

Solveig Perret (ESR5)

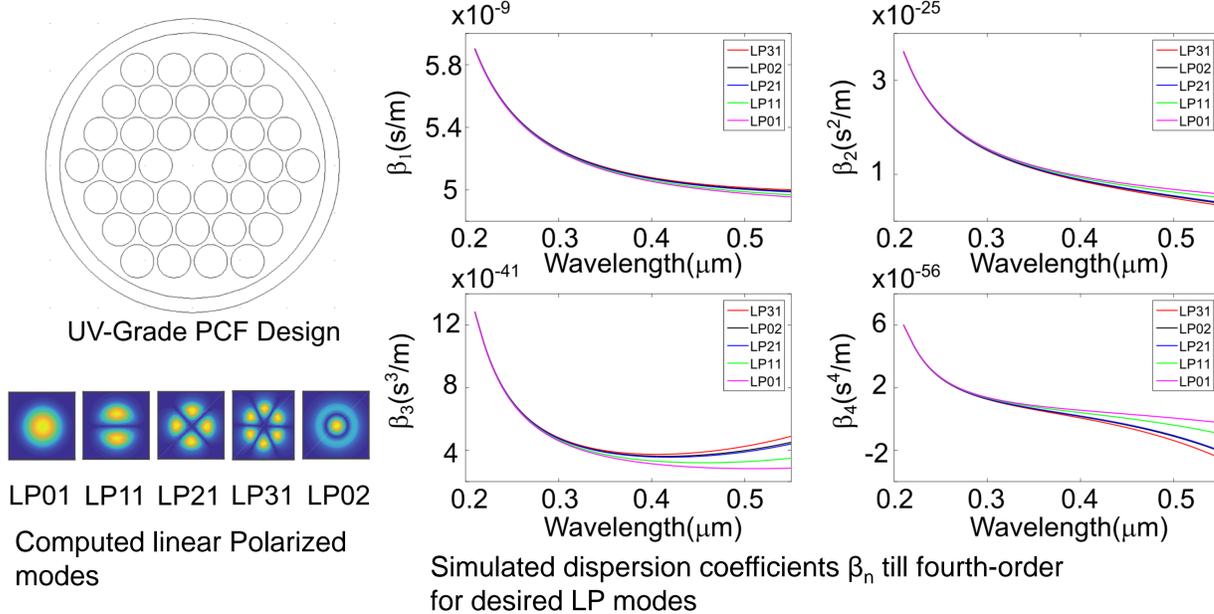
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Context:

- The objectives are here to demonstrate and improve SC generation in the ultraviolet (UV) range using highly nonlinear UV-grade silica photonic crystal fibres (PCFs) with a high degree of OH doping, pumped with high-power Q-switched pulsed picosecond lasers at 355 nm [1]. A multimode PCF was designed and fabricated using F110 type silica glass for SC generation in the UV-A black-light (200-400 nm) band through intermodal four-wave mixing.

Expected results and progress towards objectives:

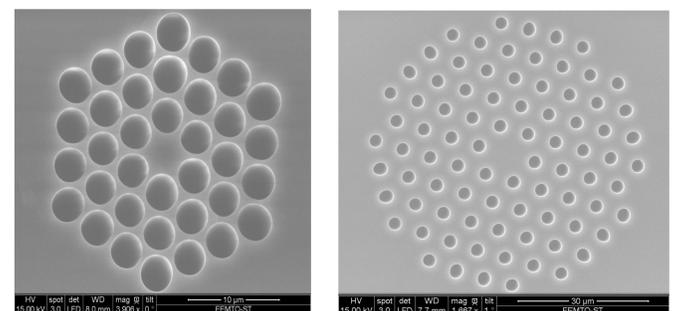
➤ Design of UV-Grade PCF Fiber



- A few-mode UV-grade PCF was numerically designed in collaboration with A. N. Ghosh (ESR4) using a core diameter of 4.26 μm , air hole diameter of 3.5 μm , a pitch of 3.88 μm and an air-filling fraction of 0.902. Group velocity dispersion was computed for pumping around 355 nm to get intermodal four-wave mixing in the UV.

