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High Dynamic Range Imaging & Glare Analysis

III. GLARE ANALYSIS WITH EVALGLARE

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HDR Imaging and Glare Analysis

This document is one out of a series of three tutorials that introduce the reader to high dynamic range (HDR) imaging, photography and how to analyze an HDR photo or simulation for potential glare.

The tutorials can be downloaded from the G(SD)2 website.

First tutorial that introduces some basic terminology related to high dynamic range imaging.

Second tutorial that shows how to generate a calibrated HDR image using a digital camera, the Photosphere program written by Greg Ward and a luminance meter.
Note: A MAC is needed for this tutorial!

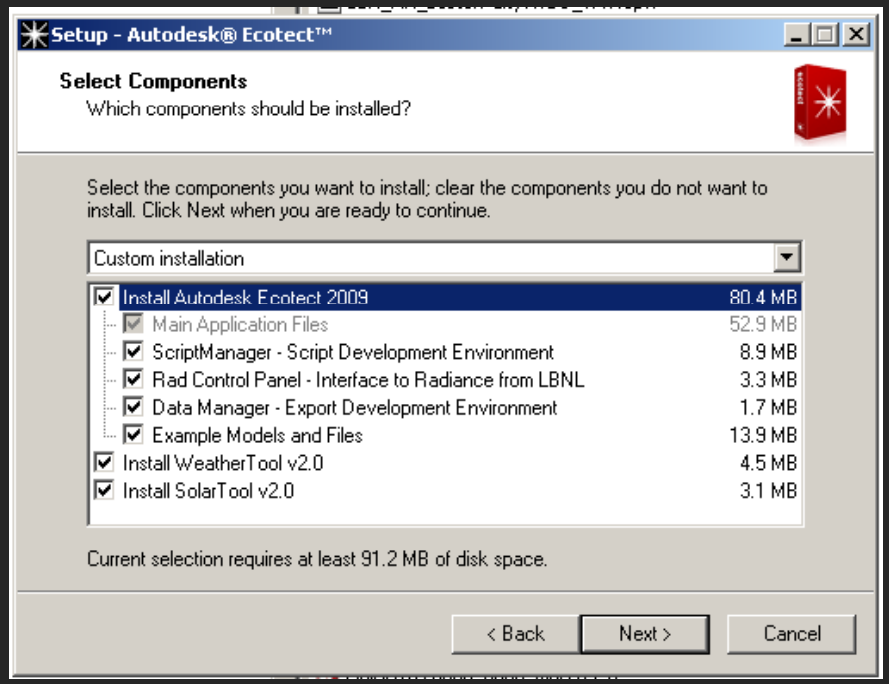
Third tutorial that shows how to analyze an HDR image (photo or simulation) using the ‘evalglare’ program written by Jan Wienold as well as the Radiance Image Viewer from Autodesk Ecotect written by Andrew Marsh.
Note: A PC is needed for this tutorial!

In This Tutorial

* *Note: You will need a PC to follow this tutorial.*
- Download + Install Evalglare
- Define working area and glare source criteria
- Verify glare sources via a check file
- Calculate the Daylight Probability Number
- Interpret results
- More available tools.

Install Autodesk-Ecotect Image Viewer

The free trial version of Autodesk-Ecotect comes with a free image viewer for HDR images. Go to http://usa.autodesk.com >> Search “Downloads Ecotect”. While you are installing Ecotect make sure that you are also installing the Radiance Control Panel (see below). Note that this is not a default option.



Install Daysim 3.0 (Evalglare)

To use Evalglare download Daysim 3.0 or higher at www.daysim.com.

Once Evalglare has been installed, you will have ot run the program form the DOS command line ot carry out a glare analysis of an HDR image. The process is explained in the following.

