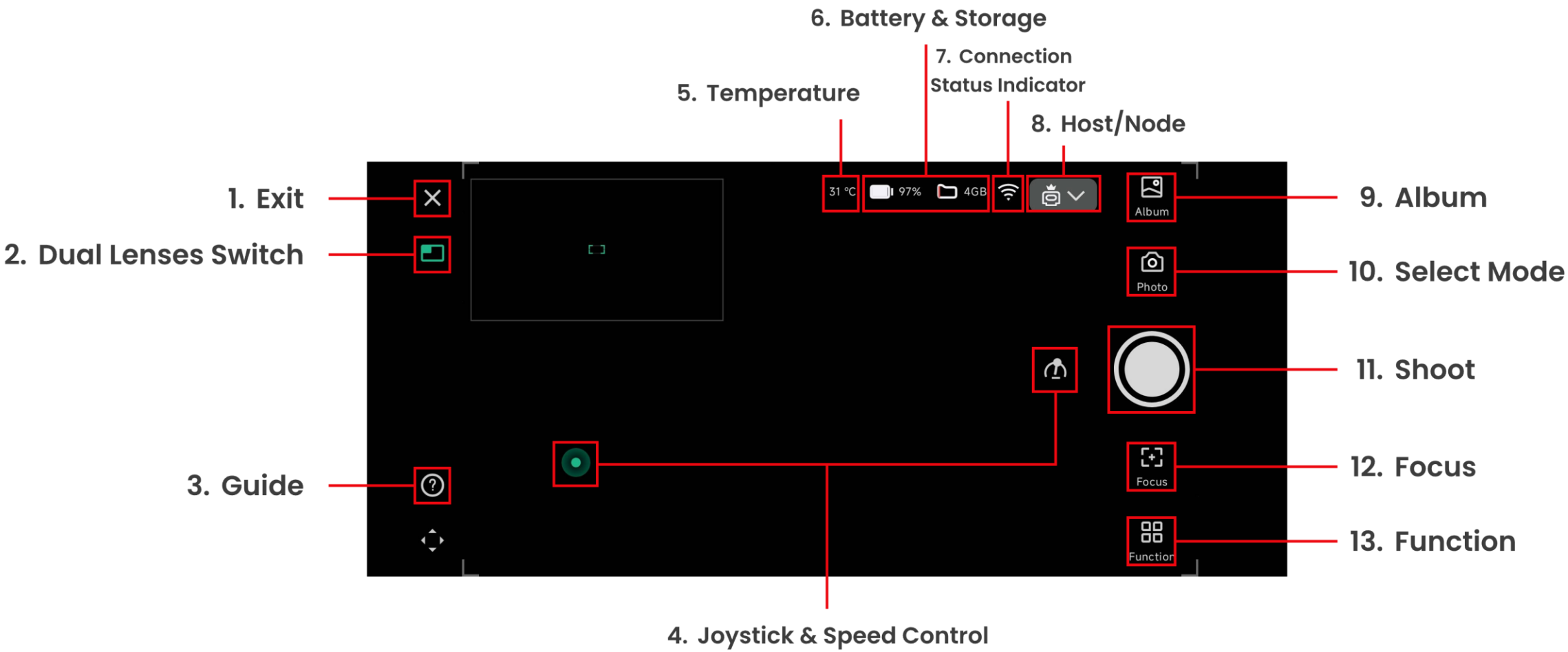
3I/ATLAS	NGC 391
C6	NGC 498
C15	NGC 708
C/2025 A6 (LEMMON)	NGC 4111
C/2025 K1 (ATLAS)	NGC 4117
C/2025 R2 (SWAN)	NGC 6118
Eskimo Nebula	NGC 6559
HD 210806	NGC 6820
HD 211982	NGC 6914
IC 410	NGC 7822
IC 4628	V* T CrB

Dwarf 3 – Select Mode

Click required button to choose different shooting modes.

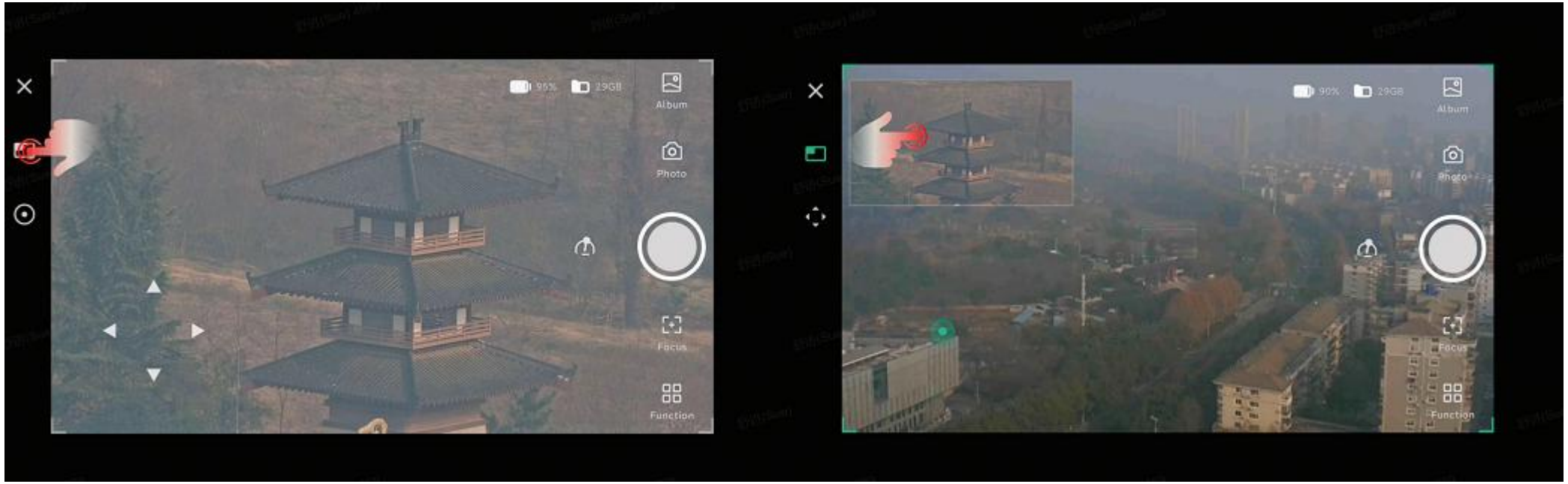


Dwarf 3 – Shooting Interface



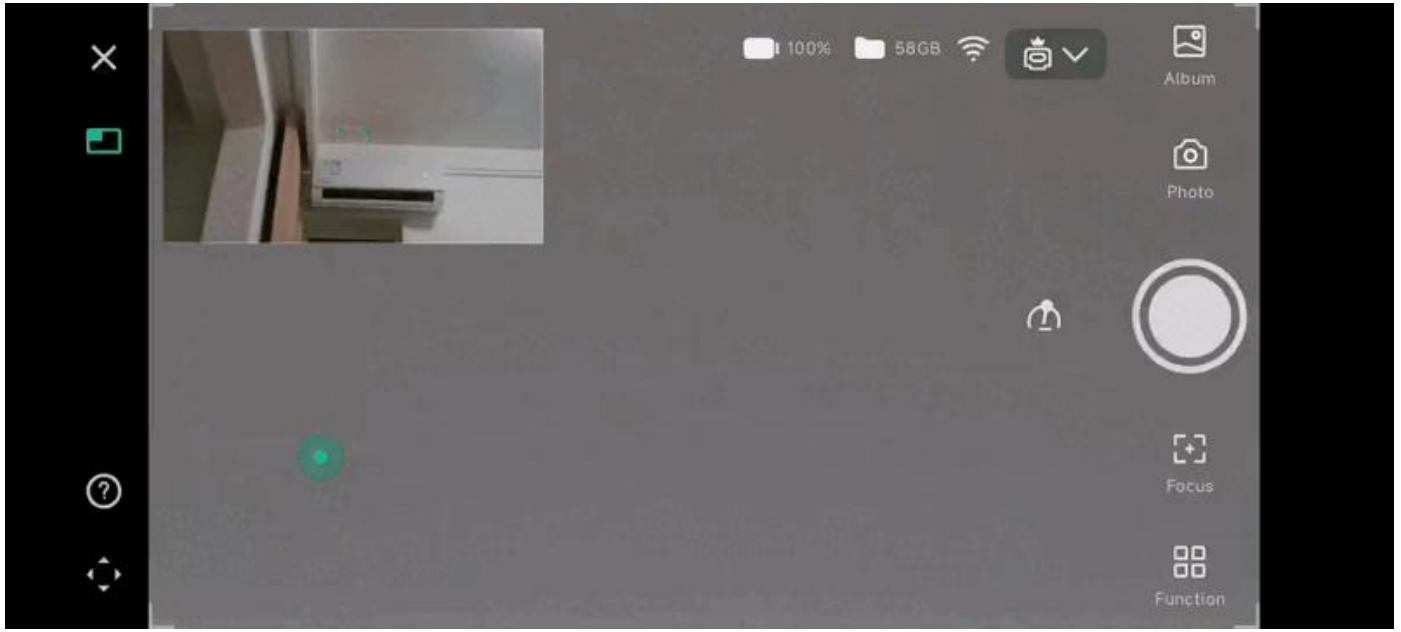
Dwarf 3 – Dual Lenses Switch

The dual-lens system helps in quickly locating targets.
Switch View: Click the small rectangle to switch between views. Double-clicking on the telephoto view enables auto-focus.
View Indication: The telephoto view shows the content within the green frame in the wide-angle view. Double-clicking on the telephoto view enables auto-focus. Focus is not applicable in the wide angle view.



Dwarf 3 – Joystick and Speed Control

- Move the joystick to navigate your lenses, and use the speed wheel to adjust its movement speed.
- Click to switch to the arrow panel for more precise control.
- You can quickly and precisely locate your target by combining the following three methods:
  - Manually rotate the lenses to roughly align with the target.
  - Use dual-lenses locating to align the target.
  - Adjust the lens position finely with the joystick/arrow panel.

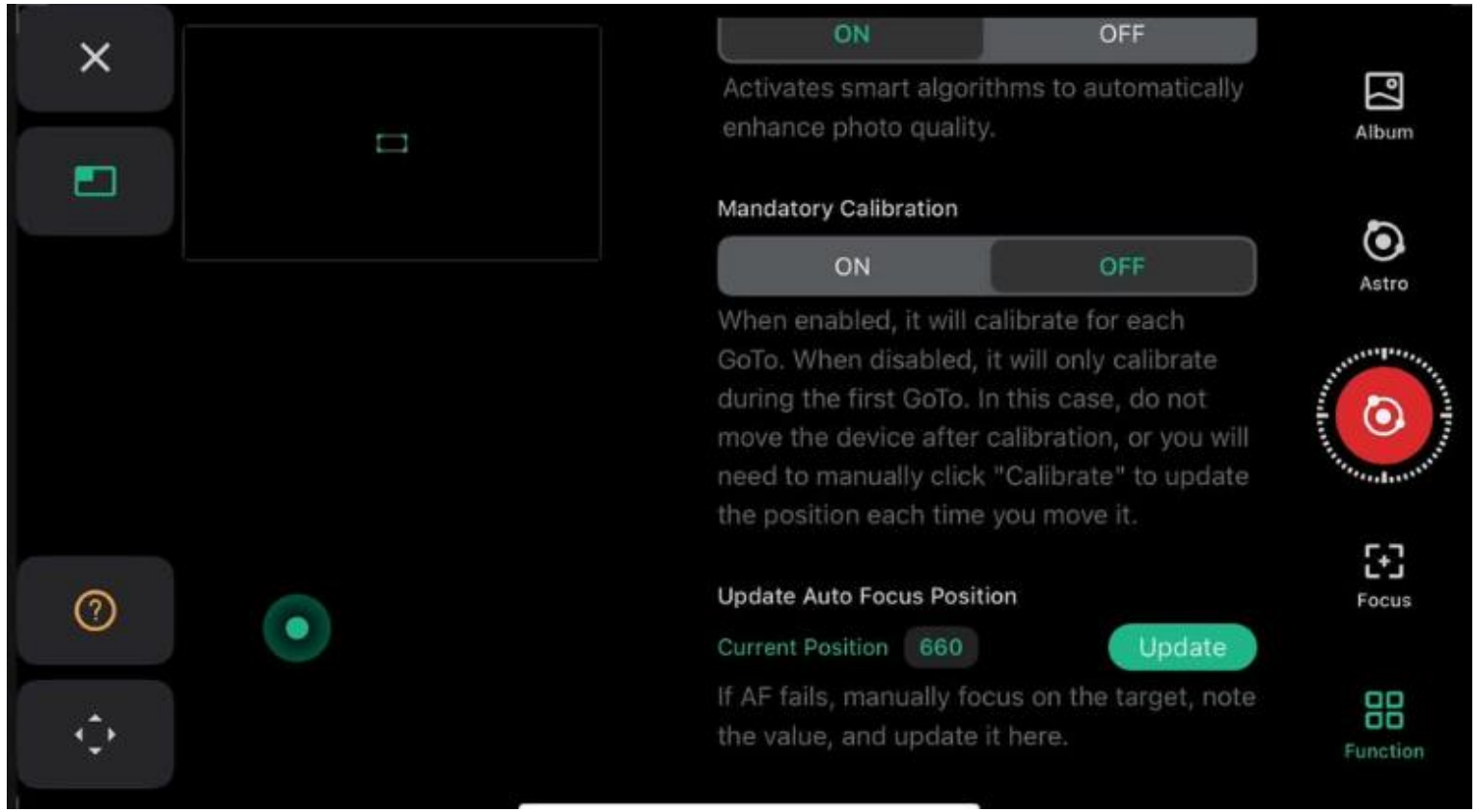


Dwarf 3 - Focus

- Tap 'Focus-**AF**' for auto-focus, or use the +/- to manually focus.
- The AF button turns green during focusing and reverts to white once focus is achieved.
- **Long press** or tap **+/-** to adjust the focus. The focus scale value helps you better confirm the appropriate focal point. A useful piece of knowledge for astrophotography is that the **focal point** for deep-sky objects is usually **fixed**. You can gradually find the most suitable focal point during use and remember it for quick adjustments later.
- Focusing on targets at a distance of **5 meters** or more. Focusing on targets less than this may result in autofocus failure.
- The Auto button turns green during focusing and reverts to white once focus is achieved.

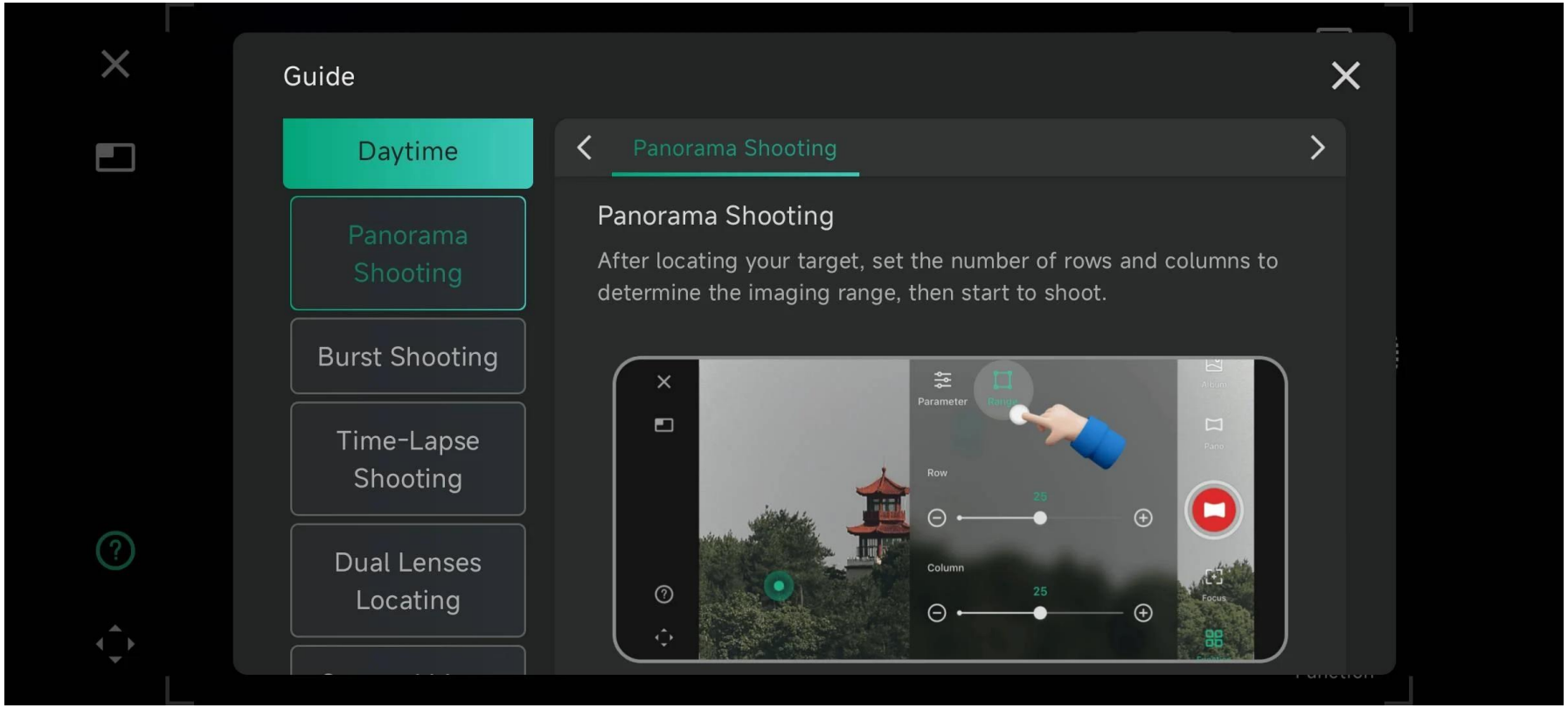
Dwarf 3 – Auto Focus Position Setting

- This function allows you to manually set your auto focus position to save your preferred number that you found was the most useful setting.
- You can find it under Astro > Function > Settings (scroll to the bottom).



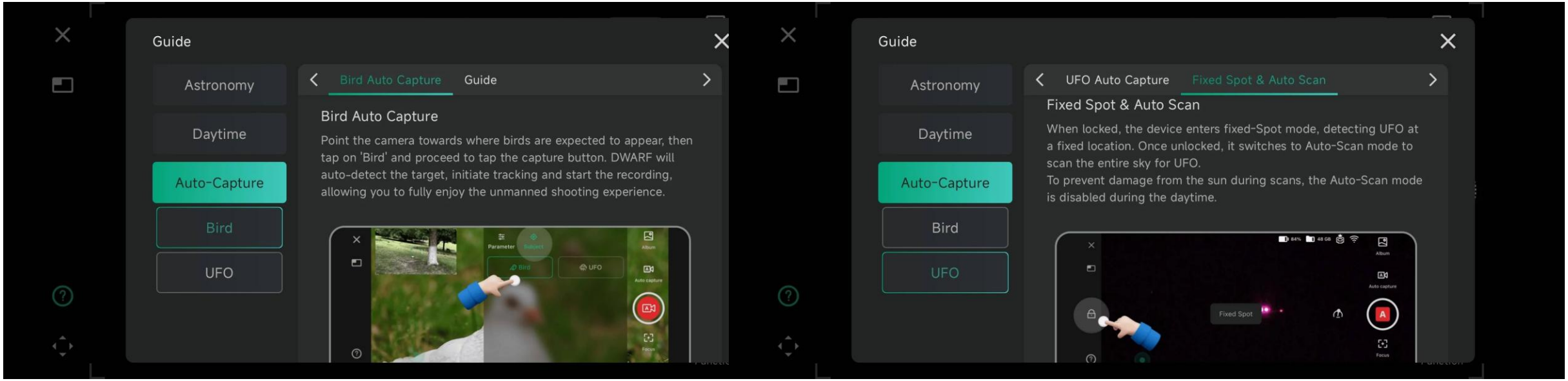
Dwarf 3 – Daytime Shooting Mode

Daytime: Panorama Shooting, Burst Shooting, Time-Lapse Shooting, Dual Lenses Locating, Sun and Moon Track, Object Track, Double-tap to Focus.



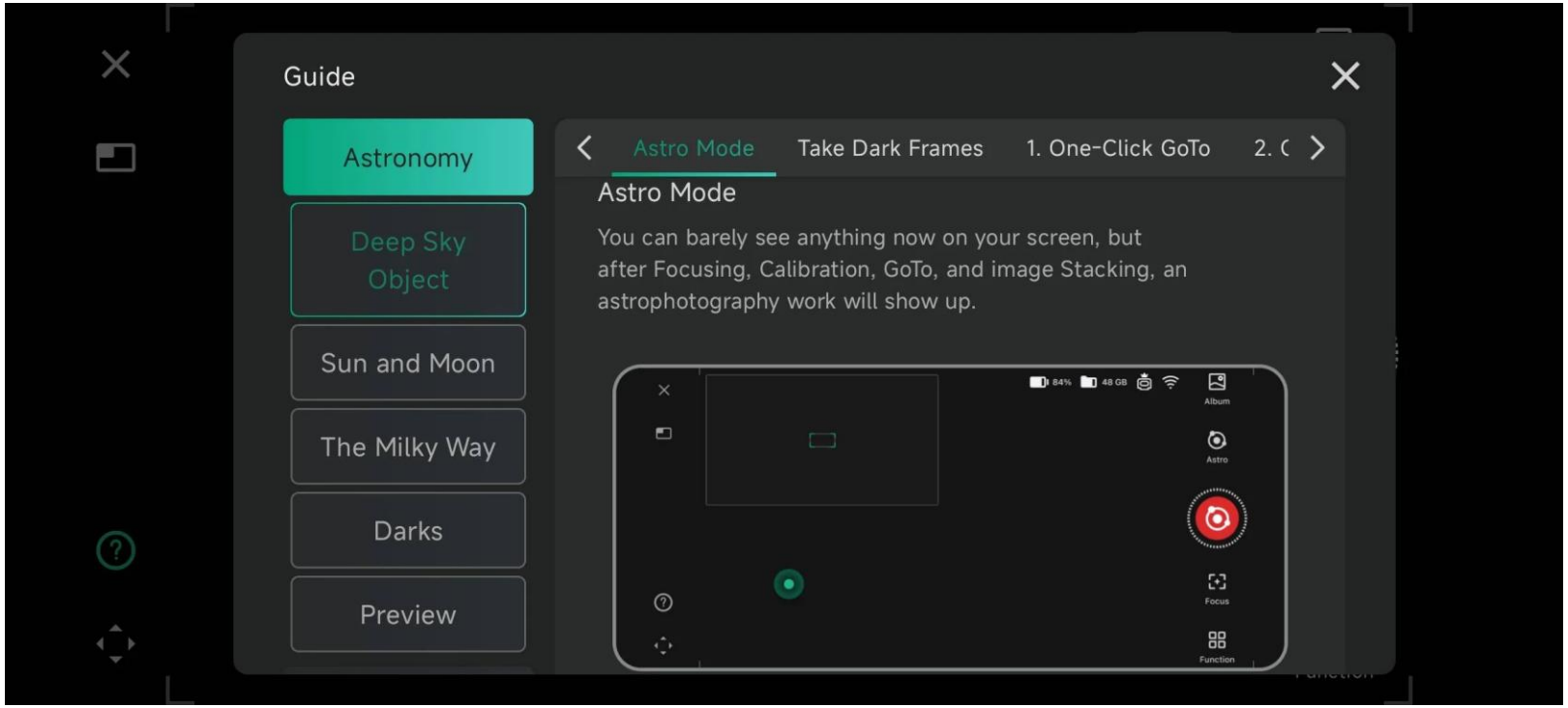
Dwarf 3 – Auto Capture Shooting Mode

Auto-Capture: Bird, UFO. In UFO mode, there are UFO Auto Capture and Fixed Spot & Auto Scan. When DWARF 3 detects movement in wide-angle lens, it will rotate towards the target and switch to telephoto for closer detection. Once a moving object is identified, a tailed tracking template is created, and the DWARF 3 begins tracking that object based on that template.



