NKT Photonics

aeroGAIN - Ultrafast Fiber Laser Gain Products

Crystal Fibre • *aero*GAIN • *aero*PULSE • Koheras • SuperK • Fianium • LIOS

NKT Photonics

Vision

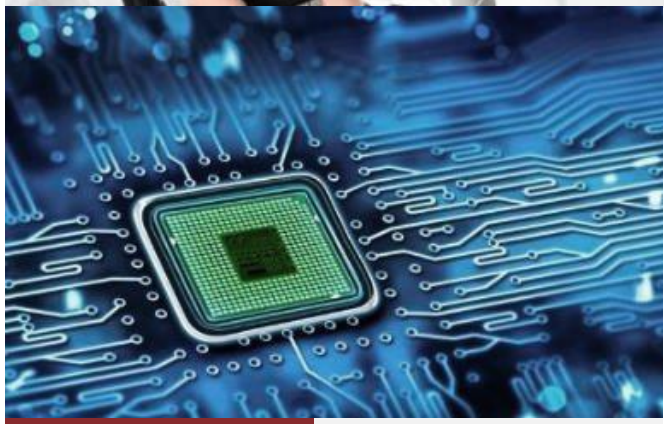
“Through optical fiber- and laser technology, we deliver state-of-the-art commercial solutions in collaboration with our partners for the benefit of mankind”

How are we different?

- NKT Photonics at the forefront of switch to fiber lasers
- Unique and IP protected fiber platform (>350 patents and applications)
- We provide the main fiber engine for the majority of the ultrafast fiber laser market
- Market leader in supercontinuum white light lasers

