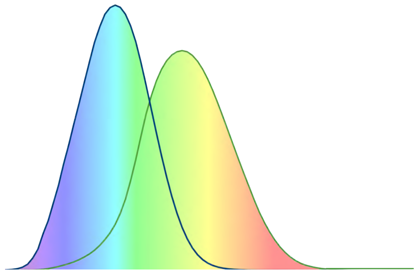
Post Processing HDR

Bo Jung | Mehlika Inanici

Melanopic HDR Capture

Photopic Light

Calibrated with:
Luminance and / or
Illuminance Meters

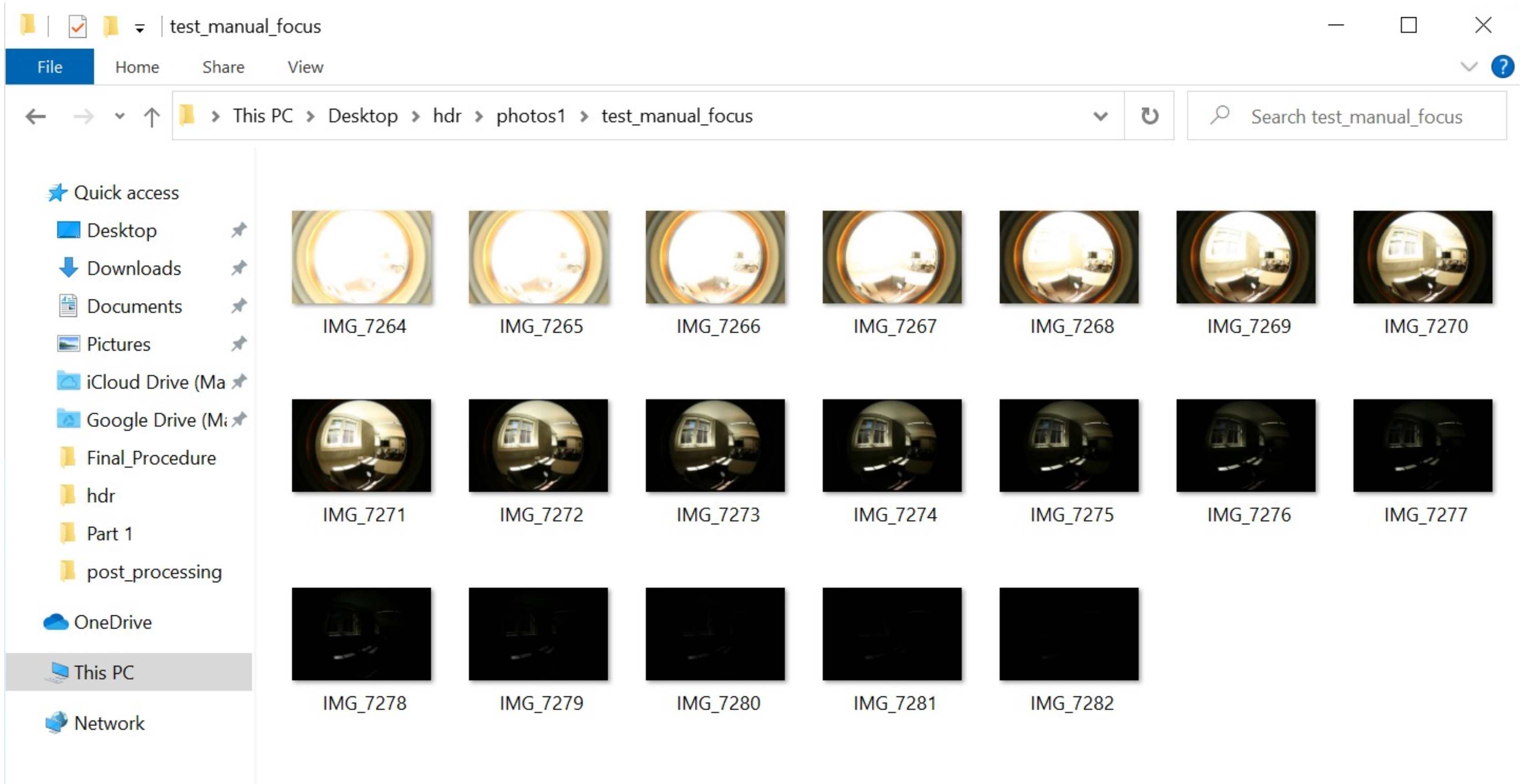


Non-Visual (Circadian) Light

Can be calibrated with:
Spectrophotometers (expensive) or
Colorimeters (CIE XYZ) (feasible)

Jung and Inanici, 2019

A set of LDR



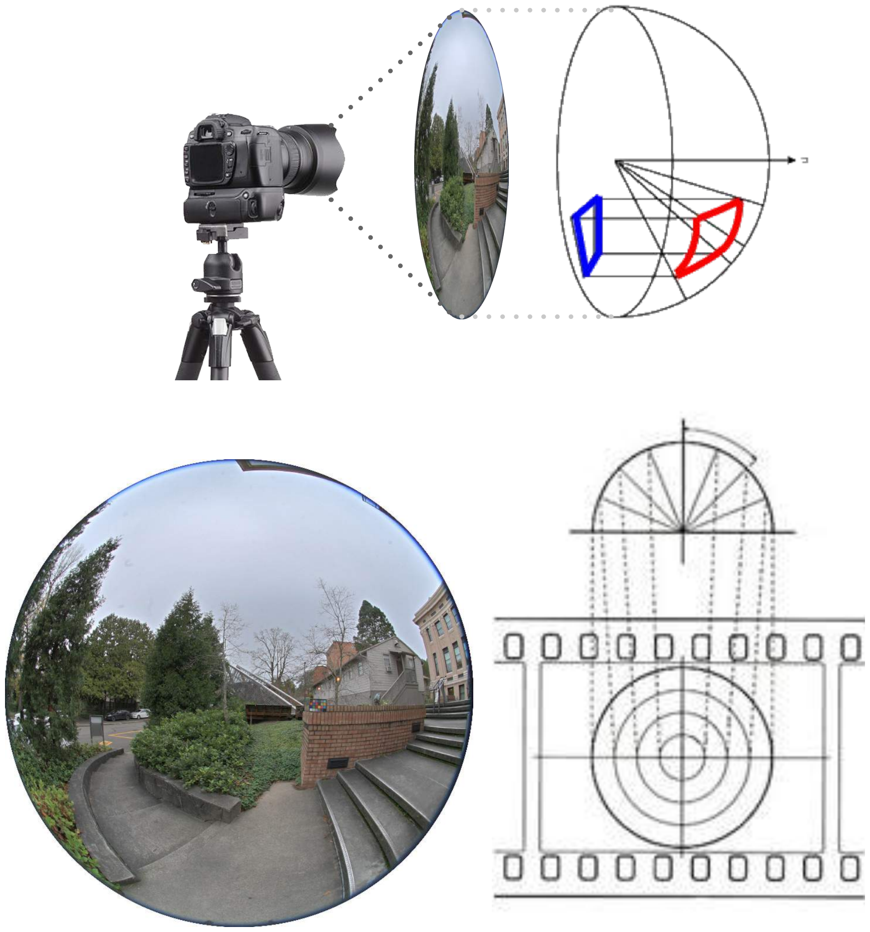
Some parts of the procedure are camera / lens specific. Those parts are indicated on the slides.

Post Processing

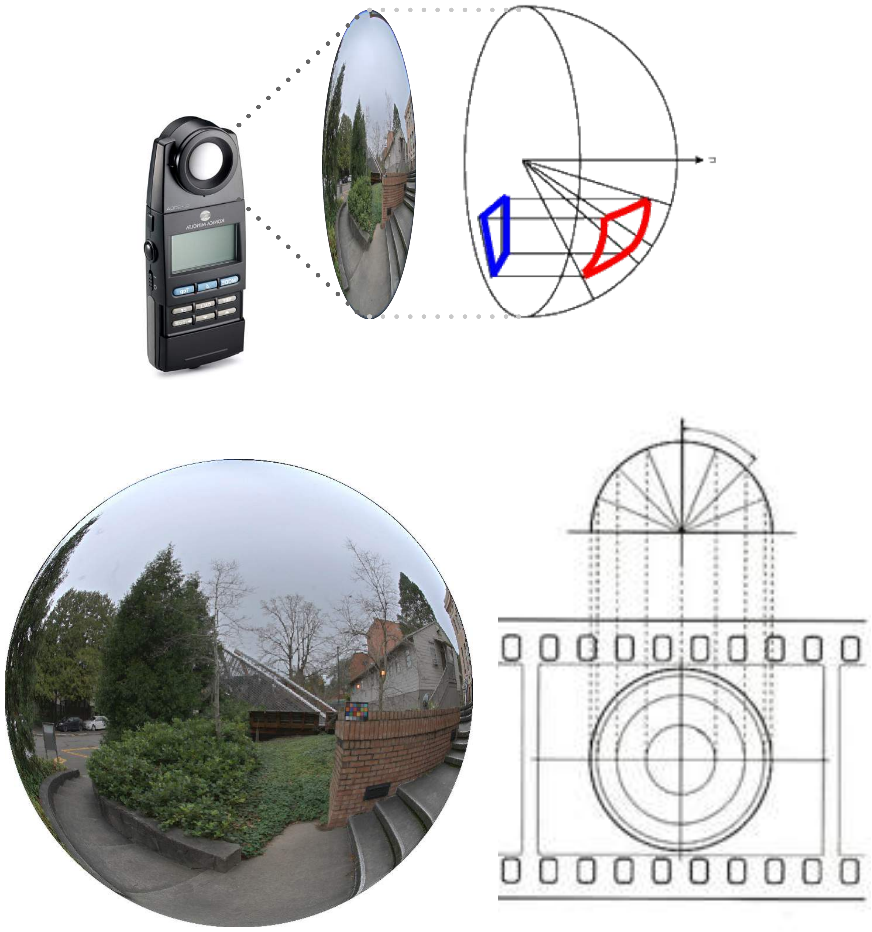
1. Correct for geometric aberrations **LENS SPECIFIC**
2. Original HDR merge + Luminance calibration **CAMERA SPECIFIC**
3. Exposure set to 1
4. Vignetting correction **LENS SPECIFIC**
5. Edit Header
6. Luminous overflow correction (Illuminance calibration – CIE Y)
7. Clean Header
8. Color calibration **CAMERA SPECIFIC** (only for camera specific calibration method)
9. Calculate Melanopic Luminance
10. Clean Header
11. Calculate Melanopic Illuminance

1. Correct for Geometric Abberations

Equidistant Projection



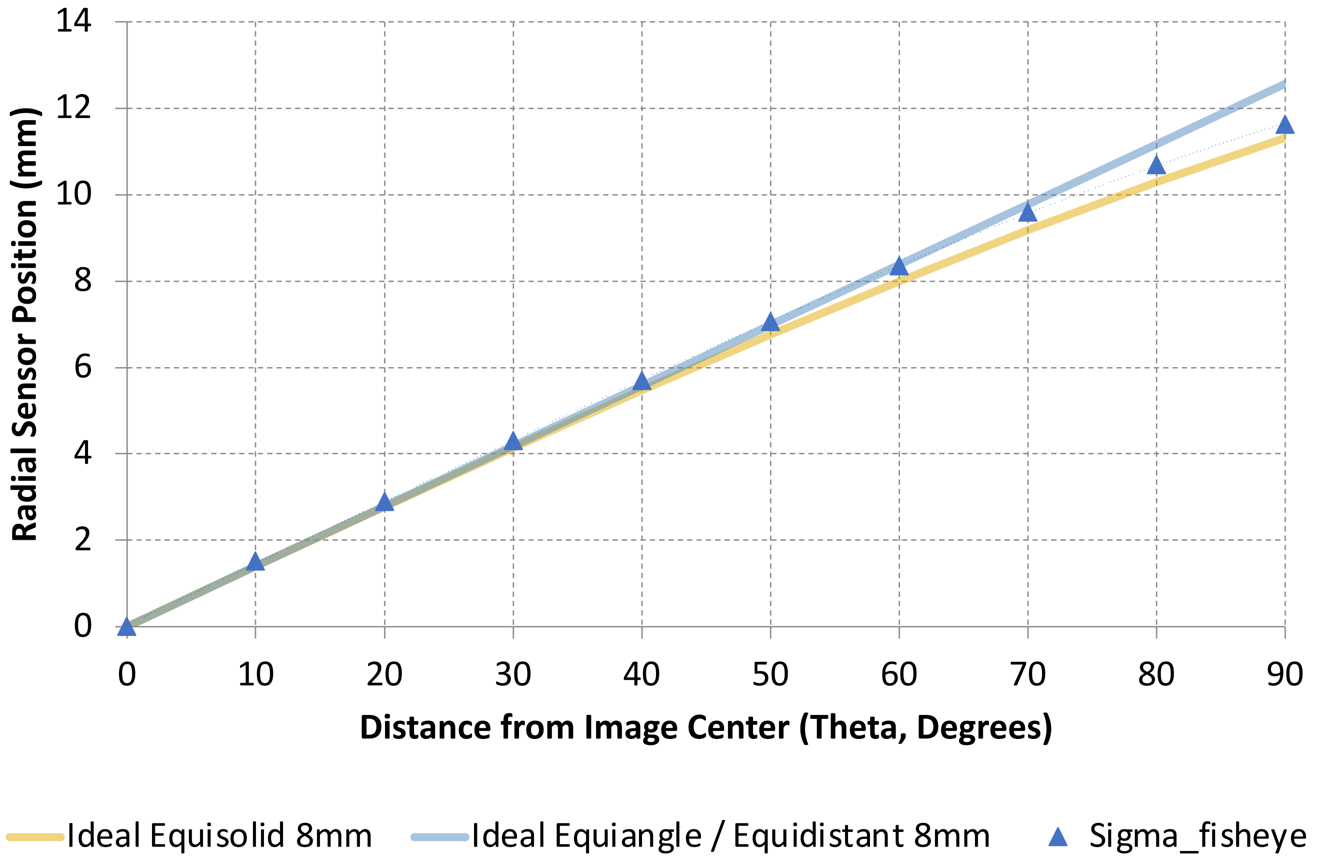
Equisolid Projection
(= Hemispherical Projection)



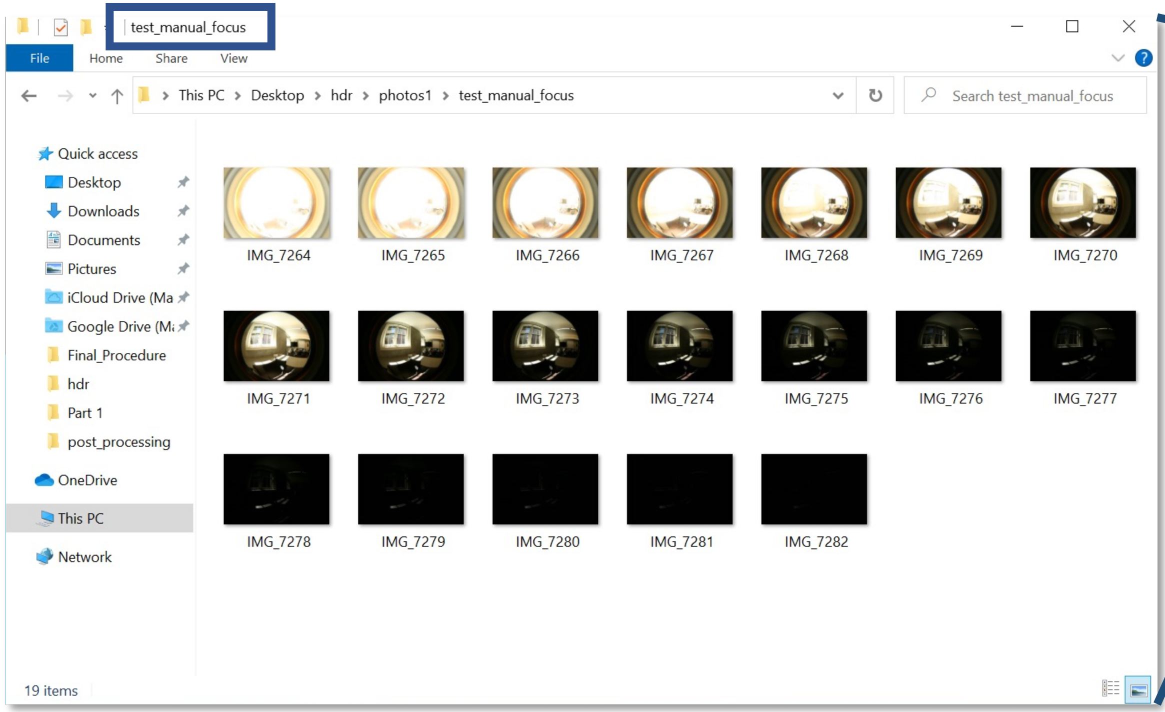
1. Correct for Geometric Abberations

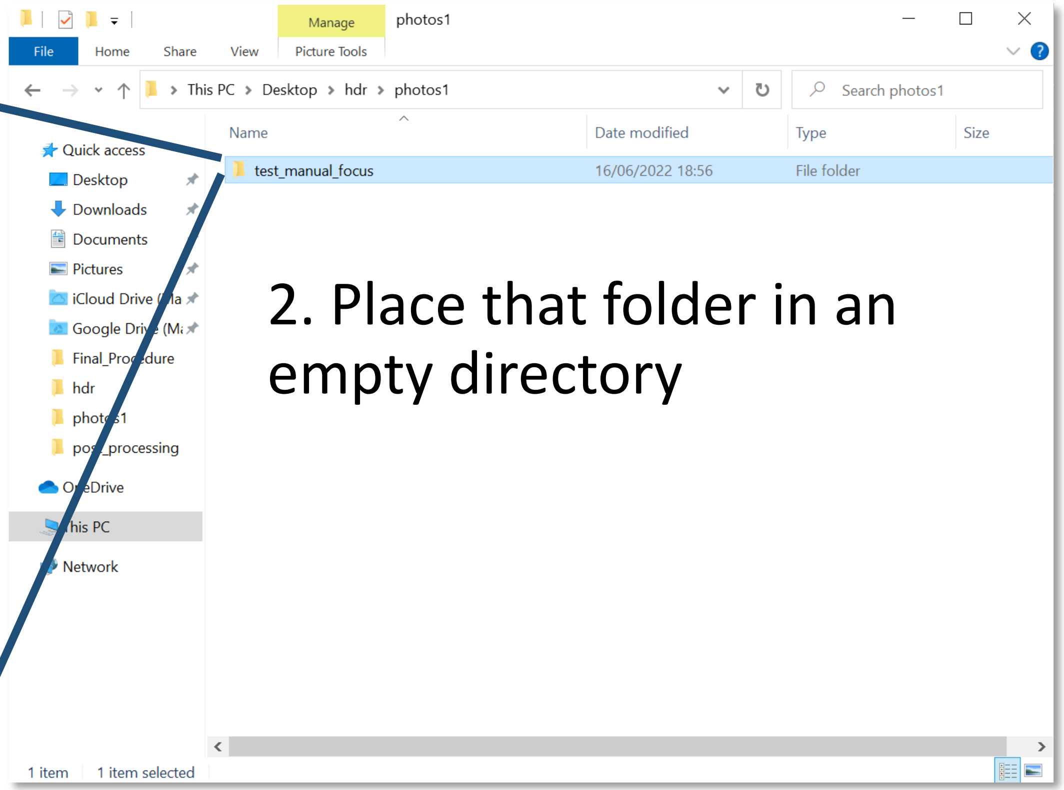
LENS SPECIFIC

Equidistant, Equisolid, or in between



1. Correct for Geometric Abberations





2. Place that folder in an empty directory

1. Place a set of HDR images in a folder

DON'T PUT SPACES IN FOLDER NAMES!!

