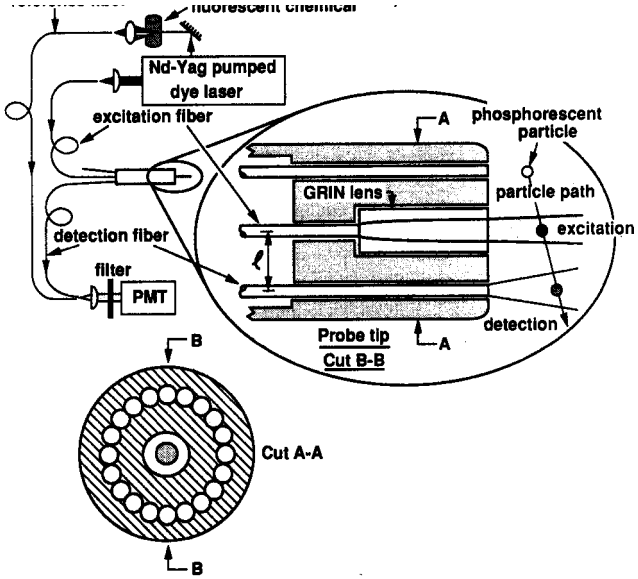
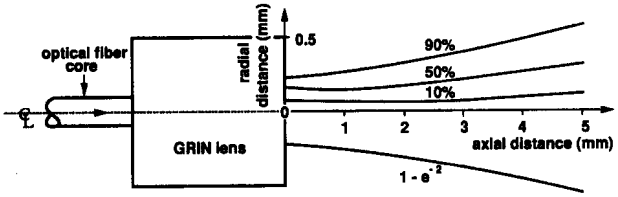
Louge, M.Y., Iyer, S.A., Giannelis, E.P., Lischer, D.J. and Chang, H.: "Optical Fiber Measurements of Particle Velocity using Laser-Induced-Phosphorescence," *Applied Optics* **30**, 1976-81 (1991).

An optical fiber anemometer that uses laser-induced-phosphorescence to measure particle time-of-flight in dense gas-solid suspensions is described. The anemometer is tested using a spinning disc coated with a phosphor having a persistent afterglow. The diagnostic technique is illustrated by measuring the velocity of free-falling particles coated with the same phosphor. Monte-Carlo simulations are employed to determine the optical characteristics of the probe, including its measurement volume.



Principle of operation of the probe. The cuts A-A and B-B show the relative position of the GRIN lens and the excitation and detection fibers at the probe tip. Only one detection channel (filter, PMT) is shown.



Integrated axisymmetric radiant energy contours from the Monte-Carlo simulation. The numbers indicate the fraction of the total beam energy contained within the radial distance from the optical axis. The dimensions of the optical components are consistent with the two different scales used in the radial and axial directions. At the wavelength of 440nm, the focal length and fractional pitch of the GRIN lens are 0.98mm and 0.26, respectively.