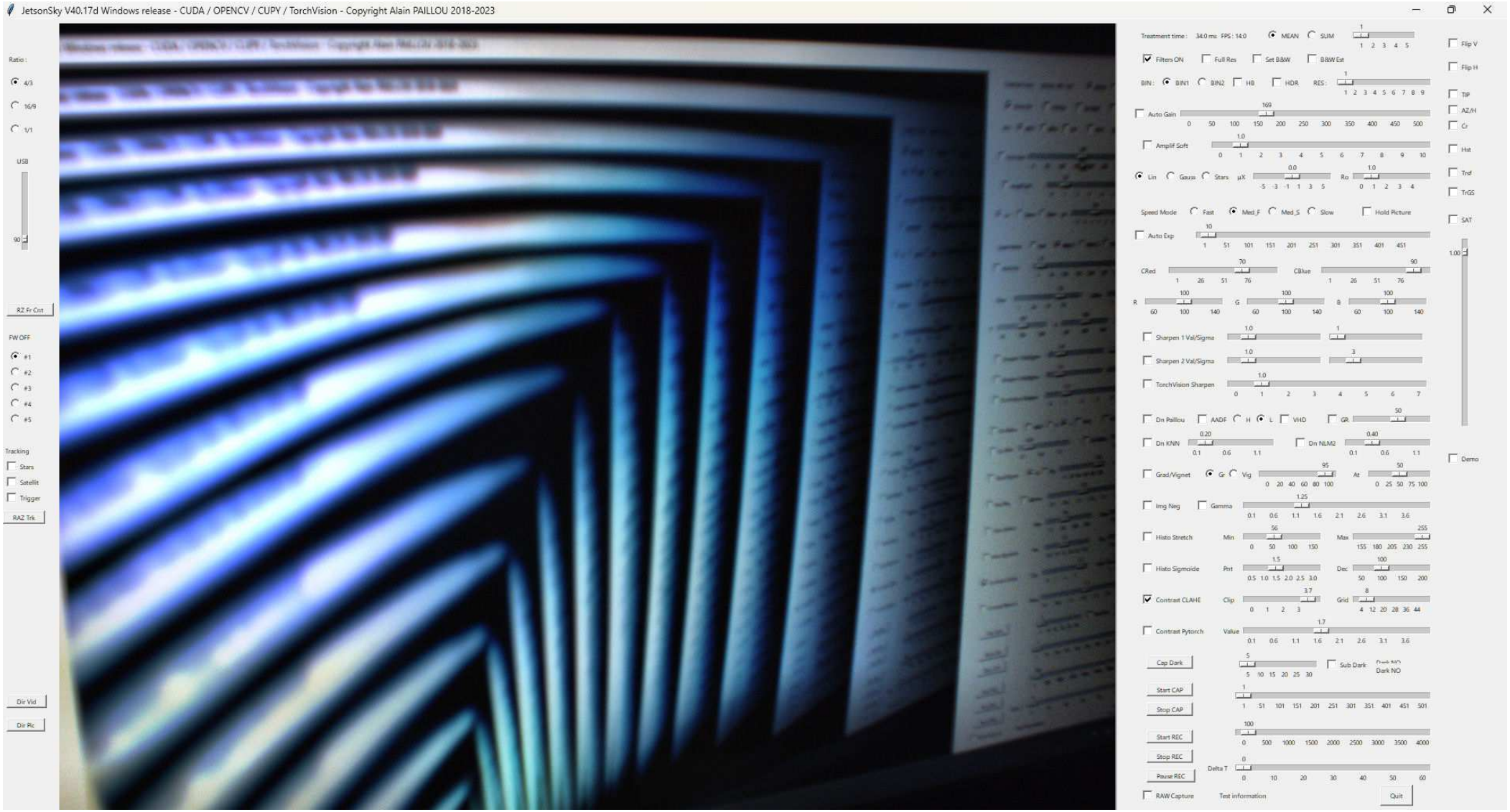

JetsonSky V40.17d Windows release - CUDA / OPENCV / CUPY / TorchVision - Copyright Alain PAILLOU 2018-2023
Ratio :
4/3
16/9
1/1
USB
RZ Fr Cnt
FW OFF
#1
#2
#3
#4
#5
Tracking
Stars
Satellit
Trigger
RAZ Trk
Dir Vid
Dir Pic
Treatment time : 34.0 ms FPS : 14.0
MEAN
SLIM
Filters ON
Full Res
Set B&W
B&W Est
BIN :
BIN1
BIN2
HB
HDR
RES :
Auto Gain
Amplif Soft
Lin
Gauss
Stars
Speed Mode
Fast
Med_F
Med_S
Slow
Hold Picture
Auto Exp
CRed
CBlue
R
G
B
Sharpen 1 Val/Sigma
Sharpen 2 Val/Sigma
TorchVision Sharpen
Dn Paillou
AADF
H
L
VHD
GR
Dn KNN
Dn NLM2
Grad/Vignet
Gr
Vig
At
Img Neg
Gamma
Histo Stretch
Min
Max
Histo Sigmoide
Pnt
Dec
Contrast CLAHE
Clip
Grid
Contrast Pytorch
Value
Cap Dark
Sub Dark
Dark NO
Start CAP
Stop CAP
Start REC
Stop REC
Pause REC
Delta T
RAW Capture
Test information
Quit
Flip V
Flip H
TIP
AZ/H
Cr
Hst
Trsf
TrGS
SAT
Demo

JetsonSky is Python based program and needs a Nvidia GPU and some Python libraries to work properly :

sys
time
numpy
cupy (absolutely needed)
opencv (with or without CUDA)
psutil (optional)
PIL
tkinter
torchvision (optional)
threading
datetime
argparse
math
zwoasi (if camera control needed, optional)
zwoefw (if filter wheel needed, optional)

# CAMERA CONTROL MODE

## Supported ZWO cameras :

ASI178MC, ASI178MM, ASI178MM Pro
ASI224MC
ASI290MC, ASI290MM
ASI294MC, ASI294MM, ASI294MC Pro, ASI294MM Pro
ASI385MC
ASI462MC
ASI482MC
ASI485MC, ASI585MC
ASI533MC, ASI533MM, ASI533MC Pro, ASI533MM Pro
ASI662MC
ASI678MC, ASI678MM
ASI1600MC, ASI1600MM

## LEFT SIDE controls :

**Ratio** : select the camera sensor ratio width / Height (3 possibles ratios : 4/3, 16/9, 1/1)

**USB slider** (from 0 to 100%) : select the USB bandwidth for the USB camera connection

Button **RZ Fr Cnt** : Reset the frame count in the Text In Picture information

**FW** selection boxes : for ZWO mini filter wheel 5 positions. Display ON (filter wheel detected) or OFF
Select filter wheel position from 1 to 5

