East Valley Astronomy Club (EVAC)

Imaging Kit Instructions

Introduction

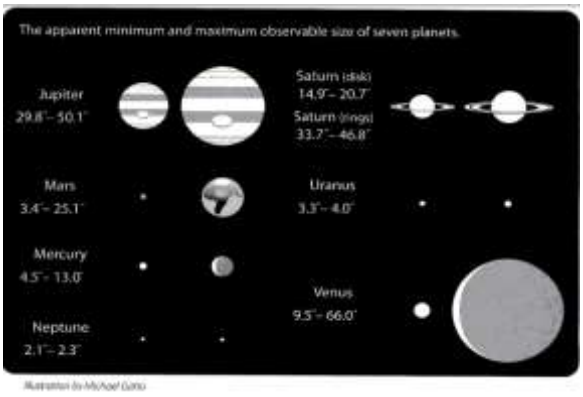
This imaging kit contains all the hardware(except for the telescope) and software you need to experiment with astrophotography. The kit is ideal for photographing the planets and the moon and might be able to be used on a few bright deep sky objects. The primary components of the kit include a camera (QHY 5-11c), a Laptop computer, Flip Mirror, 12mm illuminated reticle and associated cables. The laptop computer contains all the software needed to capture and process the images/video captured to produce a final image.

NOTE: All date will be wiped from this computer when returned, so please make sure you save and retain a copy of any images or videos you want to keep.

While imaging these targets can be a simple as capturing a single frame of the target, best results are obtained utilizing a technique known as Lucky Imaging, a technique where a video of the target is taken and various software programs are used to sort through each frame of the video, pick out many of the best frames, then stack them together to create a single image and finally sharpen the image for the final product. The laptop supplied in this kit has all the software needed to perform lucky imaging.

NOTE: Lucky Imaging is generally not utilized for deep sky objects.

Apparent Minimum and Maximum Size of Planets



Moon Average Angular size is 31’
But ranges from 29.3’ to 34.5’

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Kit Contents

Listed below is the equipment that is included in the Imaging Package.

Ref	Item	Replacement Cost	Comments
IMG01-01	Carry Case	$45	All imaging kit equipment fit into this case
IMG01-02	Laptop (EVAC-01)	$250	DELL Inspiron 7348
IMG01-03	Keyboard	$35	RedDragon Kumara Model K552 RGB
IMG01-04	Camera Tin	$5	Contains Imaging Camera and 12mm Eyepiece
IMG01-05	QHY5L-II-C Camera	$150	QHYCCD Color Imaging Camera Color Camera |Pixel size = 3.75um 1280 x 960 pixels | 1.2 Megapixels USB2.0 interface | Data Bit Depth = 12 bit Optical format = 1/3”
IMG01-06	12mm Eyepiece	$85	Baader Illuminated Reticle with LED
IMG01-07	10’ USB 2 Cable	$15	
IMG01-08	Flip Mirror	$45	Orion Imaging Flip Mirror
IMG01-09	Wireless Mouse	$15	Leadsail 2.4Ghz Wireless mouse and dongle
IMG01-10	Laptop Power Supply	$25	
IMG01-11	Laptop Power Supply Cable	$10	
IMG01-12	1.8x Barlow lens	$25	

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Some Prime Targets for Imaging

Target	Type	Difficulty	Comments
Moon	Moon	Easy	Due to the size of the imaging chip on the camera you will likely only be able to capture a small area of the moon.
Venus	Planet	Challenging	The brightest of the planets; The size of Venus varies greatly. However, since it is continually covered in clouds there are generally no features to be identified on this planet, but does exhibit a phase that can be interesting to observe.
Jupiter	Planet	Challenging	One of the brightest planets this planet also has interesting features.
Saturn	Planet	Difficult	The rings of Saturn are always interesting. This object is fairly dim.
Mars	Planet	Difficult	Size of this object varies greatly and is fairly dim, but can present interesting features such as the ice caps.
Mercury	Planet	Difficult	Similar to Venus, there will be little to no detail visible on the planet, but does present a phase as it orbits the sun.
M-42	Deep Sky	Difficult	One of the brightest deep sky nebula in the northern hemisphere. This object is located in the winter sky (October – March) and best positioned on December 14th. Utilize "Live Stacking" in SharpCap for deep sky objects
M-13	Deep Sky	Difficult	The best Globular Cluster in the northern hemisphere. This object is located in the summer sky (April - August) and is best positioned on June 1st. Utilize "Live Stacking" in SharpCap for deep sky objects

Due to planetary rotation, you are limited to how long you can capture video for processing provided below is a general guide on maximum time to limit capturing images to create a final image. Deep sky objects don't suffer from this issue, but are more restricted by mount tracking accuracy, and Field Rotation for Alt/Az mounts.