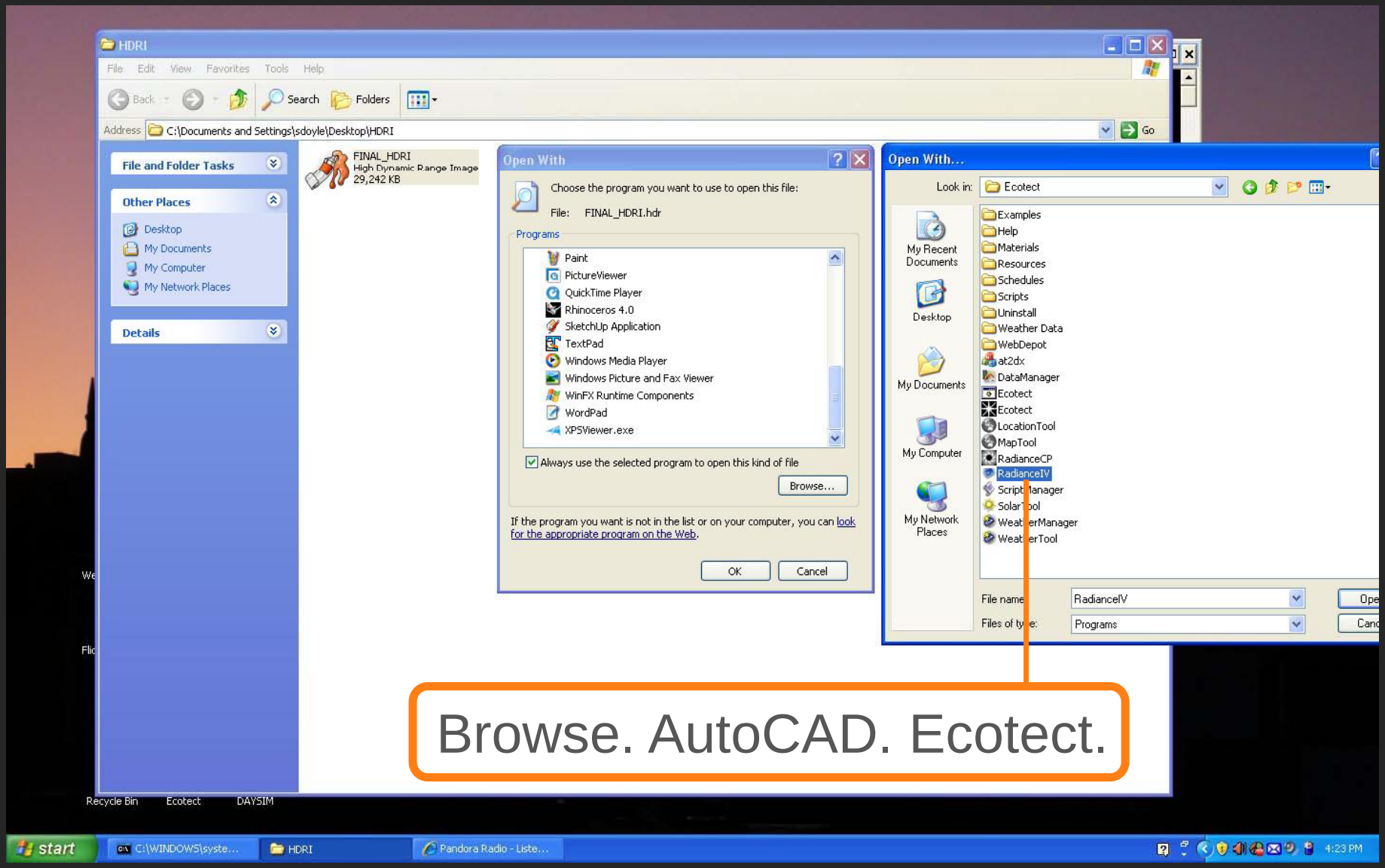
Select an HDRI to Analyze

Save the .hdr and/or .pic files to be analyzed for glare in a folder on your Desktop named HDRI.