**Tracking** check boxes :
Stars : detect stars
Satellites : detect satellites
Trigger : allow video capture only if satellites are detected

Button **RAZ Trk** : Reset Stars and satellites trajectories lot

Button **Dir Vid** : open dialog box to select Videos directory (for video captures saving)
Button **Dir Pic** : open dialog box to select Pictures directory (for images captures saving)

**EXTREME RIGHT SIDE controls :**

**Flip V** : Flip the image vertically (Camera is performing the flip)
**Flip H** : Flip the image horizontally (Camera is performing the flip)

**TIP** : Text In Picture – Add the date and time in the upper left corner of the image
**AZ/H** : for further development
**Cr** : Draw a cross in the center of the image

**Hst** : Draw the histogram of the image (RGB or Mono histogram)

**Trsf** : Draw the transformation applied to the image (modifications applied to the pixels – RGB or Mono)

**TrGS** : Show the amplification applied to each pixel – Related to Ampli Soft with 3 kinds of amplification : Linear, Gaussian and Stars – see on the RIGHT SIDE controls)

**SAT** and its **slider** : apply Colour saturation preserving image details and sharpness

**Demo** : the left side of the image is the RAW image – the right side of the image is the image with the treatments.

## RIGHT SIDE controls :

**Information about treatment time (filters) and FPS**

**MEAN, SUM and #FS slider : perform the mean or the SUM of 2 to 5 consecutive images.**

**Filters ON** : the filters can be used. OFF : no filter is active.

**Full Res** : display the center of the Full resolution image (depending of the resolution set). Useful for telescope fine tuning.

**Set B&W** : convert a colour image into a monochrome image

**B&W Est** : works only with colour camera. Calculate for each pixel the sum of Red,Green Blue channels, regarding the bayer matrix 4 pixels. It gives you the image you would have with a monochrome sensor.

