Imaging for the Everyone: A review of the Meade DeepSkyImager

By Stephen P. Hamilton

Like so many amateur astronomers, I was captivated by the beautiful images of deep space objects that I would see in the magazines and on the internet. And, like so many, I was also captivated by the thought of capturing these images myself. How hard could this be? You get a camera, take a picture, post it on the internet, and that's it, great images just like the pros. If only it were that easy.

Unfortunately, to date, anyone wanting to get into astro-imaging has been met with a dizzying array of decisions to be made. What type of camera to get including film, digital SLR, Modified Webcam, CCD, etc. Furthermore, there is the selection of capture software, another item for which there seems to be so many options but rarely a single solution for the beginner imager. Add to that the many applications for post processing and the experience required to use them and a new imager can often be left frustrated and lose interest.

Recently, Meade Instruments introduced a new CCD camera to the market which addresses many of theses issues for new photographers. The Meade DeepSkyImager follows Meade's new line of astronomical imagers first introduced in 2003 with the LPI (Lunar, Planetary Imager) and expands on its earlier offering by providing true long exposure imaging and a much more sensitive CCD chip. Its small size, simplicity of use and the extensive capabilities of its bundled software provide a complete platform for not only the beginning imager but one which the experienced photographer will appreciate also.

Meade DSI - 80mm Refractor 5 x 84 seconds, 7 x 30 seconds

I was fortunate enough to have a chance to test this new camera prior to release and have had many opportunities to use it over the past couple of months. The first thing that struck me upon receiving the camera was its size and weight. While obviously larger than its smaller brother (the LPI), it is still only about 3 ½ inches square and weighs less than most 2" eyepieces. The construction is very durable aluminum with a 1.25" nosepiece attached to a standard T-adaptor and removable IR filter.

Like the LPI, the camera is completely controlled via a single USB cable alleviating the need for additional Parallel or Serial ports for long exposure. This is a particular advantage these days as many laptop computers no longer come with these ports installed.

The camera comes with a very extensive suite of software that has been designed by Meade specifically for their cameras. Anyone that used the LPI previously will immediately recognize the similarities between the original software and the new applications for the DSI. Meade has ensured that the new software is also compatible with the LPI meaning LPI users will be able to take advantage of the increased functionality in this new suite with their existing camera as well. This new functionality includes an increased number of image formats, greater control over camera and histogram settings, greatly improved guiding capabilities (with guide between capture technology) and several other enhancements. The suite also includes Meade's Star map, image

processing, and telescope control (with networking capabilities) software.

As with any new camera, it takes practice to learn to use it to its greatest capacity, but Meade has gone far in reducing this learning curve, especially for new astro-photographers. Meade's ads claim that the user will be taking images of Deep Space Objects the first night out and I was pleasantly surprised to find this to not only be true but also far simpler than I would have first guessed. While there are numerous settings that the user can manually control, the software offers a variety of automated processes for setting the various color values, histogram, and exposure times. The user then has the option of using these settings or manually adjusting them from that point to their liking. This is one of the most powerful aspects of the software and enables beginner imagers to take great images immediately while allowing more experienced imagers to simply make small adjustments or completely control all settings of the camera.
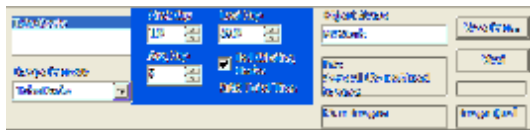

Unlike traditional imaging where the photographer takes a series of dark frames at some point in the imaging process and then subtracts these later from the final images, the DSI software takes care of this automatically as well. In the same manner as normal dark frames are taken, the user must first cover the front of the camera (or telescope) to ensure no light is able to get to the CCD. Meade has done a fantastic job of simplifying the dark frame process from this point by providing a specific capture setup for managing the dark frame process. The user has only to set the number of exposures and the minimum and maximum exposure time and click the start button. From that point, the software takes over capturing all the required images, averaging them together and storing them for later use as a single dark frame FITS file. The method for dark frame subtraction that Meade employs only adds to the ease of the process by automatically subtracting the dark frame from each individual image as it

is captured and prior to being saved. Since the dark frame is actually saved in the raw format, the subtraction process actually takes place prior to the images being converted to their 640 by 480 format ensuring that hot pixel match is exactly the same as that captured in the dark frames. Of course, the user may still elect to do this manually in post processing if they so desire.

