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GUIDE TO SELECTING INPUT FIBER OPTIC PROBES FOR THE OL 770

In the field of spectroradiometry, fiber optic probes are used to transfer light from the input optic to the entrance slit of the spectroradiometer for presentation to the diffracting element of the system. Ideally, the fiber should present a uniform image to the diffraction element to eliminate spectral errors at the CCD. In addition the FOP should transmit all of the light available from the input optic in order to take advantage of the highest system sensitivity. Therefore the choice of FOP in spectroradiometry is highly dependent on application and intended usage.

Fiber optic probes can come in a variety of dimensions, and their cores can be made of single fibers *(called single core)*, or bundles of fibers *(referred to as multi-core*). Single core fibers are highly desirable in spectroradiometric applications because they affect light passing through them in the same way as integrating spheres integrate light entering them. Single core fibers take non-uniform sources and scramble them such that there is uniform output at the other end. By the physics of wave propagation in confined materials, single core fibers are highly susceptible to bend radius under certain conditions; the larger the fiber the more susceptible to bend radius. These fibers can be subject to more than 40% attenuation in signal with bend radius. A reduction in core diameter can help alleviate this condition, but as the fiber diameter is decreased, its throughput is decreased as well. A reduction in throughput means loss in system sensitivity.

The second type of fiber, the multi-core fiber is resistant to signal attenuation due to bend radius. The reason for this is that each of the individual cores in the bundle is a single core fiber with a tiny diameter which makes them insensitive to bend individually and collectively. However the multi-core fiber fails to effectively integrate the light as it passes through it. Each individual core in the bundle effectively integrates the rays that pass through it, but since the fibers in the bundle are independent of one another, each fiber transmits a different part of the image and therefore an image is formed at the entrance slit of the spectroradiometer, rather than the ideal uniform spot. It may be used for uniform sources, however is not recommended for non-uniform sources.

It is clear from this discussion that single core fiber optic probes should only be used in applications where bend radius is not a concern, preferably in stationary systems where the fiber location is set and is not subject to movement during the course of a measurement.

Examples of uniform sources include non-imaging applications such as the use of an integrating sphere as an input optic and extended sources such as displays. Non-uniform sources, on the other hand can include applications where an imaging element is used as an input optic, such as telescope.

The choice of fiber optic probes is recommended to be defined by the measurement application. Recommended FOP selections are summarized below:

STATIONARY SYSTEM		NON-STATIONARY SYSTEM	
Uniform	Non-uniform	Uniform	Non-uniform
600 um Single Core	600 um Single Core	600 um Multi-core	300 um Multi-core

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