

INQUIRING MINDS NEED TO KNOW

...OR “IGNORANCE IS BLISS”

Archetype
Digital Imaging Alliance



MAKING GOOD COLOR PROFILES

Camera Calibration & Profiling

Little Things Matter...

**Minor improvements can contribute
toward our quest for perfection**

Camera Calibration & Profiling

What's the problem?...

The scanning back is an **extremely accurate & precise digital capture device** and the **owners are a higher echelon of image makers** who demand quality and perfection beyond the expectations of the majority.

However...most equipment and software are designed to meet the needs of the masses.

Camera Calibration & Profiling

What is the profile intended to do?...

- ◆ Each digital device will display color differently.
- ◆ The profile is a description of how each of these devices will reproduce color.

The camera profile describes the way color is reproduced by a specific combination of spectral capture conditions.

Camera Calibration & Profiling

**But...a bad profile can be worse
than none at all!**

If struggling...use Adobe RGB 1998 in ViewFinder
and as the working color space in Photoshop and make
your selective color edits as needed.

Camera Calibration & Profiling

Robin's Rules:

**You cannot cheat the
Laws of Physics!**

Camera Calibration & Profiling

Bad Information...

Early recommendations to manipulate grey values
to “match” chart target values.

WRONG!

Camera Calibration & Profiling

The practical application of profiles...

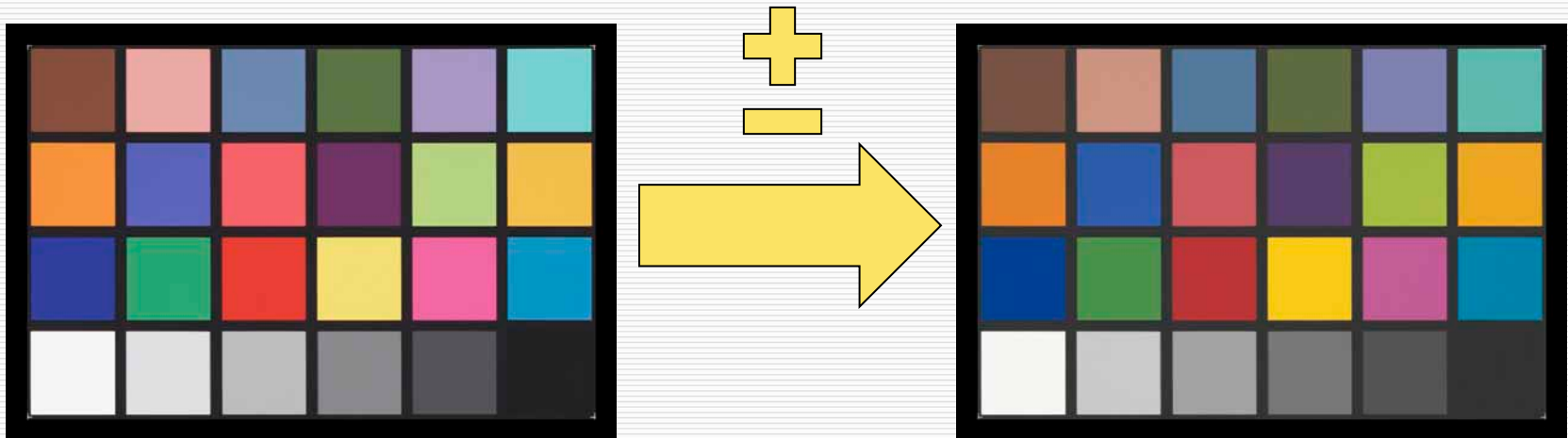
Our objective is to minimize the variables to get repeatable & satisfactory reproduction of the original.



Camera Calibration & Profiling

The practical application of profiles...

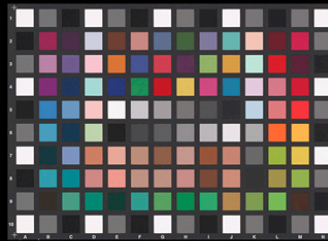
Our objective is to minimize the variables to get repeatable & satisfactory reproduction of the original.



Camera Calibration & Profiling

Our Objective...

To prevent any capture errors or variables from contaminating profile results and to get MOST scans as accurate as possible to minimize labor and proofing runs.



Repro 2.2 Curve Profile

RESULTS:
Improvements in Accuracy
of Color and Tonality



Repro 2.2 Curve Profile

RESULTS:
Better Contrast
Improved Saturation



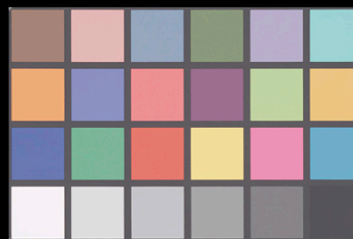
ORIGINAL SCAN

NO PROFILE APPLIED



Bent 6 Curve Profile

RESULTS:
Lower Contrast
Decreased Saturation
Slightly Lighter



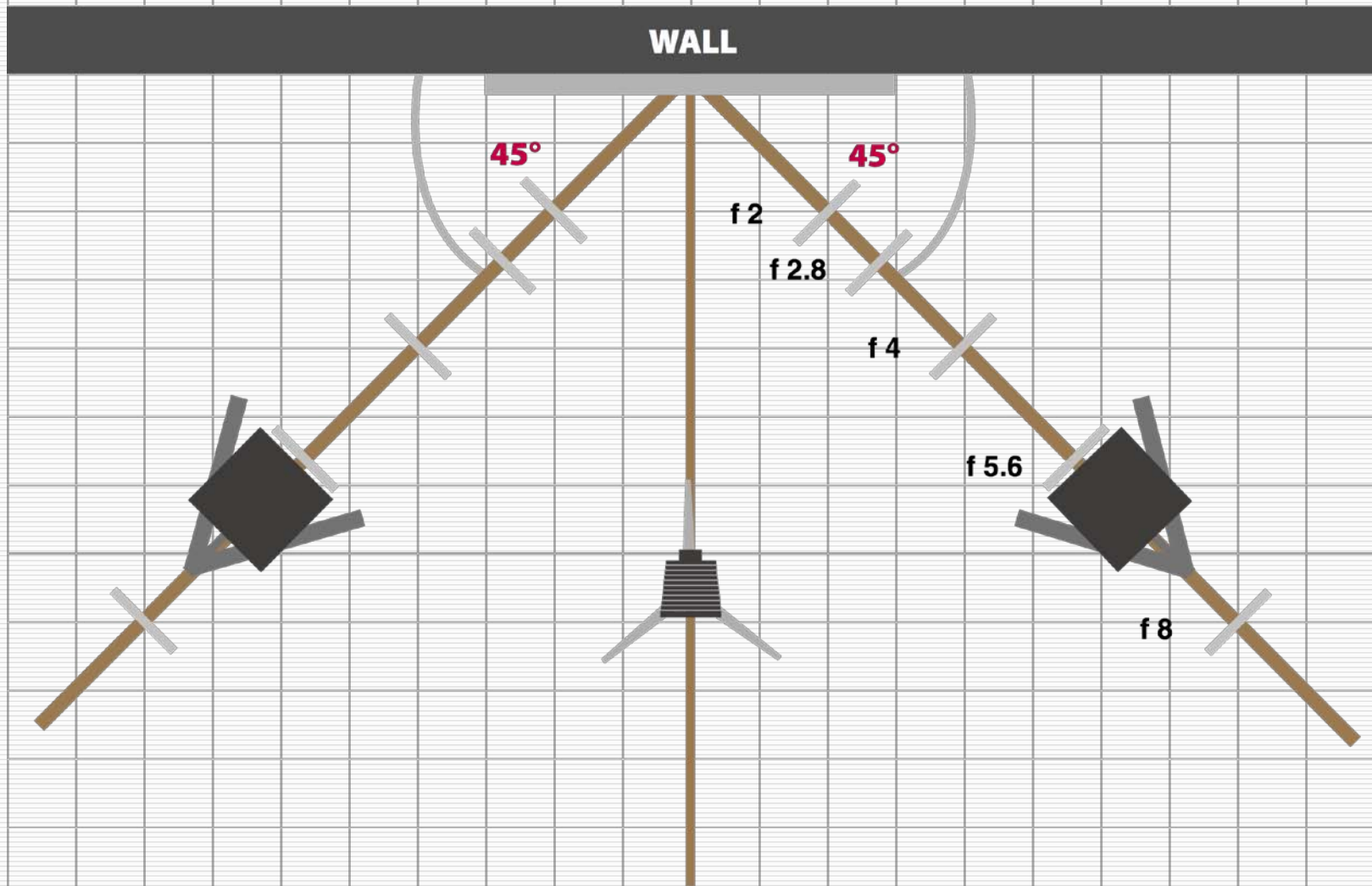
Flat 8 Curve Profile

RESULTS:
Higher Contrast
Increased Saturation
Somewhat Darker

Camera Calibration & Profiling

Known Problems & Issues of Confusion

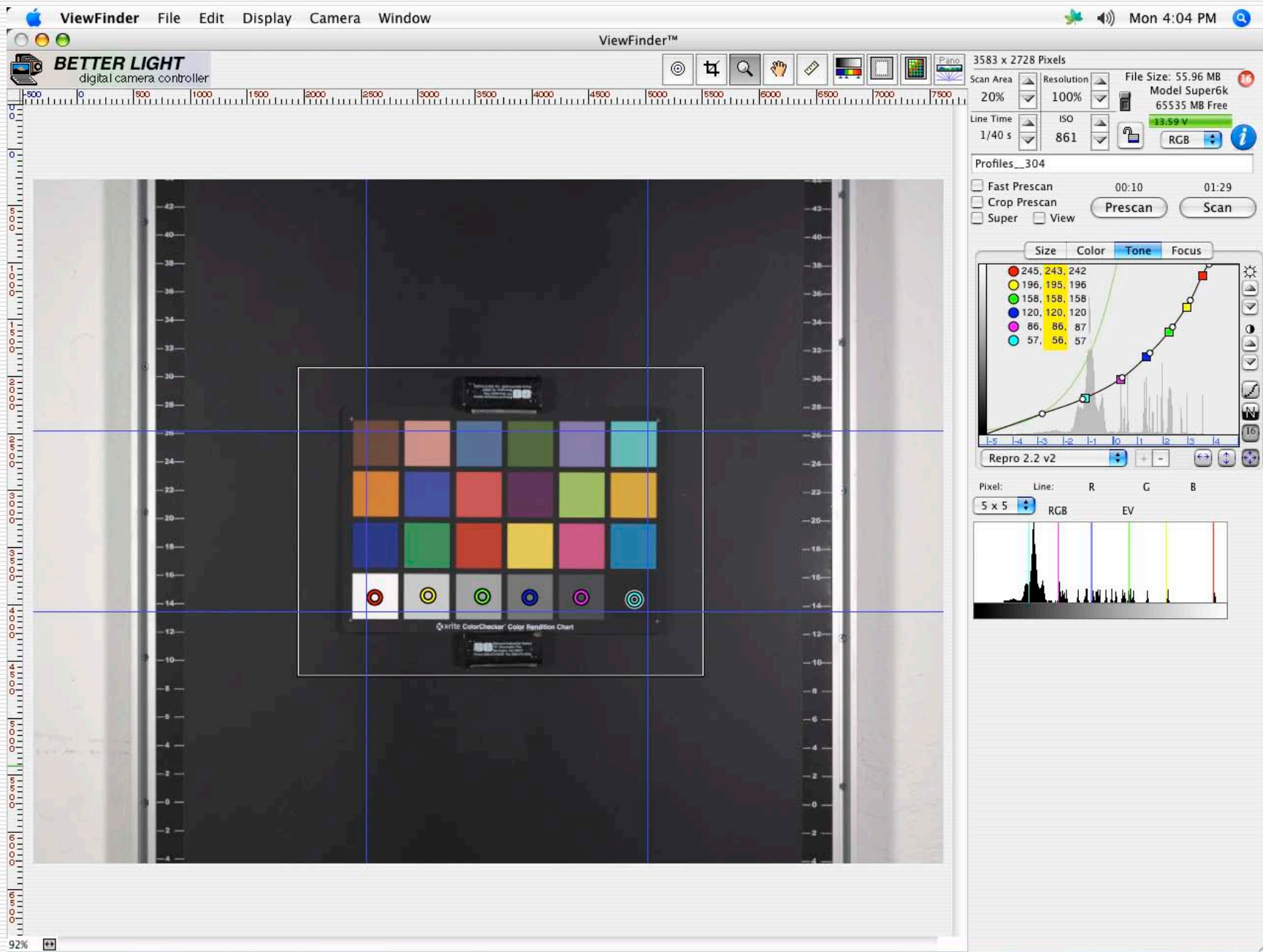
- ◆ Light Falloff – Lens and Lighting
- ◆ Variables in Contrast in Chart Capture
- ◆ Exposure Errors
- ◆ Veiling Glare
- ◆ Chart Selection
- ◆ Misunderstanding Profile Software
- ◆ Isolation of Profile and Tone Curve
- ◆ Lack of Consistency and Attention to Detail
- ◆ Quality Instead of Quantity...One Good Profile!



Put Lines on floor at **90°** and **45°** to have reference angle for light and camera positions and marks at **1 f-stop increments**.



