

## HOW SHARP IS THAT LENS? – BY JEFF GARDNER



In order to determine how sharp a new lens is before purchasing or to compare the sharpness of different lenses, you can use an MTF chart provided by lens manufacturers.

**What is an MTF Chart:** It's a graph indicating a lens' ability to resolve sharpness, measured by both *resolution (detail)* and *contrast (difference between white and black)*. Sharpness is determined in a test lab by photographing repeating lines running from one corner of the image to the other, through the centre. Fine lines are photographed to measure *resolution (detail)* and bold lines are used to measure *contrast*. By running the lines from one edge of the image to the other, its possible to determine lens sharpness across the image. This is important since many lenses don't perform well at the edges or in the corners. Interestingly, detail varies for objects running top left to bottom right (Meridional) when compared to objects running the other way (Sagittal), thus both measurements must be recorded in the graph.

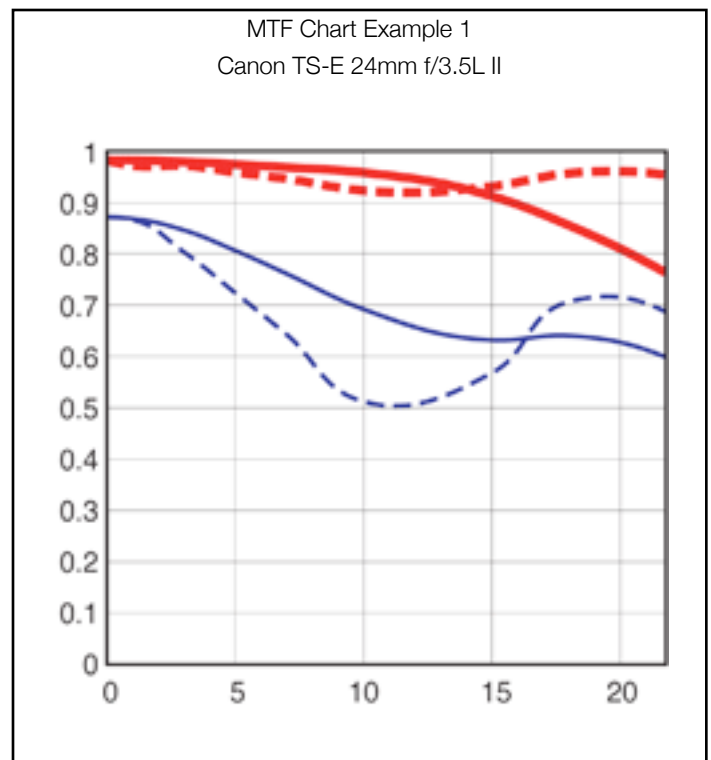


**MTF Chart Format:** Before I explain how to read the details, let's examine the axis. The Vertical axis labeled from the bottom as 0 and 1 on the top measures the lens' variance (its sharpness). 1 indicates 100% accurate or no variance. Generally anything below 0.6 is considered unacceptable by most photographers.

The Horizontal axis 0 – 20 represents the distance in mm out from the centre of the lens to the edge.

A perfectly straight line running along the top of the chart would indicate a perfect lens from the lens centre to its' edge.

The chart formats (defined below) are coded using different colours to record sharpness for *resolution* and *contrast* for Meridional and Sagittal lines. Newer MTF chart formats, as in example 1 for a Canon TS-E 24mm f/3.5L II lens, use four lines all measuring the lens when fully open ). Older MTF charts have eight lines, four lines for fully open and four lines at f8. In the above MTF chart, the lens has excellent contrast since all red lines are well above 60%, but has slightly less detail at about 10mm from the centre of the lens. Objects may not be perfectly sharp at that point, but elsewhere on the lens



detail is good. In personal tests, I could actually see some fuzziness with this lens although overall the lens is quite sharp.

**Chart Formats:** The following table provides a key to the lines in the MTF chart. Also please note that most manufacturers have switched to the new chart format so new lenses only come with MTF information corresponding to the lens fully open.

**NEW CHART FORMAT - LENS WIDE OPEN**

MTF Chart Line Format	Sharpness Measurement	Diagonal Direction
Green or Blue - dotted	Resolution	\ Meridional
Green or Blue - solid	Resolution	/ Sagittal
Red - solid	Contrast	/ Sagittal
Red - dotted	Contrast	\ Meridional

**OLD CHART FORMAT**

Older lenses have old format MTF charts with eight lines. See the example on the next page.

