Photonic Crystal Fiber end-sealing

Longterm use of solid core fibers is often limited by end facet damage due to the high intensity in a fiber core. This is especially the case when small core nonlinear fibers are pumped by high peak power femtosecond pulses.

Crystal Fibre has developed an elegant fiber end treatment to increase the fiber end damage threshold and generally ease the interfacing. By collapsing/tapering of the fiber end, we obtain the following advantages:

- Hermetical sealing of the fiber
- Can be connectorized and polished
- Beam expansion such that the fiber end facet spotsize is minimum an order of magnitude larger than the internal mode field diameter resulting in very high fiber end damage threshold
- Effective incoupling NA is reduced/mode field diameter is increased resulting in higher coupling efficiency and stability

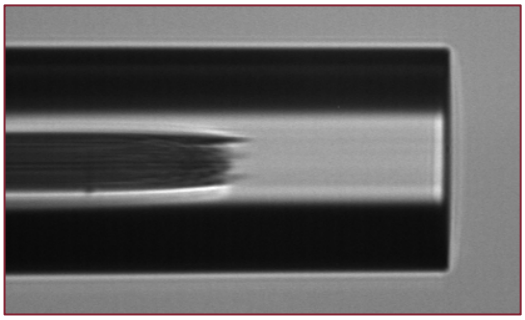
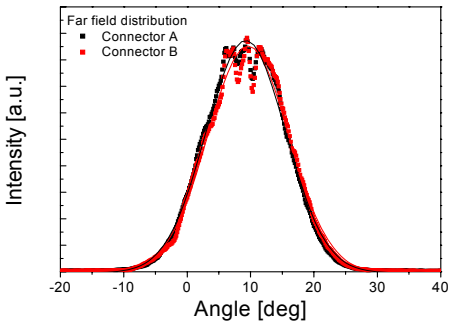
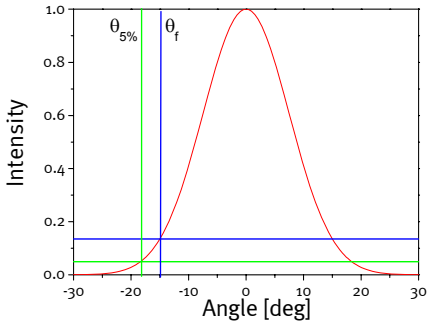


Photo of collapsed fiber end

Example of far field distribution for collapsed and FC/PC connectorized nonlinear fiber, λ = 780 nm





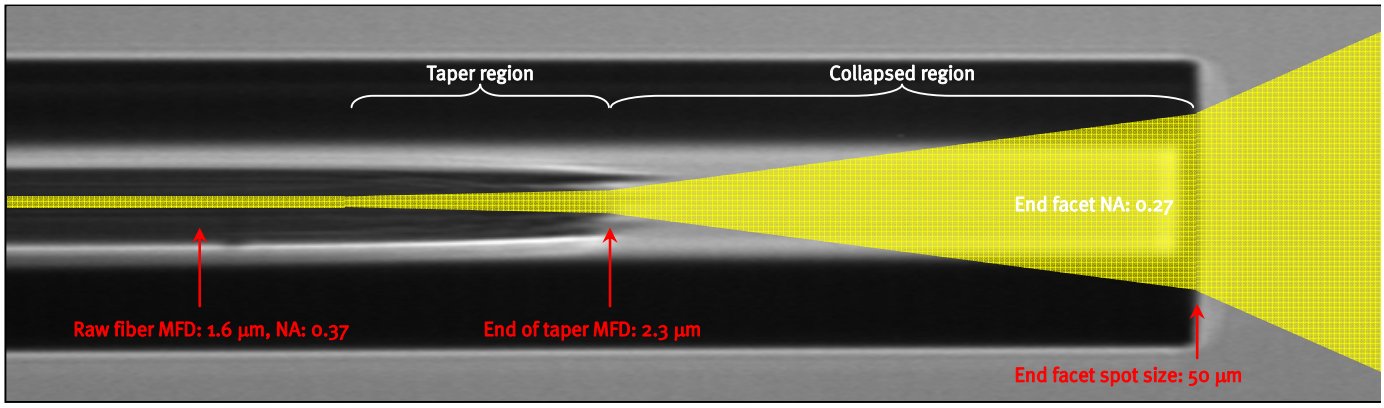
Definition of far field parameters

Assuming a Gaussian far field distribution, the following definitions are used:

- θ_f is the angle where the peak intensity has descreased to $1/e^2$ (see figure)
- θ_5 % is the angle where the peak intensity has descreased to 5% (see figure)
- $\theta_5\,\% = (\ln(20)/2)^{1/2} * q_f = 1.2239 * \theta_f$
- $NA = \sin(\theta_5\%)$
- $MFD = 2l / (p \sin(q_f))$ (Gaussian mode field diameter)

Example of nonlienar fiber end treatment, λ = 780 nm

The end of the Photonic Crystal Fiber is heat treated to collapse the airholes



End-sealing-100121

NKT Photonics A/S (Headquarters)
Blokken 84 • 3460 Birkerød • Denmark
Phone: +45 4348 3900
Fax: +45 4348 3901
www.nktphotonics.com

NKT Photonics GmbH
Schanzenstrasse 39 • Bldg D9-D13
51063 Cologne • Germany
Phone: +49 221 99511-0
Fax: +49 221 99511-650

NKT Photonics Inc.
1400 Campus Drive West • Morganville
NJ 07751 • USA
Phone: +1 732 972 9937
Fax: +1 732 414 4094