

# SFR results: Chromatic Aberration

## Chromatic Aberration, noise, and Shannon capacity

The camera chosen for the plot below has significant Chromatic Aberration. The Noise spectrum and Shannon capacity plots, shown below beneath Chromatic Aberration, are plotted only if the Noise Spectrum and Shannon capacity (in CA plot) checkbox in the Iimatest SFR input dialog box has been checked. It is unchecked by default.

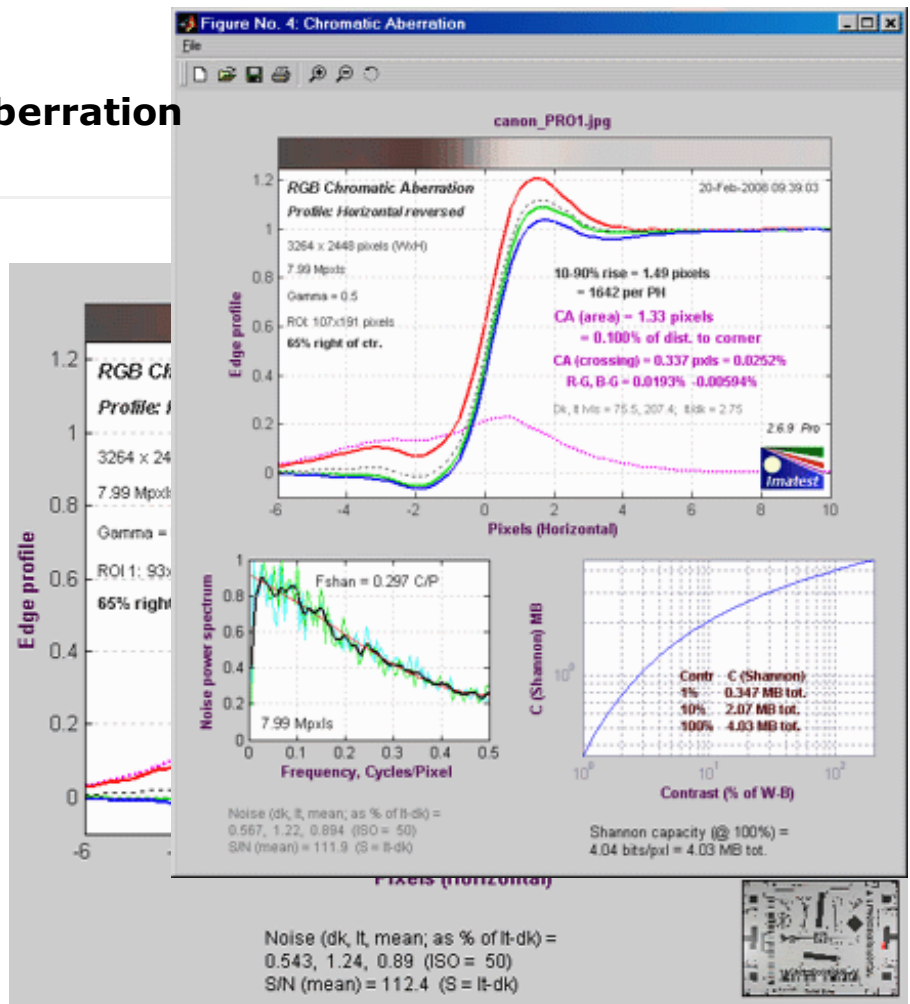
### Upper plot: Chromatic Aberration

More about this plot can be found in the page on [Chromatic Aberration](#). Much of this plot is grayed out if the ROI is too close to the center for reliable CA measurements (less than 30% of the distance to the corner).

Red, Green, and Blue lines (bold) Edge profiles for the R, G, and B channels (original, uncorrected). (Standardized sharpening is not used for chromatic aberration.)

Black line (dashed) Edge profile for the luminance (Y) channel.

