Dispersion tailoring of a silicon strip waveguide employing Titania-Alumina thin-film coating
We numerically demonstrate dispersion tailoring of a silicon strip waveguide employing Titania-Alumina thin-film coating using a finite-difference mode solver. The proposed structure exhibits spectrally-flattened near-zero anomalous dispersion within the telecom wavelength range. We also numerically predict the wavelength conversion efficiency for degenerate four-wave mixing, and obtain a 3 dB bandwidth of 80 nm.

All-fiber photon-pair source at telecom wavelengths
Single photon sources are a key element for quantum computing, quantum key distribution (QKD) and quantum communications. In particular, producing single photons at telecommunications wavelengths is valuable for QKD protocols and would enable realizing the quantum internet. The preferred method for their generation has long been spontaneous down conversion in bulk crystals, which suffers from connection loss to fiber networks. In-fiber spontaneous four-wave mixing provides a viable alternative as a photon pair source due to being compatible with existing fiber networks. We present an all-fiber photon pair source based on degenerate four-wave mixing in a 400 m Highly-Nonlinear fiber, with signal and idler wavelengths generated at 1552.5 nm and 1557 nm respectively. The source consists of CW pump laser operating at 1554.75 nm, which is slightly detuned from the zero group velocity dispersion wavelength into the normal dispersion regime. After pair generation in the highly-nonlinear fiber, three arrayed waveguide gratings are employed to spatially separate signal and idler, and provides a 120 dB pump power reduction. Firstly the source is modelled and experimentally characterized in the well known classical regime of stimulated four-wave mixing. The effect of fiber cooling on spontaneous Raman scattering is modelled and characterized, and a 30% reduction in spontaneous emission is found
when cooling the fiber to −77 °C. In the low power regime the coincidence to accidental count ratio is simulated and measured. An increase in the coincidence to accidental count ratio is observed when cooling the fiber.

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**Full-vectorial propagation model and modified effective mode area of four-wave mixing in straight waveguides**

We derive from Maxwell's equations full-vectorial nonlinear propagation equations of four-wave mixing valid in straight semiconductor-on-insulator waveguides. Special attention is given to the resulting effective mode area, which takes a convenient form known from studies in photonic crystal fibers, but has not been introduced in the context of integrated waveguides. We show that the difference between our full-vectorial effective mode area and the scalar equivalent often referred to in the literature may lead to mistakes when evaluating the nonlinear refractive index and optimizing designs of new waveguides. We verify the results of our derivation by comparing it to experimental measurements in a silicon-on-insulator waveguide, taking tolerances on fabrication parameters into account. (C) 2017 Optical Society of America

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High coincidence-to-accidental ratio continuous-wave photon-pair generation in a grating-coupled silicon strip waveguide: Letters
We demonstrate a very high coincidence-to-accidental ratio of 673 using continuous-wave photon-pair generation in a silicon strip waveguide through spontaneous four-wave mixing. This result is obtained by employing on-chip photonic-crystal-based grating couplers for both low-loss fiber-to-chip coupling and on-chip suppression of generated spontaneous Raman scattering noise. We measure a minimum heralded second-order correlation of $g^{(2)}(0) = 0.12$, demonstrating that our source operates in the single-photon regime with low noise. (C) 2017 The Japan Society of Applied Physics
Experimental characterization of Raman overlaps between mode-groups

Mode-division multiplexing has the potential to further increase data transmission capacity through optical fibers. In addition, distributed Raman amplification is a promising candidate for multi-mode signal amplification due to its desirable noise properties and the possibility of mode-equalized gain. In this paper, we present an experimental characterization of the intermodal Raman intensity overlaps of a few-mode fiber using backward-pumped Raman amplification. By varying the input pump power and the degree of higher order mode-excitation for the pump and the signal in a 10km long two-mode fiber, we are able to characterize all intermodal Raman intensity overlaps. Using these results, we perform a Raman amplification measurement and demonstrate a mode-differential gain of only 0.25dB per 10dB overall gain. This is, to the best of our knowledge, the lowest mode differential gain achieved for amplification of mode division multiplexed signals in a single fiber.

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Higher order mode optical fiber Raman amplifiers

We review higher order mode Raman amplifiers and discuss recent theoretical as well as experimental results including system demonstrations.

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