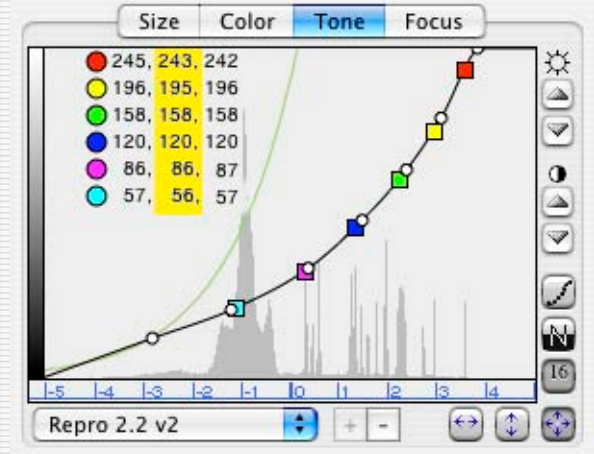
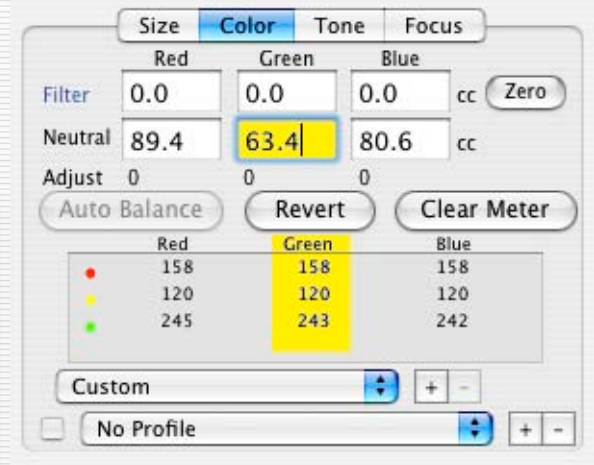
- Setup height of lights and lens to center of easel
- Position camera for largest piece of the session
- Set lens to working aperture and use Repro 2.2 curve



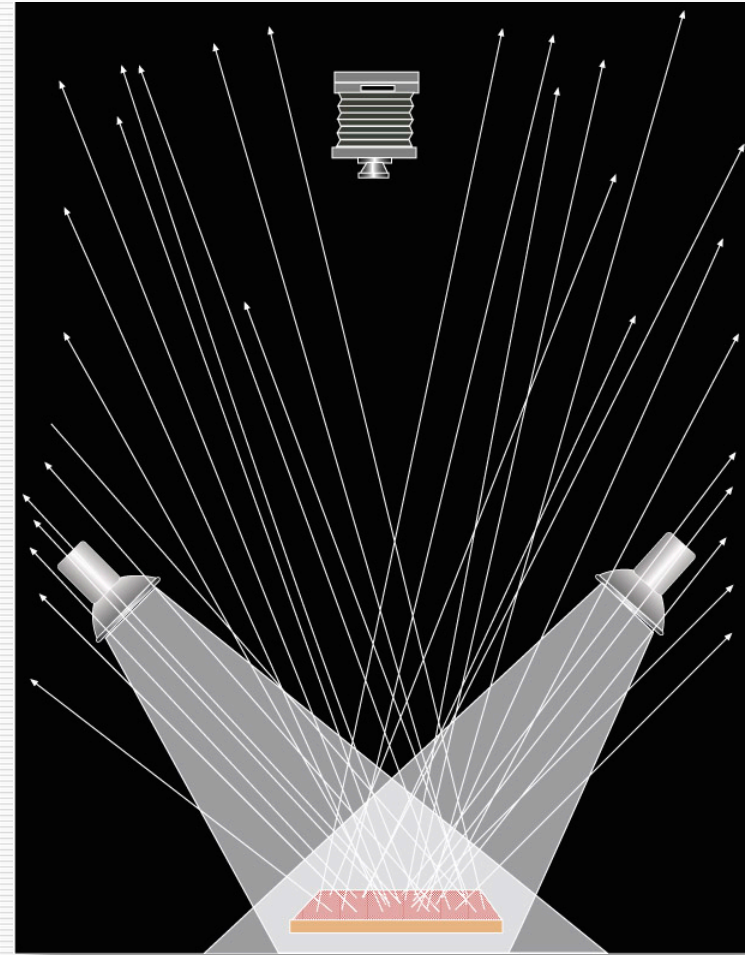
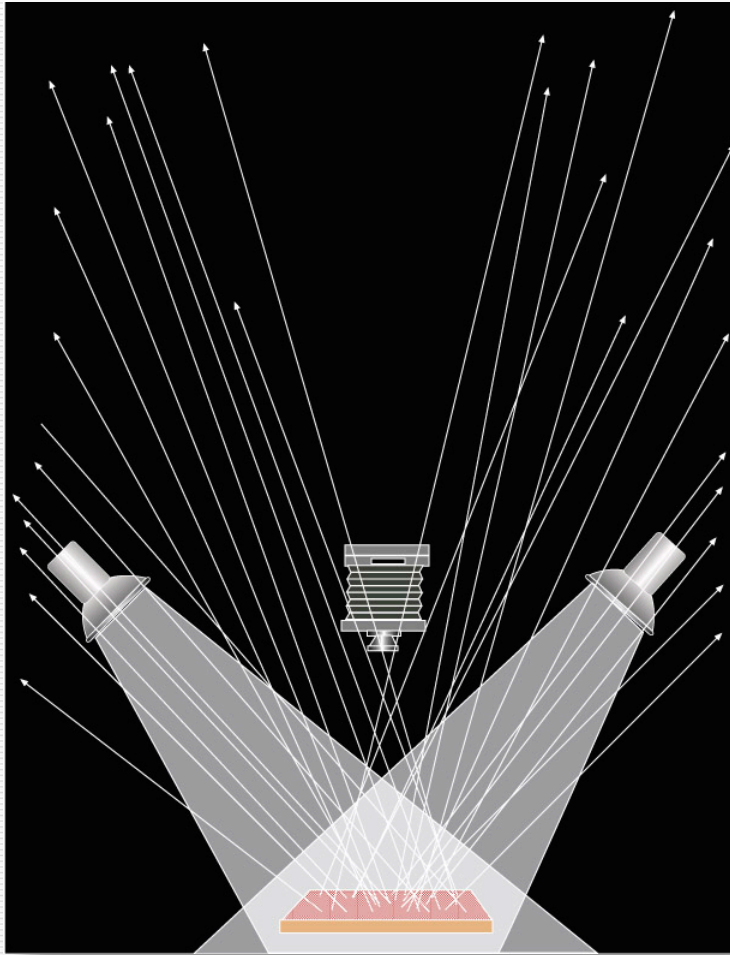
Think Green...

Repro Curve Values

ColorChecker Classic			ColorChecker Passport			ColorChecker SG		
	Repro Curve			Repro Curve			Repro Curve	
	1.8	2.2		1.8	2.2		1.8	2.2
White	241	243	White Balance	190	201	E5/Outer White	243	245
N8	190	201				J6	217	223
N6.5	145	161	<i>Photo Enhancement</i>			F5	184	195
N5	104	122	Light Clipping 4	241	243	I6	175	187
N3.5	67	85	Light Clipping 3	215	222	K6	157	172
Black	37	53	Light Clipping 2	190	201	G5	140	156
			Light Clipping 1	167	181	H6	127	144
			Dark Clipping 4	51	68	H5/Outer Gray	100	119
			Dark Clipping 3	46	63	K7	89	108
			Dark Clipping 2	42	58	G6	76	95
			Dark Clipping 1	37	53	I5	65	83
						F6	56	73
			<i>ColorChecker Classic</i>			K8	36	52
			White	241	243	J5	30	44
			N8	190	201	E6/Outer Black	20	32
			N6.5	145	161			
			N5	104	122			
			N3.5	67	85			
			Black	37	53			



- All of our reference numbers refer to “Green Channel” values
- Values printed in Repro Curve White Paper on Better Light website



- Use a **black surround** behind the color chart to kill reflecting light
- Use the **longest lens** you have to minimize veiling glare on the edges
- Use **bellows lens shades** and/or gobos to shield stray light from the lens

VEILING GLARE EFFECT ON COLOR CHART VALUES

Target Values:

