Paper number: 233

Effect of Refractive Index Profile of Multimode-fiber on Nonlinear Beam Self-cleaning

Shuzheng Fan[1], Xiaosheng Xiao[1]*, Lili Kong[2], Xia Zhang[2]

1 State Key Laboratory of Information Photonics and Optical Communications, Beijing University of Posts and Telecommunications, Beijing 100876, China

2 Shandong Provincial Key Laboratory of Optical Communication Science and Technology, School of Physics Science and Information

ICOCN 2021

INTRODUCTION

- **Numerical simulation shows that beam self-cleaning can be achieved by optimizing the refractive index profile**
- **In order to realize Kerr self-cleaning, a method for optimizing optical fiber parameters is proposed**

SIMULATION RESULTS

$$n^2(\rho)=\begin{cases} n_0^2[1-2\Delta(\frac{\rho}{R})^{\alpha}], \rho \le R \\ n_0^2(1-2\Delta), \quad \rho > R \end{cases}$$

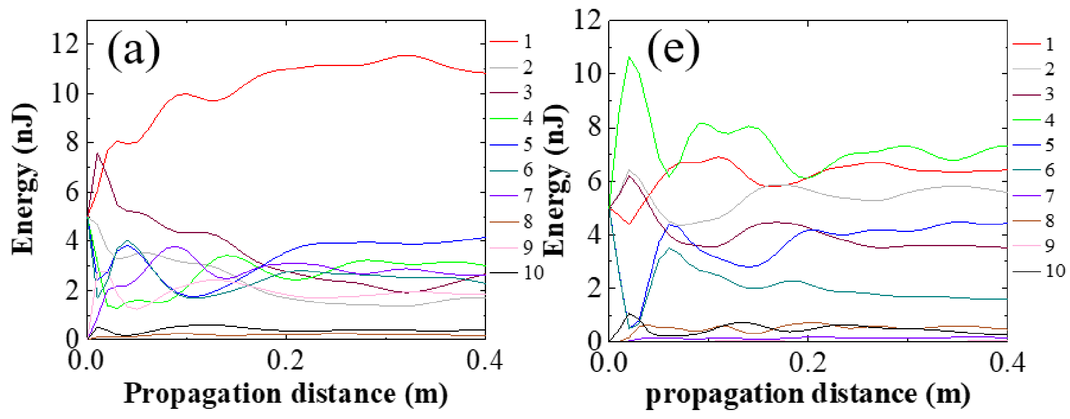

Fig. 1 Numerical results of nonlinear pulse propagation in MMFs with different refractive index profile, (a-d) α=1.97 and (e-h) α=1.955. (a,e) Evolution of energy distribution along the distance. Mode-resolved (b,f) temporal shapes and (c,g) spectra, and (d,h) the whole beam profiles of the output pulses.

Corresponding author email: xsxiao@bupt.edu.cn

We studied the influence of the fiber parameters, α and NA, on the beam self-cleaning. The ratio of fundamental mode content to total energy after transmission are shown in Fig. 2.

