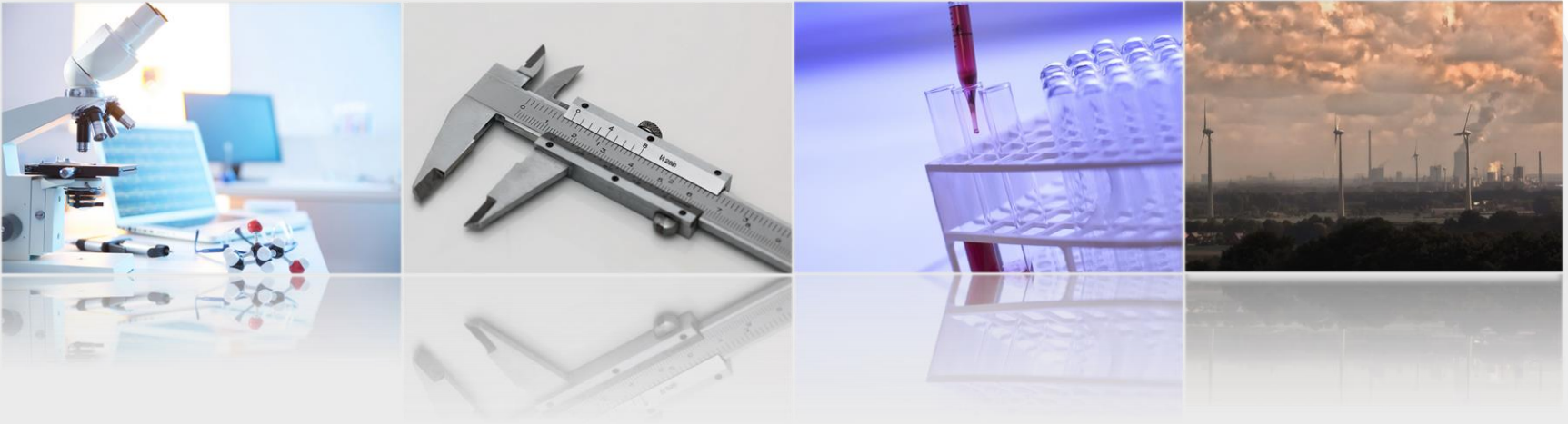
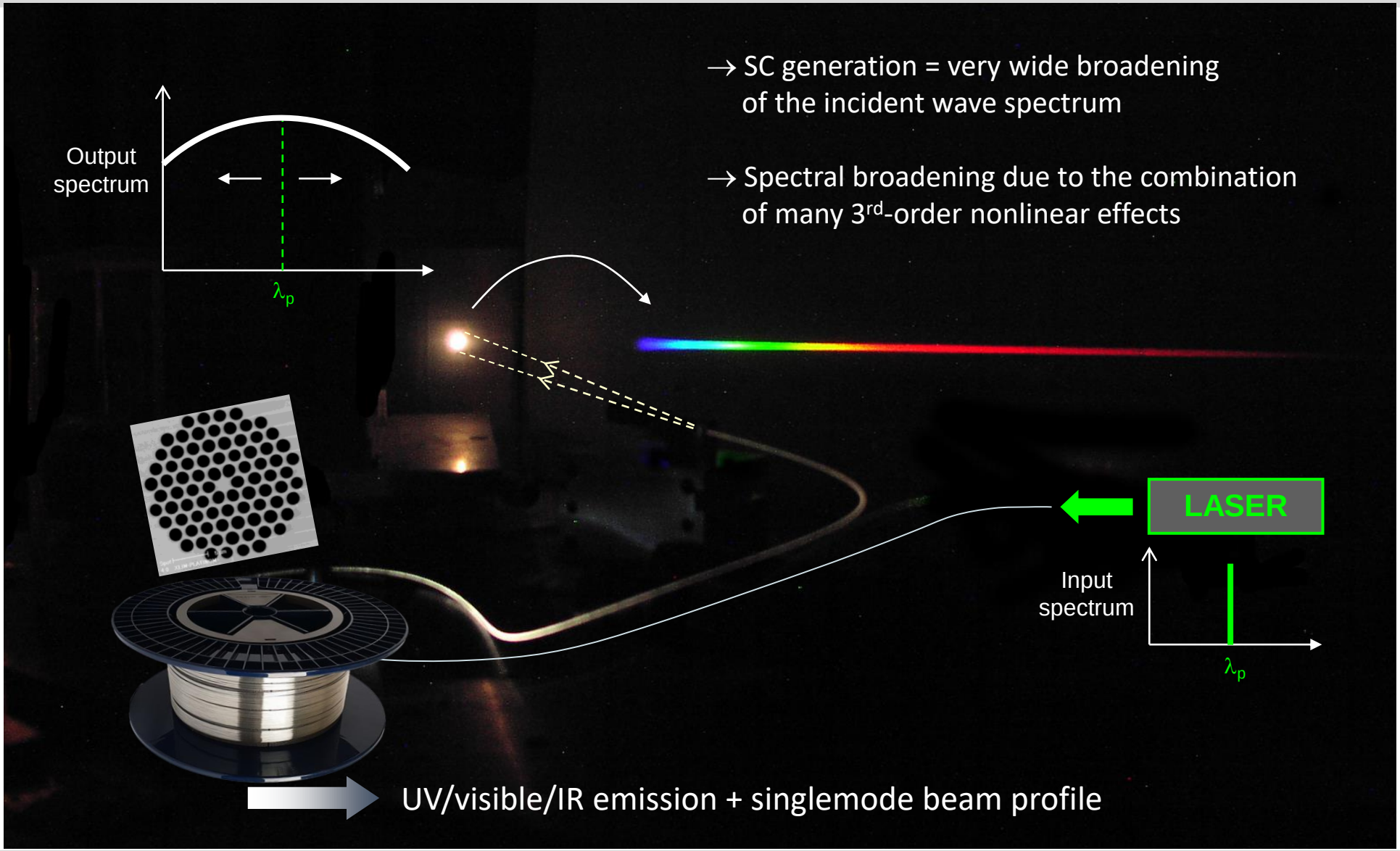