1. Correct for Geometric Abberations

C: > Users > Bo > Desktop > hdr > transform_SIGMA-to-vta.py

```
1   from PIL import Image
2   import os, sys
3   import numpy
4   import math
5
6   ##########################################################################################
7   # input is presumed to be a folder containing folders of images taken with a Sigma EX DG 8mm 1:
8   # input will be cropped based on a Sigma EX DG 8mm 1:3.5 lens.
9   # output will be the same image [0-255] in an equi-angle projection with square ratio and metad
10  ##########################################################################################
11
12  base_folder = 'C:\\Users\\Bo\\Desktop\\hdr\\photos1\\'
13
14  def fbilinear(source, row, col):
15      # source = numpy image base array, RGB image representation
16
17      y = row
18      x = col
19
20      x0 = numpy.floor(x).astype(int)
21      x1 = x0 + 1
22      if x1 >= 800:
23          x1 = 799
24      y0 = numpy.floor(y).astype(int)
25      y1 = y0 + 1
26      if y1 >= 800:
```

3. Change line 12

To match folder location of step 2

(empty directory containing a folder with a set of HDR images)

Make sure there is double backspaces between each directory

1. Correct for Geometric Abberations

```
### load image into memory
# path = 'e:\\Luminous Overflow\\Pilot\\ND1 - 01\\18 No Filter\\5C3A0313.JPG'
im = Image.open(path)
### crop
x_dim,y_dim = im.size # dimensions

# locate centers
x_center = 1573  # camera specific
y_center = 1064  # camera specific
# bounds
radius = 1050  # camera specific

left_bound = x_center - radius
right_bound = x_center + radius
top_bound = y_center - radius
bottom_bound = y_center + radius
box = (left_bound, top_bound, right_bound, bottom_bound) # crop box
cropped = im.crop(box) # crop
```

CAMERA SPECIFIC

Note that some parts of the code are camera specific.

i.e.) center of the image / radius

1. Correct for Geometric Abberations


```
# locate centers
x_center = 1573  # camera specific
y_center = 1064  # camera specific
# bounds
radius = 1050  # camera specific
```

radius: (X2 – X1) / 2 or (Y2 – Y1) / 2

x_center: X1 + radius

y_center: Y1 + radius

1. Correct for Geometric Abberations

Command Prompt - py transform_SIGMA-to-vta.py

```
(c) Microsoft Corporation. All rights reserved.

C:\Users\Bo>cd Desktop

C:\Users\Bo\Desktop>cd photos1
The system cannot find the path specified.

C:\Users\Bo\Desktop>cd hdr

C:\Users\Bo\Desktop\hdr>py transform_SIGMA-to-vta.py
C:\Users\Bo\Desktop\hdr\transform_SIGMA-to-vta.py:101: DeprecationWarning: BILINEAR is deprecated and will be removed in
Pillow 10 (2023-07-01). Use Resampling.BILINEAR instead.
  scaled = cropped.resize(size, resample=Image.BILINEAR)
```

4. In Command Line

Change directory to where the python code is saved to.

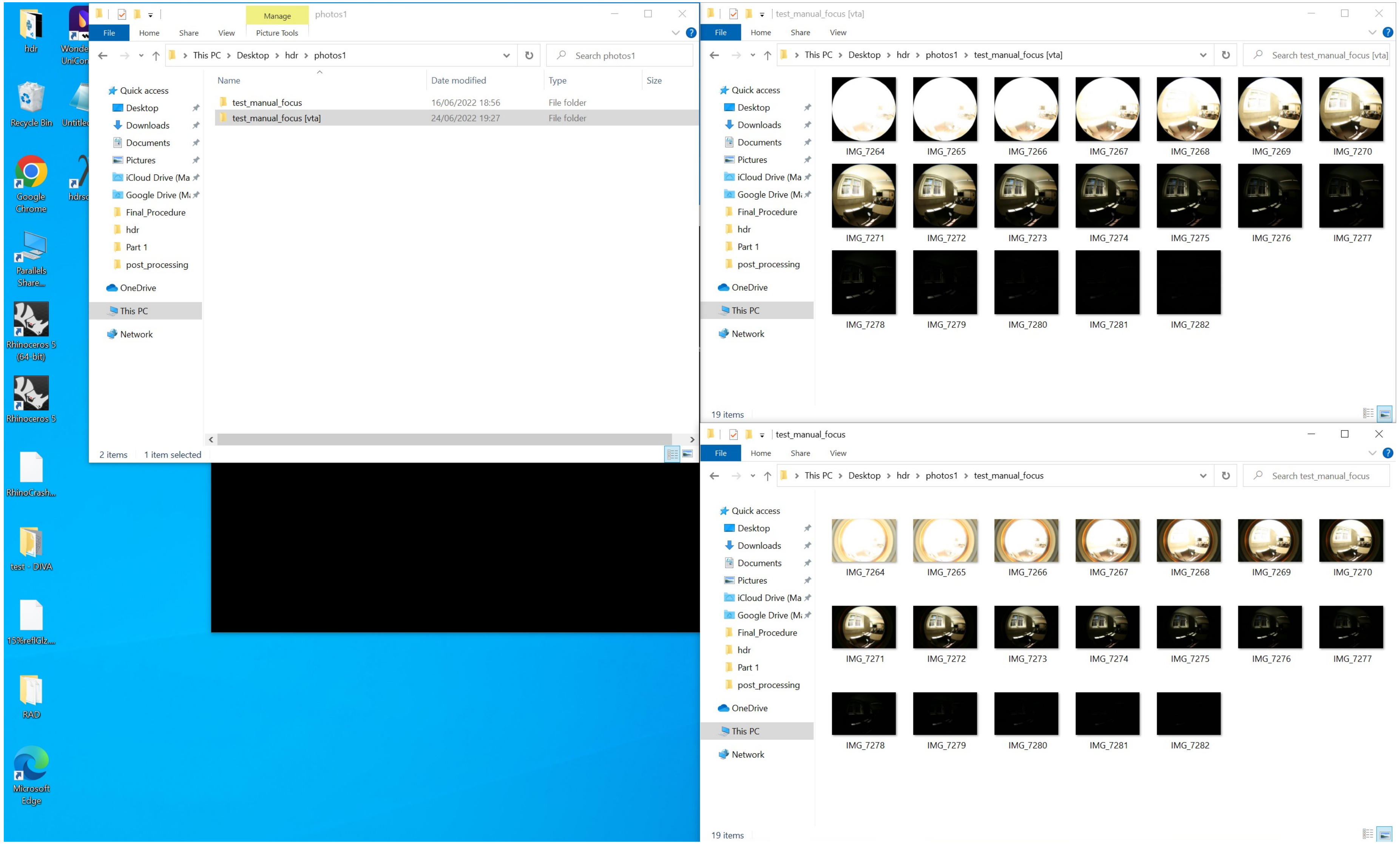
Type:

