Rule of Thumb -"Lens Sweet Spot (Aperture) Calculator"

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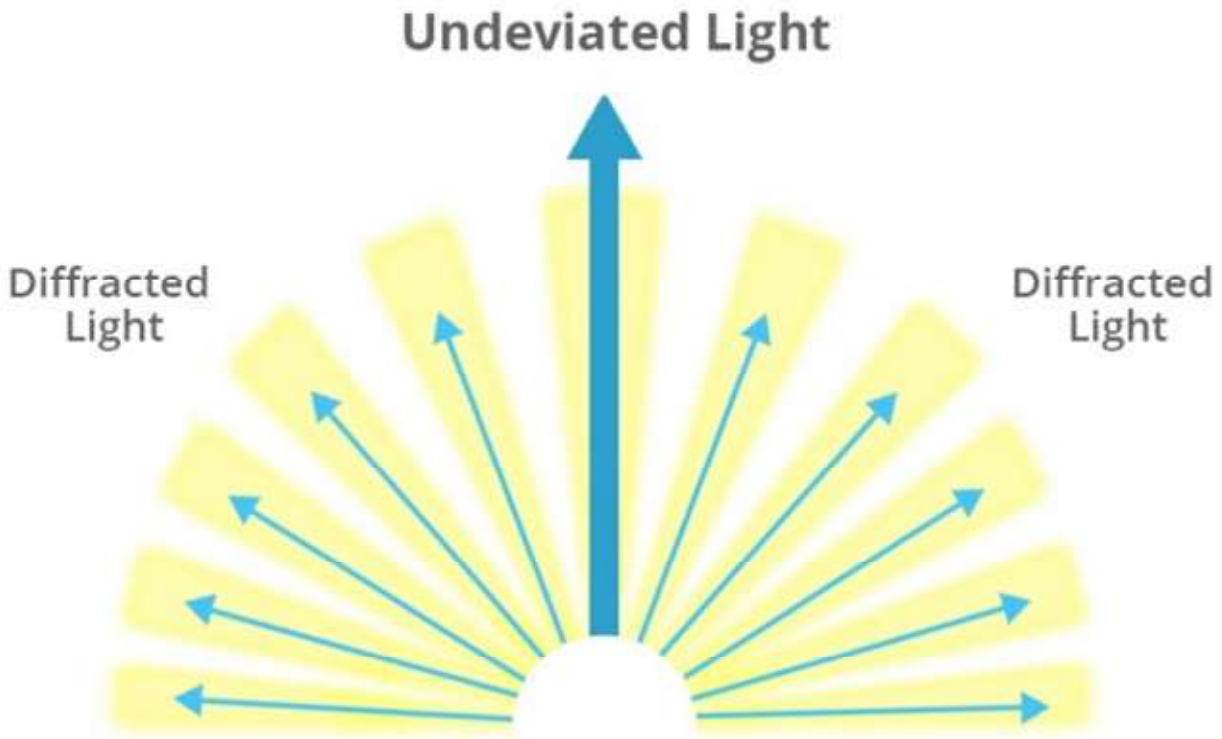
1. Lens Diffraction: What It Is, and How to Avoid It

Reference: http://www.bhphotovideo.com/explora/photography/tips-and-solutions/lens-diffraction-what-it-and-how-avoid-it

With the ever-increasing number of pixels manufacturers can cram onto a single digital image sensor, the optics themselves are beginning to become the limiting factor in image quality. This is making it all the more important to Stop down our lenses in an effort to squeeze as much sharpness from them as possible. Unfortunately, while stopping down is a great way to sharpen pictures, if we go too far, we end up with deteriorating image quality. This optical effect is called *Diffraction*.

<u>Diffracted light creates a softer image. Non-Diffracted light creates a Sharper, more detailed image.</u>

A Lens utilizes an Aperture to help control depth of field(DOF), one of the most important tools in photography. However, leaving the aperture wide open will often result in slightly soft images, due to the lens's lack of ability to focus the light rays at that aperture. On the other hand, if you Stop down too much, diffraction will also soften images because the extremely small aperture opening will bend the light in a different way, resulting in rays that aren't accurately captured.



Light entering the camera from a single, small point has the potential to spread out at sharper angles, causing diffraction and softer images.

In order to get the best possible performance from a lens, we have to find its *'Sweet Spot'(Aperture)*.

There are many factors that go into finding the sweet spot of a lens, perhaps the most important of which is the *"Camera's Image Sensor*".

http://www.bhphotovideo.com/explora/content/rules-thumb-finding-your-lens-sweet-spot

(See pages 3-5)

2. Rule of Thumb - Finding Your Lens 'Sweet Spot'

Reference: http://www.bhphotovideo.com/explora/content/rules-thumb-finding-your-lens-sweet-spot

Rule of Thumb - Finding Your Lens 'Sweet Spot' (Aperture)

When defining the term image quality there are several qualifiers that go into the mix. Among them are ***tonality, contrast, brightness, and dynamic range***, which is the degree of detail one can detect in the deepest shadows and brightest highlights. And then you have sharpness, which might be the trickiest to define.

"Is it sharp?" might just be the number-one question people ask when shopping for lenses. After all, if you're going to be taking pictures with the camera you worked long and hard to purchase, you want to be assured the lens you're contemplating to buy will perform as advertised and deliver pictures you'll want to share with others.