Specialty fibers for supercontinuum generation

LEUKOS

Make a bright future

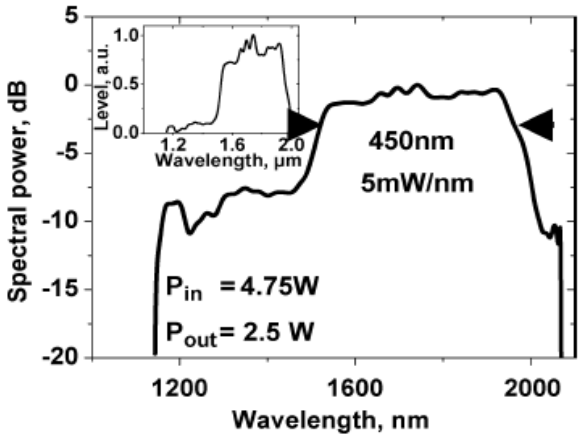
Supercontinuum generation



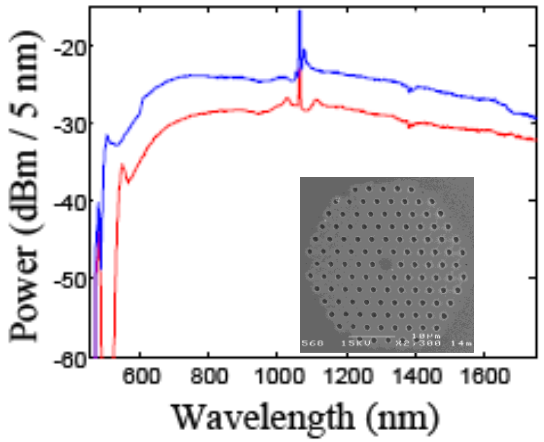
Supercontinuum generation

→ Pumping near the zero dispersion wavelength

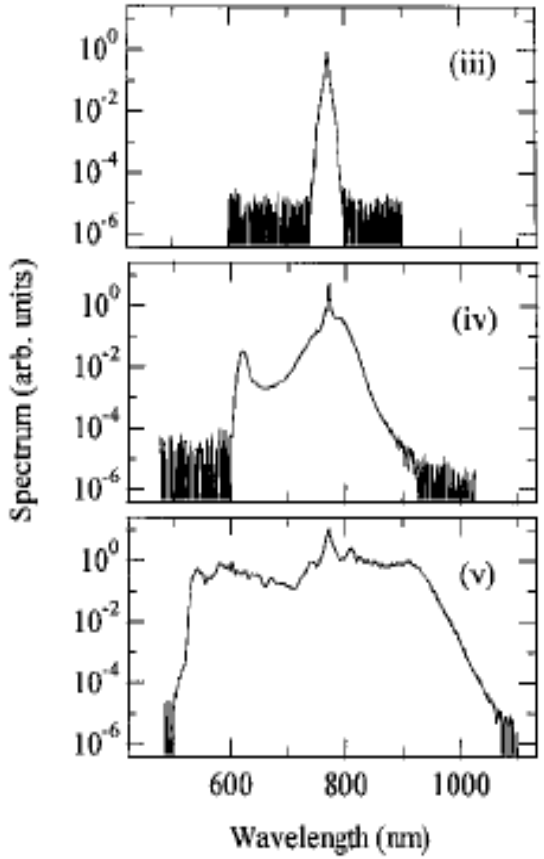
→ CW, ns to fs regime



[1] P. A. Champert *et al.*, IEEE Phot. Tech. Lett. **16** (2004)



