

# How to Photograph a Nova Using the Seestar S50

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Stratford Astronomy Group - KR  
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## 1 Introduction

This how-to document HPNS sketches the method used to photograph the nova V615-Vul using the Seestar S50 astrophotography scope. My method was not the most efficient. This was an enjoyable learning experience. There are many opportunities for improvement.

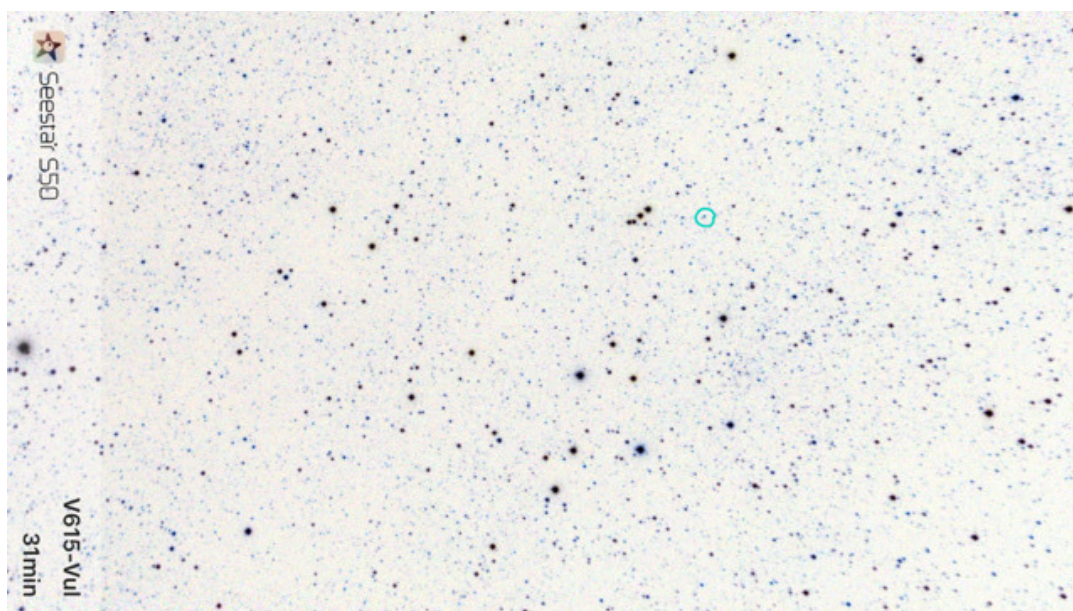


Figure 1: S50 Image of V615-Vul.  
V615-Vul is the mag 15 star inside the green circle.  
Photo frames taken 20240922 0215-0300UT.

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<sup>1</sup>File location: LT4:u4:kwork4:58notes

## 2 V615-Vul Facts

V615-Vul is a recent nova in the constellation Vulpecula. It was first observed on 2024-07-29, magnitude 11.2, at coordinates (RA,DEC) 19h43m07s.51+21d00m21s.4. No star was previously recorded at the location, as of 2024-07-28 (down to limiting magnitude 14.5) and as of 2024-07-27 (down to limiting mag 16.5). My observational data was collected 2024-09-22UT between 0215-0300UT. The AAVSO light curve shows a decline from about mag 10 to about mag 15 as of that date, and I assume my observation is about mag 15.<sup>2</sup>

## 3 Observational Steps

### 3.1 Decide to observe V615-Vul

The CBAT website publishes CBET bulletins which report unusual astronomical events in a timely manner. Such events include nova discoveries, comet discoveries, and unexpected meteor showers. Details of the CBAT website and the page listing recent CBET bulletins are in section 4 below.

A skim down the list of CBETs shows several recent novas. However, several of those novas are at negative declinations, and unlikely to be readily observable from my back yard which has several horizon obstructions. Someone with a flatter viewing horizon may wish to observe those other novas. CBET 5423 on 2024-08-01 describes V615-Vul, which is the most recent nova discovery that I expected to be able to capture in the S50 scope, about 55 days after its first appearance.

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<sup>2</sup>As seen in figure 1, the S50 with a 30-min frame set is easily able to show a mag 15 object, and some fainter stars are also shown. Tentatively I think the S50's limiting magnitude on clear nights is about mag 16.