Object	Max Time
Moon	5 minutes
Jupiter	2 minutes
Saturn	5 minutes
Mars	4 minutes

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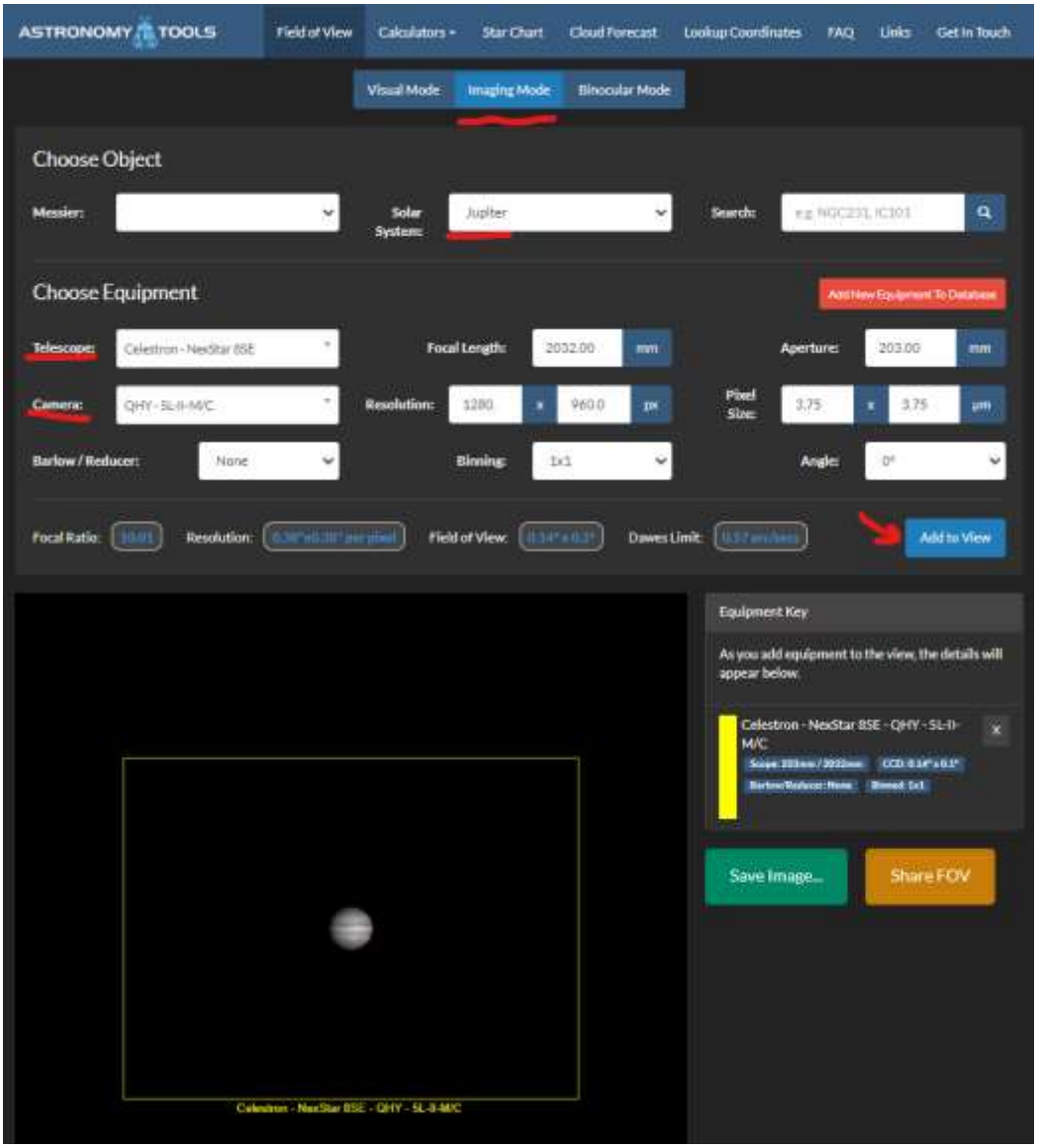
Want to know what a potential target will look like for you imaging system with this camera? Utilize the Field of View Calculator on the Astronomy Tools website. Select the Imaging Mode tab located near the top of the page, then select the target Object, Telescope and Camera (**QHY-5L-II-MC**). Finally select the **Add to View button** to show the calculated Field of View.



