

How DSLR Astro-Imaging Has Changed in the Last 10 Years

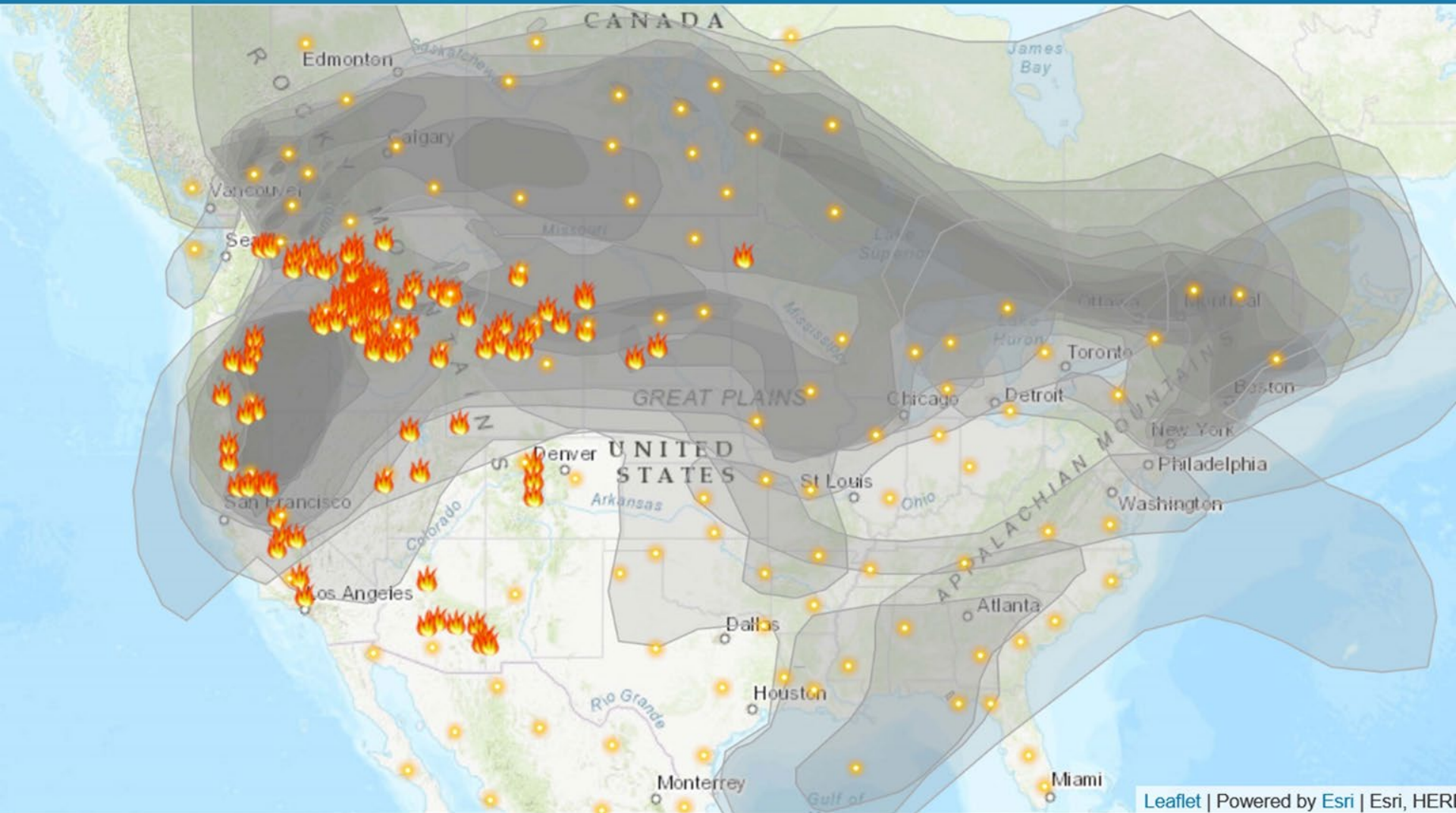
By AI Takeda

How DSLR Astro-Imaging Has Changed in the Last 10 Years

By AI Takeda

Enviroment

Fire and Smoke Map v2.0



Smoke

Experimental service, use at your own risk.

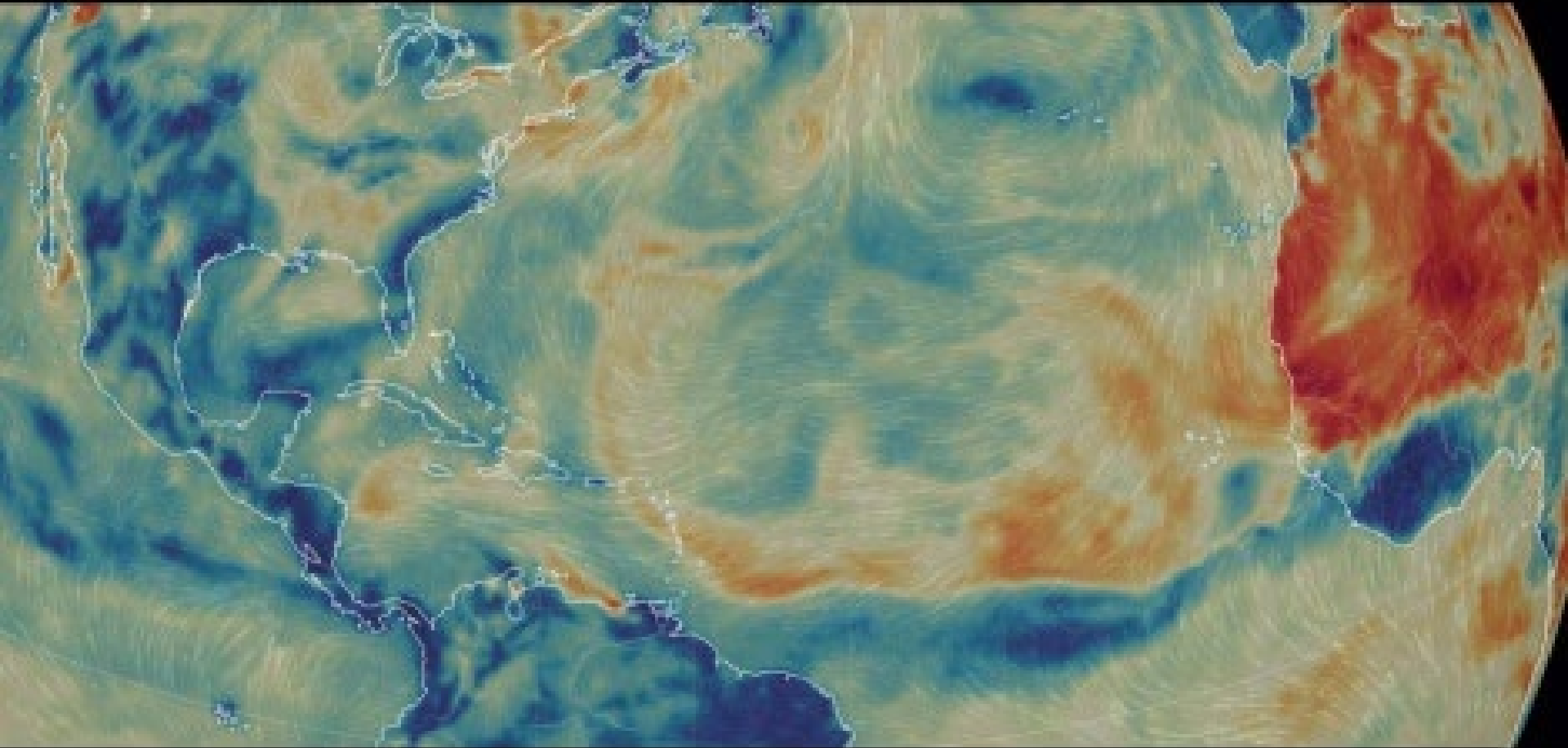


2021-07-27T02:00:00.000Z

8fps

Leaflet | Powered by Esri | NOAA

Sand from the Sahara





High Pressure Sodium

High Pressure Sodium (HPS) Lamp Spectrum

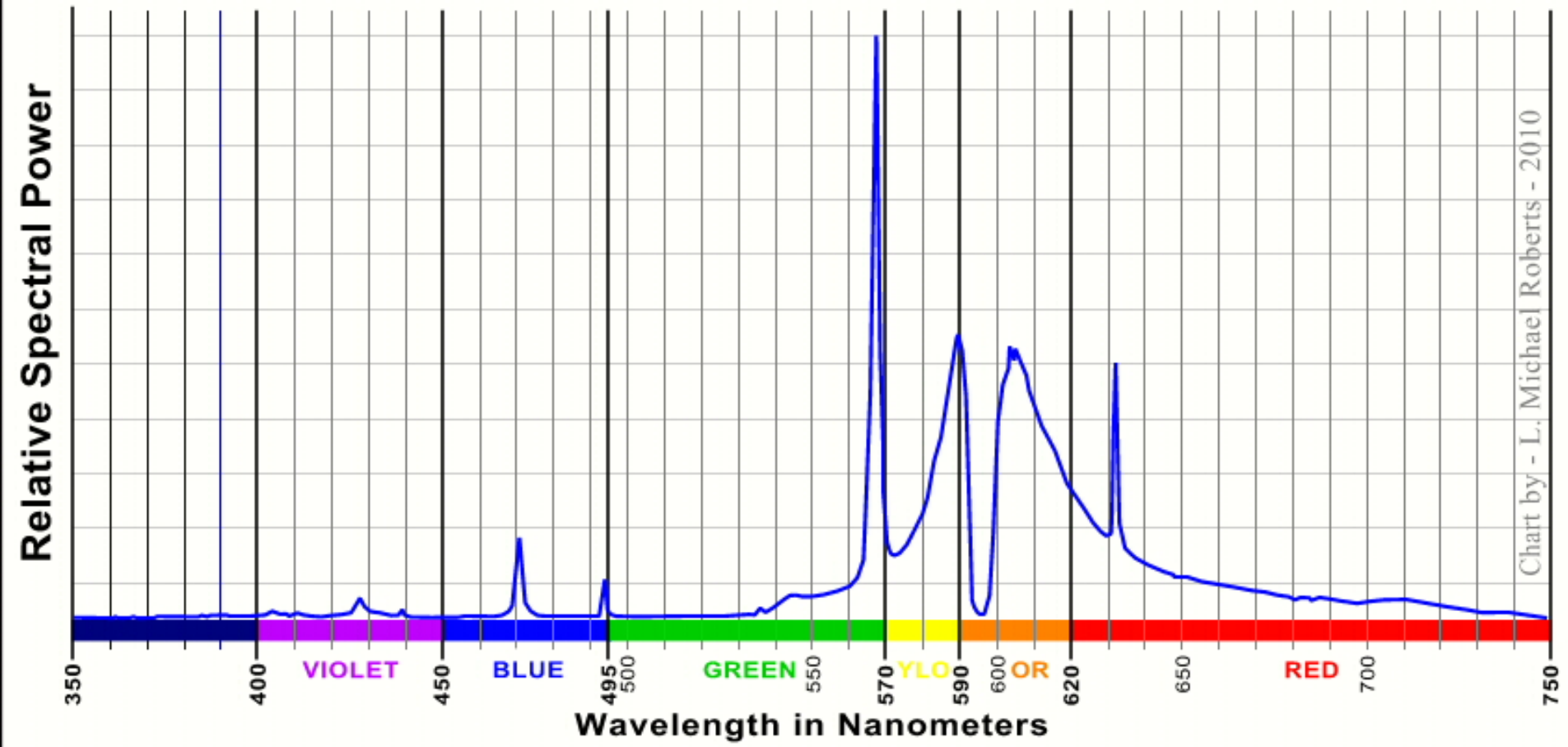
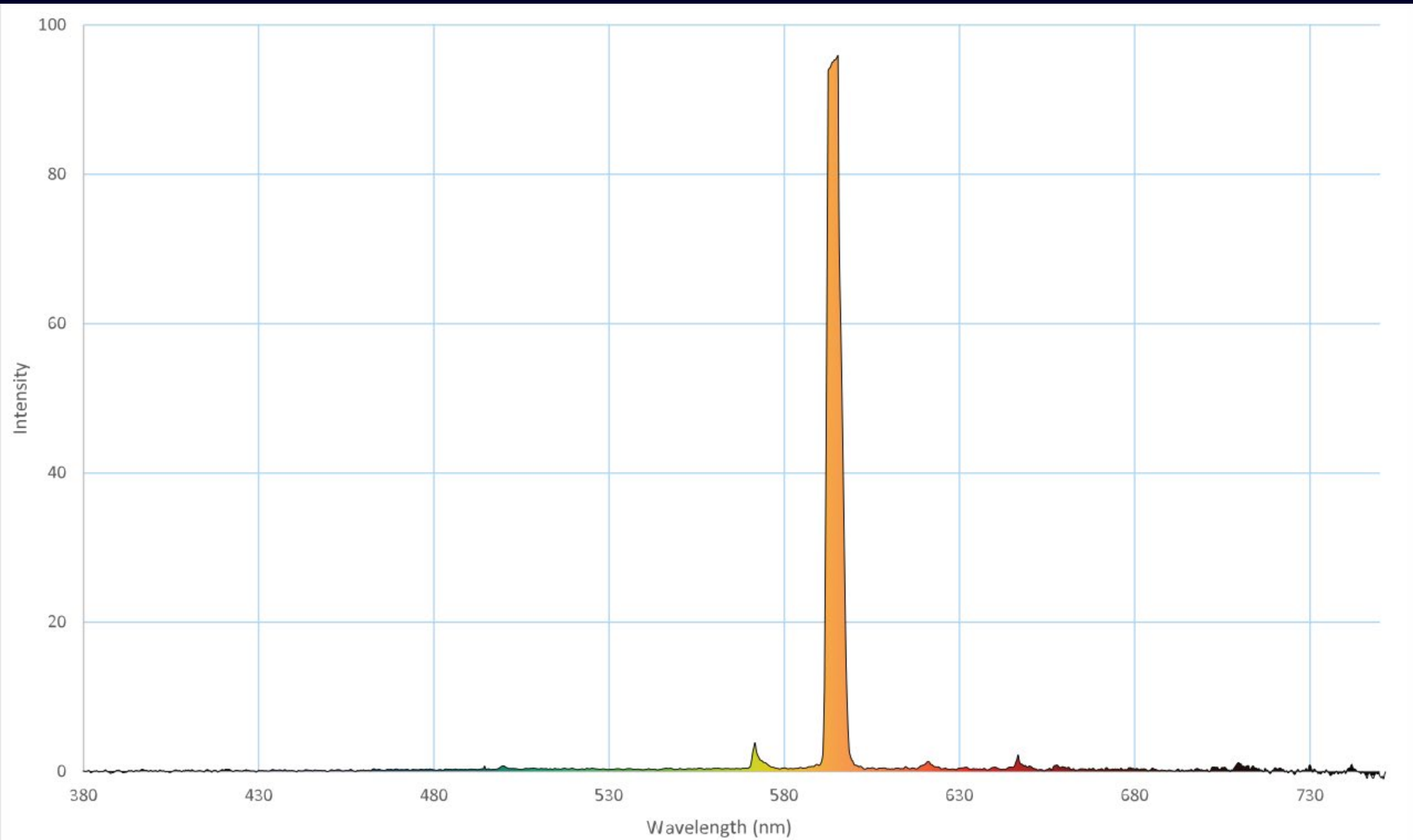