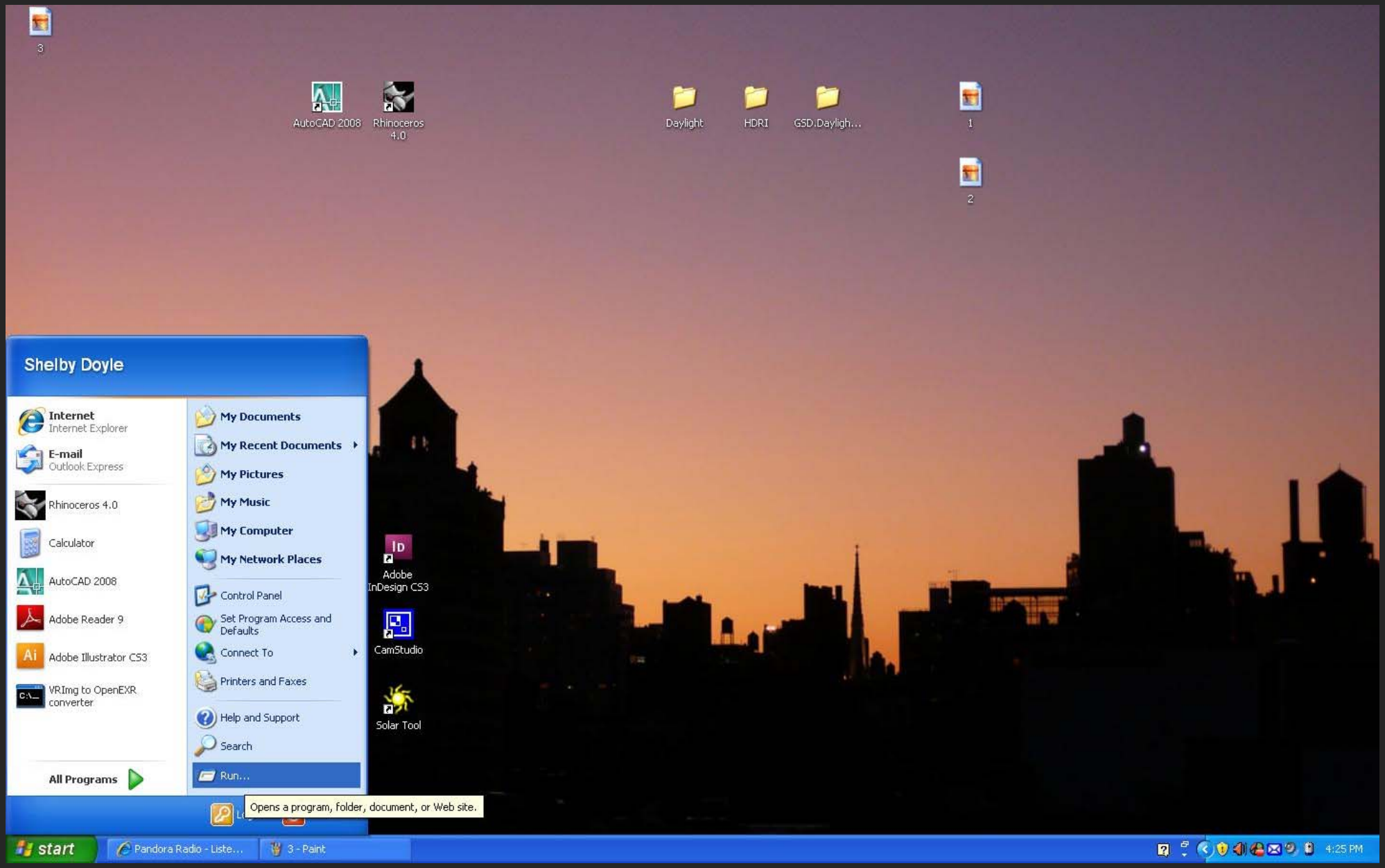
.hdr = .pic

Radiance images produced in computer simulations and HDR photos are the same file format and can be used interchangeably for glare analysis!

Set Radiance IV to open .pic and .hdr files. Now these files will open in Radiance Image Viewer when double clicked.