**BIN1** : set the camera sensor in BIN1 mode
**BIN2** : set the camera sensor in BIN2 mode
**HB** : hardware BIN (for supported cameras). Only works in BIN2 mode. Hardware BIN gives you the mean of the 4 pixels instead of the SUM (lower noise).
**HDR** : HDR capture mode (multiple acquisitions with different exposure times)

**RES & slider** : select the resolution of the camera within 9 defined resolutions (7 for BIN2 mode).

**GAIN** : set the camera sensor gain.
**Auto** : the gain will be adjusted by the camera

**Ampli Soft** : software amplification of each pixel with 3 modes
- **Lin** : linear amplification for each pixel value (from 0 to 255)
- **Gauss** : the amplification is set with a Gaussian function you can adjust with 2 parameters (µX and Ro). This allow you to get selective amplification. Activate TrGS to see the Gaussian.
- **Stars** : the same as Gauss but it will only amplify Stars.

**Speed Mode** : for selecting the exposure time
- **Fast** : from 100µS to 100mS
- **MediumF** : from 1 ms to 500ms
- **MediumS** : from 1 ms to 1000ms
- **Slow** : from 500ms to 20s

**Hold** : the video acquisition is stopped and you will work only on the last image acquisition.

**Exposition & slider** : select the exposure time with the slider

**Auto** : the exposure time will be adjusted by the camera

**CRed & slider** : select the camera response for Red channel (camera internal setting)
**CBlue & slider** : select the camera response for Blue channel (camera internal setting)

**R, G, B & the 3 sliders** : software adjustment and fine tuning for the three channels red green blue

**Sharpen 1 & Val/Sigma sliders** : will sharpen the image
Val : amount of sharpening
Sigma : level of sharpening detail (from fine to coarse)
**Sharpen 2 & Val/Sigma sliders** : the same as Sharpen 1. 2nd pass sharpening.
**Torchvision sharpen** & **slider** : will sharpen the image (torchvision function)

**Dn Paillou** : a home made noise removal filter

**Dn Adaptative Absorber** : a home made noise removal filter which perform great on static images.
You can choose **High dynamic** or **Low dynamic** option.
**VHD** check box is useless for now.
**GR** check box & **slider** : Ghost effect reducer – Can reduce the AADF ghost effect mainly for Low dynamic option.

**Dn KNN** and **slider** : KNN noise removal filter. The slider allow to choose noise removal level

**Dn NLM2** & **slider** : Fast NLM2 noise removal filter. The slider allow to choose noise removal level

**Grad/Vignet** : remove image gradient or image vignetting (**select in the checkbox the filter you want to apply**)
- **1st slider** : choose the threshold for the gradient/vignetting
- **2nd slider** : choose the attenuation of the gradient/vignetting correction

**Img Neg** check box : turns the image into a negative image

**Gamma & slider** : modify the image gamma. Activate Trsf (LEFT CONTROL) to see how this filter works.

**Histo Stretch & 2 sliders** : modify the histogram. Activate Trsf (LEFT CONTROL) to see how this filter works.

**Histo Sigmoide & 2 sliders** : modify the histogram (sigmoide function). Activate Trsf (LEFT CONTROL) to see how this filter works.

**Contrast CLAHE & slider** : modify the contrast of the image

**Contrast Pytorch & slider** : modify the contrast of the image with torchvision function

**Cap Dark** : capturing Master Dark
With the **slider**, you select the number of darks captured to create the master dark.
Clicking the **Cap Dark Button** will open a **dialog box** asking you to cover the telescope. Click **OK** and the program will capture the darks and create the master dark.
Dialog Information on le right will say "**Dark dispo**" or "**Dark NON dispo**" (means Dark available or Dark unavailable).
**Check the checkbox "Sub dark"** to subtract the Master Dark.