### **3.2 Observe V615-Vul as a custom S50 object**

The object coordinates were entered into the Seestar S50 as a custom object, with the name V615-Vul. There are several “V615” objects in different constellations, so the suffix “Vul” avoids ambiguity. The S50 will record frames in a V615-Vul-sub directory, and record stacked images in a V615-Vul directory. As well, the S50 will place a caption on the image jpeg files to identify them as being images of V615-Vul.

The coordinates I used for observing V615-Vul were slightly incorrect (bad entry into S50 screens), but were close enough to capture image frames. Observing for 30-minutes of data collection with 10-sec frames took about 45 minutes, with quick on-the-fly stacking snapshots at 2-min, 6-min, 10-min, and 30-min indicating that good detail was being collected. The sky was dark and clear. A light shield tube was used to reduce stray side-lights.

After frame gathering, the S50’s deep sky stacking calculation was performed, to obtain the image which is shown in figure 1. That image has been rotated 90 degrees right, and colors inverted (to dark stars on light sky) to reduce toner usage when printing. The pinetools utilities were used to perform rotations of the image and inversion of colors.

### **3.3 Reconcile with AAVSO Information**

The AAVSO website provides two important resources for observation of V615-Vul. The first is a star finder chart, inverted, ie dark stars on light sky. It has cross-hairs where the nova V615-Vul is to be found. See figure 2.

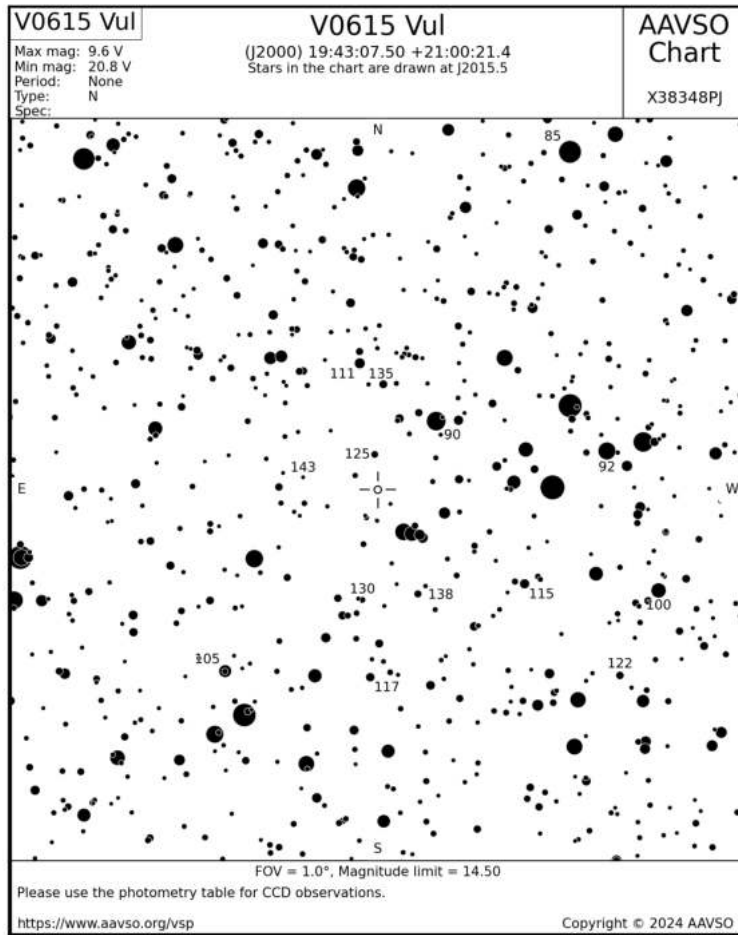


Figure 2: AAVSO finder chart for V615-Vul.  
 The crosshairs mark the position of V615-Vul.  
 Chart is copyright by AAVSO.

As well, the AAVSO website provides a light curve, which shows the magnitude of a variable star vs the Julian date. In the case of V615-Vul, which is still (as of end-Sept-2024) under active observation, one can see that the visible magnitude of this nova is presently about mag 15 when I collected imagery.