Dashed magenta The difference



<b>line (bold)</b>	between the highest and lowest channel levels. (All channels are normalized to go from 0 to 1.) The visible chromatic aberration is proportional to the area under this curve.
<b>Left column text</b>	Input settings: Plot title, profile orientation (Horizontal profile corresponds to a vertical edge, etc.), image dimensions (WxH), total megapixels, gamma, ROI size, ROI location.
<b>Right column text</b>  (results)	<p>10-90% rise distance (original; uncorrected) in pixels and rises per picture height (PH).</p> <hr/> <p><b>CA (area): Chromatic aberration area in pixels.</b> An indicator of the <i>perceptual</i> severity of CA. The area between the channels with the highest and lowest levels. In units of pixels because the x-axis is in pixels and the y-axis is normalized to 1. Affected by both lens and demosaicing. Explained in the page on <a href="#">Chromatic aberration</a>.</p> <hr/> <p><b>CA (area) %: Chromatic aberration area as a percentage of center-to-corner distance. A better indicator than pixels (above).</b> Equal to <math>100 * (\text{CA area in pixels}) / (\text{distance from center in pixels})</math>, corrected for the edge angle. Relatively independent of the ROI location because CA tends to be proportional to the distance from the image center. It is also independent of the number of pixels in the sensor. Explained in the page on <a href="#">Chromatic aberration</a>. <b>Approximate meaning:</b> Under 0.04; insignificant. 0.04-0.08: minor; 0.08-0.15: moderate; over 0.15: serious.</p> <hr/> <p><b>CA (crossing):</b> Chromatic aberration based on the edge centers (where the edges cross 0.5). This is generally smaller than CA (equiv.) and less indicative of the visibility of the CA, but <b>more indicative of lens performance</b>. This measurement can be very different from CA (area) due to the effects of demosaicing. It is primarily the result of lens chromatic aberration, and tends to be very close to CA (area) when Bayer <a href="#">RAW</a> images are analyzed.</p> <hr/> <p><b>R-G, B-G :</b> Red-Blue and Red-Green spacings in percentage of center-to-corner</p>

distance. Useful for correcting CA, especially when applied prior to [demosaicing](#).  
Displayed only in Imatest Master.

Average pixel levels in the dark and light areas. Clipping can occur if they are too close to 0 or 255.

### Below the plot

These items are only displayed if the Noise Spectrum and Shannon capacity box is unchecked.

Noise in the dark and light areas, described [below](#).

A thumbnail of the image showing the region of interest (ROI).

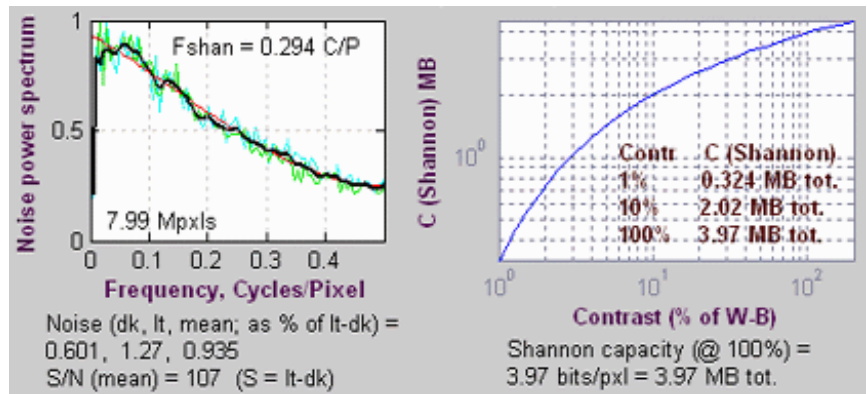
## Lower part of figure: Noise and Shannon information capacity plots for the selected channel, normally luminance (Y)

Shannon capacity is an experimental measurement that is strongly affected by signal processing (especially sharpening and noise reduction). It is not a reliable way of quantifying camera performance (though it's somewhat better with RAW files than with processed files (in-camera JPEGs)).

### Noise spectrum plot (left side)

The noise spectrum plot is somewhat experimental. Bayer interpolation causes the noise spectrum to roll off to about 0.5 at 0.5 Cycles/Pixel; noise reduction causes additional rolloff. Low to middle frequency noise components tend to be more visible. The spiky **light cyan** and **green** curves

Noise spectrum and Shannon capacity are only plotted if the selected region is large enough to provide reasonable noise statistics.



represent two different directions. The thick **black** line is the smoothed average of the two. The **red** line is a third order polynomial fit to the noise.

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**Shannon capacity plot**  
(right sde)

Shannon capacity **C** as a function of signal **S** (closely related to image Contrast), where **S** is expressed as the percentage of the difference between the white and black regions of the target (**S<sub>std</sub>**). A Contrast of 100% represents a fairly contrasty image, 10% represents a low contrast image, and 1% represents a smooth area like skies. These numbers are only meaningful for comparing digital cameras. They should be used with caution because signal processing, especially noise reduction, has a strong effect on Shannon Capacity. There is a table of results in the page on [Shannon information capacity](#).

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**Text at bottom**

Noise in the dark and light areas, and the mean of the two. Measured after the input data has been linearized (corrected for the gamma encoding). Expressed as a fraction of the difference between the average levels of the light and dark areas (**S<sub>std</sub>**). This difference is the standard signal, **S**, used in the calculation of [Shannon information capacity](#). The noise measurements in [Q-13 Stepchart](#) and [Colorcheck](#) are more reliable and useful.

Signal-to-noise ratio S/N for the mean of the light and dark areas. This is the inverse of the noise for the mean of the light and dark areas, above. Used in the calculation of **Shannon capacity**.

[Shannon information capacity](#) of the camera for signal **S** = **S<sub>std</sub>**, measured in bits per pixel and megabytes total. This is an approximate calculation that provides an estimate of overall image quality for moderately contrasty images, as affected by sharpness and noise.

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