# How to read MTF chart

There are two types of MTF chart. One considers the diffraction quality of light, which is called "Diffraction MTF", and the other, "Geometrical MTF" does not.

The quality of light appears in the diffracted light, and becomes more distinct as the F value gets bigger, resulting in lower image quality. Also, diffracted light exists at every aperture, which is why SIGMA has been releasing Diffraction MTF data from the beginning since it is very close to the actual image data.

The advantage of using "Geometric MTF" data is that it is easy to measure and calculate since it does not consider the diffraction quality of light, yet it tends to show higher values in the graph than actual images.
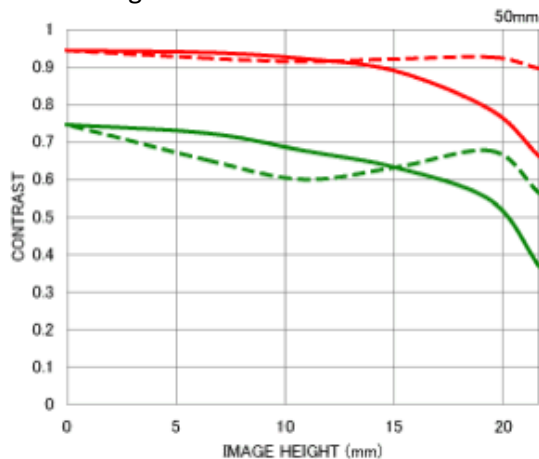
| Spatial frequency	S:Sagittal Line	M:Meridional Line
10lp/mm	————	··············
30lp/mm	————	··············

The MTF chart gives the result at the wide-open aperture

The readings at 10 lines per millimeter measure the lens's contrast ability (red lines), repeating fine parallel lines spaced at 30 lines per millimeter measure the lens's sharpness ability (green lines), when the aperture is wide open.

Fine repeating line sets are created parallel to a diagonal line running from corner to corner of the frame, are called Sagittal lines (S) and sets of repeating lines vertical to these lines are drawn, called Moridional (M) line sets.
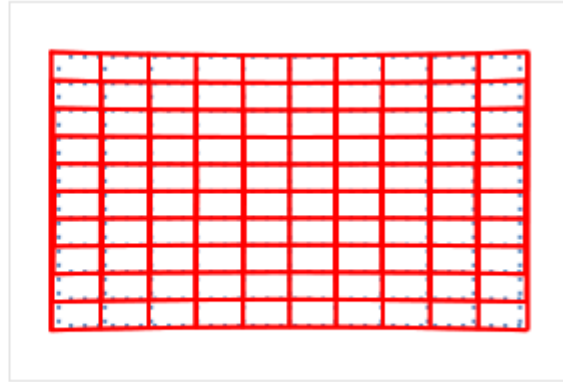
How to read the distortion chart

effective distortion

When you take a picture of a lattice pattern, it will appear as the blue dotted line shows. The red line illustrates how the lattice pattern will appear in the actual picture when any lens distortion is taken into account.
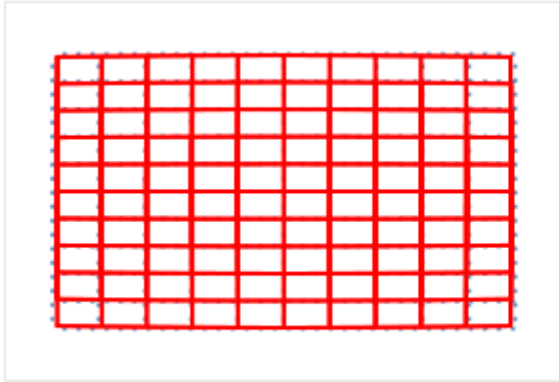
Barrel distortion

Pincushion distortion

relative distortion

In this chart, the horizontal axis shows the ideal image height (the distance from the center to the edge of the image [mm]). The vertical axis shows the extent of distortion. The extent of distortion is represented by how much Y, which is the actual image height, grows (or shrinks) against Y0 which is the ideal image height.
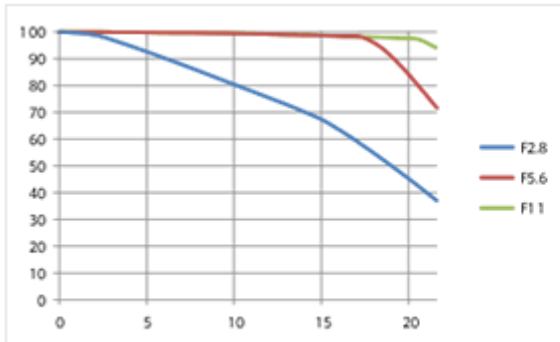
Extent of distortion ： $D[\%] = \frac{Y - Y0}{Y0} \times 100$

When you take the picture of a square object, if the distortion amount shows a minus value, the image will be seen as expanded (Barrel distortion). If the distortion amount is a plus value, it will be seen as a recessed (Pincushion distortion). When the distortion value is close to 0, the appearance of distortion is very minimal.
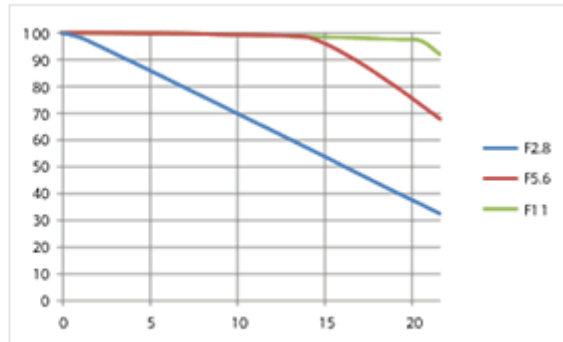
How to read the relative illumination chart

The horizontal axis shows the image height (the distance from the center to the edge of the image [mm]).
The vertical axis shows the amount of light in the image (based on the amount of light in the image center being 100%). If the peripheral amount of light is lower than the center, the four corners of image will be darker (vignetting).

Wide

Tele