The astrometry.net website was used to do plate solving for the S50's stacked jpeg which contains the image of V615-Vul. That website indicated that the S50's image was not oriented the same as the AAVSO star chart. A rotation of 321.5 degrees clockwise was performed, in an attempt to make the two images orient the same. However – probably

because V615-Vul was off-center in the S50 stacked image (perhaps due to my error in entering the precise coordinates), it turned out that a rotation of 316 degrees CW was a better match with the AAVSO chart.

The pinetools utilities were used to do rotations and color inversions, and could have been used to crop the AAVSO and S50 images to zoom-in on the two images to locate the V615-Vul nova on the S50 image. That was instead done on the Ipad, rather tedious, but eventually successful. V615-Vul was identified as the star marked in figure 1, and a freehand circle drawn around it.

There are clearly improvements in procedure which can be made to expedite this process. On the other hand, there are relatively few observable novae in the region of the night sky which are observable given my location and horizon, and of sufficient magnitude (at least mag 15), so I plan to wait for the next opportunity to look into further improvements in methods.

The next section has extra nitty-gritty.

## 4 Resources and How-To Details

This section gives more details of the various resources used.

### 4.1 CBAT and CBETs

CBAT is the Center Bureau for Astronomical Telegrams, and the name goes back to the days when sky events were notified by sending telegrams to astronomers all over the world. Carl Sagan's novel *Cosmos* makes mention of this system.

CBETs are Central Bureau Electronic Telegrams, and are the individual notices. CBET 5423 dated 2024-08-01 is the notice for V615-Vul. Nowadays, there is a website which lists “the fifty most recent CBETs”. Actually, that website lists all recent CBETs, in reverse date order (newest at top of list). It is a simple matter to scan down the list and identify novae, or comets, or meteor bursts, of possible interest.

The URL is

<http://www.cbat.eps.harvard.edu/cbet/RecentCBETs.html>

A CBET is a text file, so one can save the webpage to get a \*.txt file. Then it can be printed. I found it advisable, on Windows, to open the text file in MS Wordpad (to avoid line wrap if opened in Notepad), and to print in Landscape mode to avoid breaking of long lines. The printout is a convenient place to record the details of one’s observations. Sitting inside at the Ipad, warm and suitably lit, while the S50 does its work outdoors, is very convenient.

## 4.2 AAVSO chart and light curve

AAVSO publishes info for variable star observers. Their website home page is

<https://www.aavso.org/>

On that home page, in the “Find a Star” box, one can enter “V615 Vul” and click on “Create a finder chart” to obtain a chart which shows that object. More advanced charting options are available via their variable star plotter at

<https://www.aavso.org/>

but I have not needed to use that. The simple finder chart for V615-Vul is shown in figure 2.

The URL for the light curve generator is

<https://www.aavso.org/LCGv2/>

One enters “V615 Vul” to obtain that light curve.

### 4.3 S50 custom object

S50 Entry of Custom Object:

Go to Stargazing, then select customize to enter a custom object. Name it V615-Vul. Enter RA and DEC figures (see below). Be sure to get the figures correct before adding the new object, since there does not seem to be a feature to allow editing of custom object locations. Instead one must delete, then re-enter, the custom object.

### 4.4 Convert RA and DEC figures

<https://www.astrouw.edu.pl/~jskowron/ra-dec/>

is the “RA DEC flexible converter” website.

It will convert RA and DEC coordinates among various notations.

For instance, some resources list the

V615-Vul coordinates as “295.78125 +21.00594”.

The input “d 295.78125 21.00594”

(the prefix “d” indicates that the RA figure is in degrees)

to the website results in display of alternative formats,

including “19h 43m 07.50s 21d 00m 21.38s”.

For input to the S50, this must be rounded to

RA of 19h 43m 08s and DEC of +21 00m 21s.

Note that the S50’s DEC input screen begins with

a choice of Minus “-” or Plus “+”,

and defaults to the first choice (Minus),

so that one must explicitly select Plus

in order to enter a positive declination figure.

### 4.5 Astrometry plate solving website

The [astrometry.net](https://nova.astrometry.net/) website is very useful for plate solving.