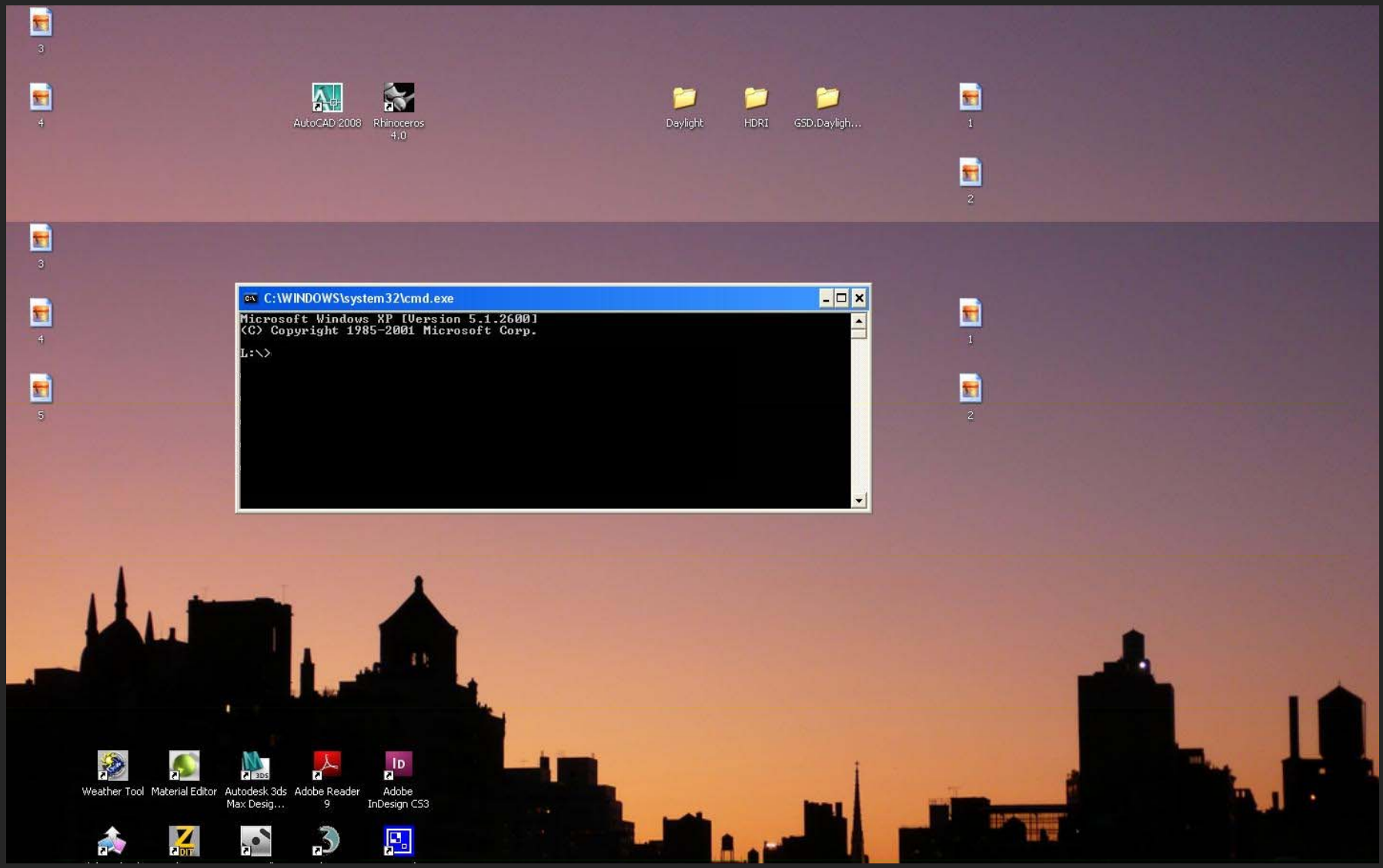


Click Start and then Run.



Type cmd and then click OK.

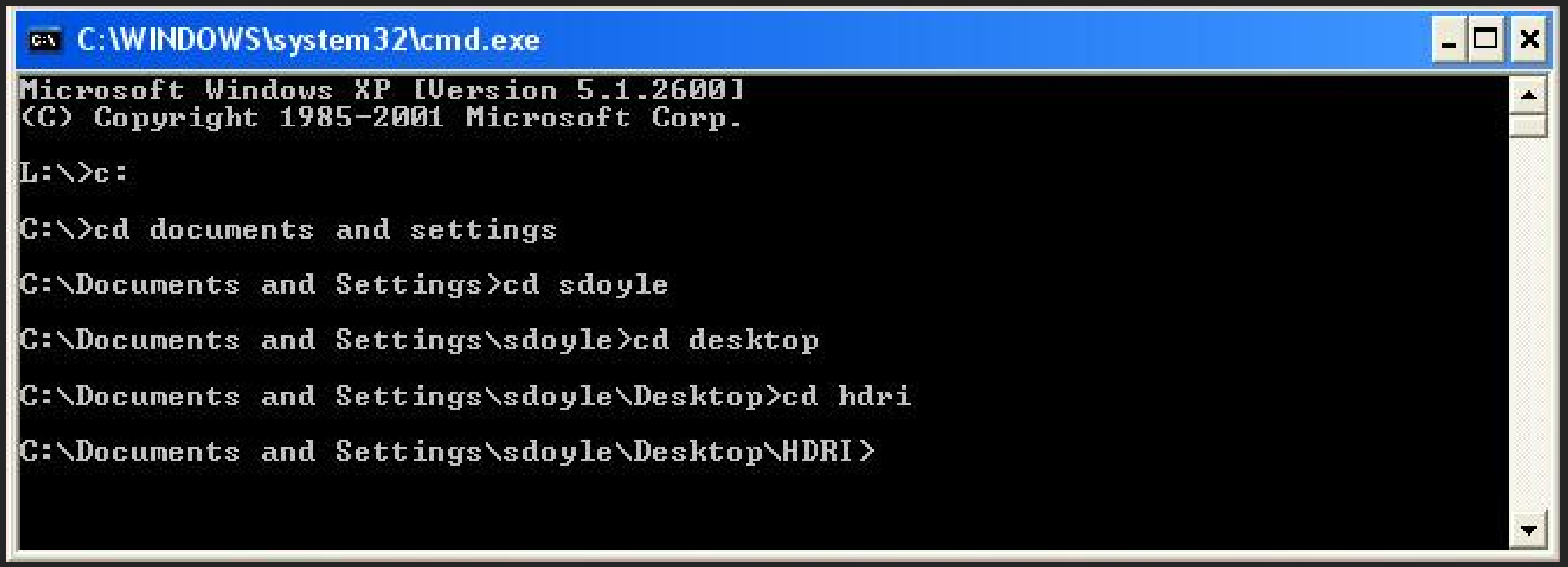
A DOS Window will appear on your screen.



