NANYANG TECHNOLOGICAL UNIVERSITY
School of Electrical & Electronic Engineering

OPTIMUS PHOTONICS
OPTIMUS – Centre for OptoElectronics and Biophotonics

High Power Silica Fibre Based Mid-IR Lasers

Introduction

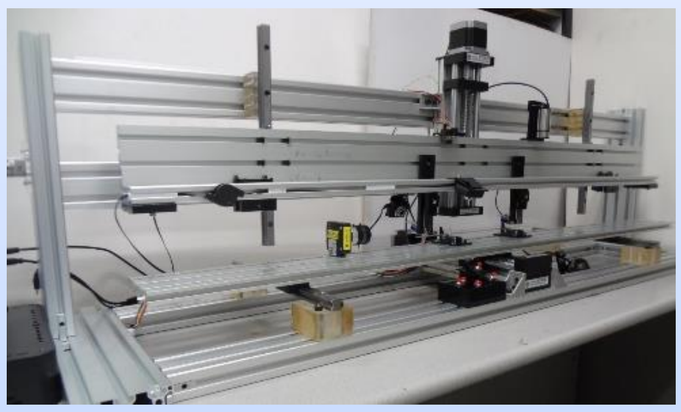
Objectives:
- Design and fabricate loss low hollow core fibres for MidIR nonlinear applications
- Package hollow-core fibres for real applications
- Use hollow core fibre to convert NIR pump source to MidIR efficiently

Novelty:
- Novel fibre design to achieve low loss in MidIR
- New fibre fabrication process
- New fibre package/interface

Research Challenges:
- Loss mechanism of silica hollow-core fibre in mid-IR
- Low-loss guiding for both pump and lasing wavelengths
- Fabrication using local facility
- Interfacing/Packaging

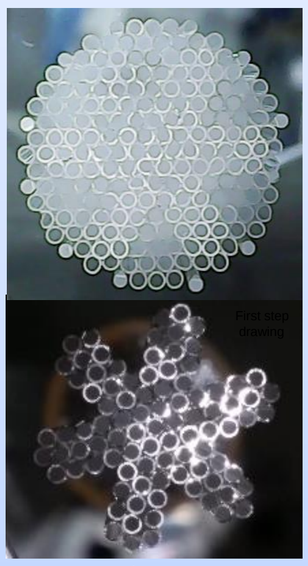
Fibre Fabrication

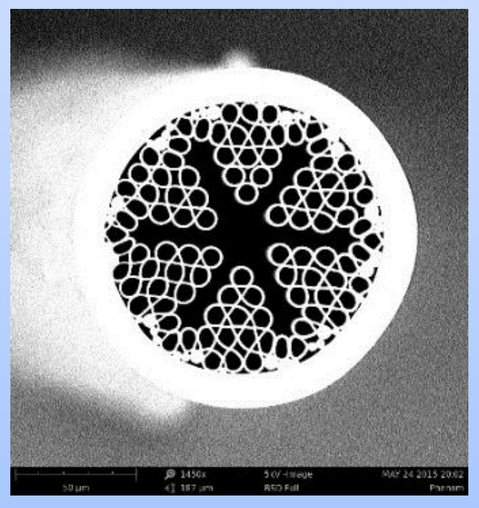
Home made stacking machine



Stack capillaries

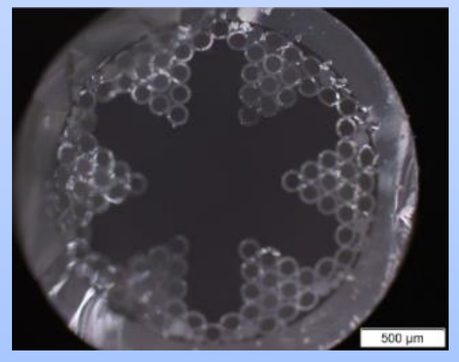
16mm diameter preform





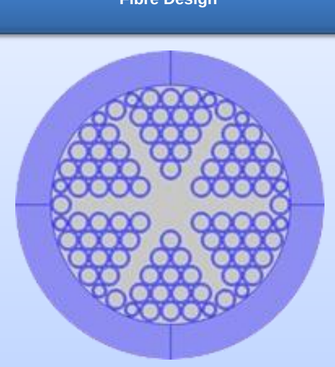
114um inner diameter fibre

Second step drawing



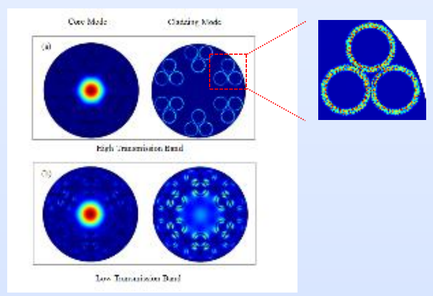
2.5mm diameter cane

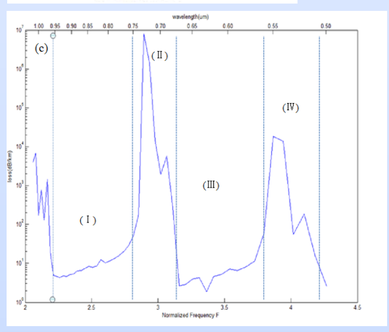
Fibre Design

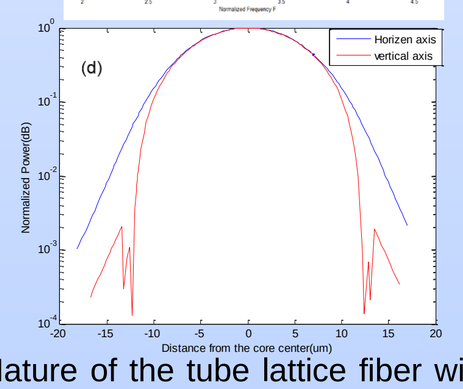


Advantages:
- Less Rayleigh scattering
- Potential to achieve low loss
- Low nonlinearity
- Efficient for light gas interaction

Simulation







Nature of the tube lattice fiber with split cladding. (a) The two columns show the hollow core mode and the cladding mode respectively for a frequency F=2.5 in band I. Inset: zoom in view of cladding mode, the fast intensity oscillation can be observed. (b) Same as in (a) for F=3 in band II. (c) Confinement loss of fundamental mode plotted as the function of normalized frequency $F=\frac{2t}{\lambda}\sqrt{{n_2}^2-{n_1}^2}$. (d) Intensity profile of fundamental mode along the horizontal and vertical cross-section, respectively.

Project Members

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Acknowledgment:
This work was supported by Singapore Ministry of Education (MOE) Academic Research Fund Tier 2 (MOE2011-T2-2-120) and Agency for Science Technology and Research (A*STAR SERC1223600002).