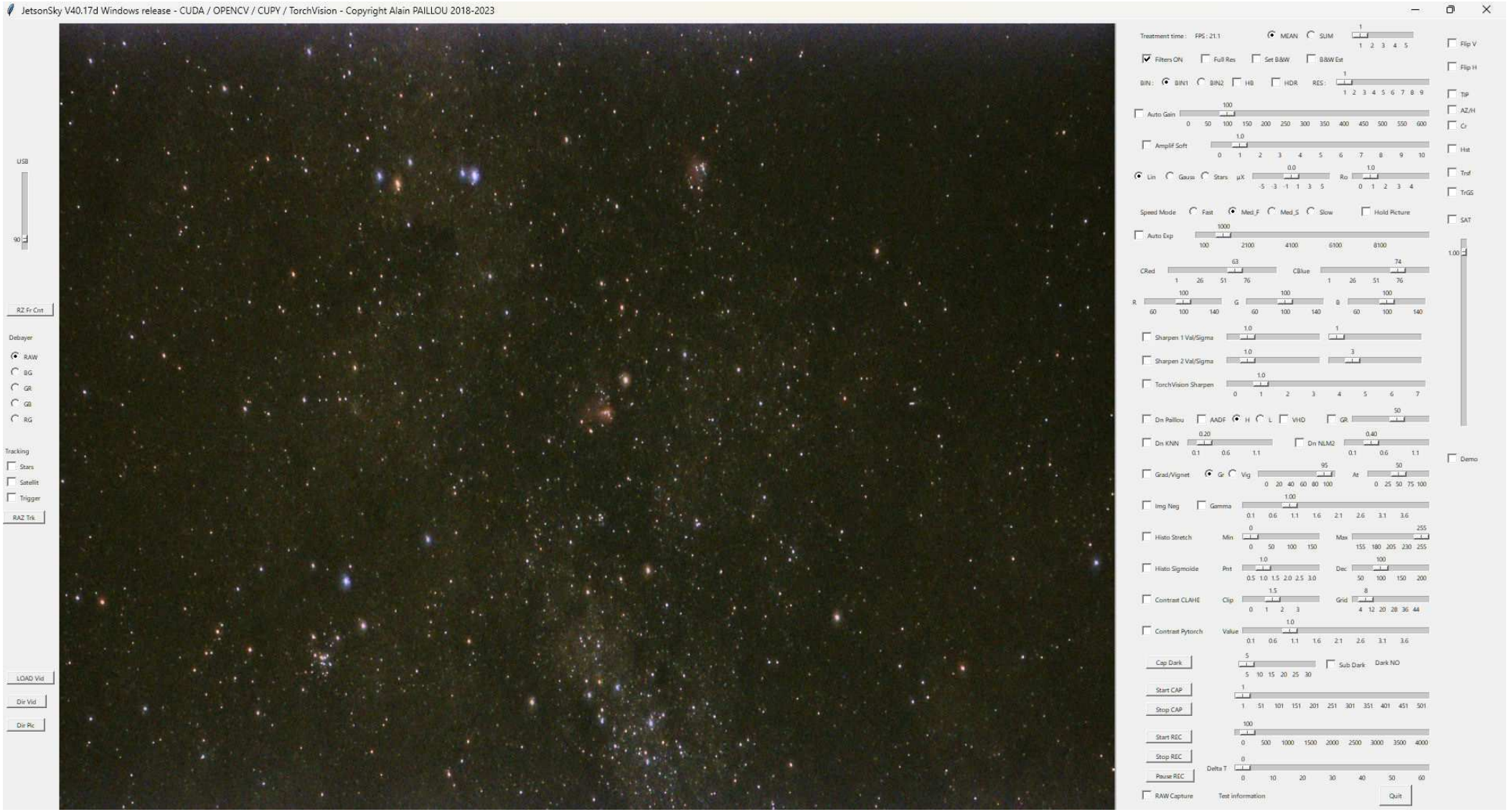
**Start CAP / Stop CAP buttons & slider** :
Select the number of images you want to capture
Press Start CAP to start the images capture
Press Stop CAP to stop images capture
Note : don't forget to choose the capture quality you want by checking unchecking HQ Capture

**Start REC / Pause REC / Stop REC buttons & sliders** :
Select the number of frames you want to capture with the **slider**.
If you select **0** with the slider, the number of frames will be set to **10000**.
Press Start REC to start the video capture
Press Stop REC to stop video capture
Press Pause REC to pause video capture
**Delta T slider** : set the number of seconds between 2 frames

**HQ Capture** : Select (or not) high quality for captures
High Quality : TIF for images and RAW videos
Low Quality : JPG for images and MPEG videos

**Quit** button : exit the program

# VIDEO TREATMENT MODE (no camera control)



## The camera control functions are not active.

## Some small changes :

LEFT SIDE controls :