I chose on my "first light" with the camera to allow the software to use its automated processes to control all the initial settings. For a target, I selected M57 which had the advantage of being fairly high up in the sky and bright enough that I knew I could capture it from my very light polluted skies. As I generally do, I set the live exposure setting to about half a second to focus on a star near the target. There had been a lot of talk on the internet groups about the supposed sensitivity or lack of sensitivity of the chip in this camera. At .5 seconds, not only could I see several stars on the screen with which to focus, but I could also faintly see the outline of the Ring Nebula itself which made getting it perfectly centered incredibly simple. Having only used the Black and White variants of the Sony HAD chips in other cameras, I was pleased to see that initial concerns over the sensitivity of this being a color chip were completely unfounded.

The software provides the user with a large number of image formats with which to save their images. These include several 8 Bit formats such as BMP, JPEG, GIF, and TIFF and several 16 bit formats including FITS (separate R, G, and B images), FITS3p (3 color plane FITS), and Raw, which is in the FITS format but is a direct save from the camera without the pixels being "squared up" to 640 by 480. Furthermore, the user is given a choice as to how these images are saved including a single combined image, separate uncombined images, or individual combined (each image is a progressive combination of itself and all previous images). These options provide the beginning photographer with a quick way to get a very good single image in a format they are familiar with which requires no sophisticated post-processing while also

allowing the more experienced imager to process the individual files as they see fit.
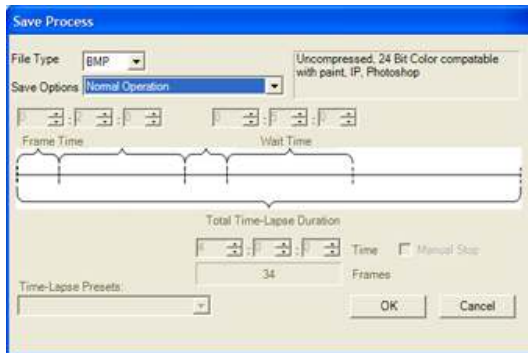
For my first night out with the camera, I chose the BMP image format so I could quickly see what the camera is capable of. I have since found that starting an imaging session this way has the added benefit of allowing you to take as many test images as are required without saving multiple FITS files if that will be your final format. Once I had gotten the scope aligned, I enabled the long exposure mode, entered 15 seconds for the exposure and clicked the preview button. This is another feature in the new software which differs from the original in that you are able to take single preview images for testing purposes. Once again, I was surprised at the sensitivity of this camera. With the camera setup at prime focus on my LX90 at F10, a 15 second exposure of the Ring Nebula was slightly overexposed. After a few more test exposures, I found that 11 seconds worked well for this object and my setup.

By far, the most useful aspect of the DSI software is its ability to not only take images, subtract darks if needed, and save them to various file formats but also its built in Track and Combine functionality. The user has several options as to how this is implemented for each image including setting the number of images to capture for determining quality level and the minimum quality of images to include in the final combined image. Once these setting are completed, the user needs only to click the "Combine" check box, select a star or some other prominent feature to track on, and click the start button. The camera will then begin capturing the images and after completing

its quality assessment, begins building an image by combining all captured frames that meet the minimum quality level set by the user. As each image is captured, the dark frame saved earlier is first subtracted, and then the quality of the image is measured against the "standard" frame. If the quality is equal to or greater than the setting entered by the user, the image is then aligned with the current image based on the star selected and averaged into the stack.

Having taken my dark frames, set my quality settings and selected a star for my M57 image, it was time to see just how well the software would do in the Track and Combine mode. For anyone that has used the LPI for planetary imaging, this aspect of the imaging session will be very familiar. Experience told me that combining multiple images of Jupiter was one thing but registering, averaging, dark frame subtracting, and histogram manipulation of a DSOs was totally different story. As the first few images were captured and added to the current picture, the work that Meade put into this portion of the software to ensure its accuracy and quality became quickly evident. After just a few images, the Ring Nebula began to take on greater contrast and the noise in the background began to smooth out. This is something that would have taken me quite a while to do if I were registering and combining these images myself.

The software will continue to capture and combine images until the user chooses to stop the process. I elected to end the capture process after 50 images were captured. The resultant image is automatically saved for the user to folder selected in the format requested at the beginning of the process. The user may then open the new image in either the Meade IP (image Processing) application or another program of their choosing for any post-processing required. The M57 image I had captured required little to any post-processing so I elected to open the image in PhotoShop and applied only some curve and levels adjustments to it before saving.