<https://nova.astrometry.net/>

## 4.6 Pinetools utilities website

The pinetools website provides various useful tools. Among these are:

<https://pinetools.com/invert-image-colors>

<https://pinetools.com/rotate-image>

<https://pinetools.com/crop-image>

## 4.7 Julian date conversion website

The following website is useful for converting between Julian dates and standard dates. That is relevant, for instance, when consulting the AAVSO light curves, which have Julian dates on their horizontal axis.

<https://www.juliandate.org/>

## 4.8 Virtual telescope website

The virtual telescope website has a nice locator display which helps one locate V615-Vul. It helps supplement and confirm the deductions which one makes from a comparison of the AAVSO chart and the inverted and rotated S50 stacked image. See, for instance, the following URL

[https://www.virtualtelescope.eu/wordpress/wp-content/uploads/2024/08/NovaVul2024\\_01Aug2024\\_pw17\\_masi\\_pw17\\_vtp.jpg?x48793](https://www.virtualtelescope.eu/wordpress/wp-content/uploads/2024/08/NovaVul2024_01Aug2024_pw17_masi_pw17_vtp.jpg?x48793)

It shows (figure 3) the starfield (inverted) on 2024-08-01, shortly after discovery of V615-Vul, when the nova was mag 9-10.

[end]



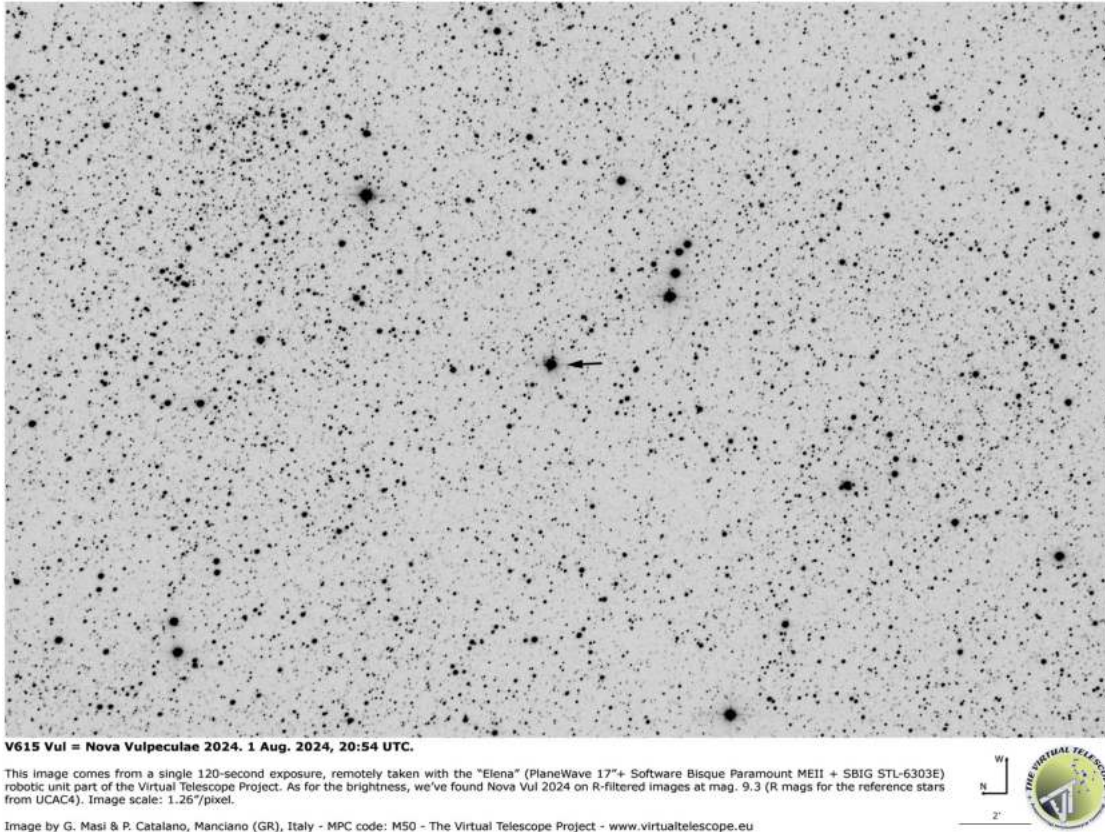


Figure 3: Virtual Telescope showing V615-Vul.  
The arrow marks the position of V615-Vul.  
Image taken 2024-08-01.