243

201

161

122

85

53

243	200	159	125	95	71
243	199	159	123	92	67
243	199	159	120	87	58

GretagMacbeth™ ColorChecker Color Rendition Chart

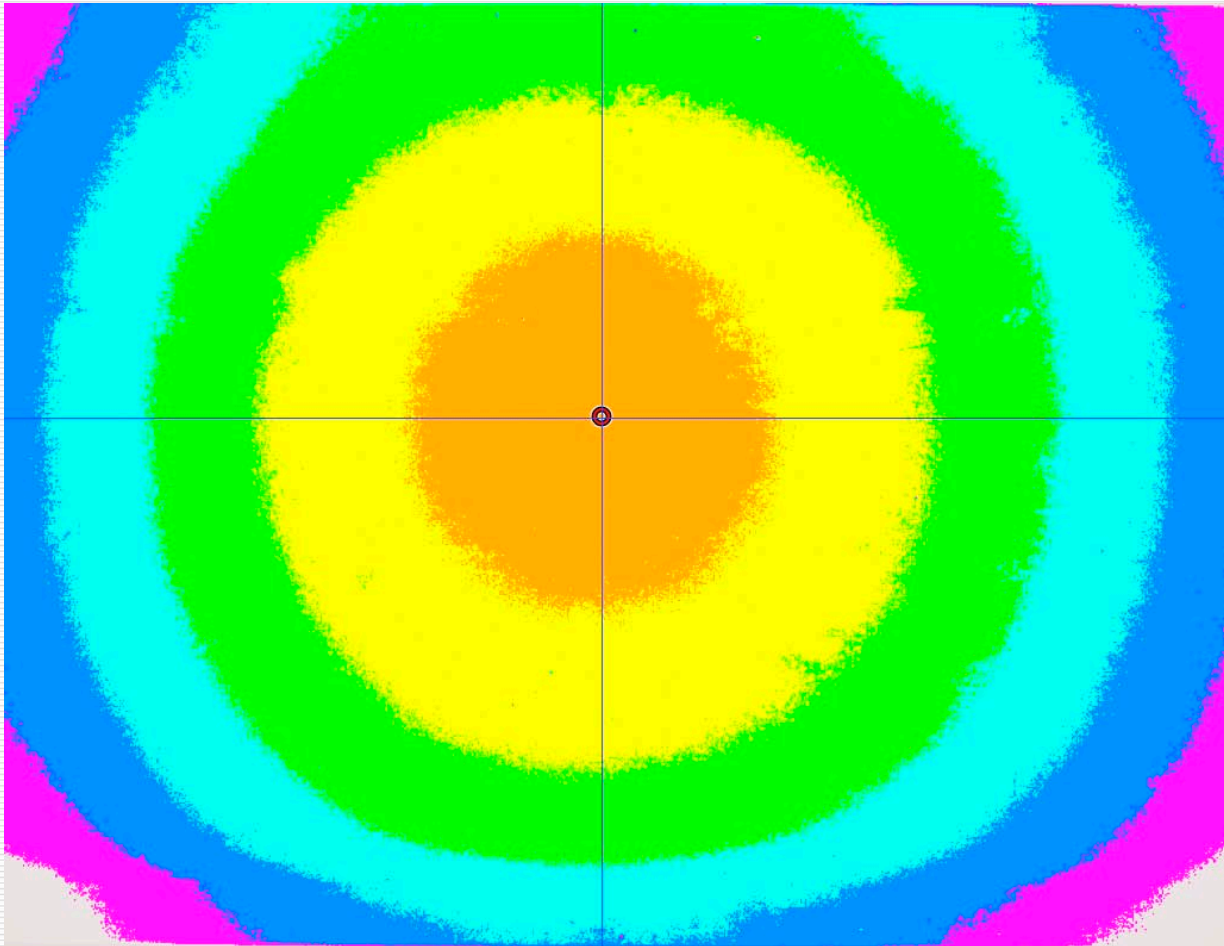
WHITE Bkgnd
No Hood
No Gobos

WHITE Bkgnd
With Hood
Plus Gobos

BLACK Bkgnd
With Hood
Plus Gobos

Camera Calibration & Profiling

Cosine Fourth Lens Falloff



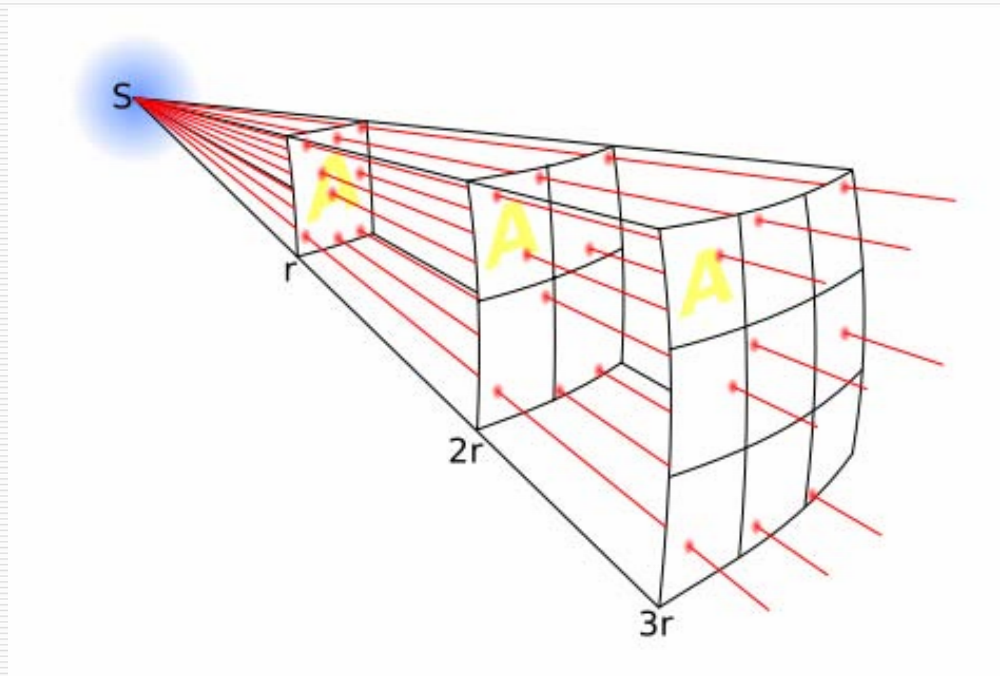
Camera Calibration & Profiling

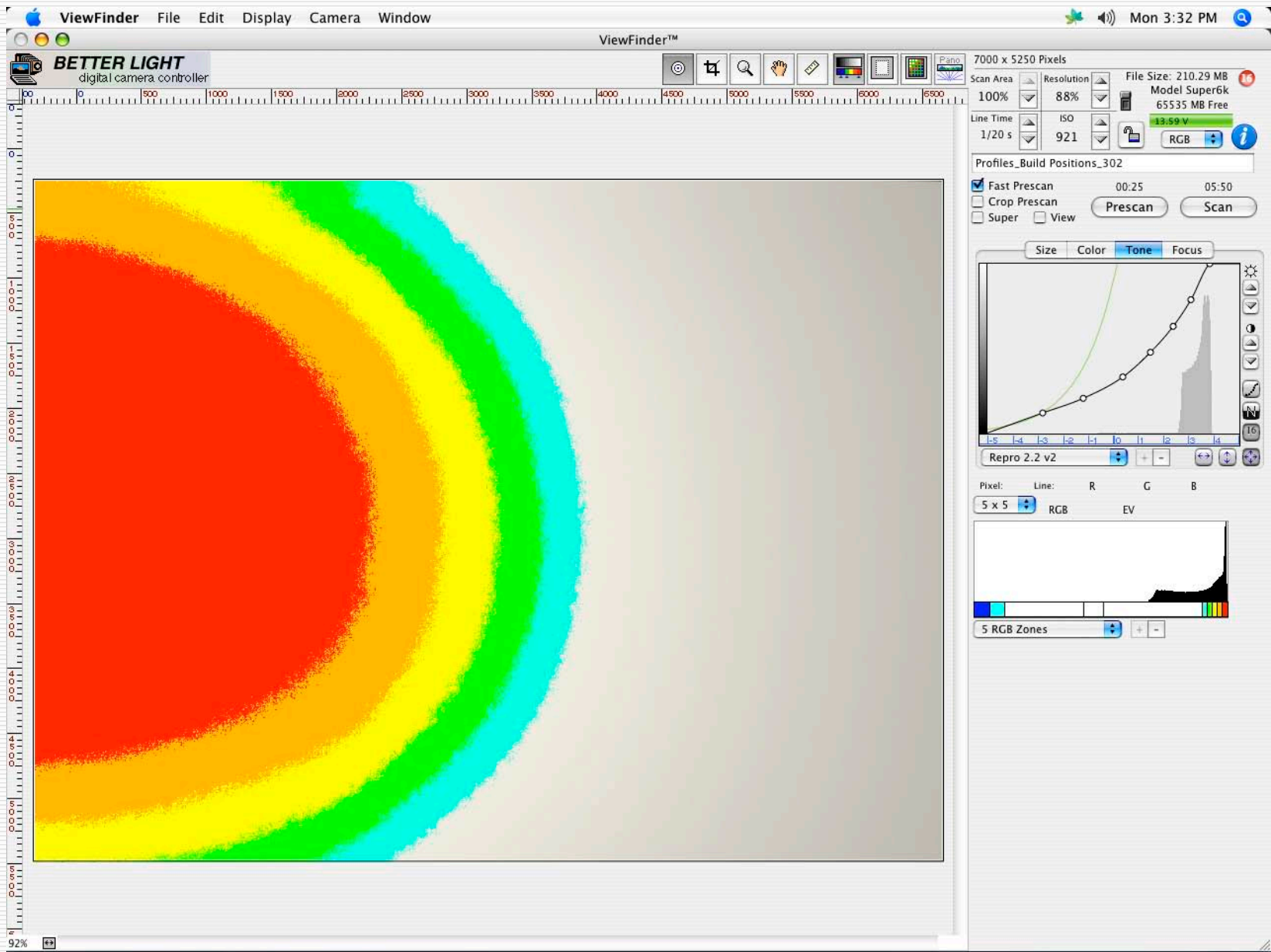
INVERSE SQUARE LAW

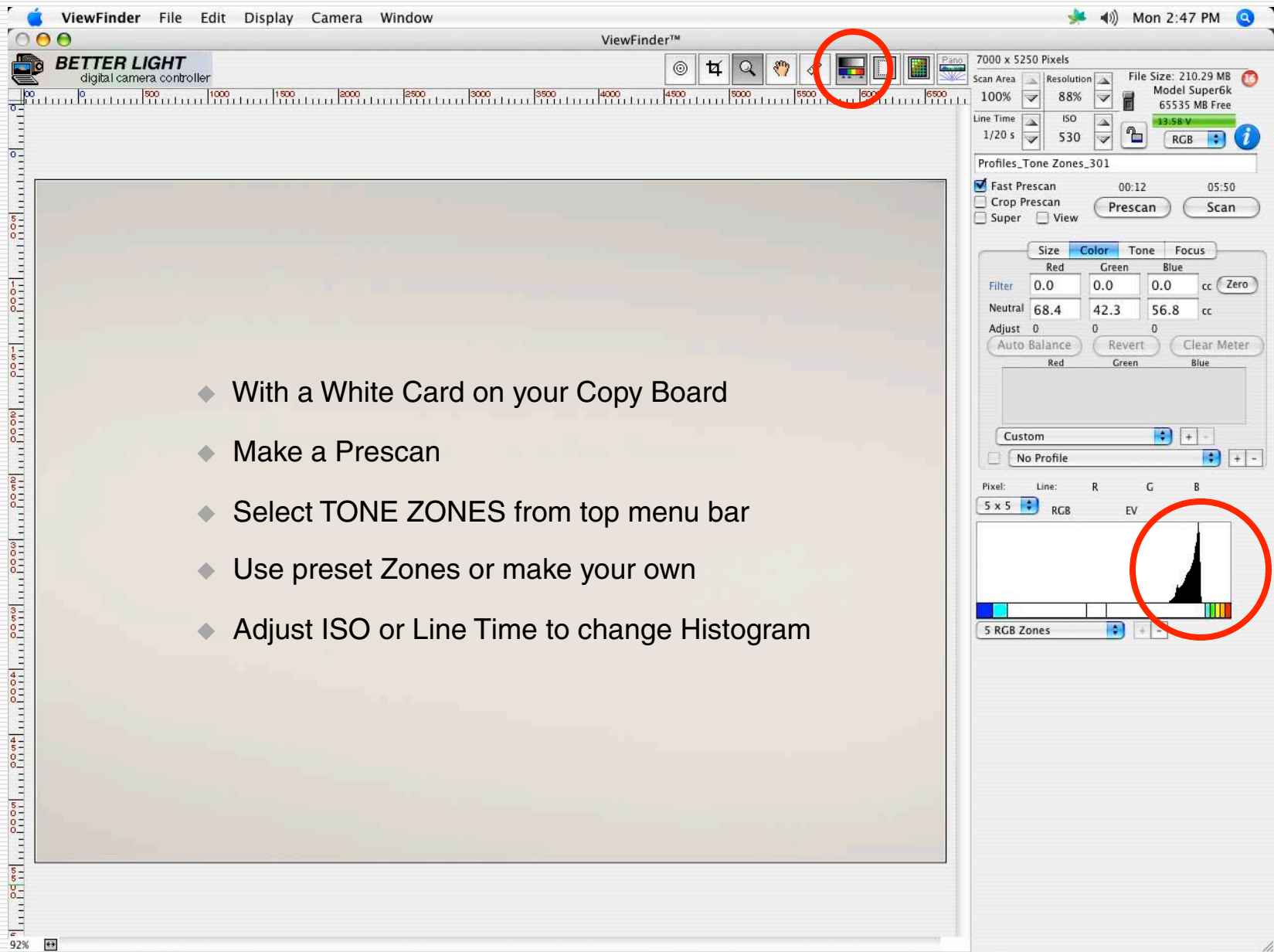
DOUBLE THE DISTANCE = OPEN 2 F-STOPS

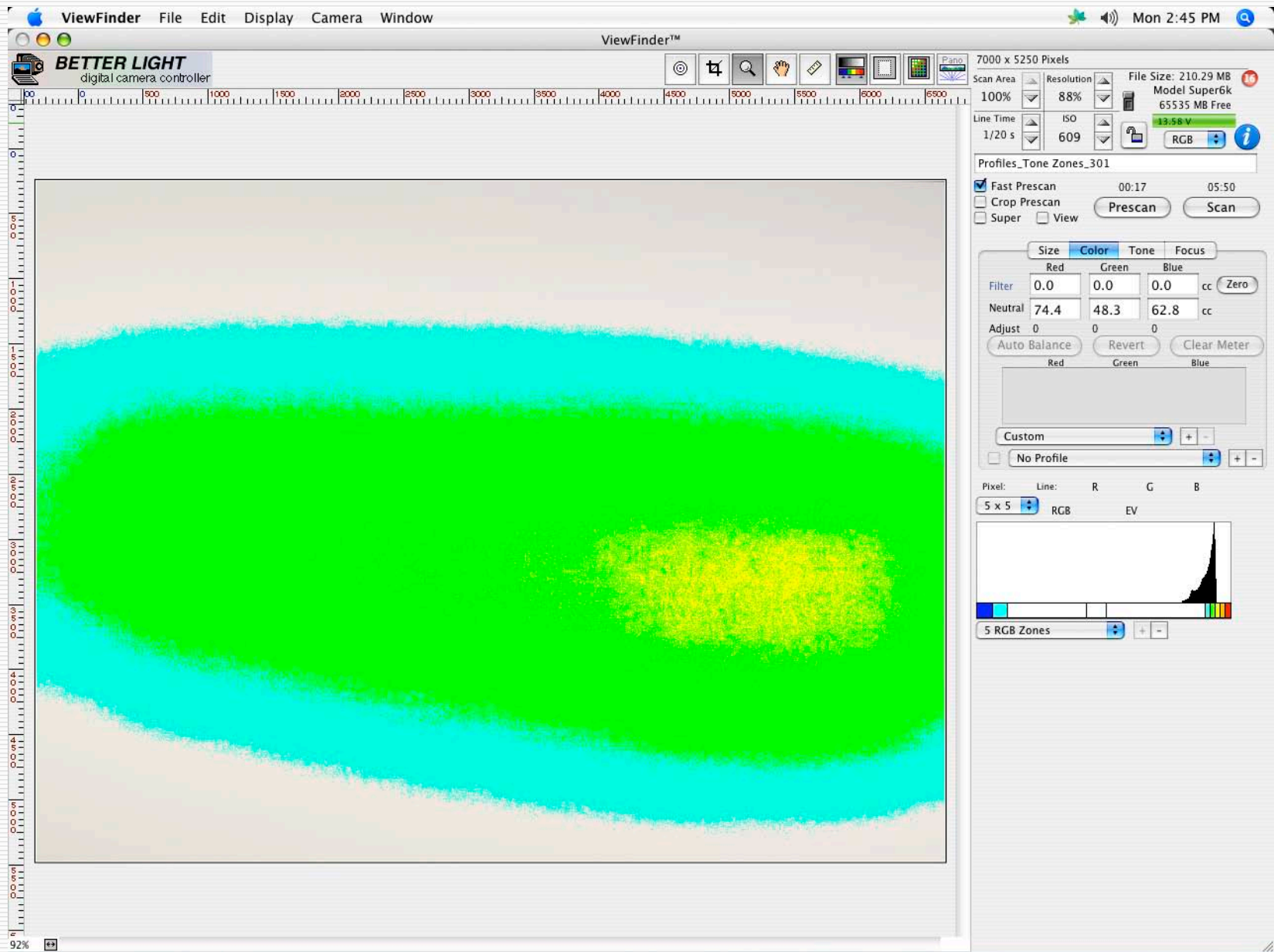
Therefore: HALF THE DISTANCE = CLOSE 2 F-STOPS

