1. Vaonis – Stellina: The BGGR/RGGB issue & stacking:

What is all the fuzz about those sensor issues?!

Well, The Stellina is equipped with a mechanical derotator, by necessity.

By necessity since we have an Azimuthal (AZ) and not equatorial mount (EQ).

The mechanical derotator can rotate till 180° and flips around to continue, otherwise the wires would get strangled …

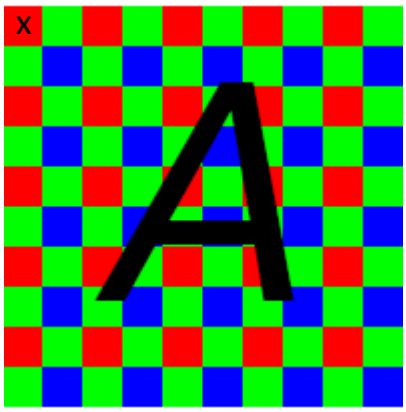
With normal framing this happens around the zenith or in the neighbourhood of it. But when you alter your framing to get your framing as you want it to be, it might happen a lot sooner.

This process can be compared with astrophotography on an EQ mount, but this happens when we pass the meridian. Then your equipment may get blocked by your tripod. Guiding systems protect your gear with the meridian flip block. You must activate your meridian flip, so your gear can continue to image your object without being crashed on your tripod.

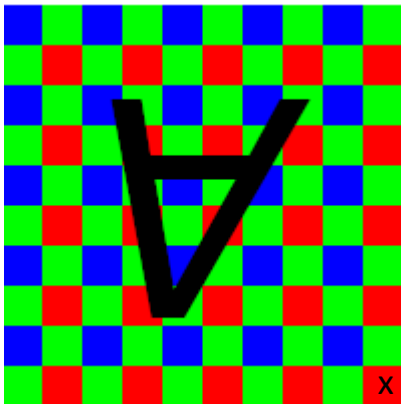
Our 180° rotation with Vaonis is the same principle, BUT 😉!

I marked the upside of the sensor with an x

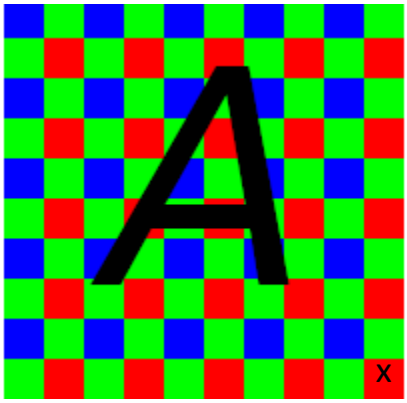
Sensor: EAST Side meridian



Sensor: WEST Side meridian



Vaonis makes of West meridian/ Zenithal Flip or how you want to call it:



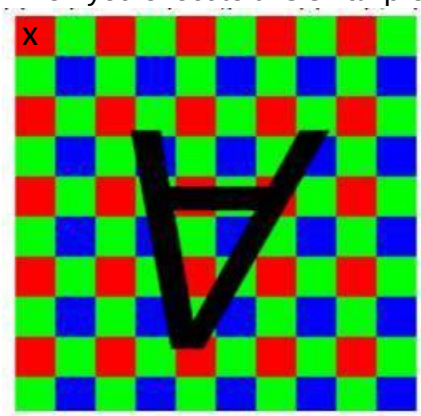
We discovered this after testing and reading out the fits. This is however a very unconventional and strange way of handling:

The image is turned (so they can fast stack in their tiff or jpegs) but physically, the pixels are still upside down, so we need separate darks and flats to patch the lights taken this way. Also, the image is not read out inversed, a CMOS image is dumped, not like a CCD where you really read out the lines of your camera.

This leaves us, Stellina users with some frustration because you cannot see the flip in your app. The first time you know it is by looking on your USB stick after your observations, but then it is too late …

One of our experienced amateur astronomers at our observation post "Urania Antwerp Belgium" and professional IT guy, "Paul De Backer", was very willing to help me out on this tempting issue.