Meade DSI - LX90 - 50x11 Seconds

While the application preformed beyond my expectations using all the automated selections, I chose to manually set the parameters for my next image and save all the individual files in FITS format for registering and combining afterwards. For this image, I selected M27, the Dumbell Nebula. This target is much larger then M57 and also quite a bit dimmer, especially at its edges. With a 3.3 focal reducer installed on the LX90, I found that 42 second exposures were more than adequate for capturing the dim details of this object.

I had noticed some drift occurring in my polar alignment and thought this would be a good time to try out one of the other new features of the DSI software, the Guide between Exposures functionality. To set this up, the telescope must be connected to the computer via a serial port or network connection and communications established via the Connect button. To begin guiding, the user has only to select a star and click the guide button, the software will then calibrate itself against the scope and begin guiding on the selected star. Combining this with an imaging session is as simple as starting the guiding process, then starting the imaging process in the same manner as you would if imaging only. During the capture process, the software will not only track and combine images but also assess any drift between the current image and the starting location of the selected star. Guide commands are then sent to the telescope to correct back to the starting location.

While guiding between images is not as accurate as real time guiding, I found that very few images were dropped and over the course of the next 30 minutes, the selected star never drifted farther than a few pixels. For those images where the drift was noticeable, the software would not include these images in the final combined image an only include those that are still within the quality setting selected by the user. I was able to capture 12 images out of about 20 using this process without the use of an additional guide scope and camera. For photographers that do not employ a second guide scope or if you simply do not want to set up separate guiding, this provides a great mechanism for guiding without the hassle and only minimal frames lost.

I was anxious to see what could be done with the 16 Bit images created in the FITS format and tried processing them in several applications. None of the programs I tried experienced any issues with manipulating the files including MaximDL, AIP4WIN, FITSLiberator plug-in for Photoshop, and of course the Meade IP application. I did find the FITS3P (three plane FITS files) which are a newer standard from NASA had some issues in older applications but also loaded easily in most programs.

Meade DSI - LX90 f6.3 - 12 Images Saved as FITS (RGB)

I was pleased to find that the 16 bit format provided great detail that was able to be pulled out of the image not evident in the initial screen preview. After registering and combining the individual R, G, and B files, I combined the three color planes in PhotoShop CS and proceeded to process

the images as would normally be done. The final image displayed great detail in not only the central portion of this object but the dimmer outer areas of nebulosity were able to be clearly distinguished also.

Meade went far in addressing the many requests from user of their previous AutoStar Suite applications in this new release. One new feature which I found particularly interesting was the Time Lapse capabilities provided. This feature is located under the Save Proc Menu and provides the user with options for setting individual exposure times, number of exposures per frame, time between each frame, and total duration of the capture session. The user has only to set these parameters, select the target as they normally would and click start.

I was able to try this new feature out recently during the total Lunar Eclipse that occurred in October. During the imaging session, the software and camera performed flawlessly and I only had to stop it a couple of times to adjust the brightness settings for the varying brightness of the moon as it went thru the eclipse cycle. Other uses for this functionality might include tracking the rotation of Jupiter during a single session or tracking a comet or asteroid as it moves thru the sky in an evening.

Meade DSI - 80mm Refractor - Time Lapse Autocreated by DSI Software

The one final item about this camera and software I would like to note is its extensive guiding capabilities. Anyone who has used the LPI for guiding will be pleased to find many enhancements to the guiding capabilities in the new software including the ability to auto-center your target and selecting any point on the screen to have the scope automatically slew to. Combined with the greater sensitivity of the DSI over its sibling, this camera provides an awesome platform for guiding that rivals many systems costing twice as much or more. I have used this functionality extensively while imaging

with my Digital rebel (300D) and have spoken with many experienced imagers who are now using this software exclusively for their guiding needs. Even for someone who does not wish to use the camera for imaging, it is well worth the price for its guiding capabilities alone.

There are many more capabilities of this camera and software that are too numerous to mention here. Meade has produced a product that was well thought out and constructed, designed software that far exceeds what might be expected in this price range, and brought this product to market as a price that makes it a tough deal to beat. The gauntlet has defiantly been laid down for other manufactures in the market. If this camera is any indication of the future of imaging products from Meade, I can only foresee that there are great things ahead.

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