1. Record Nr. UNINA9910254210203321

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Titolo	Ultra-Broadly Tunable Light Sources Based on the Nonlinear Effects in Photonic Crystal Fibers / / by Lei Zhang
Pubbl/distr/stampa	Berlin, Heidelberg : , : Springer Berlin Heidelberg : , : Imprint : Springer, , 2016
ISBN	3-662-48360-2
Edizione	[1st ed. 2016.]
Descrizione fisica	1 online resource (105 p.)
Collana	Springer Theses, Recognizing Outstanding Ph.D. Research, , 2190-5053
Disciplina	621.366
Soggetti	Microwaves Optical engineering Lasers Photonics Optical materials Electronic materials Microwaves, RF and Optical Engineering Optics, Lasers, Photonics, Optical Devices Optical and Electronic Materials
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references at the end of each chapters.
Nota di contenuto	Introduction -- New wavelength generation based on PCF with two zero dispersion wavelengths (TZDW) -- PCF based optical parametric amplifier (OPA) -- Widely tunable optical parametric oscillator (OPO) based on PCF -- PCF based OPO with high energy conversion efficiency -- Conclusion.
Sommario/riassunto	This thesis examines laser generation from the ultraviolet to the short edge of the mid-infrared band by exploiting the nonlinear effects in photonic crystal fibers (PCFs). Several different physical mechanisms are investigated by using homemade PCFs with elaborately customized dispersion profiles. A particular focus is on the development of fiber optical parametric amplifiers (FOPAs) and oscillators (FOPOs) based on the PCFs with a zero-dispersion wavelength of ca. 1.06 m. In particular, several schemes are proposed for solving the key problems

involved in the application of FOPOs. These oscillators can be made more convenient to use by optimizing the wavelength-tuning mechanisms, and made more energy-efficient with the help of specially designed cavity structures. Today's oscillators are more reliable, powerful and maneuverable than ever. This thesis provides a systematic road map in connection with the study of nonlinear wavelength generation in PCFs, from their fiber design and technical fabrication, to their physical mechanism and experimental investigation.