

Wrocław University of Science and Technology Numerical modelling of conical wave formation in multimode optical fibers

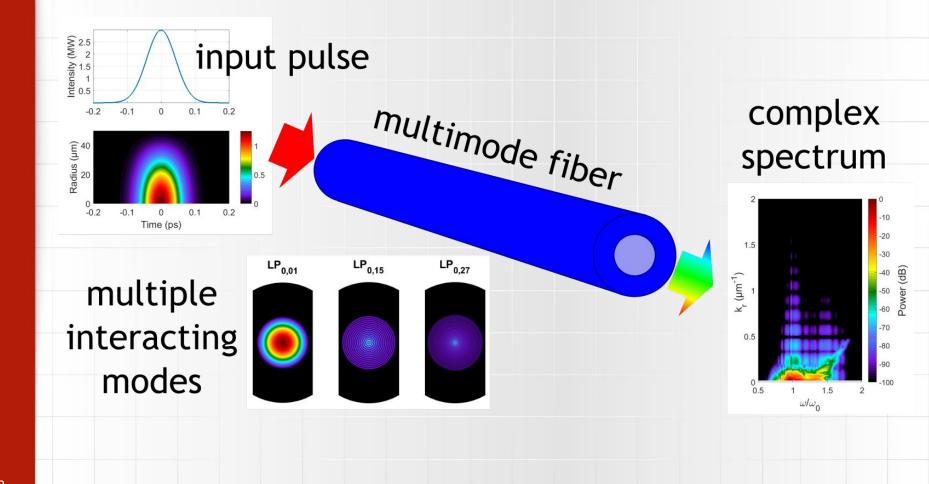
Sylwia Majchrowska¹ Karol Tarnowski¹, Pierre Bejot², Bertrand Kibler²

¹ Department of Optics and Photonics, Wrocław University of Science and Technology, Wybrzeze Wyspianskiego 27, Wroclaw 50-370, Poland ² Laboratoire ICB, UMR6303 CNRS-Universite Bourgogne Franche-Comte, 21078 Dijon, France

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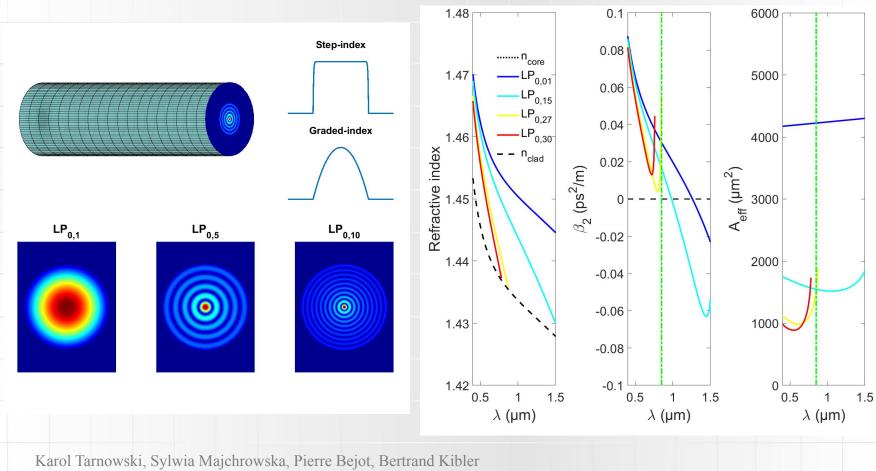


Introduction and objectives





Multimode optical fiber

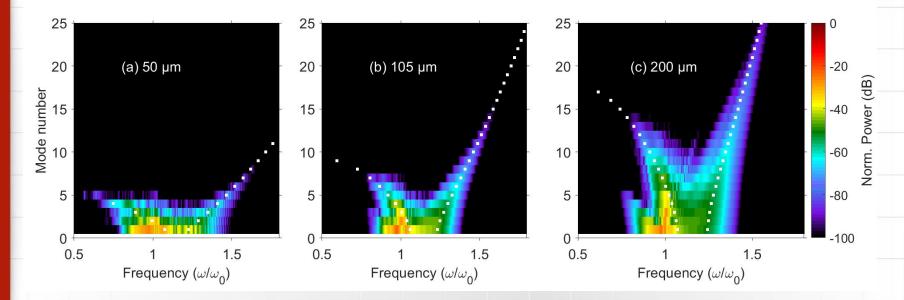


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Discretized Conical Waves

Karol Tarnowski, Sylwia Majchrowska, Pierre Bejot, Bertrand Kibler Journal of the Optical Society of America B 38(3), 732-742 (2021)



The spectral position of conical wave component in each mode can be predicted by using the following phase-matching condition

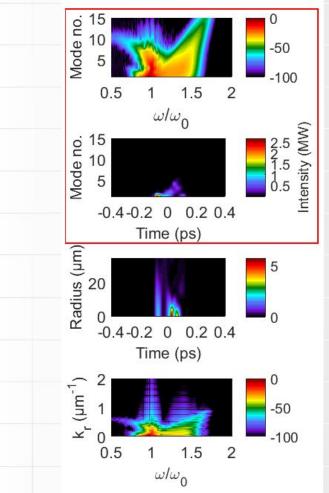
 $\beta(m, \Omega) - |\beta_0 + \delta\beta_0| - |\beta_1 + \delta\beta_1|\Omega = 0$