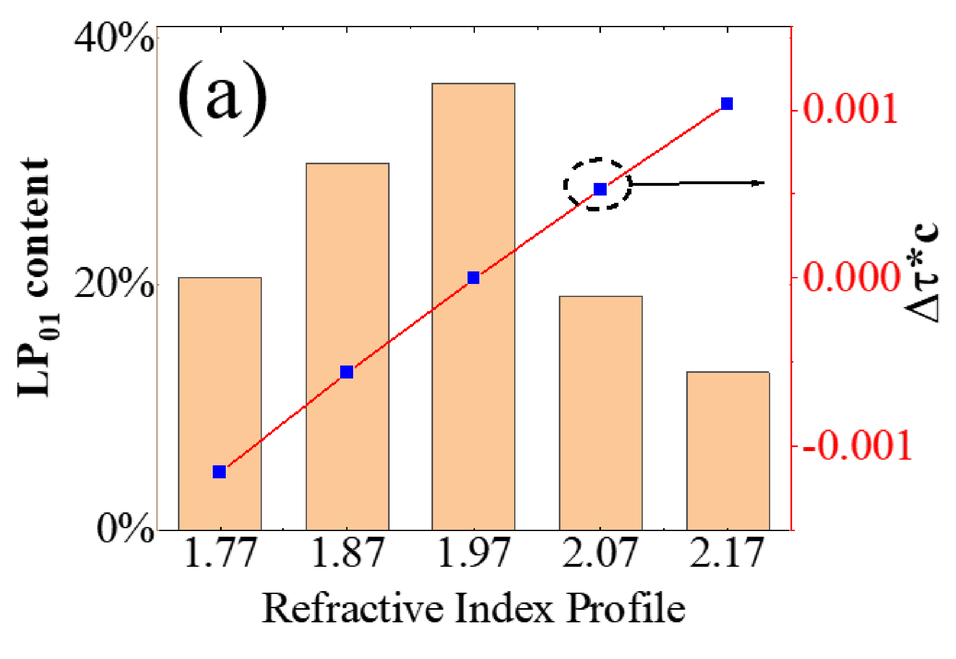

Fig. 2 The calculated output LP_{01} content for different fiber paramters, (a) NA=0.25, refractive index profile α and (b) α=1.97, NA.

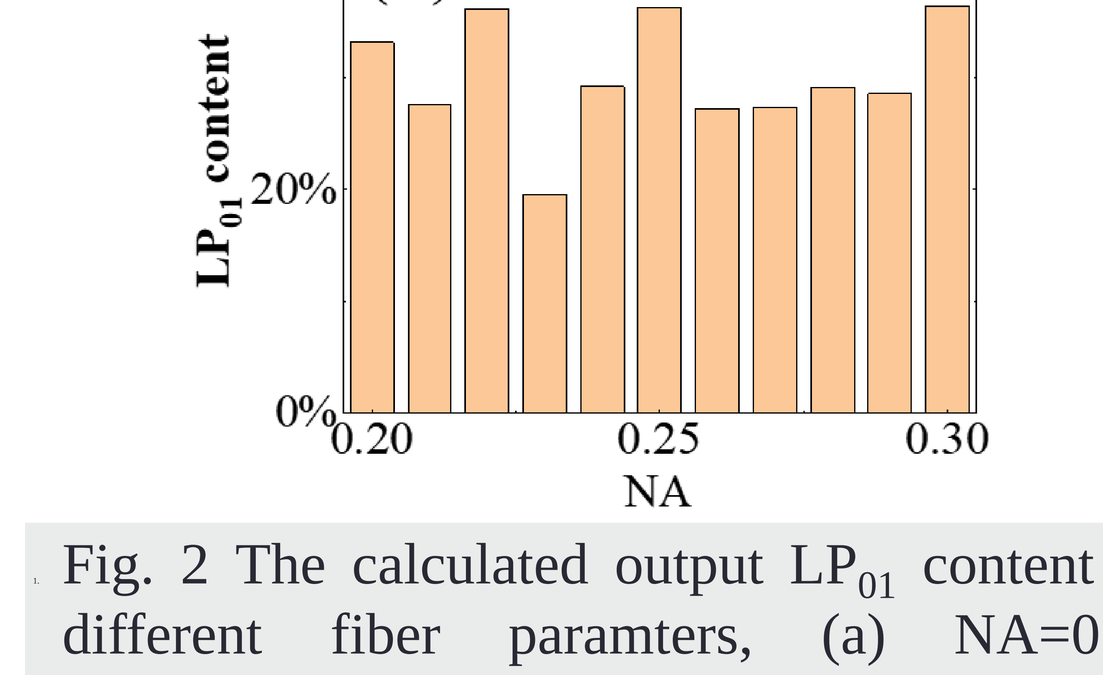

Fig. 3 The calculated output LP_{01} content for different center wavelength of input pulses. For each wavelength, the fiber parameter α is optimized by minimizing the modal dispersion.

CONCLUSIONS

- **Changing the refractive index profile has a great influence on Kerr self-cleaning phenomenon of the multimode fiber.**
- **The optimized value of the refractive index profile can be calculated by letting the modal dispersion approach to zero.**