Numerical Modal Analysis of Silica/Air-Clad Dual-Core Fibres

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A numerical modal analysis is performed of the specially fabricated dual-core tapered fibre.

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Silica/air-clad fibres are promising photonic devices due to extraordinary dispersion and nonlinearity. Supercontinuum SC generation is one of many stunning examples [1]. The properties of the generated SC, as well as its occurrence, are rather sensitive to the interplay between nonlinearity and dispersion. In a recently developed dual-core tapered fibre [2], a new geometry and a new degree of freedom (the core separation) are introduced that can be used to design fibres with optimal characteristics. A dual-core fibre configuration is characterized by the core

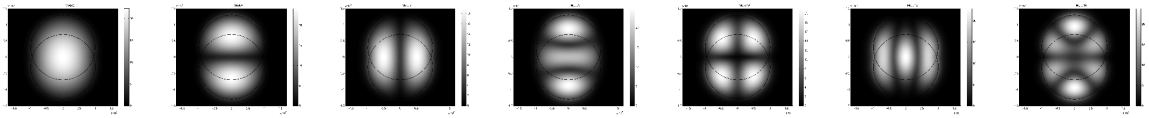

Fig. 1. Mode gallery of the silica/air dual-core fibre

diameter b and distance between the core centres a or aspect ratio b/a. Lowest modes for each configuration have been computed using full vectorial mode simulations. Fig.1 shows examples of the mode profiles.

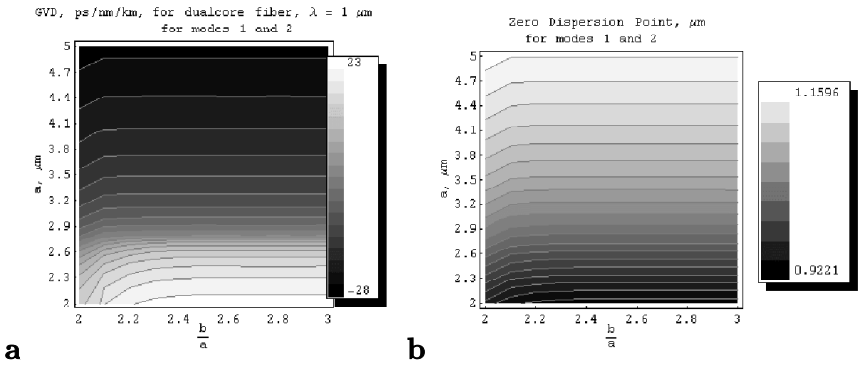

Fig. 2. Group velocity dispersion (a) Zero dispersion point (b) vs aspect ratio and core diameter

Dispersion of the dual-core fibre has also been investigated numerically Several general features can be observed. Smaller core diameter and larger distance between the cores correspond to higher dispersion. Another distinctive property is a noticeable shift of zero dispersion wavelength with variations of the core diameter.

[1] T.A. Birks et al. OECC'2000, PD2-3, pp. 20-21.

[2] S. Kobtsev et al. Quant. Electr., 32 (2002), 11.; S. Kobtsev et al. OFC'2003