py transform_SIGMA-to-vta.py

OR

python transform_SIGMA-to-vta.py

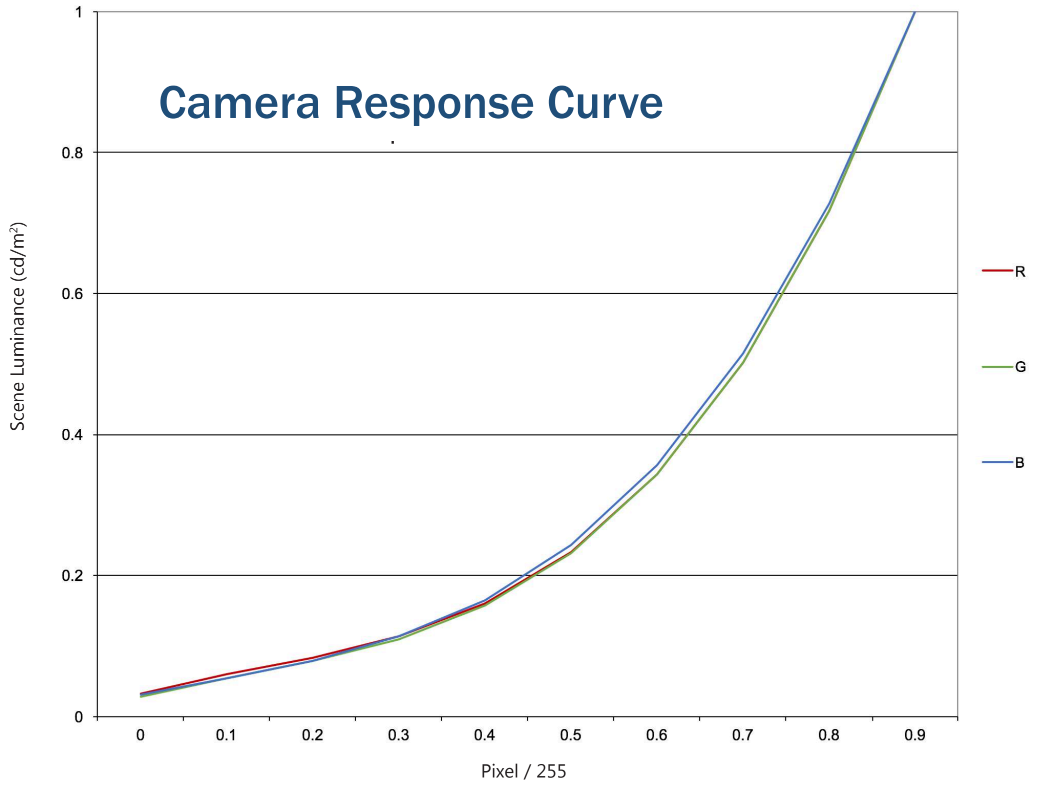
1. Correct for Geometric Abberations

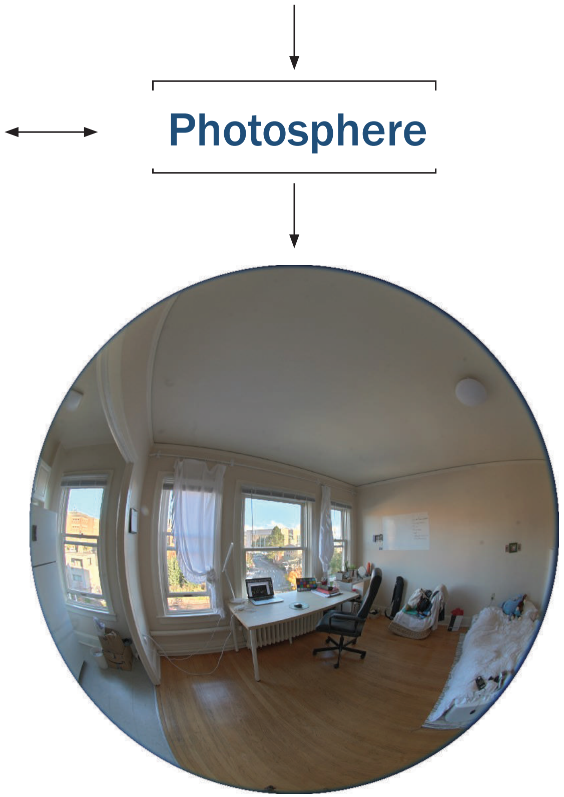


1. Correct for Geometric Abberations

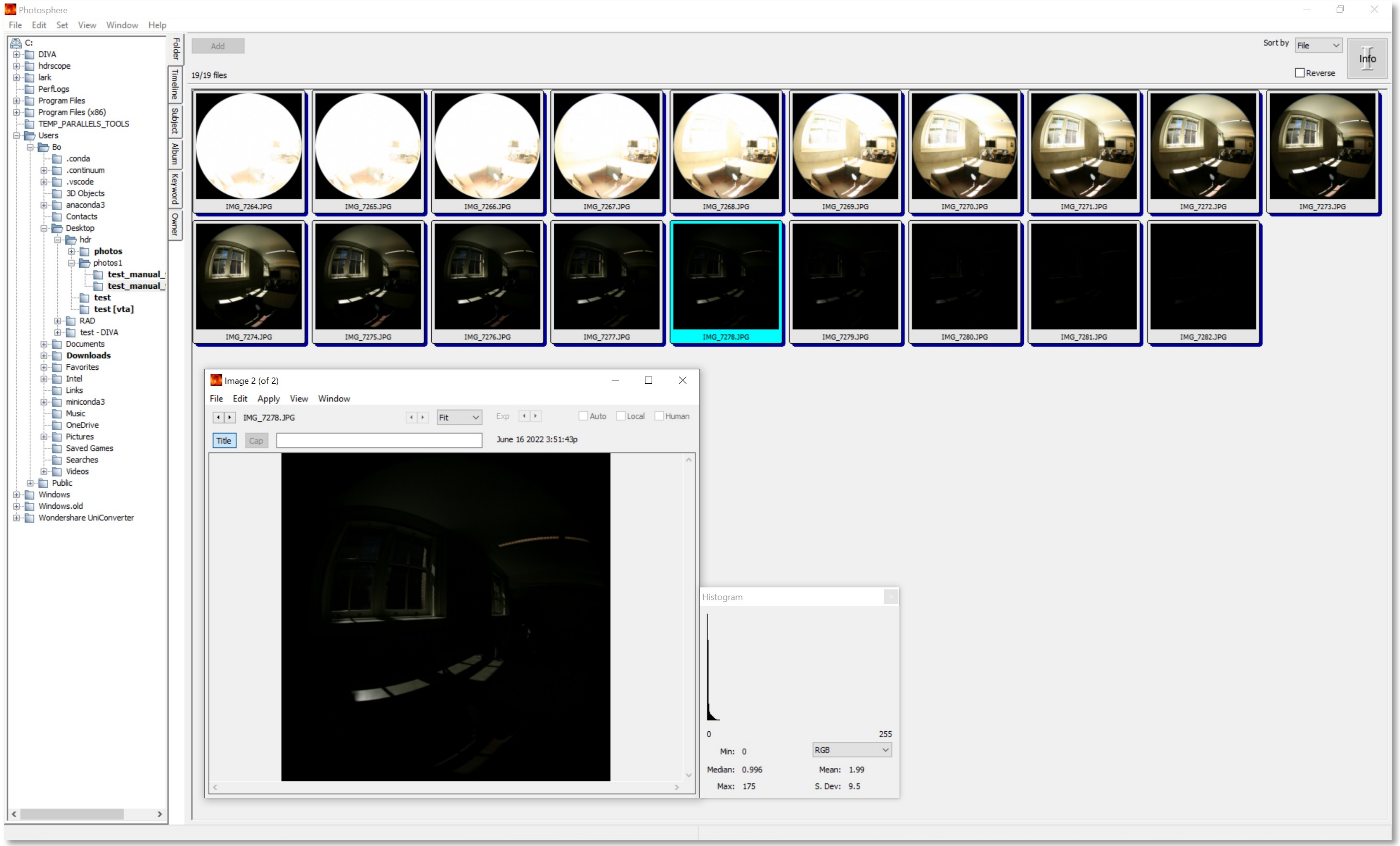
2. Merge HDR + Luminance Calibration

CAMERA SPECIFIC

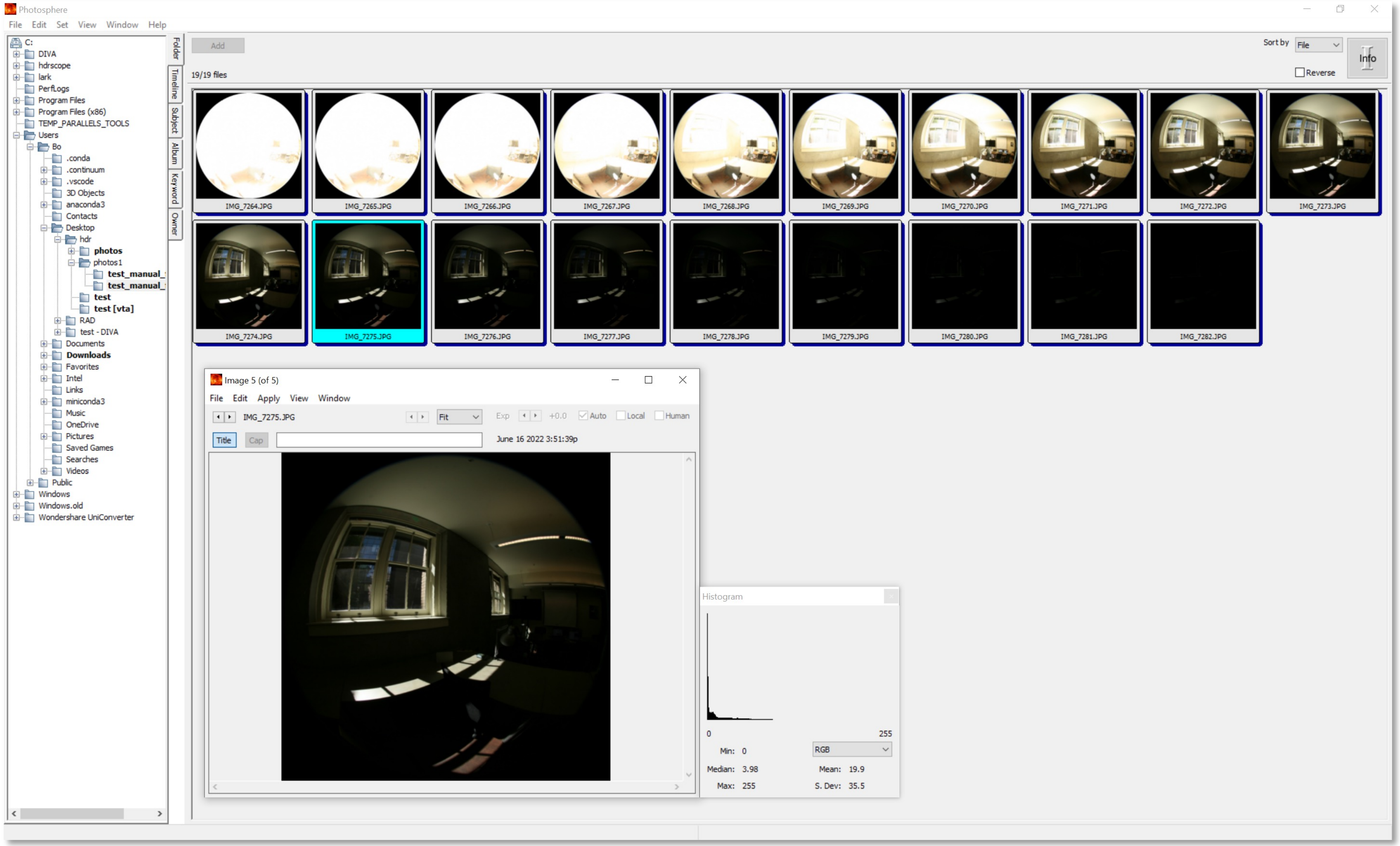




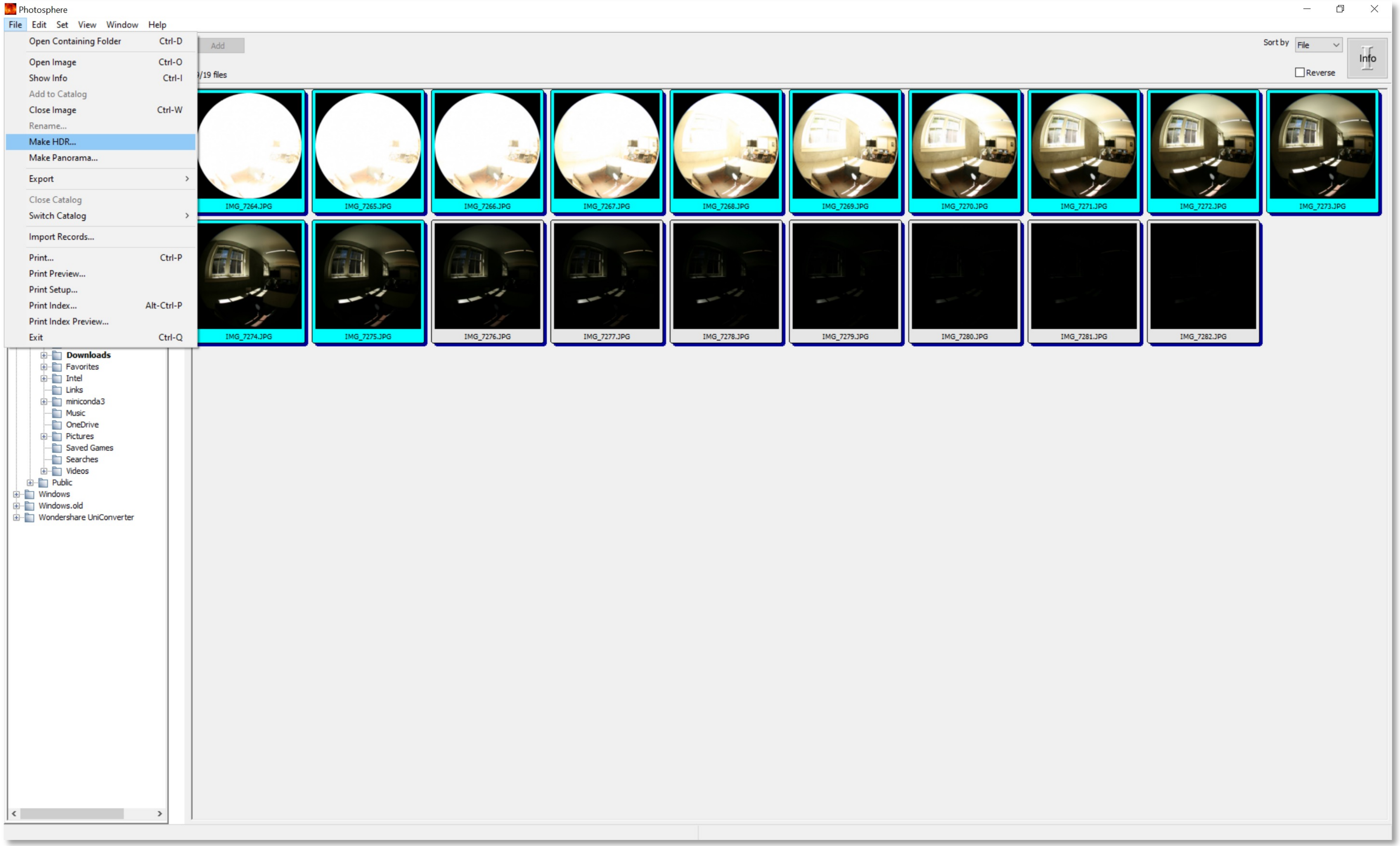
2. Merge HDR + Luminance Calibration



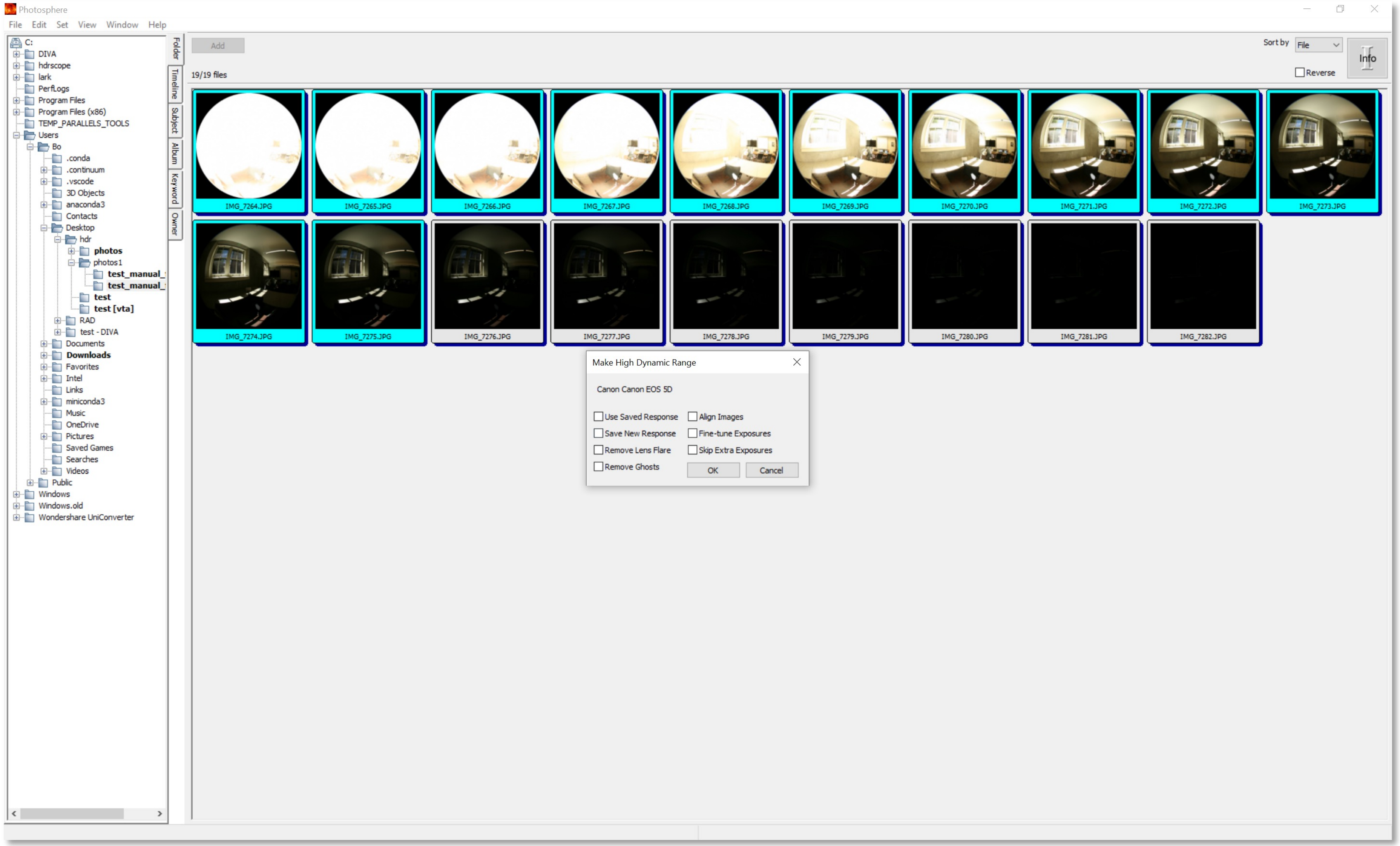
2. Merge HDR + Luminance Calibration



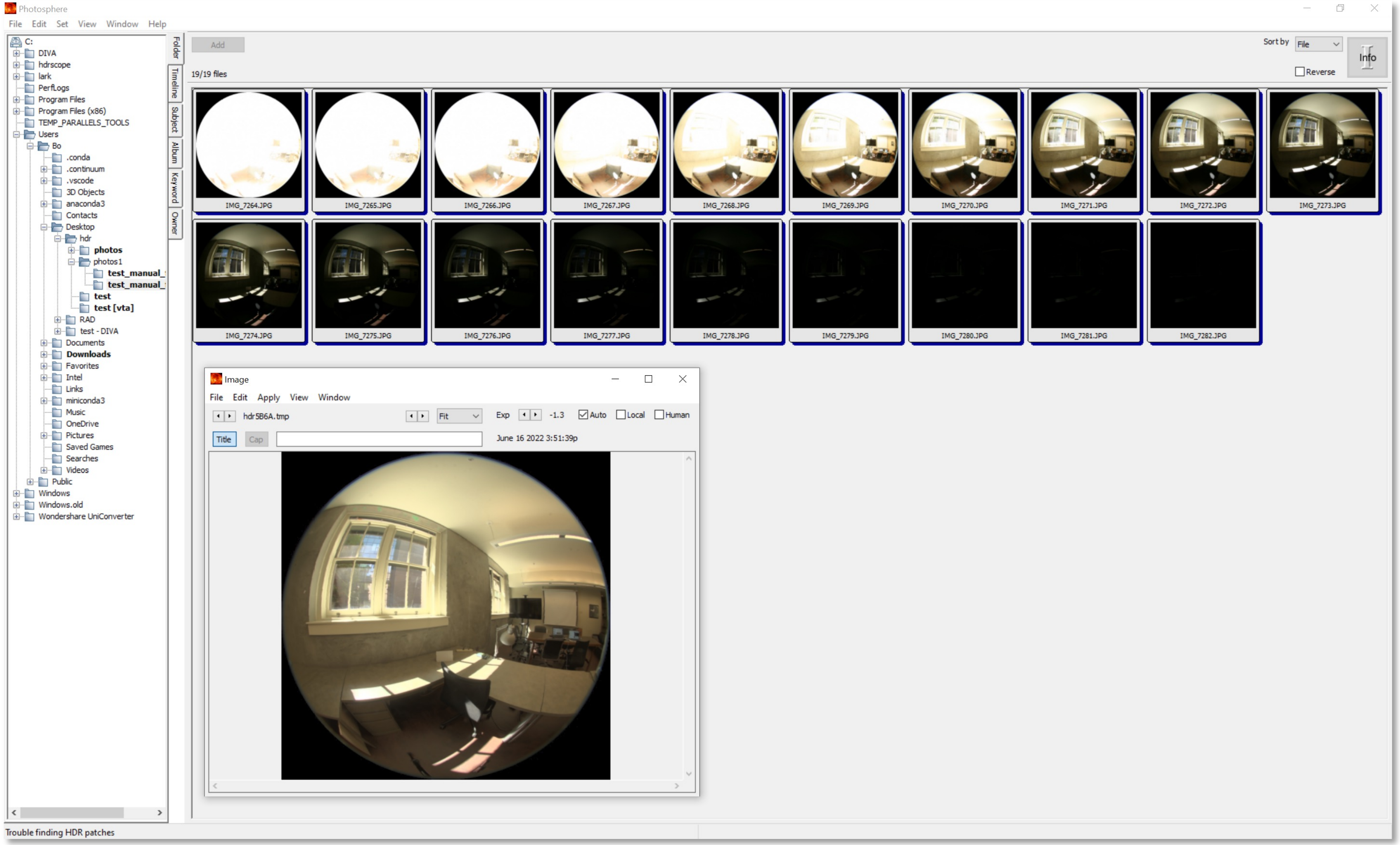
2. Merge HDR + Luminance Calibration



2. Merge HDR + Luminance Calibration



2. Merge HDR + Luminance Calibration



2. Merge HDR + Luminance Calibration

C:\Users\<user_name>\AppData\Roaming\photosphere\Library\Preferences

Photosphere - Notepad

File Edit Format View Help

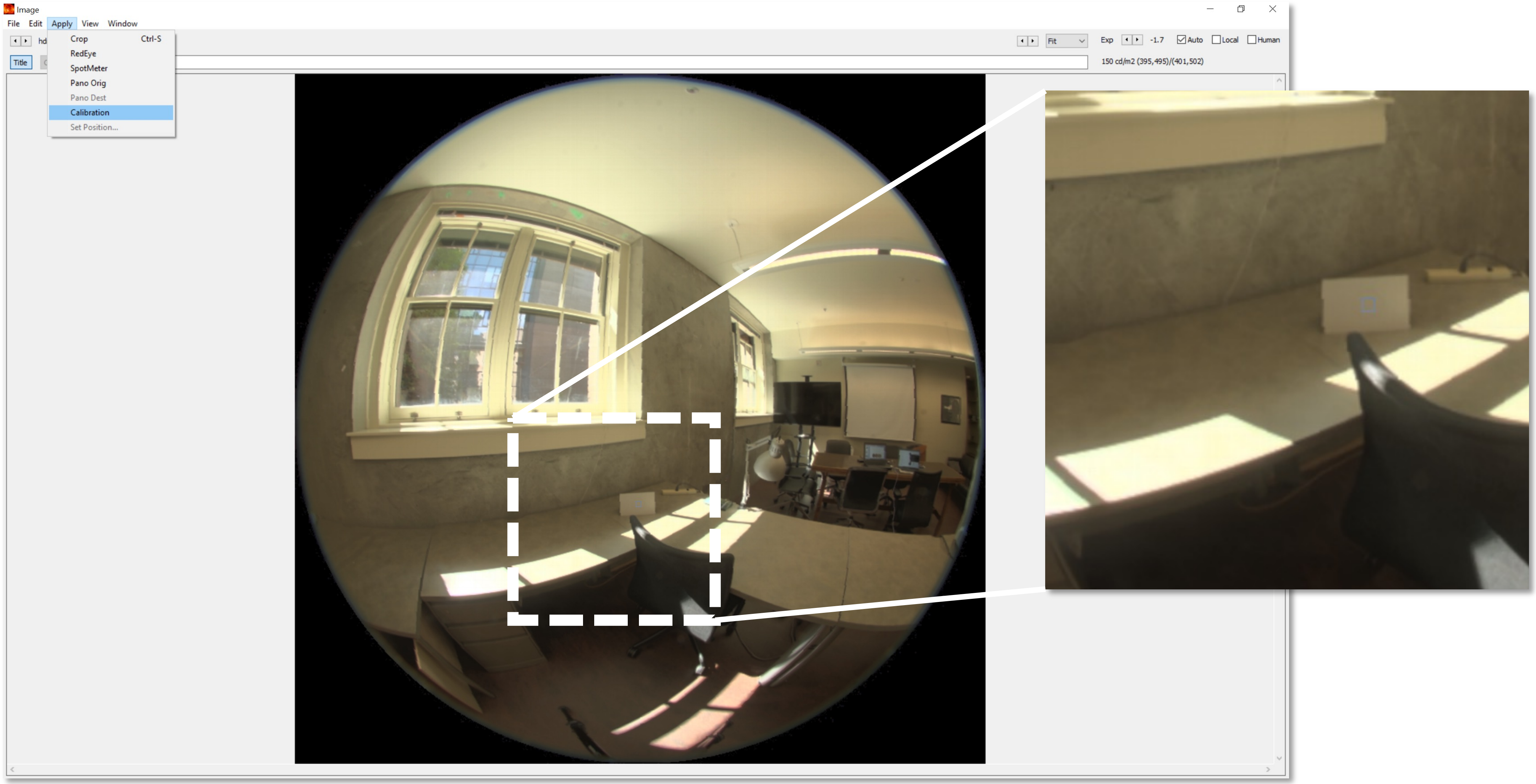
```
PhotospherePreferences = {
ShadowCatalog = C:\Users\Bo\AppData\Roaming\photosphere\Library\Caches\Photosphere.adb
ErrorLog = C:\Users\Bo\AppData\Roaming\photosphere\Library\Logs\Photosphere.log
StartupOption = 1
DisplayExposureFlags = 1
MemoryCacheMegs = 128
ThumbnailCacheMegs = 512
ThumbnailCacheDirectory = C:\Users\Bo\AppData\Roaming\photosphere\Library\Caches\PhotosphereCache\
CameraResponses = {
Make|Model|Version|Red|Green|Blue
"Canon"|"Canon EOS 5D"|"v.0"|{-9.020149e-003,5.425878e-001,-1.015498e+000,1.481930e+000}|{-1.198579e-002,4.895166e-001
} // CameraResponses
RecentDirectory = C:\Users\Bo\Desktop\hdr\photos1\post_process
}       // PhotospherePreferences
```

2. Merge HDR + Luminance Calibration

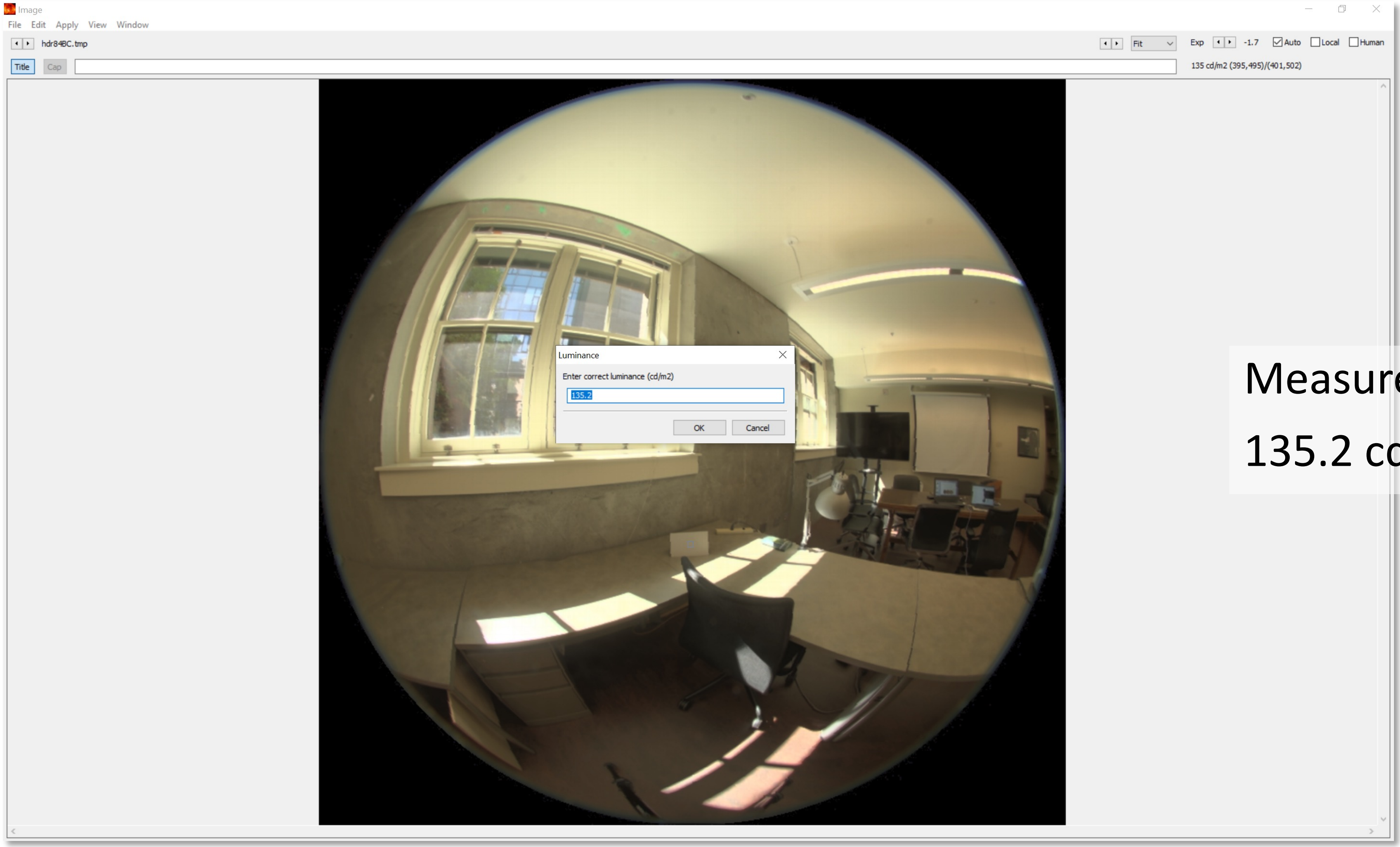
- Measure a gray card in the scene from the position of the camera