Chart by - L. Michael Roberts - 2010

Low Pressure Sodium



Outdoor LED Lighting



Light domes from surrounding towns

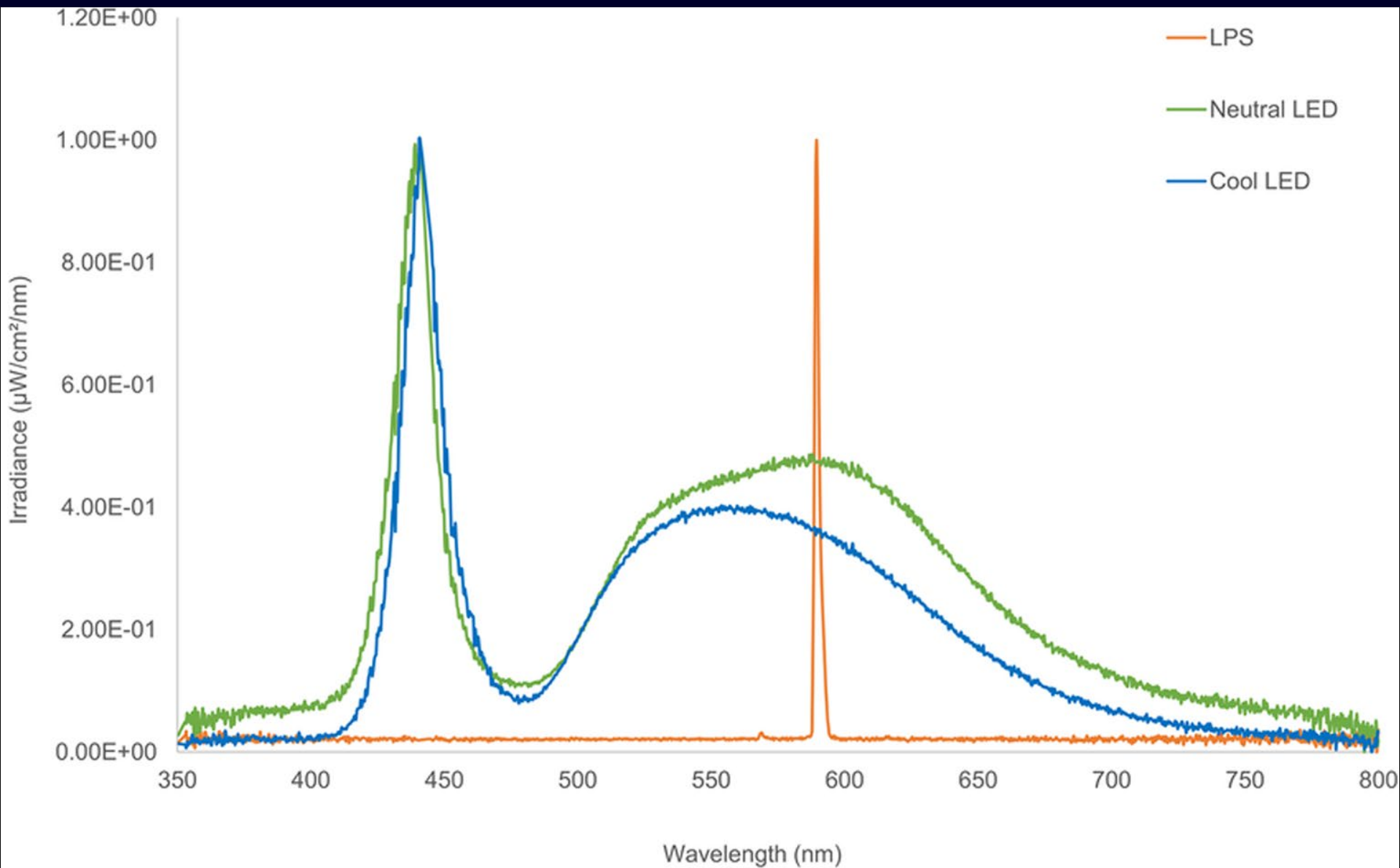


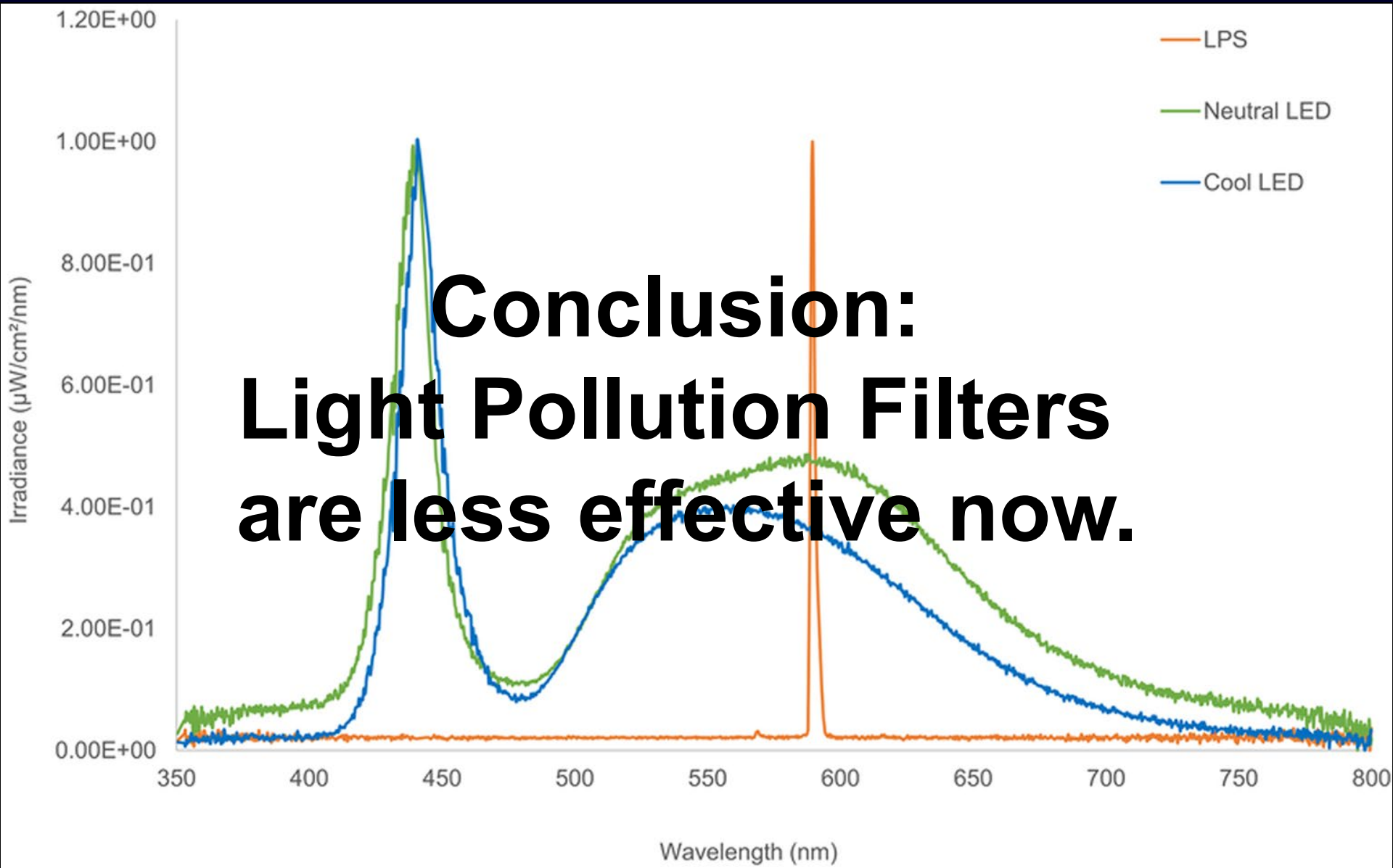
Cloud Reflections



Wikipedia Commons. Image by Gppercy

LED vs Low Pressure Sodium





**Conclusion:
Light Pollution Filters
are less effective now.**

Starlink

Victoria Girgis/Lowell Observatory

Equipment 10 Years Ago



Canon 20D DSLR



Canon TC80N3 Timer / Remote



Dell Inspiron – Windows XP

Computer USB Adapters

- **Pre-Canon 40D:**
 - (1) **USB Control cable (Shutter release)**
 - (2) **USB Download cable**





Epsilon-180 on a Losmandy G-11 Gemini 1



Takahashi Epsilon-180

7-inch f/2.8 Hyperbolic Astrograph

- Corrected Newtonian with a 7" primary
- Hyperbolic primary mirror
- Flat field lens in the focusing tube
- Focal length= 504 mm, 2-3 degree field
- Photographic Only Telescope



Guide scope

Orion 90 mm f/5.6 Refractor

- 90mm diameter (9th – 10 mag. Stars)
- Achromatic refractor

CCD Autoguider

- SBIG ST8300 CCD
- 5.4um, 13.5 x 18 mm
- 2-degree field
- Peltier cooled



Equipment Present



Canon T1i

Canon Rebel T1i (500D) “Unmodified”

- 15.1 Mega pixel DSLR
- 14 bit CMOS Chip, 4.7 um pixel size
- 22.3 x 14.9 mm, APS-C
- Unmodified – Standard off the shelf
- Fixed View Screen
- Canon CR2 RAW format



Canon T4i

Canon Rebel T4i (650D) “Unmodified”

- 15.1 Mega pixel DSLR
- 14 bit CMOS Chip, 4.3 um pixel size
- 22.3 x 14.9 mm, APS-C
- Unmodified – Standard off the shelf
- Variable Angle Screen
- Canon CR2 RAW format



Canon Ra

Canon Ra (500D)

“Hydrogen-alpha sensitive”

- 15.1 Mega pixel DSLR
- 14 bit CMOS Chip, 5.36 um pixel size
- 36 x 24 mm, Full Frame
- Variable Angle Screen
- RF lens mount (Adapters for EF mount)
- Modified for 656nm (Hydrogen-alpha)
- Canon CR3 RAW format

Interval Timer Remote Controls





Ioptron Sky Tracker



E-180 on a AP900 GTO Mount

DELL Inspiron E6410

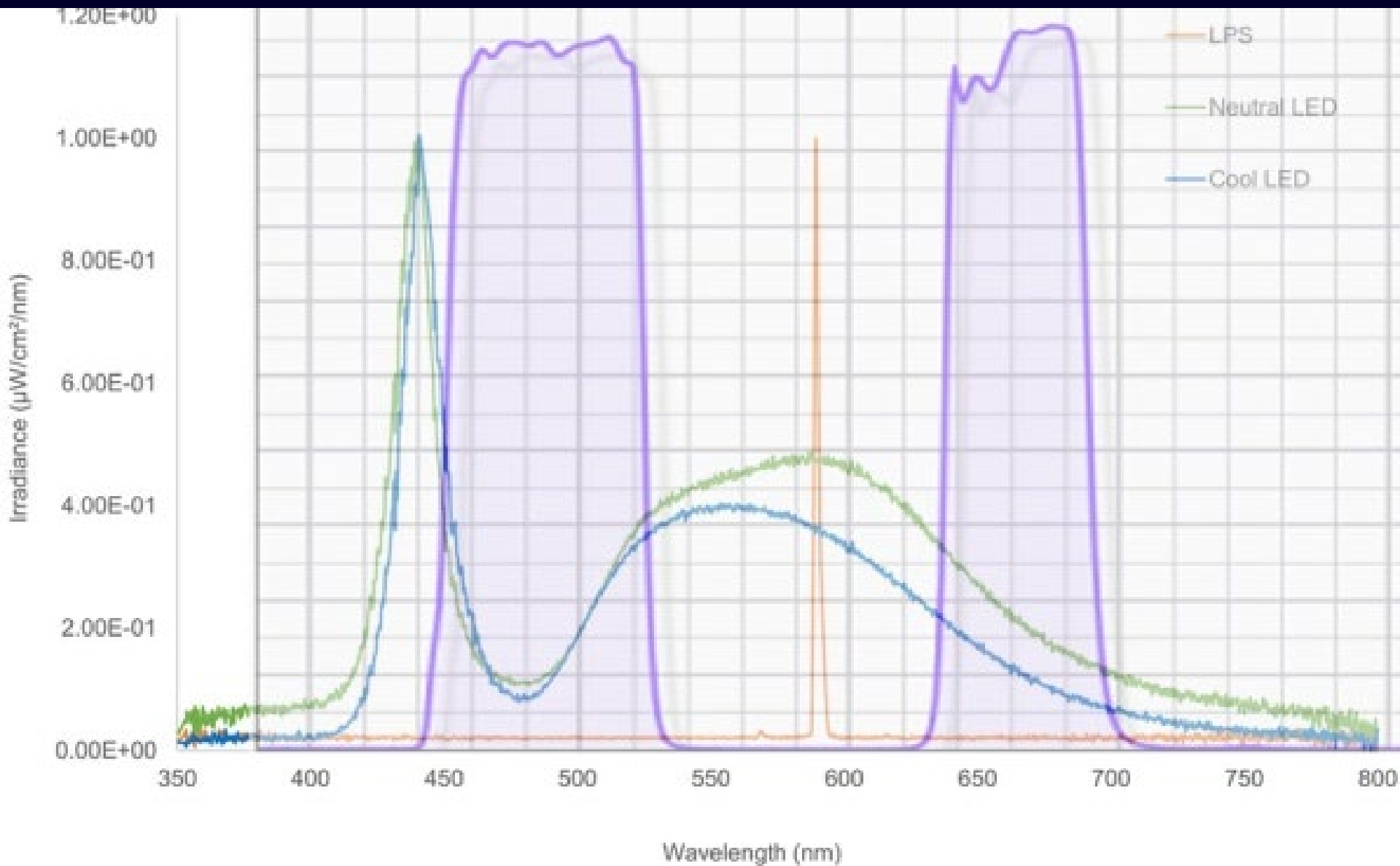


Filters

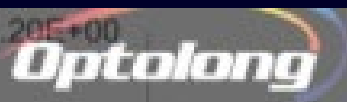
DSLR Light Pollution Filter



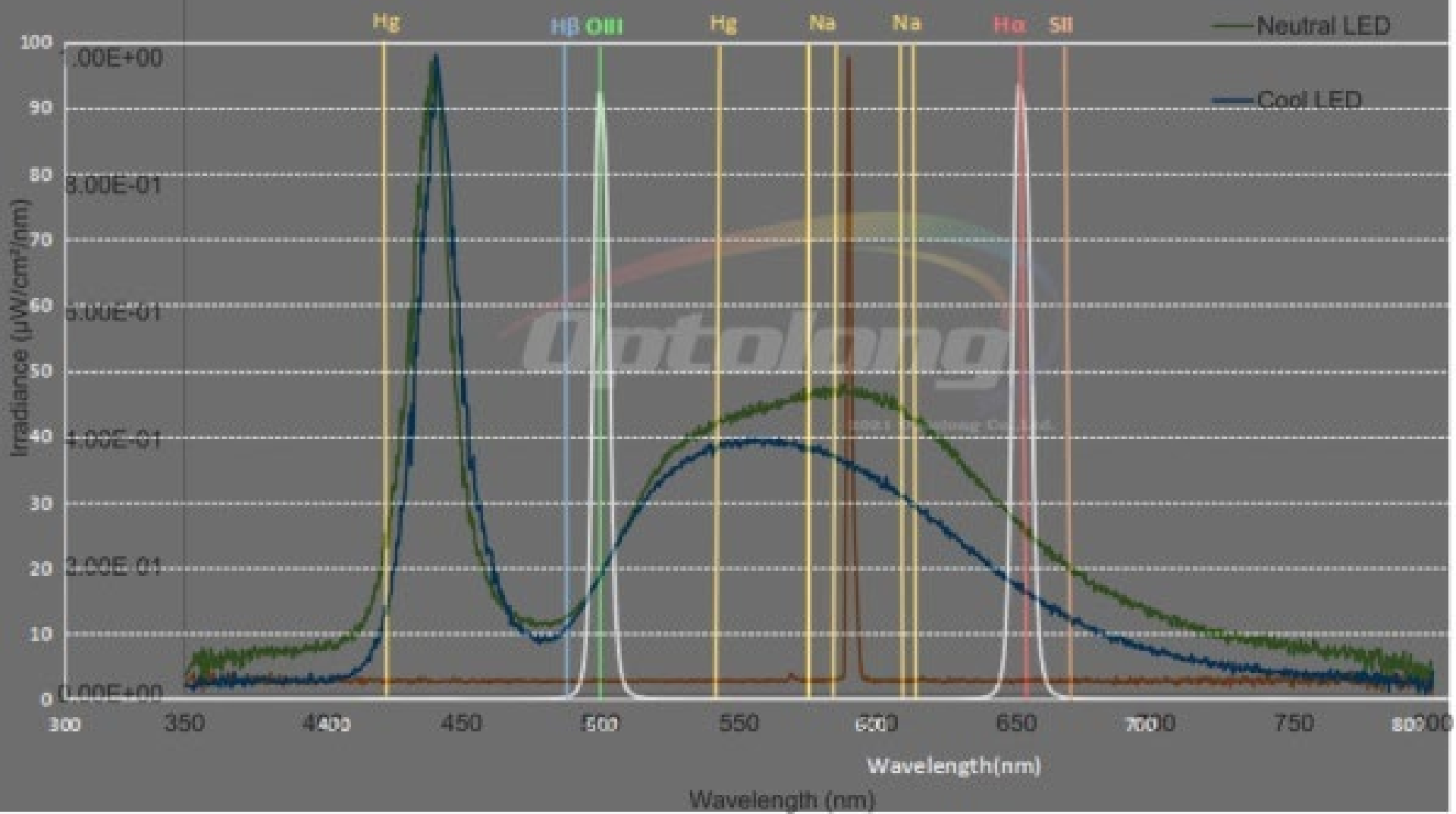
Astronomik CLS Filter



1.20E+00



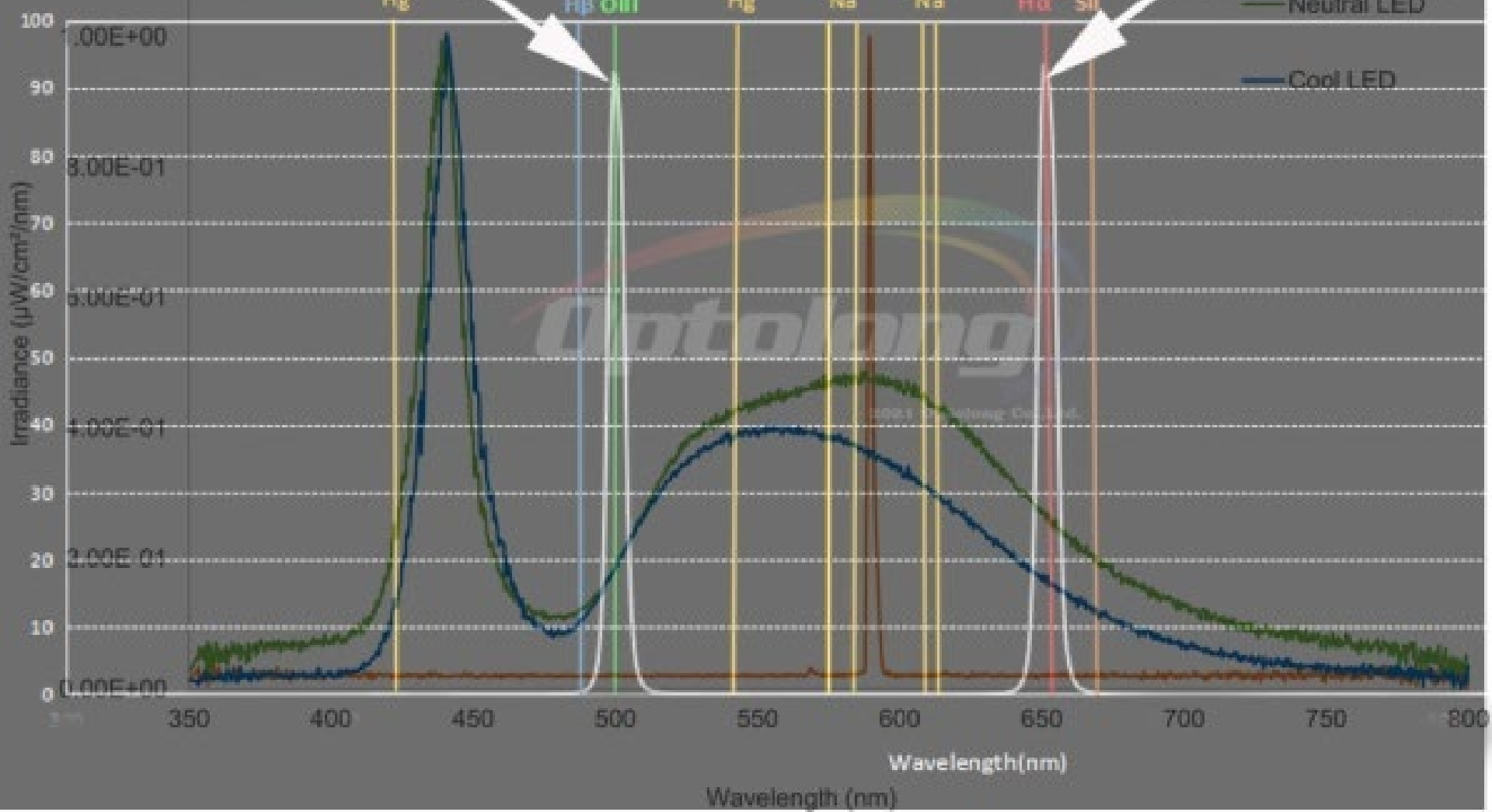
OPTOLONG L-eXtreme Filter



OPTOLONG L-eXtreme Filter

O III = 500.7

Ha = 656.3 nm



ISO Setting

800

3200

100

200

400

1600

12,500

ISO Setting

“You have great images. I’ll use your ISO”

ISO Setting

“You have great images. I’ll use your ISO”

Only works if you have an identical
camera

Increasing ISO Increases Sensitivity WRONG!