[2] Wadsworth *et al.*, Opt. Expr. **12** (2004), 299-309



[3] Ranka *et al.*, Opt. Lett. **25** (2000), 25-27

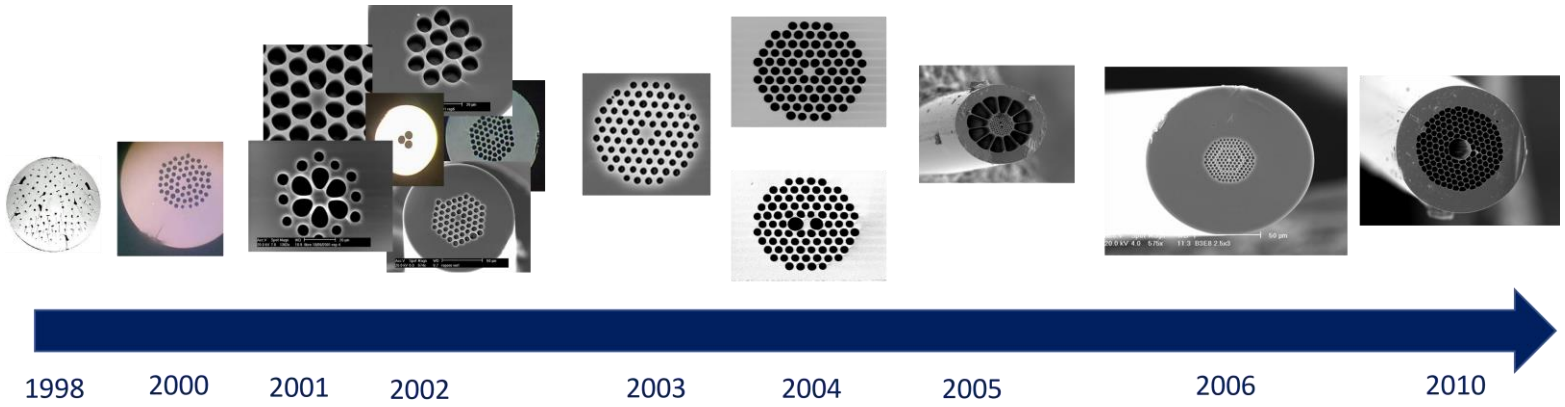
➡ **Silica fibers, spectrum limited to 2.4µm**

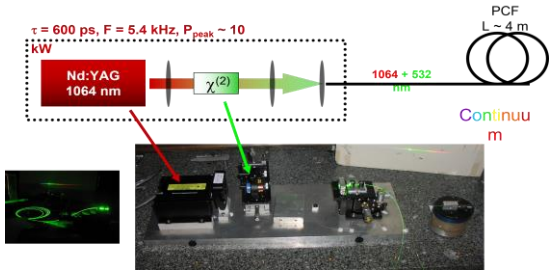
➡ **For MIR extension, use of fluoride fibers**

One key component : the non-linear fiber

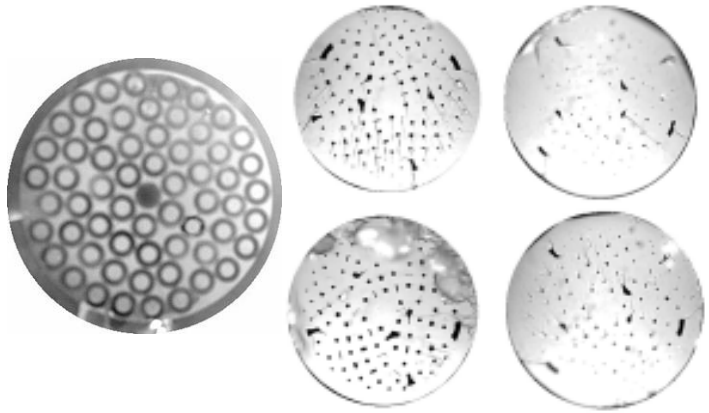
Photonic crystal fiber

- First PCF: Pr. Russel , university of Bath ,1996
- Founding of Blaze photonics (Crystal fibre in 2004)
- First PCF in Limoges : 1998 (IRCOM)