**Blue lines are at F8**

MTF Chart Line Format	Sharpness Measurement	Diagonal Direction
Blue Thin Solid	Resolution	\ Meridional
Blue Thin Dotted	Resolution	/ Sagittal
Blue Thick Dotted	Contrast	/ Sagittal
Blue Thick Solid	Contrast	\ Meridional

**Black lines are Lens wide Open**

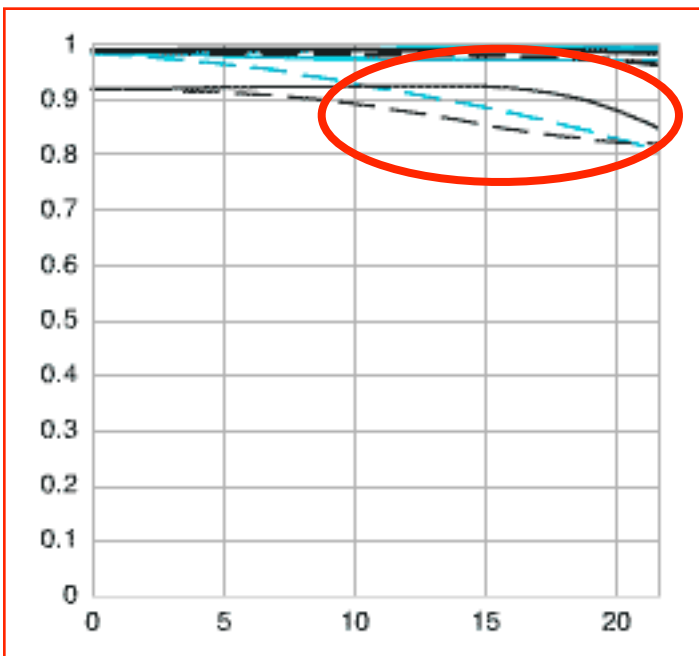
MTF Chart Line Format	Sharpness Measurement	Diagonal Direction
Black Thin Solid	Resolution	\ Meridional
Black Thin Dotted	Resolution	/ Sagittal
Black Thick Dotted	Contrast	/ Sagittal
Black Thick Solid	Contrast	\ Meridional

## Comparing two lenses

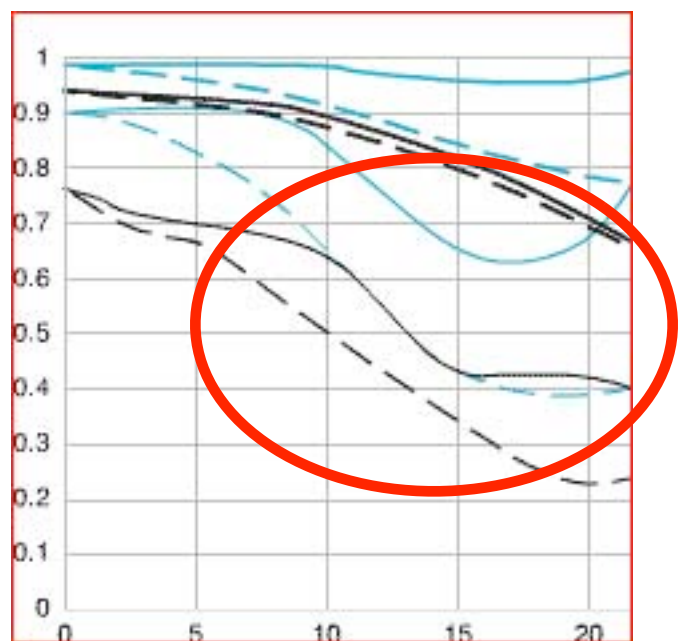
The following two MTF charts compare two different types of Canon 400mm lenses. Since there are 8 lines on the chart, refer to the old chart format on the previous page. The F2.8 lens (left chart) is considered a very sharp wildlife/action lens. The 5.6 is not as sharp a lens and is of course slower at 1/5 the price of the 2.8 lens. Note the areas circled in red which indicate any weakness in the lens. The 2.8 lens does not degrade image quality below 80% which is very good. This holds true from the centre of the lens to its edges at both f2.8 and f8.

Compare that with the 5.6 lens with a resolution that falls off dramatically 10mm out from the centre of the image. This resolution loss is more pronounced if the lens is wide open (note the black thin lines representing wide open f5.6 as compared to the blue lines at f8).

Canon EF 400mm F2.8L



EF 400mm f/5.6L USM



### THE BOTTOM LINE

In the end, the quality of a lens is subjective, you either like the image quality or you don't. The quality of each lens also varies, so you may not achieve the same results as a lab, but at least the MTF table provides an opportunity to compare lenses in an objective manner.