Design of an 1800 nm Raman Amplifier

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Different approaches are being explored to increase the capacity of communication systems [1,2], both long and short range systems. One approach is by exploiting new optical wavelength bands, outside the conventional communication window from 1530 nm to 1625 nm. Hollow core fibers have been suggested as potential transmission fibers for extended wavelength operation, as low losses at long wavelengths have been predicted [3]. Fig. 1 illustrates the predicted low loss limit for a hollow core fiber and for comparison the measured loss of a OFS True Wave fiber. Besides low loss transmission fibers, also extended band amplifiers are required. As a solution to the latter challenge, Raman amplifiers are suggested as promising candidates.

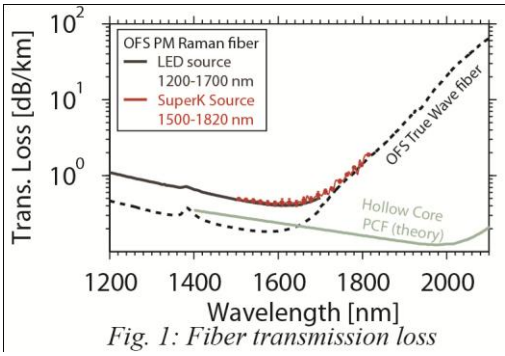

Fig. 1: Fiber transmission loss

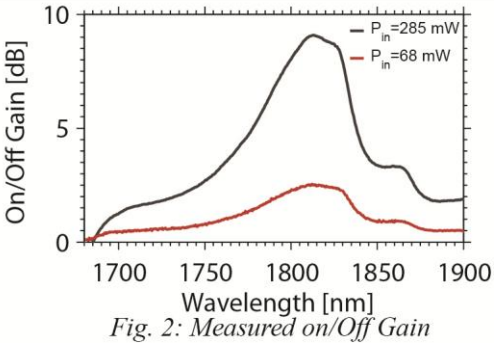

Fig. 2: Measured on/Off Gain

The main hurdle when designing a long wavelength Raman amplifier is the increased intrinsic fiber attenuation which as a consequence leads to an increase in the pump power requirement and deteriorated noise properties. Here we demonstrate a Raman amplifier designed for signal wavelengths around 1800 nm. The amplification fiber is an OFS PM Raman fiber, and is pumped by a Raman fiber laser emitting at 1680 nm [4]. The amplifier was pumped co-polarized and backward, with respect to the singal. In Fig. 2 a measured Raman on/off gain exceeding 9 dB for 285 mW of injected pump power is obtained in a 4.35 km long fiber. A broadband supercontinuum source was used as a signal from 1700 nm to 1900 nm.

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