



## Design of an 1800 nm Raman Amplifier

**Svane, Ask Sebastian; Rottwitt, Karsten**

*Publication date:*  
2013

[Link back to DTU Orbit](#)

*Citation (APA):*

Svane, A. S., & Rottwitt, K. (2013). *Design of an 1800 nm Raman Amplifier*. Abstract from 15th Photonics North Conference, Ottawa , Canada.

---

### General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

## Design of an 1800 nm Raman Amplifier

Ask Sebastian Svane and Karsten Rottwitt

DTU Fotonik, Department of Photonics Engineering, Technical University of Denmark, Ørsted's Plads 343, DK-2800 Kgs. Lyngby, Denmark

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.

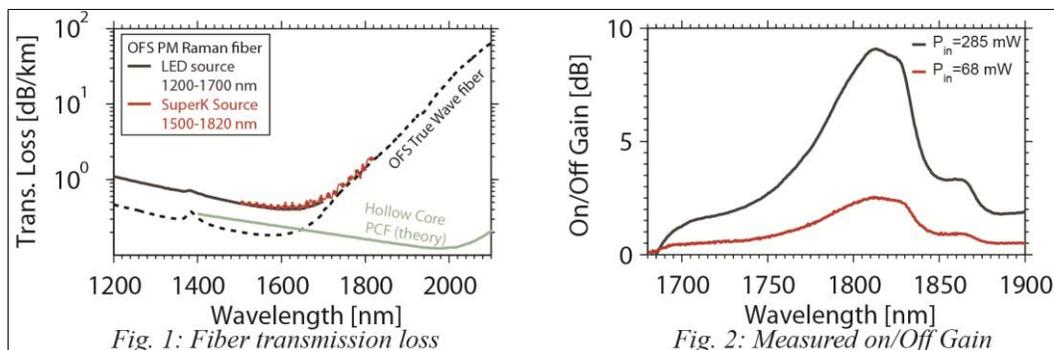


Fig. 1: Fiber transmission loss

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 signal. 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.

- [1] D. J. Richardson, "Filling the Light Pipe", Science, Vol. 330, 6002 (2010).
- [2] P. J. Winzer, "Modulation and multiplexing in optical communication systems", IEEE Leos Newsletter (2009)
- [3] P. Roberts, F. Couny, H. Sabert, B. Mangan, D. Williams, L. Farr, M. Mason, A. Tomlinson, T. Birks, J. Knight, and P. St. J. Russell, "Ultimate low loss of hollow-core photonic crystal fibres", Opt. Express 13, 236-244 (2005)
- [4] A. S. Svane and K. Rottwitt, PM Raman fiber laser at 1679 nm, Conference on Nonlinear Photonics (NP), Colorado Springs, JTU5A.28 (2012).