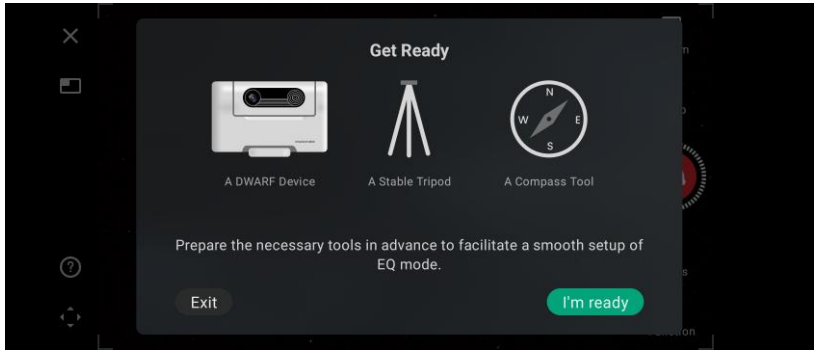
Dwarf 3 – Astronomy Shooting Mode

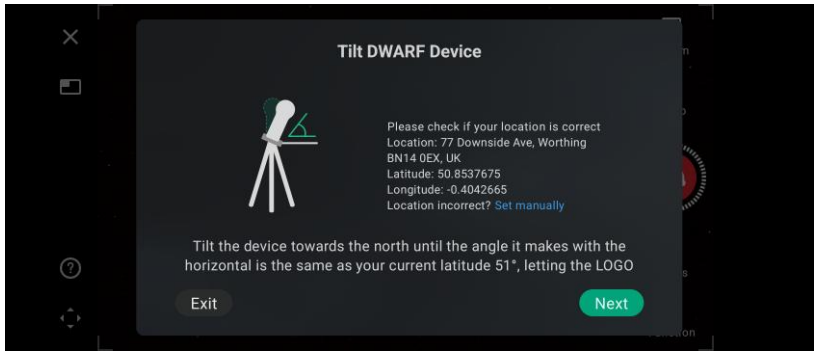
Astronomy: There are Deep Sky Objects, Sun and Moon, The Milky Way, Darks and Preview. Each category includes descriptions and illustrations of the shooting process, ensuring comprehensive understanding.

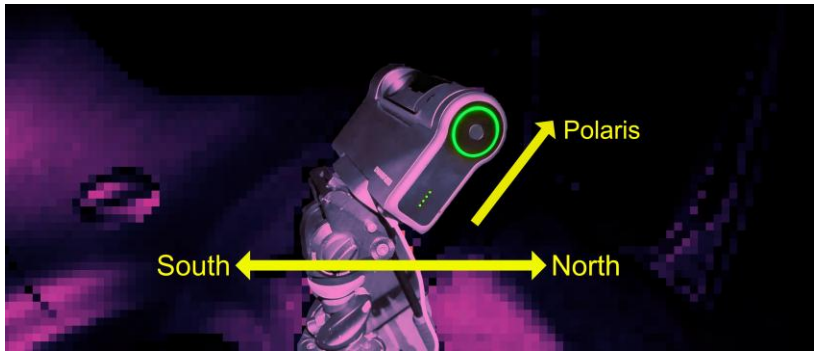


Dwarf 3 – Equatorial Mode & Polar Alignment 1

- Enter EQ Mode by selecting "**Astro mode**". Click the "**Function**" button and select "EQ Mode" from the menu that appears. This upper box pops up letting you know what you will need. The compass is only relevant if you cannot see Polaris or if you need help finding north. Click on "**I'm ready**".
- The middle box gives your location details and tells you how to set the Dwarf unit on the tripod. Ensure that the information is correct and setup the Dwarf device as per the instructions then click "**Next**".
- The lower box will give you the ideal declination (tilt) for your location.

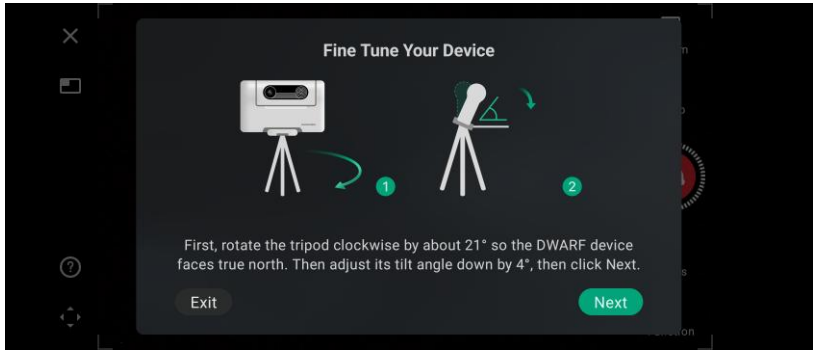


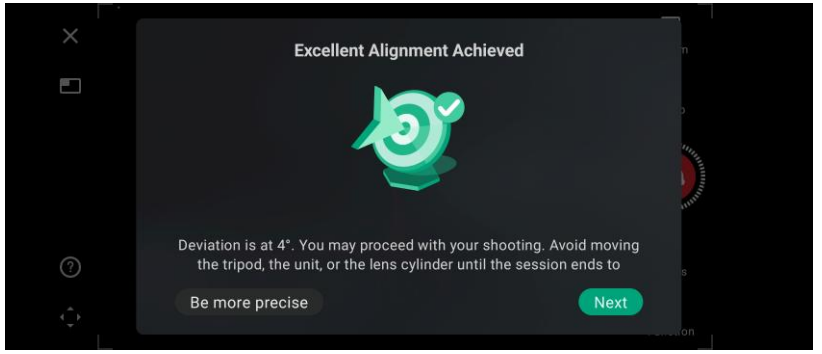


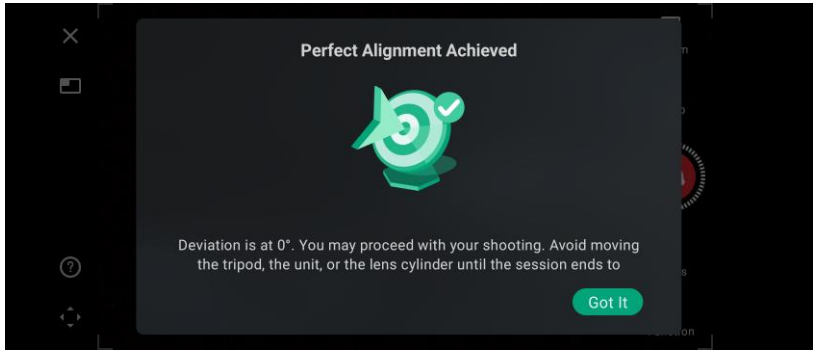


Dwarf 3 – Equatorial Mode & Polar Alignment 2

- By following the instructions in the above box, your Dwarf should be facing in the direction shown. The back of the unit will be facing north with the front (Dwarf logo) facing south. Rotate the lens up so that it faces forward, either by hand or by using the on-screen joystick control. The unit should now be tilted backwards with the top of the unit pointing roughly towards Polaris **(you can set the angle to match your latitude with an inclinometer).** Click "**Next**".
- After clicking Next the Dwarf will take some pictures to see how close to Polar alignment you are. The middle box will appear telling you how far out the device is and in which directions you need to make adjustments. Make the relevant adjustments given on the screen by rotating the **tripod head**, tilting the Dwarf or both. Do not move the whole tripod, the legs should stay where they are. Repeat this process making the required adjustments each time until you get the box in the image below.

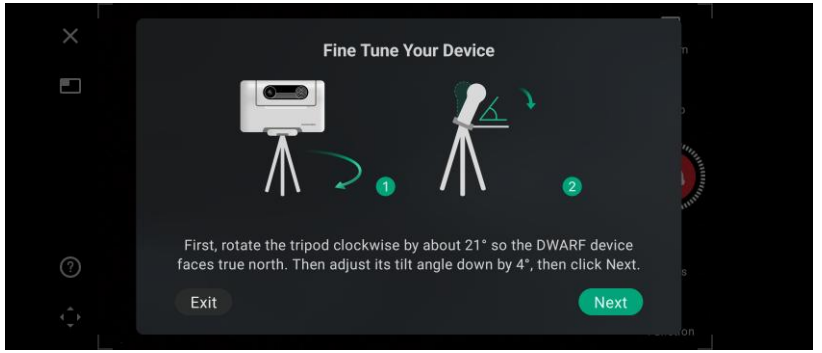


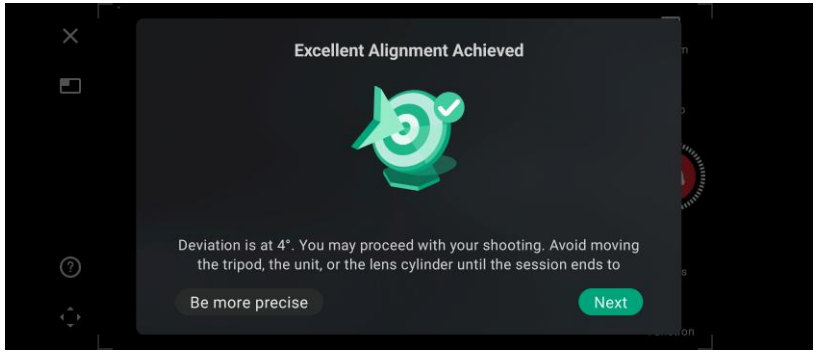


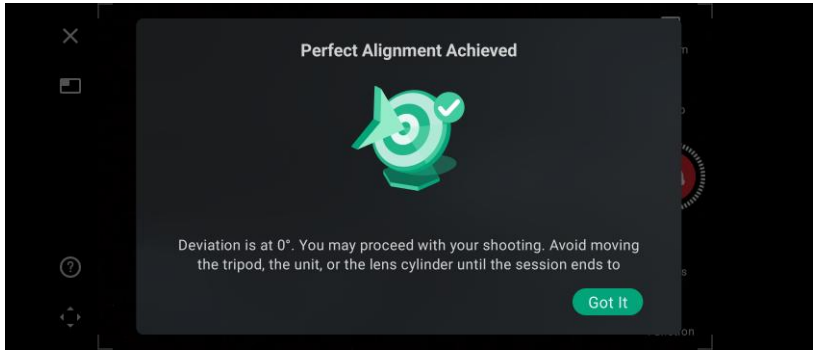


Dwarf 3 – Equatorial Mode & Polar Alignment 3

- The middle box means that you have achieved what the Dwarf deems to be a good Polar alignment and it will let you exit here and start imaging. To get the best possible images, especially if using long exposures (see below), then you will need to use the "**Be more precise**" control to cause the Dwarf to carry on with the alignment process allowing you to make further adjustments in order to reach a deviation of 0.
- NB: If 0 alignment has not been reached within 3 adjustments then the alignment will fail on the 4th attempt. All you need to do is to centre the Dwarf by hand to its home position and click on "**EQ Mode**" and repeat steps as above.
- The latest firmware has introduced an animated alignment tool.
- The maximum shutter time for telephoto is **120**s and wide-angle is **90** seconds.





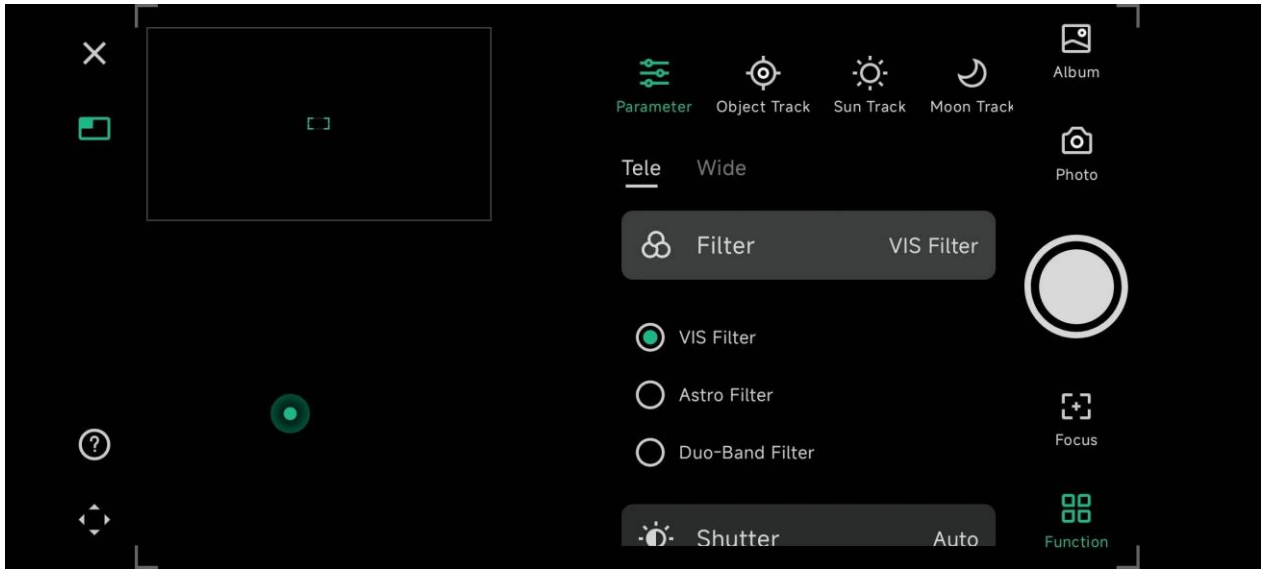


Dwarf 3 – Parameter Settings

You can adjust the shooting parameters for telephoto and wide-angle lens.

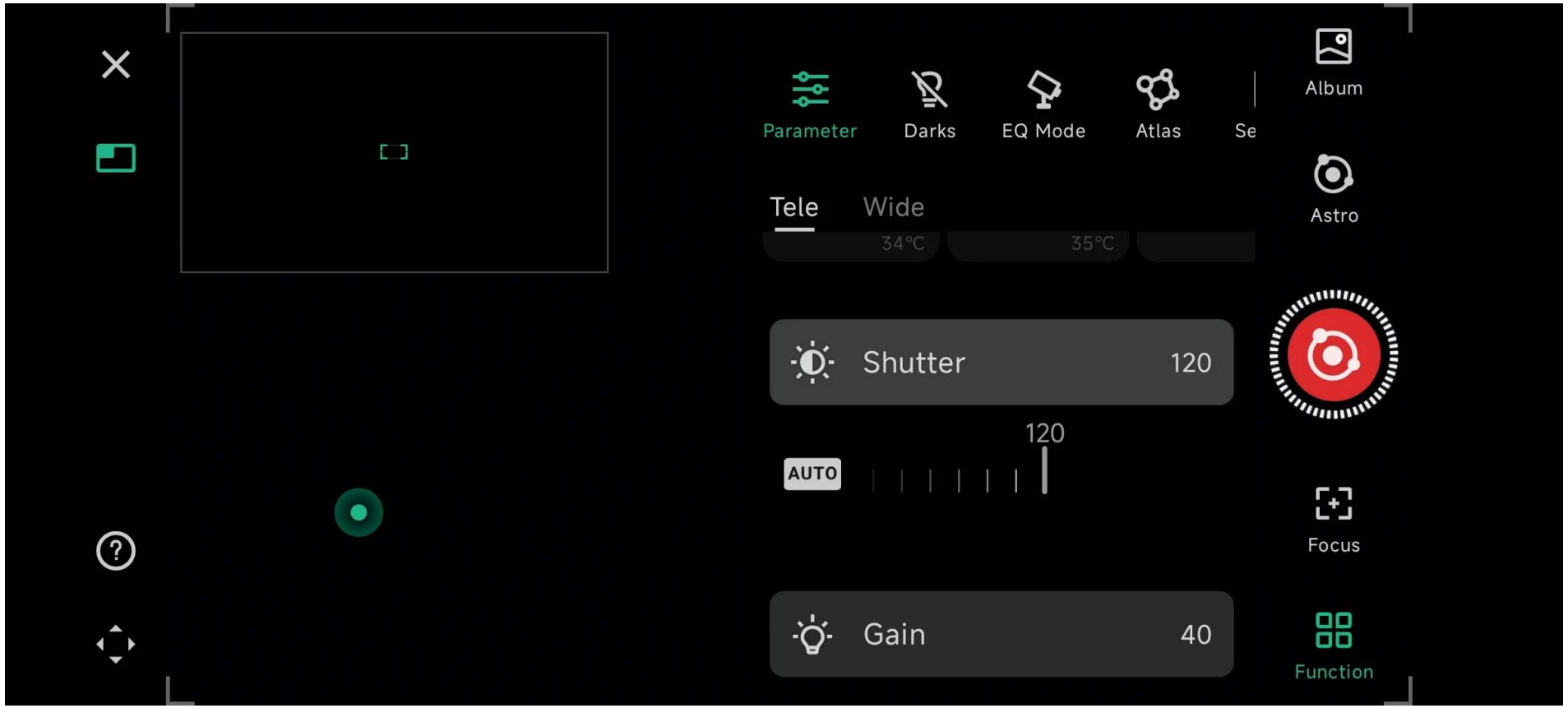
Dwarf 3 – Filter Settings

- **The VIS filter** is designed to **block ultraviolet and infrared light** while allowing visible light to pass through. It is particularly effective within the visible light range of approximately 430-650nm, enabling the capture of most visible light while reducing the impact of ultraviolet and infrared wavelengths. This makes it suitable for general photography applications.
- **The Astro filter,** on the other hand, is designed to allow **infrared light to pass** while blocking ultraviolet light and a portion of visible light. It is effective within the combined visible and infrared range of about 430-690nm, making it ideal for infrared photography as it enables the capture of infrared light above 650nm while minimizing the effects of ultraviolet and shorter visible wavelengths.
- **The Duo-Band filter** is specifically designed to **pass two particular wavelengths of light: Hα (656.3nm) and OIII (500.7nm)**, which are highly beneficial for **observing emission nebulae**. The bandwidth (FWHM) for Hα is approximately 15±3nm, and for OIII, it is around 30±3nm. This filter enhances the visibility of emission nebulae by selectively transmitting Hα and OIII light while blocking other wavelengths.



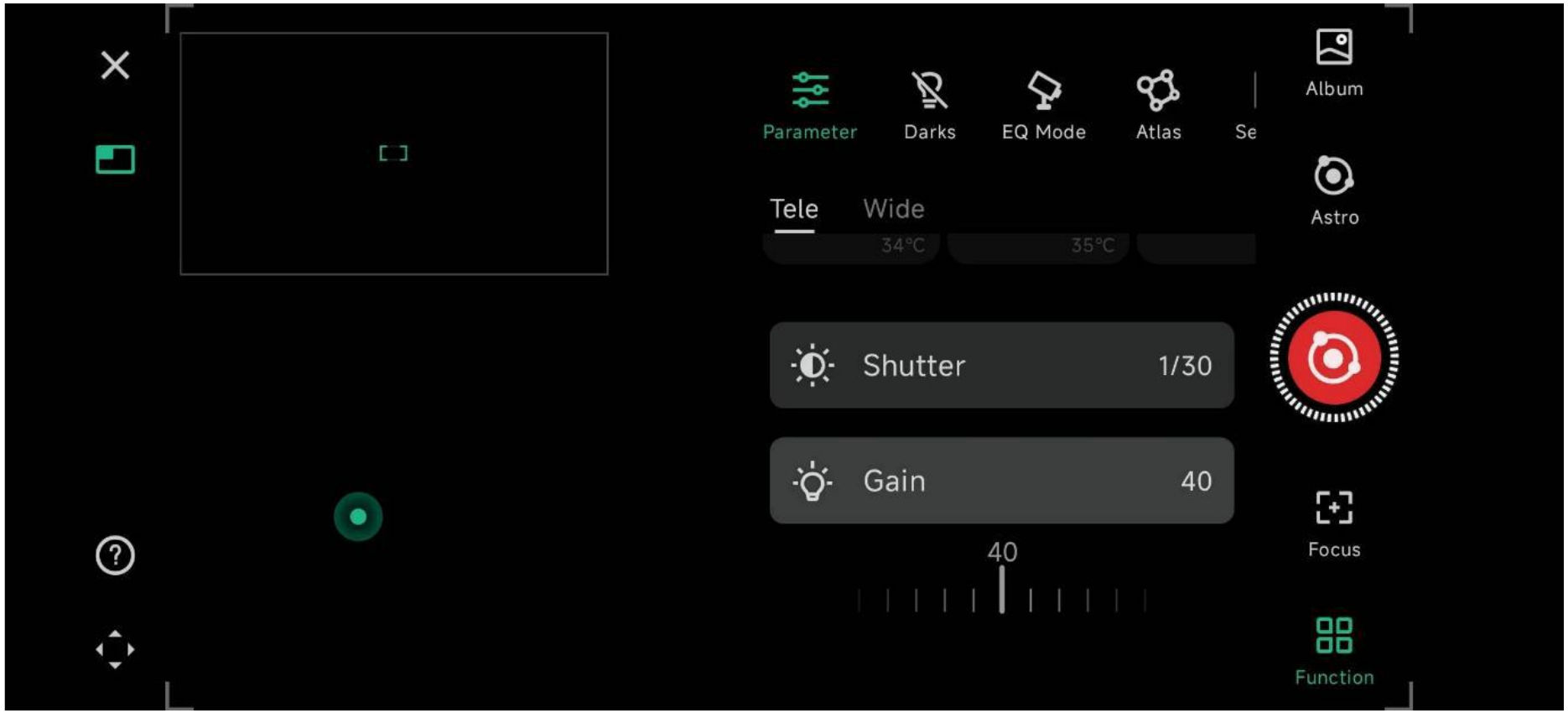
Dwarf 3 – Exposure/Shutter Settings

Adjust shutter time. Automatic shutter setting is always recommended for daytime.



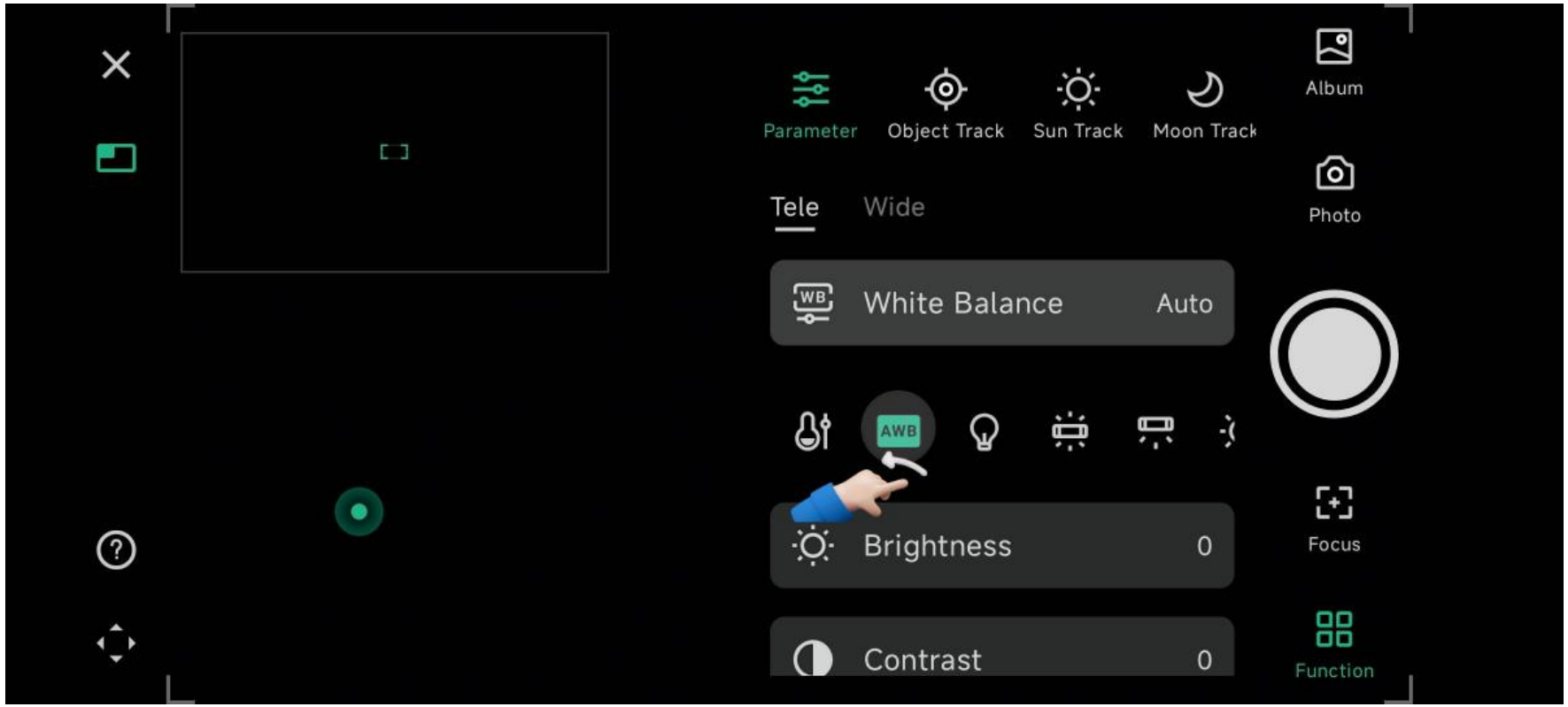
Dwarf 3 – Gain Settings

Adjust the gain setting. Keep between 0-30 for daytime normally.