- Only works with Film (Analog)
- Film grains become more sensitive at a higher ISO
- The camera is not picking up more light
- The sensor is not changing
- Therefore, it is NOT increasing sensitivity

Increasing ISO

The signal is amplified

- Signal can be amplified in the Analog domain before digitally processed
- Signal can be amplified digitally
- Or Both

Qualifying your camera

<https://www.photonstophotos.net/index.htm>

- Is your camera ISO Variant or Invariant?
- What is your dynamic range vs ISO
- What is your read noise vs ISO

Qualifying your camera

ISO Variant

- More noise at lower ISO
- Less noise at higher ISO

Qualifying your camera

ISO Invariant

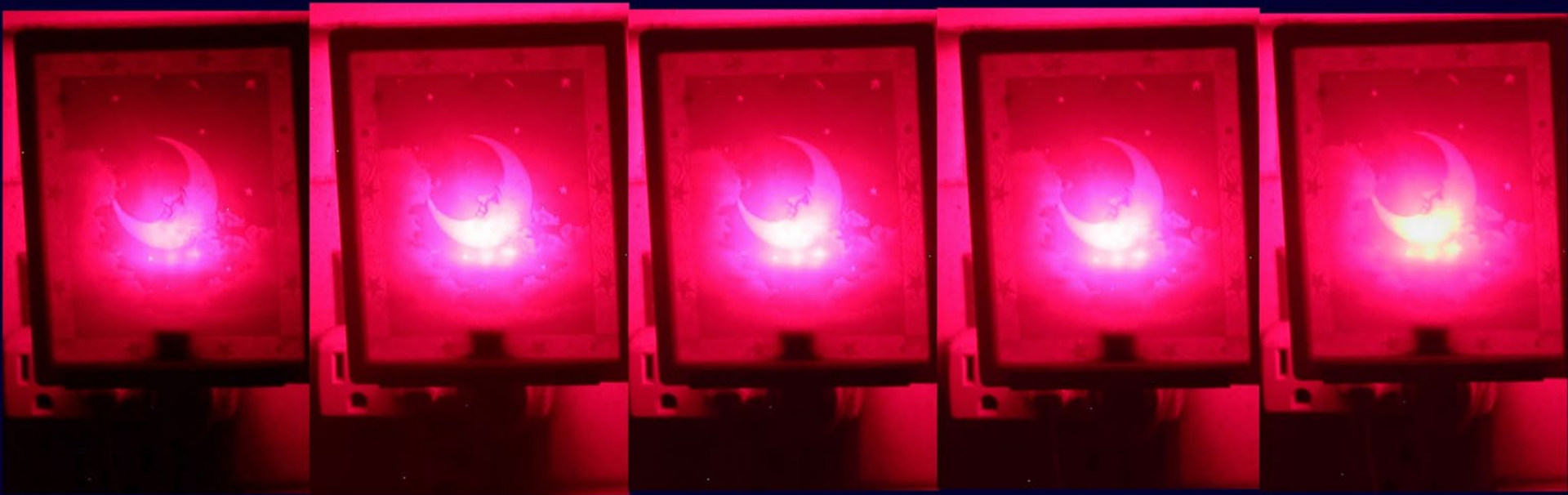
- Same noise at both lower and higher ISO
- Less shadow noise
- Signal to noise ratio stays constant

ISO Variance Test

<https://www.lonelyspeck.com/how-to-find-the-best-iso-for-astrophotography-dynamic-range-and-noise/>

- Image in dark conditions: a dimly lit room or outdoors at night
- RAW file format
- Use (M) manual exposure mode
- Set “daylight” or "custom" white balance
- Disable all noise reduction
- Meter a neutral exposure at ISO 3200
- Shoot one exposure at each whole stop ISO (200, 400, 800, 1600, 3200, 6400)
- Change only the ISO
- Match exposures in post processing and compare

ISO Variance Test Camera



ISO 200

ISO 800

ISO 1600

ISO 3200

ISO 6400

ISO Variance Test

Photo Editing Software (Change by 1 Stop)

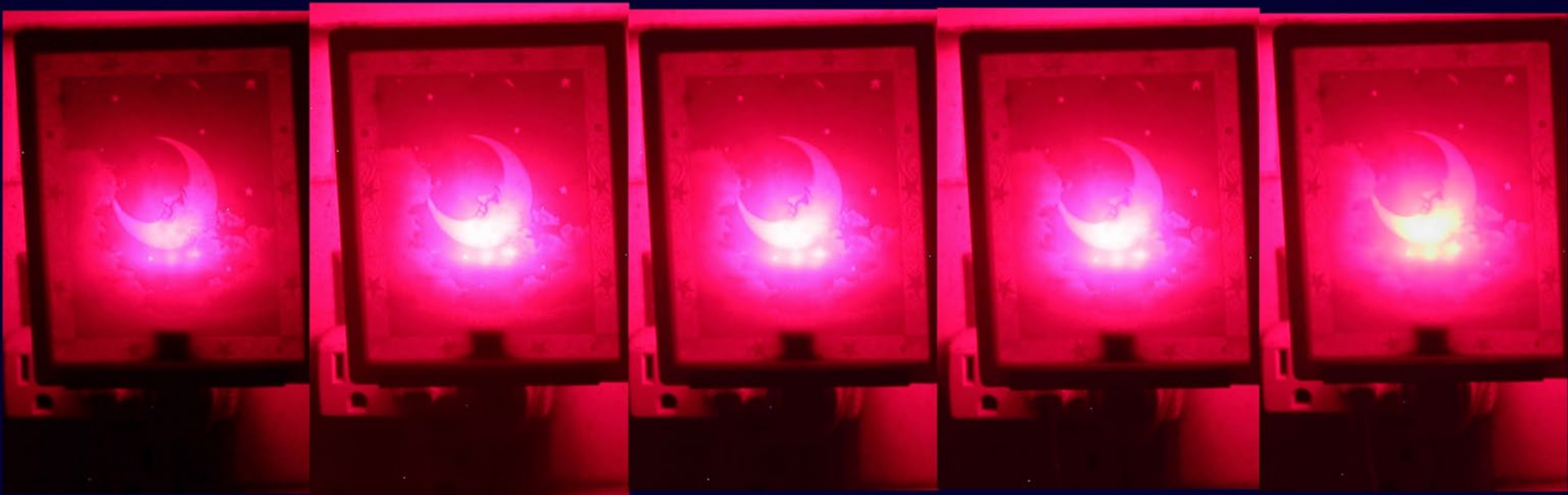
+4EV

+2EV

+1EV

No Adjustment

-1EV



ISO 200

ISO 800

ISO 1600

ISO 3200

ISO 6400

ISO Variance Test

Canon Ra is ISO Variant

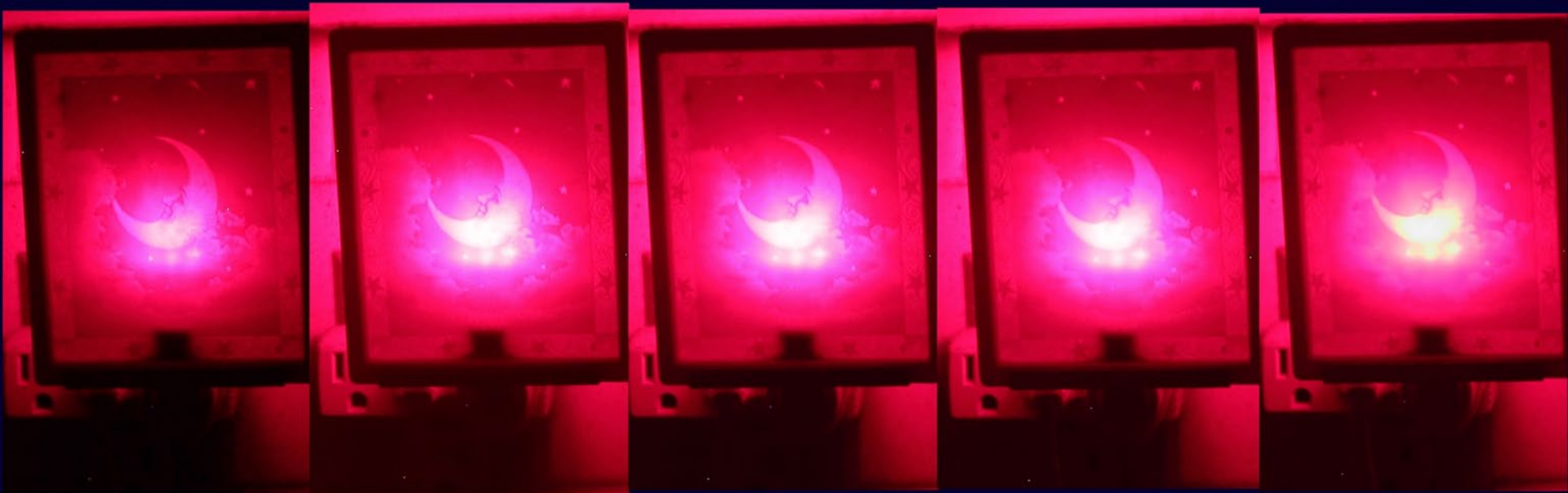
+4EV

+2EV

+1EV

No Adjustment

-1EV



ISO 200

ISO 800

ISO 1600

ISO 3200

ISO 6400

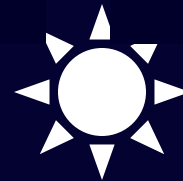
Very Noisy

Some Noise

Less Noise

Changes are hard
to tell

Ditto



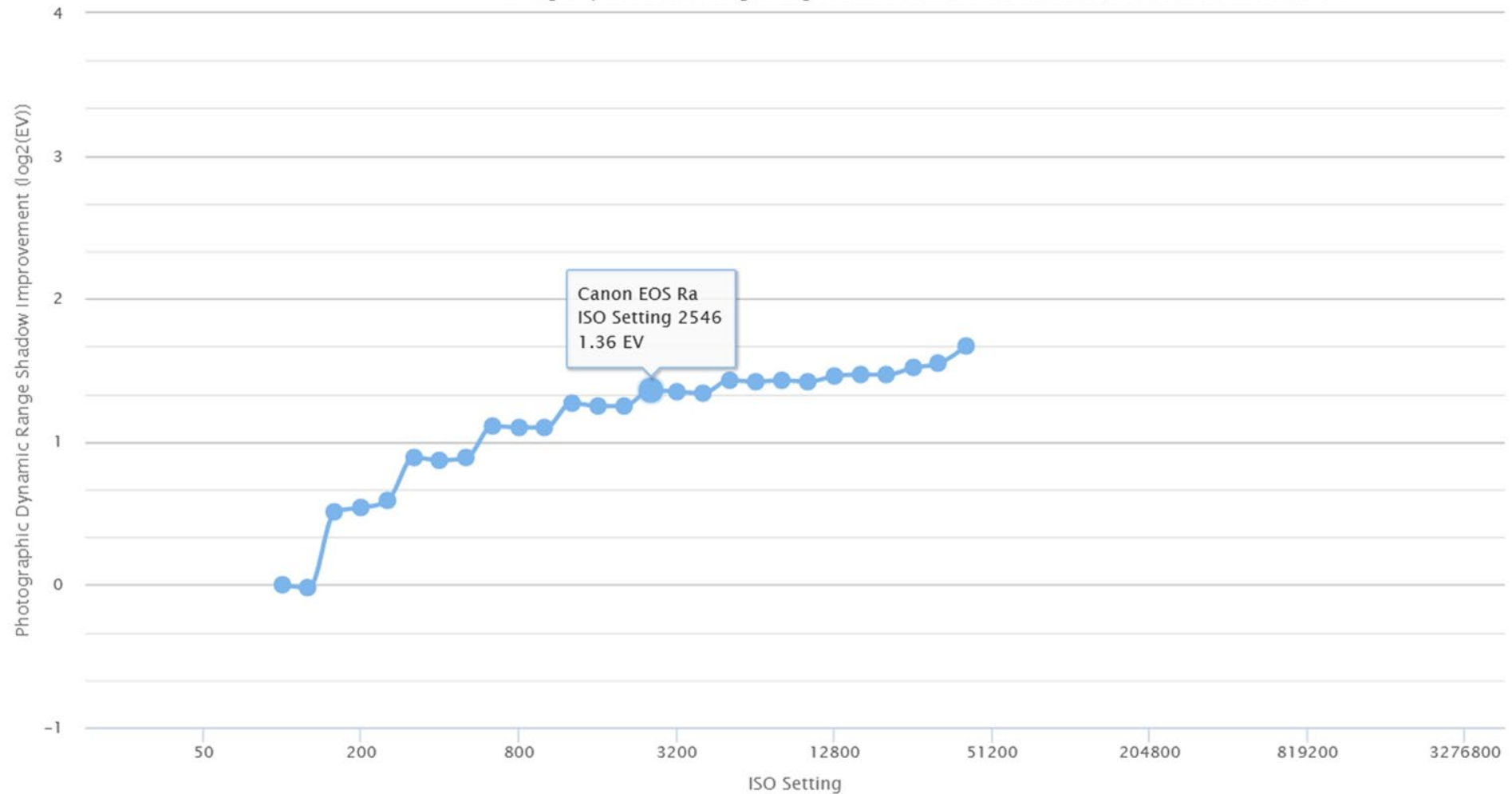
Dyn Range (Shadow) vs ISO

Photographic Dynamic Range Shadow Improvement versus ISO Setting

(DX) indicates DX crop (APS-C) indicates APS-C crop, and (FF) indicates FF crop. (ES) indicates electronic shutter.

Open symbols indicate values outside the normal analog range

Triangle up indicates scaling, triangle down indicates noise reduction, and diamond indicates both



(Copyright)

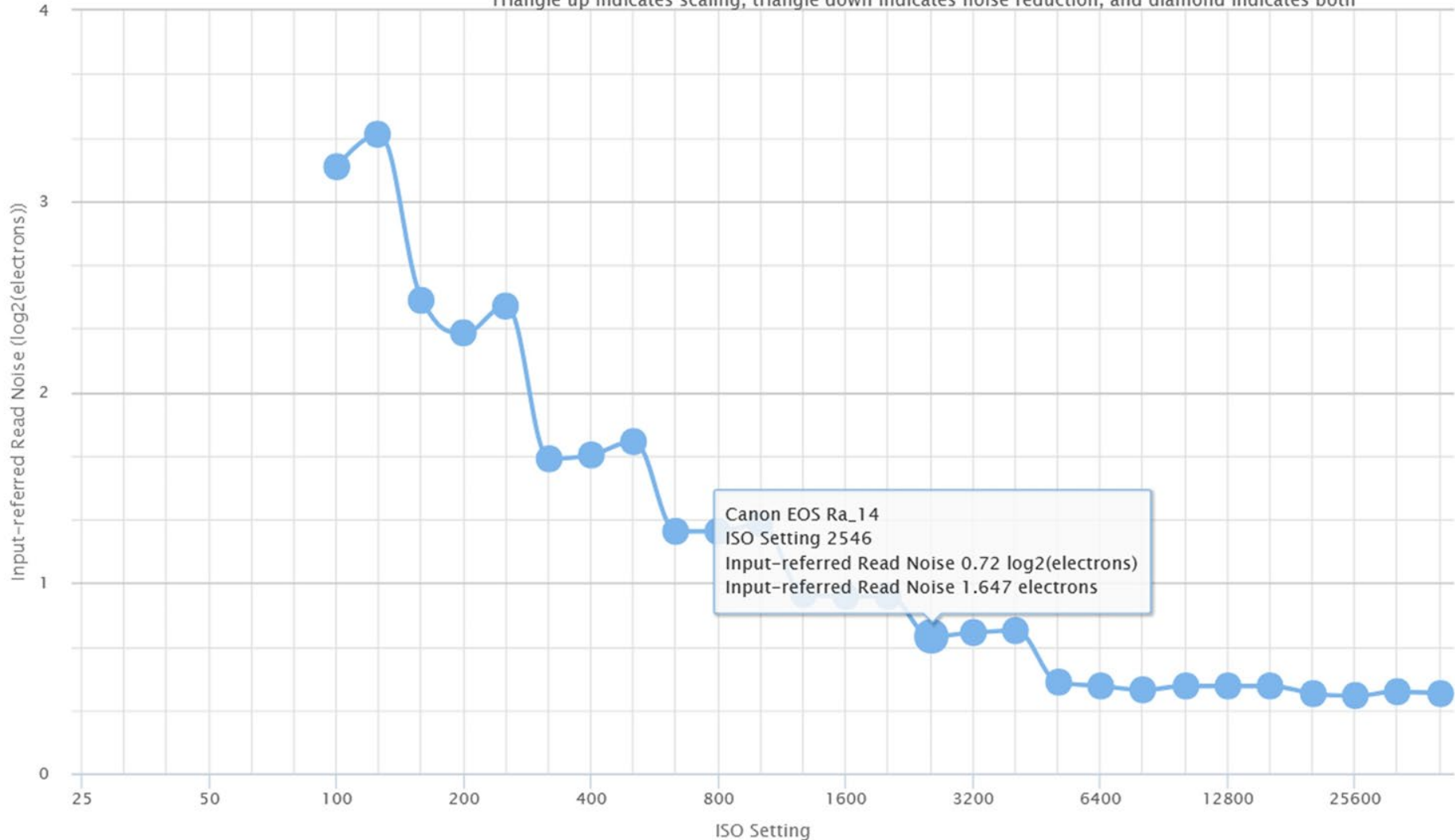
<https://www.photonstophotos.net/index.htm>