* For a full list of MS DOS commands:
http://www.computerhope.com/msdos.htm

Step into the HDRI Folder on your Desktop using the following commands. Press Enter after each command.

c: change into C Drive
cd change directory



* Right click on the HDRI Folder and click Properties to find the full name and location of the file you are using.

Evalglare commands are included in the documents downloaded with the Evalglare software installation.

usage:
evalglare [-s] [-y] [-Y value] [-b factor] [-c checkfile] [-t xpos ypos angle] [-T xpos ypos angle] [-d]
[-r angle] [–i Ev] [–I Ev yfill_max y_fill_min] [-v] picfile

Options:

-s	enables smoothing function (default: disabled)
-d	enables detailed output (default: disabled)
-y	enables peak extraction (default: disabled)
-Y value	enables peak extraction with value as threshold for extracted peaks (default: disabled)
-c fname	writes a checkfile in the RADIANCE picture format
-t xpos ypos angle	definition of task position in x and y coordinates, and its opening angle in radiant
-T xpos ypos angle	same as -t, except that the task area is colored bluish in the checkfile
-b factor	Threshold factor, if factor >500, it is used as constant threshold in cd/m², regardless if a task position is given or not if factor is <= 500 and a task position is given, this factor multiplied by the average task luminance will be used as threshold for detecting the glare sources if factor is <= 500 and no task position is given, this factor multiplied by the average luminance in the entire picture will be used as threshold for detecting the glare sources, default value=4.
-r angle	search radius (angle in radiant) between pixels, where evalglare tries to merge glare source pixels to the same glare source (default value: 0.2 radiant)
-i Ev	The vertical illuminance is measured externally. This value will be used for calculating the dgp.
-I Ev y_max y_min	The vertical illuminance is measured externally. This value will be used for calculating the dgp. Below y_min and above y_max, the picture is filled up by the last known value. This option should be used, when the provided picture is cut horizontally.
-v	show version of evalglare and exit

Check the dimensions of the image to be analyzed using the getinfo command. The image must be *smaller than 800 x 800 pixels* for the Evalglare software to be effective.

```
C:\Documents and Settings\sdoyle\Desktop\HDRI>getinfo -d FINAL_HDRI.hdr
FINAL_HDRI.hdr: -Y 2376 +X 4224
```

Change the size of the image using the pfilt command. Divide the x and y pixels by the *same factor* (in this case 5.5) to maintain the proportion of the photo.

```
C:\Documents and Settings\sdoyle\Desktop\HDRI>pfilt -x /5.5 -y /5.5 FINAL_HDRI.h
dr > FINAL_HDRI_small.hdr
```

FINAL_HDRI.hdr is the name of the original photo.
FINAL_HDRI_small.hdr is the new resized photo.

Check the dimensions of the new image using the getinfo command. Confirm that the image is *smaller than 800 x 800 pixels.*

```
C:\Documents and Settings\sdoyle\Desktop\HDRI>getinfo -d FINAL_HDRI_small.hdr
FINAL_HDRI_small.hdr: -Y 432 +X 768
```

Run Evalglare to establish the Daylight Glare Probability (DGP) of the image. In this case it is 18%.