When you execute this small program, Bayer convert (I elaborate on that below) you get this:



Which is in fact the normal view after a flip. Many will think, OMG my image is now flipped, but do not worry. All programs like Siril, DSS, APP, …. Are programmed to detect a meridian flip!

This means NO more double darks or Flats or bias …. NO splitting up in RGGB and BGGR sessions, where even comparing is even more tempting and difficult.

And voila, once the conversion is done, we are ready to go full ahead without worrying about our Bayer pattern. The only small issue might be the choice between RGGB or BGGR depending on how much you have of each. It is most convenient to convert the smallest number formats. But the program is so fast that it does not really matter. On top of that Stellina gave the intention to add a letter (R or B) or something to the filename to see very fast your Bayer pattern.

How does this Bayer convert program works?

Paul wrote it as a GUI, so it is very easy to use.

You just start the “winconvertbayer.bat” file up (it starts the “winconvertbayer.py” file), it asks which directory and then converts all files in it to the Bayer format you want. Note: it is only limited to flipping the Bayer matrix nothing else!

Prerequisites:

- Python
- Astropy (package)
- Pysimplegui (package)

⇨ IMPACT, this means, I must rewrite a bit my manual on stacking with APP, DO NOT put in 2 sessions, because all software combines all session into in 1 BPM (Bad Pixel Map). Since the sensor is upside down, you get inverted data what you may correct with straight data, so your BPM gets in fact useless and cases even harm!

⇨ Also, one must have Darks and flats at all times of both RGGB and BGGR, you are never sure. Once you have created a master dark or master flat in the past, at a certain temperature range you are saved, but you must be disciplined …

Just to give you guys an idea of the impact (M1)

On the left 586 frames stacked, first 165 in BGGR => stack 1, then 421 in RGGB => stack 2, then combining stacks

On the rigth 634 frames in RGGB stacked (converted 165 BGGR first to RGGB)

⇨ Serious increase in image quality, correct debayering, less noise, easier to compare

Very short introduction on how and what is python:

Windows Convert Bayer BGGR <=> RGGB

its a Python script
you need these prerequisites:
- Python
- Astropy (package)
- Pysimplegui (package)

with gratitude and many thx to a collegue of mine
Paul De Backer, Senior Amateur Astromer
(and professional IT guy in his former life)
@ our observatory Urania, Province Antwerp, Belgium

HOW to install python & what is it?

Python is an open-source high level programming language

https://www.python.org/about/gettingstarted/

Download the latest release of **Python**(3.9.1)

https://www.python.org/downloads/windows/

at installation, click custom and chose to install for all users

this causes the program to install itself in the C:\programs\python 3.9 directory

Astropy

Then start your command prompt (cmd) with administrator level

(documentation: https://docs.astropy.org/en/stable/install.html)

Type in cmd:

pip install astropy

PySimpleGUI

when that is done, install pysimplegui

(documentation https://pypi.org/project/PySimpleGUI/)

Type in cmd:

python -m pip install PySimpleGUI

Now python interpreter is running on your machine

Now place the WinConvertBayer.py in a folder or on your desktop and double click it

It will start and show a very simple screen:

Choose your directory where your fits files are and chose in which format you want everything. The program runs through all files and converts all to that format. The ones which are already in the right format will be left untouched. We are working now on a version that includes/treats also the subdirectories as well.

Reason: I tend to put my flats and darks in subdirectories of my observation to keep everything needly together and organised.