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Read Noise vs ISO

Input-referred Read Noise versus ISO Setting

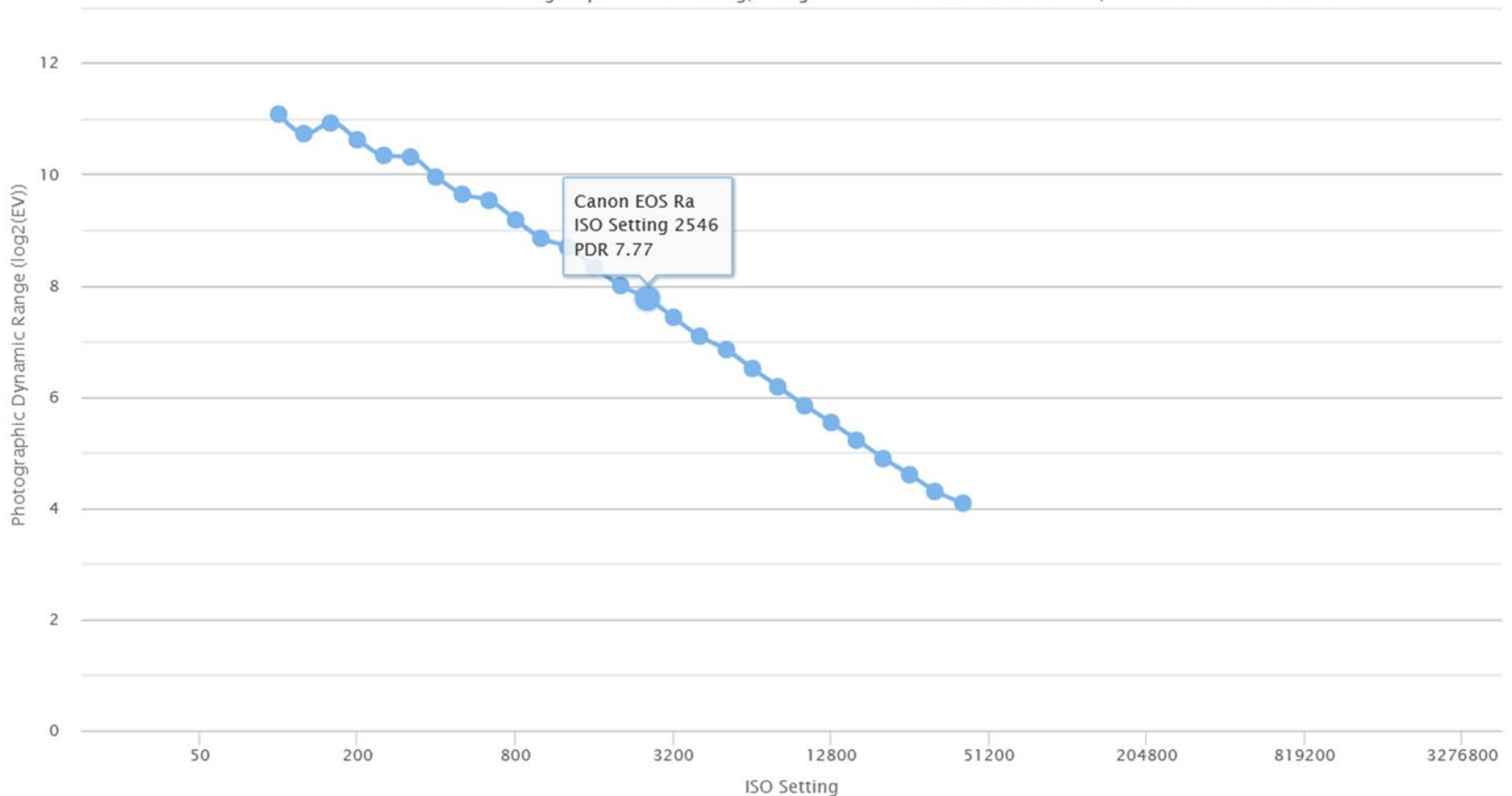
Open symbols indicate values outside the normal analog range
Triangle up indicates scaling, triangle down indicates noise reduction, and diamond indicates both



Dynamic Range vs ISO

Photographic Dynamic Range versus ISO Setting

(DX) indicates DX crop (APS-C) indicates APS-C crop, and (FF) indicates FF crop. (ES) indicates electronic shutter. (p) indicated preliminary data.
Open symbols indicate values outside the normal analog range
Triangle up indicates scaling, triangle down indicates noise reduction, and diamond indicates both



<https://www.photonstophotos.net/index.htm>

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Focusing

Focusing

- Find the Brightest Star (Vega, Sirius, etc.)
- Reduce the size of the “Donuts”
- No double lines (Diffraction focusing)
- Center the diffraction spike (Bahtinov mask)



Canon T1i

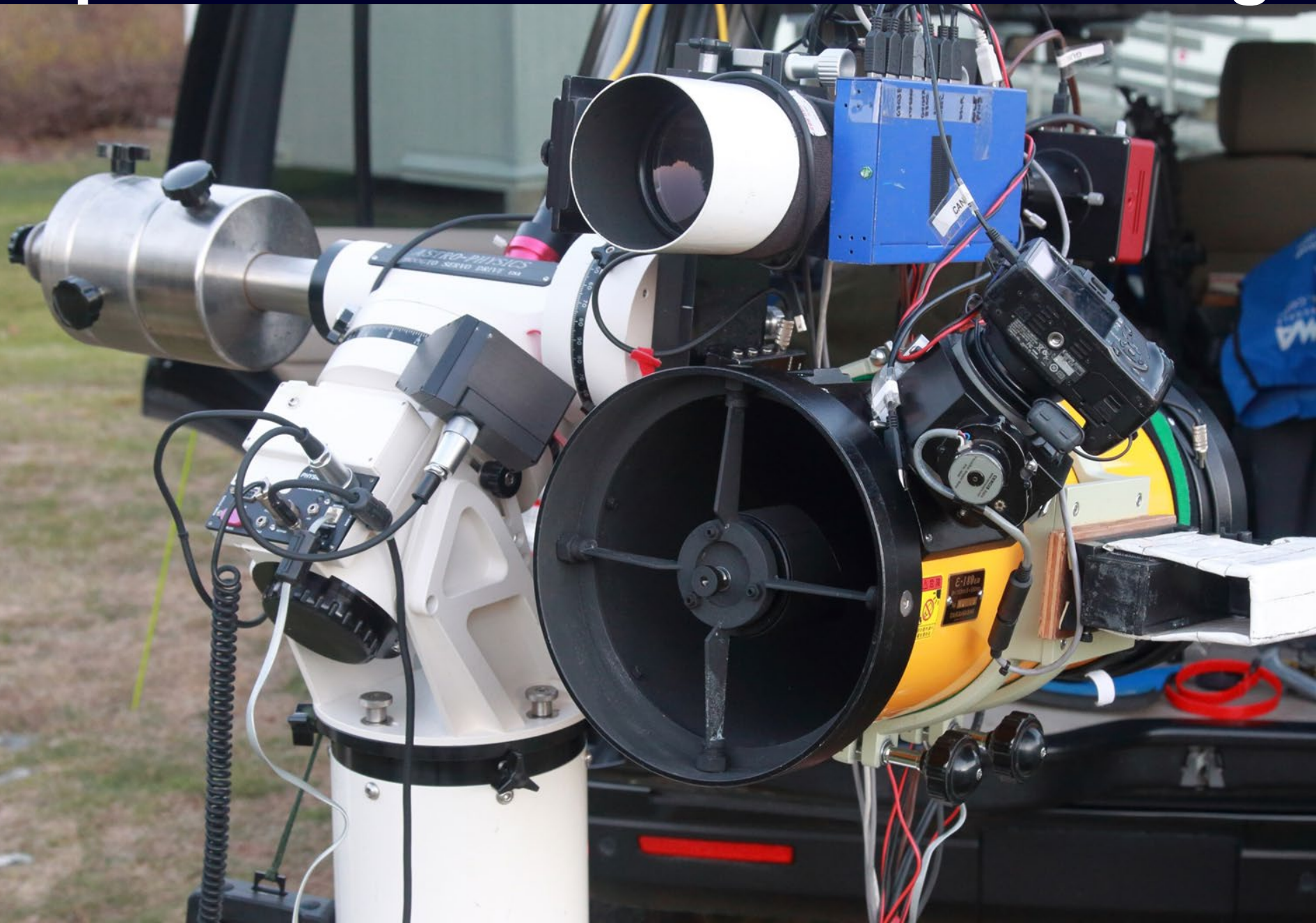
“It Looks Focused Technique”





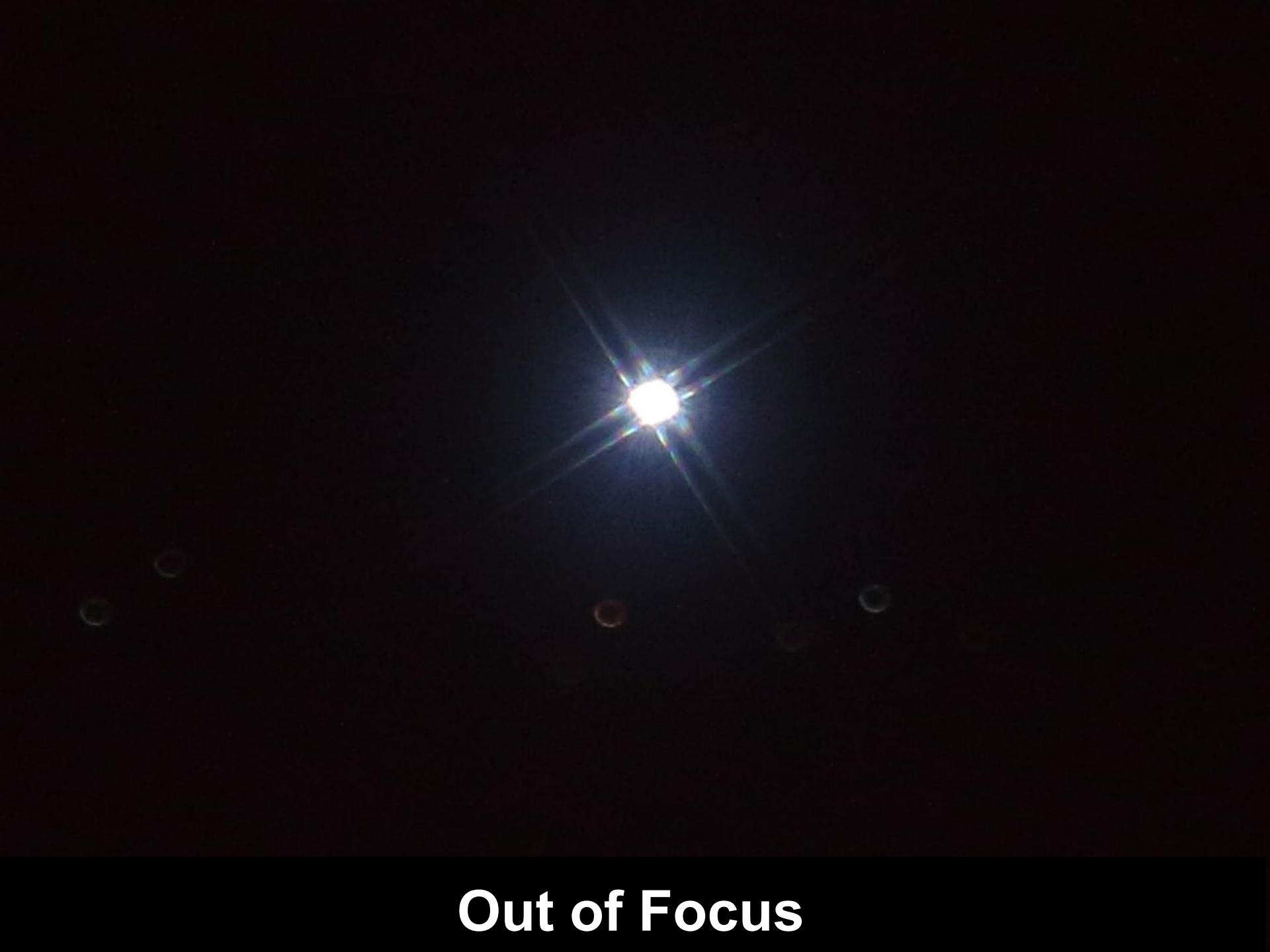


Spider Diffraction Pattern Focusing





Show second screen	
Preview control panel	Ctrl+Alt+L
Pin	Alt+O
Remove from selection preview	
Fit to window	Alt+Shift+1
12.5%	Alt+Shift+2
25%	Alt+Shift+3
50%	Alt+Shift+4
100%	Alt+Shift+5
200%	Alt+Shift+6
300%	Alt+Shift+7
400%	Alt+Shift+8
Rotate Left	Ctrl+L
Rotate Right	Ctrl+R
Label	
Copy recipe	Ctrl+Alt+C
Copy selected recipe	Ctrl+Shift+C
Select and copy recipe settings...	
Paste recipe	Ctrl+Shift+V
Save recipe in file...	Ctrl+Alt+S
Read and paste recipe from file...	Ctrl+Alt+V
Paste recipe of edited image to original image	Ctrl+Alt+U
Paste recipe of original image to edited image	
AF points	Alt+J
Grid	
Highlight/shadow warning	Alt+M
Soft-proof colors	Ctrl+Alt+Y
Properties	Ctrl+Alt+I
Show scroll bars	
Info	Ctrl+I



Out of Focus



Focused

Bahtinov mask







Don't Forget
to Remove
Your Mask!



Canon Ra

Focusing with the Canon Ra

The screen: It's full of stars!

M [262]28 29:59 



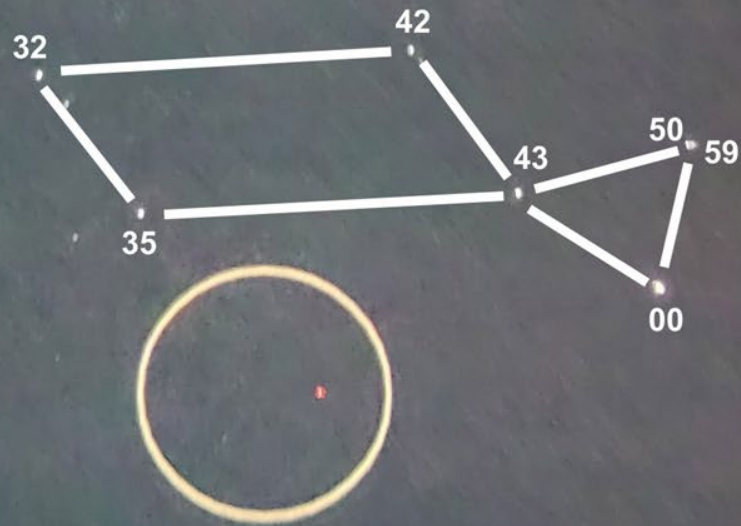
30"

F5.6

3..2..1..0..1..2..3

ISO 1600

M [262]28 29:59 



30"

F5.6

3..2..1..0..1..2..3

ISO 1600

Canon Ra 30x Magnification





Samyang 14mm f/2.8 Lens



75 mm diameter Bahtinov mask



Window Screen mask

Canon Ra 30x Magnification



Total Solar Eclipses Past

Timing and Prompts





Shutter Speeds

Total Solar Eclipse Shutter Speeds

1/2000	1/1000	1/500	1/250	1/125	1/60	1/30	1/15	1/8	1/4	1/2	1	2	4
---------------	---------------	--------------	--------------	--------------	-------------	-------------	-------------	------------	------------	------------	----------	----------	----------



Folder: Collection(0) Check mark: 1 2 3 4 5 Rating:



High quality Recipe data: Number of images: 34 Number of selected images: 0

A Sony IC Recorder is the central focus, with a pair of white headphones plugged into it. The recorder has a small screen and several buttons. In the background, a camera lens is visible. The text is overlaid on the image in a large, white, sans-serif font.

Hey BOZO!
Stop taking pictures! NOW!
Step away from the camera!
Look at the eclipse,
NOW!





