

Theory of Long-Period Fiber Gratings



Overview

The inscription of long-period gratings on optical fibre basically consists in the generation of a periodical perturbation of the refractive index in the core, the cladding, or both along the optical fibre (Vengsarkar, 1996). This review. In essence, a long period fibre grating (LPFG) is an all-fibre device with wavelength dependent loss. As a band rejection filter, all light in a spectral slice is discarded without affecting the amplitude and phase of neighbouring wavelengths, with the additional advantage of low insertion losses. This paper presents a review of the evolution of LPFGs, with a specific focus on the progression and current trends of mechanically induced long-period fiber gratings. It offers a concise overview of coupled-mode theory, the fabrication processes, the merits, and the limitations associated with. The period of such a structure is of the order of a fraction of a millimeter. In contrast to the fiber Bragg gratings, LPFGs couple copropagating modes with close propagation constants; therefore, the period of such a grating can considerably exceed the wavelength of radiation propagating in the. The photonic crystal fiber (PCF) is a special class of components incorporating photonic crystals with a two-dimensional (2D) periodic variation in the plane perpendicular to the fiber axis and an invariant structure along it [1-3]. The periodic perturbations enable the coupling between the fundamental core mode and several copropagating cladding.

Article Content

Arc-Induced Long-Period Fiber Gratings at INESC TEC. Part I ...

In this work, we reviewed the most important achievements of INESC TEC related to the fabrication of long-period fiber gratings using the electric arc technique.

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ABSTRACT We present a review of the development of long-period fiber grating devices for application in optical communication. The recent studies on the realization of long-period gratings in optical

Long period fiber grating-based biosensing: Recent trends and future ...

Decades have passed since the first demonstration of a long-period fiber grating (LPFG) and its practical application for sensors, and, in this period, manufacturing techniques, sensitivity

Long Period Fibre Gratings

The strain response of a long-period fibre grating arise due to the physical elongation of the fibre, changing the grating pitch and the effective refractive index of the core and cladding due to the

Long-Period Fiber Gratings

As an important passive optical component, long-period fiber gratings (LPFGs) have all the advantages of optical fiber sensors, such as anti-electromagnetic interference, corrosion resistance, high

Mechanically-Induced Long-Period Fiber Gratings Using Laminated Plates

This work presents a formation method of mechanically-induced long-period fiber gratings using laminated plates. The mechanically-induced long-period fiber grating is temporarily inscribed

Mechanically Induced Long-Period Fiber Gratings and

This paper presents a review of the evolution of LPFGs, with a specific focus on the progression and current trends of mechanically induced

Comparing and analysis of calculation methods of long-period fiber ...

Abstract Many methods are considered for calculating long-period fiber gratings (LPFGs) transmission spectra such as integral method, formula method and transfer matrix method. In this

Recent progress in design and fabrication of novel long-period fiber ...

Long-period fiber grating (LPFG) is a kind of wide-range transmission passive photonic device with extensive applications in the field of fiber communication and fiber sensing. In this review, from the

Advances on Mode-Coupling Theories, Fabrication Techniques, and ...

Abstract: In this paper, we have briefly review the developing history and recent advances made with regard to helical long-period fiber gratings (HLPFGs) in three aspects, i.e., the mode-coupling

Long-period fiber grating

A long-period fiber grating couples light from a guided mode into forward propagating cladding modes where it is lost due to absorption and scattering. The coupling from the guided mode to cladding

Theory analysis of mode coupling in tilted long period fiber grating ...

Abstract The mode coupling in the tilted long period fiber grating (TLPG) is analyzed by using the full vector complex coupled mode theory (FV-CCMT). Compared with the non-tilted LPG,

Mechanically induced long period gratings in different silica multi ...

Abstract This work presents a thorough comparative investigation of mechanically induced long period gratings (MILPGs) realized in different unconventional multi-layered silica optical fibers:

Long-Period Fiber Gratings for Mode Coupling in Mode-Division ...

We study the design of such mode scramblers implemented as long-period multimode fiber gratings for systems using $D = 12$ modes (six spatial modes). By optimizing the grating chirp

Mechanically Induced Long-Period Fiber Gratings and Applications

Long-period fiber gratings (LPFGs) functioning as band-reject filters have played a pivotal role in the realm of optical communication. Since their initial documentation in 1996, LPFGs have ...

Core-modulated long-period fiber gratings formed by heating and ...

1. Introduction Recently, long-period fiber gratings (LPFGs) are optical devices that are extensively used in the fields of structural health monitoring, biomonitoring and artificial intelligence

Long-Period Fiber Gratings in Active Fibers

1. Introduction Traditionally, long period fiber gratings (LPG) are made in passive optical fibers that have negligible loss. However, loss or gain that can be controlled via optical pumping adds a new degree

Structure-Modulated Long-Period Fiber Gratings: A

This review synthesizes and categorizes a class of novel long-period fiber gratings (LPFGs) engineered through the modification of the external

Review of Helical Long-Period Fiber Gratings

In this paper, comprehensive remarks are given that focus on the main fabrications and wide applications of helical long-period fiber gratings (HLPFGs). Firstly, the techniques of fabricating

Long Period Fibre Gratings

2. Fabrication methods of long-period fibre gratings The inscription of long-period gratings on optical fibre basically consists in the generation of a periodical perturbation of the refractive index in the

Theory and practice of long-period gratings: When a loss becomes a

Our long period fiber gratings are created by the periodic structure of large perturbations in the fiber diameter. These perturbations result in unique spectral response, even in off-resonance ...

Long-Period Gratings Based on Photonics Crystal Fibers and Their ...

A long-period fiber grating (LPG) is a one dimension (1D) periodic structure, and is formed by introducing periodic modulation of the refractive index along an optical fiber. Since its period is about 100 to

Few-Mode Fiber-Based Long-Period Fiber Gratings: A Review

Long-period fiber gratings (LPFGs) are efficient ways to achieve high-order core mode conversion and vortex mode conversion in few-mode fibers (FMFs), which have the benefits of

Long Period Gratings in New Generation Optical Fibers

2. Long period gratings: a view back Long Period Gratings are a periodic perturbation of the properties of the optical fiber, generally of the refractive index of the core and/or geometry, in a single mode fiber.

Core-modulated long-period fiber gratings formed by heating and ...

In this paper, we developed and experimentally evaluated a new type of long-period fiber grating. This structure is fabricated by CO₂ laser polishing and subsequent heating with an

Mechanically Induced Long Period Gratings: Recent Progresses

Specifically, long period gratings (LPG) have been mechanically induced in different optical fibers through a 3D printed nearly sinusoidal grooved structure. LPGs have been mechanically induced in

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