

Astrophotography & Monochrome Camera Features

**Or in other words
4,096 Shades of Grey**

Image Scale and Resolution

Rayleigh Limit = $116/D$ mm or $4.56/D$ inch

Dawes Limit = $138/D$ mm or $5.45/D$ inch

This is as good
as it gets!!
Perfect Conditions!!

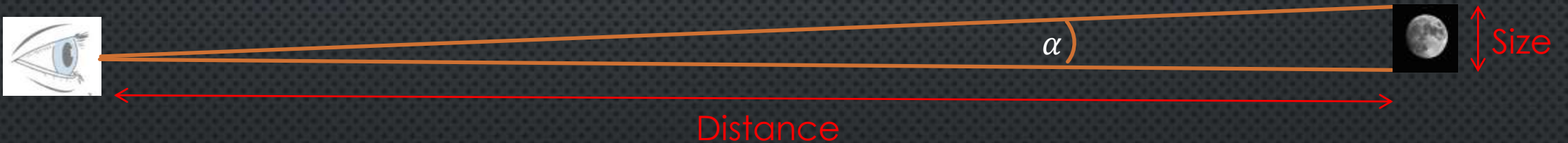


Example:

Easy Approximation $\sim 5/D$ inch

Human Eye Pupil Diameter = 4mm IS = $116/4 = 29$ Arcseconds = 0.000,1677,5 radians

Hubble Telescope Aperture = 2400mm IS = $116/2,400 = 0.0483$ Arcseconds = 0.000,000,28 radians



$$\sin \alpha = \tan \alpha = \alpha \quad \text{i.e. Size} = \alpha * \text{Distance}$$

$\alpha = \text{Radians}$

Human Eye looking at Moon = 70 kilometers \sim 45 miles

Hubble Telescope looking at Moon = 112 meters

Image Scale = 206 x Pixel Size / Telescope Focal Length



ZWO ASI 1600 MM Pro
Pixel Size = 3.8 microns
Width = 4,656 Pixels
Height = 3,520 Pixels
Sensor = 16MPixels

Telescope Focal Lengths

SW Esprit 150mm = 1,050mm
Edge 11" SCT = 2,800 mm
11" Hyper Star = 560 mm



**This is as good
as the camera
Can perform
Perfect Conditions!!**

Telescope / Camera Image Scale

SW Esprit 150mm = 0.75 Arcseconds / pixel < Dawes Limit = 0.92 Arcseconds ~ **okay**
Edge 11" SCT = 0.28 Arcseconds / pixel < Dawes Limit = 0.49 Arcseconds ~ **Poor**
11" Hyper Star = 1.40 Arcseconds / pixel > Dawes Limit = 0.49 Arcseconds ~ **Good**



Monochrome Advantages

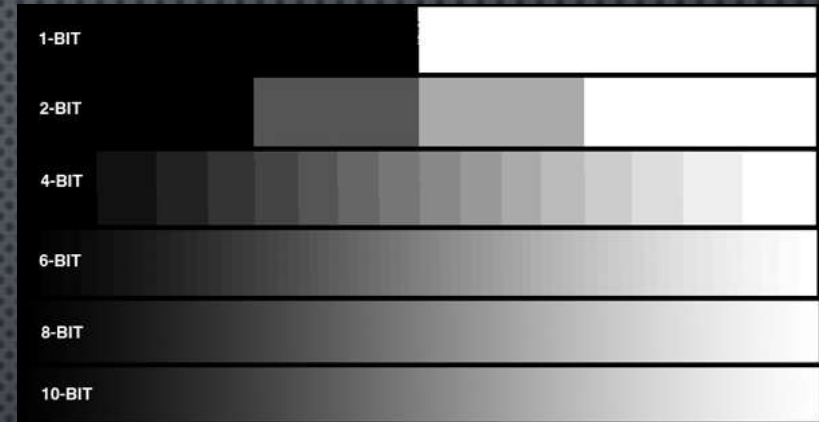


1) Higher Resolution since all pixel are recording image luminosity no Bayer Filter

$$8 \text{ bit} = 2^8 = 256$$

$$12 \text{ bit} = 2^{12} = 4,096$$

$$16 \text{ bit} = 2^{16} = 65,536$$



2) Easier to use – No color calibration

3) Can use for Solar Imaging – Sun is all white no color

4) Can use with Filters to produce color and Ha filters to block unwanted light

5) Most stuff in space is black and white

6) Shorter Imaging Time

Monochrome Disadvantages



1) Cameras usually cost a bit more than color cameras

ZWO294 MM = \$1,498 vs ZWO294MC = \$999

ZWO2600MM = \$2,480 vs ZWO2600MC = \$1,999

2) Requires purchasing filters if you want color or narrowband - \$\$\$

3) Take longer time to produce a color image if you want one, 4 X to get LRGB

a - Lights

b - Bias

c - Flats



Required for each filter if you are really ambitious!

4) Requires processing software to produce a color image.

5) Filter Wheels are too large to work on HyperStar Lens