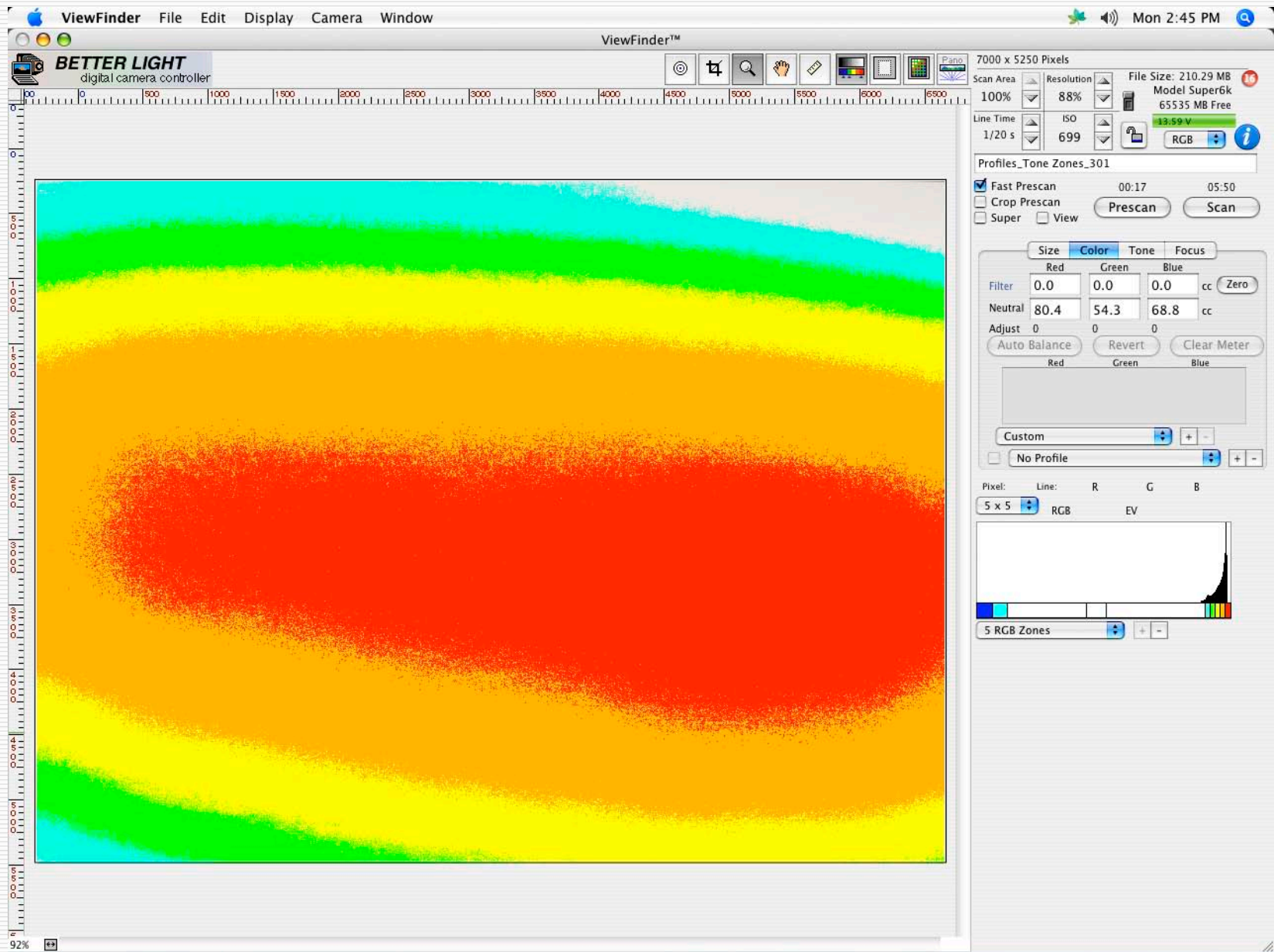
And: ONE QUARTER THE DISTANCE = CLOSE 1 F-STOP

