

BACKGROUND

There is a burgeoning transformation in the optics & photonics world, which so far had been driven by Gaussian light beams [Fig. 1(a)]. Increasingly, scientists and engineers are finding new applications that benefit from a beam of light that has the shape of a single ring [Fig. 1(b)]. Recently, annular beams have shown to enhance the quality and control over the laser processing of materials, have revolutionized the field of high resolution optical microscopy (vindicated by a 2014 Nobel prize), and are promising to keep the Internet and Information Age growing by extending the data-carrying capacity in optical fibers and opening new quantum information capabilities.

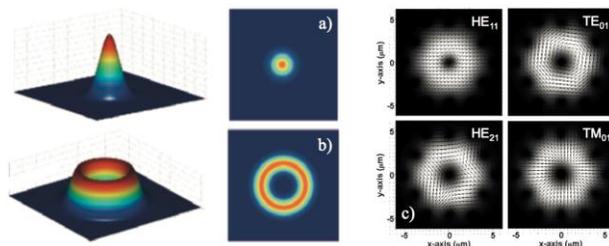


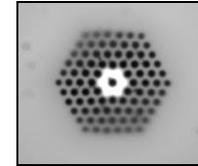
Fig. 1. Exemplar intensity profile of (a) Gaussian and (b) annular beam. (c) Typical annular cylindrical vector beams' intensity profiles (black arrows denote the local E-field direction) guided inside the proposed AC-PCF.

Actual methods of generating and delivering such annular beams rely on a complex arrangement of bulky and expensive optical components that currently inhibits industrial adoption. To address this issue, a novel type of optical fiber, called “annular-core photonic crystal fiber” (AC-PCF), has been developed.

TECHNOLOGY

The proposed AC-PCF resembles a standard photonic crystal fiber where holes of diameter “d” are separated by a pitch “Δ”. By carefully adjusting these parameters and the geometry of the ensemble it is possible to attain a guiding regime in which the modes with radial order $m=1$ are exclusively supported by the fiber at all input wavelengths.

Moreover a proper design makes it possible to control the non-linearities of the fiber.



Cross-section of AC-PCF where light is guided in an annular beam

COMPETITIVE ADVANTAGES

- AC-PCF design guarantees a strictly mono-annular output beam over an infinite wavelength span (endlessly mono-radial order)
- Eliminates the need of bulky and expensive optics to generate annular beams
- Cleaner edges and minimal induced material stress in material cutting & drilling applications
- Annular beams can support orbital angular momentum useful for space division multiplexing (SDM) and high data transmission capacity

APPLICATIONS

- Supercontinuum sources with white annular beams for super-resolution microscopy applications
- Laser material processing
- Space-division multiplexing in telecoms

TECHNOLOGY DEVELOPMENTAL STAGE

- Prototypes to be tested and characterized

BUSINESS OPPORTUNITY

- Partnering and licensing opportunities (patent pending)

FOR INFORMATION PLEASE CONTACT:

Nadia Capolla, Ph.D.
 Director – Business Development
 Phone: 514-840-1226 #3010
 E-mail: ncapolla@aligo.ca