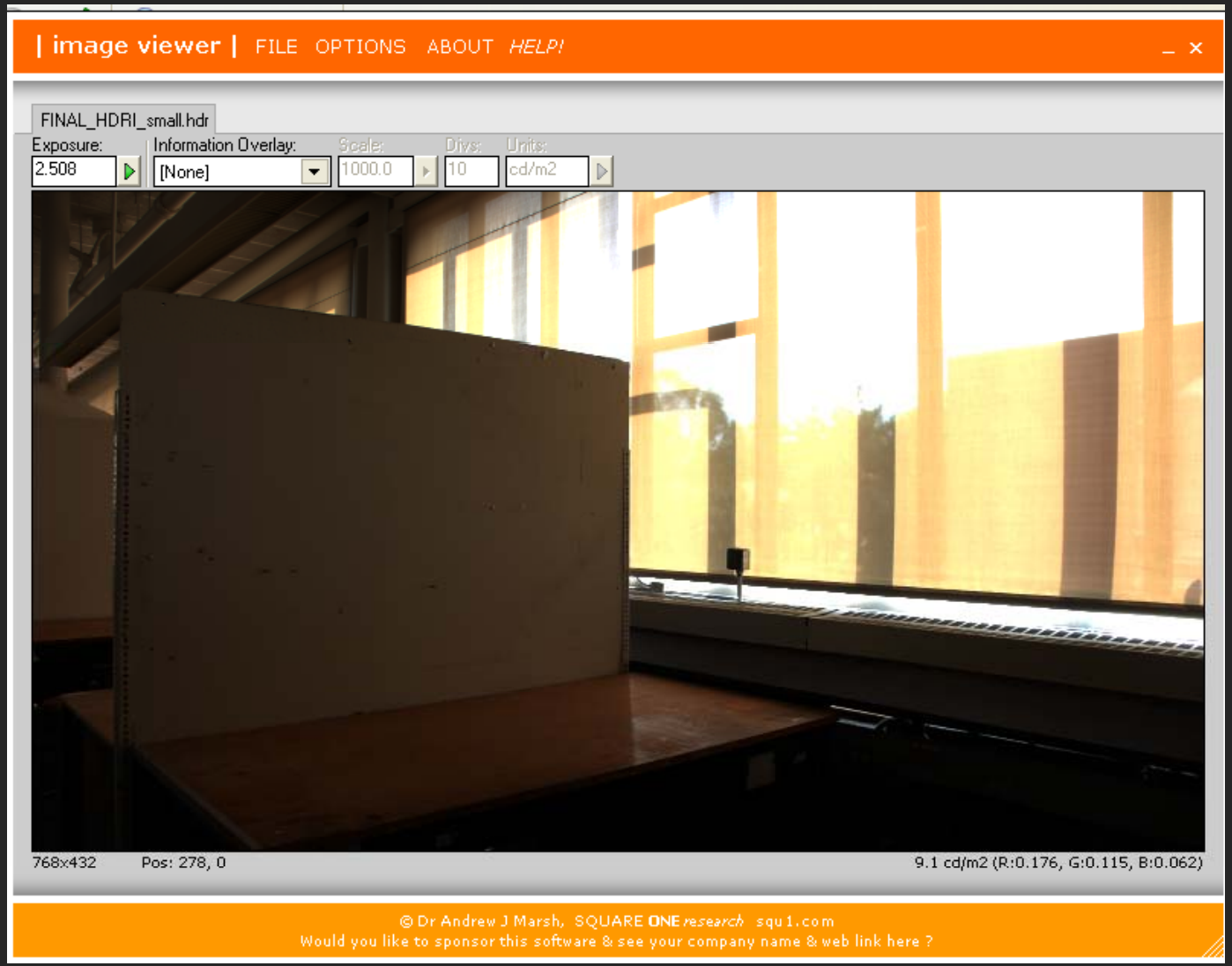
```
C:\Documents and Settings\sdoyle\Desktop\HDRI>evalglare FINAL_HDRI_small.hdr
dgp,dgi,ugr,vcp,cgi: 0.180821 9.478831 11.111439 95.458061 14.280996
```

