



HAL
open science

Sub-wavelength optical propagation in passive and active 1D-nanostructures

John Bigeon, Nolwenn Huby, Jean-Luc Duvail, Bruno Bêche

► **To cite this version:**

John Bigeon, Nolwenn Huby, Jean-Luc Duvail, Bruno Bêche. Sub-wavelength optical propagation in passive and active 1D-nanostructures. 3d International Conference and Exhibition on Lasers, Optics & Photonics, Sep 2015, Valence, Spain. hal-01197337

HAL Id: hal-01197337

<https://hal.science/hal-01197337>

Submitted on 11 Sep 2015

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Sub-wavelength optical propagation in passive and active 1D-nanostructures

John Bigeon^a, Nolwenn Huby^{*a}, Jean-Luc Duvail^b and Bruno Bêche^a

^aInstitut de Physique de Rennes, University of Rennes 1, UMR CNRS 6251, Rennes, FRANCE

^bInstitut des Matériaux de Nantes, University of Nantes, UMR CNRS 6502, Nantes, FRANCE.

* Corresponding author, nolwenn.huby@univ-rennes1.fr

Scientific Sessions: Nanophotonics and biophotonics

Track: 6-4 Nanodevices and nanophotonics

In the field of nanophotonics, the understanding of optical phenomena related to sub-wavelength guiding in 1D-nanostructures is a fundamental interest for devices down-scaling. We present theoretical and experimental investigation of light propagation in original passive and active organic nanotubes. For this, polymer nanotubes has been designed and developed by the template wetting method. To characterize their optical behavior and in particular the sub-wavelength propagation, numerical and experimental tools have been developed. Modelling phenomena propagating in these nanofibers was performed by the numerical FDTD method. The effects of the geometry of these nanotubes and nanowires have been investigated. In particular, the effect of the diameter (outer and inner diameter for nanotubes) on the propagation behavior (energy distribution, losses), as well as the effect of the substrate, have been determined. Experimentally, two types of nanofibers were studied. First, direct injection into passive nanofibers of SU8 polymer was performed through a microlensed optical fiber. A striking result is the assessment of optical losses measured by the cut-back around 1.25 dB/mm for nanotubes of external and internal diameters respectively 240 nm and 120 nm. This appears very competitive compared to other systems currently envisaged for integrated nanophotonics. Second, active polymer nanofibers (polyfluorene PFO) embedded in a waveguiding polymer were elaborated and appeared to be an efficient design for a nano-source.