B. Kibler and P. Bejot. Discretized Conical Waves in Multimode Optical Fibers. Physical Review Letters, 126(2):023902, 2021



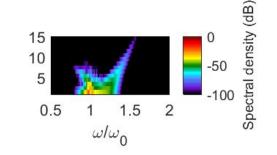
Numerical modelling

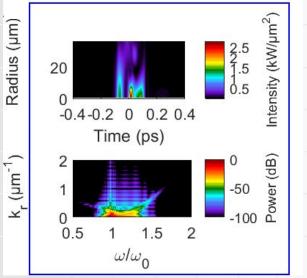
MM-GNLSE



MM-UPPE

Mode no

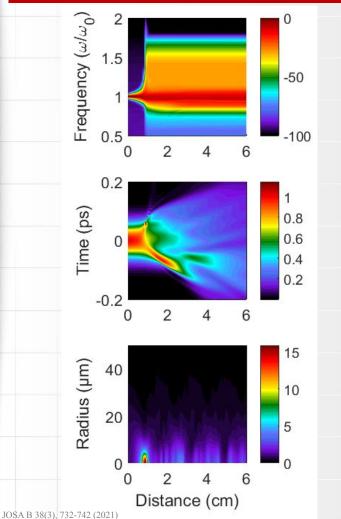




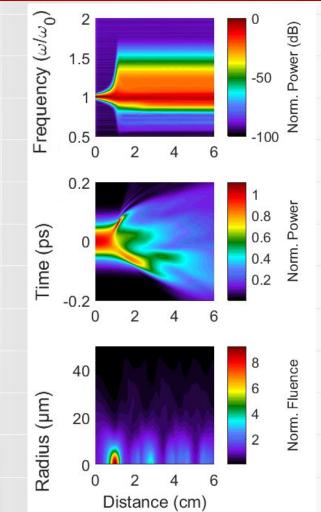


Evolution of integrated spectrum

MM-GNLSE



MM-UPPE

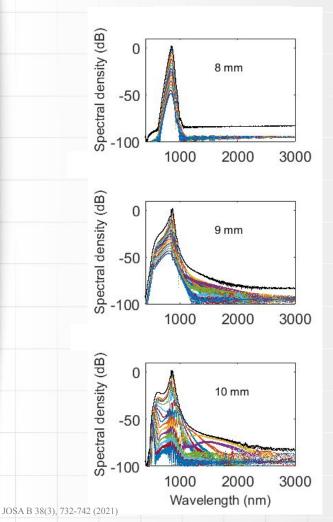


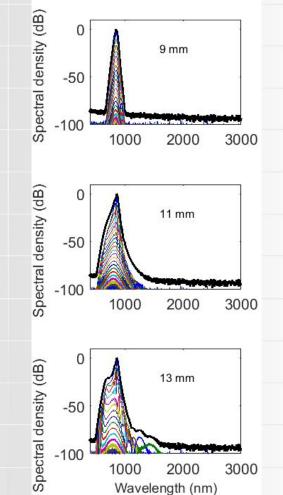


Conical wave formation

MM-GNLSE

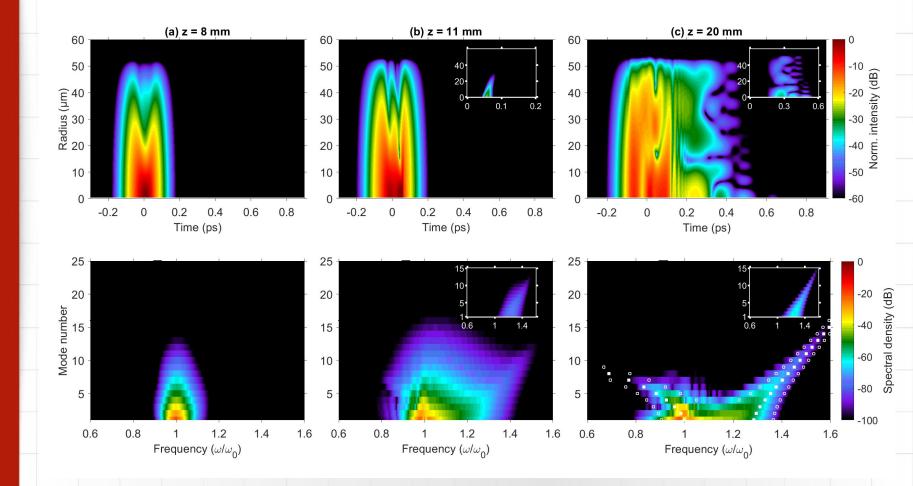








Closer look with MM-UPPE





Summing up

- We numerically studied discretized conical waves formation in multimode fibers using two well-known modeling approaches.
 - Spectral positions of conical wave components are in good agreement with theoretical predictions.
- The difference in the nonlinear step of modelings is the main origin of discrepancies.
- Our numerical studies have shown that outcomes from both models are qualitatively in good agreement.
- Experimental works in the topic are on-going.



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Thank you for your attention.