2. Vaonis – Stellina: The initialisation failed issue:

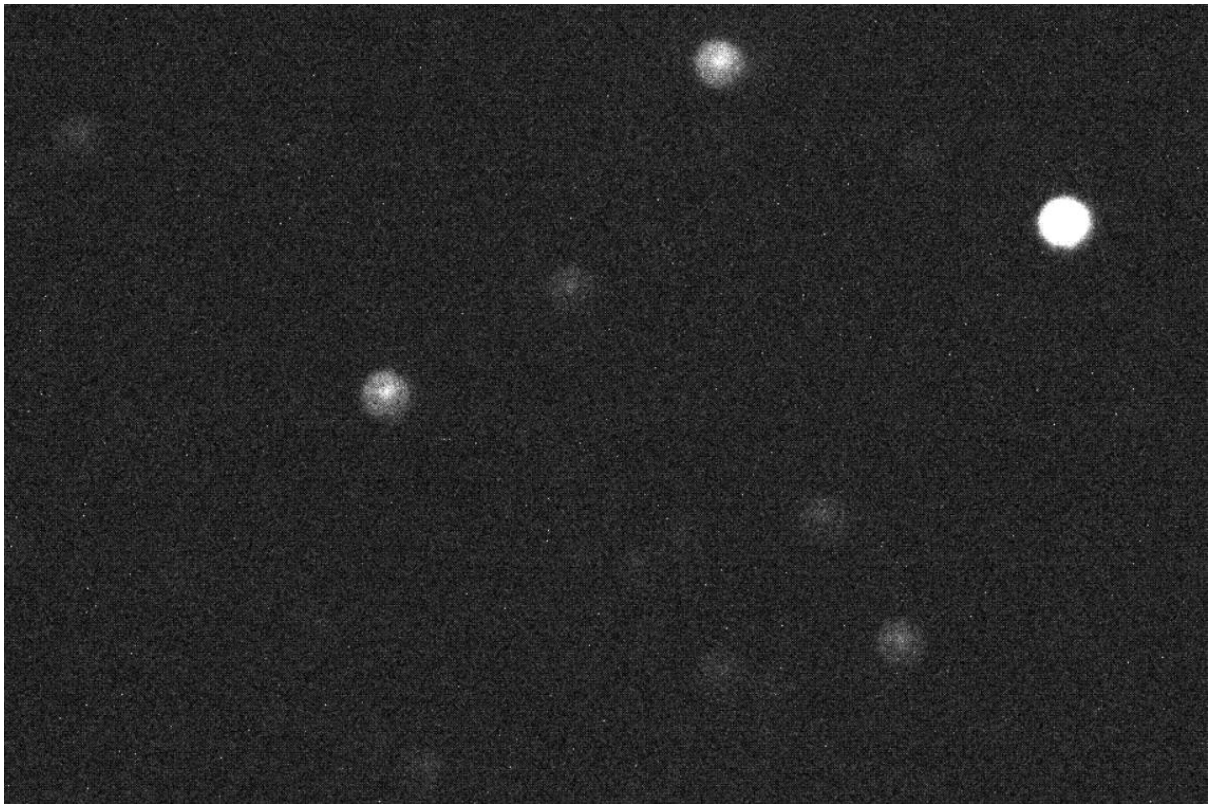
Very annoying for all of us …. But in fact, logical.

A frequently returning issue is the initialisation fail of Stellina.

At a certain point many of us tried meticulously to follow a step-by-step restart procedure without success. The first who brought some sense on the Stellina forum: “I try 3 times a full initialisation, if it doesn’t work, I just pack everything and stop my attempts”. A very wise decision …. Frustrating but yes, in fact the best method 😉.

Another milestone was another comment on the Stellina forum: DON’T focus on a bright object like a star, planet! Indeed, it creates a halo and complicates focussing a lot.

Also, sometimes Stellina has a hard time to focus, but still succeeds to “align” but then images may appear out of focus (below a part of a fits file to give you an idea):



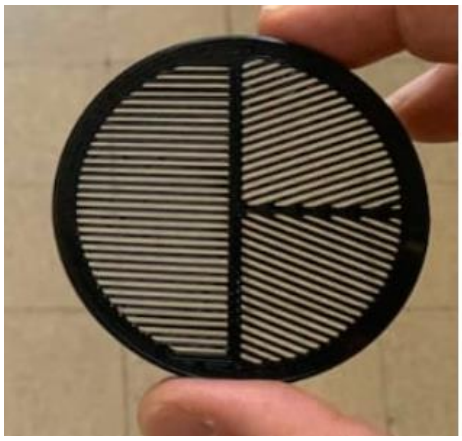
On many occasions, only or a small number of fits will be converted to jpeg by Stellina, because the fits do not comply to the Stellina quality standards to produce a JPEG for further stacking use.