Markets

Imaging & Metrology



47%

Sensing & Energy

41%

Material Processing

12%

Material Processing

Industrial

Mobile, electronics, display

Market size EUR ~270m
CAGR ~14%

Medical

LASIK, cataract

Market size EUR ~100m
CAGR ~30%

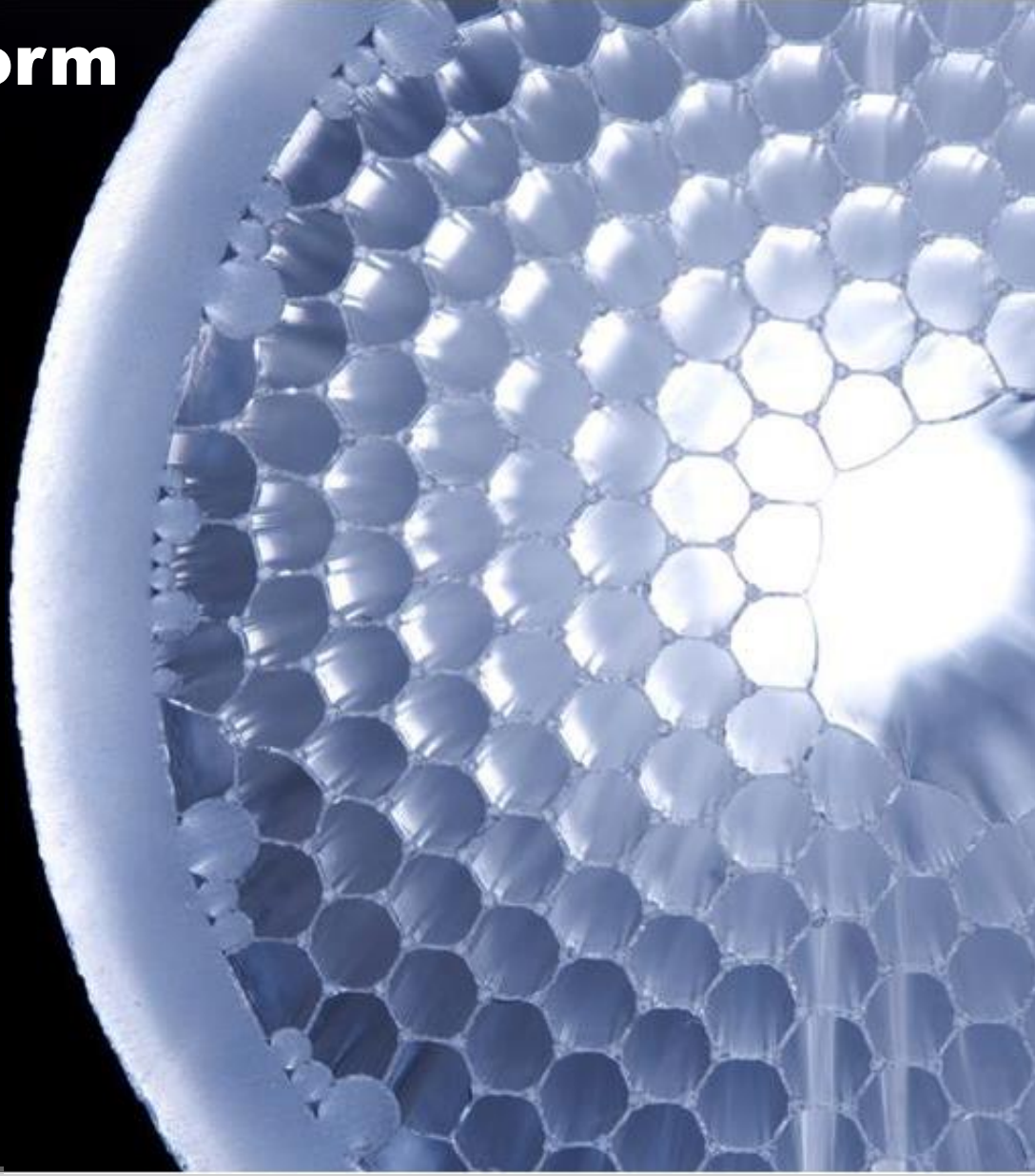
Marking