2006 Total Solar Eclipse – Canon 20D

Total Solar Eclipses

Present





AP400 GTO, TMB92, AT66, Lenovo Laptop

Backyard EOS

BackyardEOS 3.1.11 - Premium Edition (500D-T1i) 13:21:29

Camera Information Center
Tv 1/350 Av f/4 ISO AUTO
Dial M White AWB Mirror Off
Quality RAW Battery

ASCOM Focuser

Weather Center
Dither Daylight Setting

Image Center [Egypt2006_total_eclipse_AI_Takeda.jpg]
180° Zoom 15%

Histogram Center
2 L RGB
Reset

Capture Plan Center [TEST-Solar.bt]

Frame Type	Cable support	Save To	Mirror lock
LIGHT	Camera USB	PC	0

Target Name	Filter	Delay
		0

Exposures	Shutter	Aperture	Duration	ISO	Pause
1	1	1/...	f/4	1	200 0
2	1	1/15	f/4	1	200 0
3	1	1	f/4	1	200 0
4	1	1/...	f/4	1	200 0
5	1	1/30	f/4	1	200 0
6	1	1	f/4	1	200 0

Load Save Save as... Reset

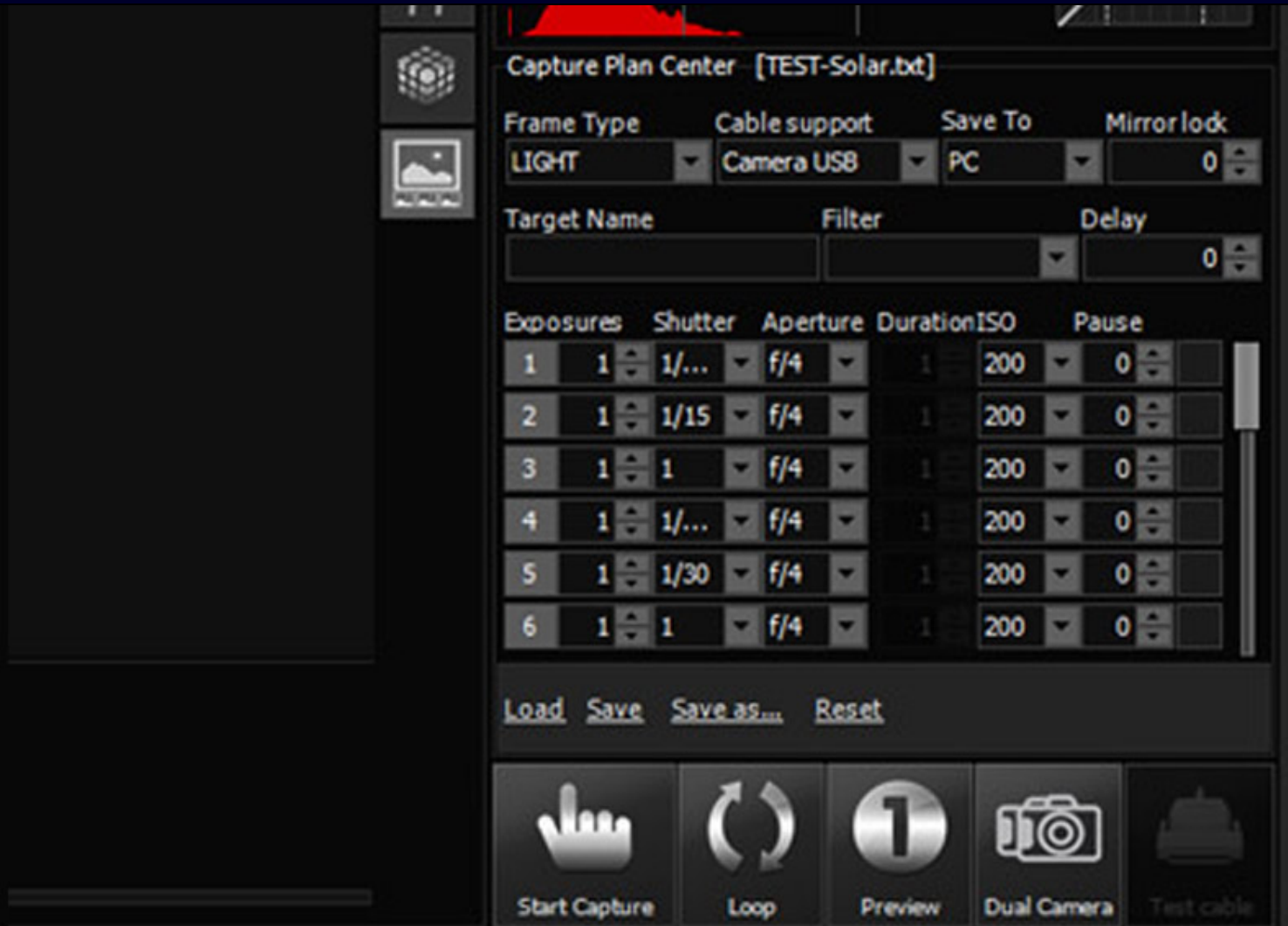
Start Capture Loop Preview Dual Camera Test cable

1 @ 13h21m18s

Windows Taskbar: Start, File Explorer, Internet Explorer, Firefox, Chrome, Calculator, Word, BackyardEOS, System Tray: 109/109, 1:21 PM 7/13/2017

Backyard EOS

Capture Plan Center



Capture Plan Center [TEST-Solar.bt]

Frame Type: LIGHT | Cable support: Camera USB | Save To: PC | Mirror lock: 0

Target Name: | Filter: | Delay: 0

Exposures	Shutter	Aperture	Duration	ISO	Pause	
1	1	1/...	f/4	1	200	0
2	1	1/15	f/4	1	200	0
3	1	1	f/4	1	200	0
4	1	1/...	f/4	1	200	0
5	1	1/30	f/4	1	200	0
6	1	1	f/4	1	200	0

Load Save Save as... Reset

Start Capture Loop Preview Dual Camera Test cable

Images Plus

The screenshot displays the ImagesPlus Camera Control software interface. The main window is titled "ImagesPlus Camera Control" and features a menu bar (File, Open Operators, Camera, Focuser, Filter Wheel, Help) and a toolbar with various icons. A secondary window, "Canon DSLR Control", is open, showing the "Focus Metrics" tab. This window contains a "Shutter Sequence Parameters" table, a "Focus Tracking" section with radio buttons for "Off", "Graph", and "Correct", and a "Temperature Drop Correction" section with radio buttons for "Focus In" and "Focus Out". Below these sections is a table with columns for Image, Focus X, HFD, Eccen., Temp, dX, dHFD, dEccen., and dTemp.

Canon DSLR Control

Connect and Download | Settings and Live View | Focus Metrics | Capture

Shutter Sequence Parameters

Delay	Inter...	Expo...	Total	ISO	Prefix	Type	Av	Quality	Focu
0	2	1/250	1	100		Light	4.0	Raw	
0	2	1/125	1	100		Light	4.0	Raw	
0	2	1/15	1	100		Light	4.0	Raw	
0	2	1/4	1	100		Light	4.0	Raw	

Loop Shutter Sequence Add Edit Cancel

Dither Setup Load Save Delete Release

Focus Tracking Temperature Drop Correction

Off Focus In Focus Out Target HFD: [] dEccen+: [0.20]

Graph [] dHFD+: [0.75] dTemp+: [1.25]

Correct Force Correction

Image	Focus X	HFD	Eccen.	Temp	dX	dHFD	dEccen.	dTemp
-------	---------	-----	--------	------	----	------	---------	-------

Windows taskbar: Start, 106 106, 1:32 PM 7/13/2017

Images Plus

Shutter Sequence Parameters

The screenshot shows the 'Canon DSLR Control' software interface. The 'Shutter Sequence Parameters' section contains a table with the following data:

Delay	Inter...	Expo...	Total	ISO	Prefix	Type	Av	Quality	Focus
0	2	1/250	1	100		Light	4.0	Raw	
0	2	1/125	1	100		Light	4.0	Raw	
0	2	1/15	1	100		Light	4.0	Raw	
0	2	1/4	1	100		Light	4.0	Raw	

Below the table are several control buttons: Loop Shutter Sequence, Add, Edit, Cancel, Dither Setup, Load, Save, Delete, and Release.

The 'Focus Tracking' section includes radio buttons for Off (selected), Graph, and Correct. The 'Temperature Drop Correction' section includes radio buttons for Focus In (selected) and Focus Out, and a checkbox for Force Correction. Numerical input fields are present for Target HFD, dEccen+, dHFD+, and dTemp+.

At the bottom, a table header is visible with columns: Image, Focus X, HFD, Eccen., Temp, dX, dHFD, dEccen., and dTemp.

Folder structure sidebar:

- 201806_2ep030
- 20180623_Full_Backup
 - Downloads
 - Images
 - 111-Tealines
 - 222-Batch
 - Autos
 - 204
 - 205
 - 206
 - 207
 - Clubhouse
 - Other
 - 20170623_Total_Eclipse
 - 1-Jpeg
 - 2-Moving
 - 3-RAW_Images
 - 1
 - 2
 - 3-32M
 - 4
 - 3-Tif
 - 4-Dark
 - 5-Res
 - 6-Flat
 - 7-0-0
 - Y-Pre-Release
 - Z-Final-Release
 - Venment
 - 2018
 - Daylight
 - 222-601EAGS
 - Tempy
- 20180615_Portal_Backup
- 20180620_Portal_Auto_Backup
- 20180624_Portal_Backup
- New folder
- 409-Flash_Slick_Backup
- 300_Lensuv_1120_Laptop_Work_Computer
- 609-OSLR_SD_Card_457RO_ONLY
- YTF-Camera_Dump
- 222-Portrait-00MATELEITE

Collection: New Collection(s)

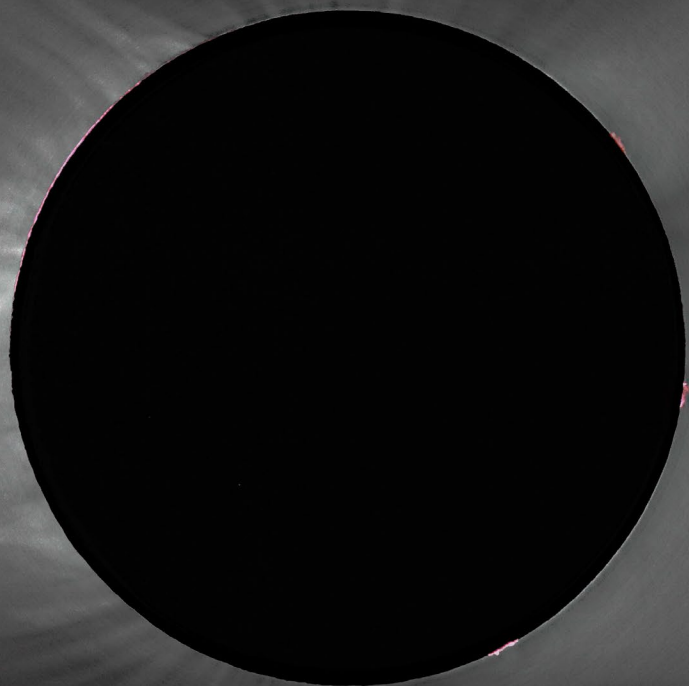
Image grid showing a sequence of 48 frames (8 rows by 6 columns) of a total solar eclipse. Each frame includes technical data:

- Row 1: IMC_3000.CR2 (1/2000, 50300)
- Row 2: IMC_3004.CR2 (1/1800, 50300) to IMC_3008.CR2 (1/1200, 50300)
- Row 3: IMC_3009.CR2 (1/1800, 50300) to IMC_3014.CR2 (1/1200, 50300)
- Row 4: IMC_3015.CR2 (1/1000, 50300) to IMC_3020.CR2 (1/1000, 50300)
- Row 5: IMC_3021.CR2 (1/1000, 50300) to IMC_3026.CR2 (1/1000, 50300)
- Row 6: IMC_3027.CR2 (1/1000, 50300) to IMC_3032.CR2 (1/1000, 50300)
- Row 7: IMC_3033.CR2 (1/1000, 50300) to IMC_3038.CR2 (1/1000, 50300)
- Row 8: IMC_3039.CR2 (1/1000, 50300) to IMC_3044.CR2 (1/1000, 50300)

Right-side panels:

- Thumbnail**: IMC_3001.CR2, 0:11 Raw X6, Tv 1/2000, Av 5.0, ISO 200, 560.0mm
- Tool controls**: Brightness adjustment (0.00%), White balance adjustment (Auto)
- EXIF Information**:

Item	Value
File Name	IMC_3000.CR2
File Size	18.9MB
Camera Model	Canon EOS Rebel X6
Firmware	Rebelia Version 1.0.1
Shooting Date/Time	11/3/2016 12:12:09 AM
Author	Al Takada
Copyright Notice	© 2017 Al Takada
Owner's Name	
Shooting Mode	Manual Exposure
Tv(Shutter Speed)	1/2000
Av(Aperture Value)	5.0
Metering Mode	Evaluative Metering
ISO Speed	200
Auto ISO Speed	OFF
Lens	EF400mm f/5.6L II USM +1.4x
Focal Length	560.0mm
Image Size	5184x3456
Crop/Aspect ratio	3:2
Image Quality	RAW
Flash	OFF
FE Lock	OFF
White Balance Mode	Auto
AF Mode	Manual focusing
Picture Style	Auto
Shooting	3
Countdown	0



Other Eclipse Software

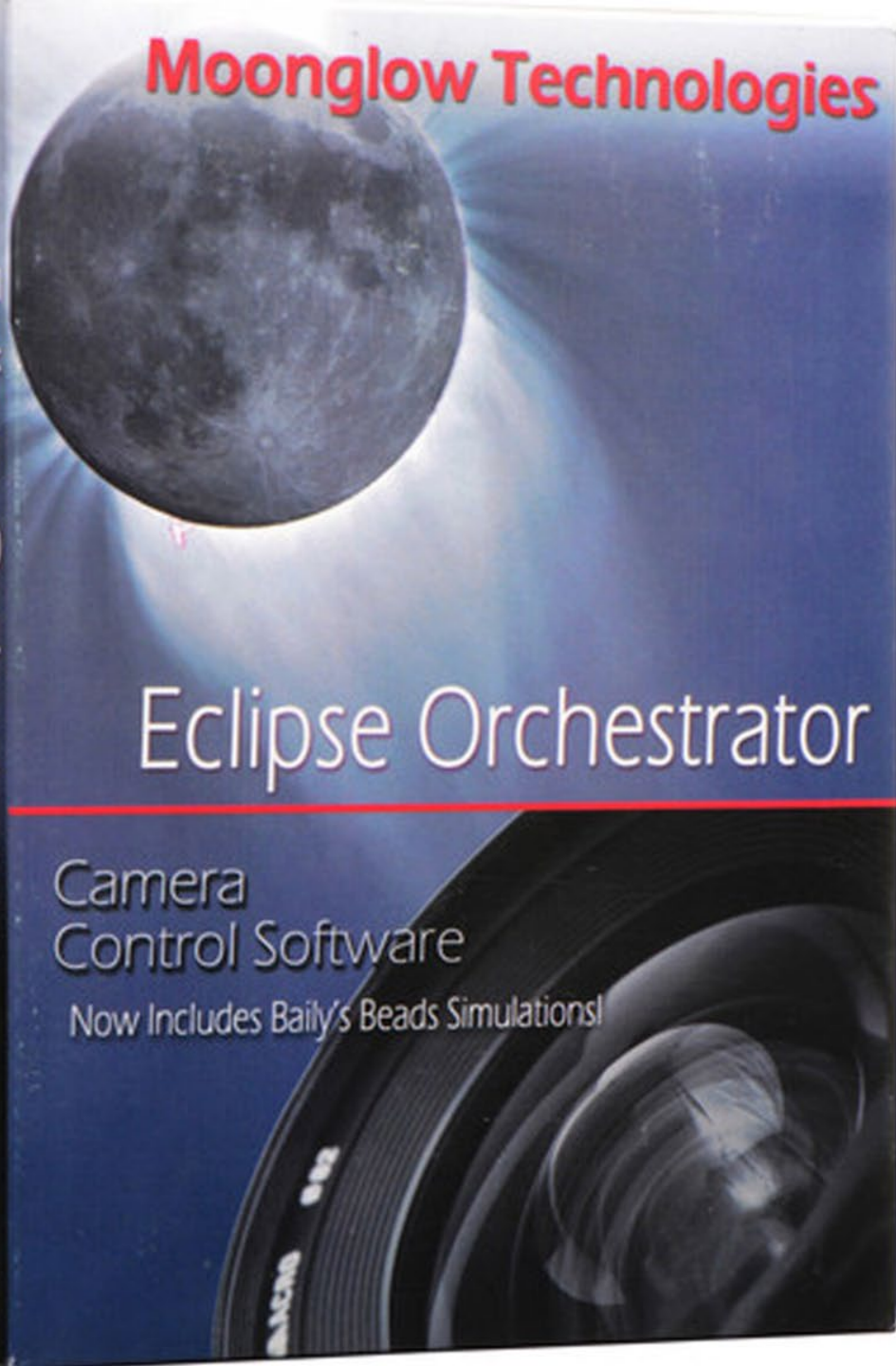
Moonglow Technologies

Eclipse Orchestrator
Camera Control Software

Eclipse Orchestrator

Camera
Control Software

Now Includes Baily's Beads Simulations!





Eclipsedroid for Android

Solar Eclipse Timer™

The image displays three sequential screenshots of the Solar Eclipse Timer app interface. The first screenshot (left) shows the main timer screen with a local time of 10:28:39 and a totality duration of 00:00:00. It features a central circular gauge and several 'Adjust' buttons for contact times. A red hand icon points to the 'Check Position' button. The second screenshot (middle) shows the 'GPS Data' screen where the user has entered the location 'Burna KY 42028'. It lists calculated contact times: C1: 16:54:30.9, C2: 18:22:28.3, MID: 18:23:48.4, C3: 18:25:08.3, and C4: 19:49:42.8. A red hand icon points to the 'Calculate Contact Times' button. The third screenshot (right) shows the final timer screen with a local time of 10:03:58 and a totality duration of 00:02:40. It displays the calculated contact times: 1st Contact 11:54:30, 2nd Contact 13:22:28, Max Eclipse 13:23:48, 3rd Contact 13:25:08, and 4th Contact 14:49:42. A red hand icon points to the 'Check Position' button. A red text overlay on the third screenshot reads: 'You're Set! The Timer Will "Talk" You Through The Eclipse'. A red number '2' with a hand icon is also present at the bottom of the second screenshot.