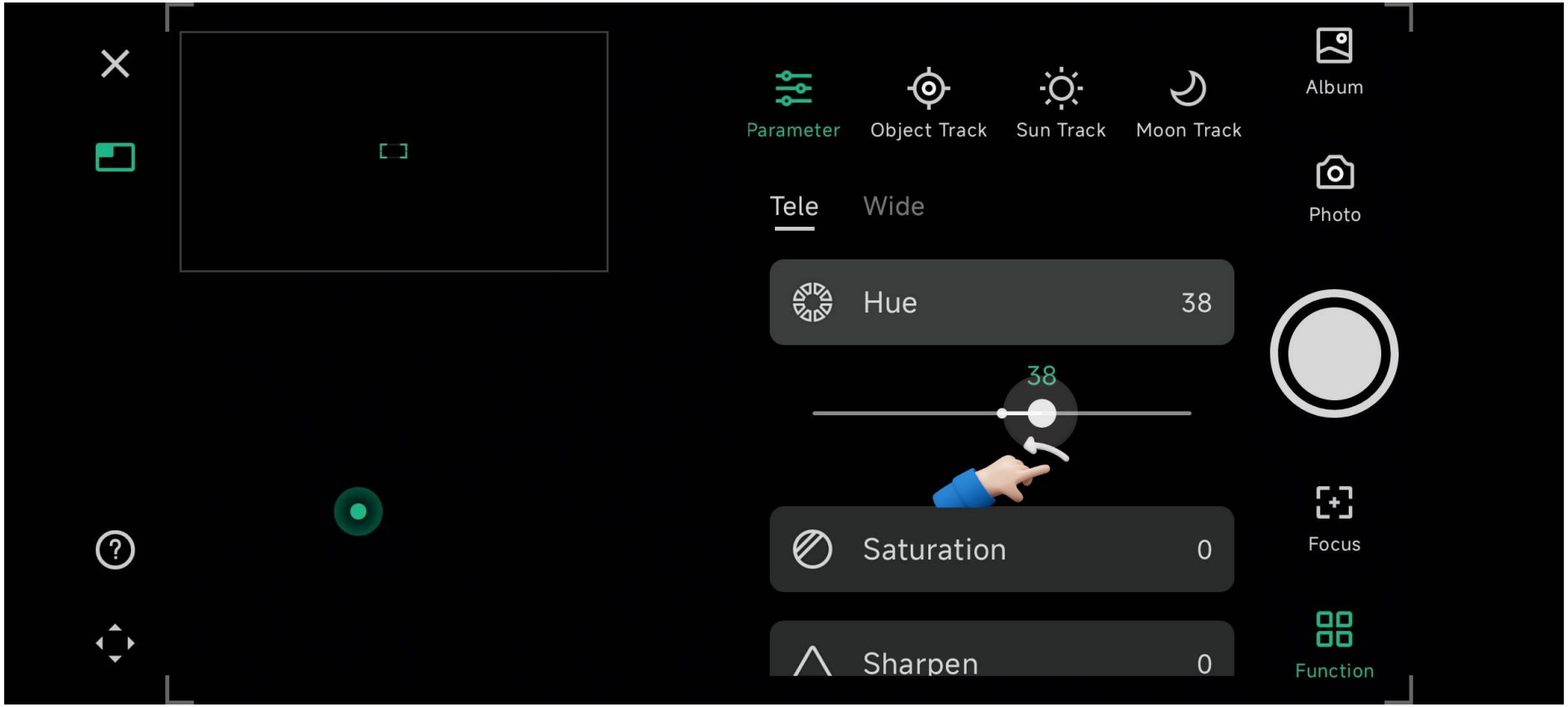
Dwarf 3 – White Balance Settings

Usually set to Auto. Adjust to warmer temperature when you feel like getting a yellow or orange sun/moon.



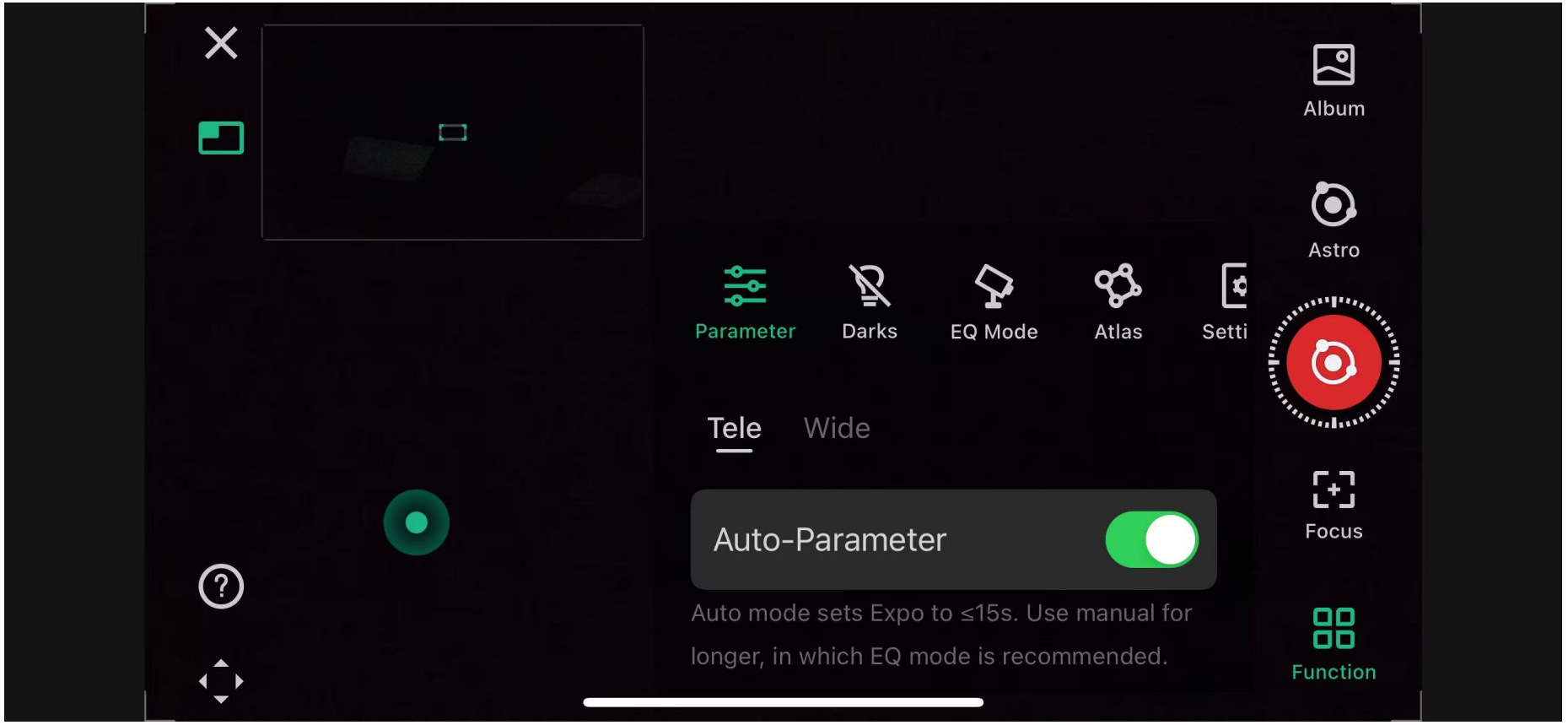
Dwarf 3 – Other Settings

Experiment with different parameter adjustments.



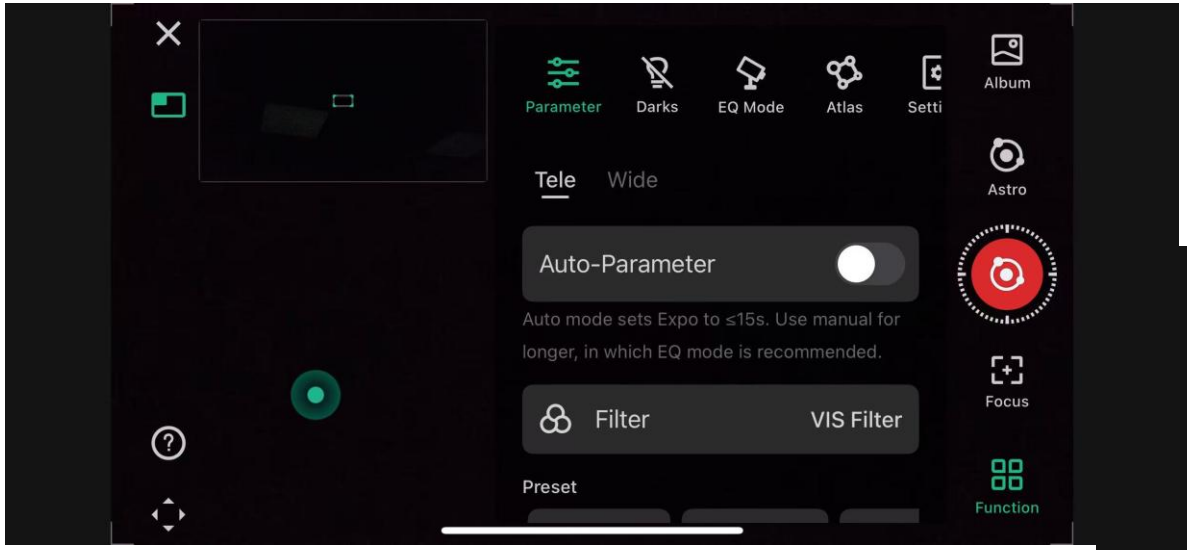
Dwarf 3 – Auto-Parameter Mode

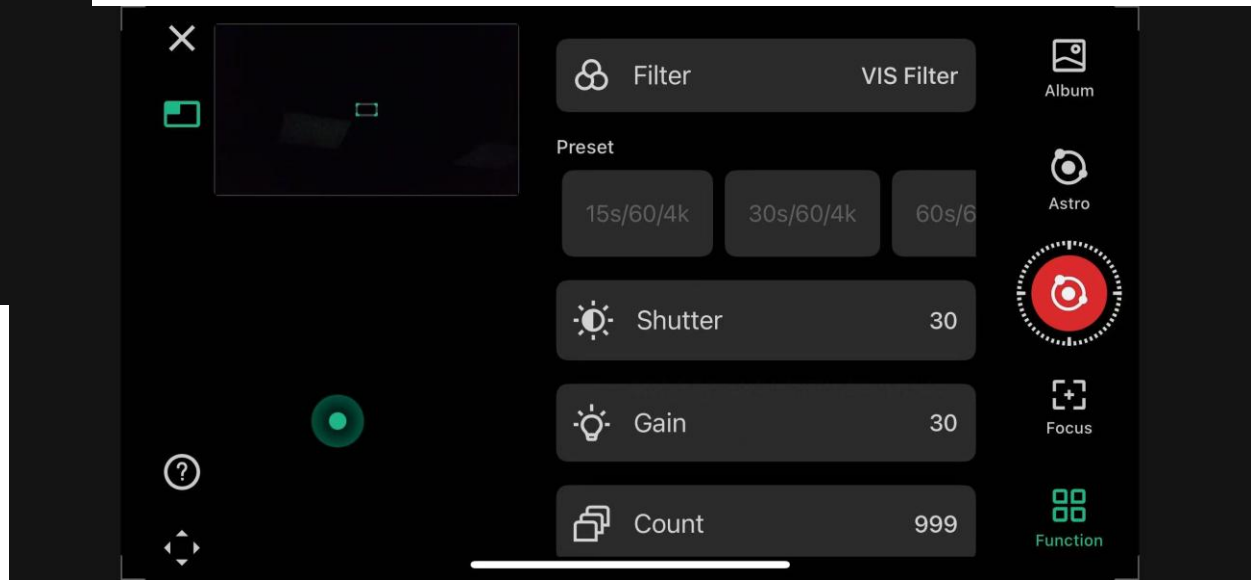
For first-time users, Dwarf have prepared **auto-configuration** where the system will automatically set the filter, shutter (to 15s) , gain, and number of shots.



Dwarf 3 – Manual Settings

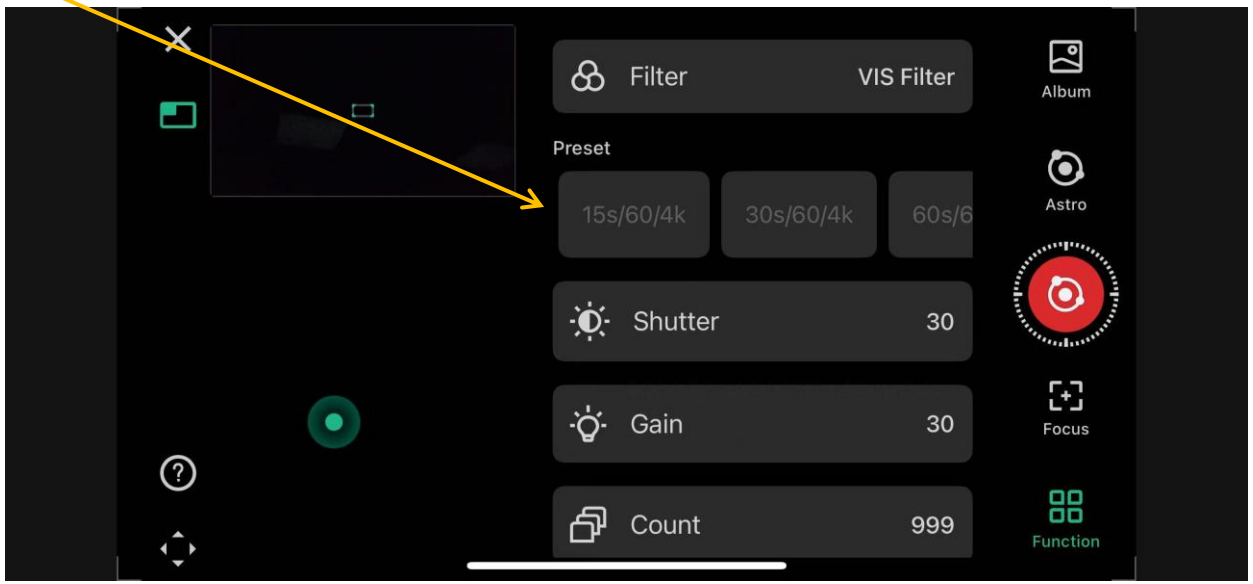
In this mode, you can adjust the shooting parameters more flexibly, enabling **longer exposures** to capture finer details of celestial objects. If long exposures make the image too bright, try **lowering the gain** value.





Dwarf 3 – Preset Settings

- Allows you to apply commonly used settings (exposure, gain, resolution) in one tap.
- Current constraints:
  - Due to the need for dark frames with the same parameters in taking astrophotography, the current preset feature only includes parameter sets for which dark frames have already been captured.
  - The preset feature for telephoto can only be accessed when **tracking a target** in astro mode. The wide-angle preset parameters, however, are not restricted and can be accessed freely.



Dwarf 3 – Notes on Parameters 1

- Each shooting mode offers unique features. In Photo mode, there are **object tracking**, **sun tracking**, and **moon tracking**. In Astro mode, you can see **Darks**, **EQ** Mode, and **Atlas**.
- In Astro Mode, when you click 'auto-focus', 'calibration', or 'End Current Session' after a shooting session, or you have just performed the angle calculation in EQ mode, the parameters will automatically change to Expo 0.5s (auto focus and infinity will just to 1s), Gain 120, Astro Filter (for firmware above 1.2.6) to obtain a proper brightness for DWARF's star calculation, also known as **'Plate Solving'**.
- The scope automatically detects the sun/moon and adjusts the appropriate shutter and gains value on hitting auto-focus.

Dwarf 3 – Notes on Parameters 2

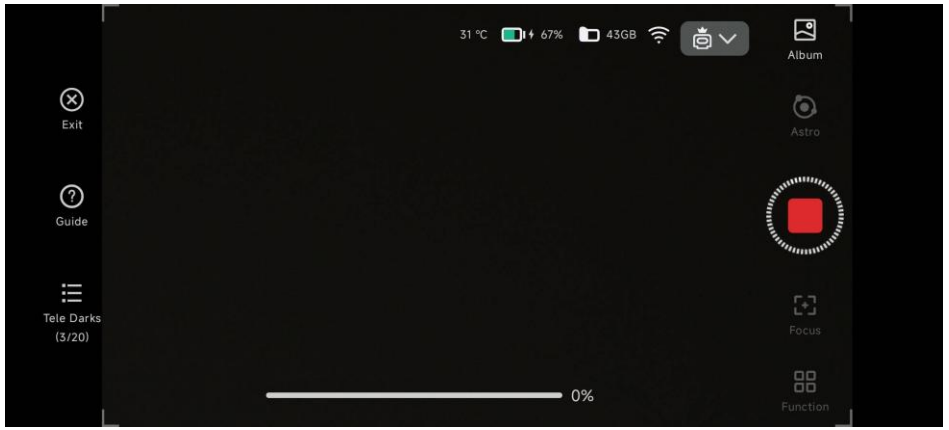
- Due to those auto actions above, it's advised to adjust settings right before pressing the shooting button to avoid having to re-adjust after automatic changes.
- To prevent your DWARF from appearing unresponsive to any settings (like switching modes), exposures longer than 2 seconds will **not** be displayed in the **preview**. Don't worry, your settings are effective; they just won't show in the preview. When it starts **shooting**, the long exposure will be **applied** immediately.
- Long exposures can present challenges when tracking celestial objects. Factors such as **tripod stability**, **light breezes**, and other conditions can affect tracking, leading to elongated stars due to **minor vibrations**.

Dwarf 3 – Dark Calibration Frames 1

- Turn off the lights in Home Page-Light Setting.
- Choose whether you need to take Darks for the **telephoto** or the **wide-angle**, then switch to that particular view.
- At Darks, navigate to Function, then set the **Shutter and Gain** (if you are taking tele darks) of your dark frames to the same settings as your Astro.
- Attach ND filters to the device, and retract the lens into the body facing downwards to prevent light from entering the lens.

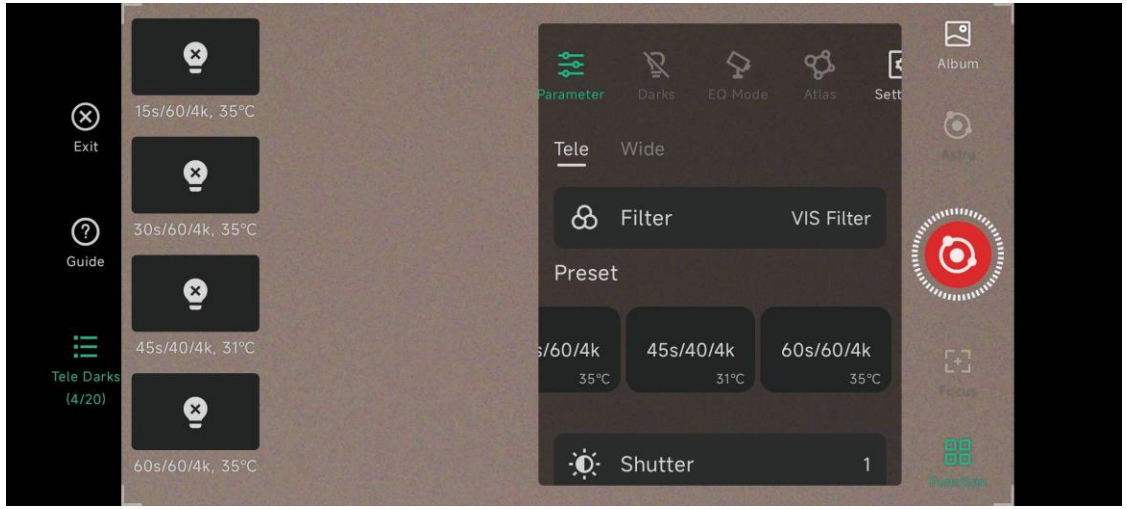
Dwarf 3 – Dark Calibration Frames 2

- Click the shooting button on the right to start capturing the dark frames.
- When stacking images, the dark frame with the closest temperature will be automatically selected and applied, so there's no need for manual selection.
- Tap 'Tele Darks/Wide Darks' to see the dark frames you have already taken
- DWARF 3 comes with some set of darks which are considered to be highly used.



Dwarf 3 – Dark Calibration Frames 3

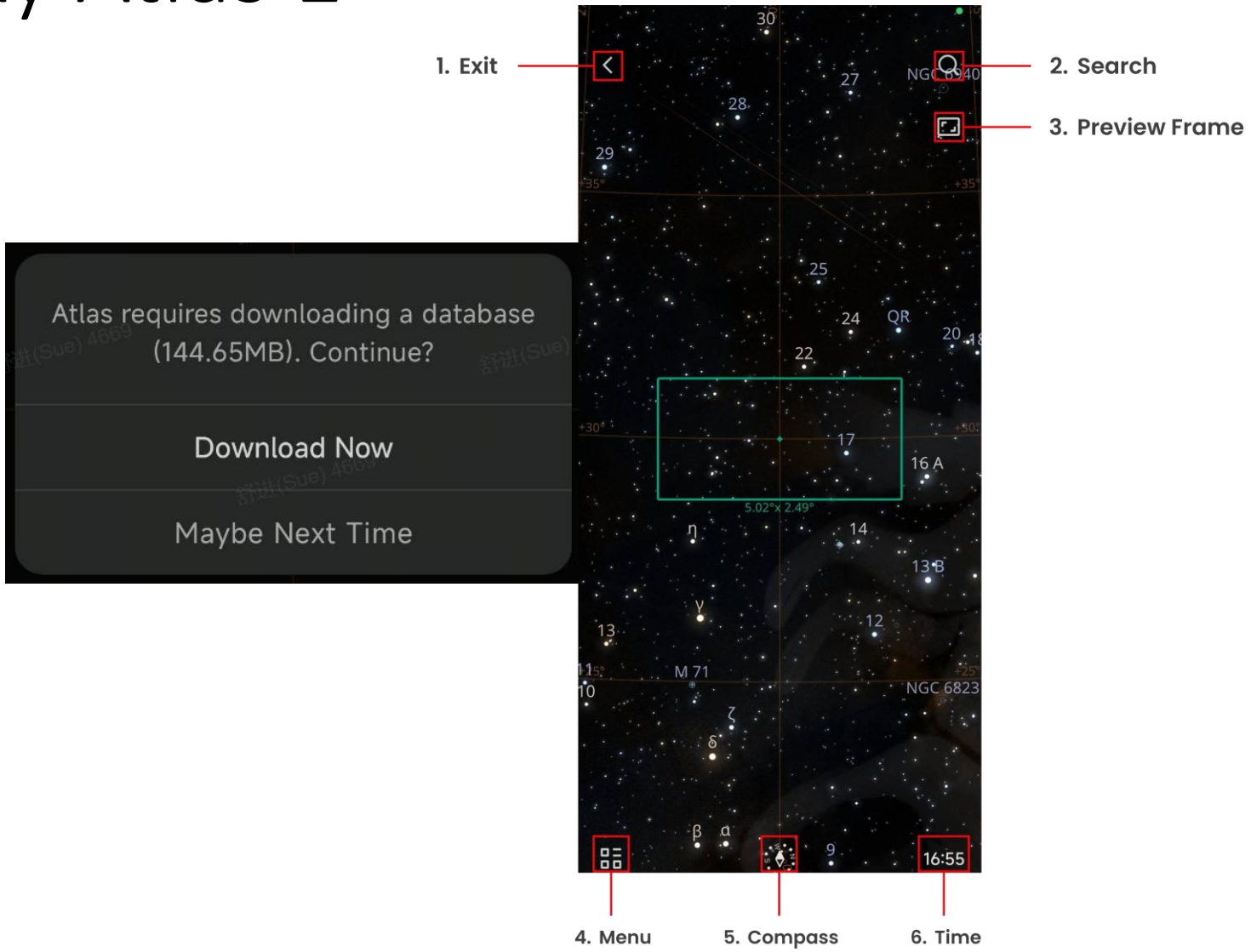
- DWARF 3 allows you to save multiple sets of dark frames for the same commonly used settings. For every 1 degree Celsius increase in temperature while shooting, a new dark frame will be generated.
- You can find the parameter sets associated with the dark frames you've captured under 'Astro Mode - **Function** - **Parameter** - **Preset**'. Simply click on your preferred parameter set to quickly apply the corresponding settings.
- Dark frames captured for wide-angle and long-focus lenses will be visible under their respective menus.