2. Merge HDR + Luminance Calibration

2. Merge HDR + Luminance Calibration



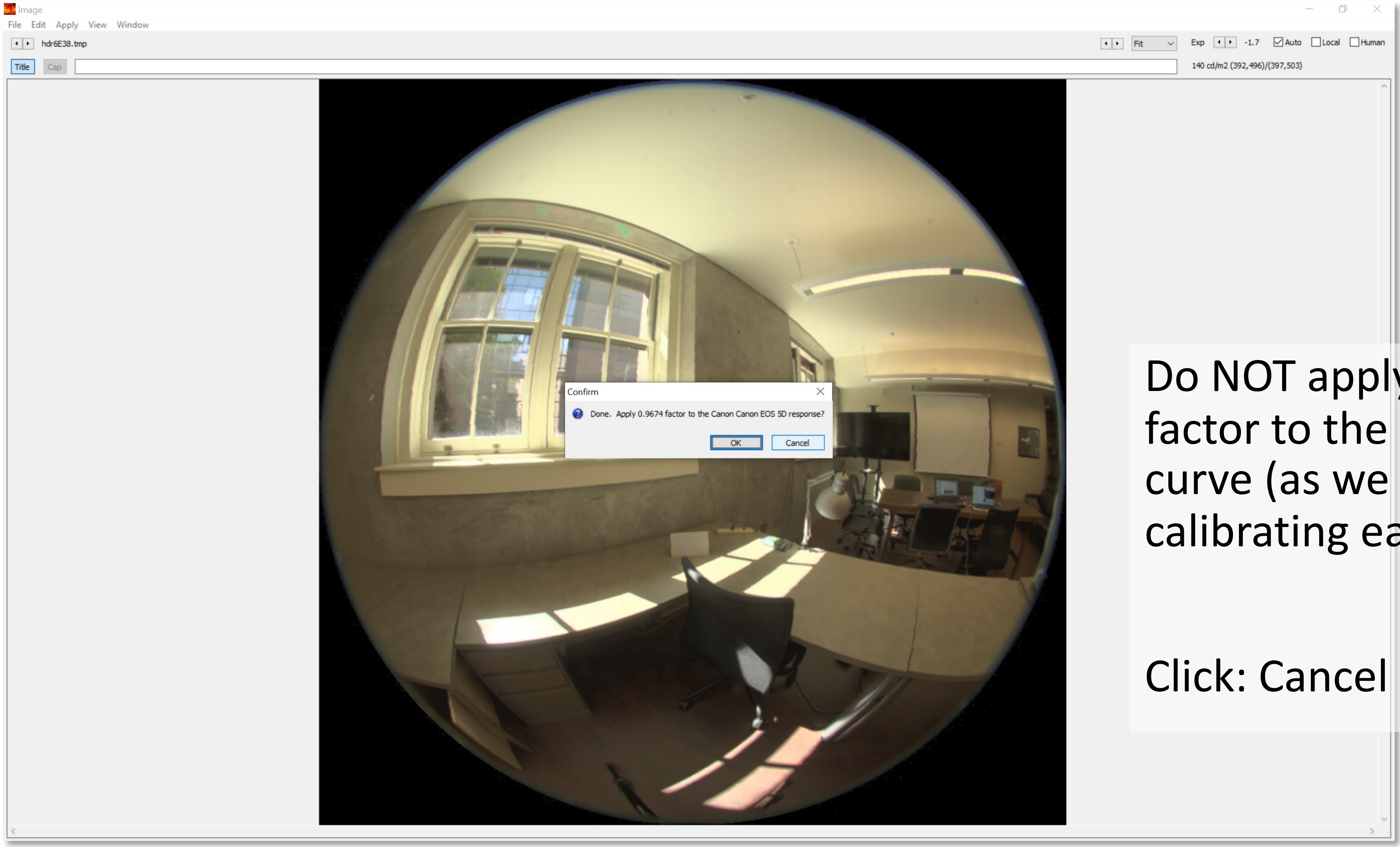
2. Merge HDR + Luminance Calibration



Measured Luminance:

135.2 cd/m^2

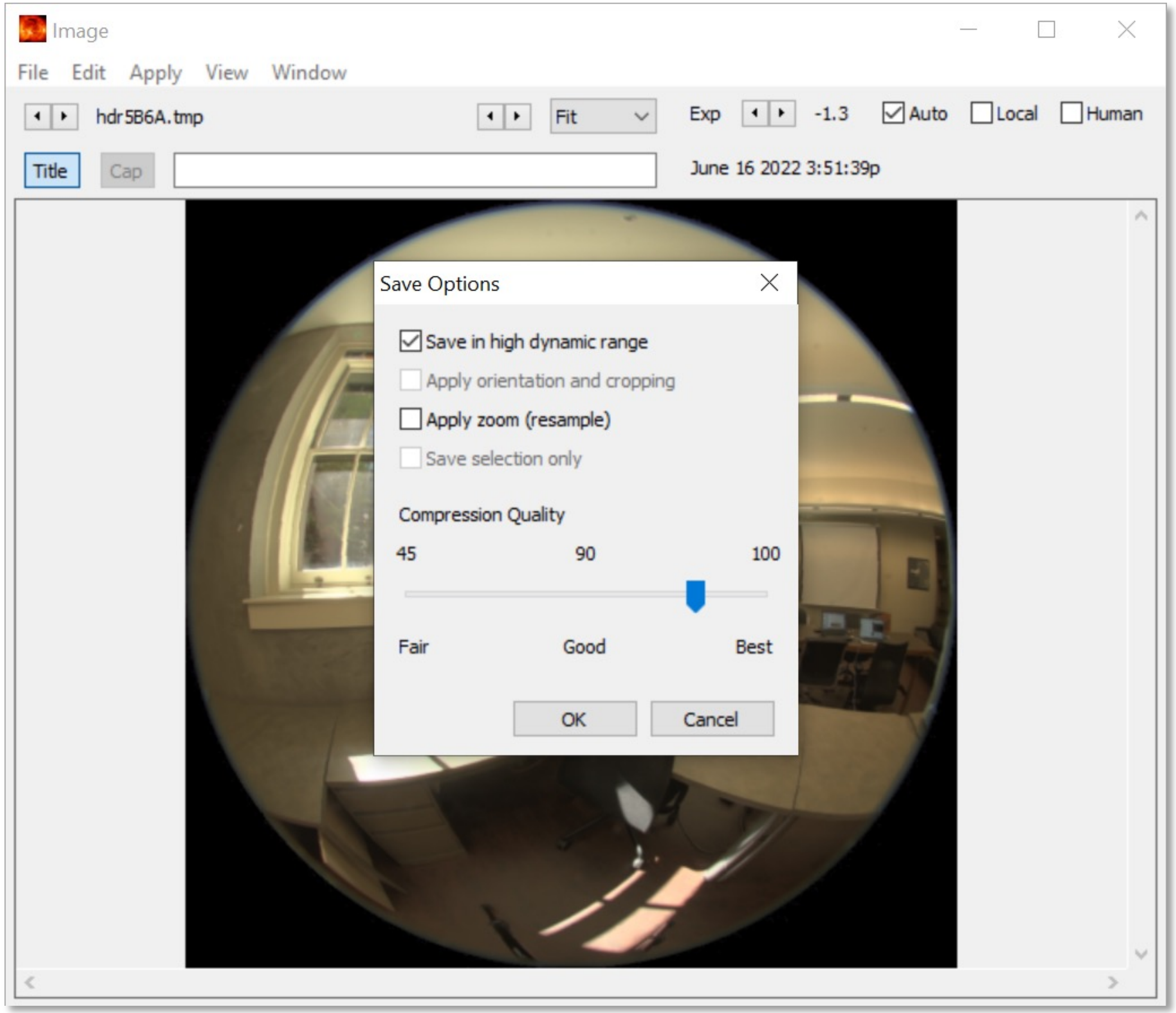
2. Merge HDR + Luminance Calibration



Do NOT apply the calibration factor to the camera response curve (as we are luminance calibrating each HDR image).

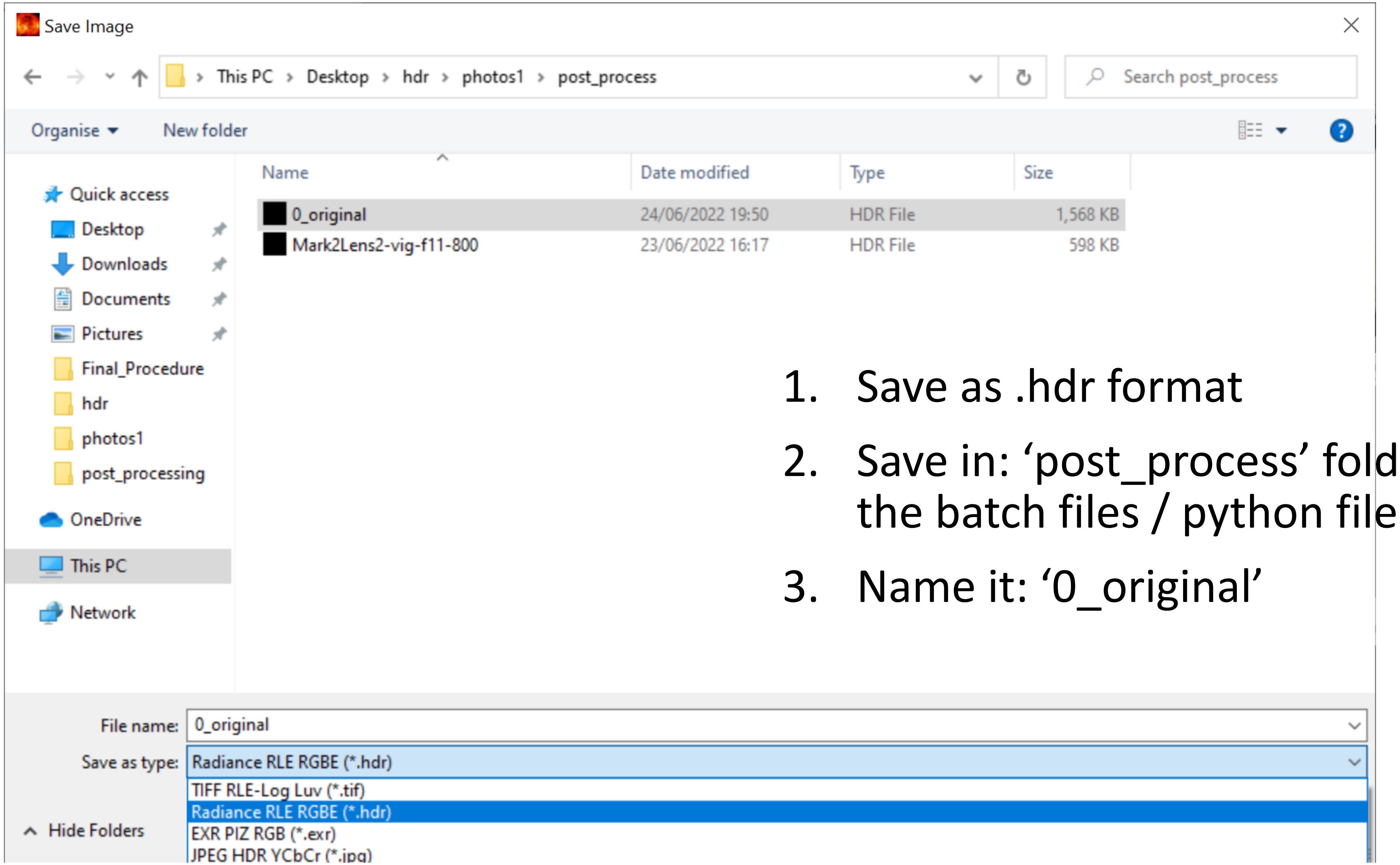
Click: Cancel

2. Merge HDR + Luminance Calibration



Make sure 'Save in high dynamic range' is checked

2. Merge HDR + Luminance Calibration



1. Save as .hdr format
2. Save in: 'post_process' folder (that contains all the batch files / python files)
3. Name it: '0_original'

2. Merge HDR + Luminance Calibration

If fixing geometric aberration is not needed:

1. merge the HDR (through Photosphere)
2. resize the image

pfilt –x 800 –y 800 –e 1 file_name.hdr > new_file_name.hdr

3. crop the image

pcompos -h -x 800 -y 800 file_name.hdr -525 0 > new_file_name.hdr

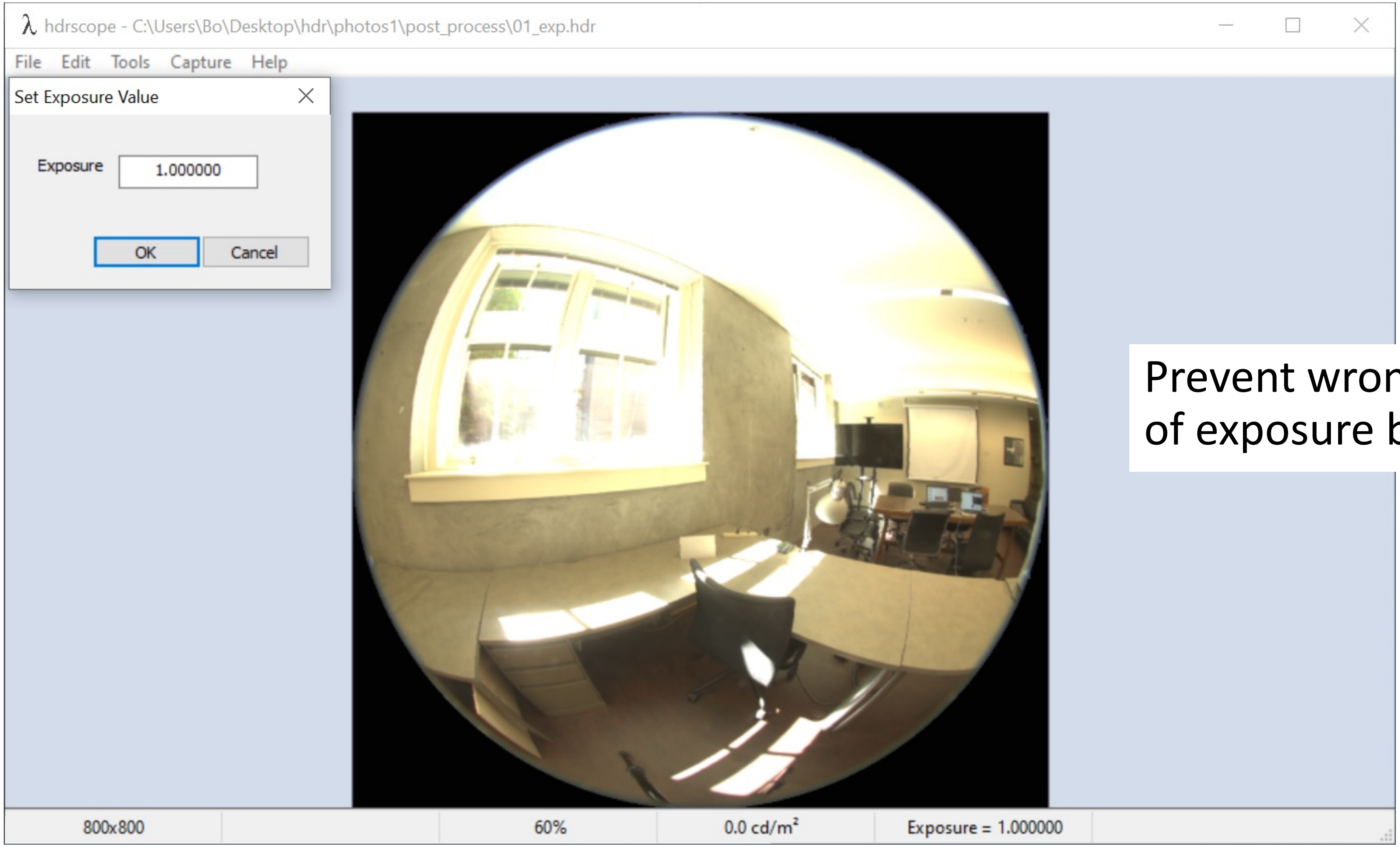
crop size

x-axis cut pixel point
(lower left corner)

Note that the location of the crop varies based on camera and lens

2. Merge HDR + Luminance Calibration

3. Exposure



Prevent wrong interpretation of exposure by changing it to 1

3. Set Exposure to 1

Exposure set to 1

ra_xyze -r -o 0_original.hdr > 01_exp.hdr

Double click:

b01_exp.bat

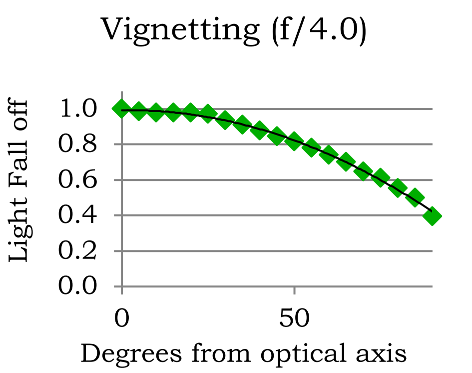
b01_exp.bat

contains above radiance command which sets the exposure to 1

3. Set Exposure to 1

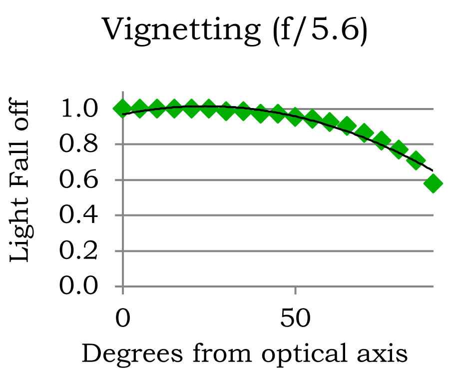
4. Vignetting Correction

LENS SPECIFIC



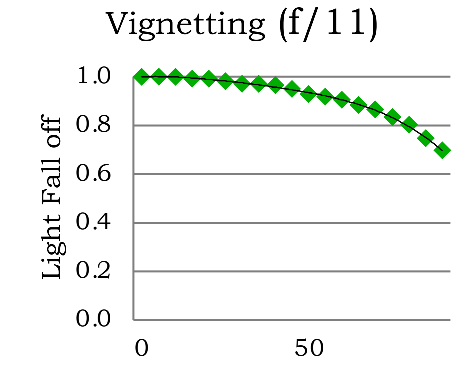
$y = -7E\text{-}05x2 + 0.0003x + 0.9932$

$R^2 = 0.997$



$y = -2E\text{-}08x^4 + 3E\text{-}06x^3 - 0.0001x^2 + 0.0021x + 0.9955,$

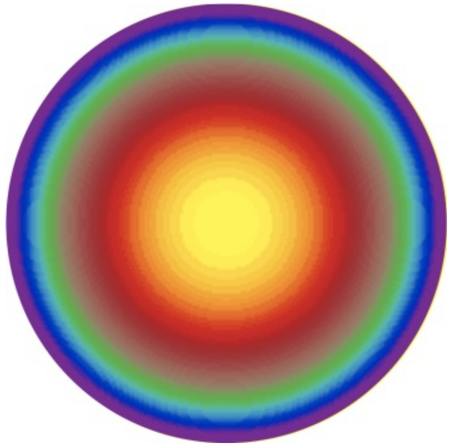
$R^2 = 0.9975$

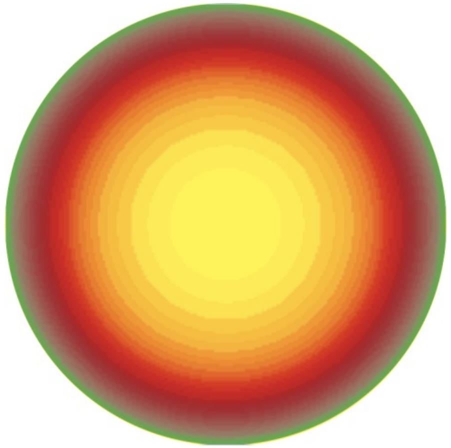


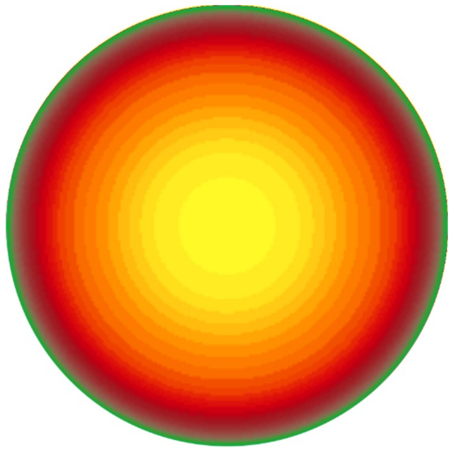
$y = -7E\text{-}06x^4 + 0.0002x^3 - 0.0025x^2 + 0.0075x + 0.9939$

