

FIBER OPTICS TECHNIQUES AND APPLICATIONS

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Questions Directed to Dr. N. S. Kapany - SPIE Session I-2

- Q. (R. Carroll Beaty) - In attempting to achieve high transmission for long fibers, how strong an effect does the cladding material transmission factor have? That is to say, should the cladding material have a very high transmission for the wavelengths one is interested in transmitting via the fiber?
- A. The transmission characteristics of the cladding material on fibers are of considerable importance for long fiber lengths. We should bear in mind that the evanescent boundary wave penetrates more than a wavelength into the cladding material at every total internal reflection, thus resulting in a considerable path length in the cladding material. Consequently, if the cladding material has any significant absorption, this will lead to extensive light losses in long fibers. Therefore, it is necessary to use cladding material having a high light transmission at the desired wavelengths, although the transmission requirements are not as stringent as those for the core glass.
- Q. (E. Marcatili) - (1) What is "Crofon"? (2) How is a conical faceplate made?
- A. (1) "Crofon" is a trade name for plastic fibers coated with a low refractive index coating material manufactured by DuPont. Such fibers have high light transmission and are quite inexpensive for many light piping applications.
- (2) A conical faceplate is made by starting with a boule of fused fibers, heating it in the middle, and pulling it apart at the softening temperature of the fibers.
- Q. (Dawirs) - What is the limit of cathode ray tube faceplate size?
- A. Fiber optics for cathode ray tube faceplates up to 4 to 6 inches in diameter are routinely available; however, some manufacturers have made faceplates as large as 12 inches or more.
- Q. (de Lange) - What is the use of etchable glasses?
- A. Etchable glasses are used in fiber optics for selectively etching a given material. For example, in the fabrication of microchannel plates, all of the fiber cores are made of etchable glass. After etching the fiber cores in such a plate, one is left with a multiplicity of close-packed hollow channels in which electron multiplication occurs.

- Q. (Valerie Olson) - What was the total white light transmission of the 50 foot bundle (%)?
- A. The white light transmission of high-quality, well-packed, 50-foot long fiber optics light pipes was found to be 8%.
- Q. (David Bosserman) - (1) To what extent are image inverters classified or restricted from commercial use by the Military Agencies? (2) What is the meaning of MTF in fiber optics — in particular, past the visual resolution cut-off frequency?
- A. (1) Commercial use of image inverters is limited since the physical dimensions and design details are classified, in addition to the optical performance characteristics.
- (2) When several fiber optics components are used in series such that the resolution is significantly less than that determined by the sampling frequency of each fiber optics component, the MTF is a wholly realistic measurement and is intrinsically independent of position and orientation. When a single fiber optics component is measured, a wide range of purported MTF curves can be obtained. However, if the Fourier transform of the line spread function of an aligned array of fibers is obtained, the measurement is a maximum response and can be repeated. It is a good measure of the plate's relative quality but is dependent on the shape of the individual fiber. Hence, caution must be taken in comparing plates for various manufacturers.