Dwarf 3 – Using Sky Atlas 1

If it is your **first time** viewing Sky Atlas, open the Atlas feature (while connected to a cellular/internet connection) and **download** the catalogue data if prompted.

- To ensure a smooth experience on your phone/tablet, you will not be able to download the Atlas database package if your device has less than **2GB** of available memory. Please clear some space and try again if you receive an error. When downloading the **database**, **Airplane Mode** and **VPN** should be turned **off**.
- You can adjust the **time** of Atlas by clicking the "time" indicator **at the lower right corner**. This will show locations of different objects at different viewing times. Helpful for planning in your Scheduling feature.



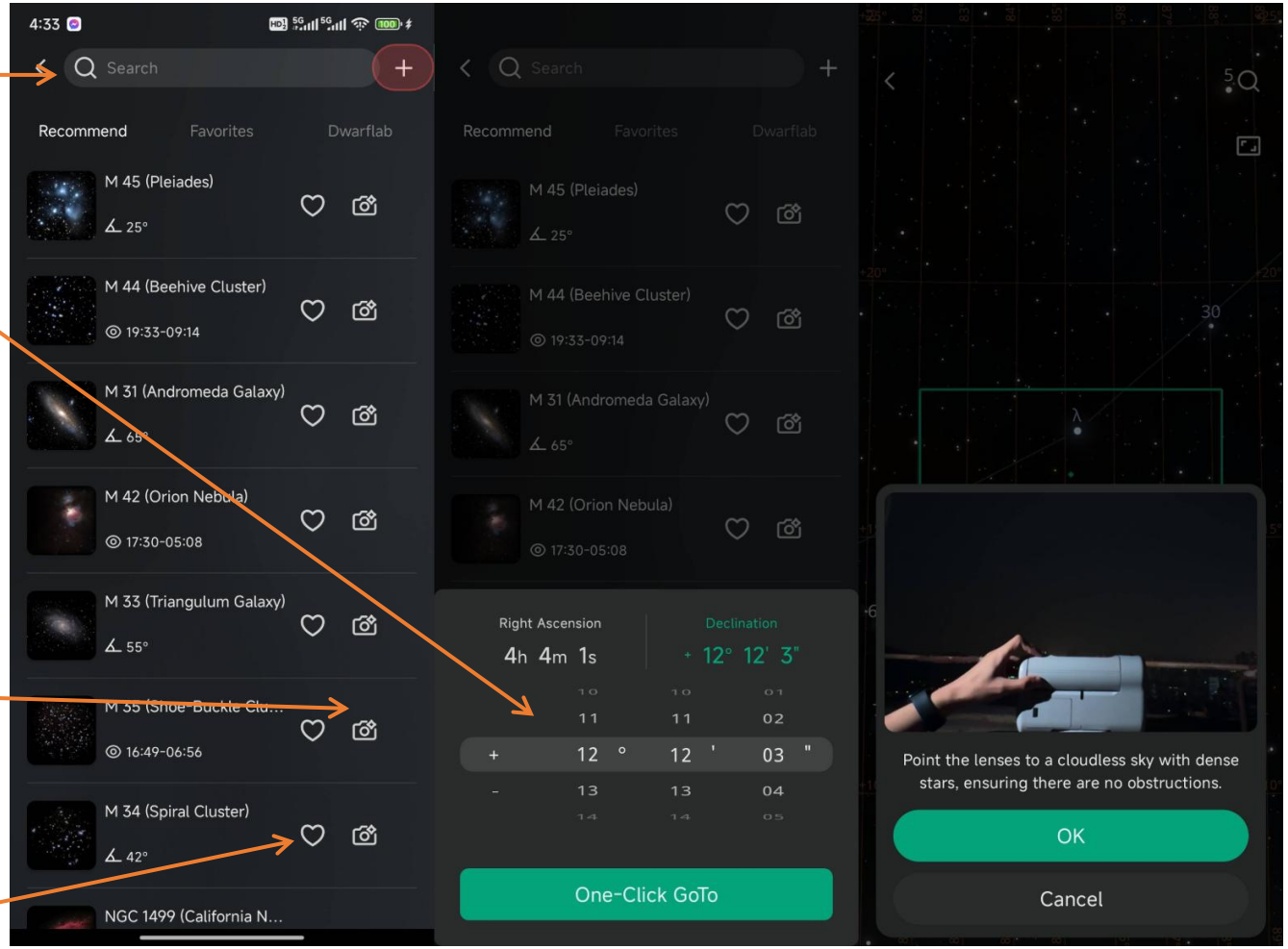
Dwarf 3 – Using Sky Atlas 2

Enter object name or alias in the search box.

Enter Coordinates: If a target's name is not available in the search, you have the ability to manually input the **RA** and **DEC** of the target. (Right Ascension and Declination are coordinates on the sky that correspond to longitude and latitude on Earth) **Tap "+"** and enter the RA and DEC of a celestial to quickly find the target.

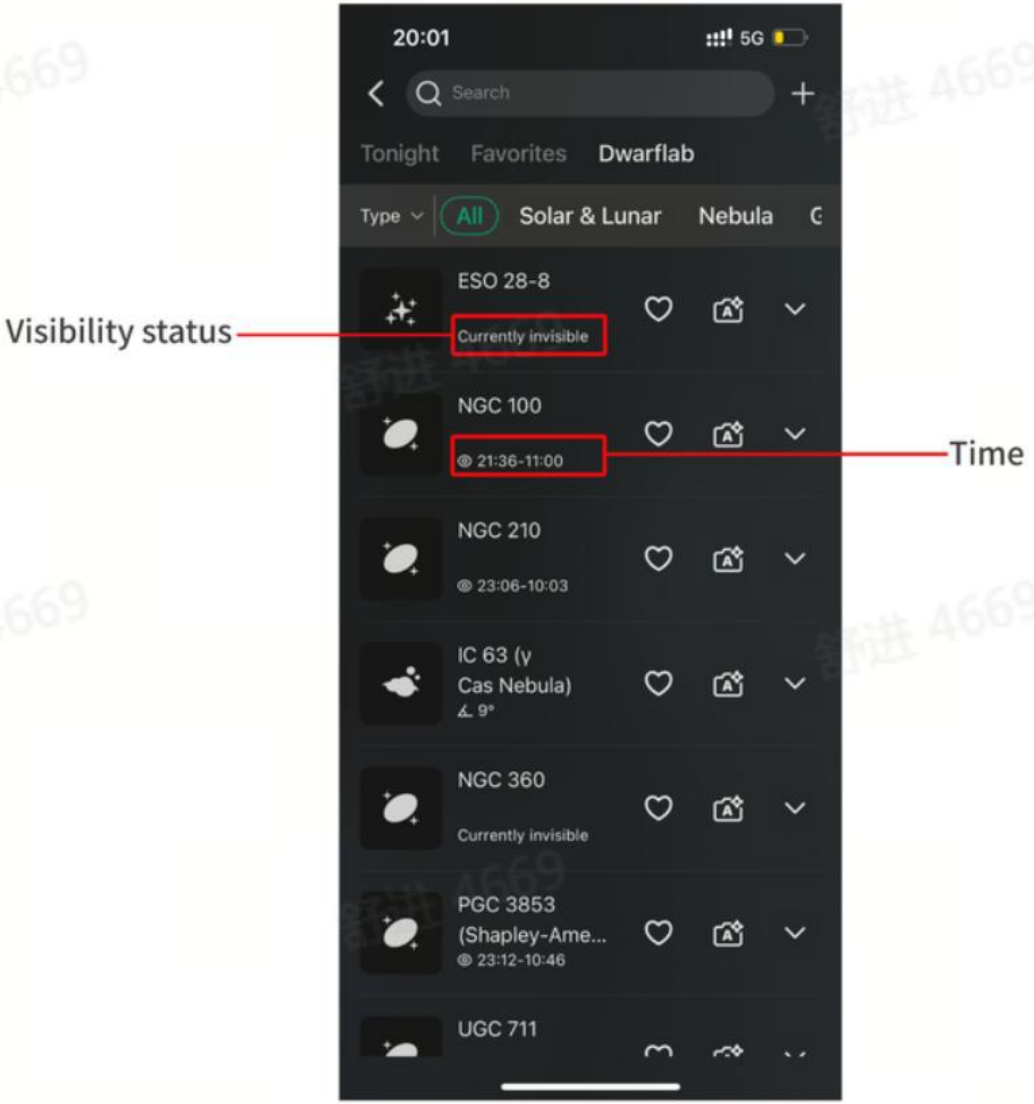
Tonight: Recommend the best targets based on your time and location. Click the little camera on the right to track the target, manually set parameters and then start the shooting automatically.

Click the "Heart" to add your favourite targets to this list.



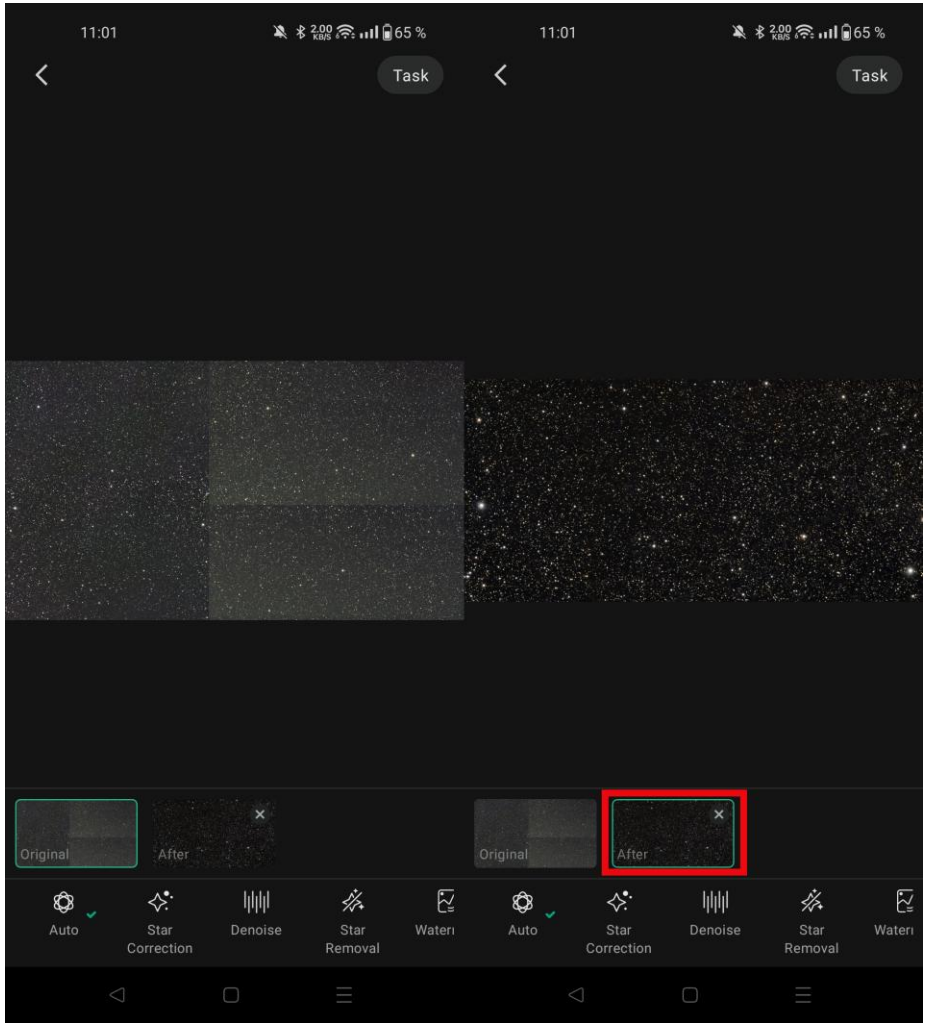
Dwarf 3 – Using Sky Atlas 3

- The Dwarflab celestial database, contains many **celestials suitable** for DWARF observation and when an object is selected their **visibility status** is displayed
- "currently invisible" means that this target is never visible at your location.
- If it is visible the times that it is will be displayed.



Dwarf 3 – Using Sky Atlas 4 – Mosaic 1

- DWARF 3's astronomical mosaic feature allows you to capture and stitch together multiple adjacent fields of view, creating a wider and more detailed image of the night sky.
- After shooting, DWARF will automatically generate a **rough preview** mosaic image.
- Finish your mosaic image using **Stellar Studio**, which can intelligently detect and eliminate edge seams between Mosaic Views.
- If you notice obvious **light seams or edge discoloration**, it's recommended to **manually review and filter the bad sub-frames**, then **restack in Mega Stack** before final processing in **Stellar Studio**.



Dwarf 3 – Using Sky Atlas 5 – Mosaic 2

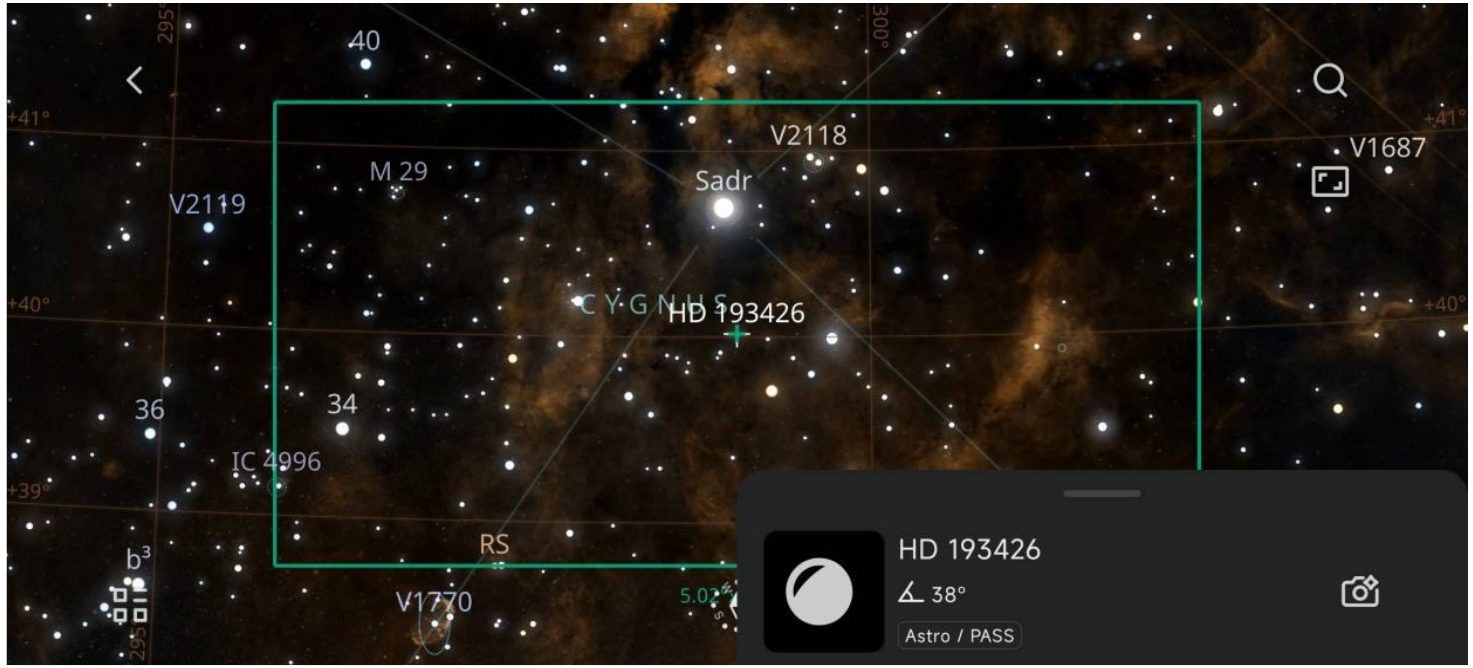
- DWARF 3 will automatically determine how many segments to shoot based on your selected composition ratio:
  - The default view is **1 × 1**, meaning only one segment is captured (no mosaic needed).
  - If **either** the horizontal or vertical composition ratio is greater than 1, that direction will use **2 segments**.
  - For example, a ratio of **1 × 1.5** results in **2 views**, while **1.5 × 1.5** results in **4 views**.
  - **Maximum supported layout: 2 × 2**, totalling **4 views**.

Dwarf 3 – Using Sky Atlas 6 – Mosaic 3

- In addition to the shooting targets, you can now freely compose your astronomical images within the preview frame of the DWARF 3.
- Slide the bar to adjust the **horizontal** and **vertical** dimensions separately to encompass the required Field of View.

Dwarf 3 – Using Sky Atlas 7 – Mosaic 4

- Drag the preview frame and position your desired target in any corner.
- Once you adjust the size of the preview frame, the **number of** subsequent **shots** will be a **fixed value** that cannot be adjusted and is calculated to produce the optimal shooting effect.

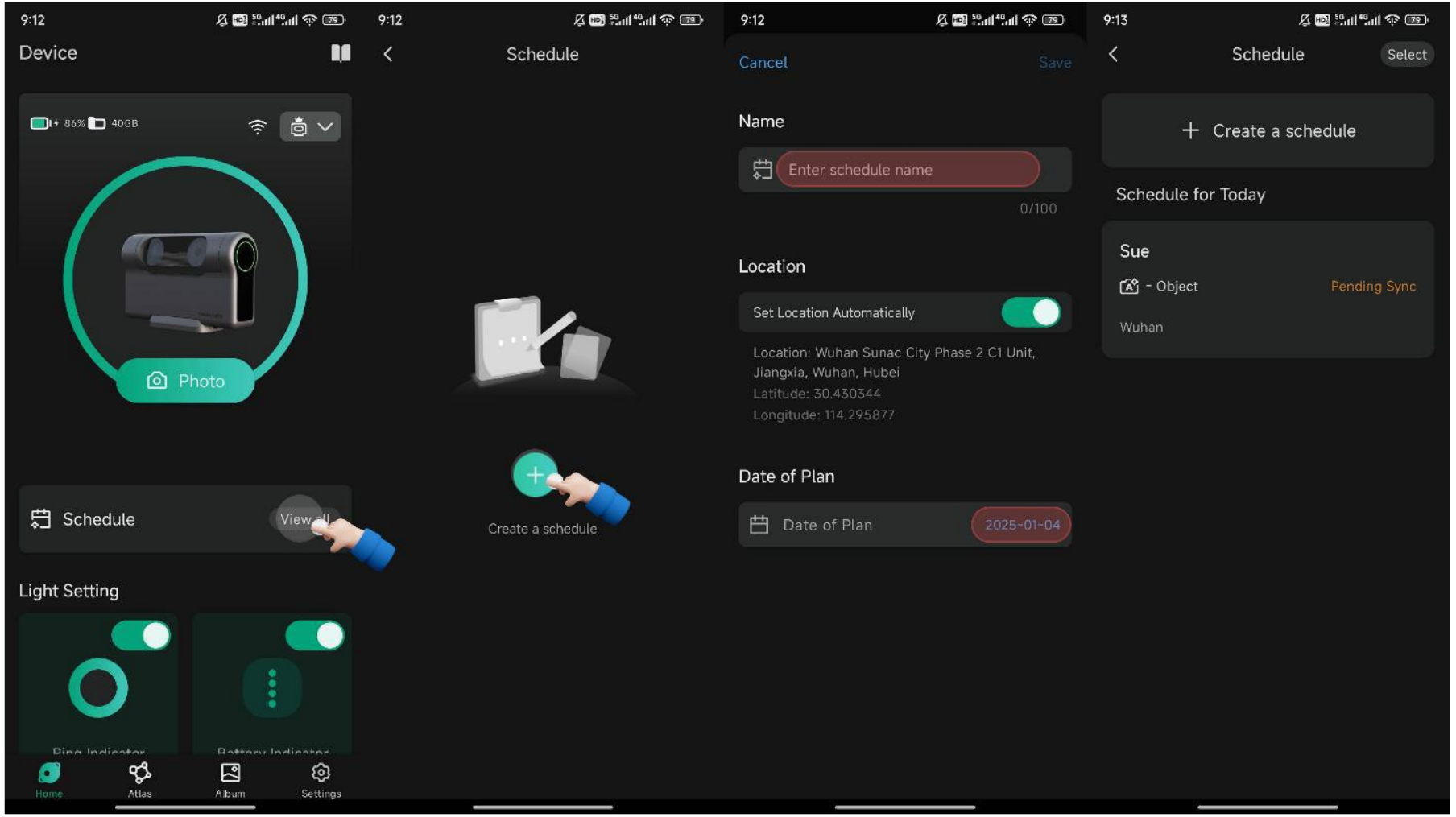


Dwarf 3 – Schedule Shooting

- Schedule Shooting allows you to capture celestial objects late at night without staying up. Simply set up your DWARF telescope, which will independently complete the task without supervision. Check the weather forecast to ensure you don't miss any clear night skies due to unexpected conditions!
- There are two ways to schedule shooting: creating a plan:
  - directly from the homepage or
  - creating a plan from the Atlas.