Glass, metal, plastic

Market size EUR ~200m
CAGR ~7%

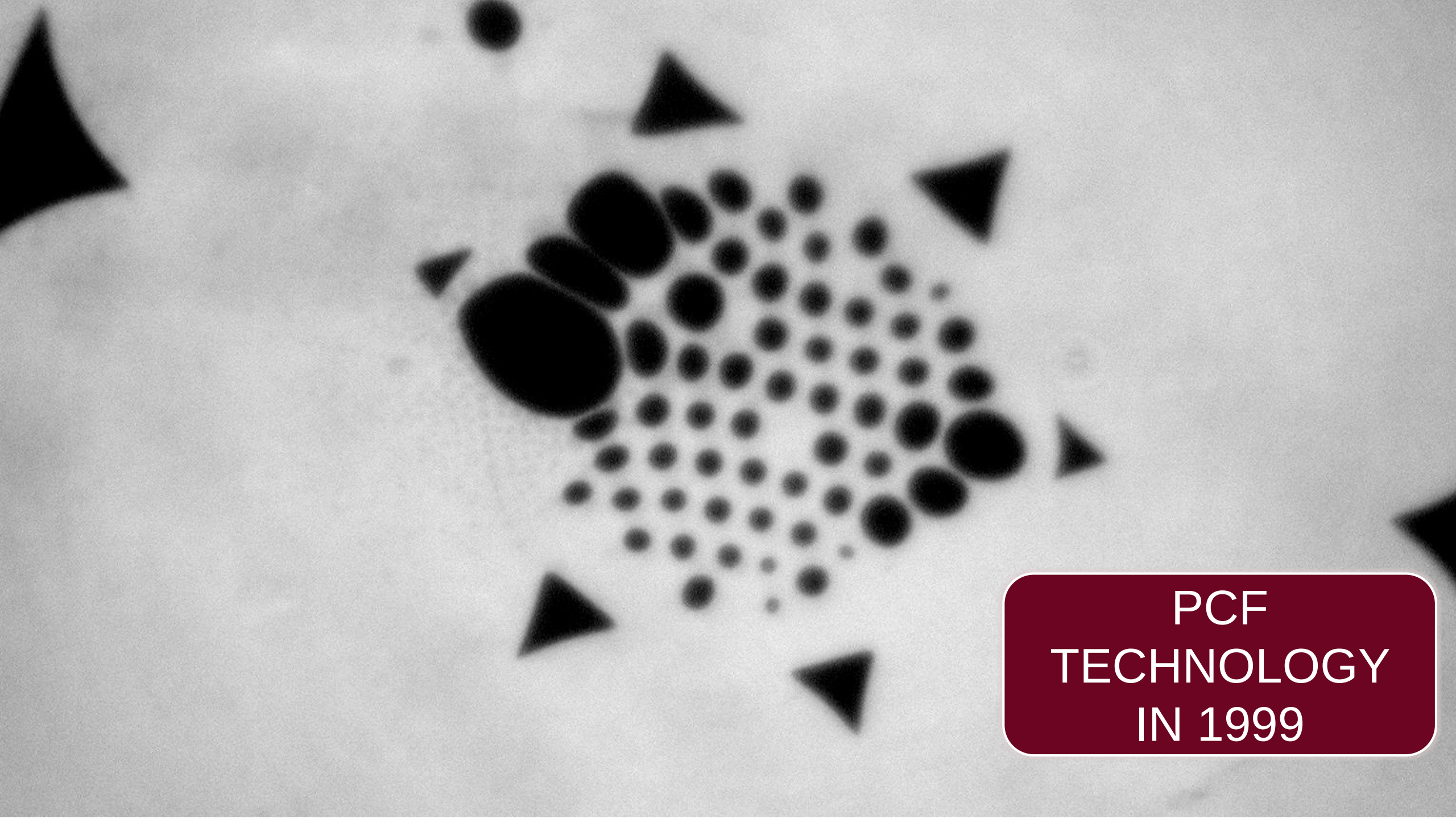
Photonic Crystal Fibers - Our Platform

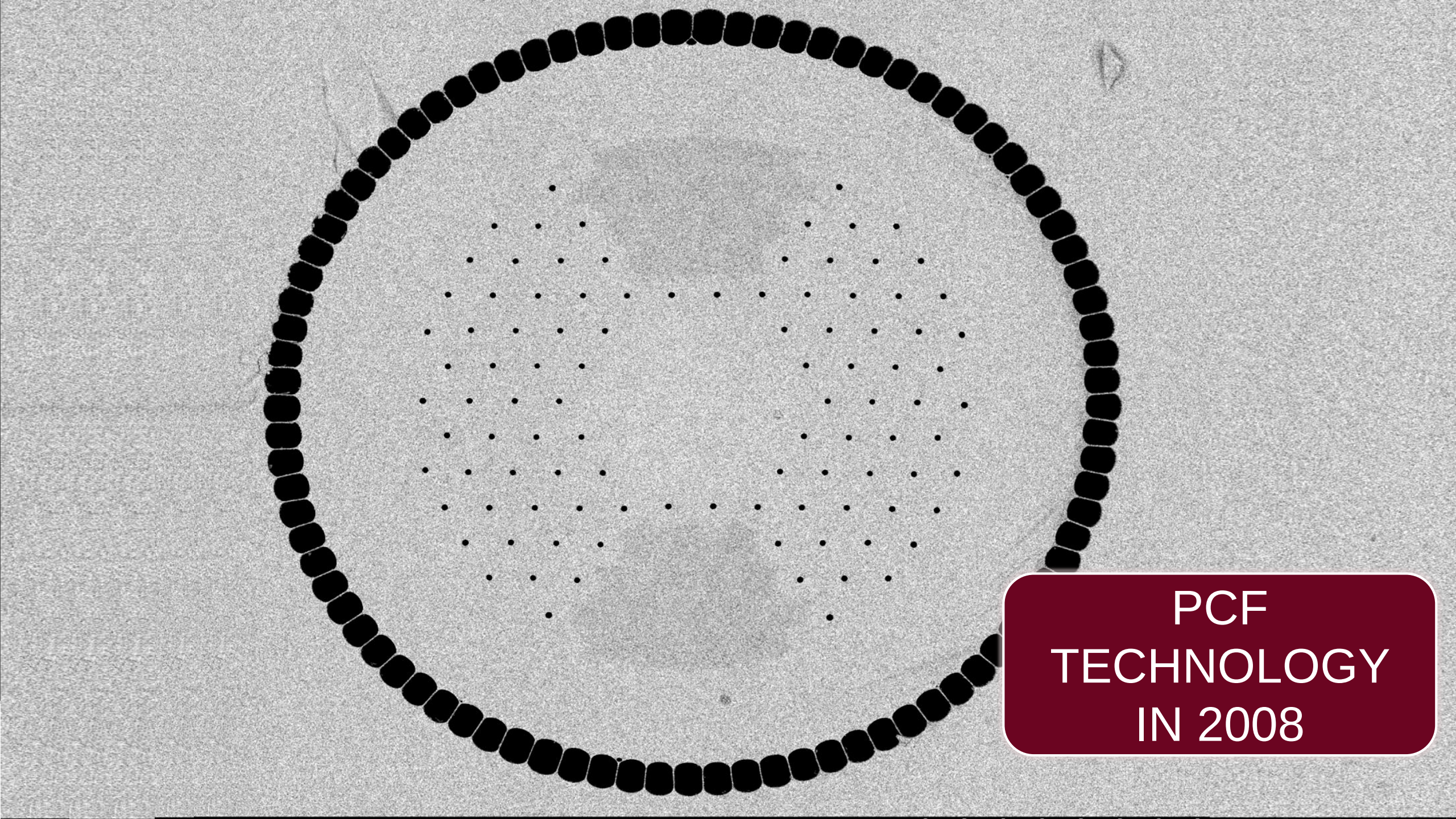
- Nonlinear fibers
- Passive single-mode large mode area fibers
- Active double clad fibers
- Gain modules
- ROD fibers
- HC fibers