Software / Apps Acquisition

The SkyX Pro

20150721_AI_T_The_Sky_X_Default* - TheSkyX Professional Edition

File Edit Display Orientation Input Tools Telescope Help

11:27:48 pm March/01/2019 1 hour

Find
Search for: Leo I Find

Filter Wheel

Details Advanced Log

Object Information Report

Object Name: Leo I
Name 2: Leo I
Object Type: Elliptical Galaxy
RA (Topocentric): 10h 09m 29.9s
Dec (Topocentric): +12° 12' 40"
RA (2000.0): 10h 08m 28.1s
Dec (2000.0): +12° 18' 23"
Azimuth: 186° 12' 17"
Altitude: +59° 43' 47"
Major Axis: 0.0
Minor Axis: 0.0
Magnitude: 11.16
Rise Time: 16:27
Transit Time: 23:15

Related Search Results

Leo I

Takahashi Epsilon-180ED f/2.8 Hyperbolic Flat-Field Astrograph + Canon EOS 500D/Digital Rebel T1i

Leo I

Leo

Sextans

Cancer

M 44 Beehive Cluster

M 67

M 48

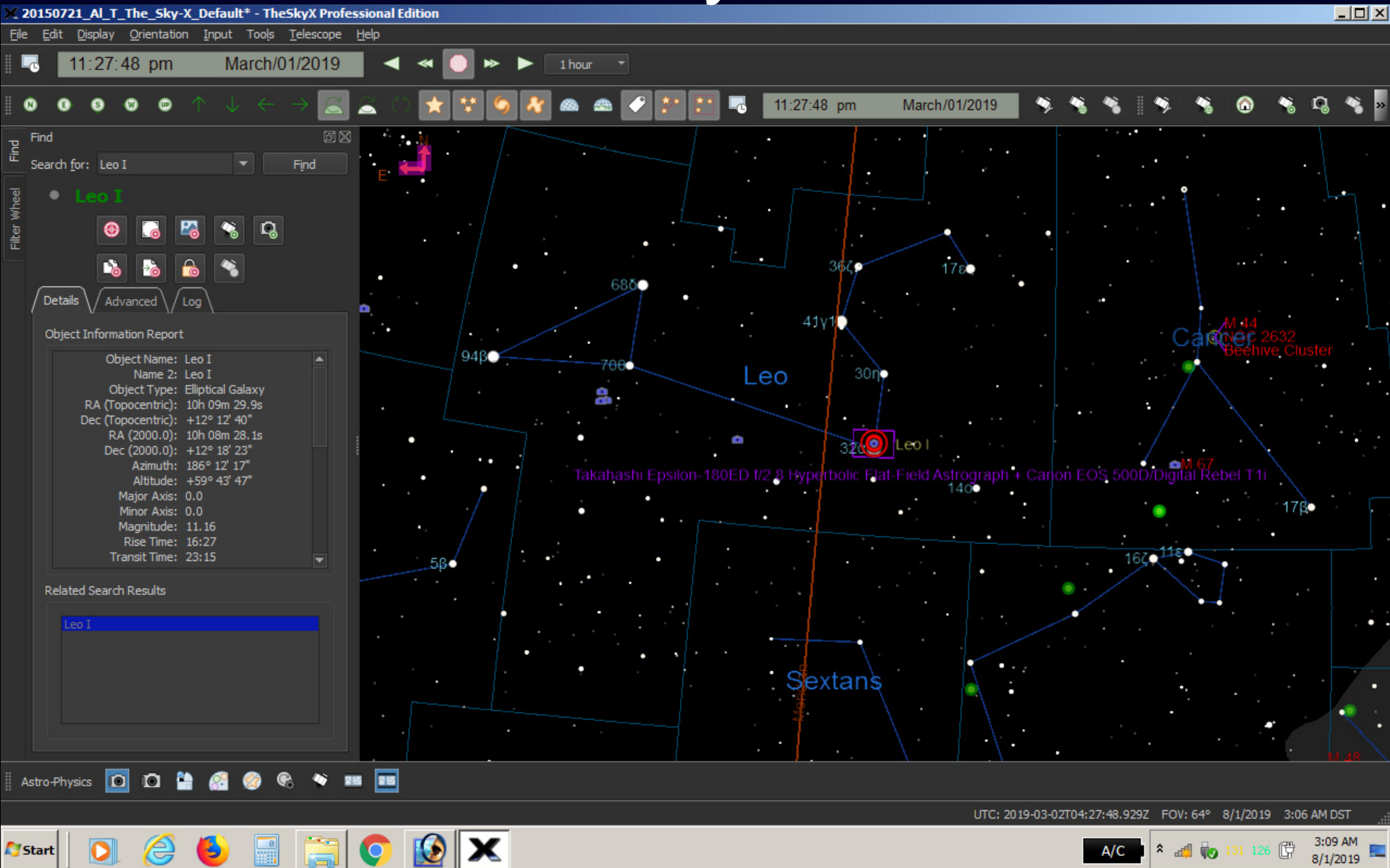
UTC: 2019-03-02T04:27:48.929Z FOV: 64° 8/1/2019 3:06 AM DST

Start

A/C

131 126

3:09 AM 8/1/2019



PHD2

PHD2 Guiding 2.5.0 - Lodestar,SV115,G11

File Tools View Darks Bookmarks Help

History

x100
y: +/-4"
Settings
Clear

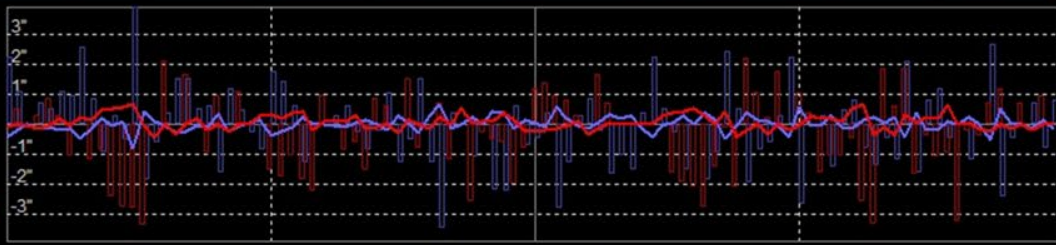
Trendlines
 Corrections

RA
Dec

RMS Error:
RA 0.75 (0.28")
Dec 0.73 (0.27")
Tot 1.04 (0.38")
RA Osc: 0.46

RA: Agr 90 Hys 10 MnMo 0.10 DEC: Agr 90 MnMo 0.10


Scope: Mx RA 300 Mx DEC 300 Auto



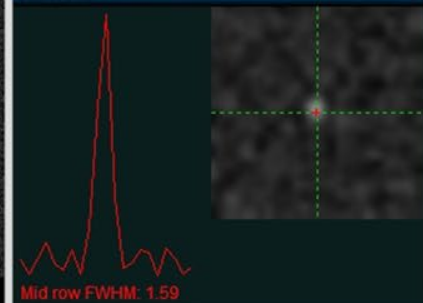
Target

100
+ -
Clear

Reference Circle
Radius: 0.6



Star Profile



Mid row FWHM: 1.59

m=146915 SNR=6.7 West 0.38 px 10 ms Camera Mount Cal

Images Plus – DSLR Control

Works with Canon 20D, T1i and T4i. Not Ra

The screenshot displays the 'ImagesPlus Camera Control' application window. An 'About ImagesPlus 6.06' dialog box is open, featuring a yellow fractal logo on a blue background. The dialog text includes: 'ImagesPlus Image Processing', 'MLUnsold Digital Imaging', 'Feature Mask Copyright © August 1, 2013 - 2015', 'Imagesplus Copyright © 1998 - 2015 Mike', 'All Rights Reserved.', 'Sales and support information:', 'Web: www.mlunsold.com', and 'E-mail: mike@mlunsold.com'. An 'OK' button is visible. In the background, the 'Canon DSLR Control' window is open, showing a 'Shutter Sequence Parameters' table and various control options.

Delay	Inter...	Expo...	Total	ISO	Prefix	Type	Av	Quality	Focu
0	2	1/250	1	100		Light	4.0	Raw	
0	2	1/125	1	100		Light	4.0	Raw	
0	2	1/15	1	100		Light	4.0	Raw	
0	2	1/4	1	100		Light	4.0	Raw	

Canon DSLR Control window details:

- Connect and Download | Settings and Live View | Focus Metrics | Capture
- Shutter Sequence Parameters (table above)
- Loop Shutter Sequence:
- Buttons: Add, Edit, Cancel, Dither Setup, Load, Save, Delete, Release
- Focus Tracking: Off, Graph, Correct
- Temperature Drop Correction: Focus In, Focus Out, Target HFD: [dropdown], dEccen+: [0.20], dHFD+: [0.75], dTemp+: [1.25]
- Force Correction:
- Table headers: Image, Focus X, HFD, Eccen., Temp, dX, dHFD, dEccen., dTemp

Backyard EOS - DSLR Control

Works with Canon Ra

BackyardEOS 3.1.11 - Premium Edition (500D-T1i) 13:21:29

Camera Information Center
Tv 1/350 Av f/4 ISO AUTO
Dial M White AWB Mirror Off
Quality RAW Battery

ASCOM Focuser

Weather Center
Dither Daylight Setting

Image Center [Egypt2006_total_eclipse_AI_Takeda.jpg]
180° Zoom 15%

Histogram Center
2 L RGB
Reset

Capture Plan Center [TEST-Solar.txt]

Exposures	Shutter	Aperture	Duration	ISO	Pause
1	1	1/...	f/4	1	200
2	1	1/15	f/4	1	200
3	1	1	f/4	1	200
4	1	1/...	f/4	1	200
5	1	1/30	f/4	1	200
6	1	1	f/4	1	200

Frame Type Cable support Save To Mirror lock
LIGHT Camera USB PC 0

Target Name Filter Delay
0

Load Save Save as... Reset

Start Capture Loop Preview Dual Camera Test cable

1 @ 13h21m18s

Windows Taskbar: Start, File Explorer, Internet Explorer, Firefox, Skype, VLC, BackyardEOS

System Tray: 109 109, 99%, 1:21 PM 7/13/2017

Canon Digital Photo Professional

EOS Viewer Utility - Folder - C:\Images\CRW2\Astro_Vermont\20080831_Vermont_31Aug2008\2

File(F) Edit(E) View(V) Option(O) Window(W) Help(H)

Small

7 0.0 8 0.0 9 0.0 10 0.0 11 0.0 12 0.0
180Sec_000042.CR 240Sec_000018.CR 240Sec_000019.CR 240Sec_000020.CR 240Sec_000021.CR 240Sec_000022.CR

13 0.0 14 0.0 15 0.0 16 0.0 17 0.0 18 0.0
240Sec_000023.CR 240Sec_000024.CR 240Sec_000025.CR 240Sec_000026.CR 240Sec_000027.CR 240Sec_000028.CR

19 0.0 20 0.0 21 0.0 22 0.0 23 0.0 24 0.0
240Sec_000029.CR 240Sec_000030.CR 240Sec_000031.CR 240Sec_000032.CR 240Sec_000033.CR 240Sec_000034.CR

25 0.0 26 0.0 27 0.0 28 0.0 29 0.0 30 0.0
240Sec_000035.CR 240Sec_000036.CR 240Sec_000037.CR 240Sec_000038.CR 240Sec_000039.CR 240Sec_000040.CR

31 0.0 32 0.0 33 0.0 34 0.0 35 0.0 36 0.0
240Sec_000043.CR 240Sec_000044.CR 240Sec_000045.CR 240Sec_000046.CR 240Sec_000047.CR 240Sec_000048.CR

37 0.0 38 0.0 39 0.0 40 0.0 41 0.0 42 0.0
240Sec_000049.CR 240Sec_000050.CR 240Sec_000051.CR 240Sec_000052.CR 240Sec_000053.CR 240Sec_000054.CR

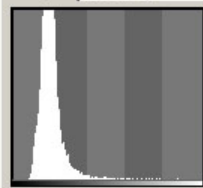
Sovera_Presentation_Sept2008
Images
Elephant

Batch
CRW2
1111_AA_Template
AI_T
Astro_Other_Locations
Astro_Vermont
20071110_Astro
20080831_Setup
20080831_Vermont_31Aug2008
1
2

ATMoB_secretary
Clubhouse
111aaa_Master_Flats
20070808_Clubhouse_8Aug2007_astro
120sec
20070813_Clubhouse_13Aug2007_astro
M8
Veil_52Cyg
20070818_Clubhouse_18Aug2007_astro
20070901_Clubhouse_1Sept07_astro
edit1
20070902_Clubhouse_2Sept07_astro
edit1
edit2
20070907_Clubhouse_7Sept07_astro
edit1_Pleadies
20071005_Clubhouse_astro_5Oct2007
20071028_Clubhouse_astro_28Oct2007
20071106_Clubhouse_astro_6Nov2007
20071109_ATA Starnarty clubhouse 9Nov

Bookmark

Bright RGB



240S...0035.CR2
9/1/2008
1:59:54 AM
EOS 20D
—
241" F 0.0
M ISO 800

Detailed Information

File Name
240Sec_000035.CR2
Camera Model
Canon EOS 20D
Shooting Date/Time
9/1/2008 1:59:54 AM
Shooting Mode
Manual Exposure
Tv(Shutter Speed)
241
Av(Aperture Value)
0.0
Metering Mode
Evaluative Metering
ISO Speed
800
Image Size
3504x2336
Image Quality
RAW

Selects image 1 of 53

Start C:\Images\Astro\Rel... C:\Documents and S... Microsoft PowerPoin... EOS Viewer Utility ImagesPlus Adobe Photoshon 2:10 PM

SkyTracker Imaging



Sky X – Field of View Indicator

The screenshot displays the TheSky Astronomy Software interface. The main window shows a star field with a red rectangular field of view indicator overlaid on a nebula. Two dialog boxes are open: 'Object Information' on the left and 'Field of View Indicators' on the right.

Object Information Panel:

- General | Multimedia | Utility | Telescope
- Object: Cirrus Nebula
- Type: Nebula Magnitude: 30.00
- Right Ascension: 20h 46m 23s Declination: +30°46'42"
- Azimuth: 175°12'56" Altitude: +78°07'51"
- Object list: Cirrus Nebula, Filamentary Nebula, Lace-work Nebula, Veil Nebula, NGC 6960, Other description: Nebula, Constellation: Cyg, Dreyer description: Very remarkable! Pretty bright, considerably large, RA: 20h 46m 22.6s Dec: +30°46'42"

Field of View Indicators Dialog:

- Description: List of telescope configurations including Canon 80-200mm, Samsung 14mm, Canon 20D+100mm, Canon 20D+50mm, Canon 20D 300mm, STF8300M-E180, DFK21AU04_AS, C8 f/10 + Canon 2, and **STL6303E+AT66** (selected).
- Size (arc minutes): Height: 159.80, Width: 239.70
- Type: Rectangular
- Buttons: OK, Cancel, Edit..., Add..., Remove, Preferences...

Star Field Labels:

- *Cirrus Nebula NW Part
- Network Nebula
- Lace-work Nebula
- Veil Nebula
- Cirrus Nebula
- Filamentary Nebula
- *STL6303E+AT66

System Information (Bottom Bar):

- RA: 20h 47m 42.6s | Dec: +35°01'40" | FOV: 16°08'57" | RA: 00h 00m 00.0s | Dec: +00°00'00" | 8/14/2015 | 11:54 PM

VELLO

SELF LONG INTV No. BEEP

00:00'33"
[30]

☀ / LOCK

TIMER START/STOP

SET

Canon Ra 30x Magnification



Nova Cass – Canon Ra @ 185mm



— M 52

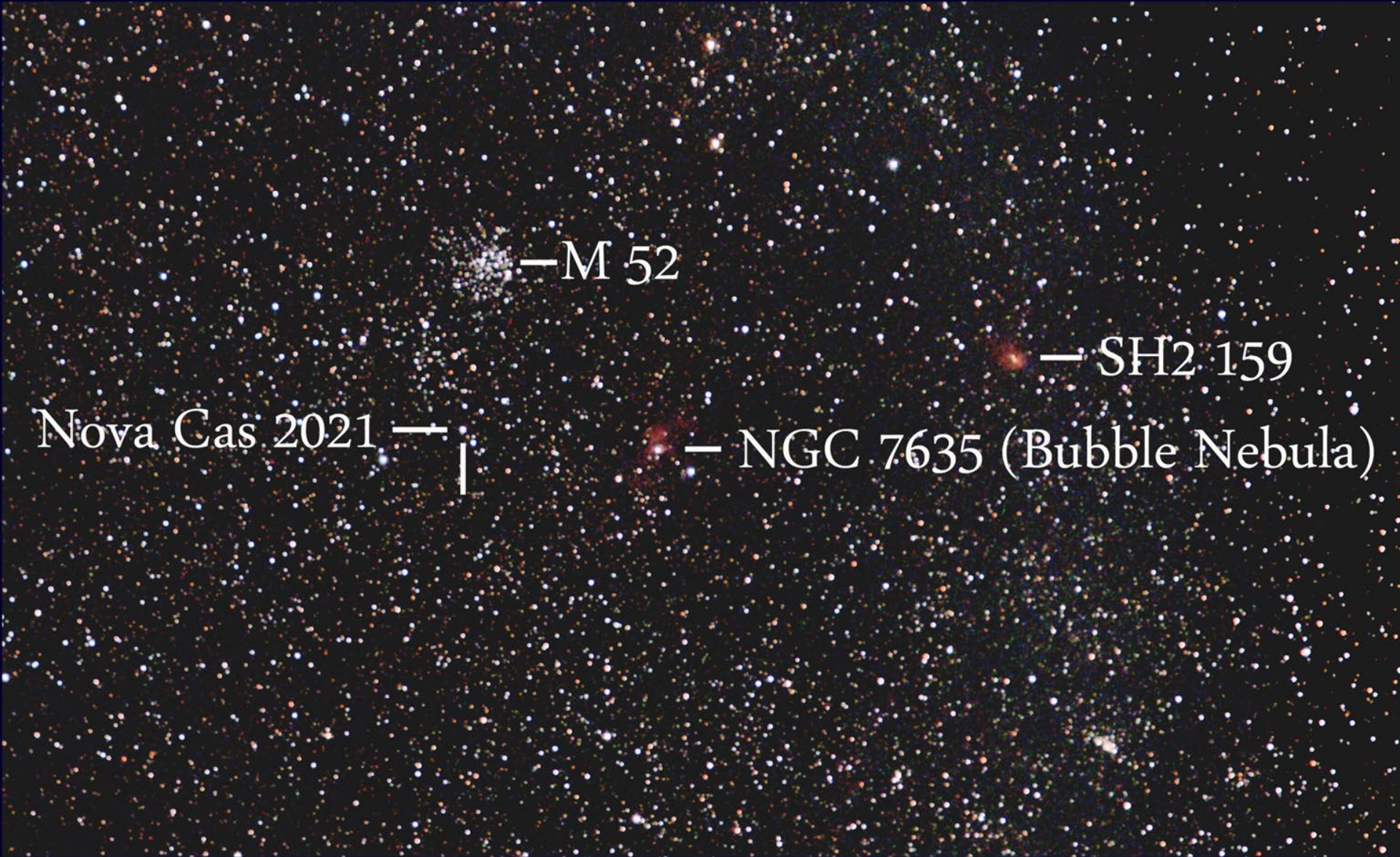
— SH2 159

Nova Cas 2021 —

— NGC 7635 (Bubble Nebula)