Debayer selection box : 5 options :
RAW
BG
GR
GB
RG

Select RAW if it is a RGB video

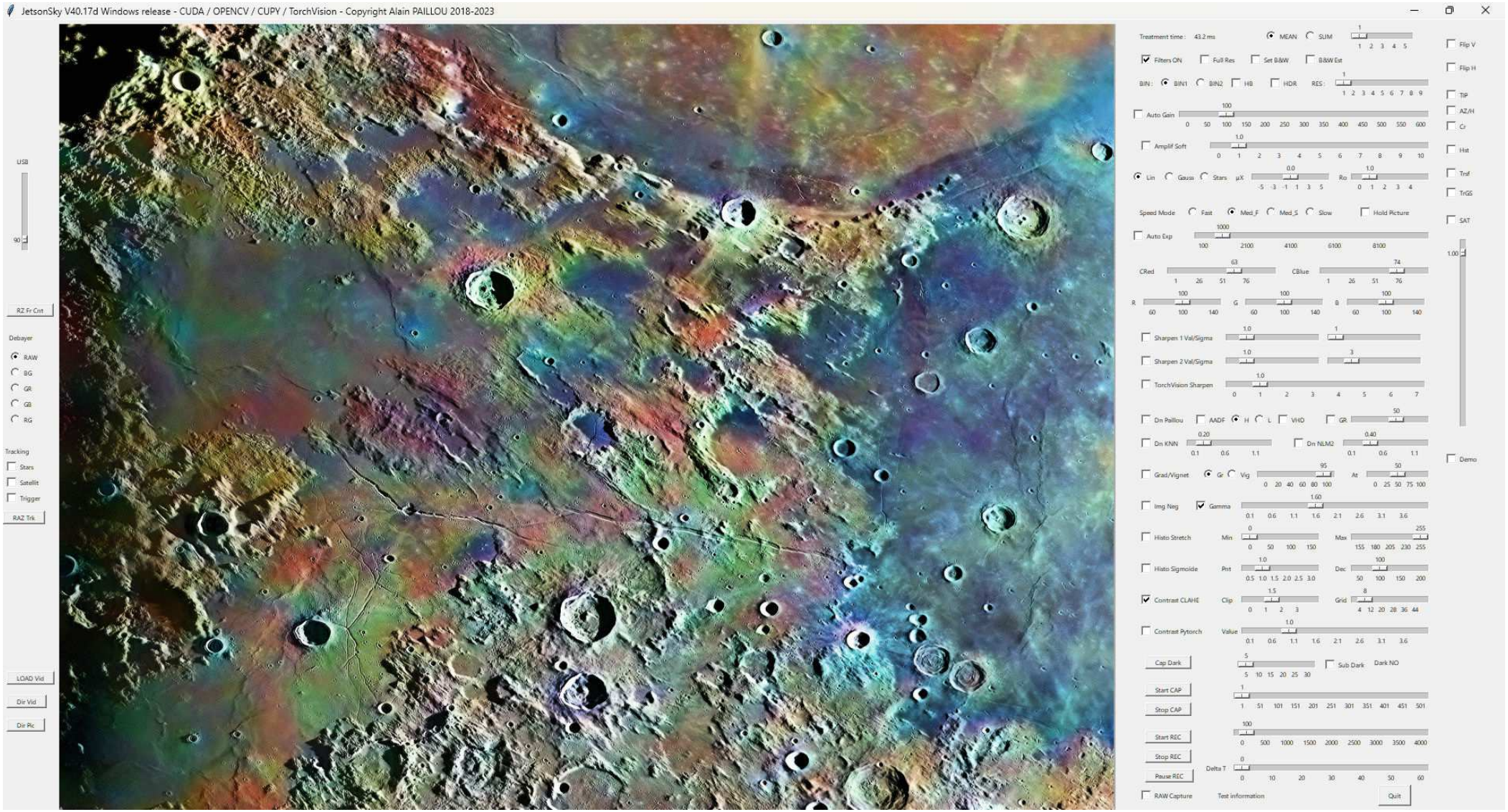
Select the appropriate bayer pattern if it is a RAW video

LOAD V/I button : open a dialog box to load the Video

## RIGHT SIDE controls :

**Information about FPS only.**

# IMAGE TREATMENT MODE (no camera control)




**The same as Video mode except it is image treatment mode.**

Debayer selection is not active. All images are considered as RGB images.