What is going on?

In fact, Stellina just cannot focus, as simple as that. I will not reinvent the wheel on focussing:

https://www.bhphotovideo.com/explora/photography/tips-and-solutions/how-focus-works

In the case of Stellina it is the "Cirrostratus" clouds (faint layer high altitude clouds), they are filled with ice crystals and are the problem to our quest. These scatter the light and make focussing with Stellina difficult to impossible. For those who can't imagine how this type of sky looks like: its clear outside, you can't see clouds but if the moon is there you will see a halo, caused by the icy crystals in the air at high altitude. The thicker this layer becomes the harder it gets to have a clear focus. With my other telescopes, I still can focus manually "on sight" or to be more precise with my Bahtinov mask (below left).



When you look with your eyes without any aid to the sky, it seems pretty nice and ok and that's the main reason why people tend to think there is something wrong with their Stellina. But even with another telescope and perfect manual focus, your image quality will not be as perfect as possible due to the ice crystals in the high-altitude clouds.

Focussing, as they do with modern system camera's or DSLRs, can be achieved by phase or contrast focussing. The latter is the best and guarantees to work more efficient and faster in dark areas as is the case in amateur astronomy.

A solution to the Vaonis team might be implementing a manual focus in a kind of "pro" button with other features like altering the exposure time or gain and delivering a Bahtinov mask for Stellina. Or even implement software to optimise the focus point by detecting the diffraction pattern (above picture on the right) before and after with automated instructions to focus. Just a thought 😉

3. Vaonis – Stellina: The elongated star issue:

Indeed, several have remarked sometimes elongated stars. If you encounter this in the JPEGs, it is for sure the wind (if it is one directional) or an unstable platform (multidirectional elongation). These are external factors which we cannot always eliminate.

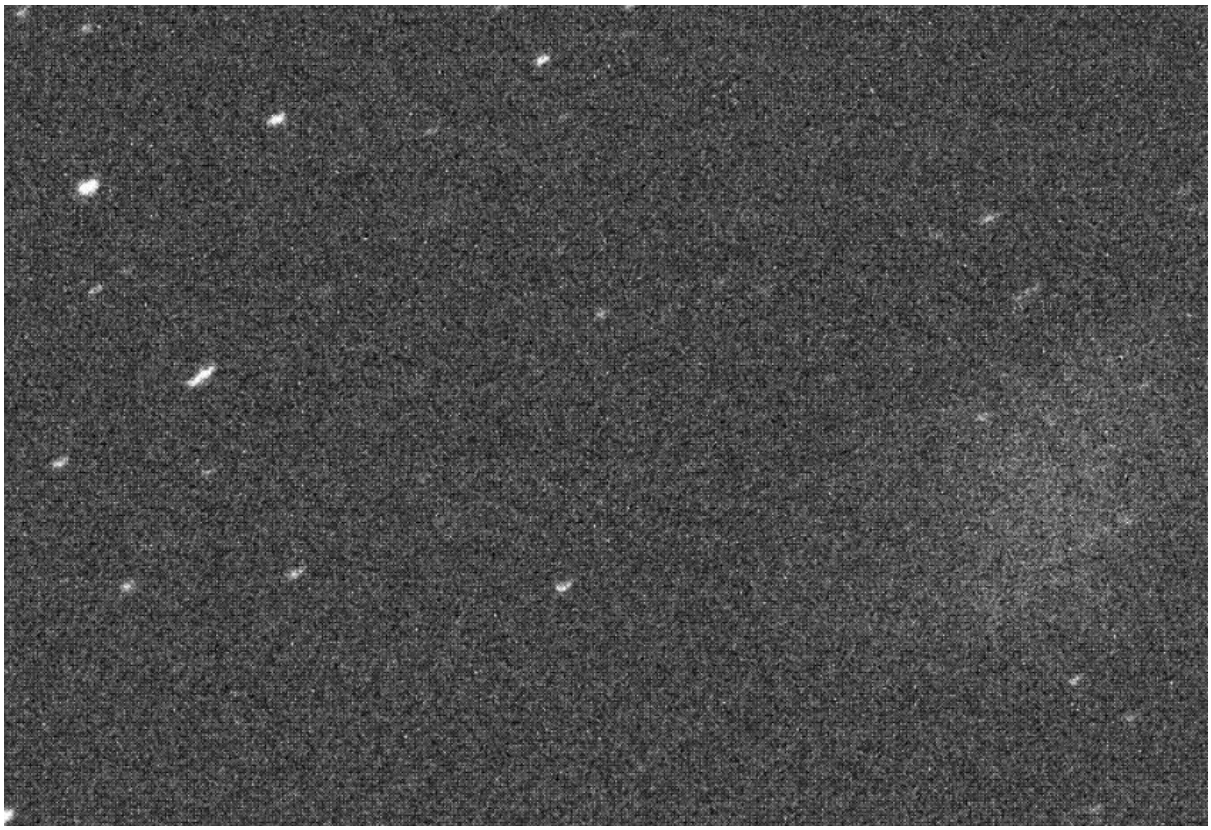
Then we have the elongated stars by Stellina, this is a (in my eyes) serious issue. Stellina photographs and adjusts the frame by simplicity of severe scientific calculations. And these should be good, but those are merely calculations and since we are using 400mm, minor errors become visible. So Stellina corrects regularly its position by using the photo taken, to adjust track. I.e., I presume that Stellina uses its telescope as telescope and as guiding scope at intervals.