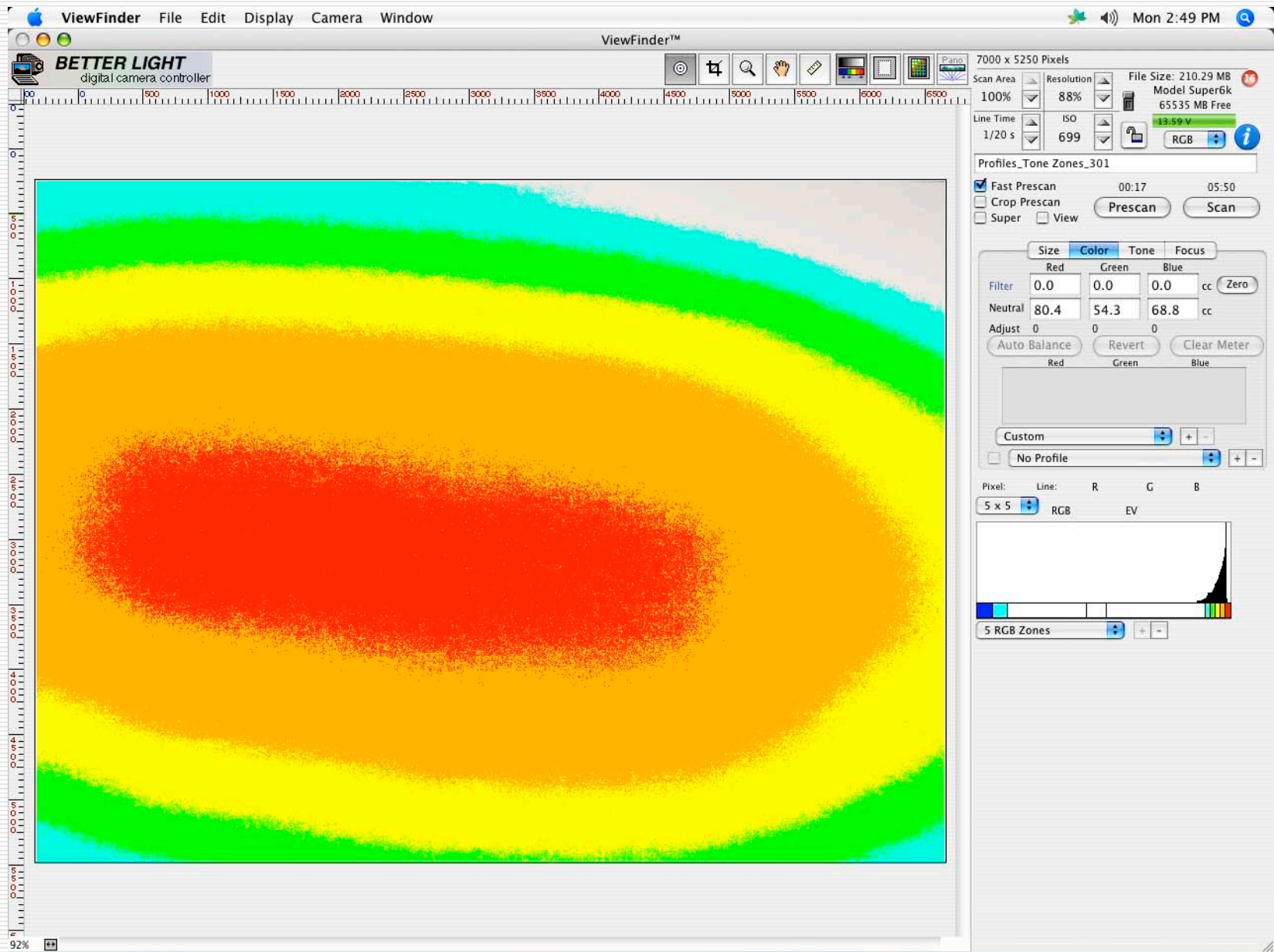


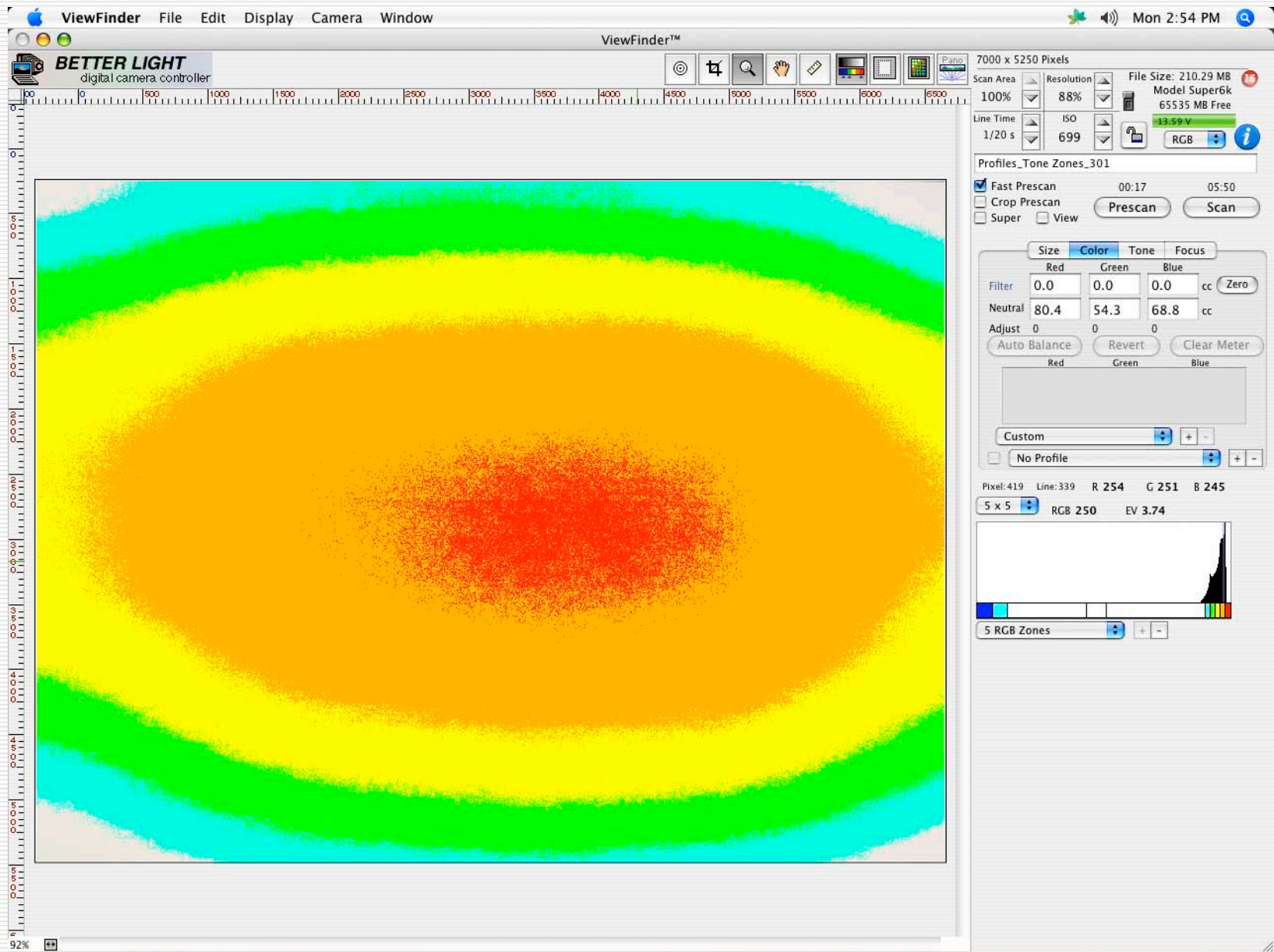


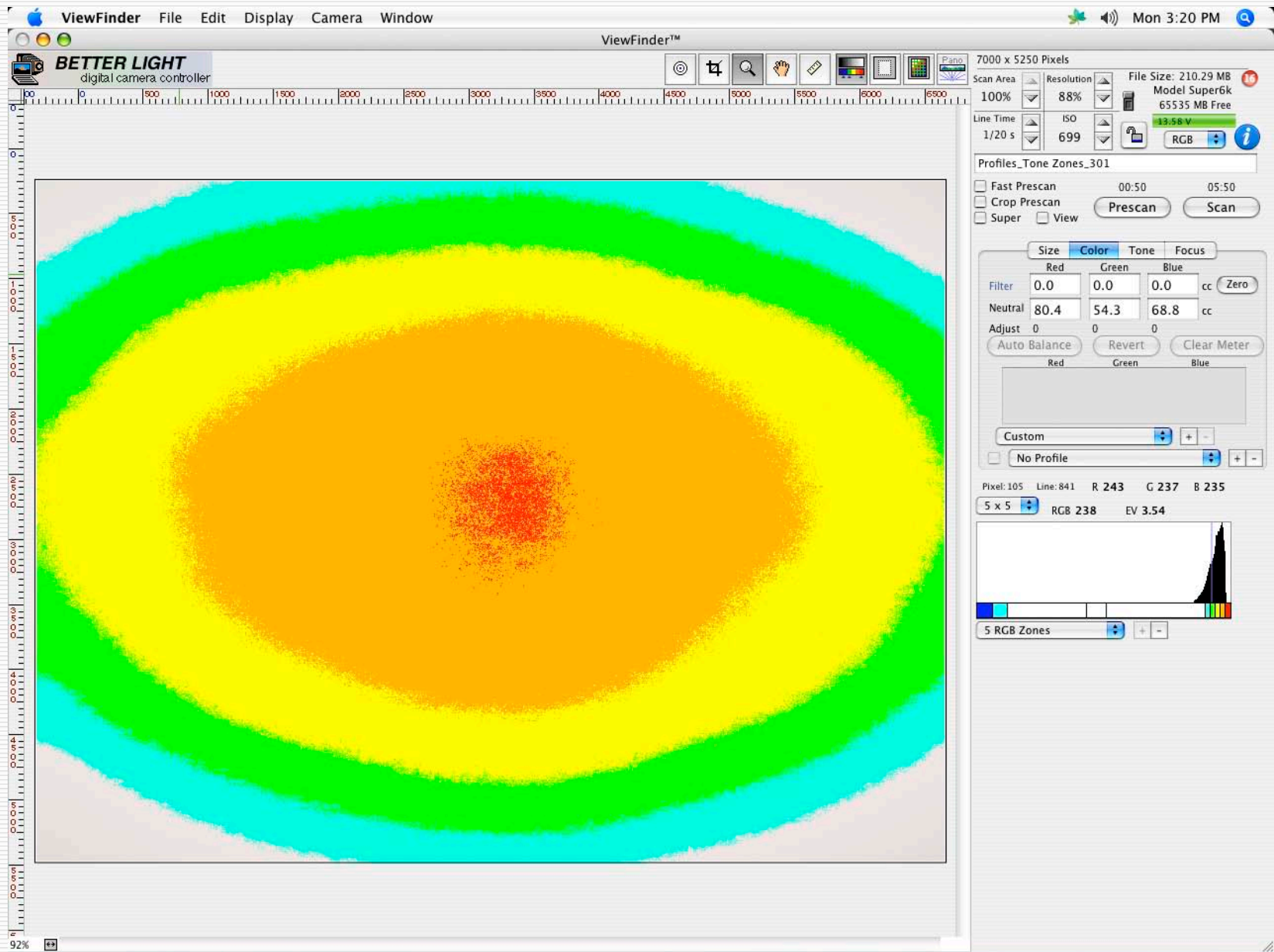


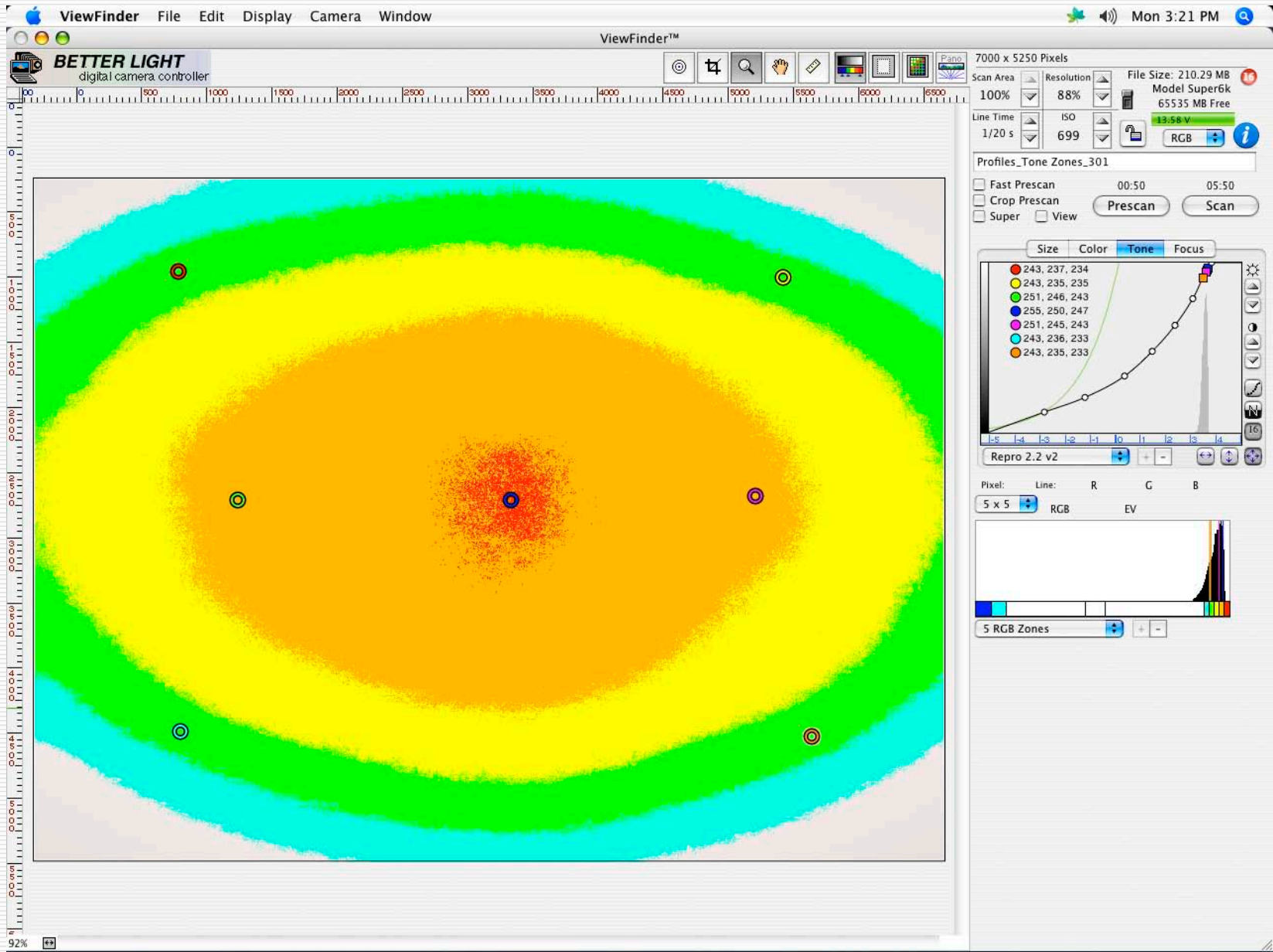


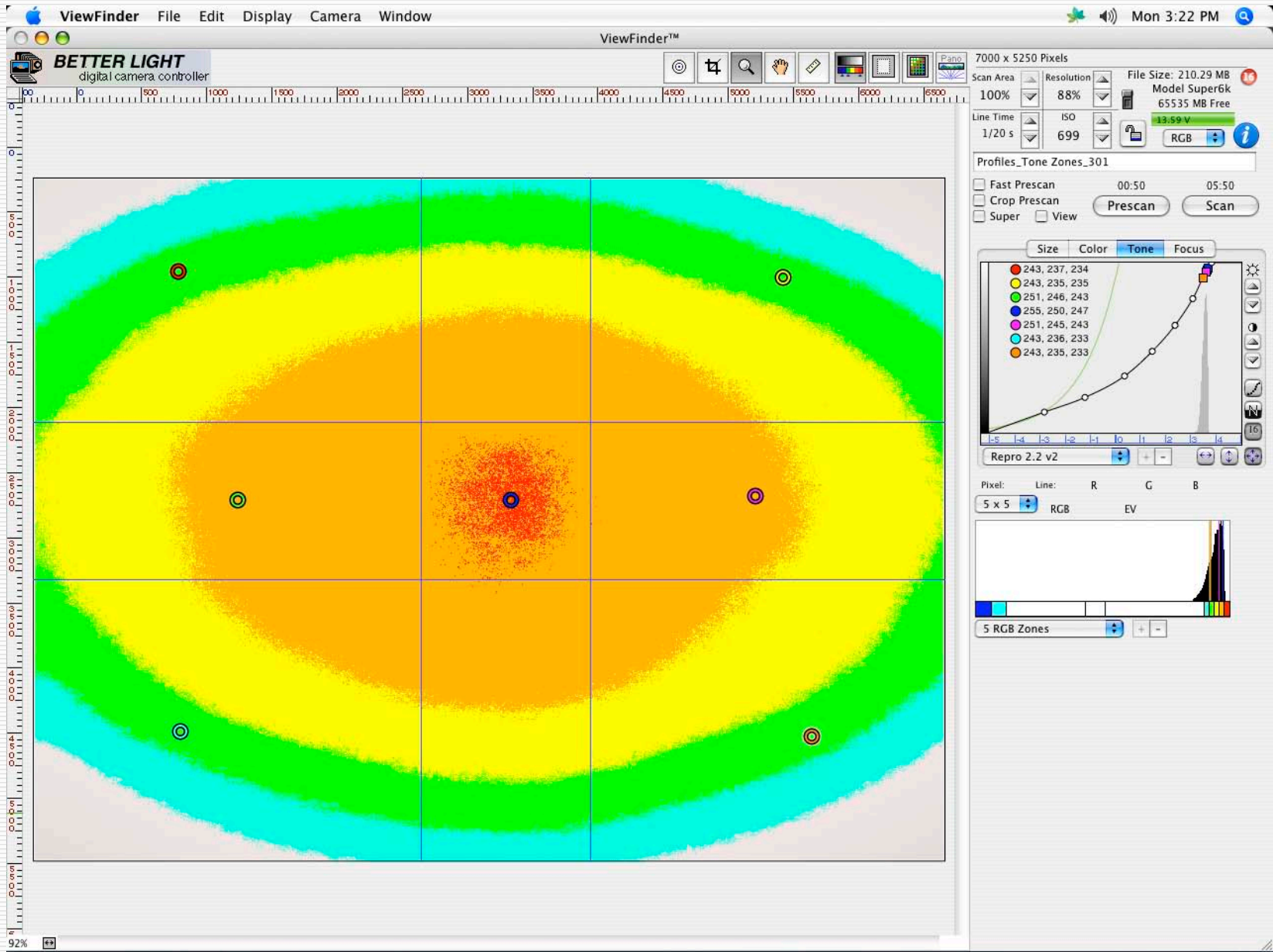