➤ Fiber Fabrication

SEM images of the PCFs cross-section



UV-Grade Few-mode PCF Fiber

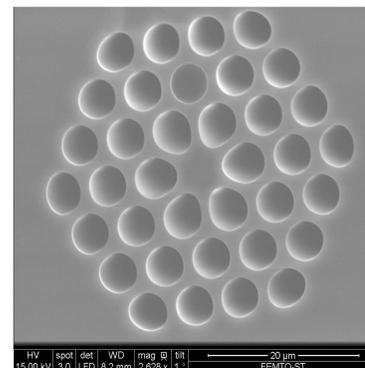
Endless single-mode UV Fiber

- Fabricated by Photonics Bretagne using F110 type silica UV glass from Heraeus and drawn using stack and draw technique

Planned secondments and purpose of the stay:

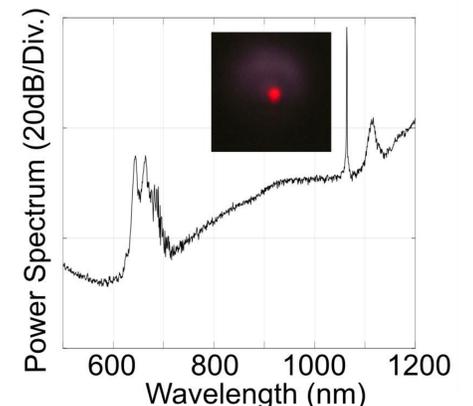
- First secondment in Leukos in Limoges from June 3rd to June 15th with P. Leproux and G. Huss:
 - Work on a prototype of an SC source
 - Experiment a new graded-index PCF for SC generation [2]
 - Demonstration of visible to near IR SC generation by cascaded Raman scattering and four-wave mixing
- Second planned secondment in UCA, Cambridge from November 26th to December 3rd 2018.
 - Test of UV SC sources for biomedical imaging

SEM image



GRIN PCF Fiber

Experimental SC spectrum



- Visible to near IR SC generation in the GRIN PCF with a strong peak at 642 nm due to four-wave mixing

Status of Publications:

- S. Perret, G. Fanjoux, L. Bigot, J. Fatome, G. Millot, J. M. Dudley, T. Sylvestre**, "Supercontinuum Generation by Intermodal Four-Wave Mixing in a Step-Index Few-Mode Fibre," *APL Photonics*, 2018. (to appear in 2018).
- S. Perret, G. Fanjoux, L. Bigot, J. Fatome, G. Millot, J. M. Dudley, T. Sylvestre**, "Supercontinuum generation and intermodal four-wave mixing in a step-index few-mode fibre", *Proc. SPIE 10684, Nonlinear Optics and its Applications 2018*, 106841D (14 May 2018); doi: 10.1117/12.2305497;
- S. Perret, G. Fanjoux, L. Bigot, J. Fatome, G. Millot, J. M. Dudley, T. Sylvestre** "Two octave supercontinuum generation by cascaded intermodal four-wave mixing in a step-index few-mode fibre", *OSA Advanced Photonics 2018 – Nonlinear Photonics 2964830*, 2-5 July 2018, Zürich, paper NpTh21.1. (oral presentation)

Awards:

Best poster Award at IFISC and Femto-ST collaborative workshop in Besançon, November 2017

Best poster Award at Symposium on Future Prospects for Photonics on Mid-Infrared Lights Sources and Applications in Tampere December 2017

[1] T. Sylvestre et al., *Opt. Lett.* **37**, 130-132 (2012)
[2] A. Labryère et al., *IEEE Ph. Tech. Lett.* **22**, 16 (2010)

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