With an equatorial, you can follow a celestial object as it moves through the sky by moving the telescope in only one direction -- right ascension. With an altazimuth, you move the scope in an east-to-west direction (azimuth) and slightly up-or-down (altitude). Beware the framing orientation of your Stellina has also to alter a 3rd parameter: rotation.

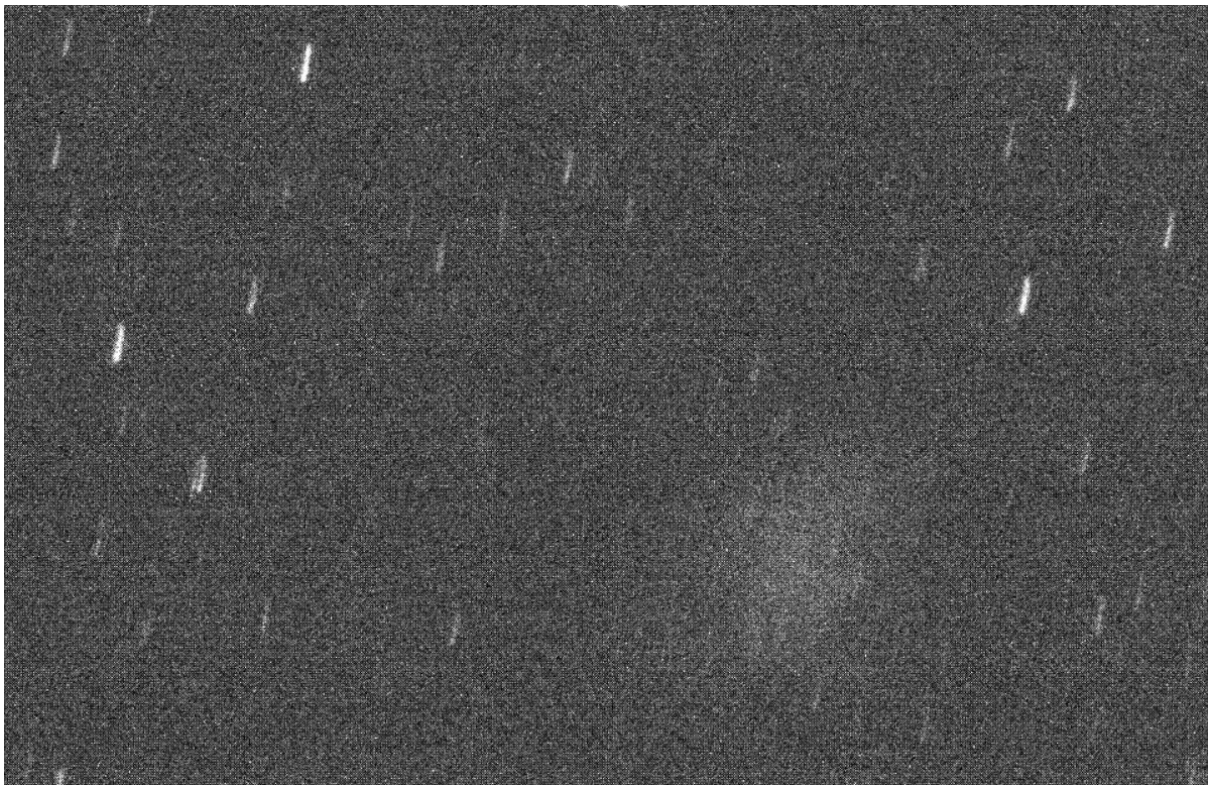
A good example of a good fit (part), in this case of M1 Nebula