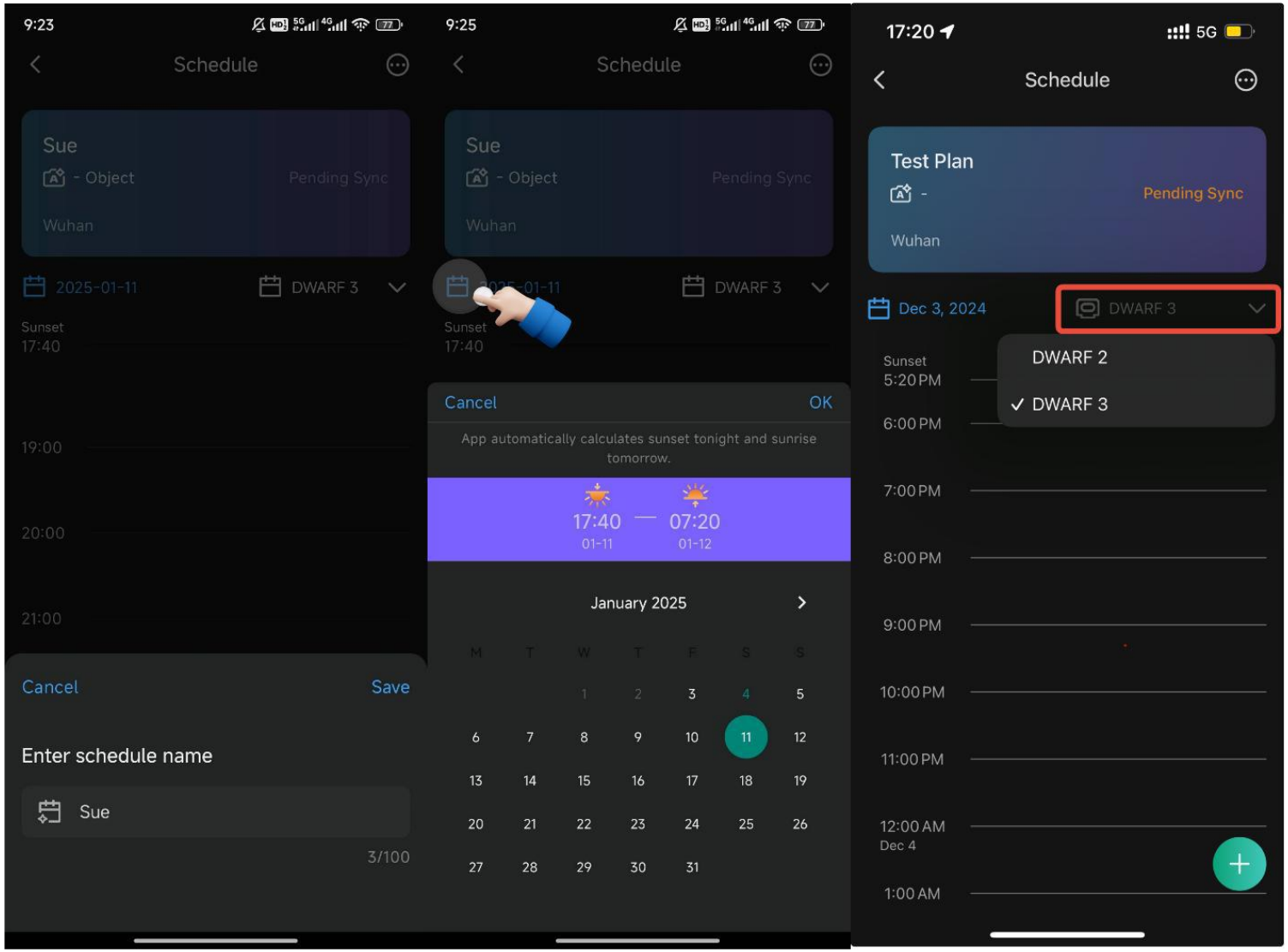
Dwarf 3 – Creating a Schedule Plan from Homepage

- **Create a plan**: Follow the prompts to create a plan, fill in the plan name, select the shooting time, and save it.



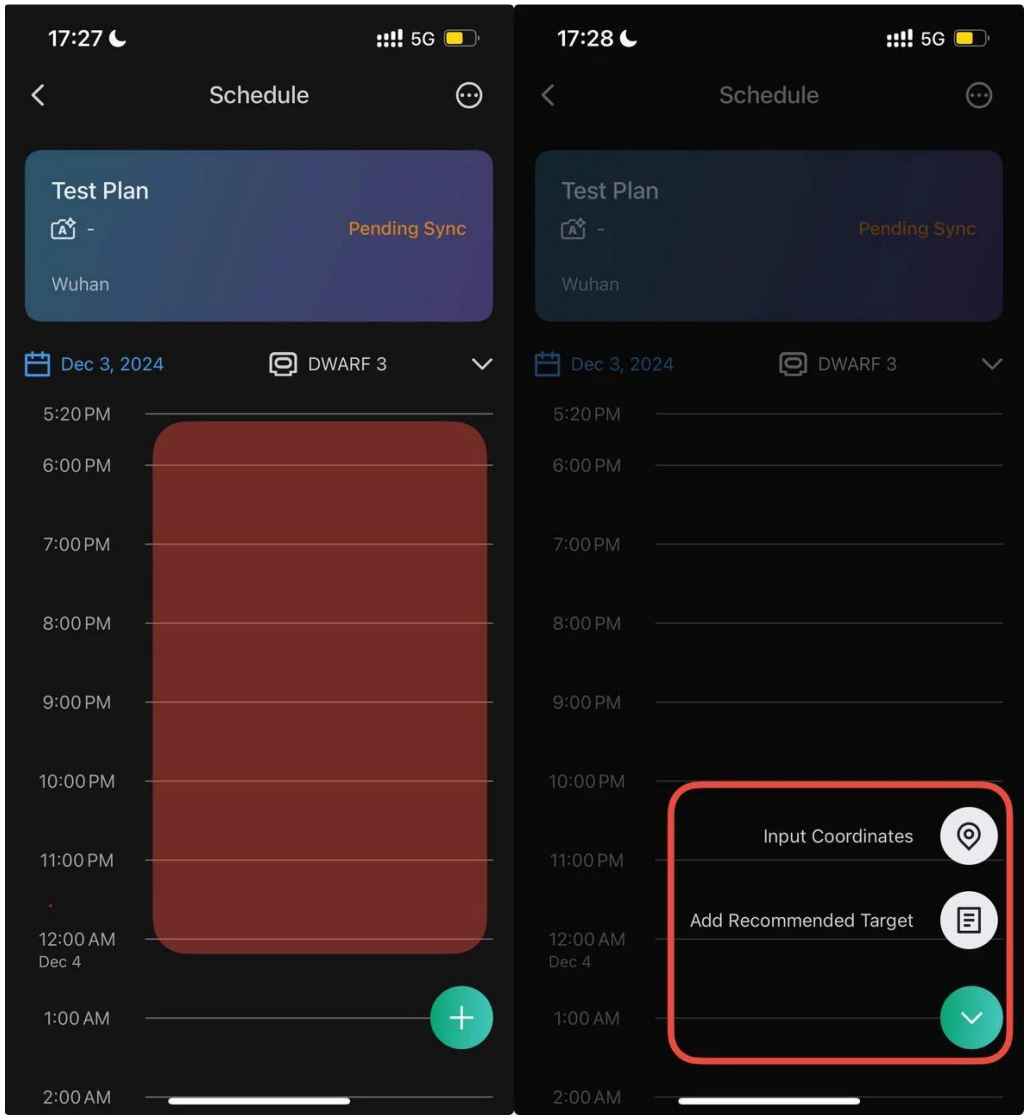
Dwarf 3 – Creating a Schedule Plan 1

- **Edit Plan**: Edit plan name and time, change shooting device:



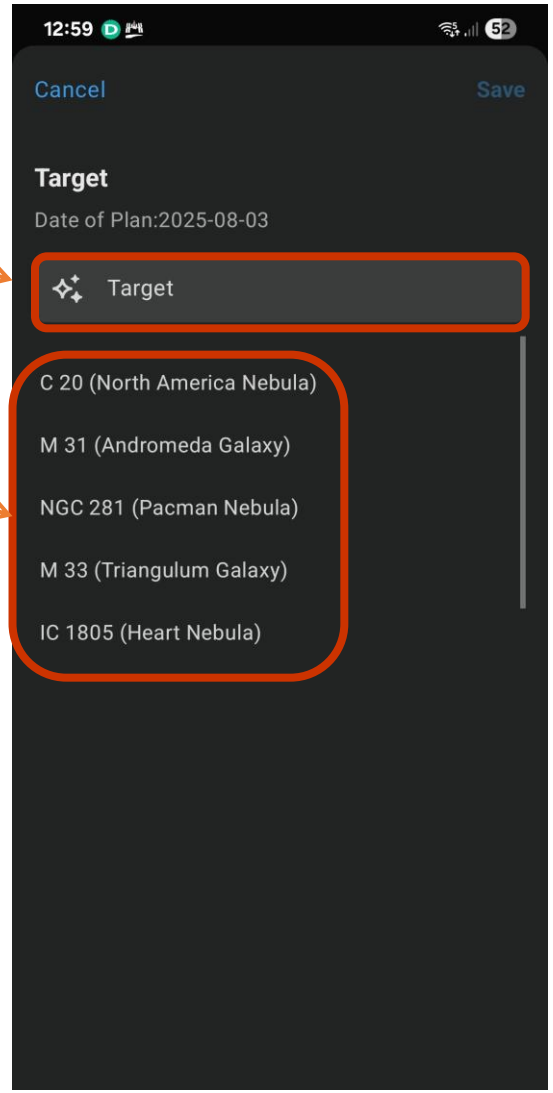
Dwarf 3 – Creating a Schedule Plan 2

- **To add a shooting target** click on the **blank space** in the schedule or the "**+**" icon in the bottom right corner to add a shooting target



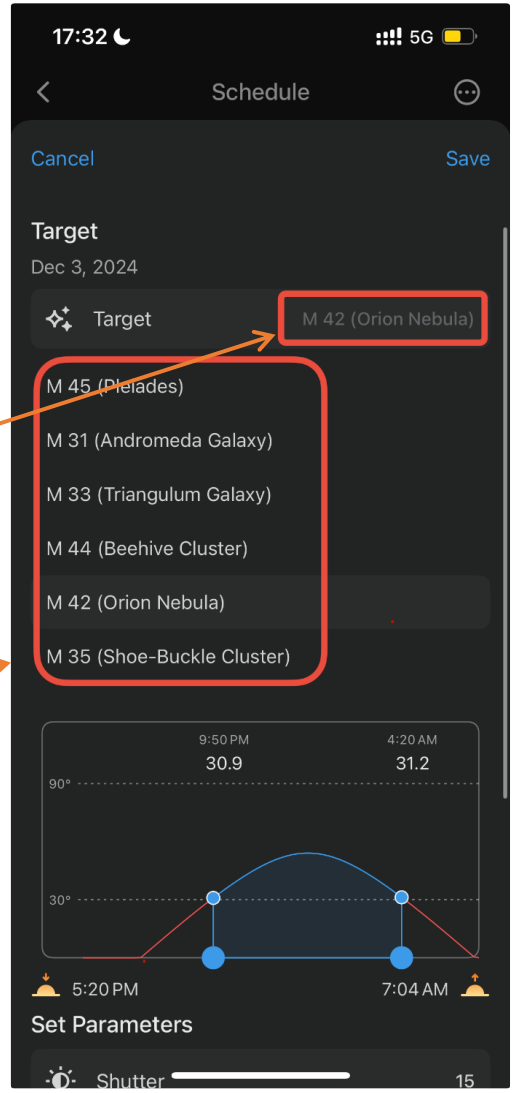
Dwarf 3 – Creating a Schedule Plan 3

- If you selected a **blank space** in the Plan, enter the target name in the input box shown to search the Atlas catalogue, or
- Choose from the recommended list.



Dwarf 3 – Creating a Schedule Plan 4

- If you select "**Add Recommended Target**", enter the target name in the input box shown to search the Atlas catalogue, or
- Choose from the recommended list.

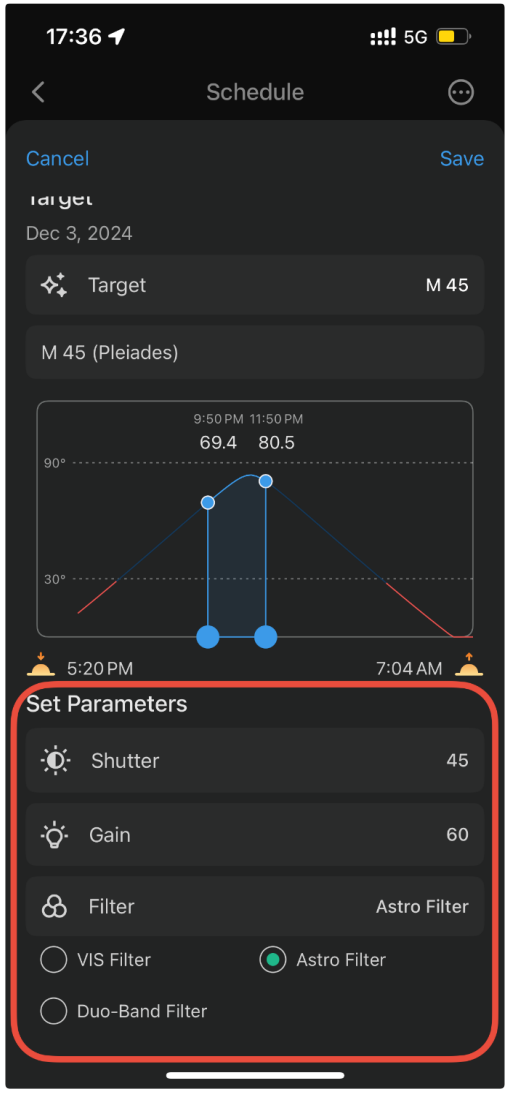


- If you select "**Input Coordinates**", click on "Right Ascension" and "Declination" in the image below to input the coordinates.

Dwarf 3 – Creating a Schedule Plan 5

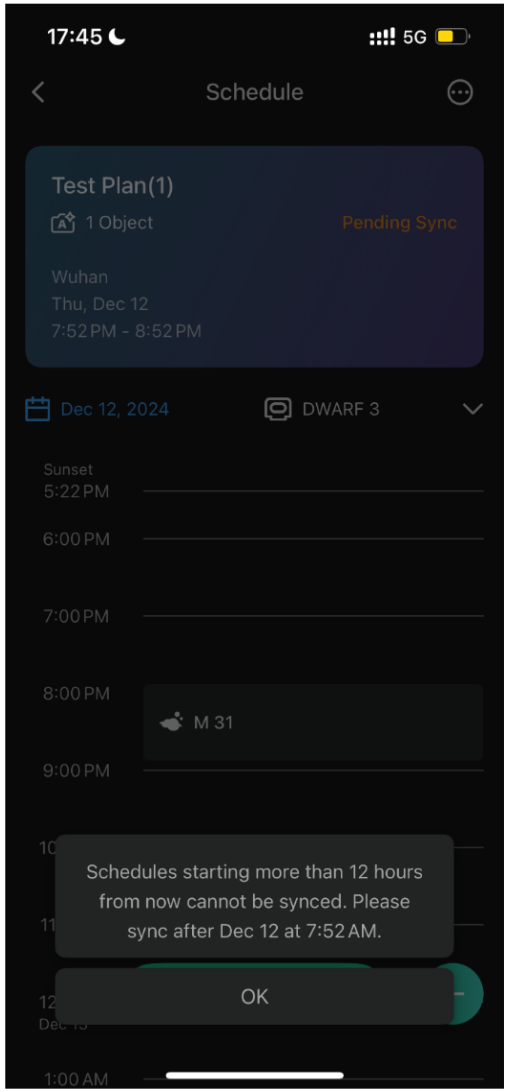
- Slide the time range below to set the shooting time.
- In schedule shooting it automatically set appropriate filters for some common targets, with other targets defaulting to astro filters.

- Click "**Shutter**" "**Gain**" "**Filter**" here to set the parameters.
- Maximum shutter time for Schedule Captures is **60S**.
- Due to various dynamic factors, the number of frames cannot be set manually. The system will automatically capture the maximum possible frames within the scheduled time.

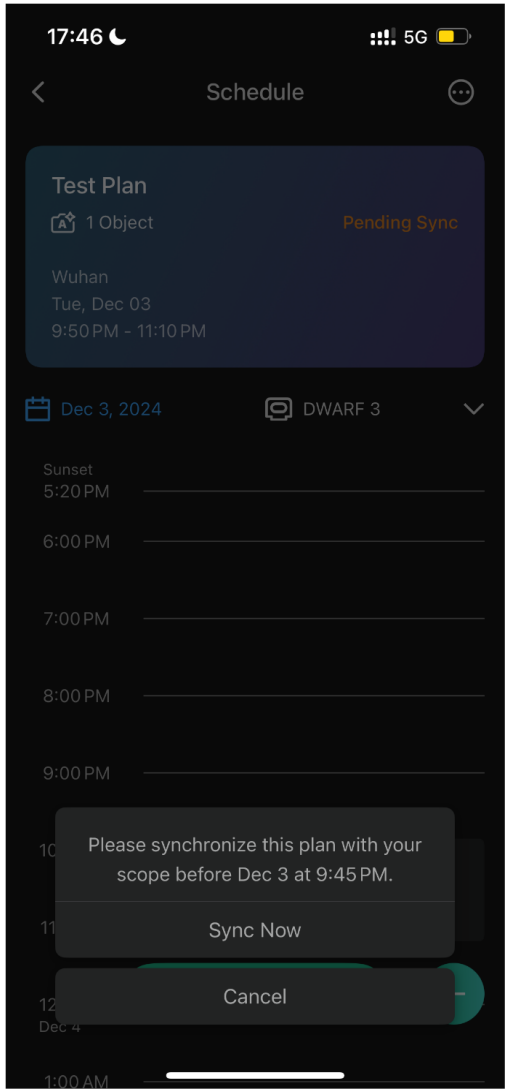


Dwarf 3 – Creating a Schedule Plan - Synchronizing

- You need to synchronize the configured shooting plan to the DWARF device. Due to the changing visibility of celestial objects, to ensure the plan is executed perfectly:
- Plans can only be synchronized for the same night.
- Synchronization is allowed up to 12 hours in advance and no later than 5 minutes before the plan starts.
- If the synchronization time has not yet arrived, you cannot sync the plan.

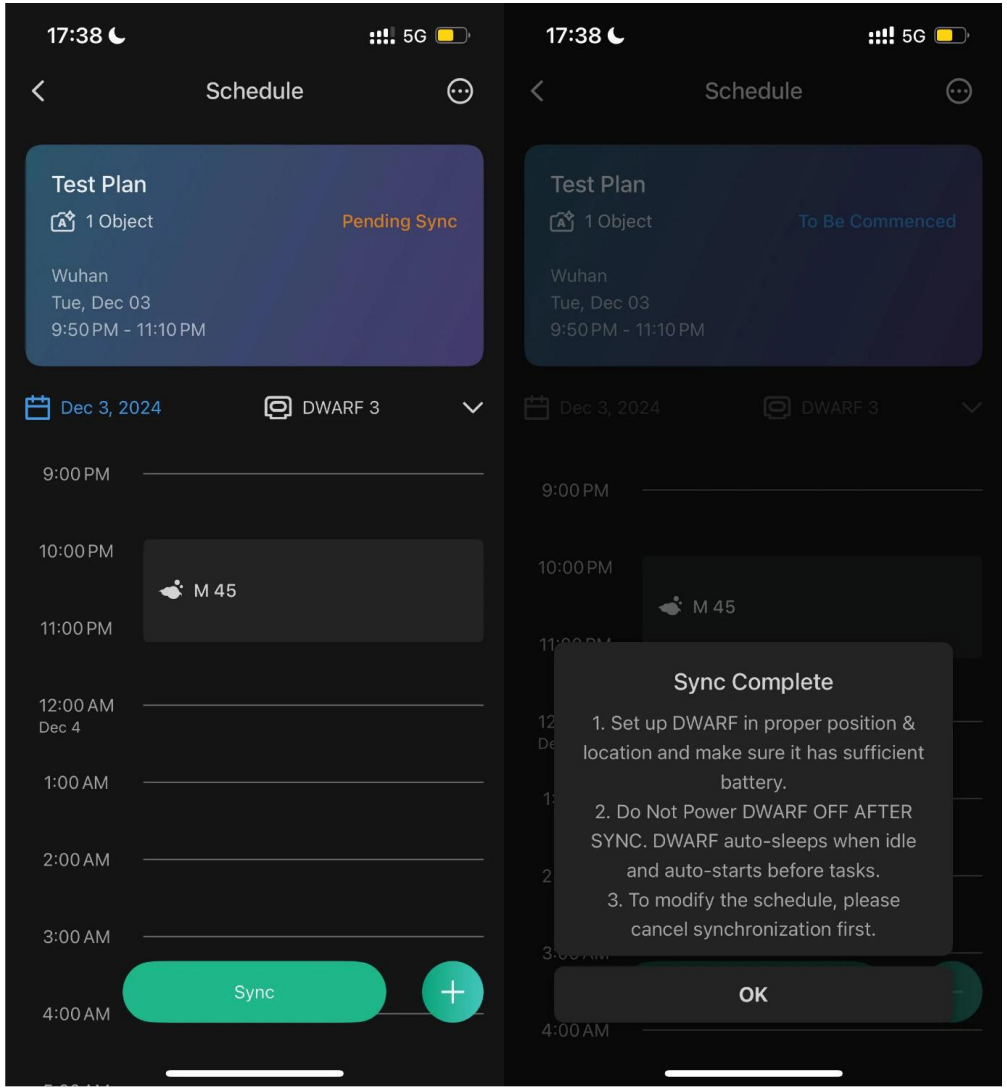


- Synchronization is **possible** within the **valid** timeframe.



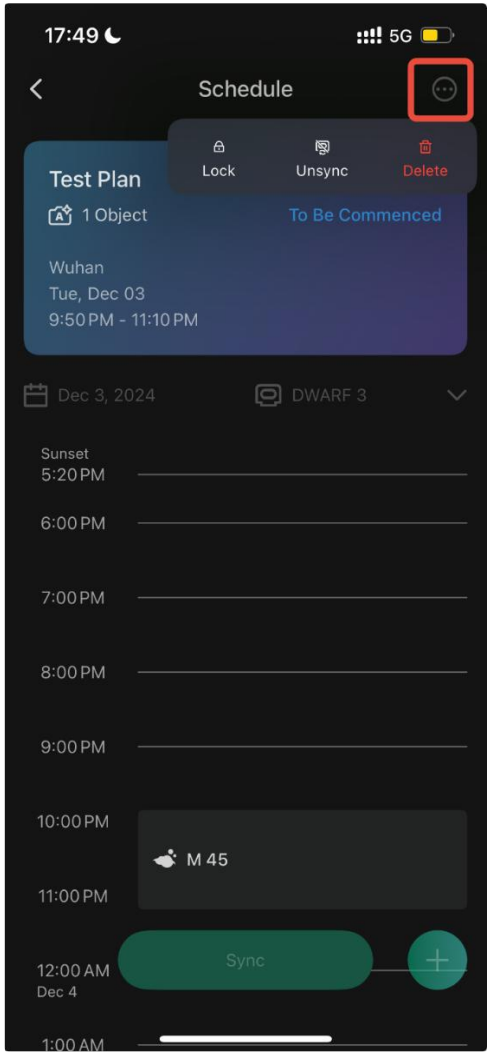
Dwarf 3 –Schedule Plan – Preparation for Shooting 1

- Once synchronization is complete, secure the following items are fulfilled:
- **Sufficient Power**: verify the DWARF device is fully charged.
- **Correct Placement**: Position the DWARF in the appropriate location.
- **Disconnect and Leave**: After all preparations are complete, disconnect your device and step away. DWARF will automatically enter sleep mode and wake up at the scheduled start time.
- **Do Not Power Off**: Ensure you do not hit the power off button.



Dwarf 3 –Schedule Plan – Preparation for Shooting 2

- Regarding **EQ Mode**: You can use EQ mode in Schedule Shooting to align the DWARF with the polar axis in advance. Also, you may turn off the ring light for better results.
- Regarding **Dark Frames**: Check the dark frame files before shooting to ensure there are corresponding frames available for stacking. If not, you can capture them now.