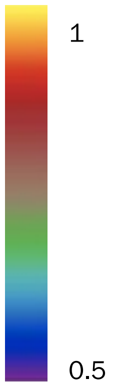
$R^2 = 0.9982$

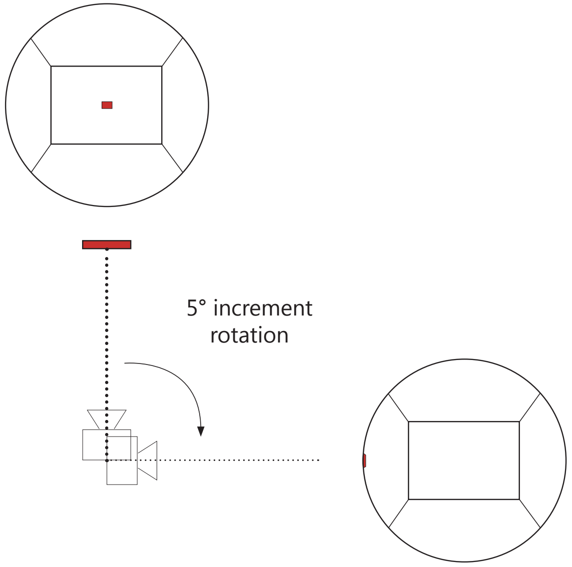
Normalized luminance values









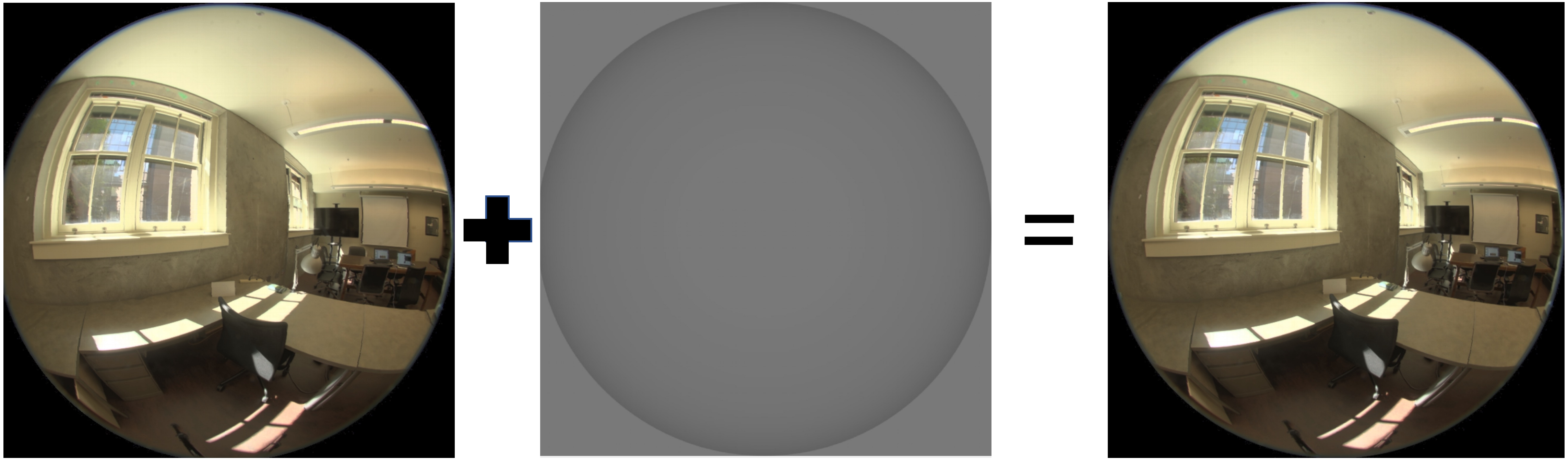


Corrected based on sigma8 vignetting aberration for f/11

4. Vignetting Correction

From a vignetting filter file:

pcomb -e "ro=ri(1) / ri(2);go=gi(1) / gi(2);bo=bi(1) / bi(2)" 01_exp.hdr Mark2Lens2-vig-f11-800.hdr > 02_vig.hdr



4. Vignetting Correction

From a vignetting filter file:

pcomb -e "ro=ri(1) / ri(2);go=gi(1) / gi(2);bo=bi(1) / bi(2)" 01_exp.hdr Mark2Lens2-vig-f11-800.hdr > 02_vig.hdr

b02_vignette.bat

contains above radiance command which applies vignetting filter

Double click:

b02_vignette.bat

4. Vignetting Correction

If the vignetting function is:

y = -0.0000005x3 + 0.000004x2 + 0.0002x + 0.9991

An example correction for 800 pixel image is:

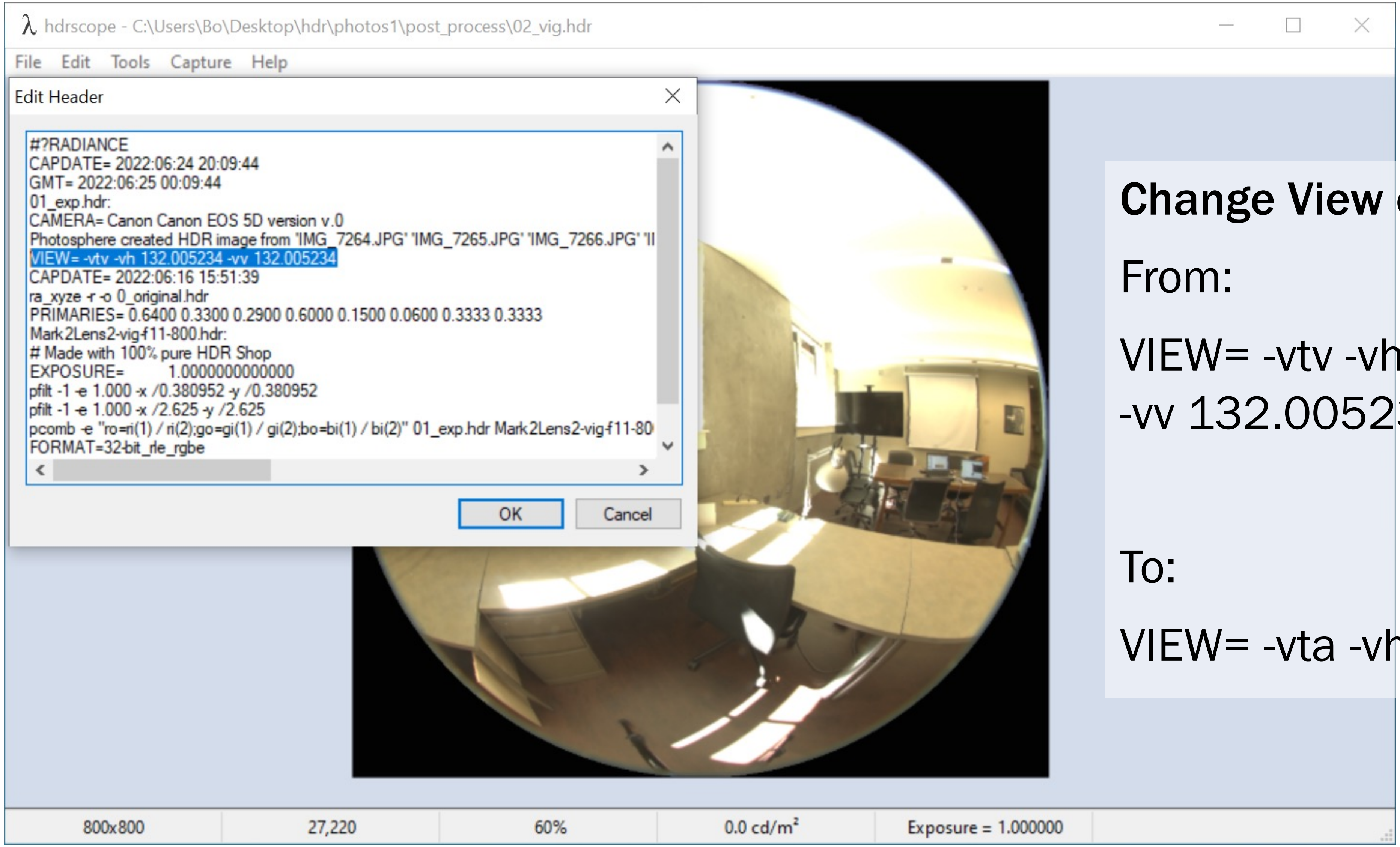
```
pcomb -e "ro=vign;go=vign;bo=vign;vign=if(dist-400.0,1,eq);eq=-0.0000005*deg^3+0.000004*deg^2+0.0002*deg+0.9991;deg=(dist/400.0)*90.0;dist=sqrt((x+0.5-400-.0)^2+(y+0.5-400.0)^2);" 800_vta.pic > vignetting.pic
```

4. Vignetting Correction

5. Change Header

1. Open 02_vig.hdr in HDR scope
2. File – Edit header

5. Change Header



Change View command

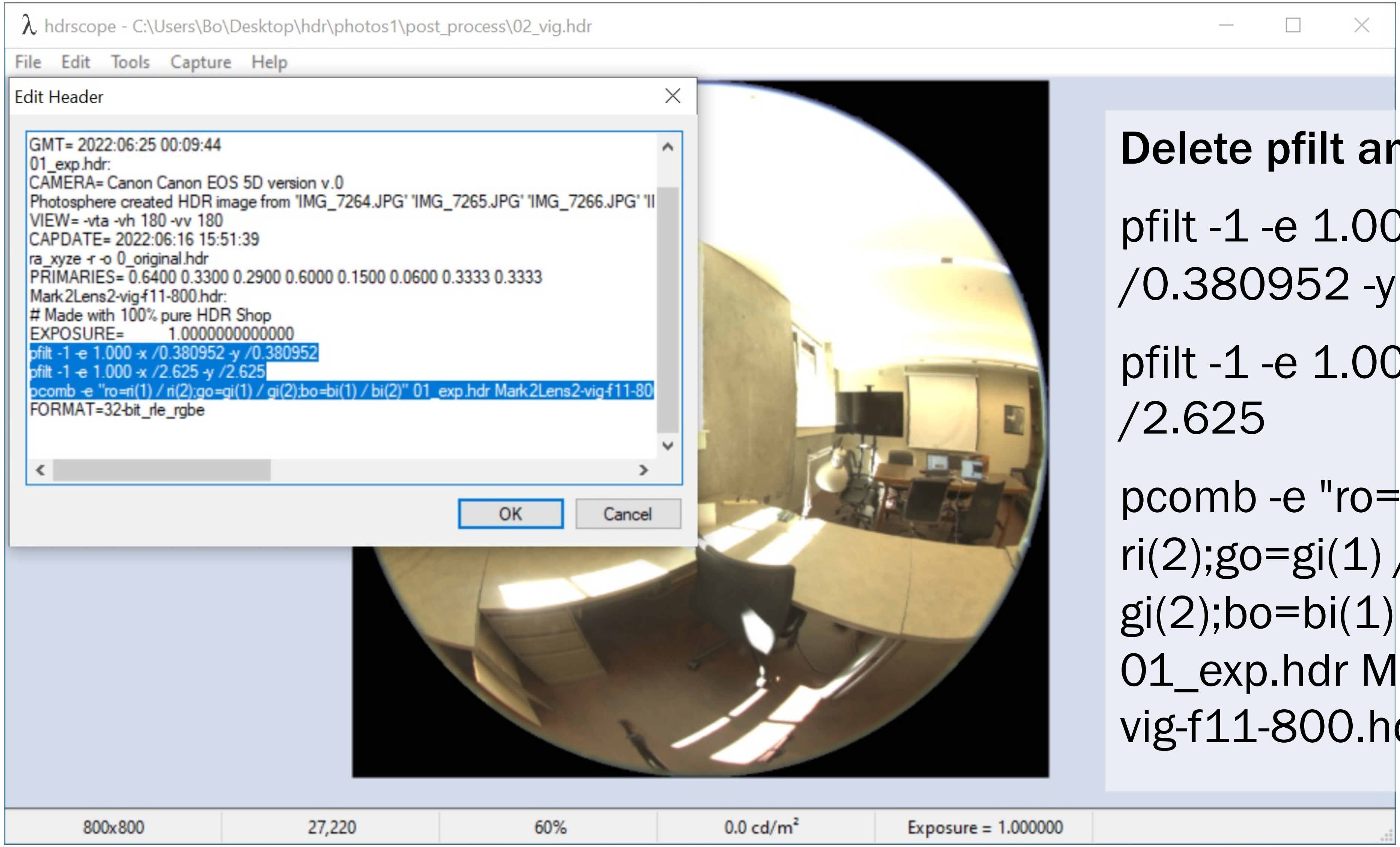
From:

VIEW= -vtv -vh 132.005234 -vv 132.005234

To:

VIEW= -vta -vh 180 -vv 180

5. Change Header



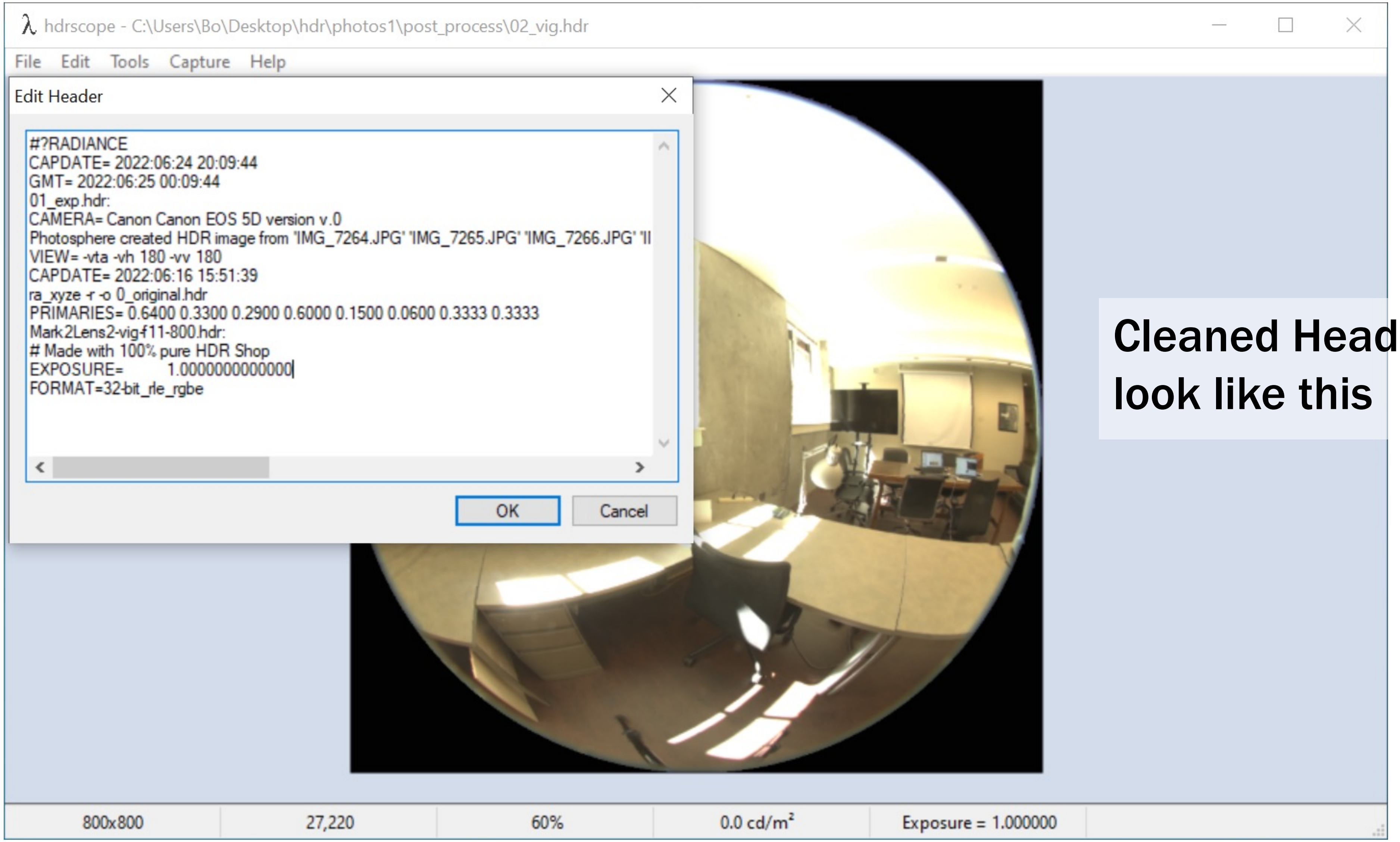
Delete pfilt and pcompos

pfilt -1 -e 1.000 -x /0.380952 -y /0.380952

pfilt -1 -e 1.000 -x /2.625 -y /2.625

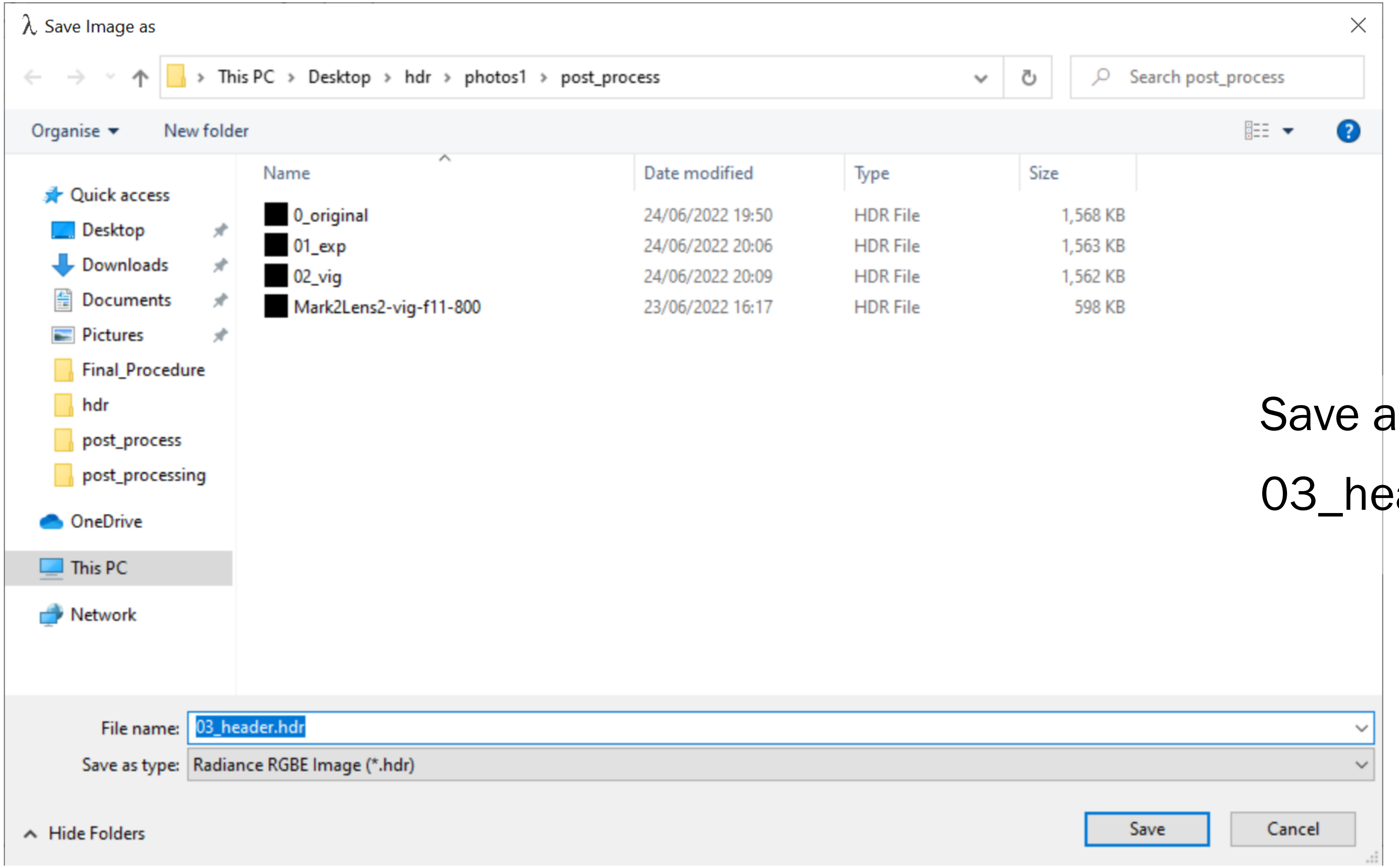
pcomb -e "ro=ri(1) / ri(2);go=gi(1) / gi(2);bo=bi(1) / bi(2)" 01_exp.hdr Mark2Lens2-vig-f11-800.hdr