— Caph (Beta Cassiopeia)

Nova Cass - Enlargement



— M 52

— SH2-159

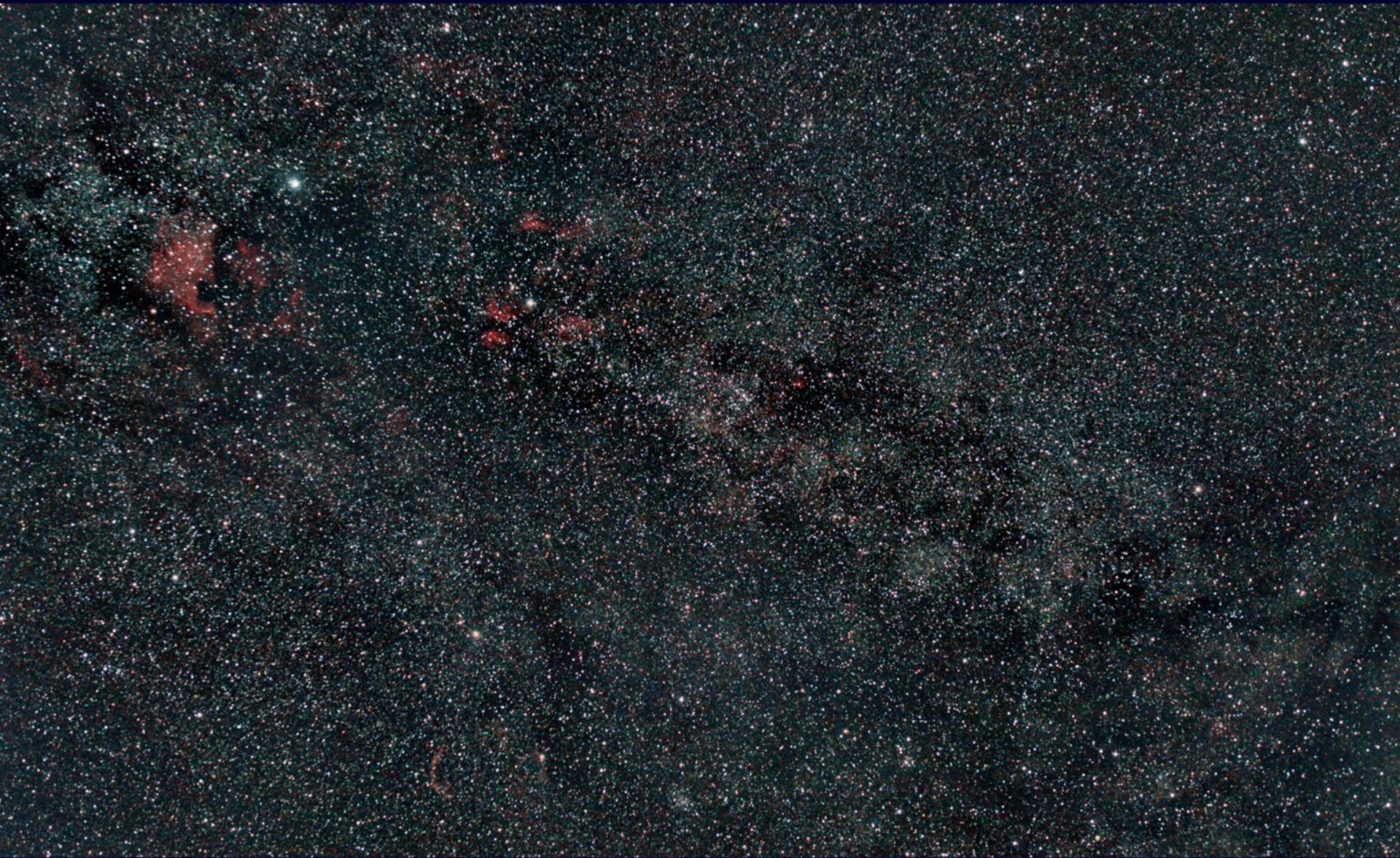
Nova Cas 2021 —

— NGC 7635 (Bubble Nebula)