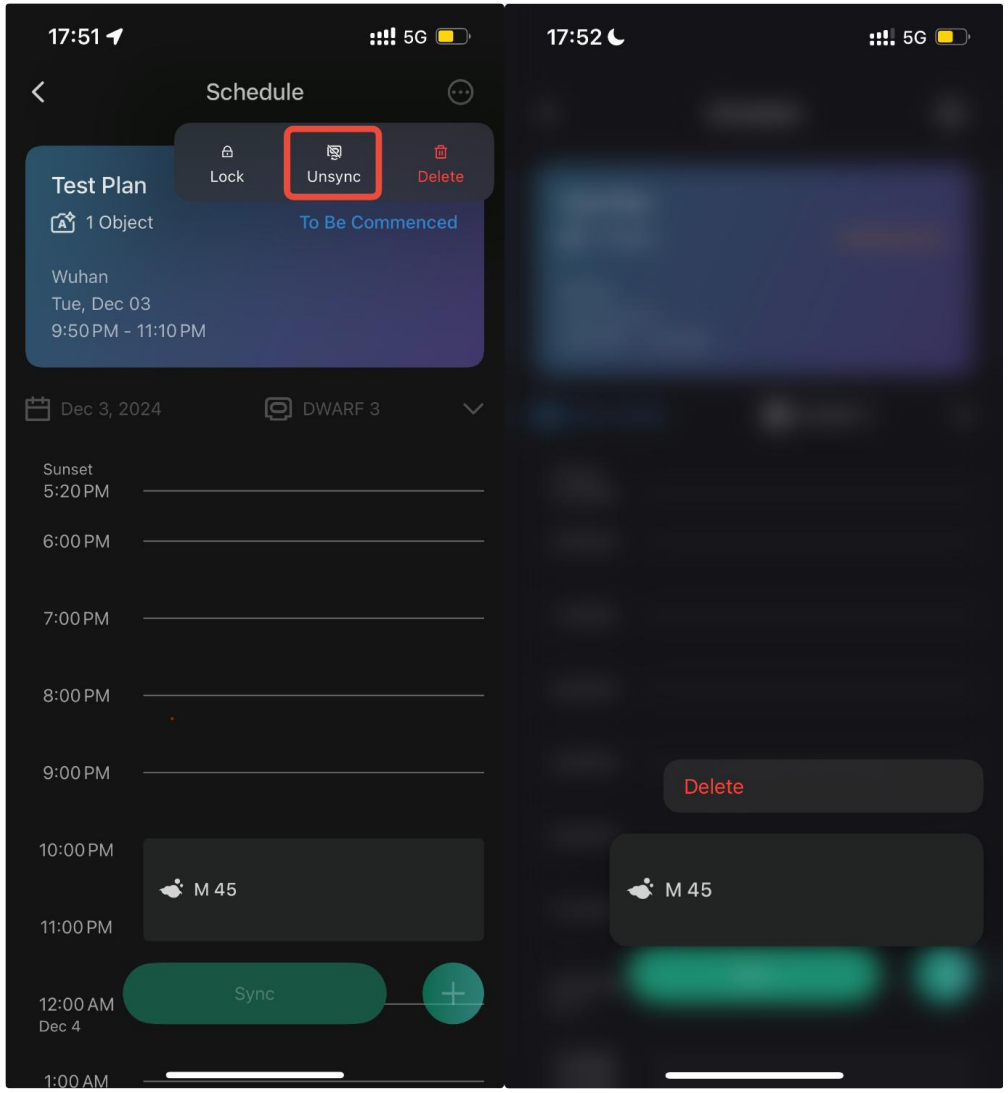


Dwarf 3 –Schedule Plan – Preparation for Shooting 3

- Do **Not** Power Off: DWARF will enter sleep mode after 15 minutes of inactivity when disconnected to save power. In sleep mode, the lens will retract automatically, and only the power indicator light will blink, consuming minimal power. DWARF in sleep mode is not completely powered off and will automatically wake up before the scheduled time. Do not press the power button, as DWARF will then forget the shooting plan and will not wake up at the scheduled time.
- **Unexpected Issues**:
  - If you accidentally **power off** the device after synchronizing the plan, please **power it back on**, **cancel** the synchronization,
  - DWARF in sleep mode **cannot** be woken up. If you need to use it in other sessions, manually turn it on and perform the desirable operations. Restarting will refresh DWARF’s schedule memory, so don’t forget to re-sync your shooting plan for the day.
  - DWARF will **not** enter sleep mode while charging. It will only enter sleep mode to save power once the charging stops.

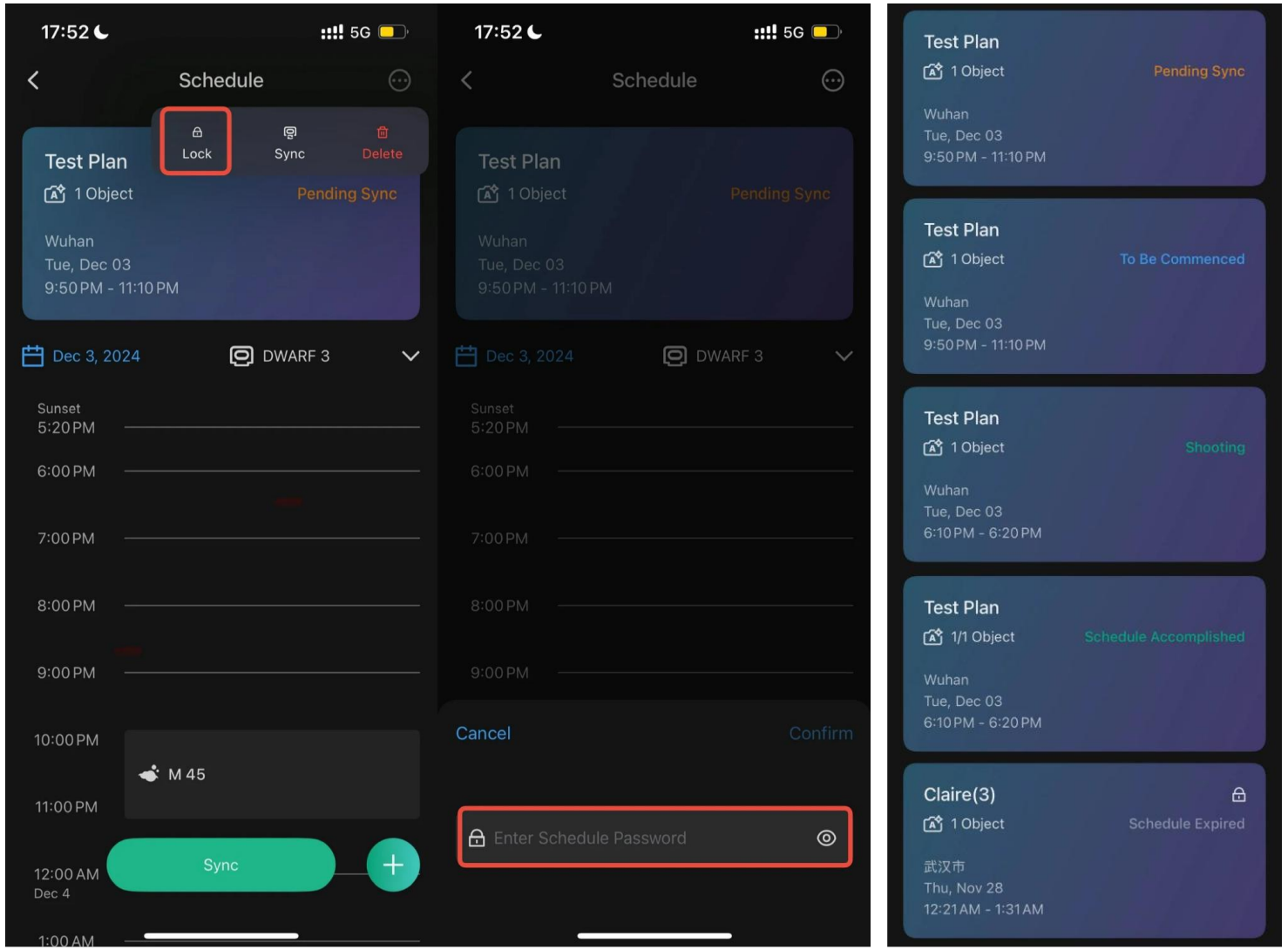
Dwarf 3 –Schedule Plan – Modifying the plan

- You can modify the plan at any time before it starts.
- To modify a plan, you must first cancel synchronization.
- You can add targets at any time. And a long press can delete the target.



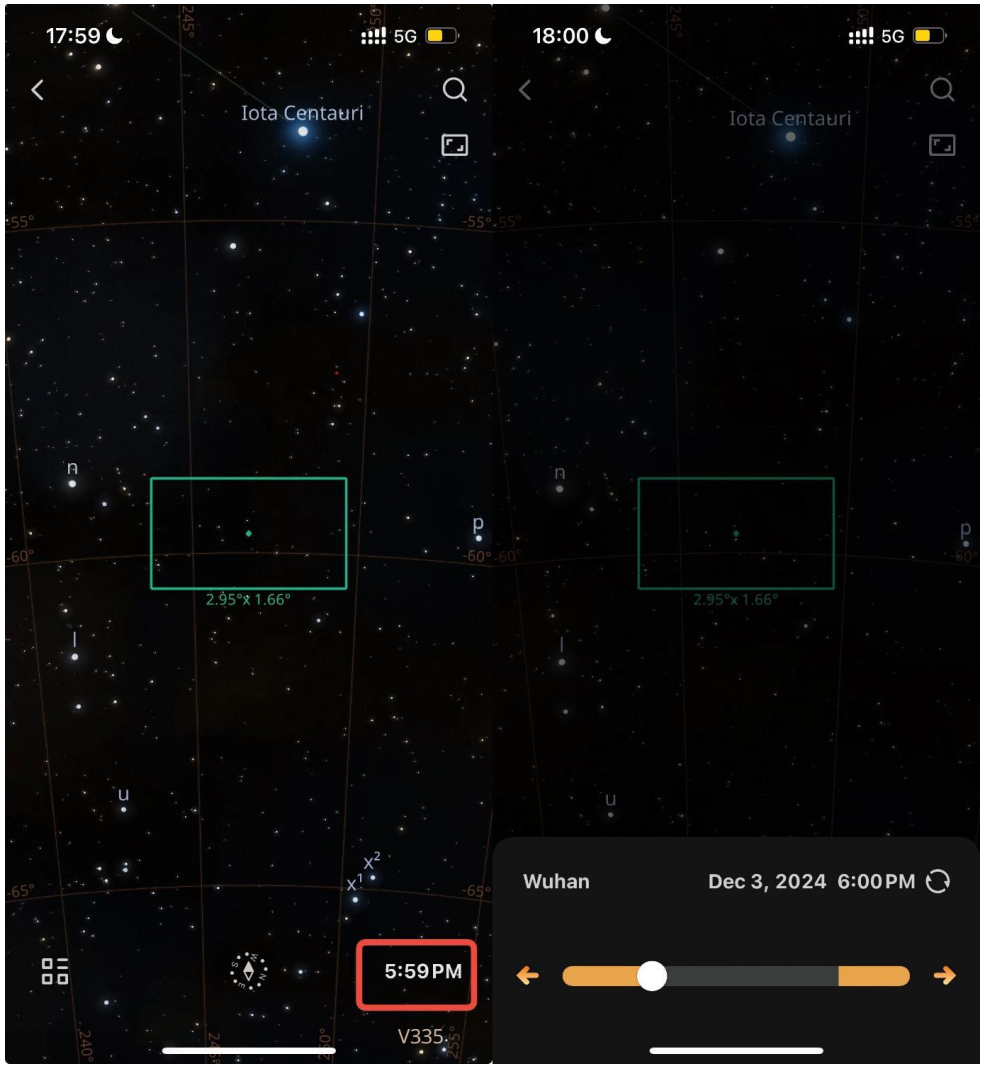
Dwarf 3 –Schedule Plan – Locking the plan

- (left) Locking a plan prevents it from being accidentally deleted.
- Plan Execution Status (right)
- Your shooting plan will have the following statuses:
- **Pending Synchronization**, **To Be Commenced**, **Shooting**, **Schedule Accomplished**, and **Schedule Expired**.
- You can connect to a DWARF at any time to check the plan's execution status. If you encounter a plan execution failure, please upload the log in Settings - Support to get assistance.



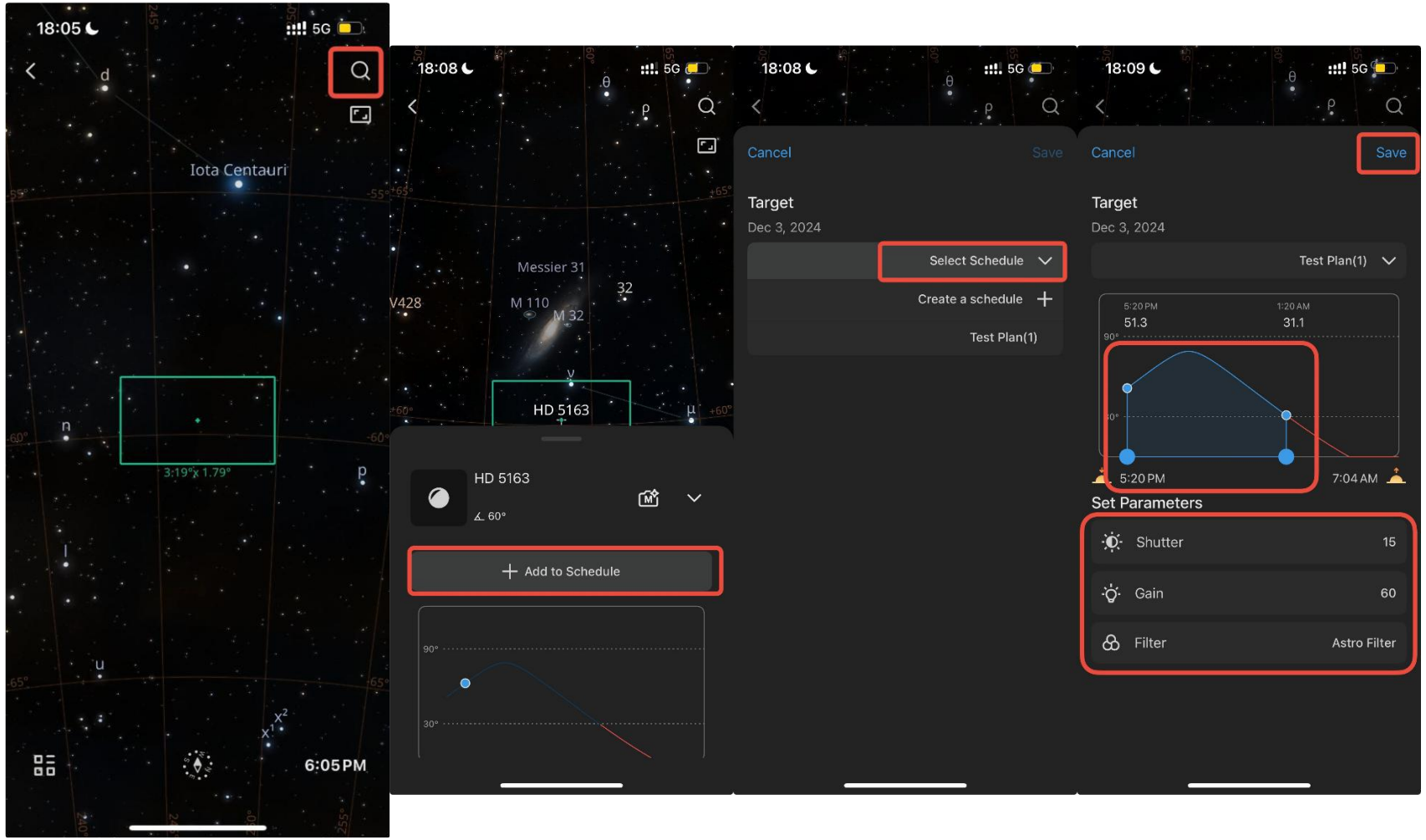
Dwarf 3 – Creating a Schedule Plan from Atlas 1

- From the Atlas, you can freely browse and click on a target to directly plan its shooting.
- To commence, you need to **Choose the Right Time**: click the time icon in the bottom-right corner.



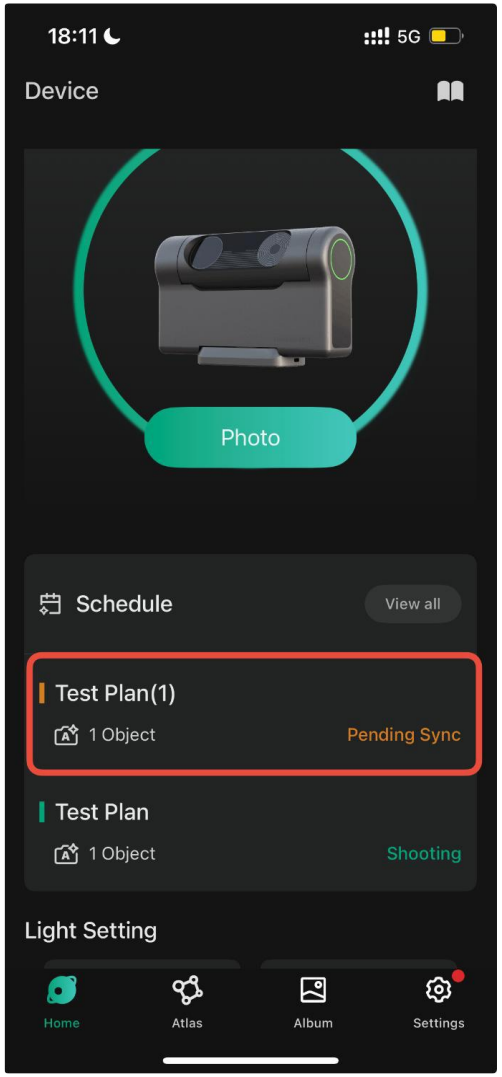
Dwarf 3 – Creating a Schedule Plan from Atlas 2

- **View Targets**: Click the top-right corner to view recommended targets or search for targets to see their visibility.
- **Select a Target**: Choose your desired target. Swipe the menu up to add it to the shooting plan.



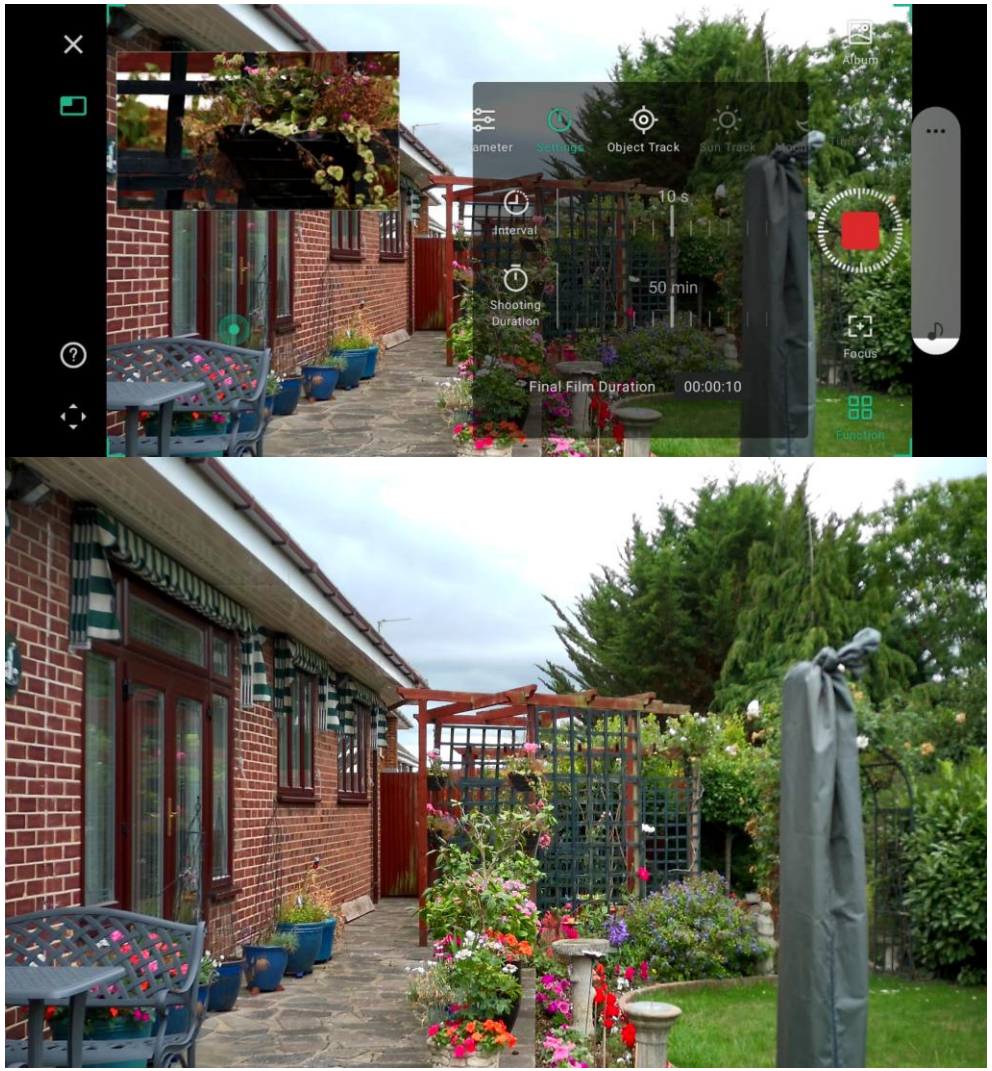
Dwarf 3 – Creating a Schedule Plan from Atlas 3

- Go back to the homepage to check your newly set shooting plan. All subsequent actions and precautions are listed in the previous section.
- With the Schedule Shooting feature, capturing stunning deep-sky objects has never been easier.
- Whether you’re planning a night-long astrophotography marathon or simply want to automate your stargazing experience, DWARF 3 ensures precision and convenience!



Dwarf 3 – Time Lapse Imaging

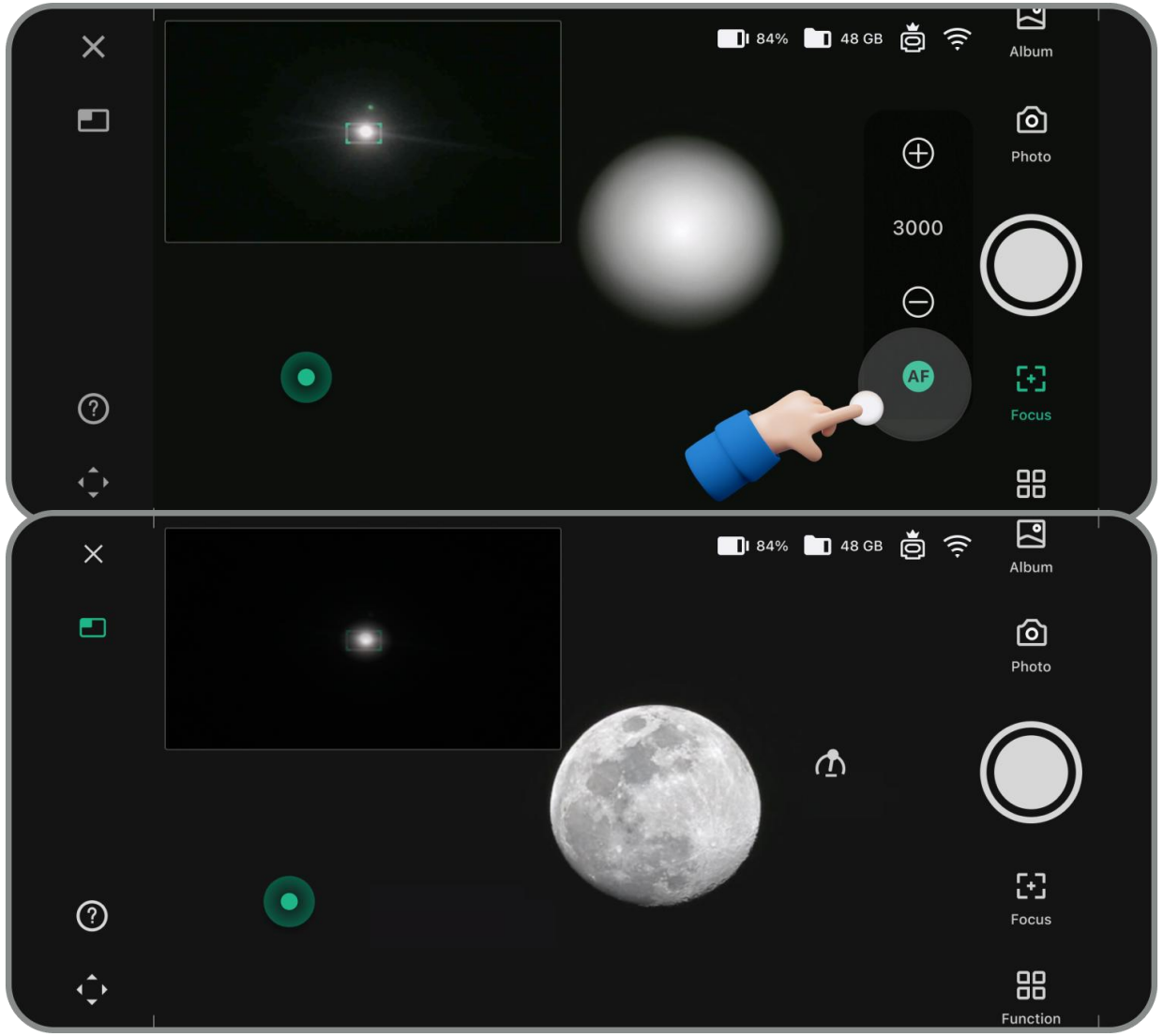
- Example wide angle timelapse taken on a very windy day to test stability of rig which was solid, and to experiment with settings.
- The settings for this was Images Interval at 10S Shooting Duration of 50 minutes (thus 300 images).
- Final video file duration is just under 10 seconds (i.e. 300 frames at 30fps).