18%

Daylight Glare Probability DGP

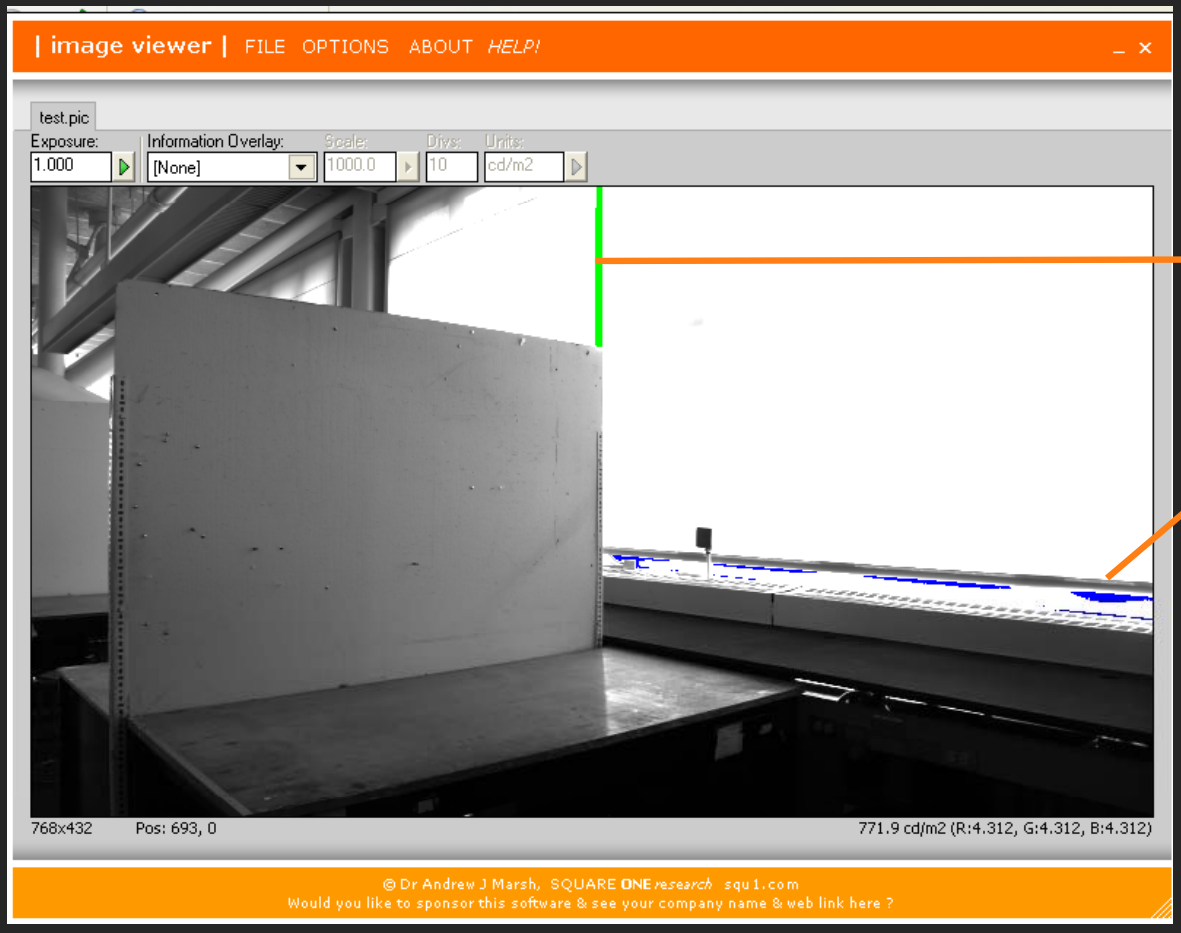
DGP	Daylight Glare Probability
DGI	Daylight Glare Index
UGR	Unified Glare Rating
VCP	Visual Comfort Probability
CGI	CIE Glare Index

Double clicking on FINAL_HDRI_small.hdr will open the image in the Radiance Image Viewer .



Make a check file of the FINAL_HDRI_small.hdr; a Radiance image will be saved in the same folder. The generated image will identify glare sources with color.

```
C:\Documents and Settings\sdoyle\Desktop\HDRI>evalglare -c test.pic FINAL_HDRI_small.hdr
```



High Glare

The areas which are green and blue are areas of high glare probability. In this case the gap in the blinds and the reflection off the metal air grates.

Make a check file which identifies the task area in blue and recalibrates the DGP in relation to the task area.