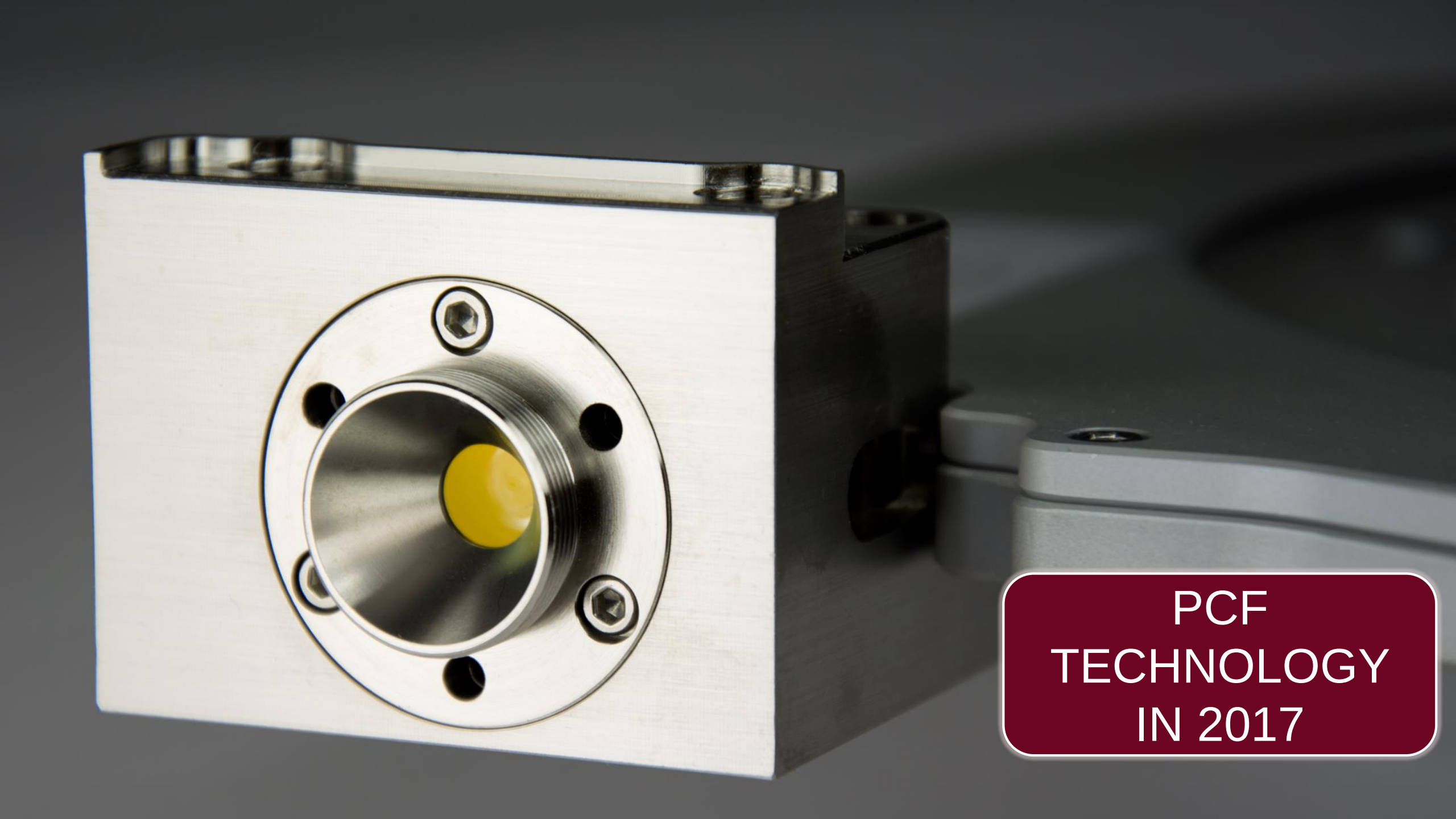


Fiber house

- 17 years of fiber experience
- All fibers made in-house
- Cutting-edge designs
- Full quality control