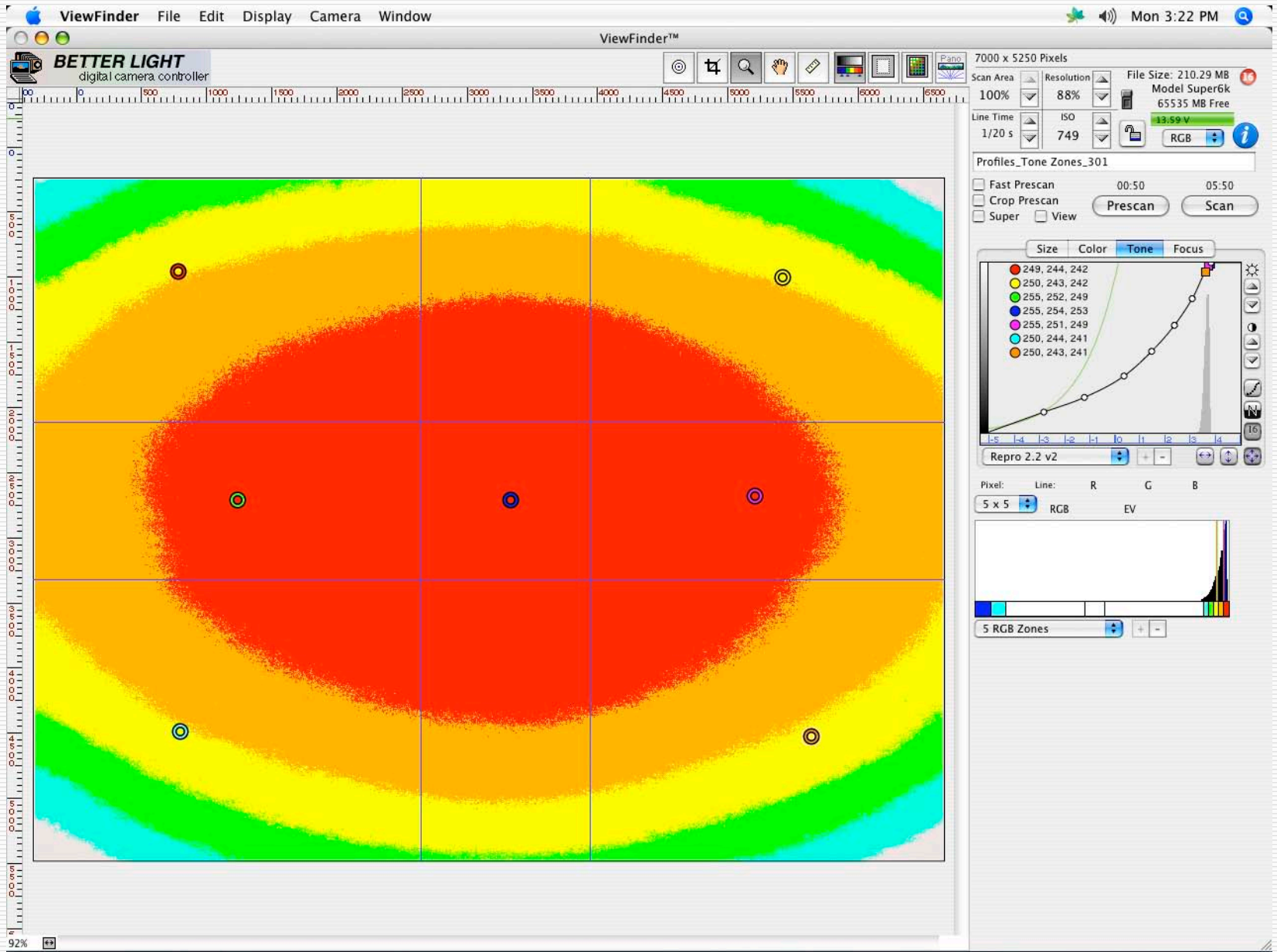


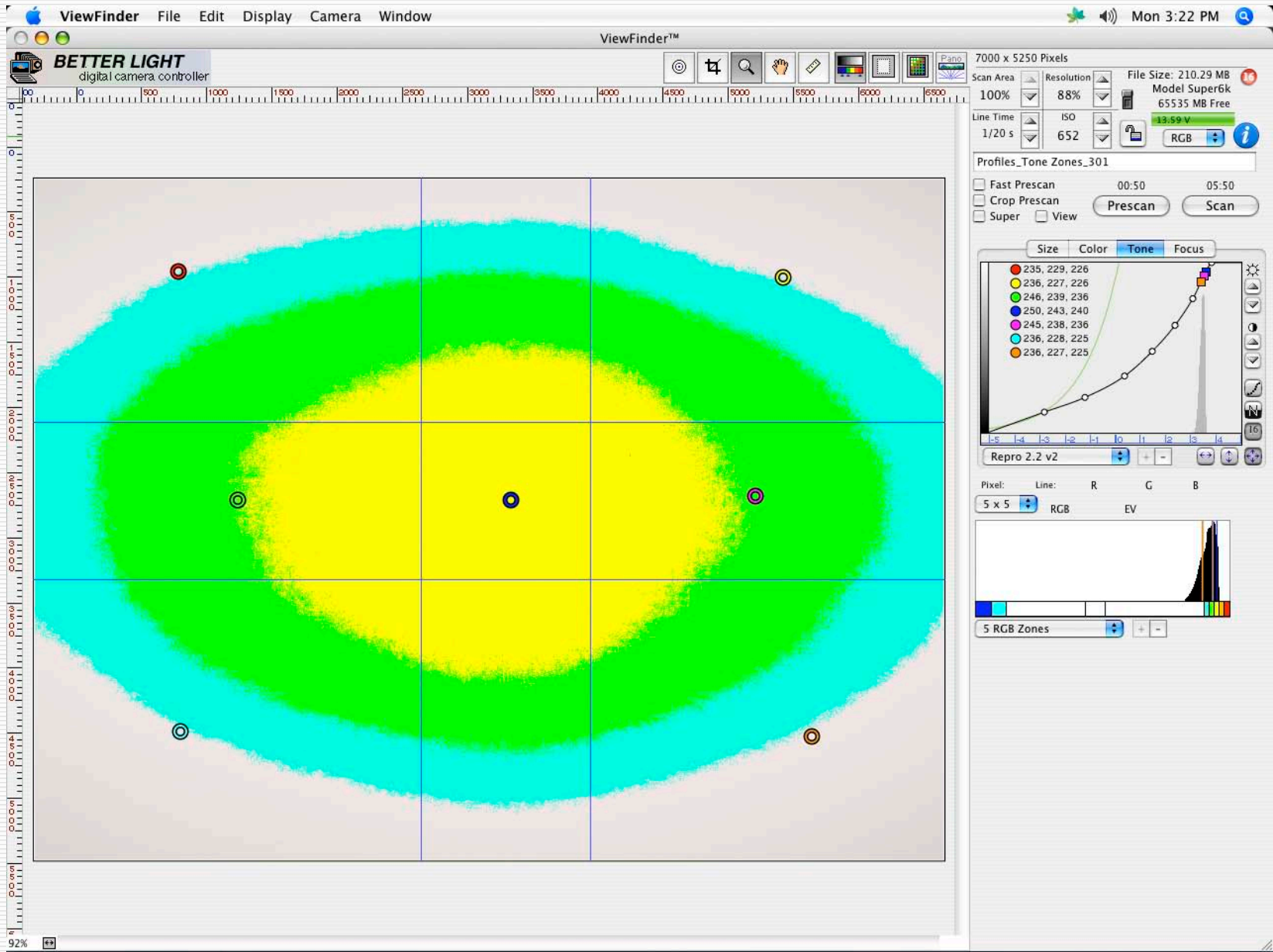


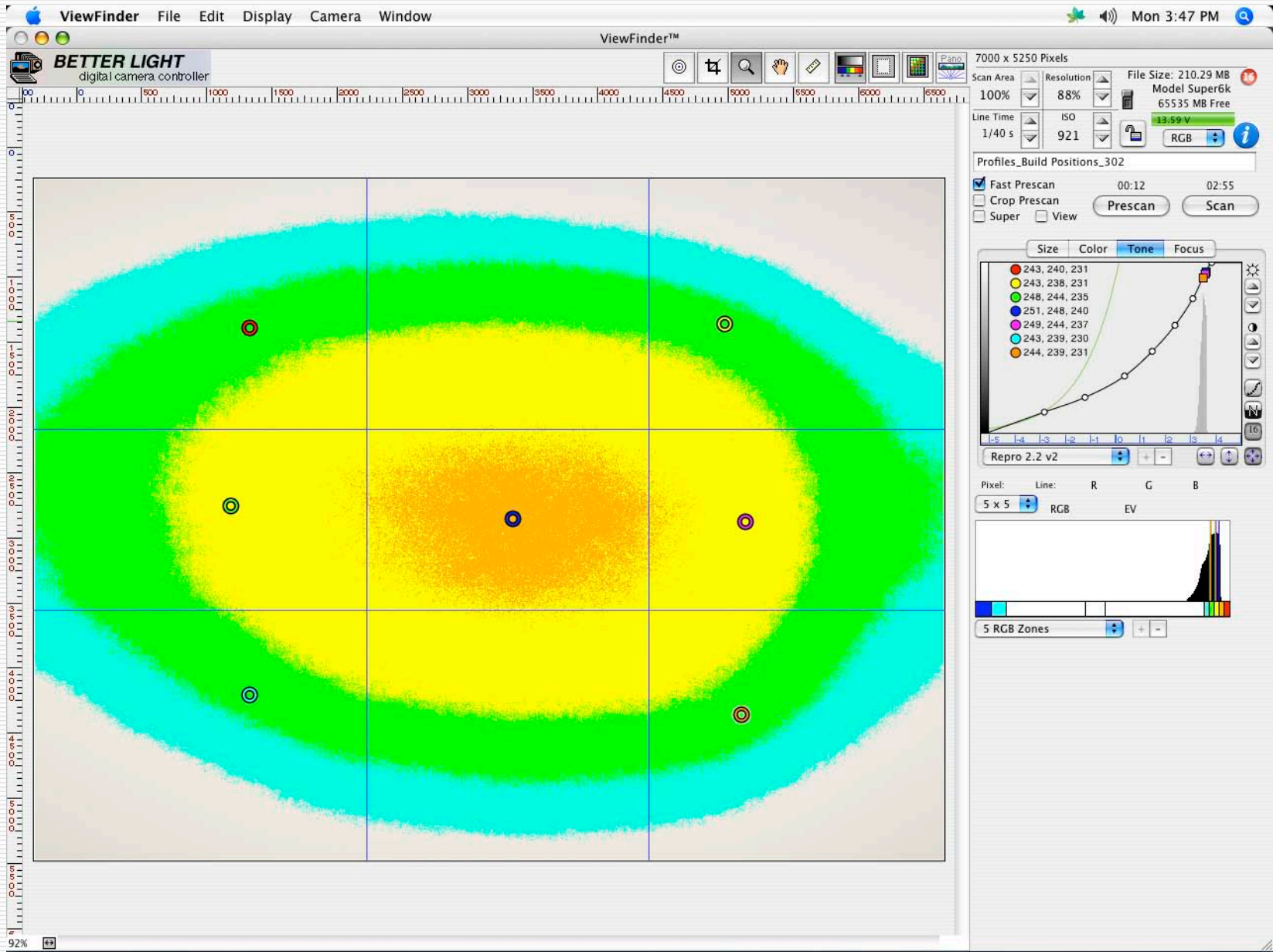


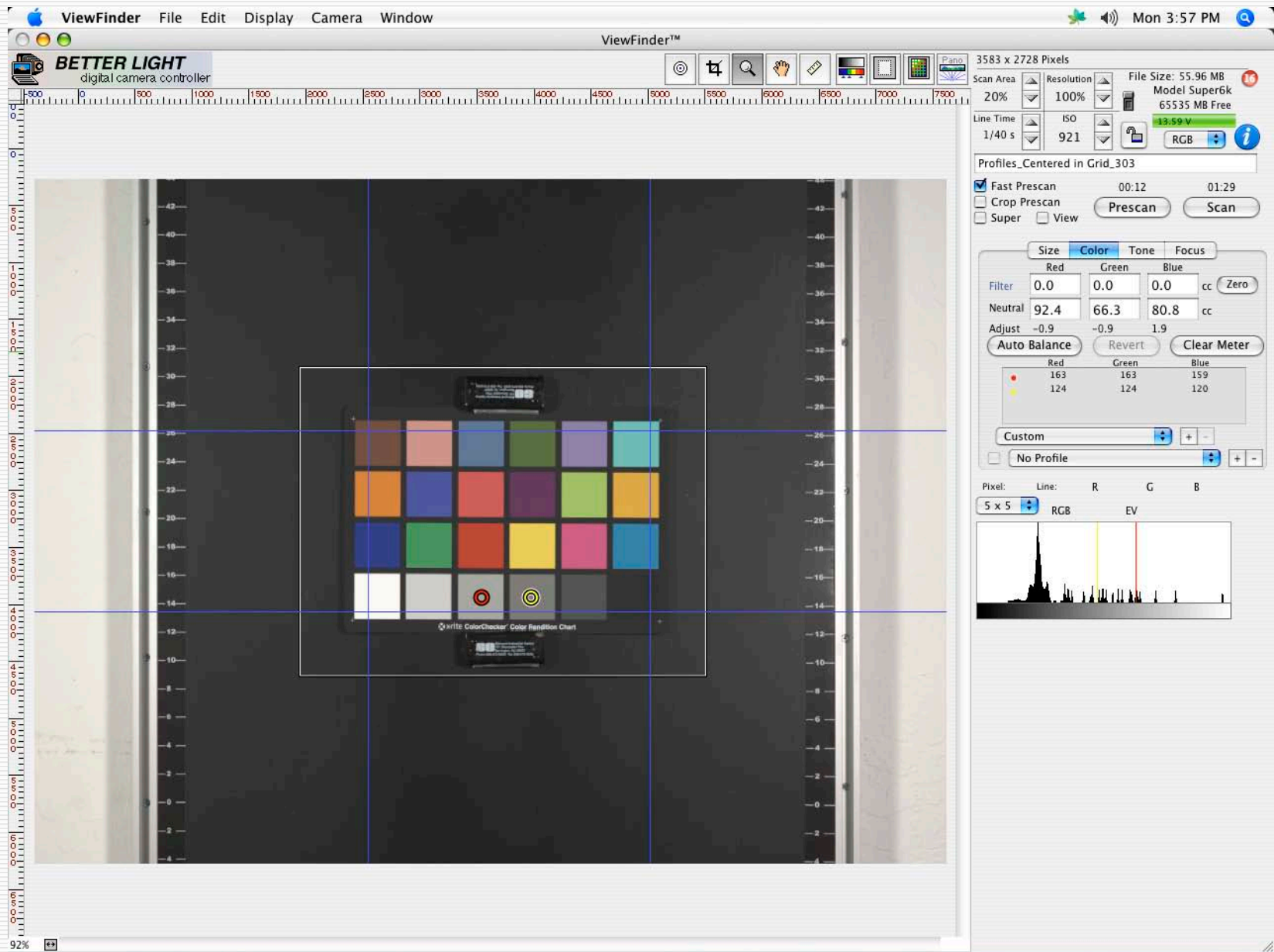


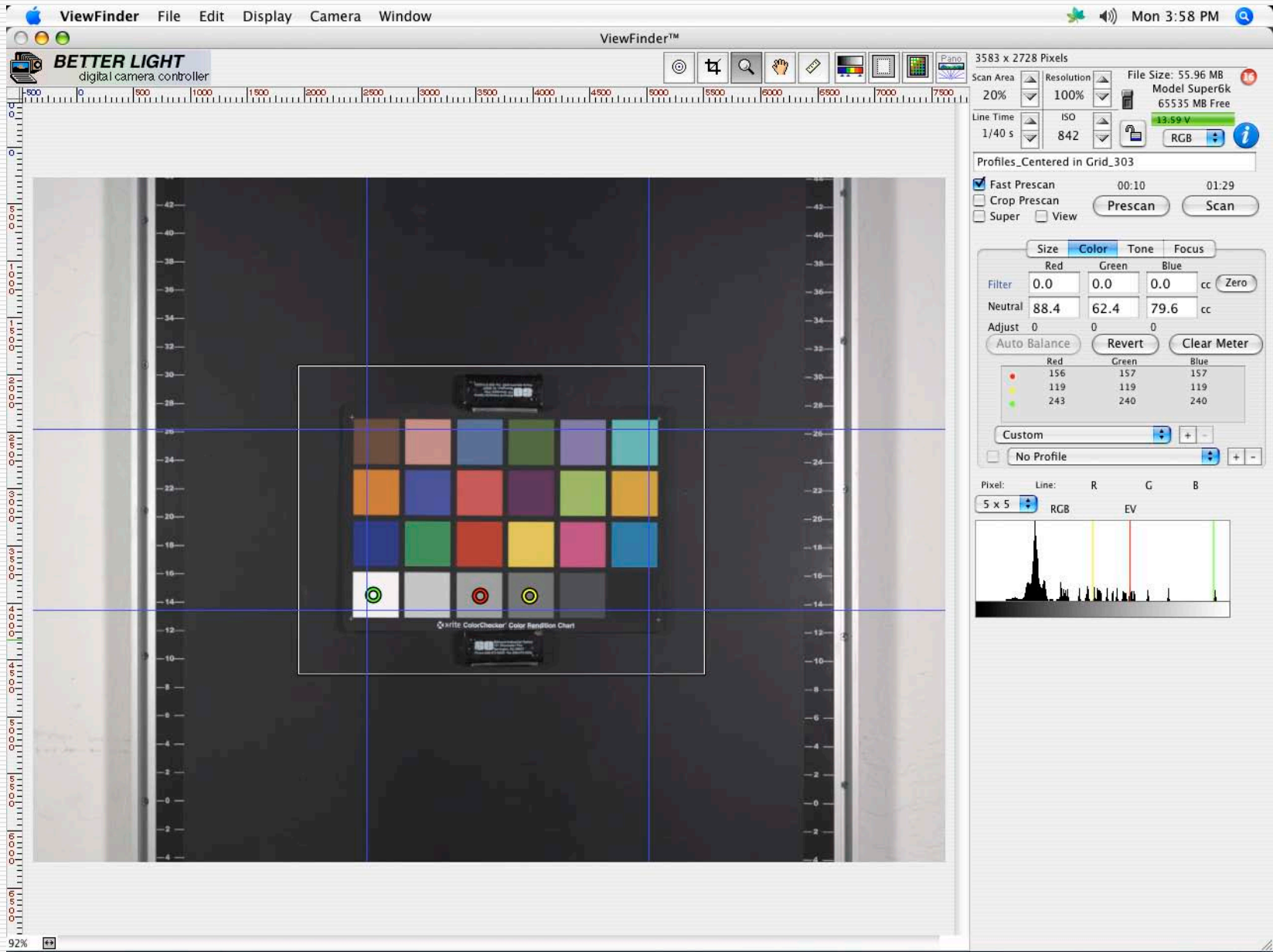