5. Change Header



Cleaned Header should look like this

5. Change Header



Save as:

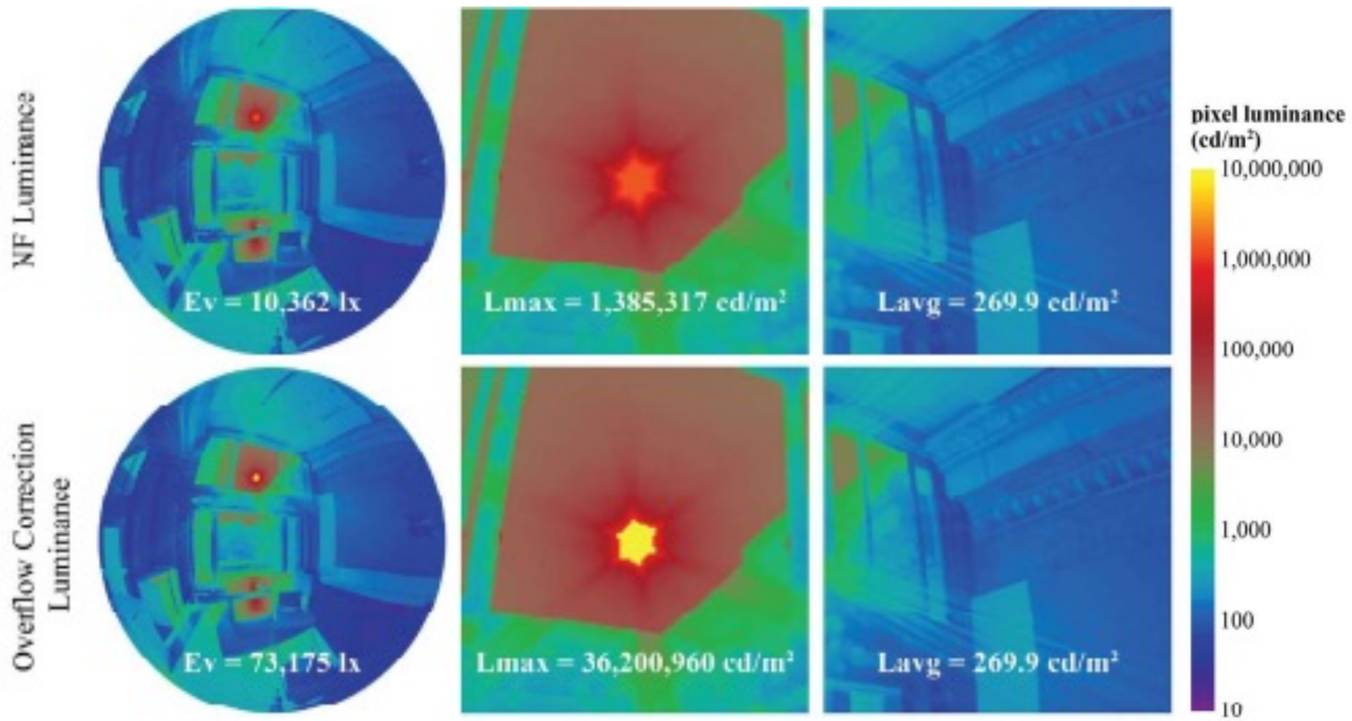
03_header.hdr

5. Change Header

6. Luminous Overflow Correction

No filter f/11

Luminous overflow correction



Jakubiec, Inanici, van den Wymelenberg, Mahic 2016

6. Luminous Overflow Correction

overflow_correctnew.py

```
import os, sys
import subprocess as sp

# image input
input_path = os.path.normcase(sys.argv[1])
str_E_measured = sys.argv[2]
output_path = os.path.normcase(sys.argv[3])


# calculate E_image
command = ["pcomb", "-e", "lo=L*Sang*cosCos;L=179*li(1);Sang=S(1);cosCos=Dy(1);", "-o", input_path, "|", "pvalue", "-d", "-b", "-h", "-H", "|", "total"]
proc = sp.Popen(command, stdout=sp.PIPE, shell=True)
str_E_image, err = proc.communicate()
str_E_image = str_E_image.rstrip()
E_image = float(str_E_image)
print('Calculated image illuminance is %.1f lx.' % E_image)


# find brightest and dimmest pixel in image
command = ["pextrem", "-o", input_path, "|", "rcalc", "-e", "$1=($3*0.2127+$4*0.7152+$5*0.0722)*179.0", ">", "extremes.txt"]
proc = sp.Popen(command, stdout=sp.PIPE, shell=True)
proc.wait()
f = open("extremes.txt", 'r')
line_extrem = f.readline()
line_extrem = f.readline()
line_extrem = line_extrem.rstrip()
line_extrem = line_extrem.replace("\t", " ")
f.close()
os.remove("extremes.txt")


# calculate 95% max luminance
extreme = (float(line_extrem))
str_extreme = str(0.95 * extreme)
```

6. Luminous Overflow Correction

Command Prompt

```
Microsoft Windows [Version 10.0.19044.1766]
(c) Microsoft Corporation. All rights reserved.

C:\Users\Bo>cd Desktop

C:\Users\Bo\Desktop>cd hdr

C:\Users\Bo\Desktop\hdr>cd photos1

C:\Users\Bo\Desktop\hdr\photos1>cd post_process

C:\Users\Bo\Desktop\hdr\photos1\post_process>py overflow_correctnew.py 03_header.hdr 1640 04_overflow_cor.hdr
```

← Go to folder location where python files is saved

python | *overflow_correcynew.py* | *03_header.hdr* | *Illuminance* | ***04_overflow_cor.hdr***

- *overflow_correcynew.py*: Python File Name
- *03_header.hdr*: HDR file to apply correction
- *Illuminance*: Measured Illuminance
- ***04_overflow_cor.hdr***: HDR file to save as

6. Luminous Overflow Correction

Command Prompt

```
Microsoft Windows [Version 10.0.19044.1766]
(c) Microsoft Corporation. All rights reserved.

C:\Users\Bo>cd Desktop

C:\Users\Bo\Desktop>cd hdr

C:\Users\Bo\Desktop\hdr>cd photos1

C:\Users\Bo\Desktop\hdr\photos1>cd post_process

C:\Users\Bo\Desktop\hdr\photos1\post_process>py overflow_correctnew.py 03_header.hdr 1340 04_overflow_cor.hdr
Calculated image illuminance is 1054.7 lx.
Highest luminance recorded in the image is 6690.8 cd/m2; therefore, the overflow threshold is 6356.3 cd/m2.
Contribution of pixels within the overflow threshold (E_contrib) is 17.4 lx.
Potential contribution of pixels above the overflow threshold (sum of solid angle plus cosine correction) is 0.00268 str.
These pixels will be adjusted to a luminance value of 112998.8 cd/m2.
RGB values in overflow pixels will be adjusted with a coefficient value of 17.77757.
04_overflow_cor.hdr successfully created from 03_header.hdr corrected to an illuminance value of 1340 lx.

C:\Users\Bo\Desktop\hdr\photos1\post_process>
```

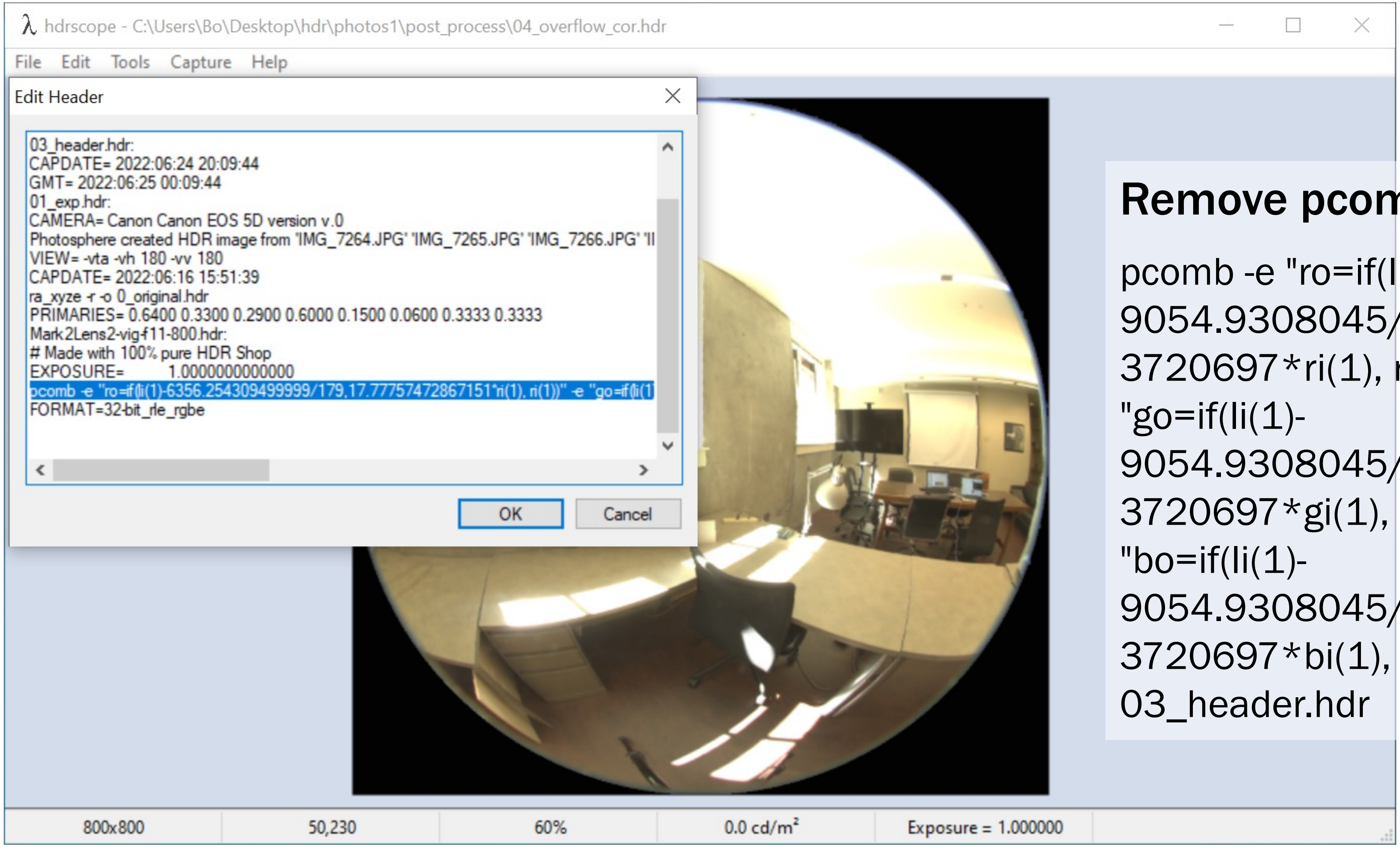
Measured Illuminance (1340)

Calculated Illuminance (1054.7 lx)

5% highest threshold (6356.3 cd/m2)

6. Luminous Overflow Correction

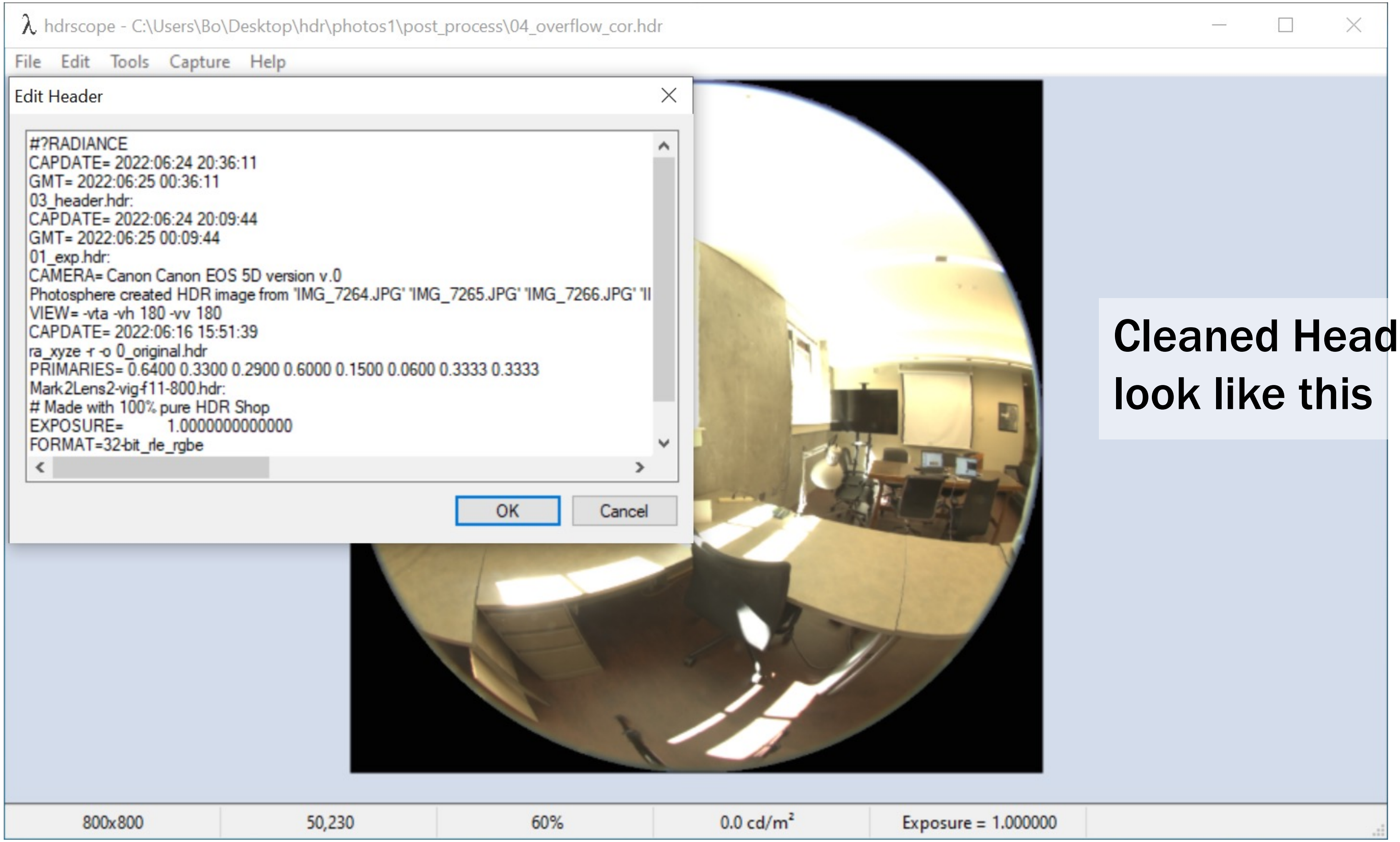
7. Header Clean up



Remove pcomb line

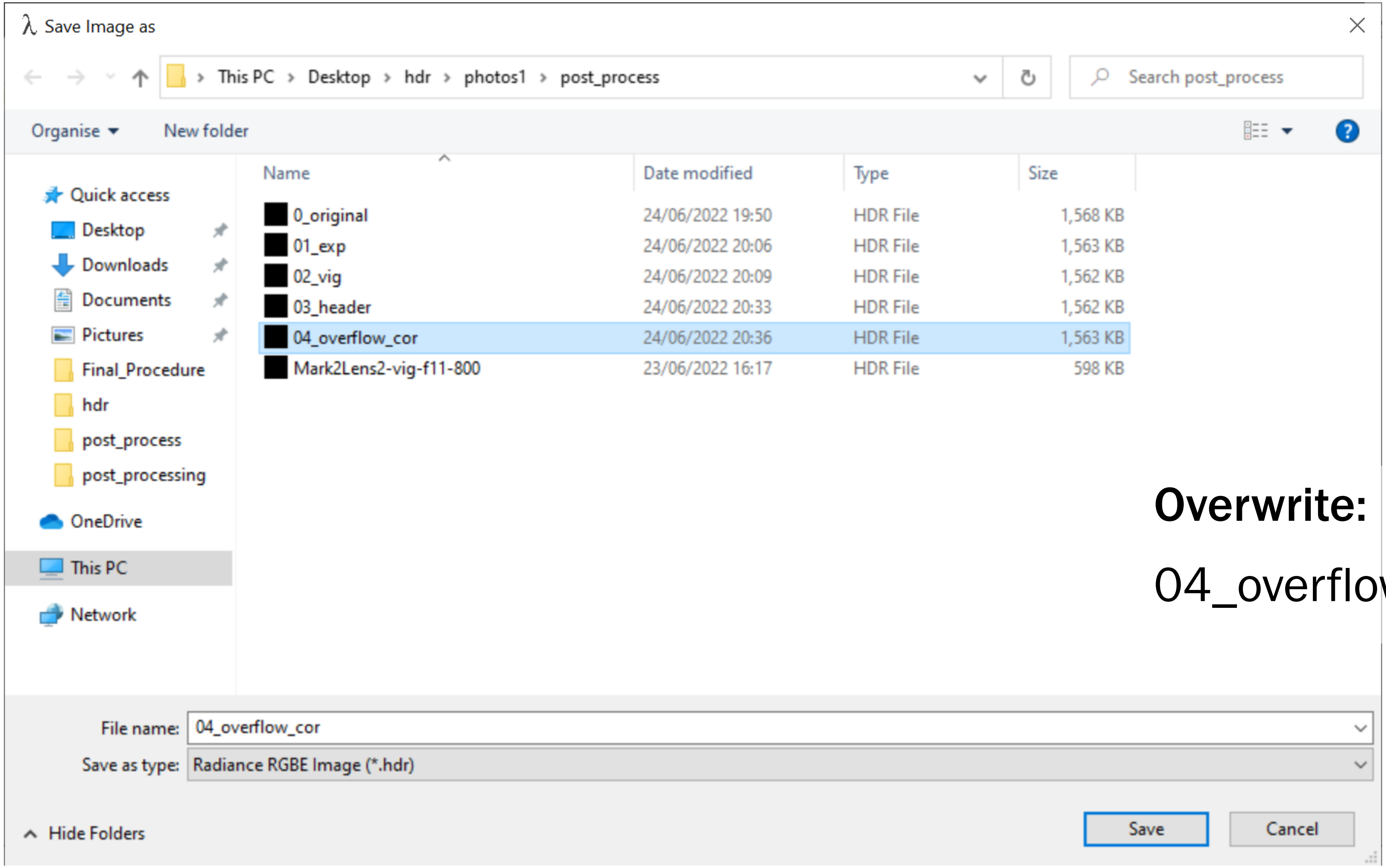
pcomb -e "ro=if(li(1)-9054.9308045/179,259.574723720697*ri(1), ri(1))" -e "go=if(li(1)-9054.9308045/179,259.574723720697*gi(1), gi(1))" -e "bo=if(li(1)-9054.9308045/179,259.574723720697*bi(1), bi(1))" -o 03_header.hdr

7. Header Clean up



Cleaned Header should look like this

7. Header Clean up



Overwrite:

04_overflow_cor.hdr

7. Header Clean up

8. Color Calibration – Scene Based

XYZ is calculated from images (cosine corrected) - for verification

```
pcomb -e "lo=X*Sang*cosCos;X=(179*(ri(1)*0.4124 + gi(1)*0.3576 + bi(1)*0.1805));Sang=S(1);cosCos=Dy(1);" -o 04_overflow_cor.hdr |pvalue -d -b -h -H | total > XYZ.txt
```

```
pcomb -e "lo=Y*Sang*cosCos;Y=(179*(ri(1)*0.2127 + gi(1)*0.7152 + bi(1)*0.0722));Sang=S(1);cosCos=Dy(1);" -o 04_overflow_cor.hdr |pvalue -d -b -h -H | total >> XYZ.txt
```

```
pcomb -e "lo=Z*Sang*cosCos;Z=(179*(ri(1)*0.0193 + gi(1)*0.1192 + bi(1)*0.9505));Sang=S(1);cosCos=Dy(1);" -o 04_overflow_cor.hdr |pvalue -d -b -h -H | total >> XYZ.txt
```