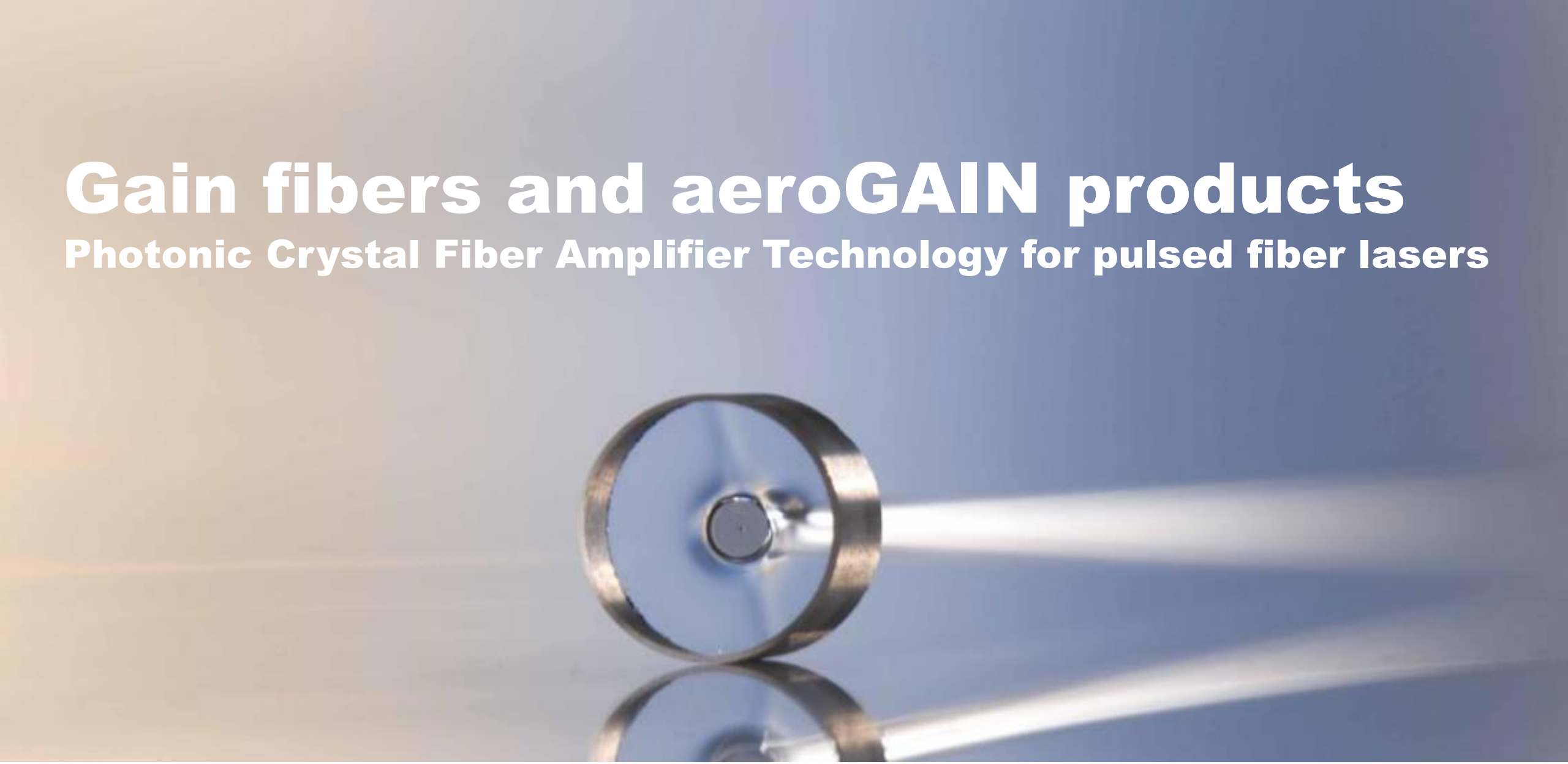

PCF
TECHNOLOGY
IN 1999


PCF
TECHNOLOGY
IN 2008


PCF
TECHNOLOGY
IN 2017

Gain fibers and aeroGAIN products

Photonic Crystal Fiber Amplifier Technology for pulsed fiber lasers



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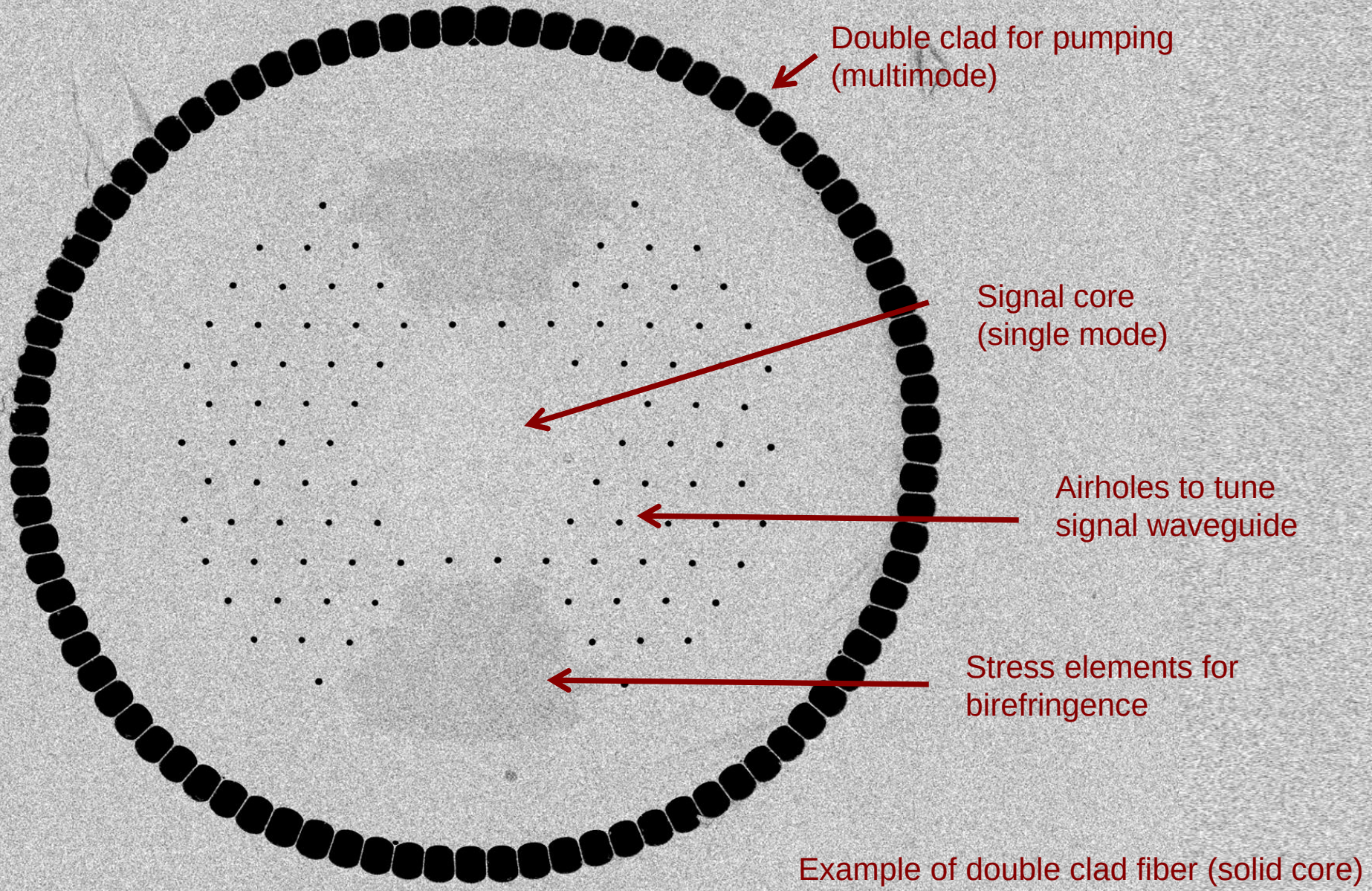
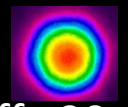