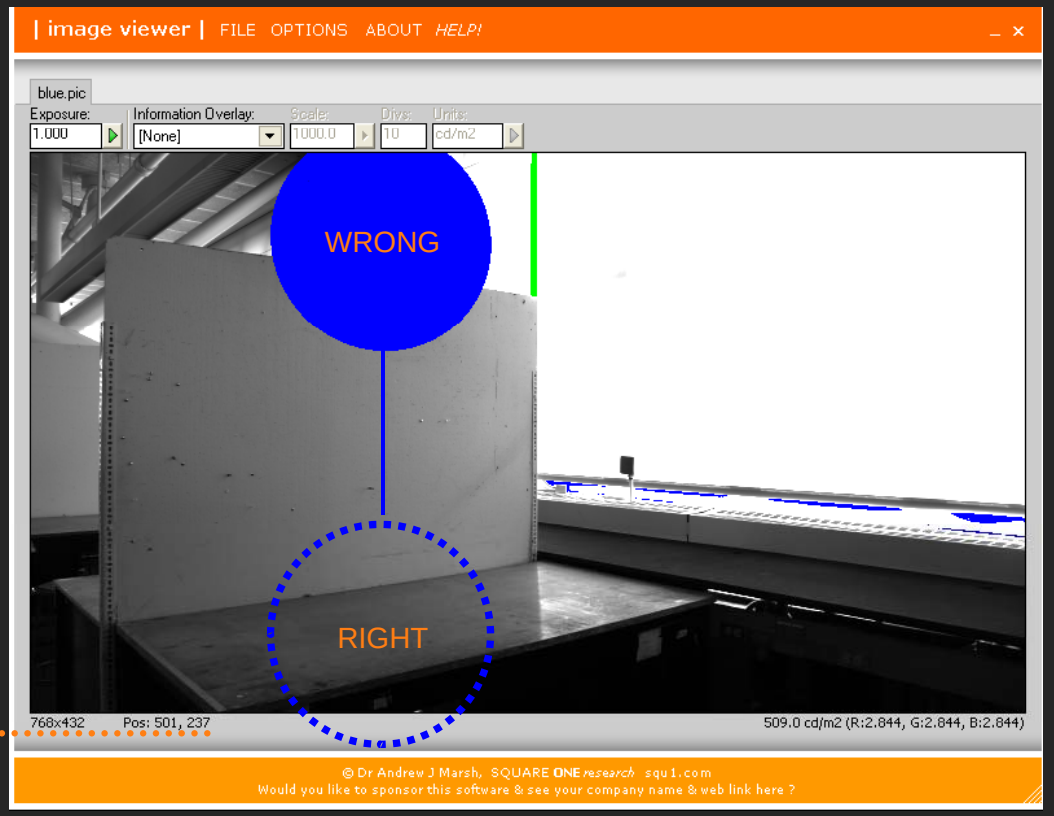
```
C:\Documents and Settings\sdoyle\Desktop\HDRI>evalglare -c blue.pic -T 272 362 .
26 FINAL_HDRI_small.hdr
dgp,dgi,ugr,vcp,cgi: 0.181148 9.590449 11.223382 95.410271 14.389360

C:\Documents and Settings\sdoyle\Desktop\HDRI>evalglare -c blue2.pic -T 272 70 .
26 FINAL_HDRI_small.hdr
_
```

-T XVAL YVAL OPENING VAL

XVALUE LOCATION OF TASK AREA
YVALUE LOCATION OF TASK AREA
OPENING VALUE IN RADIANS
1 DEGREE = 0.017 RADIANS

0,0 EVALGLARE



CLICK ON A SPOT IN RADIANCE TO IDENTIFY THE POSITION OF THE TASK AREA.

THIS NUMBER MUST BE SUBTRACTED FROM THE Y VALUE OF THE IMAGE SIZE TO BE CORRECT IN EVALGLARE.

EVALGLARE COUNTS FROM THE TOP LEFT NOT THE BOTTOM LEFT.

432 PIXELS

0,0 RADIANCE

768 PIXELS

Switch to a MAC to make an HDRI Photo.

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II. HDR PHOTOGRAPHY USING PHOTOSPHERE

http://www.gsd.harvard.edu/research/gsdsquare/tutorials.html

For HDRI Background Information.

High Dynamic Range Imaging

I. DEFINITIONS

http://www.gsd.harvard.edu/research/gsdsquare/tutorials.html