Dwarf 3 - Telephoto Photography

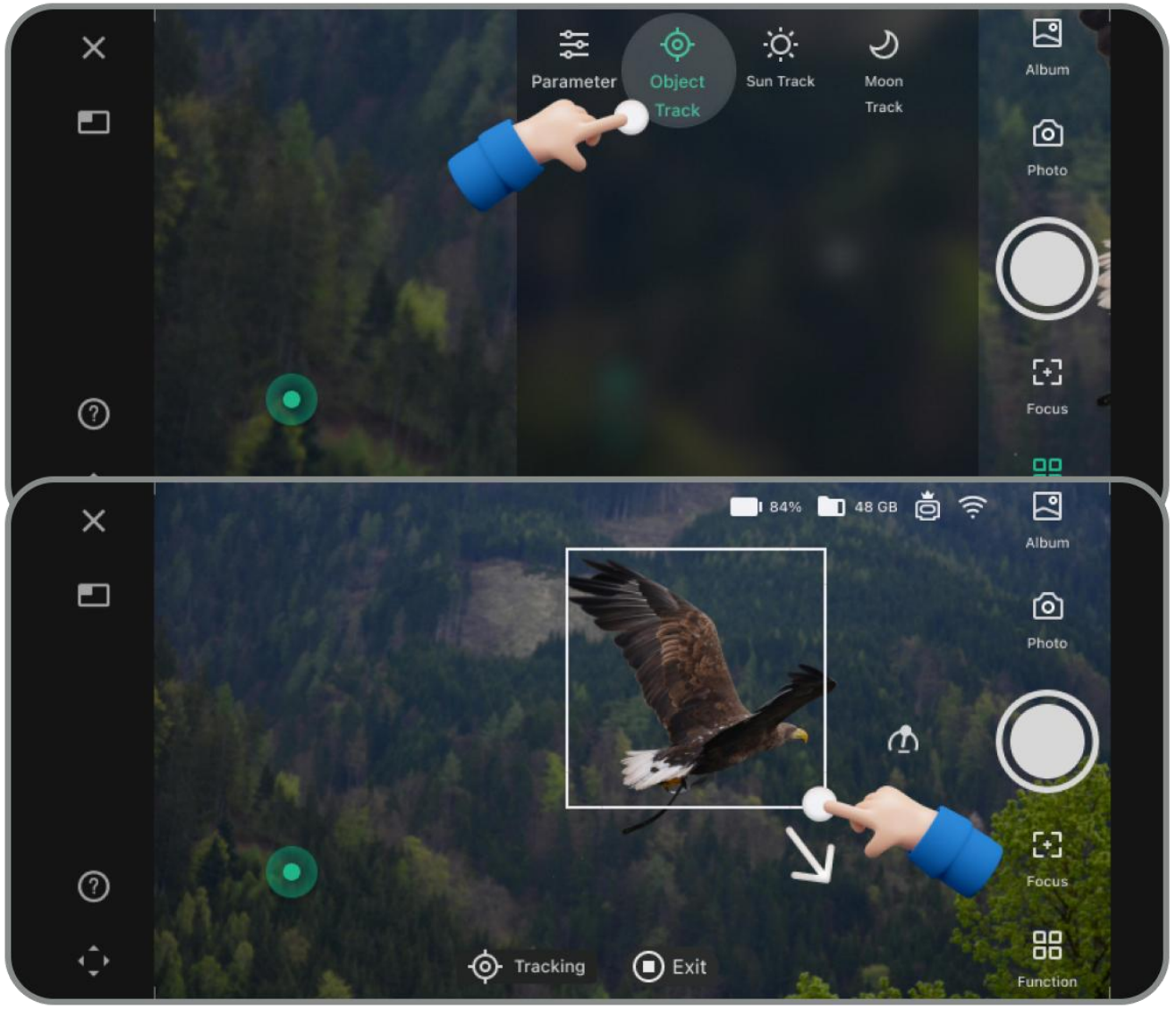
- **Target Locating**: Move the joystick or use dual-lenses locating to move the target to the centre of the wide-angle view.

- Focus, adjust settings, and shoot.



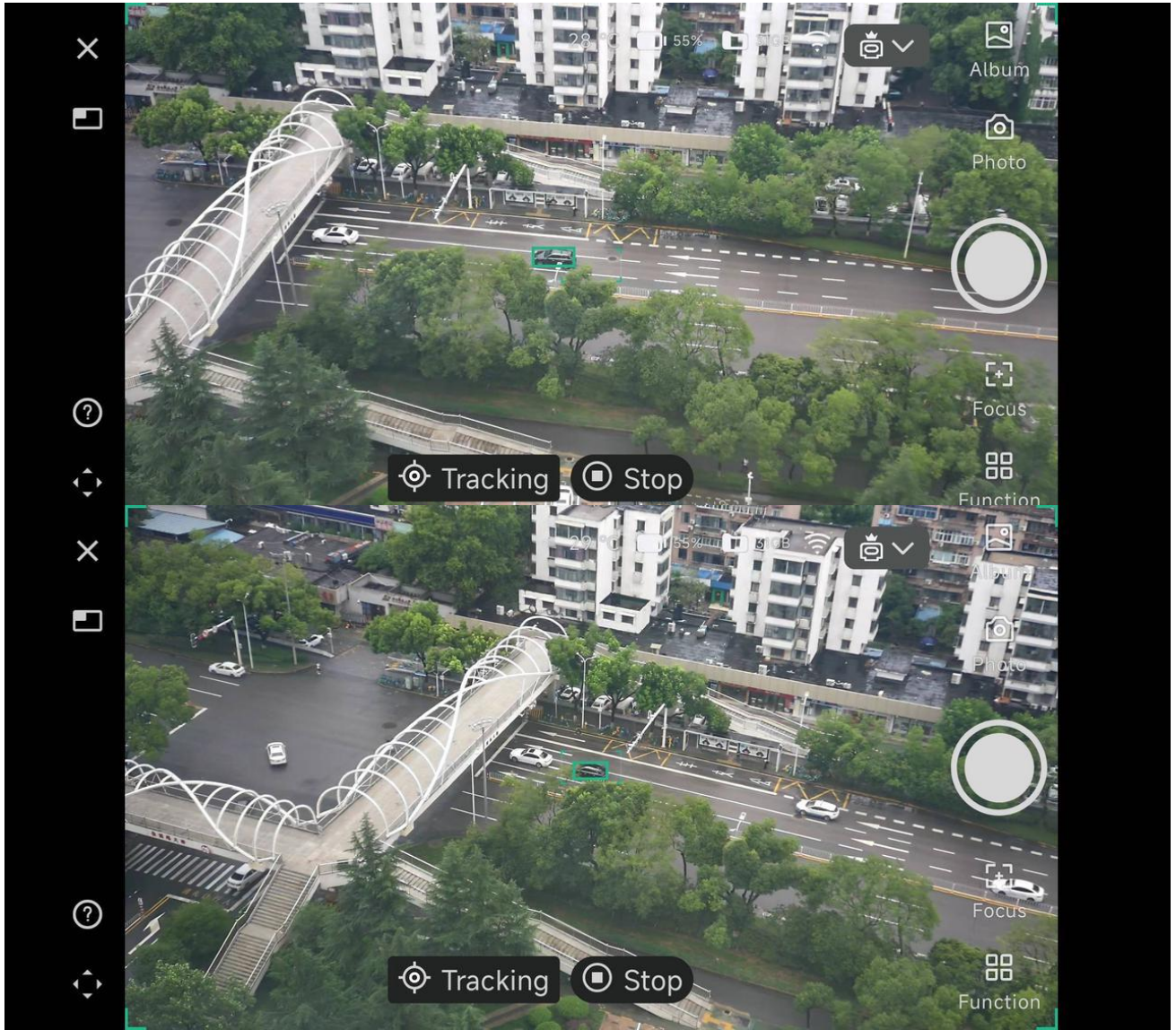
Dwarf 3 - Telephoto Photography

- **Object Tracking**
  - You can use **either the wide-angle or telephoto lens** to track an object now!
- Activate '**Function-Object Tracking**' and track the target by **tapping on it or dragging a box over it.**
- **For tele photo tracking:**
  - Move the joystick or use dual-lenses locating to move the target to the centre of the wide angle view.
  - Switch to the telephoto lens and focus (auto/manual).



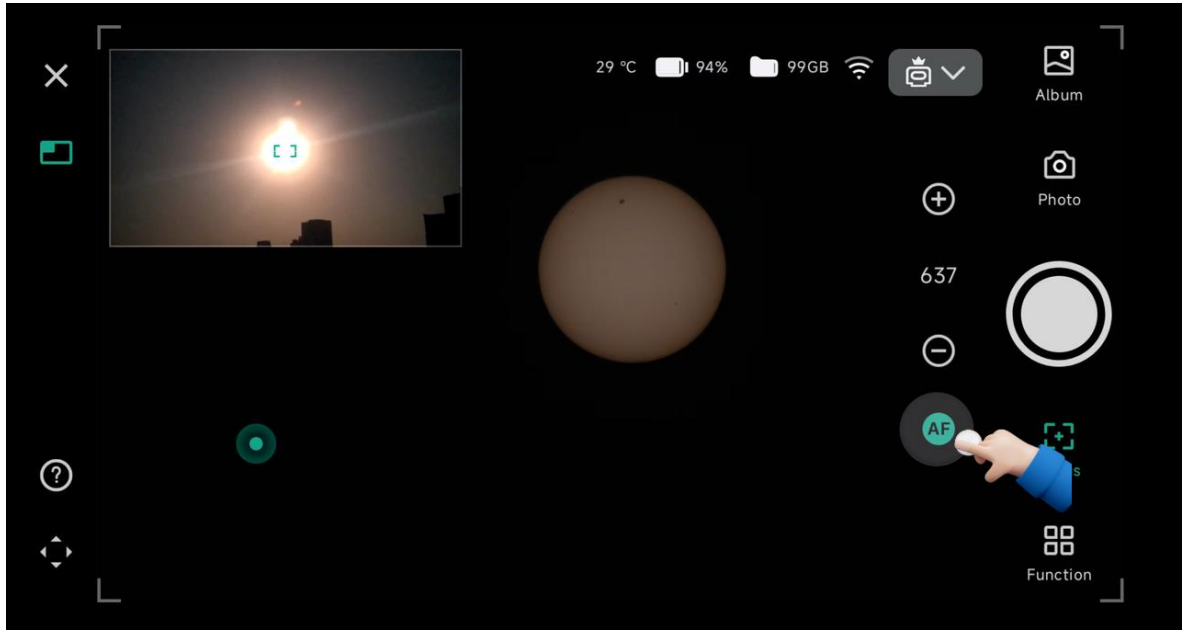
Dwarf 3 - Wide angle tracking

- Switch to the wide-angle view, enable tracking, tap to select your target, and start observing. You can switch shooting modes anytime to capture photos or videos in your preferred style!



Dwarf 3 – Sun tracking & Shooting 1

- Position your DWARF 3 **as level as possible** on a platform, table top or tripod. For this process, use **Alt/AZ** (normal shooting) to capture the Sun. If you attempt **EQ** (Polar Alignment), it may cause issues with tracking on this type of target and drift significantly.
- Place the provided **Neutral-Density (ND)** filter over your lens area to protect the sensor from blinding by sunlight before aiming at it.
- Make sure you are in "**Photo**" mode first. Manually (or electronically) move your device to point up and at the Sun - (use the Picture in Picture that displays the Wide-Angle to confirm it is in view).
- If you notice that the objects in the two views are not aligned, please point the telescope away from the sun, **remove the solar filter**, and then aim at a distant object (more than 5 meters away). Switch the **telephoto view to the main view**, and tap **Auto Focus**.



Dwarf 3 – Sun tracking & Shooting 2

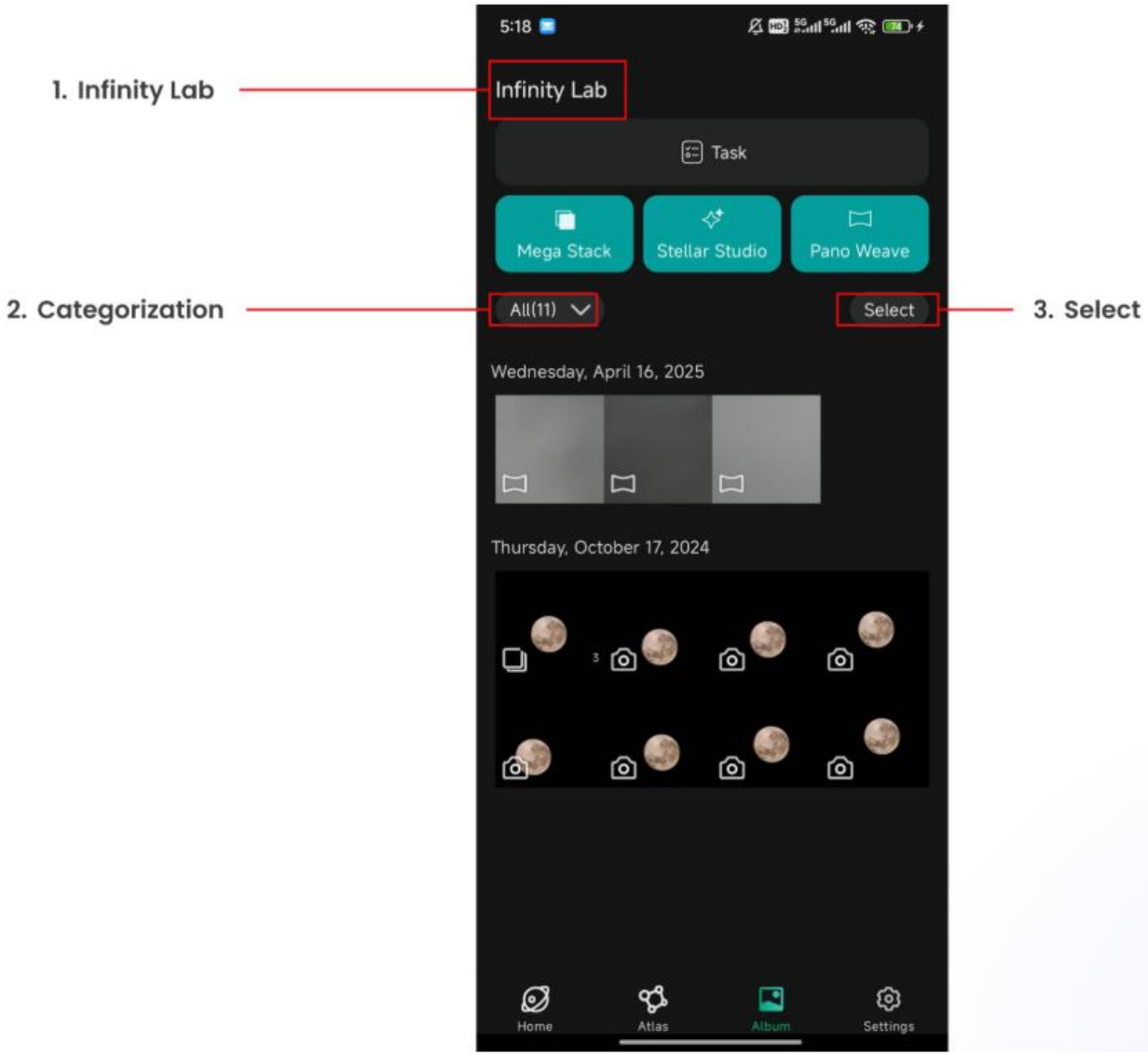
- Switch to the Tele-photo lens (if not selected already) and click Auto-Focus. DWARF 3 will automatically detect the sun and apply the best settings.
- When you have it in view and it appears focused, go to **Function** > select "**Sun Track**" - the device will ask if you're lined up, acknowledge it, then it will Auto-Scan for the Sun and start tracking it. (it may not be centered on your screen, this is ok. If you want it centered exactly, stop tracking, manually adjust your Dwarf 3 with the joystick, then Sun Track again.)
- You can take an Astro stack of the sun as well. If you want to create a stacked image that provides an additional uncompressed file for post processing, then select the **Photo** Icon, Mode Switch to **Astro**. It will still continue to TRACK when you change modes.

Dwarf 3 – Sun tracking & Shooting Caution

- It is suggested for your first time capture, change your number of images to 20 or 30 for your first session. You do have the option to select a max of 999, but that will take a long time and you run the risk of exposing your device to intense heat over a long duration.
- In tracking mode, the sun remains centered, allowing continuous observation or shooting videos/time-lapses/stacked photos after changing shooting mode to Photo/Video/Time-lapse/Astro.
- During auto-focus, the camera auto-adjusts parameters, typically at 1/250s-1/200s Exposure, Gain at 0, and VIS filter. Do adjust Hue and White Balance as preferred.
- Please note, due to the absence of calibration in this process, it is very important to keep the lens cylinder face to the front side **(DWARFLAB Logo)** while tracking the sun and moon.
- Please monitor the internal temperature reading while imaging the Sun. The recommended operating temperature range for the sensor is below **60°C (140°F)**. Charging is automatically disabled when the battery temperature **exceeds 45°C (113°F)** to prevent further heat buildup. If the internal temperature reaches **60°C (140°F)**, the Dwarf 3 will automatically **shut down** to protect the system and its sensors.

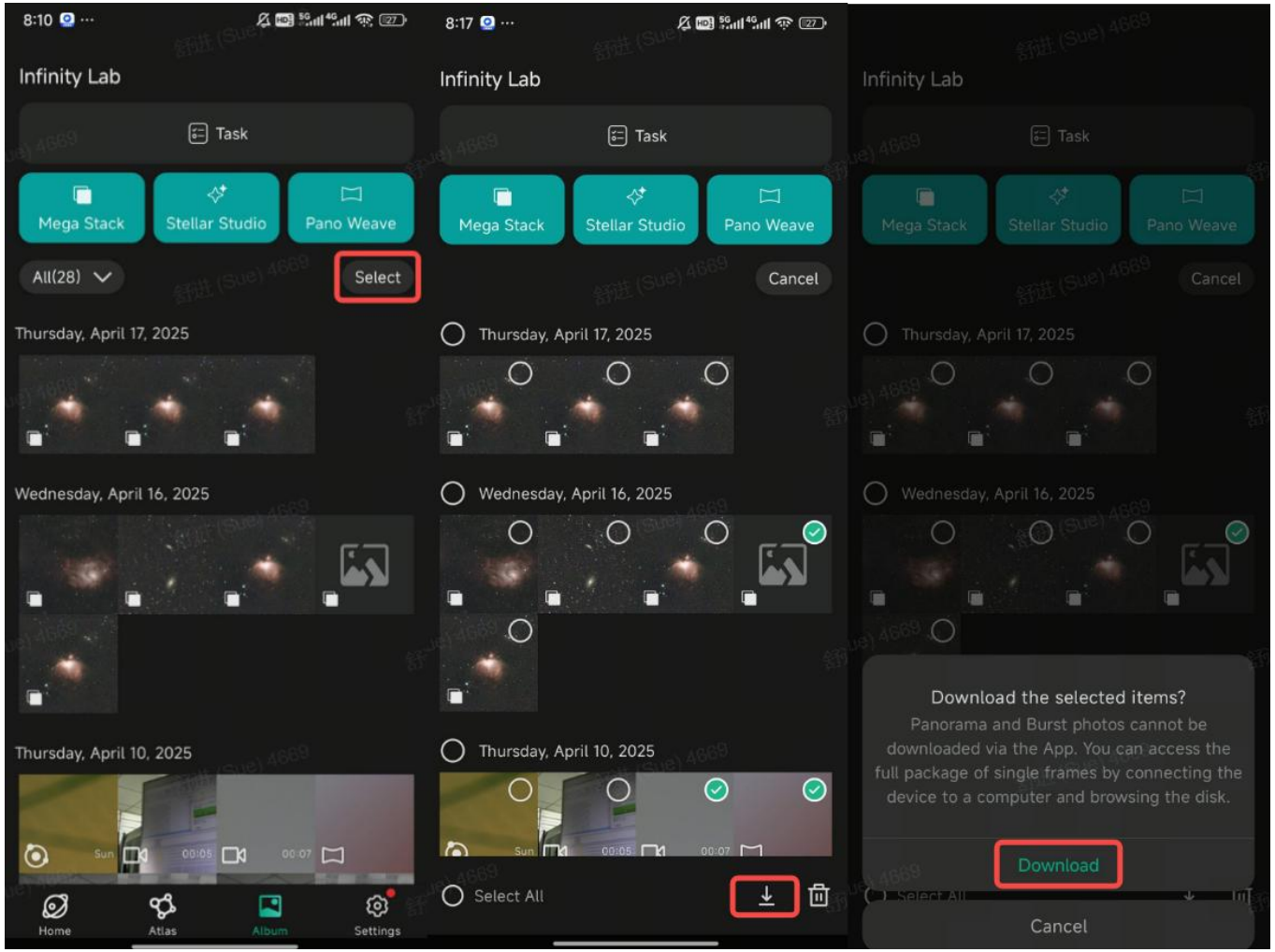
Dwarf 3 – Album 1

- The photos in the album are categorized and displayed in chronological order, with the date and time of the photo indicated. For photos taken in different modes, different icons are displayed in the corners.
- In the topmost part of the album, you can find the Infinity Lab. This feature includes **Mega Stack, Stellar Studio, and Pano Weave** — three powerful tools that let you process your captured images in amazing ways. It’s like magic for your photos!



Dwarf 3 – Album 2

- If the network conditions are poor, loading photos might take a few seconds, and videos may also require some time to be refreshed.
- When you delete your photos in the **Album**, files in your Dwarf's **storage** are also **wiped**.
- Deleting a certain Astro/Panorama/Burst photo will result in deleting **the whole package** under it, i.e. all the single frames of the stacked Astro photo or all panorama puzzles.