Sagittarius – Ra + 105mm, f/5



Cygnus – T1i + 35mm f/5.6



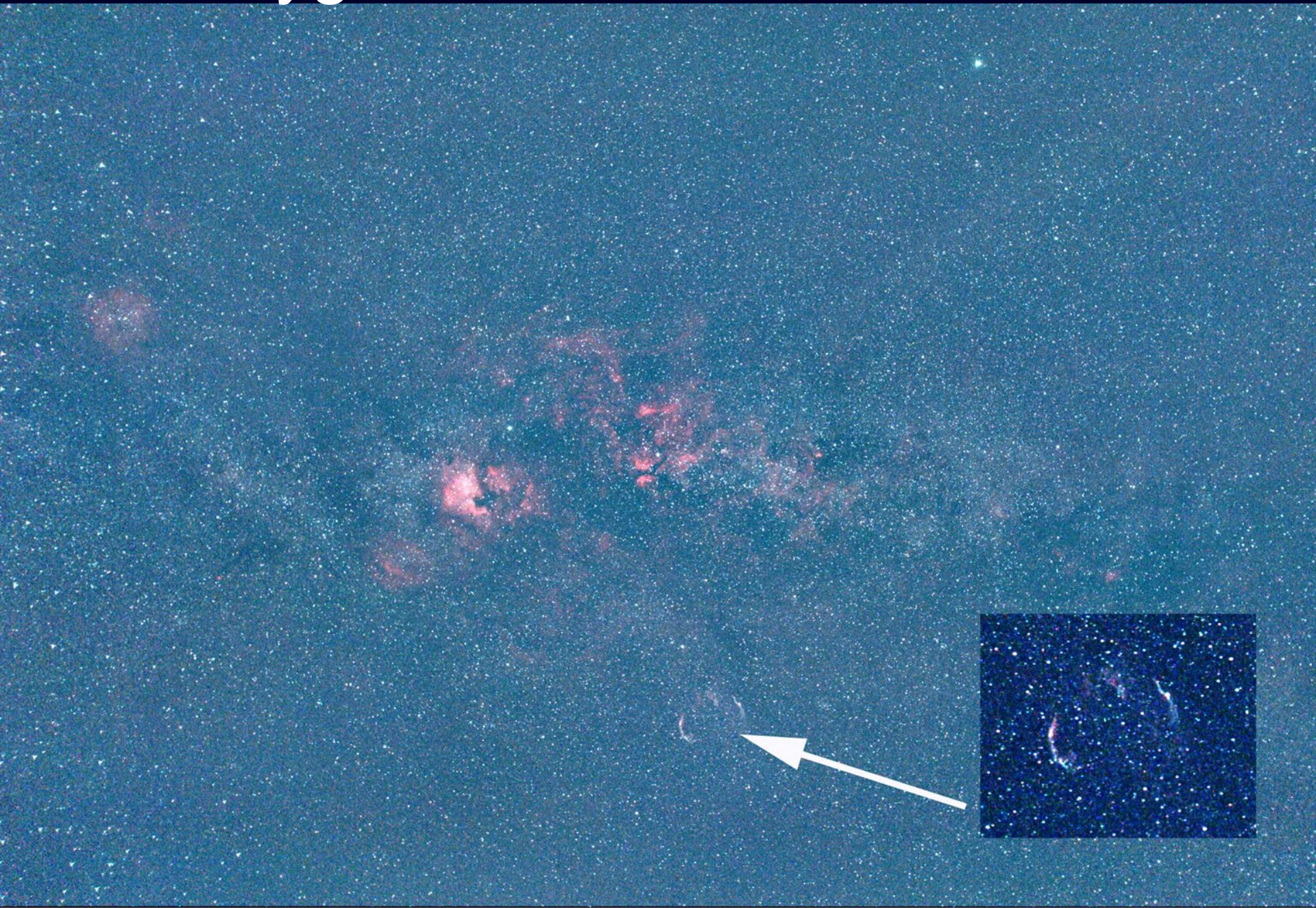
Cygnus – Ra + 35mm f/2.8



Cygnus – Ra + 35mm f/2.8



Cygnus – Ra + 35mm f/2.8



Comet Imaging

Comet 46P Wirtanen



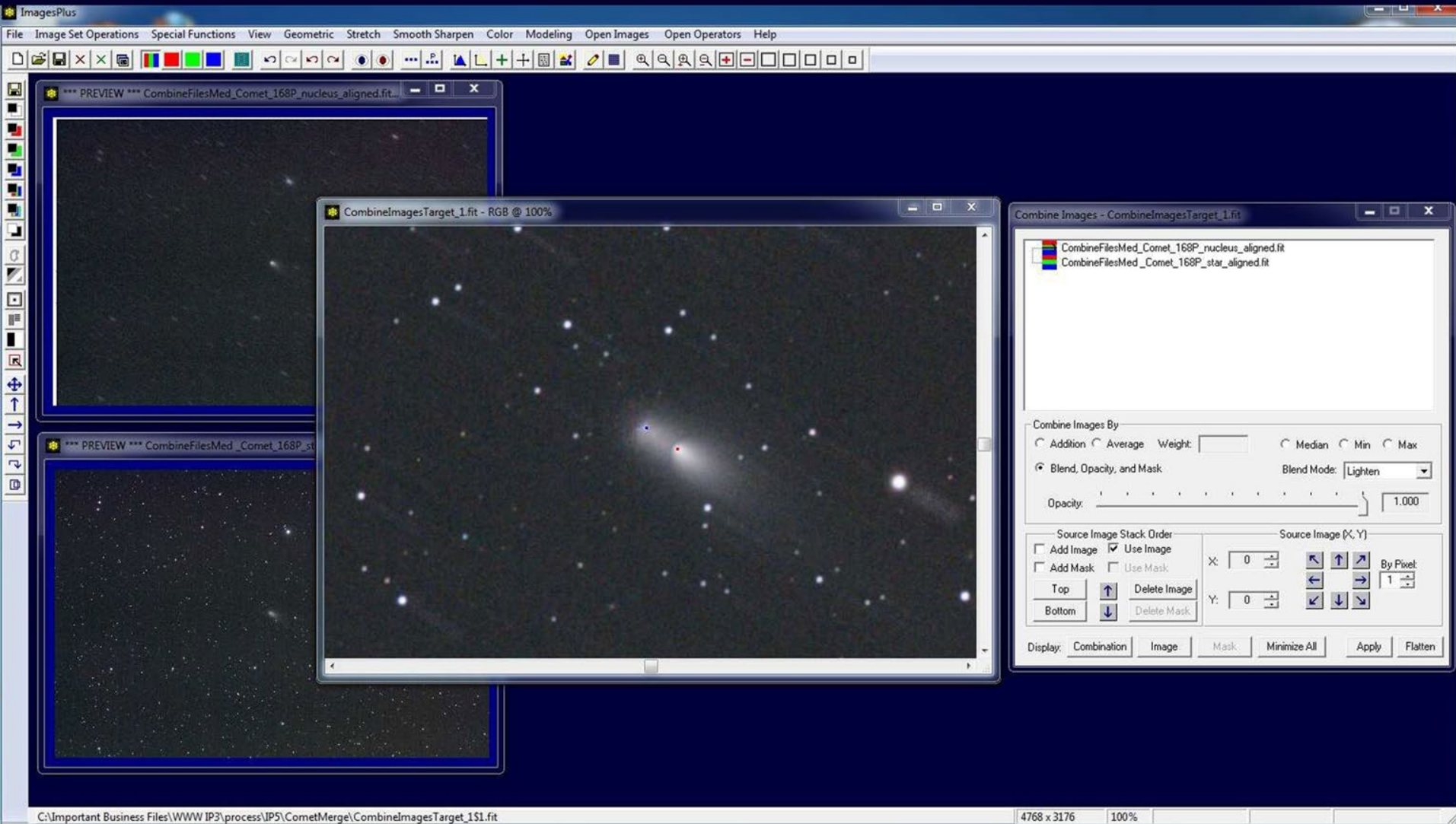
Comet Lovejoy C/2013 R1



Comet C/2020 F3 – Canon Ra GIFF



Images Plus – Comet Layer Mask



C/2020 F3 – Canon Ra + SkyTracker



Deep Sky Imaging Telescope

C/2020 F3 – Canon Ra + SkyTracker



C/2020 F3 – Canon Ra + SkyTracker



AAVSO Photometry

The AAVSO DSLR Observing Manual



AAVSO
49 Bay State Road
Cambridge, MA 02138
email: aavso@aavso.org

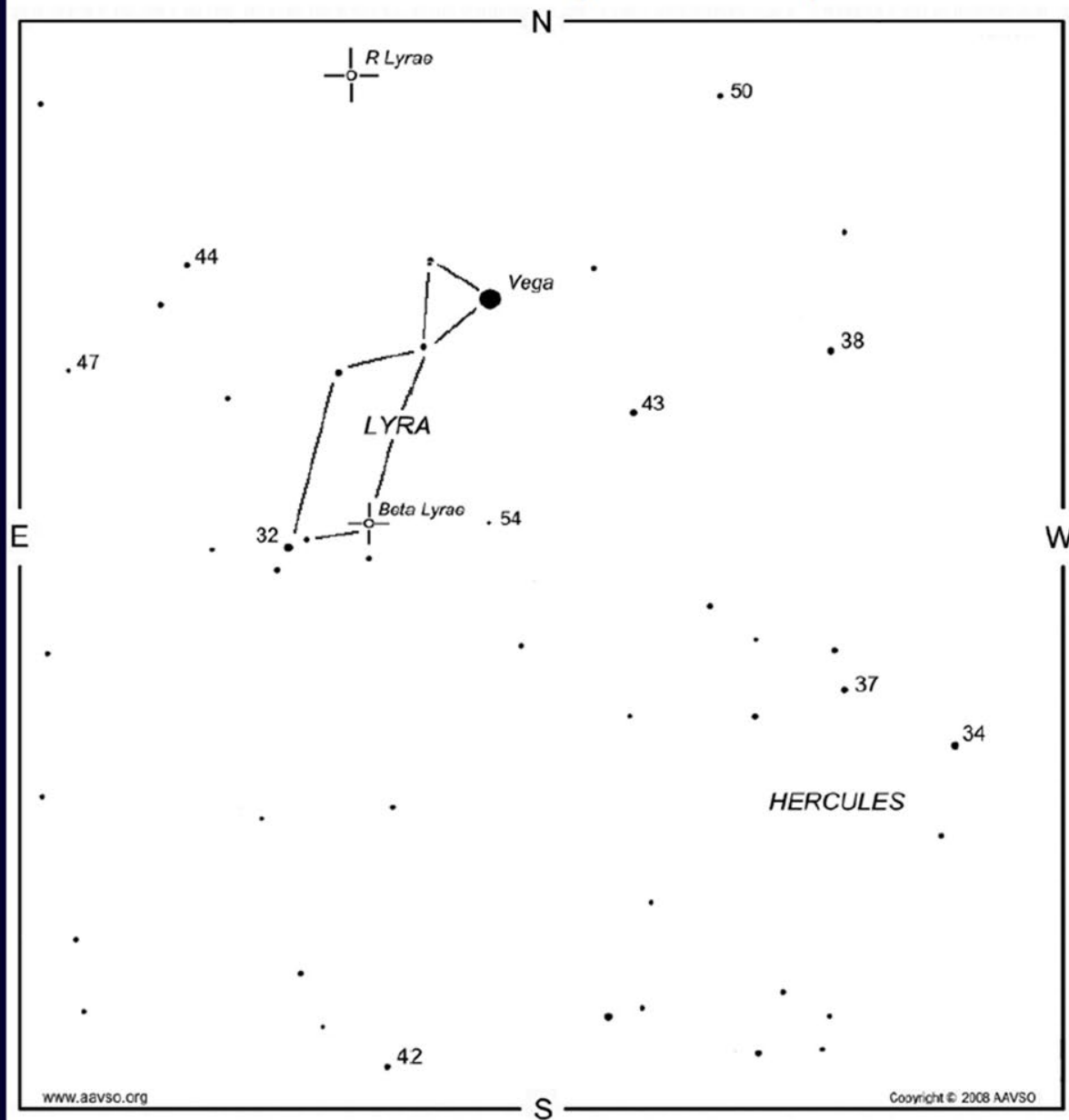
Version 1.4
Copyright 2016 AAVSO

ISBN 978-1-939538-18-5

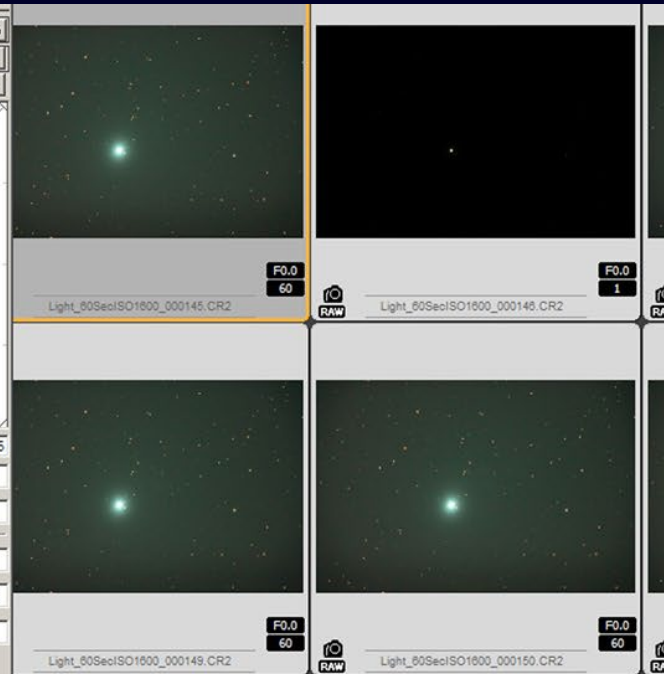
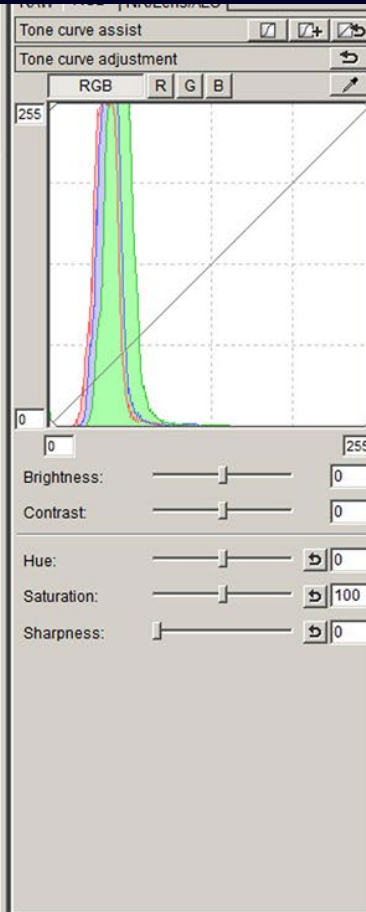
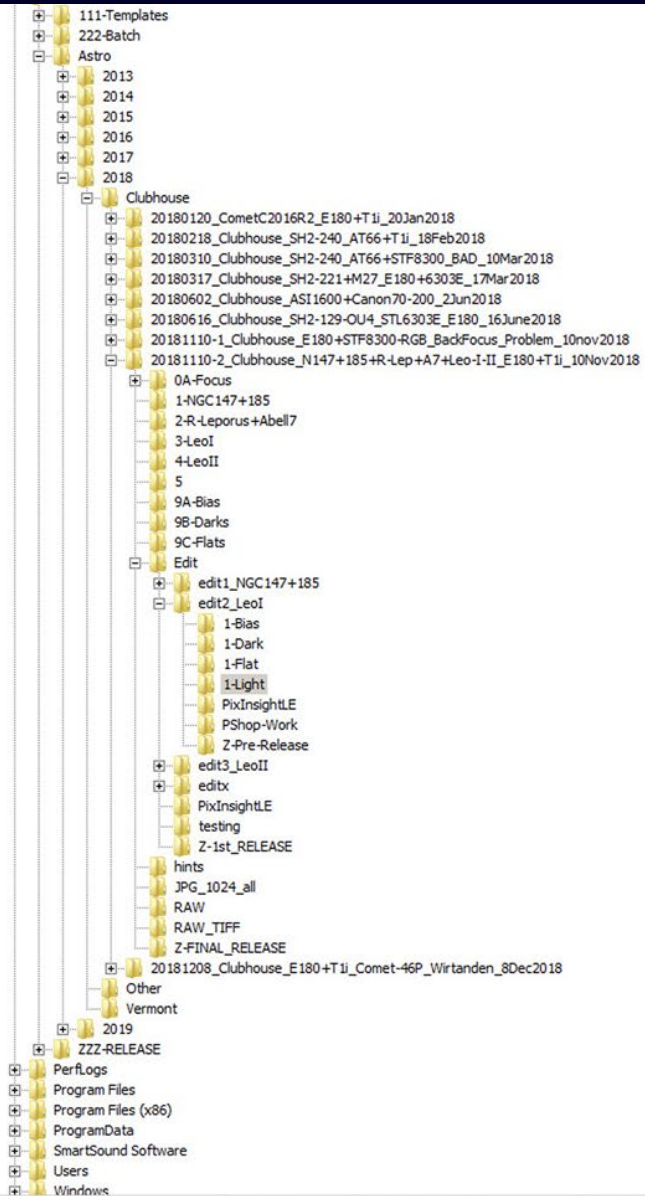




Star Chart for beta Lyrae and R Lyrae



Exposure - Histogram



Defocus Stars



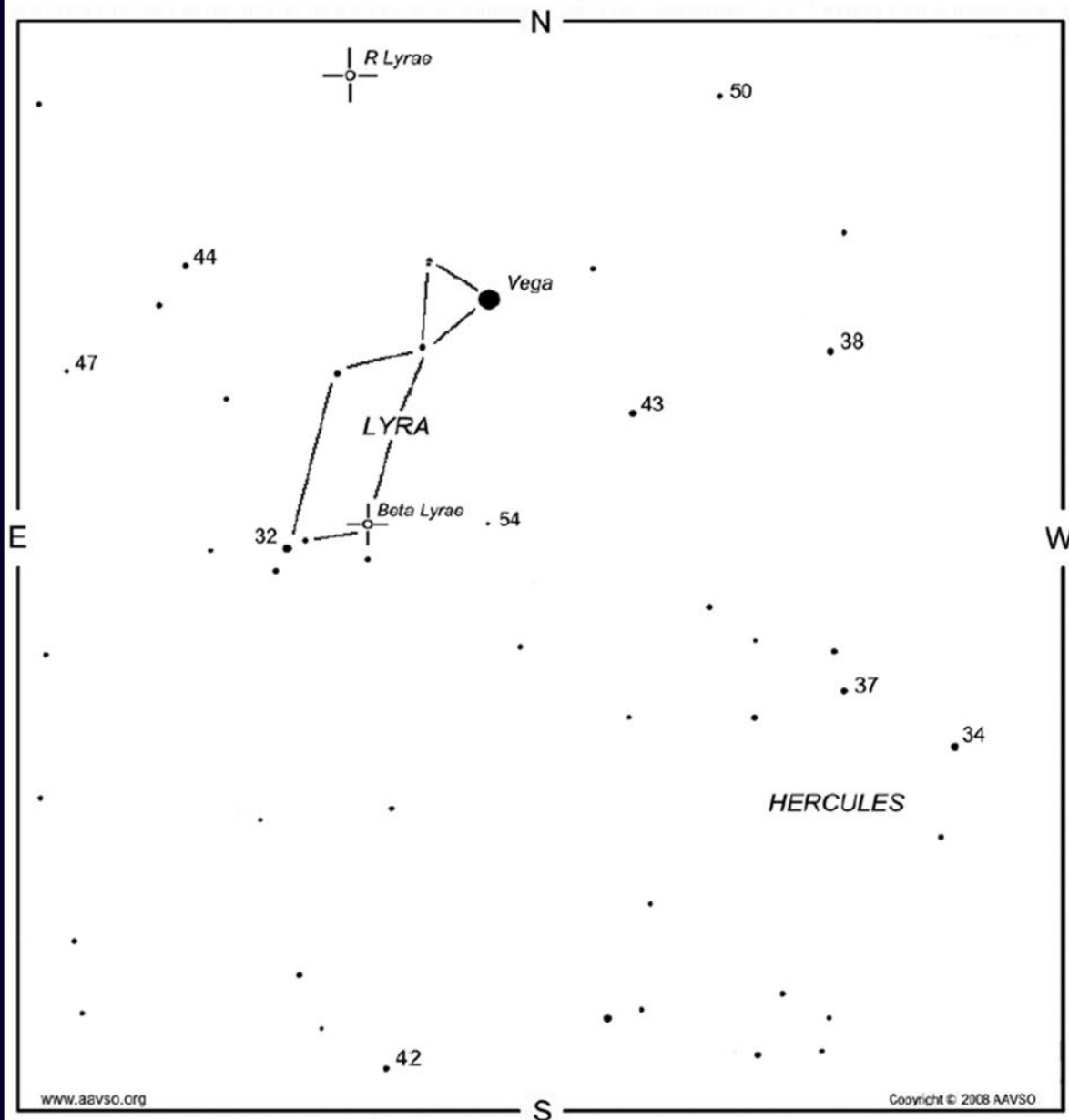
CHECK STAR



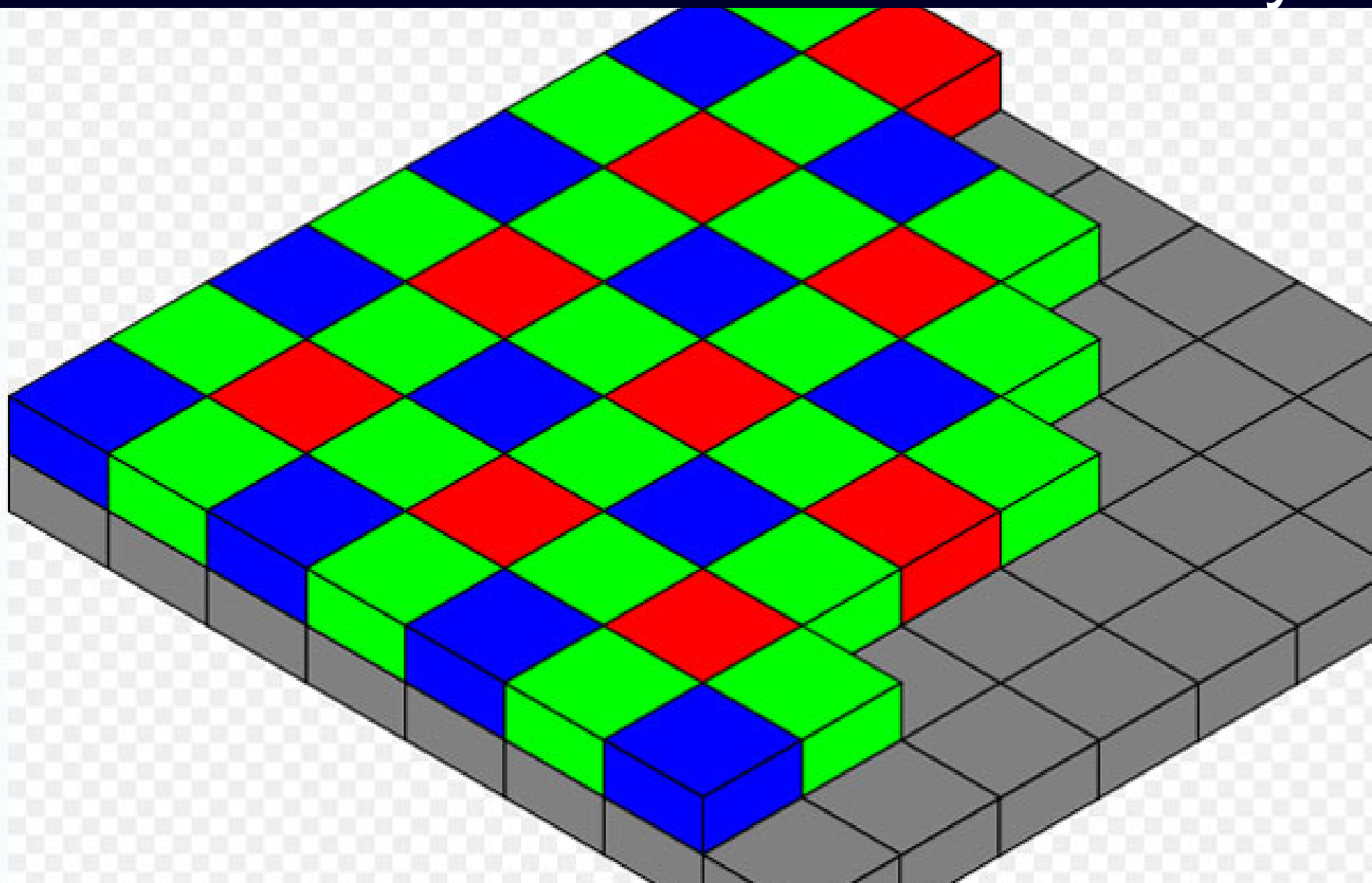
Beta Lyrae



Star Chart for beta Lyrae and R Lyrae



Use Green Channels for Photometry



Bayer Array Filter

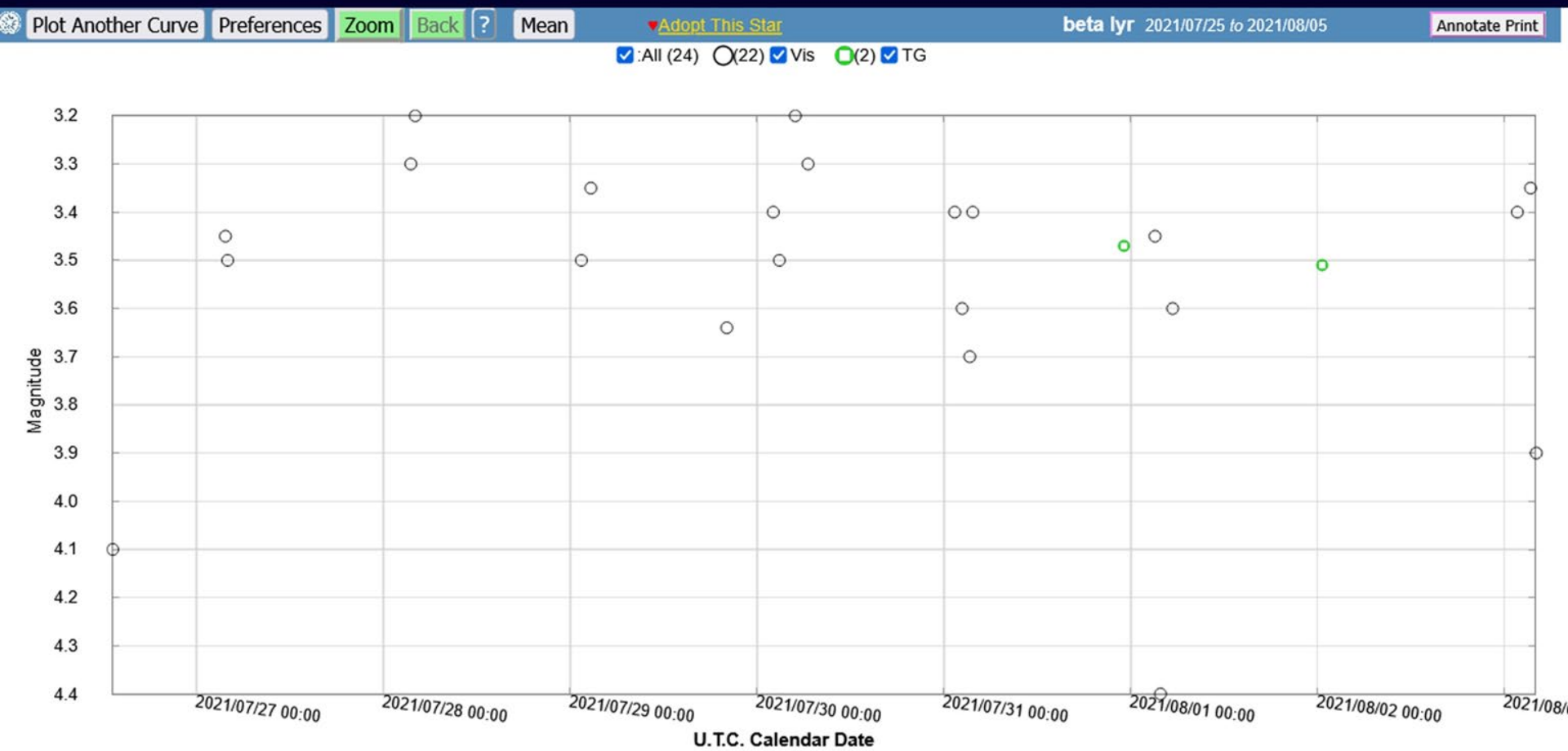


MAXIM DL
Astronomical Imaging Software

MAXIM DL™
Astronomical Imaging Software

MAXIM DL™
Astronomical Imaging Software

Submit your data to the AAVSO



Tricks



Focusing Mask

Window Screen Focusing Mask





MF



* x30



INFO



SET



Uses for a Rubber Band





Canon

EOS

EOS RF 16-35mm f/2.8 L USM
Kohel sha

16 20 24 28 35

0.5 1 ∞ m

16-35mm

16-35mm L USM
1:2.8

SkyTracker™

Aperture Adjust on an Autofocus Lens



No electronic pins on this adapter!

Using a T1i and Lens: Turn Camera On



In Manual or Bulb, Adjust Aperture



While pressing Depth of Field preview, remove the lens



Attach to camera



Preventing Lens Creep

Foam Core Support





Canon EW-83H CANON INC. MADE IN JAPAN

CANON ZOOM LENS EF 24-105mm 1:4 IS USM

MACRO 0.7 m 24-105mm

24 35 50 70 105

Canon

Cheap “Zero” Mag Finder

Plastic Film Canister






String for your Bahtinov Mask



Reminder Labels



Set camera to: BULB, 2 sec delay
Self = 4 sec Delay "put down timer"
Long = Shutter/Exposure
INTV = 1 sec No. = # Exposures

General Information

Camera Control Software

- ImagesPlus \$79.90 (Total package \$239.95)
<http://www.mlunsold.com/>
- BackyardEOS \$50
<https://www.otelescope.com/index.php?/home/&page=bye>
- Canon EOS Utility – free
- MaximDL \$199 - \$599.00
http://www.cyanogen.com/maxim_matrix.php

Camera Control Software

- Eclipse Orchestrator - \$109.00
- http://www.moonglowtech.com/products/EclipseOrchestrator/GSG_EOpro.shtml
- EclipseDroid USB - \$2.99
Android Play Store
- Solar Eclipse Timer ???
Google Play

Image Processing Programs

- GIMP – free
- Adobe Photoshop CC - \$239.88/year
- ImagesPlus - \$199.95 (Total package \$239.95)

Image Processing Programs

Misc.

- Deep Sky Stacker – free
- AutoStakkert! – free
- RegiStax 6 - free
- IRIS - free
- CCD Stack - \$199.95
- MaxIm DL - \$465.00
- PixInsight – 230 Euros
- Nebulosity - \$95

References

- *The New CCD Astronomy* by Ron Wodaski (Out of Print)
- *Astrophotographer's Guide to the Deep Sky*
- *A Guide to DSLR Planetary Imaging*
- *An Advanced Guide to Astrophotography With DSLR Cameras*
- *A Beginners Guide to DSLR Astrophotography*
- *Photoshop for Astrophotographers*
by Jerry Lodriguss - www.astropix.com
- Astro-imaging Software:
http://www.astropix.com/HTML/I_ASTROP/SOFTWARE.HTM
- *Digital SLR Astrophotography* by Michael A. Covington

References

- *Photoshop Astronomy – Second Edition with Full Res Tutorials on DVD-ROM by R. Scott Ireland*

Thank You!
Have a Great Stellafane Convention

Questions?