Example of double clad fiber (solid core)

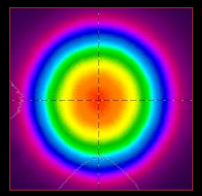
Gain fibers

PM980 /Hi1060



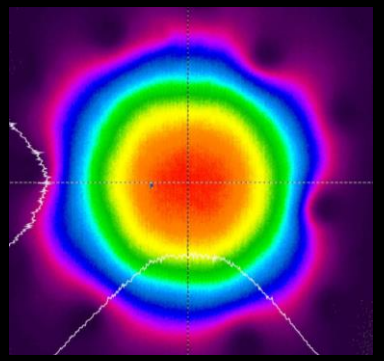
Aeff ~30μm²

DC-135/14-PM-Yb



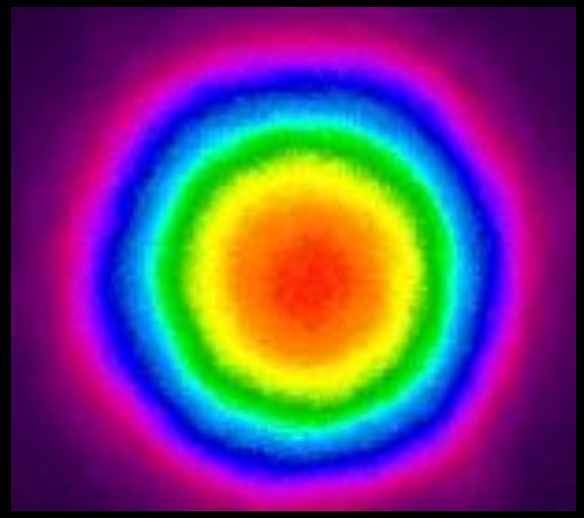
~175μm²

DC-200/40-PZ-Yb
aeroGAIN-BASE



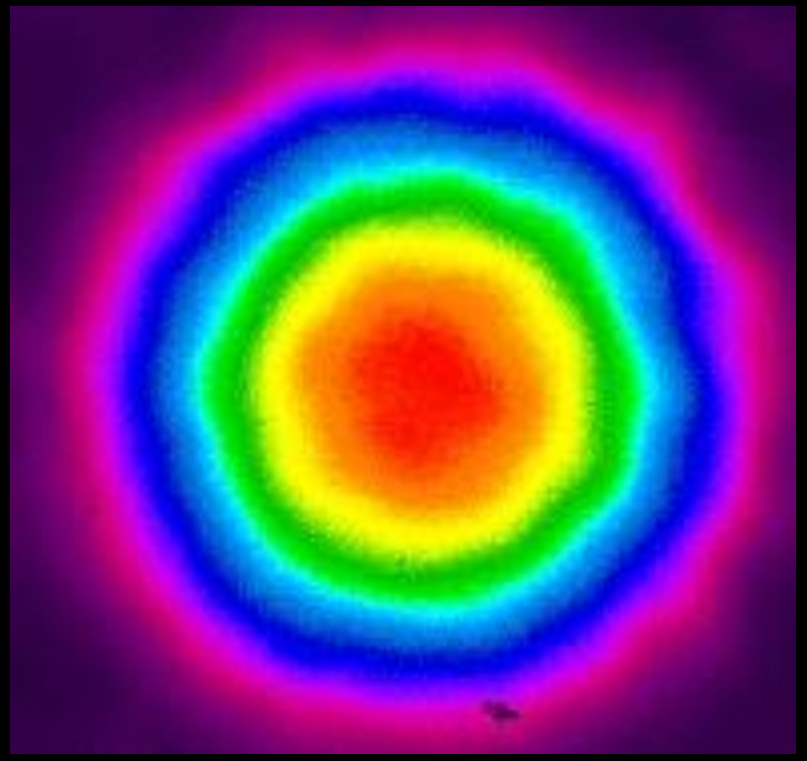
~700μm²

aeroGAIN-ROD-PM55



~1600μm²

aeroGAIN-ROD-PM85



~3500μm²

aeroGAIN-BASE

Fiber amplifiers modules

aeroGAIN-BASE OEM modules

- High pulse energy
- Nanosecond, picosecond, femtosecond

v1.1

- High average power
- Rated @ 100 W pump → 75 W signal
- Watercooled
- High power solution for 1064 nm
  - 3 m fiber length