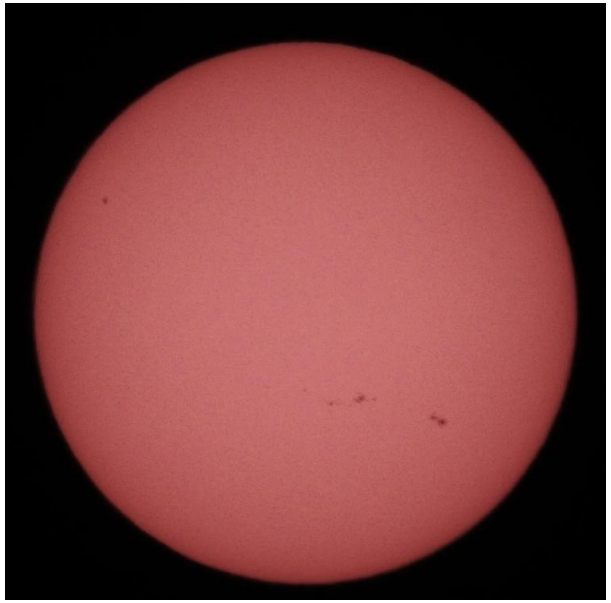


Dwarf 3 – Using Mega Stack for Astronomy Images

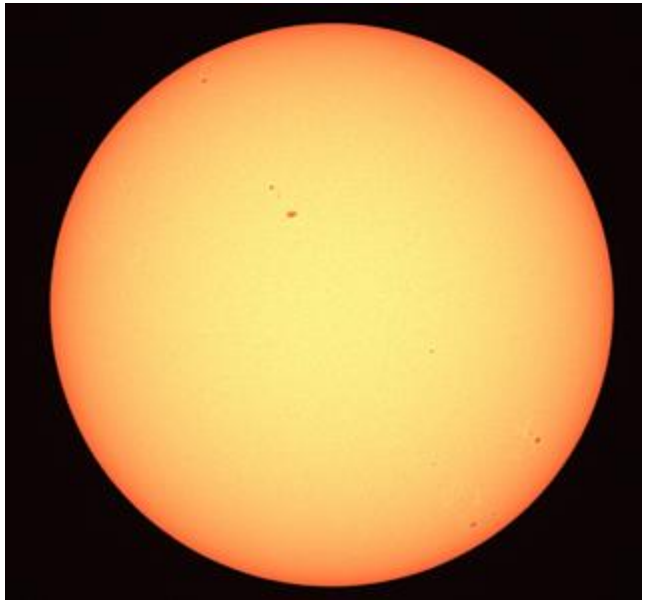
- If you have captured multiple stacked images of the same DSO object you can use Mega Stack to combine them into a single stacked file.
  - The only exception to this if darks and parameter settings have changed.
- The Mega Stacked file can be further processed using the Stellar Studio facility.
- You have options to download as a .JPG, .PNG and .FITS file.

Dwarf 3 – George's Images 1

Sun 10/6/25



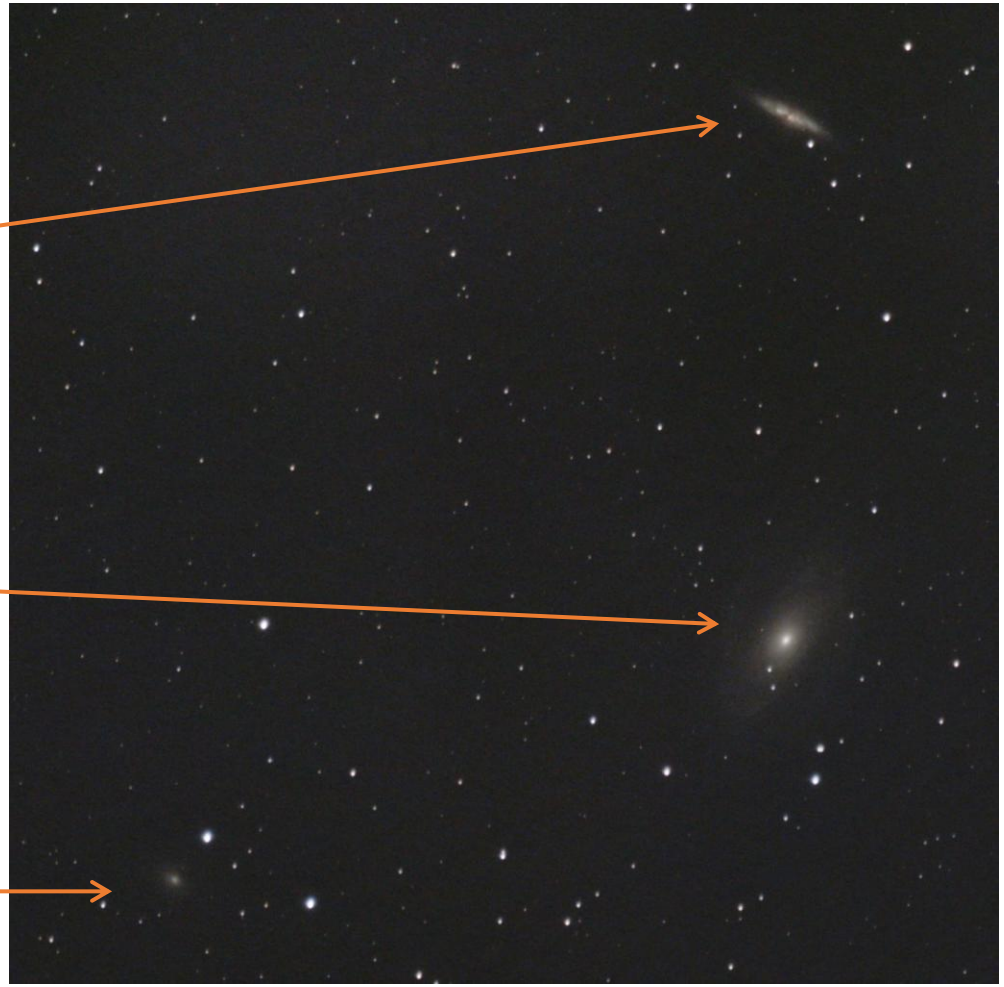
Sun 28/6/25



Moon 2/7/25

Dwarf 3 – George's Images 2

- M81 group in Ursa Major taken 28/6/25
  - 15s, Gain 60 Astro filter only 25 subs.
- M82 Cigar Galaxy
- M81 Bodes Galaxy
- NGC3077 Garland Galaxy



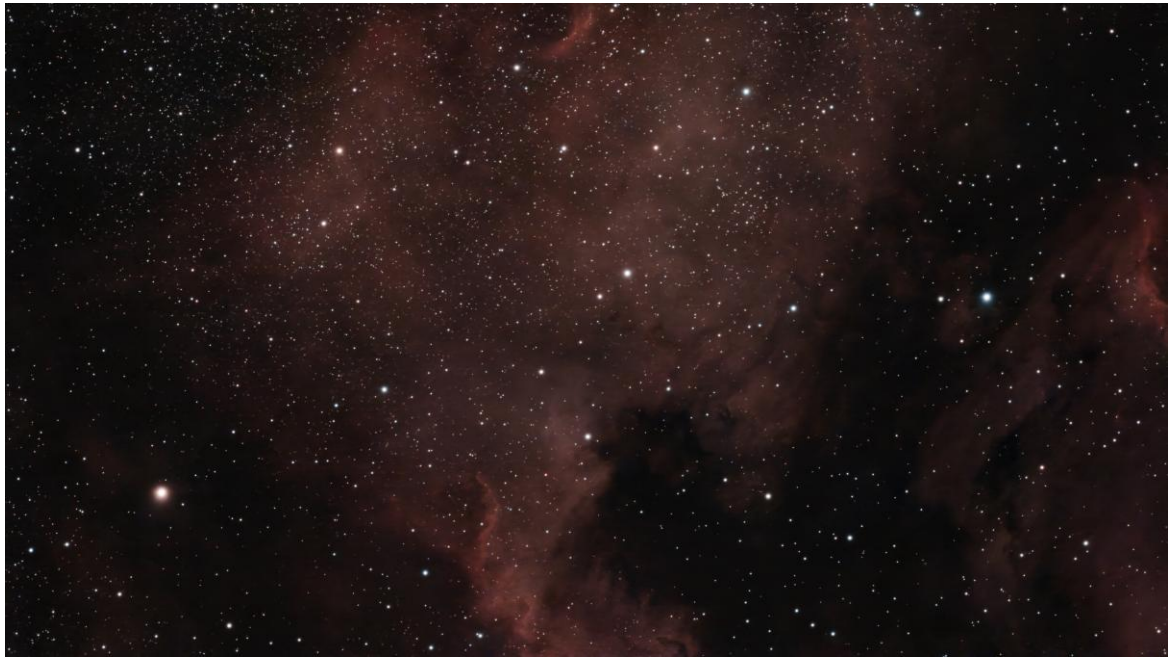
Dwarf 3 – George's Images 3

C20 – North America Nebula 29/6/25 with Auto settings for image at Exposure 15S Gain 60 Filter Astro of 39 subs, tweaked in GIMP (left), with Starless version from same data set from Dwarf 3.

Dwarf 3 – George's Images 4

C20 – North America Nebula with Auto settings for image at Exposure 15S Gain 60 Duo Band Filter, **Mega Stacked** (left) and then processed in **Stellar Studio** only (right) from three sets of data taken on:

29/6/25 – two captures with 39 subs and 2/8/25 – one capture with 194 subs, Total stacked subs = 233

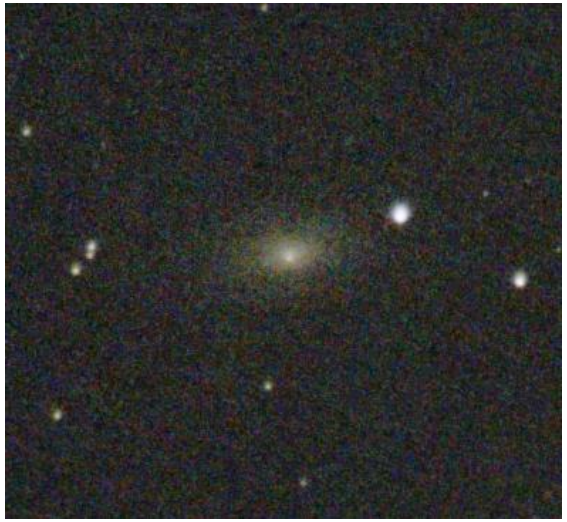


Dwarf 3 – George's Images 5

M51

120 subs

M63



35 subs

M94

20 subs

M106

21 subs

taken 30/6/25, Auto settings for all images at Exposure 15S Gain 60 Filter Astro

Dwarf 3 – George's Images 6

M51 – Whirlpool Galaxy **Mega Stacked** from two sets of data (centre) and then processed in **Stellar Studio** only (right) taken on:

- 30/6/25 – (left) Auto settings for all images at Exp 15S Gain 60 Filter Astro, 23 subs.
- 2/8/25 – Manual setting at Exp 60S Gain 60 Filter Astro, 120 subs, stacked subs = 143.

30/6/25

2/8/25 Mega Stacked

2/8/25 Stellar Studio

Dwarf 3 – George's Images 7

These are from a **4 object Schedule** taken over 9-10/8/25 all processed in **Stellar Studio** then cropped.

- M101 – Pinwheel Galaxy, Exp 15S Gain 60 Filter Astro, 163 subs.
- NGC 281 – Pacman Nebula, Exp 15S Gain 60 Filter Duo Band, 197 subs.
- M31 – Andromeda Galaxy, Exp 15S Gain 60 Filter Astro, 198 subs.
- M33 – Triangulum Galaxy, Exp 15S Gain 60 Filter Astro, 194 subs.

M101, mag 7.9, 20.87 Mly

NGC 281, mag 7.4, 9.5 ly

M31, mag 3.1, 2.54 Mly

M33, mag 5.7, 2.73 Mly

Dwarf 3 – George's Images 8

These are from images captured on 1/9/25:

- A manual capture of NGC6802 and Brocchi's Cluster(Coathanger asterism), Exp 15S Gain 60 Filter Astro, 25 subs.
- Then a **2 object Schedule** taken with Exp 30S Gain 60 then mega stacked with the same images taken on 9/8/25 all processed in **Stellar Studio** then cropped.
- NGC 281 – Pacman Nebula, Filter Duo Band, 295 subs.
- M31 – Andromeda Galaxy, Filter Astro, 306 subs.

NGC 6802 & Coathanger, mag 8.8, 3700ly

NGC 281, mag 7.4, 9.5 ly

M31, mag 3.1, 2.54 Mly

Dwarf 3 – George's Images 9

Top: Moon taken on 10/8/25 at 03:57

- Exp 1/200S, Gain 20, Filter Vis, 20 stacked subs
- This was after the four-object schedule and when the battery level on the Dwarf 3 was down to 14%.

Bottom: Moon taken on 1/9/25 at 21:35

- Exp 1/100S, Gain 2, Filter Vis, 20 stacked subs

Dwarf 3 – George's Images 10

Moon taken on 7/9/25 during Total Lunar eclipse event but only after clearing most of the clouds

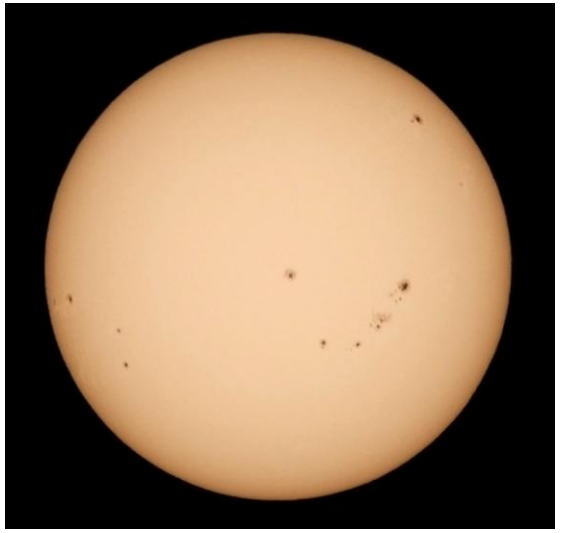
- Top: at 20:38 BST Exp 1/10S, Gain 0, Filter Astro, 26 stacked subs poor focussing due to clouds

- Bottom: at 20:50 BST Exp 1/10S, Gain 0, Filter Astro, 20 stacked subs, only slightly better focussing

Dwarf 3 – George's Images 11

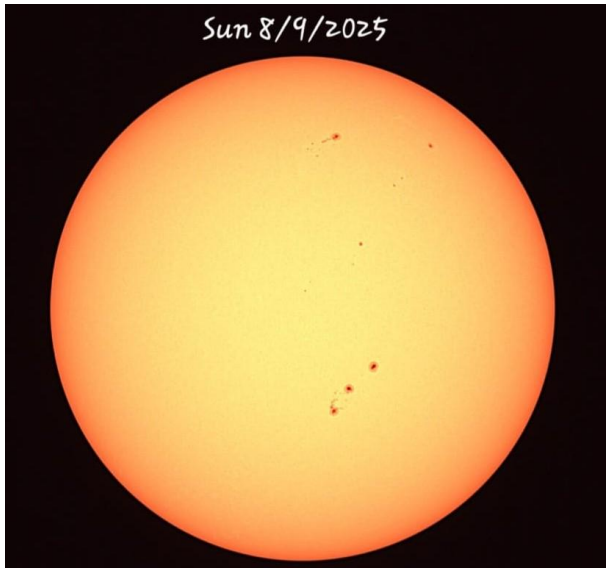
- Top taken on 10/8/25 at 15:18.
- Single image tweaked on Samsung phone. Exp 1/1000S ISO 107, F4.3.
- Unit temperature got up to 59C.

- Bottom taken on 31/8/25 at 11:46 in a very short break between clouds.
- Single image cropped in MS Photos. Exp 1/250S ISO 107, F4.3.
- Unit temperature got up to 30C.



Dwarf 3 – George's Images 12

- Sun taken on 8/9/25.
- 386 images with Exp 1/1000S, Gain 0, Vis Filter.
- Mega Stacked then cropped in MS Photos.
- Unit temperature got up to 38C.



Dwarf 3 – George’s Images 13

Auto capture of pigeon on power line on windy day 19/8/2025

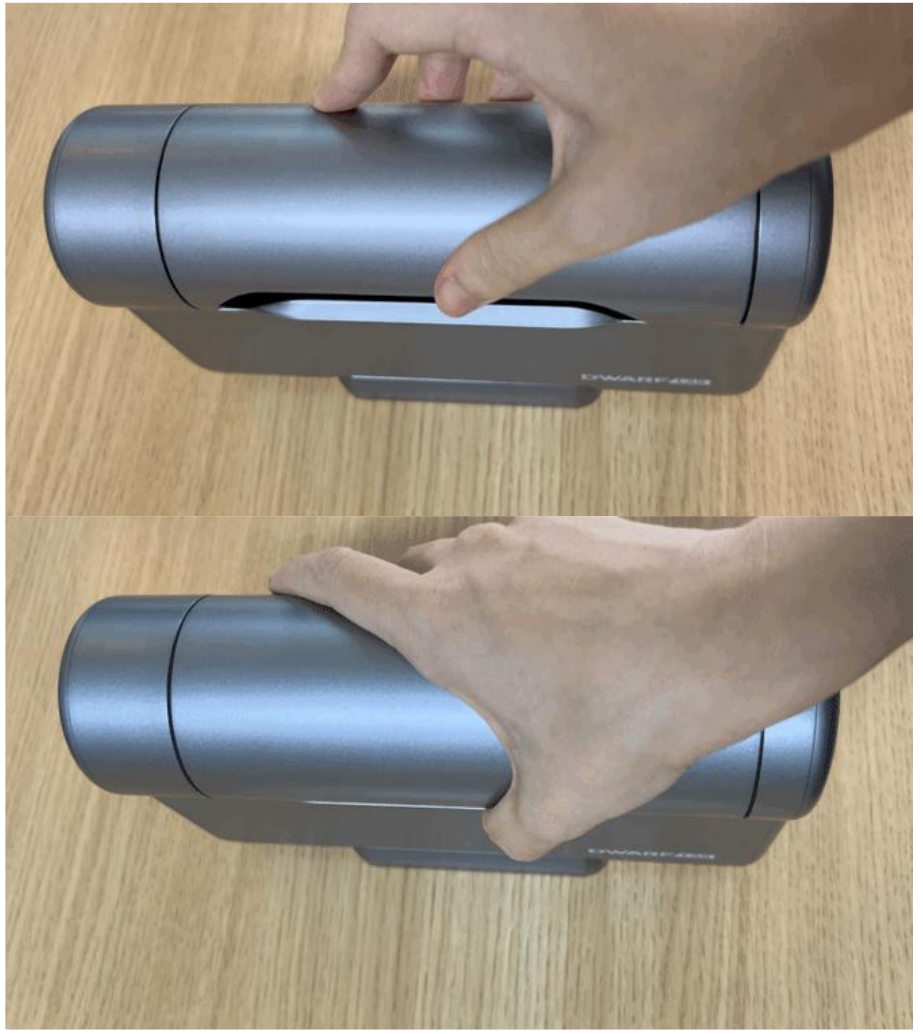
Dwarf 3 – Powering Off

- There are two Methods to **Power Off** the Dwarf 3**:**

1. Long press the power button, or
2. Once the App has been set up you can shut down the Dwarf 3 from the menu using **Settings**, **My Device**, **Shut Down** and confirm.

Dwarf 3 – Closing the Lens Assembly

- After shutting powering off or shutting down the lens may not be in the closed position.
- Simply turn the lens down into the closed position, this will not damage the unit.
- If the top part was not aligned with the bottom part, it can be safely rotated to align.
- You can’t manually move the lens assembly whilst taking images due to tracking in progress.



Dwarf 3 – System Documentation to Download

- Comprehensive User Manuals:
  - __GLH_Dwarf3___Checklist.xlsm
  - __GLH_Dwarf3__UserManual_20250310.pdf
  - __GLH_Dwarf3__UserManual_EDITED_20250312.pdf
  - __GLH_Dwarf3__UserManual_EDITED_ForCheatSheets.pdf
  - DWARF LAB Software & Firmware 3Mar25.docx
- Imaging Guides:
  - __GLH_Dwarf3_LunarEclipse_202503_20250310.pdf
  - Work Flow to Capture and Process Lunar Mineral Moon Images.docx
  - Work Flow to Capture and Process Solar Images With DWARF LAB.docx

Dwarf 3 – Additional Documentation

Excellent Documents supplied by J B Cox for Dwarf Users:

ASTRO CALCULATORS-57c9e8ee-a238-43ab-a6aa-3ff9dfac9e88.xlsx	MESSIER & CALDWELL_FIELD GUIDE-79ffc1ec-298c-4ae8-8bd9-719c0b6f857b.pdf
Astro Processing_FLOWCHARTS-301cb4a7-c27d-4918-9a13-9a39c62b2e6d.pdf	MESSIER_Objects-347c8f7d-5cd2-4795-bc23-09a8a292a543.xlsm
Astro Processing_WORKFLOW-24d4a685-0f25-45ff-82d5-28c0b8d61d3b.pdf	MOON PHASE CALENDAR-ee83f3ff-f04c-43eb-ae5a-88e0ff6613d8.xlsx
BARNARD_FIELD GUIDE-fc9f151a-76dc-414e-88af-f86f94f54ba0.pdf	OBJECT_REFERENCE-TABLES-59de73c3-51f0-41a0-a5a9-417b608d17f2.xlsx
CALCULATE AU v2-665d4e45-167e-4e25-82b0-661a77c0be41.xlsx	OBJECT_REFERENCE-TABLES-PDF-86b2a435-ebde-4d7b-813b-5be12da8901c.pdf
CALDWELL_Objects-a8eed308-4a10-4e50-9a1b-ba6dfefbfa18.xlsx	SEASONAL SUMMER_GUIDE-30e363f4-098c-4d50-b89c-54064a11592a.pdf
CONSTELLATION CATALOGUE Revised Submission-d4621a0a-9ff3-4e34-a05a-5a46968003b3.docx	SHARPLESS_FIELD GUIDE-ab79ef0b-0839-40c5-8784-111dfdca6d0e.pdf
CONSTELLATION CATALOGUE v.1.2_2025-05-20-61c0841f-89bc-4c53-9eb5-07a88dbc5229.xlsx	TRANSITIONAL How to Open the File-4019a08b-7db0-4577-9169-6cebf4f02ea6.docx
D2 & 3 Target Schedule-231d97a5-5a95-4199-a6f9-66a94a507b3c.xlsx	TRANSITIONAL OBJECTS v.1.0_2025-05-28-0663c36c-6318-48e7-bed9-b12c887dc911.xlsm

Dwarf 3 - Support and Social Media

- For support, contact: **support@dwarflab.com**
- Facebook Group pages for advice and sharing include:
  - **Dwarf Lab 3 Unprocessed Astrophotography**
  - **DWARF 3 Smart Telescope User Community (Official DWARFLAB Group)**
  - **DWARF 2 / DWARF 3 - BETA Testing - User Community (Official DWARFLAB Group)**

Dwarf 3 – Personal Observations - Positives

- The App and unit are fairly intuitive to use. Portability is excellent.
- The variety of shooting modes for daylight and nighttime makes it a versatile unit.
- Polar Alignment and use of “**Be more precise**” option with the EQ tool and plate solving was easy to use and quite quick to complete to get properly set up for equatorial mode tracked imaging. Must properly level the unit on the mount!
- Object selection (e.g. Sun and Moon) and then focussing and tracking the object is quick to achieve.
- Ability to view Image development as images captured and stacking progresses is good.
- Ability to set up scheduled plans is a great feature.
- Completed a manual stacked image after a long schedule and battery at 14%.
- DwarfLab support has been excellent and responsive to user input. Regular bug fixes and improvements in firmware and App to constantly improve features.

Dwarf 3 – Personal Observations – Negatives 1

- Some manual settings can be tricky:
  - Joystick movement on higher rates can lead to chasing object around the screen so found the up/down/left/right mode more manageable.
  - Manual setting of properties for Astro imaging
  - Need to check settings as required if changing from Auto to Manual as I found that in some cases the Exposure, Gain and filter changed causing over exposure and thus Auto focus did not always achieve a clean focus so the built in manual controls to fine tune were essential.
- Unit gets very hot when taking Solar images and in the hot weather the unit shuts down to protect itself from damage.
- Focussing to auto capture Birds or UFOs was awkward, needing time to auto focus on the object before capturing. Needs some practice to get it right.
- Initial problems of being unable to use Stellar Studio were quickly resolved by DwarfLab support by sending me a Beta Trial Firmware and App. When either of these change it appears that you have to log in again to use Stellar Studio and sometimes need to reset the wifi settings and download sky atlas all over again.
- However, Serious issues with Google Playstore to get update to latest live App version only resolved when DwarfLab again sent link to latest App .APK file.

Dwarf 3 – Overall Conclusion

- This is a fantastic versatile unit with many excellent features and more development being planned, many from user suggestions.
- There are some issues but much of that is due to the learning curve needed to develop skill in using the device and none that have not been able to be resolved.
- Am I happy with the purchase and use so far – ABSOLUTELY!
- Would I recommend people to buy it – ABSOLUTELY!


End of Presentation