I presume that Stellina is correcting frames at intervals because lines in stead of stars are regularly visible in the fits. This means that Stellina is doing a minor position adjustment while taking the 10sec shots.

Example of part of fit, when Stellina does small correction (observing M1):

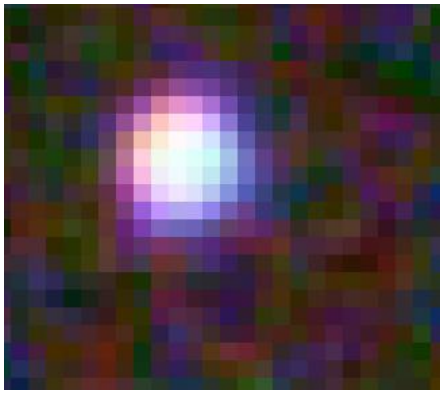


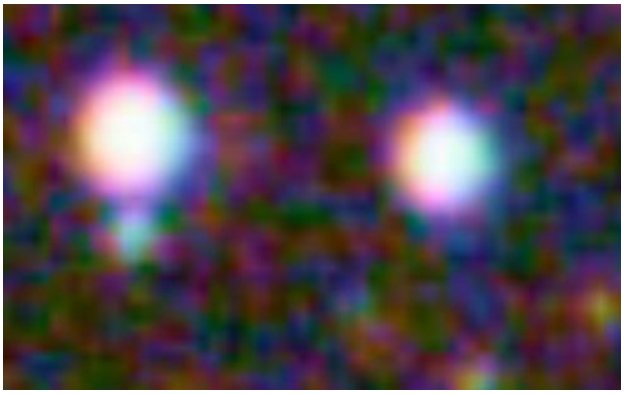
Example of part of fit, when Stellina does large correction (observing M1):



NOTE: (to avoid confusion) in both case there was 0m/s wind speed! And Stellina was on solid ground with no interference whatsoever.

When stacking them, you can get a kind of halo around your stars which might be elongated or good but with a colour shift (red on the one side of a star and blueish on the other side of a star). A bit the same effect as one might have with chromatic aberration. But we work with an 80mm doublet, a lens that correct already a huge part of this chromatic aberration (below 2 examples to visualise).





Solution is data rejection or if one has the time manually remove the frames with too much elongated stars. In APP, one can do this very quickly and objectively by looking at the “star shape” graphs while stacking. Siril has a similar feature, I think DSS might have that as well, not sure.

Conclusion, it works but Stellina has to work on a calculation refinement and or tracking/photographing moments, eventually just taking frames of 2sec as they tend to do to check on pixel guiding level. Another issue is the planetary guiding, which is not good, but indeed not the main focus of Stellina. And put those tracking frames in a separate folder as they do now for initialisation, captures etc. It is just the programming, so this is something they can work on within the Stellina concept as we have now by implementing a new software update.

Great job guys!