v1.2

- High average power
- Rated @ 100 W pump → 75 W signal
- Watercooled
- High power solution for 103x nm
  - 1.8 m fiber length

v1.3

- Medium average power
- Rated @ 40 W pump → 30 W signal
- No water cooling
- Medium power solution for 103x nm
  - 1.8 m fiber length

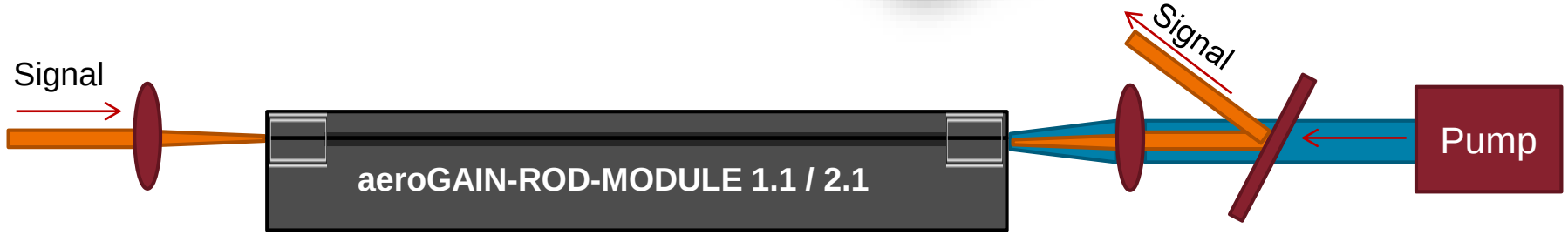
When peak power is beyond ~250 kW:

aeroGAIN-ROD

Gain modules for ultra-fast lasers

aeroGAIN-ROD fiber amplifier module

- Highest pulse energy
- Highest average power
- 55 or 85 µm core diameter, single mode
- Polarization maintaining
- Nanosecond, picosecond, femtosecond
- Rated @ ~ 170 W pump → 100 W signal
- Optimized for 1030 - 1040 nm
- No solution for 1064 nm



aeroPULSE

Ultrafast fiber lasers

aeroPULSE

High power picosecond fiber lasers

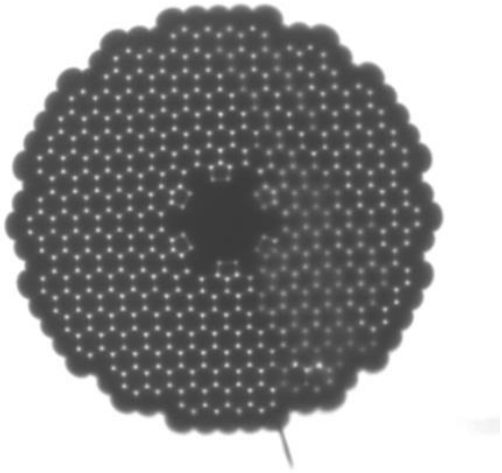
- Up to 40W Average Power
- Excellent Beam Pointing Stability
- Narrow Linewidth
- Compact & Rugged OEM Design
- Low Cost of Ownership
- All-Fiber Design, Industrial Reliability
- Maintenance Free 24/7 Operation
- System Monitoring via Remote Diagnostics
- No Warm-Up Time – Instant ON