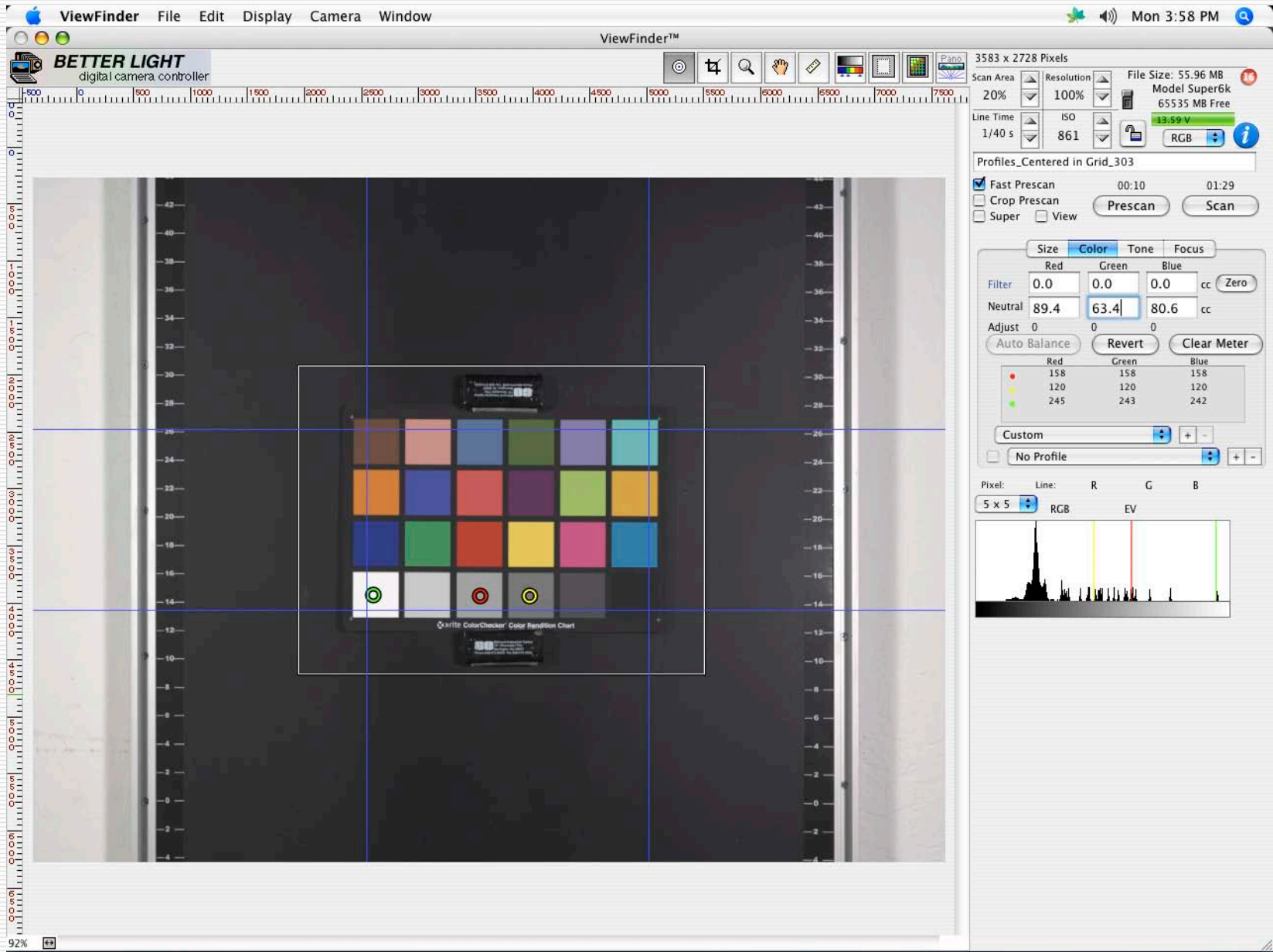


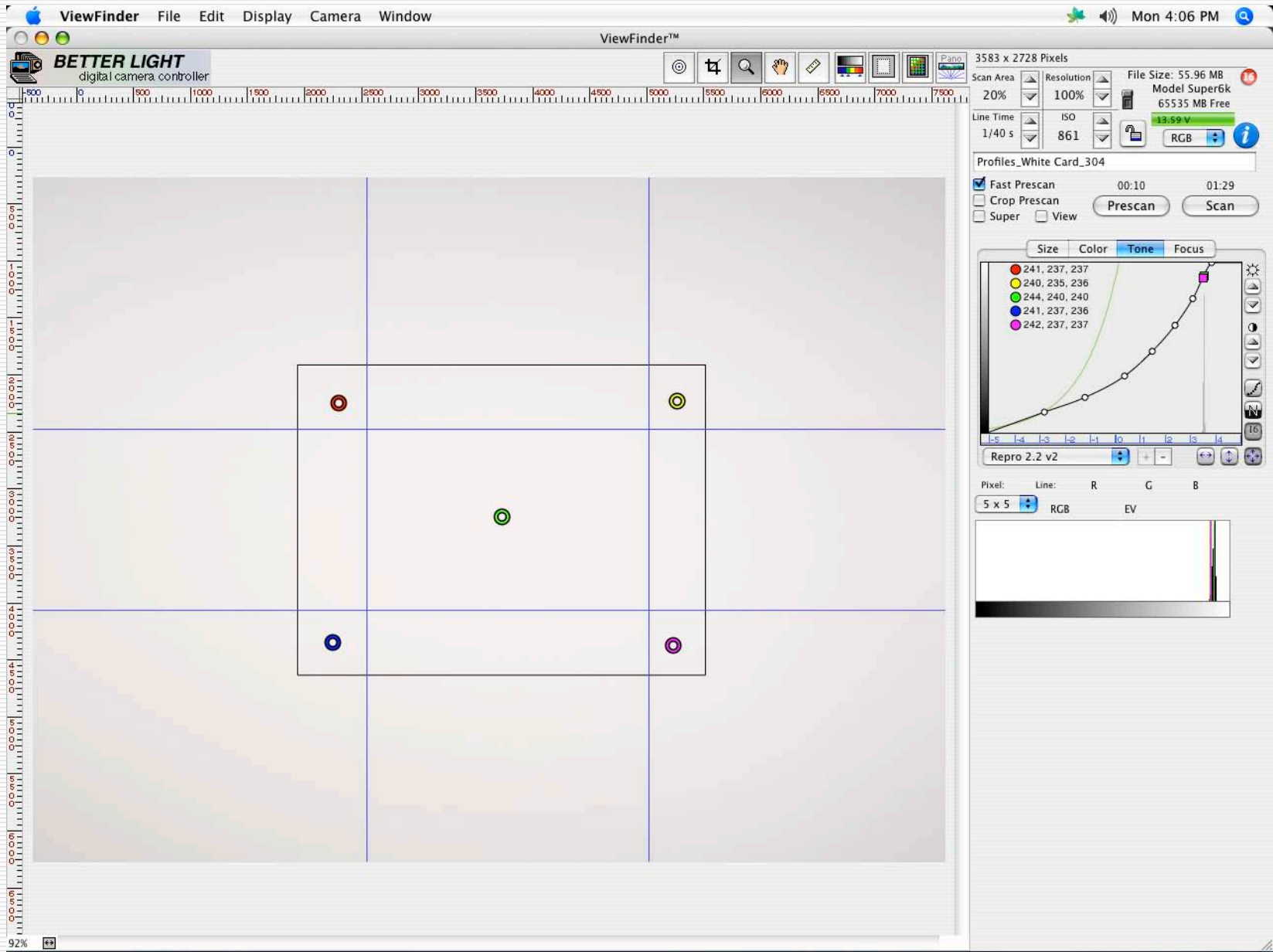


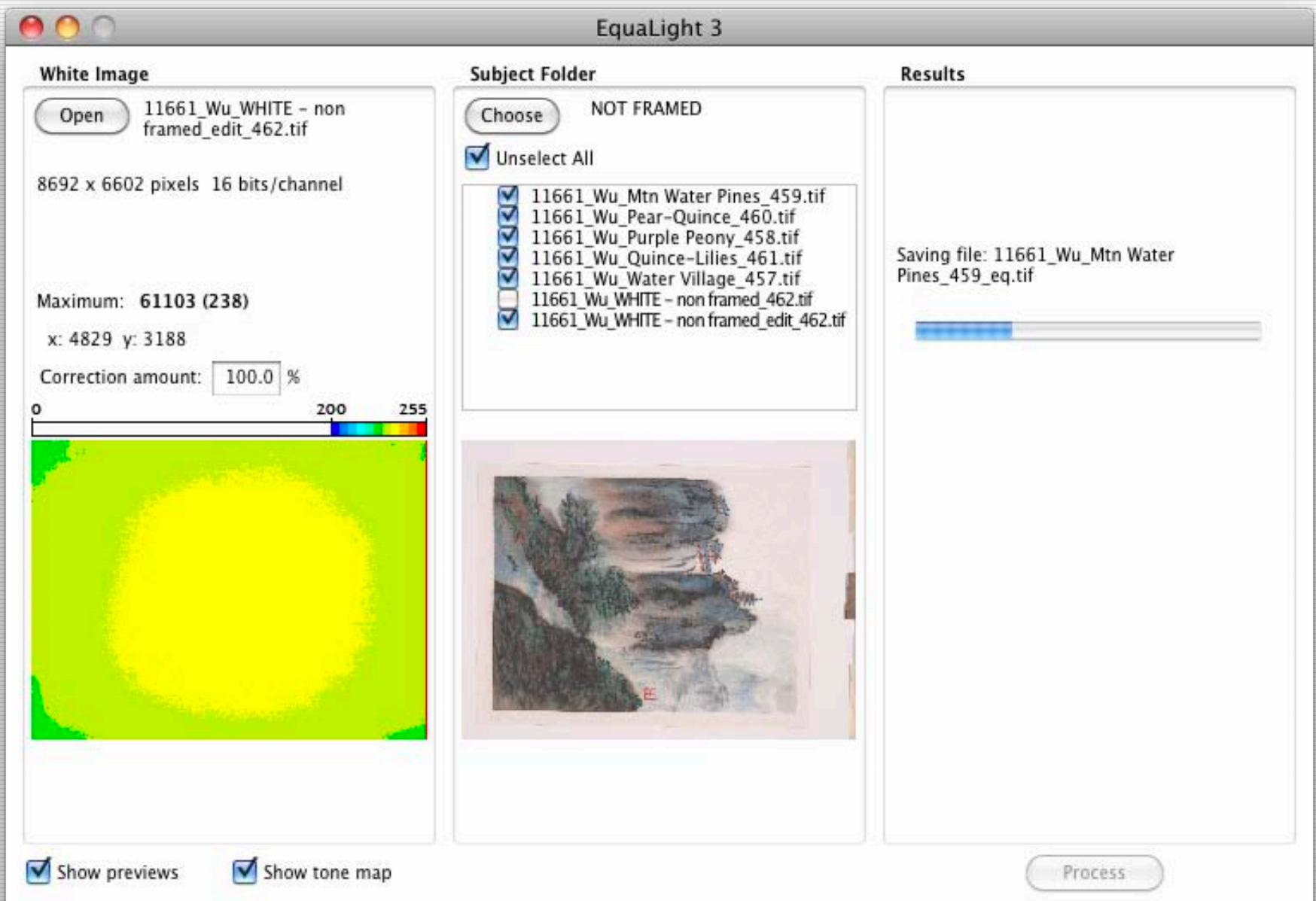




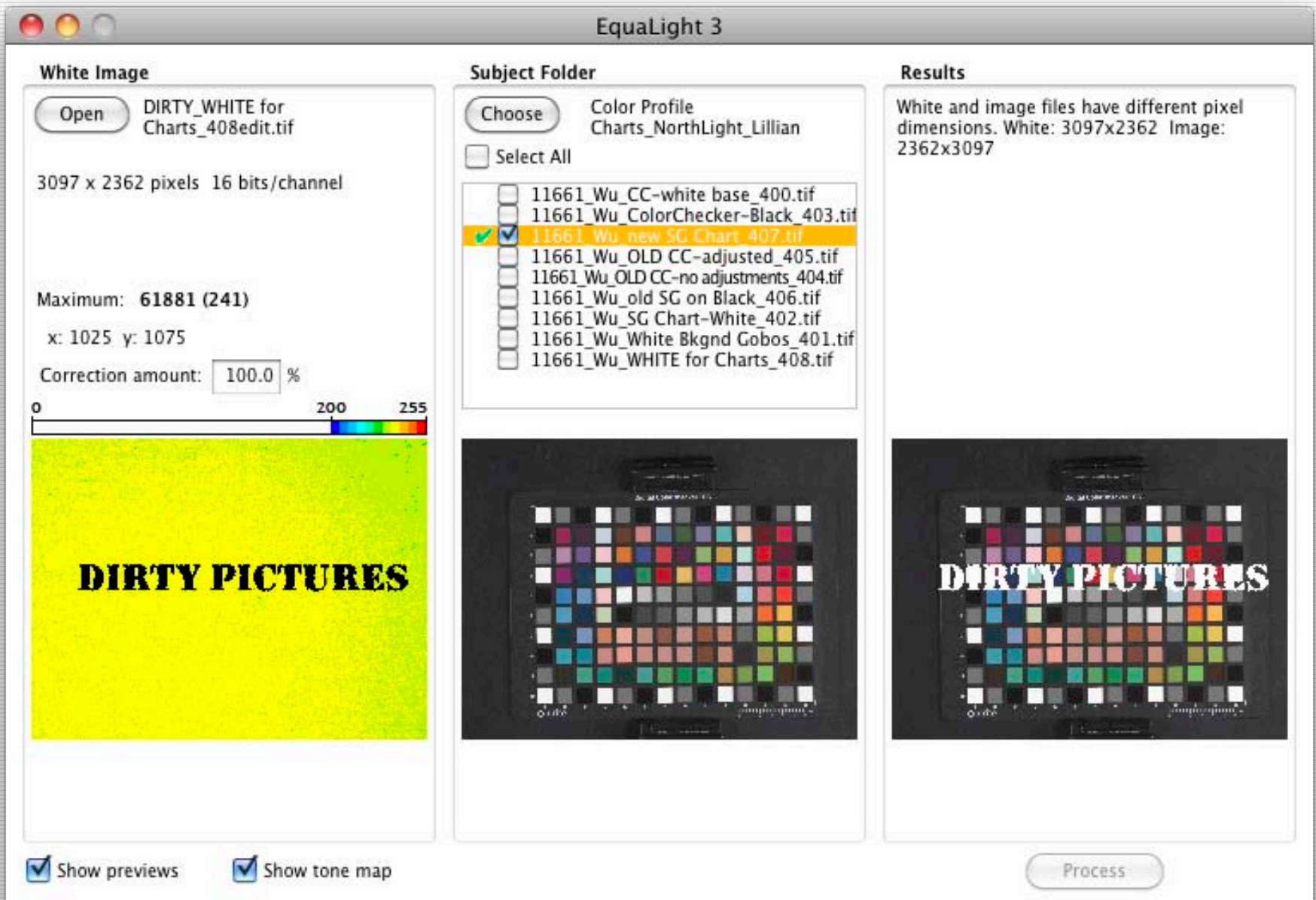








DIRTY PICTURES



Capture Recommendations...