What many shooters do not understand - and this includes many advanced shooters as well as newbies to the sport - is that lenses are not uniformly sharp at every aperture, nor at every focusing distance. And in the case of zoom lenses, not equally across the zoom range. A good example would be macro lenses, which as a rule, deliver higher resolving power at closer distances compared to non-macro lenses, which as a rule perform better than macros at distant focus settings.

Now while we can't possibly address the optimum shooting parameters needed to squeeze the highest performance out of every lens on the marketplace, there are a few guidelines we can offer up that might at the very least influence the way you go about taking pictures.

The first thing we have to do is define the difference between ***Maximum Sharpness and Maximum Focus***.

If your goal is to squeeze the maximum levels of ***Image Sharpness*** out of your lens you can achieve this by simply ***Stopping*** your lens **Aperture down 2.5 to 3-Stops** from the lens's maximum Aperture.

As in "**Example 1**", if the maximum Aperture of your lens is f/2.8, you'll want to shoot with your lens aperture set between f/5.6 and f/8.

"**Example 2**" if the maximum Aperture of your lens is f/3.5, the ***'Sweet Spot'*** of your lens resides somewhere between f/8 and f/11.

Example 3, if your lens has a maximum aperture of f/1.4, the ***'sweet spot'*** of your lens is located somewhere between f/2.8 and f/4. ***And this simple Rule of Thumb works with almost every lens you'll ever own.***

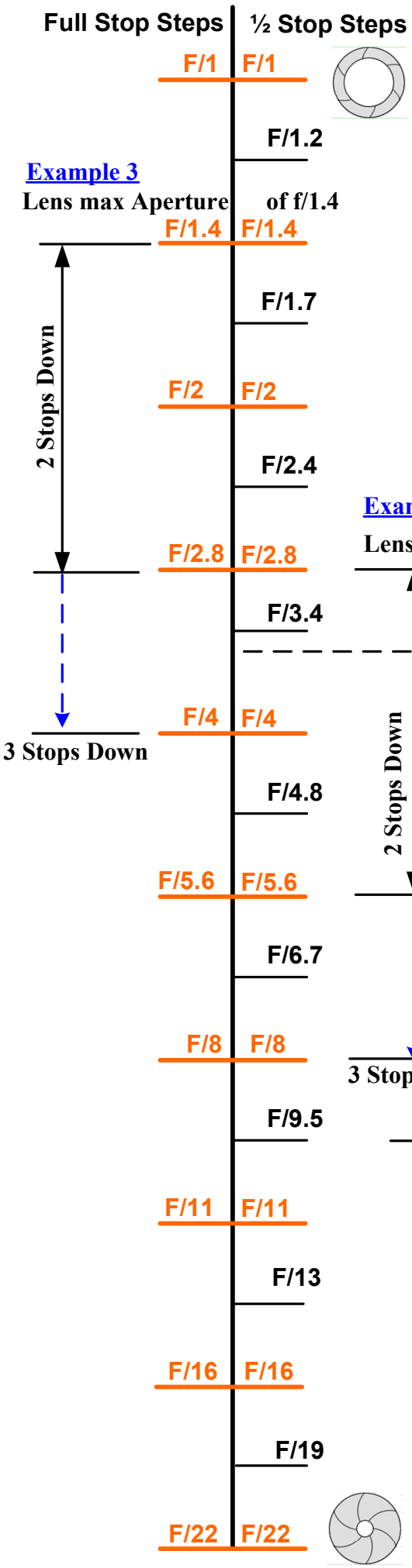
Now some readers are probably baffled by the last paragraph because they're confusing ***Sharpness***, which is a measure of resolving power, with depth-of-field(***DOF***), which is a measure of focus. When you **Stop** your lens down to smaller apertures, you do in fact bring more of the image into greater overall focus. This is akin to reading a piece of newsprint held a few inches from your eye. By squinting at it - i.e., stopping down your eye - it suddenly becomes more readable. Similarly, pictures captured at f/11, f/16, or smaller appear ***'Sharper'*** than images taken at wider (f/2.8, f/2, f/1.4, etc) Apertures. But while you might have more in Focus in a picture taken at a smaller Aperture, overall, it's probably not as Sharp compared to the in-focus portions of the same picture taken at the **"Sweet Spot"** of your lens.

What all this means is that when you're out shooting you have to decide whether you are after maximum resolving power or greater overall focus. And do keep in mind the actual differences in *Sharpness* between the two may not be all that great (or even noticable) when viewing these images side-by-side on your computer screen or in the form of mid-sized prints, but the differences are there none-the-less.

Note - When you STOP a lens Down to smaller Apertures the increase of focus is not equal fore and aft of your subject, but rather 1/3 foreward and 2/3 backward. In other words, when you STOP Down your lens you increase depth-of-field(DOF) between your subject and the background at twice the rate of the increase of focus between your subject and your lens.

It's also worth noting that just as the widest Aperture of your lens doesn't represent the true resolving power of your lens, the smallest Aperture - even though it allows more of the image to appear in Focus - is most often equally deficient in the Sharpness department.

Aperture Stops F/1 ..F/22



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