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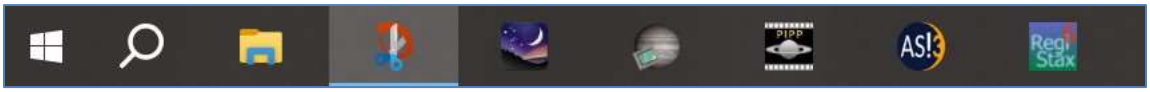
Software included on Laptop

Software	Version	Comments
Stellarium	1.1	Planetarium software for planning your imaging session
SharpCap Pro	4.0	Used for image capture
Planetary Imaging PreProcessor (PIPP)	2.5.9	Prepare video for processing with other software by centering object, and selecting best frames to generate a smaller more compact video for processing.
AutoStakkert!	3.1.4	Align and stack video into final single image
RegiStax6	6.0	Primary utilized for sharpening and other adjustments to produce the final product.

These software applications installed on the laptop are easily accessed after logging into the Laptop with the UserName of **Astro** and the password of **Imaging**. The are listed in order of utilization on the **Desktop** (Top Right of the screen), **Start Menu** (Under Lucky Imaging Tools) and **Taskbar** (see image below).



Online Tutorials

Lucky Imaging is best performed with an Equatorial mount so the telescope will track the object. Lucky Imaging can be accomplished with Alt/Az mounts and manual tracking, but this is more challenging. Of course, If you just take a single shot of the object tracking is not an issue.

Tutorials	Description
Sharpcap to capture planets (6 min)	AstroLaVista: Overview of sharpcap for capturing the planets.
Moon (26 min)	Small Optics: Start to finish tutorial Utilizing an Equatorial mount with reflector telescope and astronomy camera, showing capturing the video in field, and processing the captured video to obtain a final image.
Venus (13 min)	Late Night Astronomy: Utilizing DSLR Camera and Alt/Az mount with 8" Dobsonian to image Venus then process the video to obtain a final image.
Saturn (18 min)	Late Night Astronomy: Utilizing DSLR Camera and Alt/Az mount with 8" Dobsonian to image Saturn then process the video to obtain a final image.

Pointers and Recommendations

Sensors on most planetary cameras are quite small this sensor is no exception, measuring 1/3” on the diagonal the Field of View (FOV) will probably be quite small. This can make finding the target quite challenging. Because of this the first target of imaging should be the Moon. Other points to keep in mind include:

- **Finderscope Alignment** – It is critical the finder scope be as closed to alignment with the main scope as possible.
- **Telescope Collimation** – Collimation should be checked and optimized before beginning your imaging session to ensure you obtain the best image possible.
- **Focus** – Take the time to make sure the object is in focus.
- **Flim Mirror** – Can be utilize to help with locating the target object and make sure it is in the center of the field of view so it appears on the camera sensor. The focus point of your eyepiece may not coincide with the focus point of the camera this is really not a problem since the idea is to use the eyepiece to make sure the target is centered in the field of view.
- **Telescope Mount** – If you are using an Equatorial mount, the better the alignment with the North Pole, the better the tracking will be. If you own an Alt/Az mount that does not track imaging can be more difficult, but still possible check out the tutorial of Saturn to see how this was performed on a Dobsonian telescope.

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Resources

Resource	Description
EVAC: Planetary Imaging Primer course	This webpage is the resource page for the imaging course offered by EVAC and has many resources, and materials that may prove helpful
Stellarium Web	Online Planetarium program for planning your session
Clear Sky Chart	Forecast for cloud coverage, transparency, seeing, darkness etc.
Astronomy Tools	Field of View Calculator put in "Imaging Mode" to preview what a target will look like for your optical train setup
Tutorial: Sharpcap to capture planets (6 Minutes)	AstroLaVista: Overview of sharpcap for capturing the planets.
Tutorial: Moon (26 minutes)	Small Optics: Start to finish tutorial Utilizing a Equatorial mount with reflector telescope and astronomy camera, showing capturing the video in field, and processing the captured video to obtain a final image.
Tutorial: Venus (13 minutes)	Late Night Astronomy: Utilizing DSLR Camera and Alt/Az mount with 8" Dobsonian to image Venus then process the video to obtain a final image.
Tutorial: Saturn (18 minutes)	Late Night Astronomy: Utilizing DSLR Camera and Alt/Az mount with 8" Dobsonian to image Saturn then process the video to obtain a final image.
Tutorial: Jupiter (13 minutes)	Workflow for processing Jupiter utilizing PIPP, Autostakkert, and RegiStax to get a final image. This technique should work for all the planets