NKT Photonics
the power of light

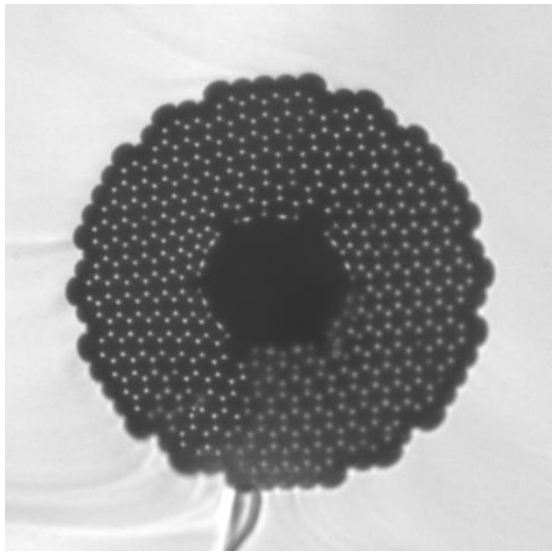
HC fibers

Ultrafast fiber delivery

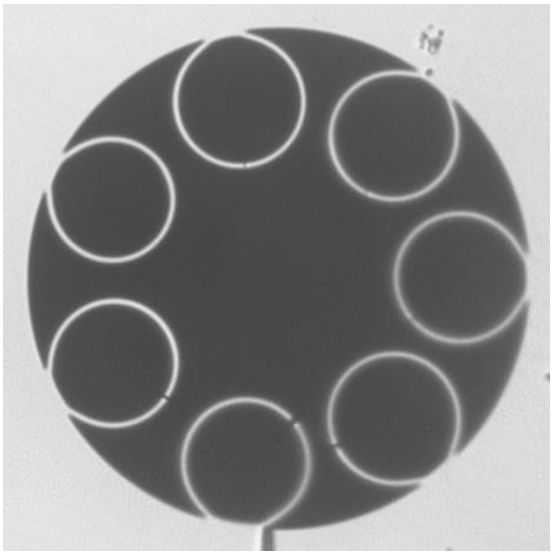
Hollowcore fibers for pulsed fiber delivery



10 µm Core

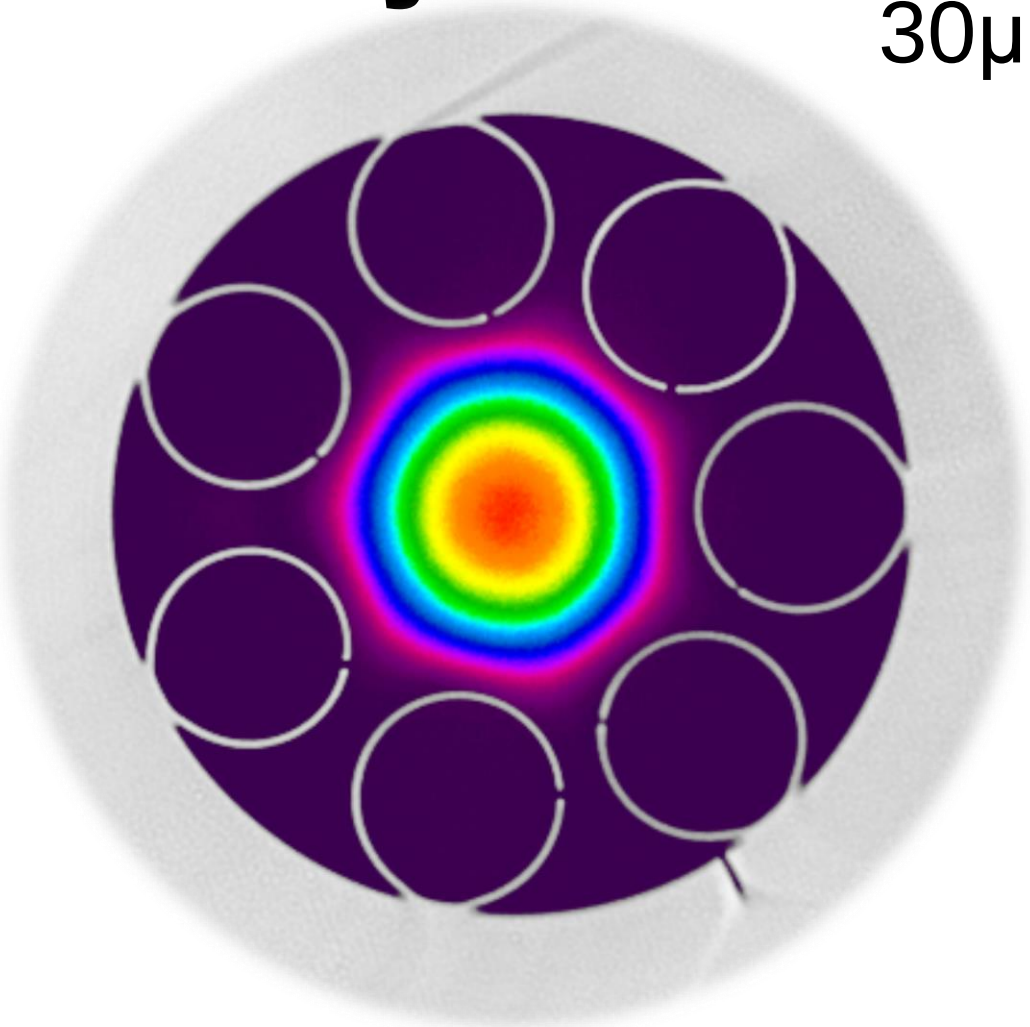


18 µm Core



30 µm Core

Hollowcore fibers for pulsed fiber delivery



30µm Core

M^2 ~ 1.2

30dB/km Loss

10cm Bend Diameter

Ultra-Low Dispersion <10ps/nm/km

Summary

NKT Photonics unique PCF technology is a scalable platform for increasing market demands and it enables new generation of ultrafast fiber lasers with high energy and high average power.