

Title: Theoretical Analysis of Multimodal Four-Wave Mixing in Optical Microwires

Author(s): Fernandes, Gil M. ^[1]; Almeida, Alvaro J. ^[2,1]; Niehus, Manfred ^[1,3]; Pinto, Armando Nolasco ^[4,5]

Source: Journal of Lightwave Technology **Volume:** 31 **Issue:** 2 **Pages:** 195-202

DOI: 10.1109/JLT.2012.2224320 **Published:** Jan 15 2013

Document Type: Article

Language: English

Abstract: Optical fiber microwires (OFMs) are nonlinear optical waveguides that support several spatial modes. The multimodal generalized nonlinear Schrodinger equation (MM-GNLSE) is deduced taking into account the linear and nonlinear modal coupling. A detailed theoretical description of four-wave mixing (FWM) considering the modal coupling is developed. Both, the intramode and the intermode phase-matching conditions is calculated for an optical microwire in a strong guiding regime. Finally, the FWM dynamics is studied and the amplitude evolution of the pump beams, the signal and the idler are analyzed.

Author Keywords: Multimode four-wave mixing; Nonlinear coefficient; Optical microwires; Phase-matching

Keywords Plus: Ultrashort-Pulse Propagation; Supercontinuum Generation; Modulation Instability; Birefringent Fibers; Mode Fibers; Region; Polarization

Reprint Address: Fernandes, GM (reprint author) - Univ Aveiro, Inst Telecomunicacoes, P-3810193 Aveiro, Portugal

Addresses:

[1] Univ Aveiro, Inst Telecomunicacoes, P-3810193 Aveiro, Portugal

[2] Univ Aveiro, Dept Phys, P-3810193 Aveiro, Portugal

[3] Inst Super Engn Lisboa, P-1959007 Lisbon, Portugal

[4] Univ Aveiro, Dept Elect Telecommun & Informat, P-3810193 Aveiro, Portugal

[5] Inst Telecomunicacoes, P-3810193 Aveiro, Portugal

E-mail Addresses: gfernandes@av.it.pt; aalmeida@av.it.pt; mniehus@av.it.pt; anp@ua.pt

Funding:

Funding Agency	Grant Number
FCT-Fundação para a Ciência e a Tecnologia	
European Union FEDER-Fundo Europeu de Desenvolvimento Regional	PTDC/FIS/112624/2009 PTDC/EEA-TEL/105254/2008 SFRH/BD/79482/2011

Publisher: IEEE-INST Electrical Electronics Engineers INC

Publisher Address: 445 Hoes Lane, Piscataway, NJ 08855-4141 USA

ISSN: 0733-8724

Citation: FERNANDES, Gil M.; ALMEIDA, Alvaro J.; NIEHUS, Manfred; PINTO, Armando Nolasco - Theoretical Analysis of Multimodal Four-Wave Mixing in Optical Microwires. Journal of Lightwave Technology. ISSN 0733-8724. Vol. 31, nr 2 (2013), p. 195-202.