RGB is calculated from images (cosine corrected) – for correction factors

```
pcomb -e "lo=R*Sang*cosCos;R=(179*(ri(1)));Sang=S(1);cosCos=Dy(1);" -o 04_overflow_cor.hdr |pvalue -d -b -h -H | total > RGB.txt
```

```
pcomb -e "lo=G*Sang*cosCos;G=(179*(gi(1)));Sang=S(1);cosCos=Dy(1);" -o 04_overflow_cor.hdr |pvalue -d -b -h -H | total >> RGB.txt
```

```
pcomb -e "lo=B*Sang*cosCos;B=(179*(bi(1)));Sang=S(1);cosCos=Dy(1);" -o 04_overflow_cor.hdr |pvalue -d -b -h -H | total >> RGB.txt
```

8. Color Calibration– Scene Based

b05_XYZRGB - Notepad

File Edit Format View Help

```
pcomb -e "lo=X*Sang*cosCos;X=(179*(ri(1)*0.4124 + gi(1)*0.3576 + bi(1)*0.1805));Sang=S(1);cosCos=Dy(1);" -o 04_overflow_cor.hdr |pvalue -d -b -h -H | total > XYZ.txt
pcomb -e "lo=Y*Sang*cosCos;Y=(179*(ri(1)*0.2127 + gi(1)*0.7152 + bi(1)*0.0722));Sang=S(1);cosCos=Dy(1);" -o 04_overflow_cor.hdr |pvalue -d -b -h -H | total >> XYZ.txt
pcomb -e "lo=Z*Sang*cosCos;Z=(179*(ri(1)*0.0193 + gi(1)*0.1192 + bi(1)*0.9505));Sang=S(1);cosCos=Dy(1);" -o 04_overflow_cor.hdr |pvalue -d -b -h -H | total >> XYZ.txt
pcomb -e "lo=R*Sang*cosCos;R=(179*(ri(1)));Sang=S(1);cosCos=Dy(1);" -o 04_overflow_cor.hdr |pvalue -d -b -h -H | total > RGB.txt
pcomb -e "lo=G*Sang*cosCos;G=(179*(gi(1)));Sang=S(1);cosCos=Dy(1);" -o 04_overflow_cor.hdr |pvalue -d -b -h -H | total >> RGB.txt
pcomb -e "lo=B*Sang*cosCos;B=(179*(bi(1)));Sang=S(1);cosCos=Dy(1);" -o 04_overflow_cor.hdr |pvalue -d -b -h -H | total >> RGB.txt
```

Double click:

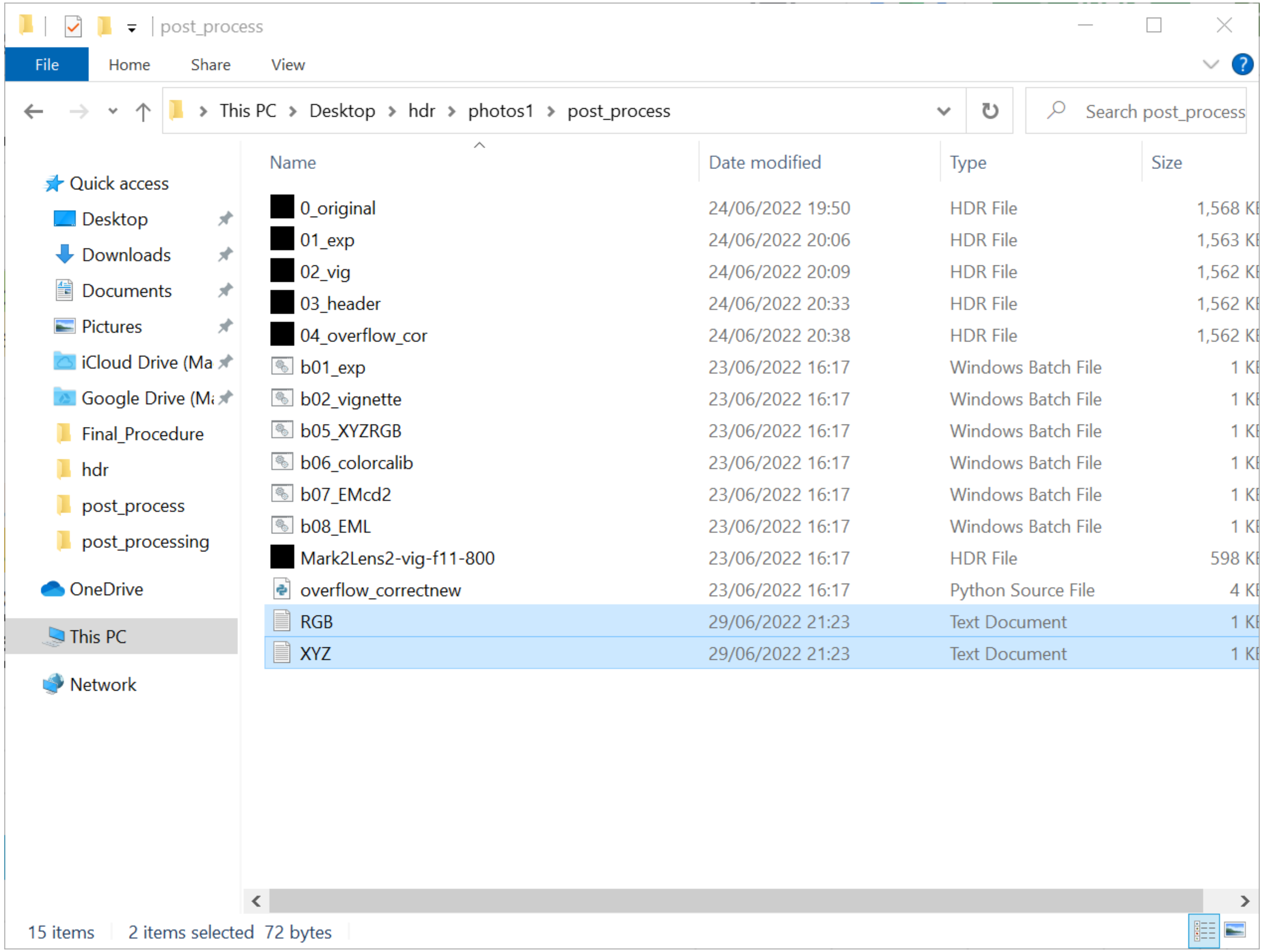
B05_XYZRGB.bat

B05_XYZRGB.bat

contains radiance commands to calculate X,Y,Z and R,G,B from the HDR

This is saved as a txt file

8. Color Calibration– Scene Based



This will create:

XYZ.txt & RGB.txt

8. Color Calibration – Scene Based

	A	B	C	D	E	F	G
1		Measurec	Image				Measured with spectrophotometer or colorimeter
2	X	1272.85	1247.97				Derived from image, stored in XYZ.text from b06_XYZRGB.bat
3	Y	1339.63	1339.63				
4	Z	871.63	1098.45				
5							
6			Calc	Image	**Correction coefficient**		Calculated in excel, XYZ to RGB transformation from measured data
7	R	1630.89	1437.18	1437.44869	**1.134780843**		Calculated in excel, XYZ to RGB transformation from image XYZ
8	G	1315.65	1349.19	1348.917	**0.9751369915**		Derived from image, stored in RGB.txt from b06_XYZRGB.bat
9	B	719.01	957.43	957.32	**0.7509802707**		**These are the computed color correction values that are passed to**
10							
11			Calc and image RGBs are done for verification				
12			They should be similar				
13							
14	EML	947.6348					EML calculated from spectraphotometric data
15							

Open RGBCorrection.xlsx

If you don't have excel, you can open in google sheet

This is used to calculate Correction Coefficient for color correction

8. Color Calibration – Scene Based

1

XYZ - Notepad

File Edit Format View Help

```
1247.96166
1339.62534
1098.44723
```

2

	A	B	C	D	E	F	G
		Measure	Image				Measured with spectrophotometer or colorimeter
	X	1272.85	1247.97				Derived from image, stored in XYZ.text from b06_XYZRGB.bat
	Y	1339.63	1339.63				
	Z	871.63	1098.45				
			Calc	Image	Correction coefficient		Calculated in excel, XYZ to RGB transformation from measured data
	R	1630.89	1437.18	1437.44869	1.134780843		Calculated in excel, XYZ to RGB transformation from image XYZ
	G	1315.65	1349.19	1348.917	0.9751369915		Derived from image, stored in RGB.txt from b06_XYZRGB.bat
	B	719.01	957.43	957.32	0.7509802707		**These are the computed color correction values that are passed to**
11					re done for verification		
12							
13							
14	EML	947.6348					EML calculated from spectraphotometric data
15							
16							
17							
18							
19							
20							
21							

Double check these somewhat match

XYZ - Notepad

File Edit Format View Help

```
1247.96166
1339.62534
1098.44723
```

3

8. Color Calibration – Scene Based

8. Color Calibration – Scene Based

To calibrate R, G, B values:

pcomb -e "ro=ri(1) * 1.134780843; go=gi(1) * 0.9751369915; bo=bi(1) * 0.7509802707" 04_overflow_cor.hdr > 05_photopic.hdr

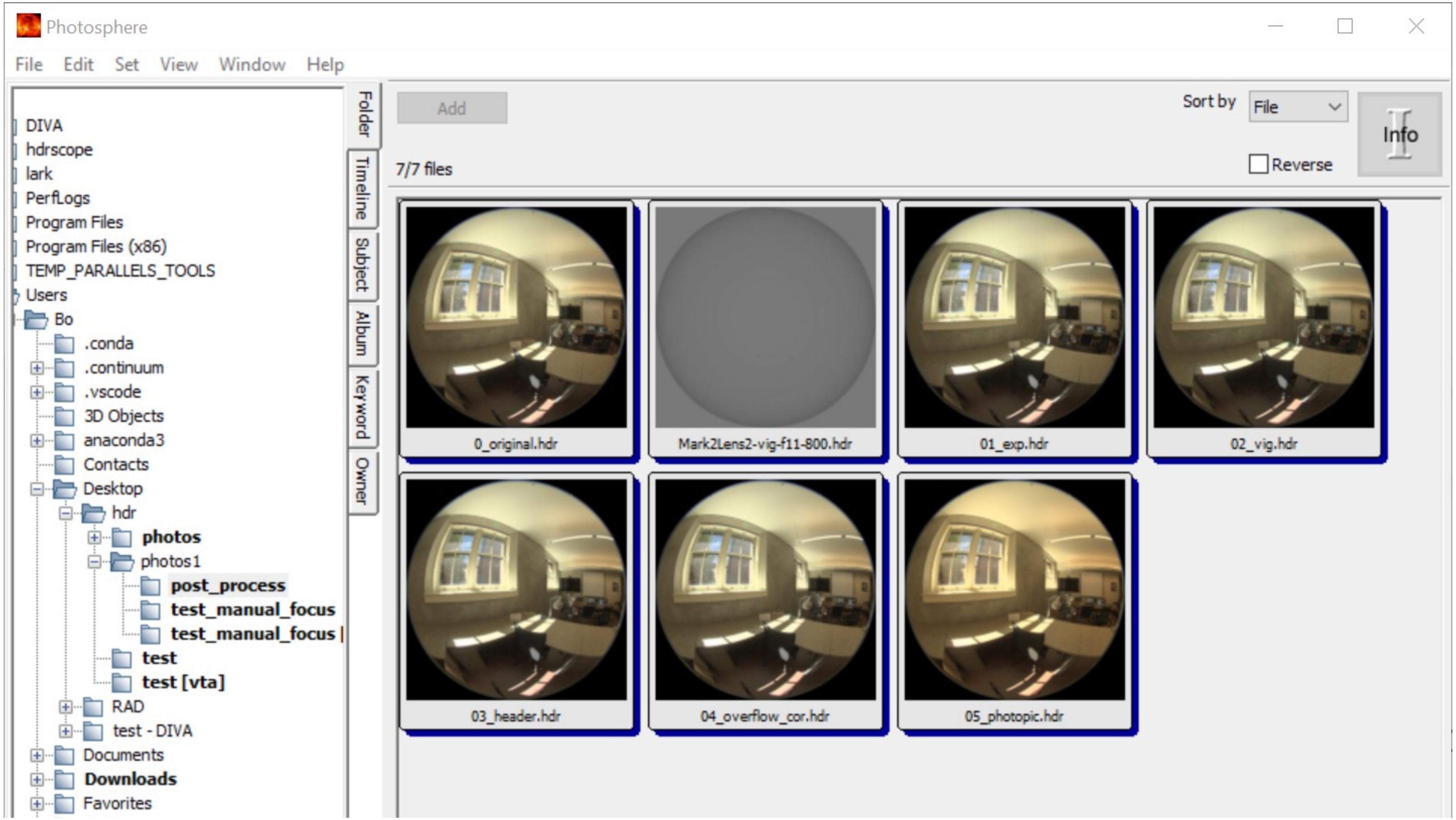
Double click:

b06_Colorcalib.bat

b06_Colorcalib.bat

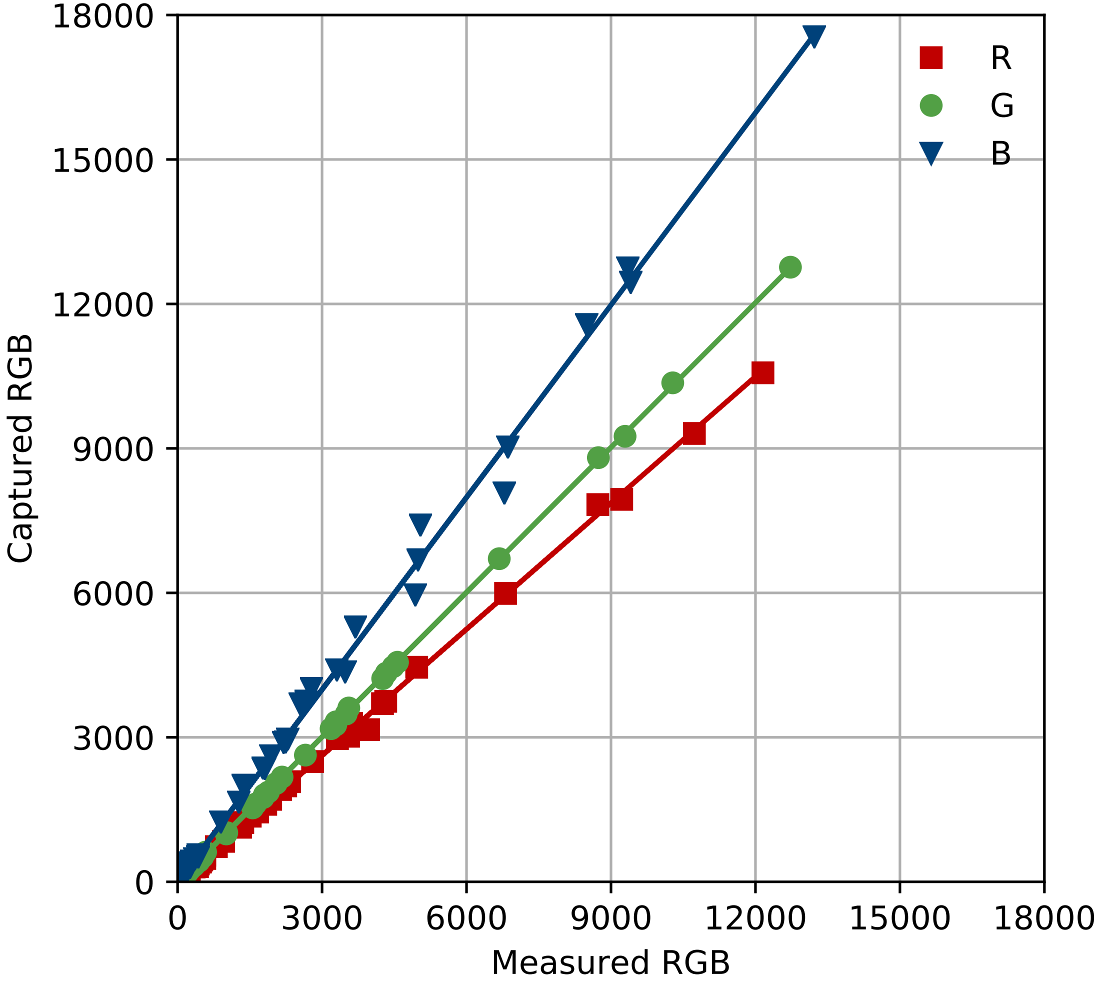
contains above radiance command to create HDR file that is color calibrated final image for photopic vision

8. Color Calibration – Scene Based



8. Color Calibration – Camera Based

CAMERA SPECIFIC



original img data

R = 0.8743 x
R^2 = 0.99721

G = 1.0022 x
R^2 = 0.99995

B = 1.3308 x
R^2 = 0.99922

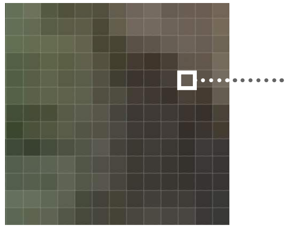
Correction Coefficient

calibrated img data

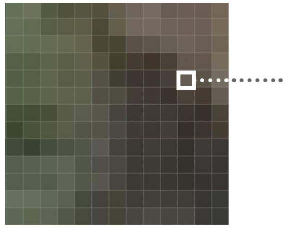
R = 1 x
R_{cal} = 1.1438 * R

G = 1 x
G_{cal} = 0.9978 * G

B = 1 x
B_{cal} = 0.7514 * B



R = 100
G = 91
B = 83



R = 114
G = 91
B = 62

8. Color Calibration – Scene Based

9. Calculate Melanopic Luminance

```
pcomb -e "ro=ri(1) *0.0013 ;go=gi(1) * 0.3812;bo=bi(1) * 0.6175" 05_image_photopic.hdr > temp.hdr

pcomb -e "ro=ri(1)+ gi(1) + bi(1);go=ri(1) + gi(1) + bi(1);bo=ri(1) + gi(1) + bi(1)" temp.hdr > 06_eml.hdr

del temp*.*
```

Double click:

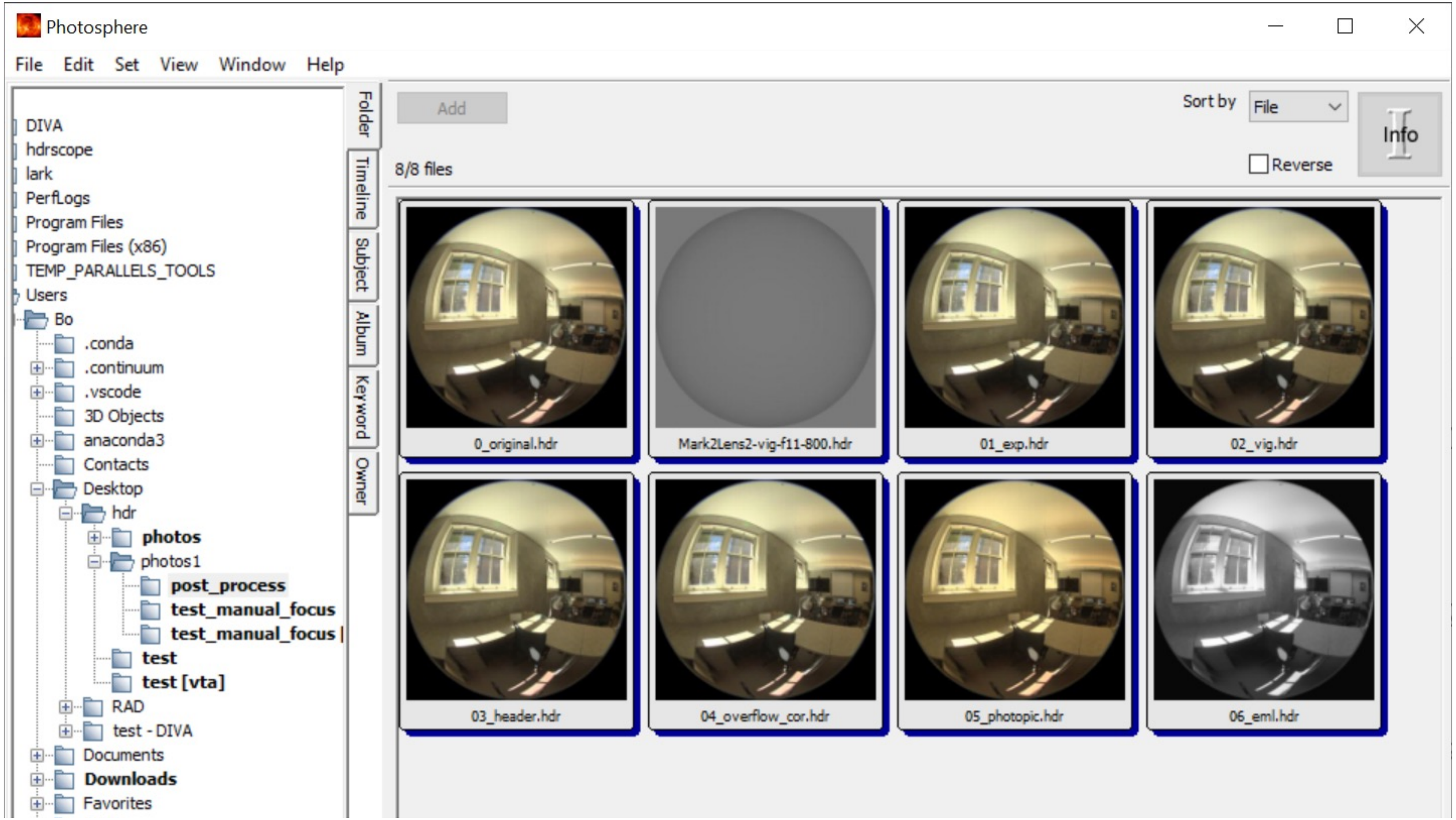
b07_EMcd2.bat

b07_EMcd2.bat

Creates .hdr file to calculate Lucas et al. Melanopic Lux based on adjusted RGB's from Canon EOS5.

