Why Collimating Lenses are So Important

Technical Tip

KEYWORDS ***Achromatic • Divergence • Spot size • Field of View***

Collimating lenses are curved optical lenses that make parallel the light rays that enter your spectrometer setup. These lenses allow users to control the field of view, collection efficiency and spatial resolution of their setups, and to configure illumination and collection angles for sampling. Single and achromatic lenses are available.

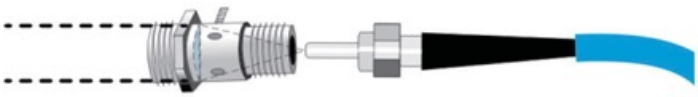

Figure 1. With a collimating lens, users can control the field of view (FOV) of the light entering a sample or spectrometer from near 0° to 45°.

In simplest terms, collimation ensures that light rays travel parallel to each other and don't disperse in unwanted directions.

Collimating Lenses in Spectroscopy Setups

Ocean Optics collimating lenses can be used in free space optics, in which light energy is collected from open beams and surfaces and directed to the spectrometer, or can be attached to optical fibers (**Figure 2**) or integrated into sampling accessories. Most lenses have an inner barrel threaded for SMA 905 connectors. The inner barrel slides relative to the lens fixture for adjusting the focus; a setscrew secures the barrel.

Figure 2. Collimating lenses screw on to the end of SMA 905-terminated optical fibers. The lens at left is best for applications that require collimation of light at long distances in open air.

For certain techniques, collimated light must enter a sample, pass through it, and then be transmitted to the spectrometer at the other side (**Figure 3**). As such, collimating lenses are attached to the fiber from the

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light source and from the fiber to the spectrometer. You can select from both single and achromatic collimating lens options, with your choice of wavelength range and focal length.

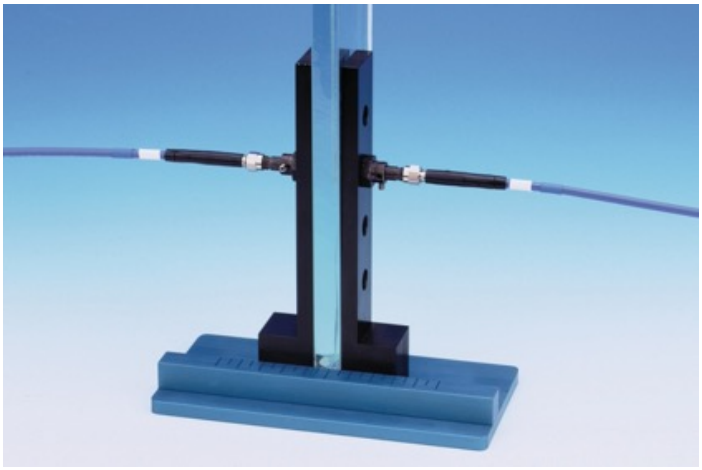

Figure 3. In this setup, collimating lenses attached to optical fibers flank a solid glass sample.

Collimating Lenses – FAQs

How do I determine divergence in single lens systems?

The divergence (a) of a beam focused using a single lens is tan(a) = d/f where f is the focal length of the lens and d is the aperture or fiber diameter. Our standard collimating lens have 10 mm focal length and 5 mm diameter.

What is the FOV of the optical fibers Ocean Optics offers?

Our fibers have FOV of ~25°. Collimating lenses are adjustable, allowing the user to establish FOV angles from near total collimation (~0°) to ~45°.

Why would I use an achromatic collimating lens?

An achromatic doublet like our 74-ACR comprises two lenses and greatly reduces chromatic aberrations. The result is a consistent FOV for the sampling setup, where "contamination" of the spectrum caused by wavelengths outside the optimal FOV is eliminated. Applications including absolute irradiance may benefit most from the use of achromatic lenses.

What lens material is used in Ocean Optics collimating lenses?

Except for the standard 74-VIS (BK7 glass) and achromatic 74-ACR (BaF10 and FD10 fused silica), the lenses are Dynasil or Suprasil fused silica. Lens barrels are anodized aluminum.

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