MORE DATA!

**Use 16-bit files when possible
30 – 40 MB (16-bit) file**

x-rite ColorChecker® Color Rendition Chart



Chart Type:

ColorChecker®


Data Reference File...

ColorChecker 24.txt

Light Source:

Custom...

NorthLightCopyLightUV.txt

 Sample Size: 173☒ Show Samples☐ Ignore Glossy☐ Brighter☒ Use Largest Window

Check Capture...

Cancel

OK

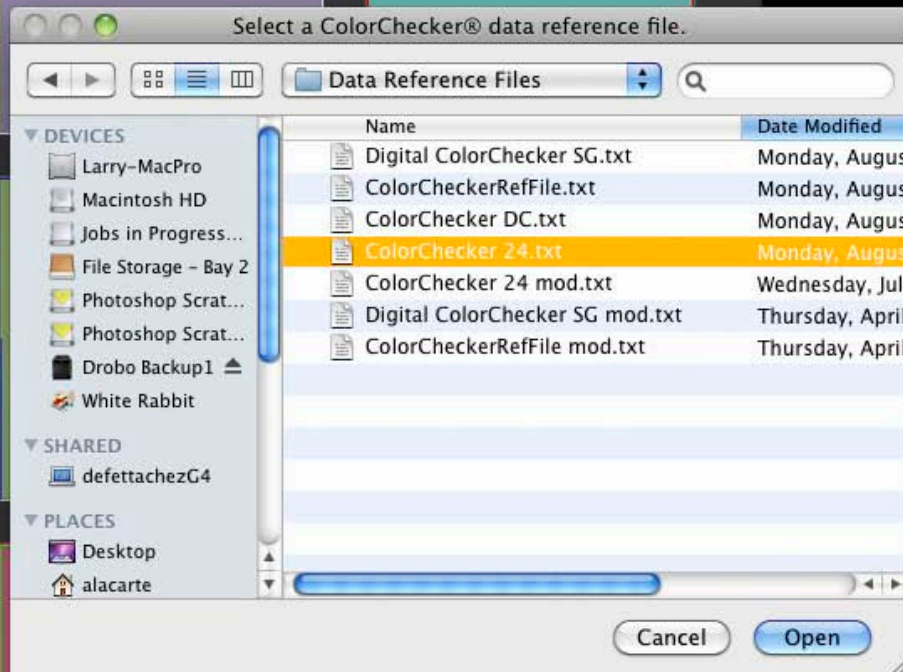


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☐ Show Samples

☐ Ignore Glossy

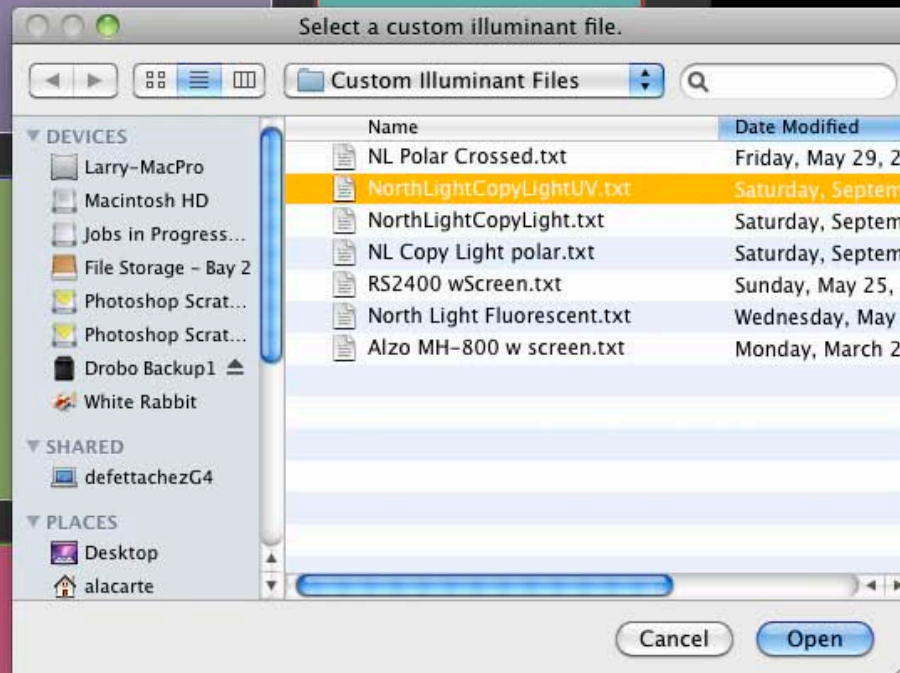
☐ Brighter

☒ Use Largest Window

Check Capture...

Cancel

OK



- D50 Daylight (5000)
- D55 Daylight (5500)
- D65 Daylight (6500)
- D75 Daylight (7500)
- A Incandescent (2856)
- C Daylight (6774)
- F2 Fluorescent (4200)
- F7 Fluorescent (6500)
- F8 Fluorescent (5000)
- F11 Fluorescent (4000)
- ✓ Custom...

NorthLightCopyLightUV.txt

- ☐ Show Samples
- ☐ Ignore Glossy
- ☐ Brighter
- ☒ Use Largest Window

Check Capture...

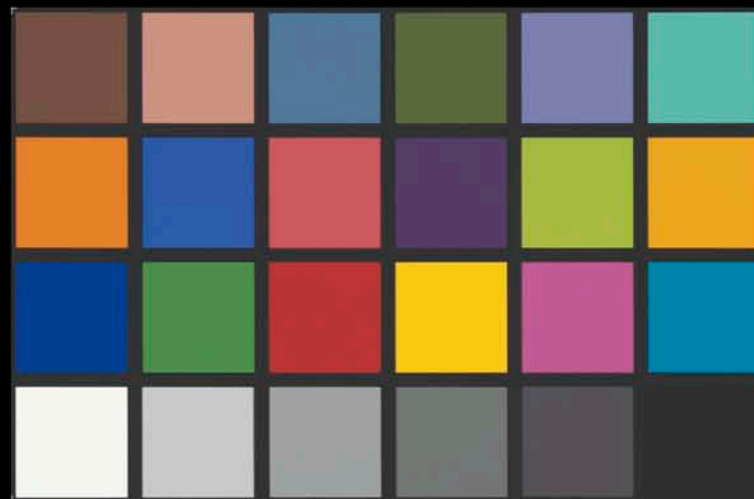
Cancel

OK



BENT 6 CURVE ON SCAN

NO PROFILE APPLIED



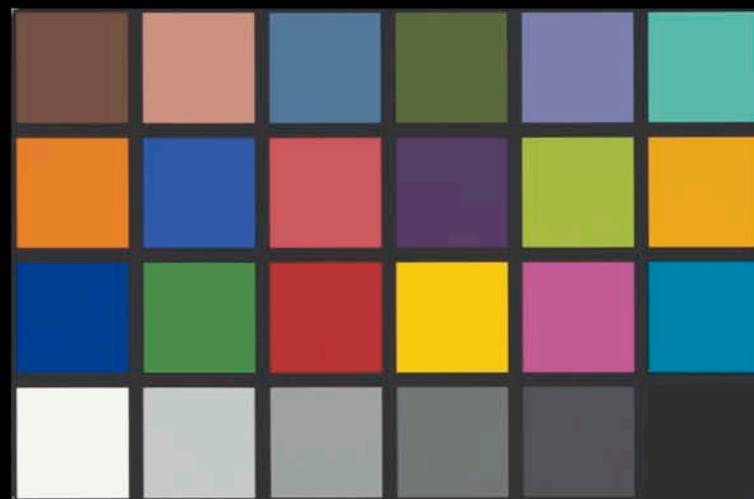
BENT 6 CURVE ON SCAN

PROFILED & CONVERTED



FLAT 8 CURVE ON SCAN

NO PROFILE APPLIED

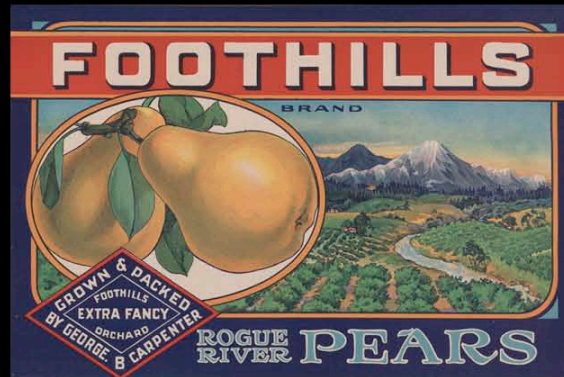


FLAT 8 CURVE ON SCAN

PROFILED & CONVERTED



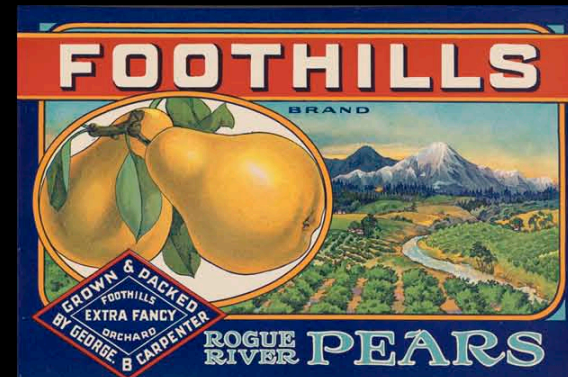




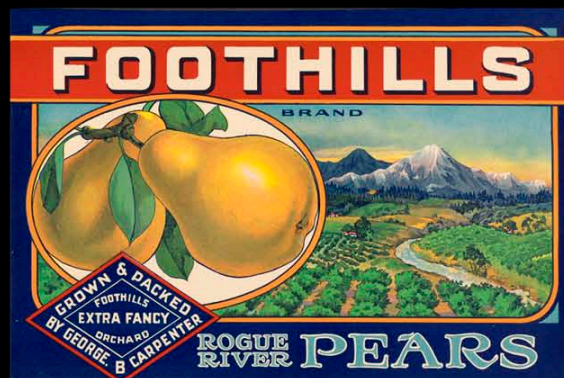
ORIGINAL SCAN
NO PROFILE APPLIED



REPRO 2.2 / SG CHART PROFILE APPLIED



CURVE ADJUSTMENTS IN PHOTOSHOP



EDITED PROFILE APPLIED
Customized in iCorrect Edit Lab

Camera Calibration & Profiling

Optimizing the Chart Capture

- ◆ Adjust Lights for Evenness (“Flat-fielding”)
- ◆ Set Tone Curve and Neutral Balance
- ◆ Set Exposure and Minimize Noise
- ◆ Image Color Chart and White Card (*optional*)
- ◆ Dust Color Chart and White Card Images
- ◆ Adjust Chart Image with EqualLight (*optional*)
- ◆ Make the ICC Profile
- ◆ Add ICC Profile to ViewFinder
- ◆ Adjust Tone Curve for Desired Subject Rendering

Camera Calibration & Profiling

Best Practices

- ◆ Shoot the color charts for profiles like a **separate project** so you can take careful steps to make the best possible profile.
- ◆ Take the time to get even Illumination and/or use EquaLight correction for “**perfect**” **evenness across chart**. Watch white values – especially if using EquaLight.
- ◆ For exposure place white patch **in the brightest part of the scene** to prevent errors in exposure and causing an increase from EquaLight processing. Especially when using texture lighting.
- ◆ Setup conditions for **minimal image noise**. Use the lowest ISO and the fastest practical Line Time to reduce noise. In difficult conditions such as cross-polarization, multiple scans of identical setup can be made and averaged in Photoshop — 4 scans averaged will reduce noise by 50%.

Camera Calibration & Profiling

Best Practices

- ◆ **Use the SG Chart for profiling.** It reduces the average color error by HALF compared to ColorChecker because of more colors for a more accurate algorithm.
- ◆ **A Profile for each Spectral difference.** A new profile for Polarized lighting, Daylight vs. Tungsten IR filters, Diffusers added, etc.
- ◆ **Don't edit tone values on the chart** before making the profile... you are giving false data to the software and it will make up for the errors in the capture. Use the Repro 2.2 curve.

Camera Calibration & Profiling

Best Practices

- ◆ To facilitate subsequent color editing, **conversion into the RGB working space** is recommended. The profile has done its job in optimizing color, so best to get rid of any influence the profile may have on future curve or color adjustments and other edits.
- ◆ **Profiles have a long life...**remains just as good as long as nothing related to the spectrum changes (assuming you are happy with the results).
- ◆ **Keep some of your previous “OK” profiles...**sometimes they provide a better starting point to certain images.

Camera Calibration & Profiling

The Truth Hurts...

**A profile will NOT be perfect
in rendering all colors all the time!**