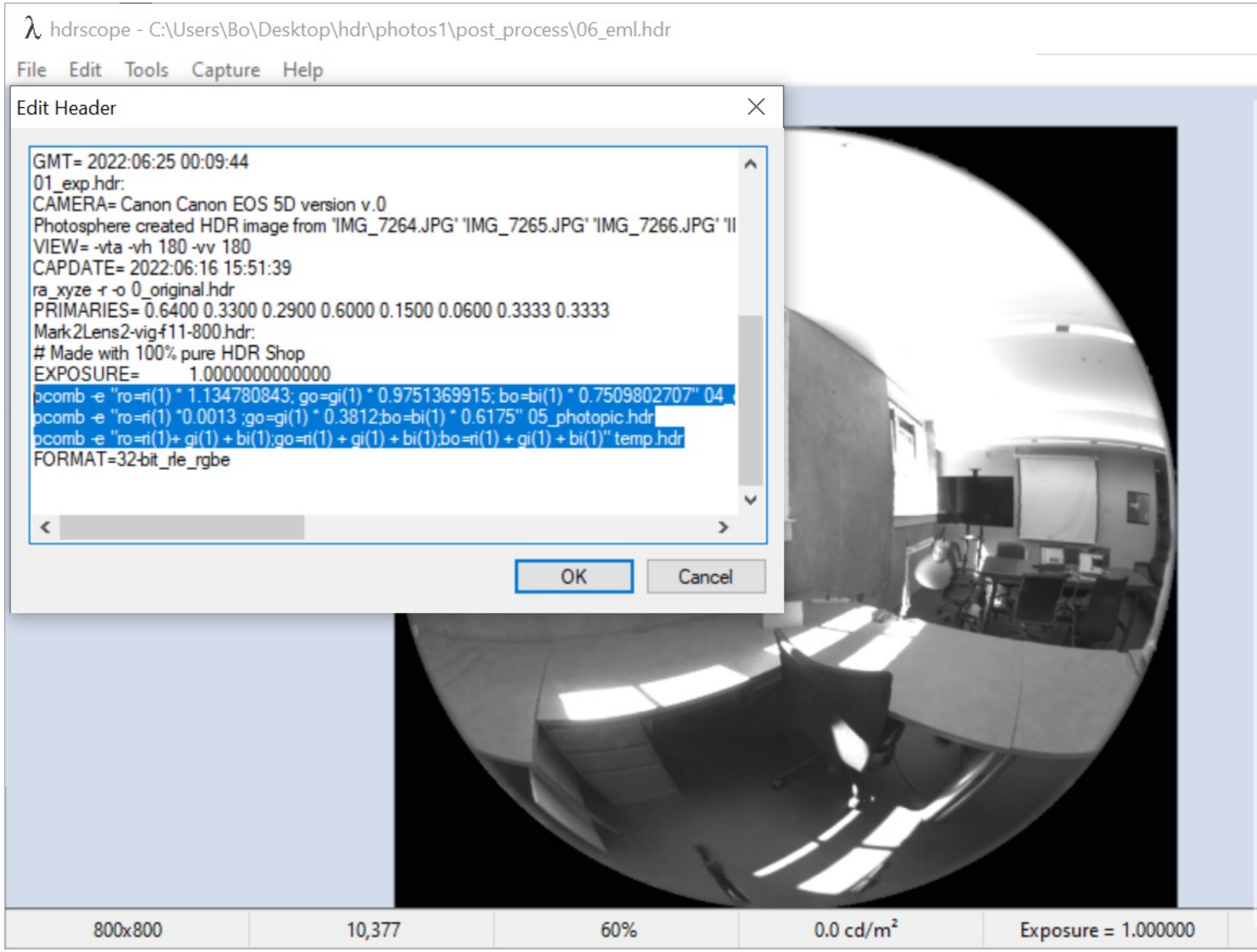
Use falsecolor to show the results.

9. Calculate Melanopic Luminance



9. Calculate Melanopic Luminance

10. Clean Header (to calculate Melanopic Illuminance)



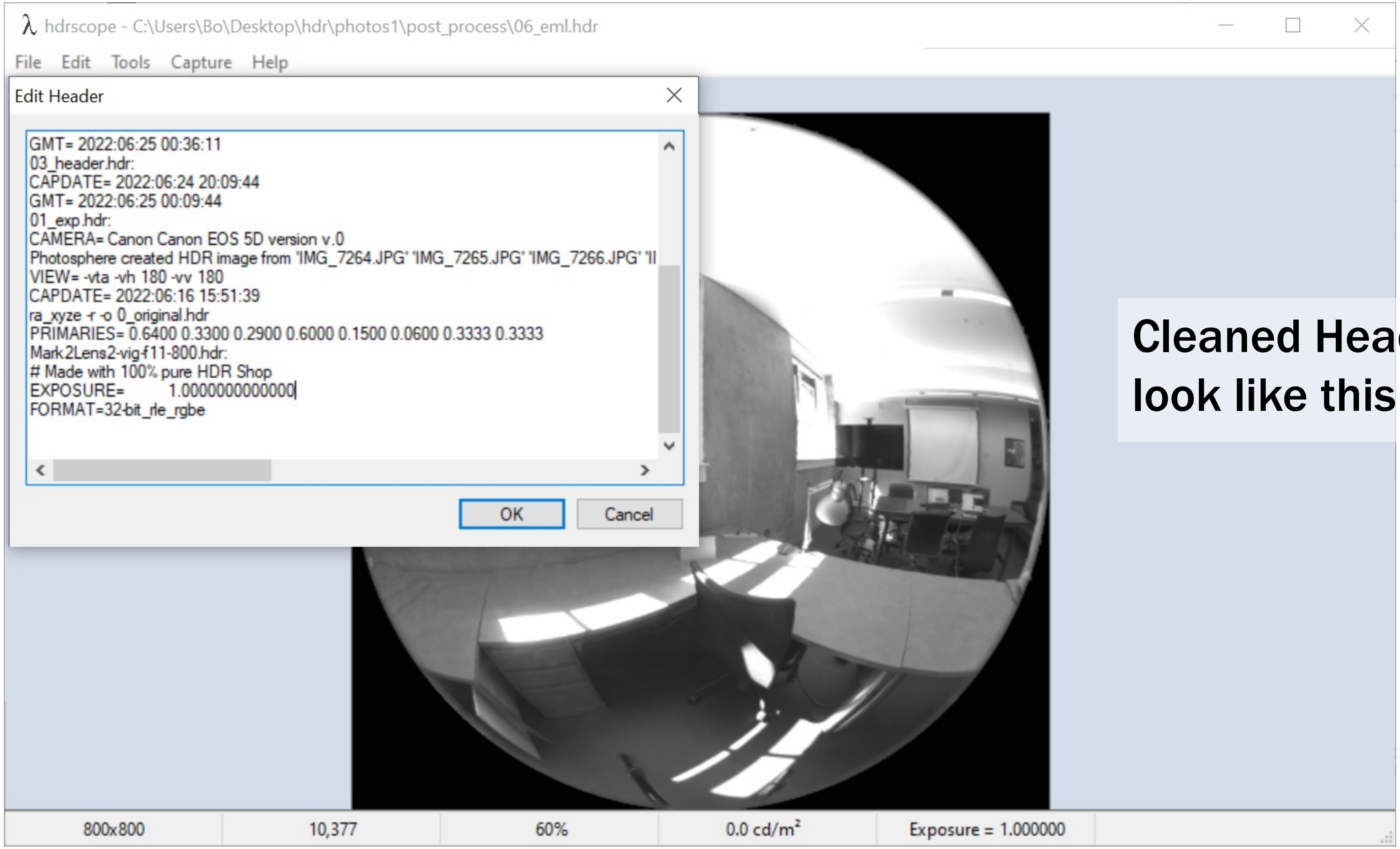
Remove pcomb line

pcomb -e "ro=ri(1) * 1.134780843; go=gi(1) * 0.9751369915; bo=bi(1) * 0.7509802707" 04_overflow_cor.hdr

pcomb -e "ro=ri(1) *0.0013 ;go=gi(1) * 0.3812;bo=bi(1) * 0.6175" 05_photopic.hdr

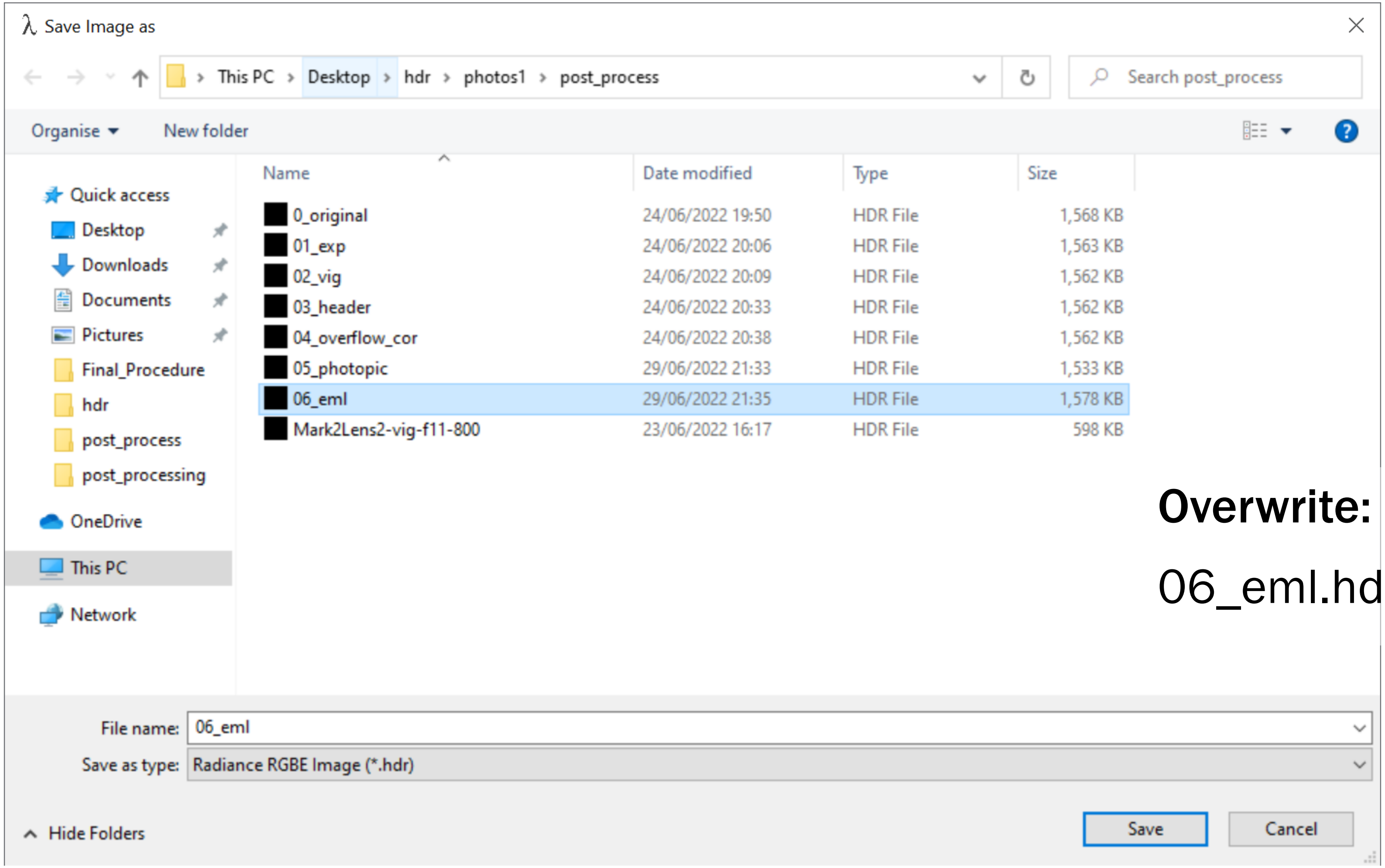
pcomb -e "ro=ri(1)+ gi(1) + bi(1);go=ri(1) + gi(1) + bi(1);bo=ri(1) + gi(1) + bi(1)" temp.hdr

10. Clean Header (to calculate Melanopic Illuminance)



Cleaned Header should look like this

10. Clean Header (to calculate Melanopic Luminance)



Overwrite:

06_eml.hdr

10. Clean Header (to calculate Melanopic Luminance)

11. Calculate Melanopic Illuminance

```
pcomb -e "lo=Z*Sang*cosCos;Z=(179*(ri(1)*0.0013 + gi(1)*0.3812 +
bi(1)*0.6175));Sang=S(1);cosCos=Dy(1);" -o 06_eml.hdr |pvalue -d -b -h -H |
total > EML.txt
```

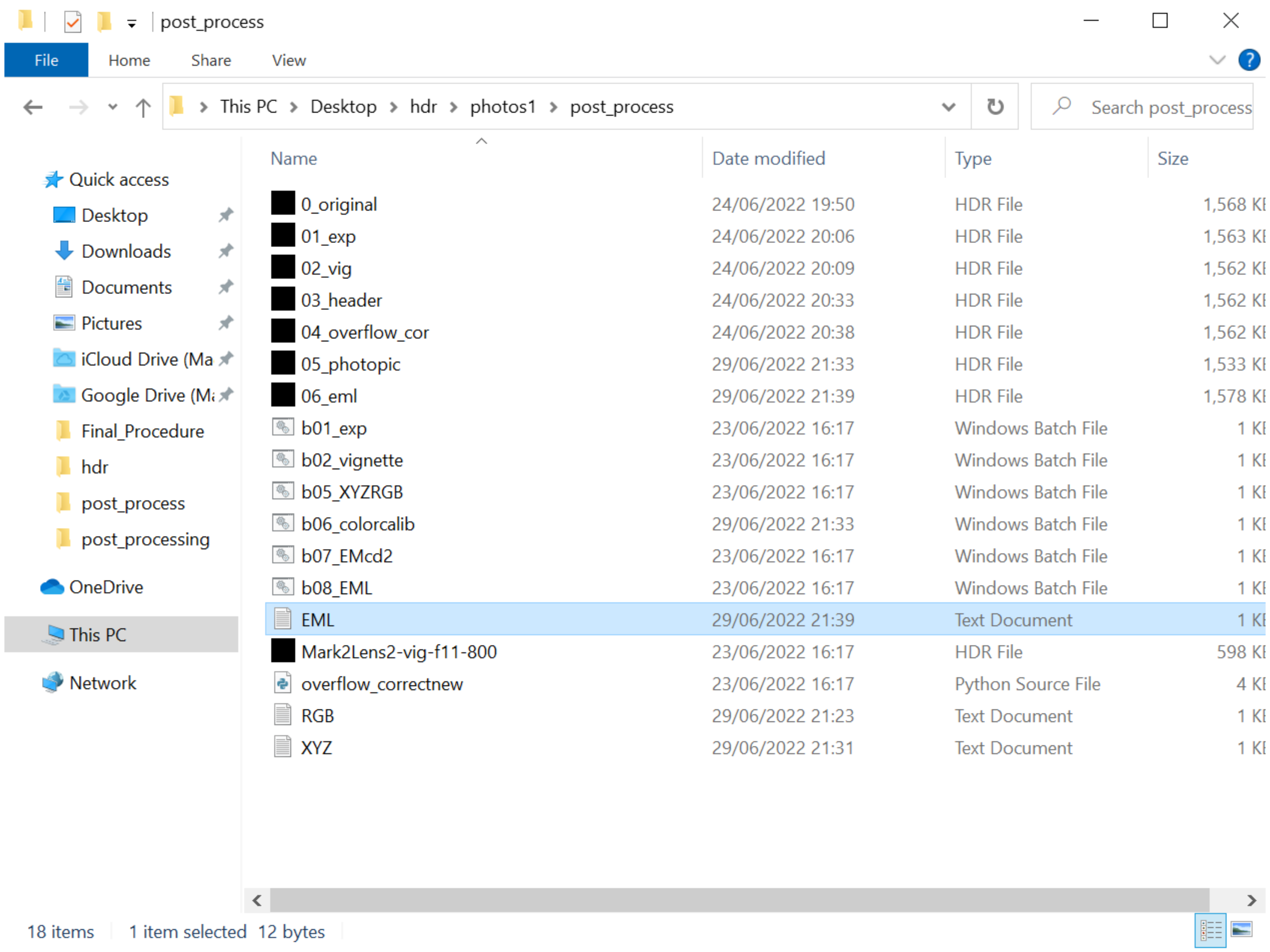
Double click:

b08_EML.bat

B08_EML.bat

Creates .txt file that shows illuminance values based on melanopic curve.

11. Calculate Melanopic Illuminance



This will create:

EML.txt

11. Calculate Melanopic Illuminance

	A	B	C	D	E	F	G
1		Measurec	Image				Measured with spectrophotometer or colorimeter
2	X	1272.85	1247.97				Derived from image, stored in XYZ.text from b06_XYZRGB.bat
3	Y	1339.63	1339.63				
4	Z	871.63	1098.45				
5							
6			Calc	Image	**Correction coefficient**		Calculated in excel, XYZ to RGB transformation from measured data
7	R	1630.89	1437.18	1437.44869	**1.134780843**		Calculated in excel, XYZ to RGB transformation from image XYZ
8	G	1315.65	1349.19	1348.917	**0.9751369915**		Derived from image, stored in RGB.txt from b06_XYZRGB.bat
9	B	719.01	957.43	957.32	**0.7509802707**		**These are the computed color correction values that are passed to b07_colorcalib.bat**
10							
11			Calc and image RGBs are done for verification				
12			They should be similar				
13							
14	EML	947.6348					EML calculated from spectraphotometric data
15							

EML - Notepad

File Edit Format View Help

947.284925

Double check:

predicted EML (based on measured data)

vs.

Calculated EML (based on captured data)

11. Calculate Melanopic Illuminance