IRCOM drawing tower



First IRCOM PCF - 1998

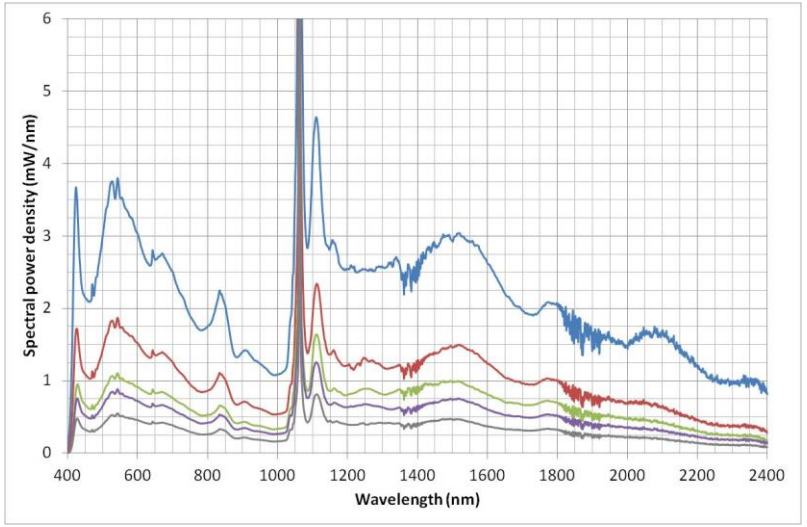
« White laser » properties

- Combined properties of white light lamp (broad spectrum) and a laser (spatially coherent, high power)

- Wide emission from UV to NIR (silica fibers) or MIR (fluoride fibers)

- Spatially single mode on the whole spectral bandwidth

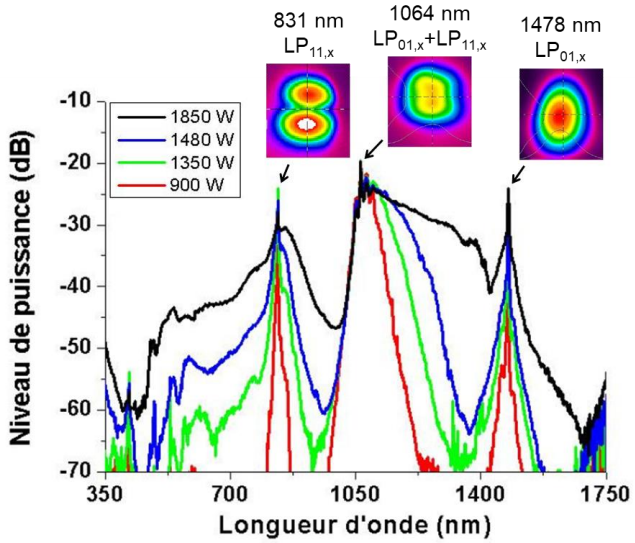
- High spectral power densities

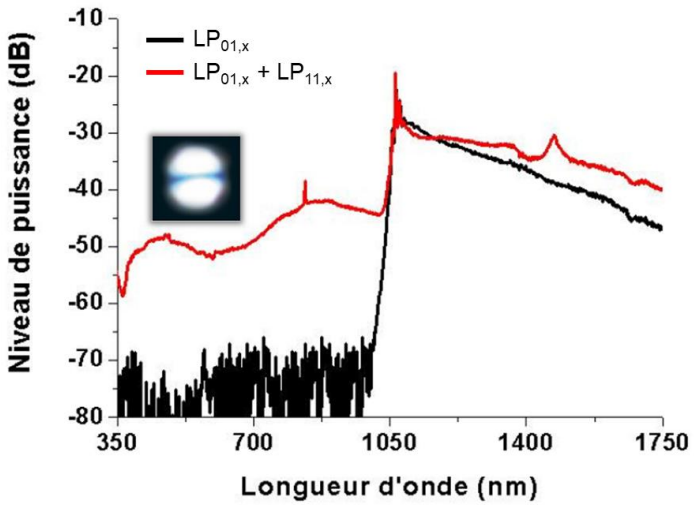


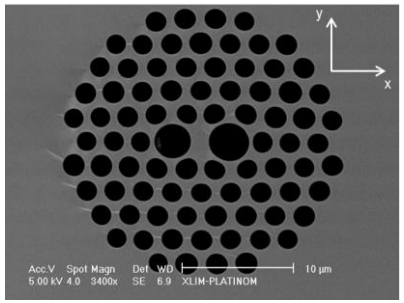
- Fiber laser

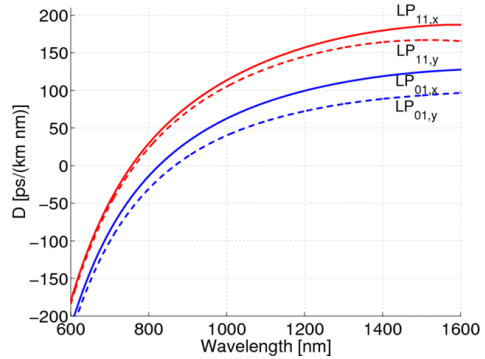
Extending wavelengths to UV

- Use of a highly birefringent PCF





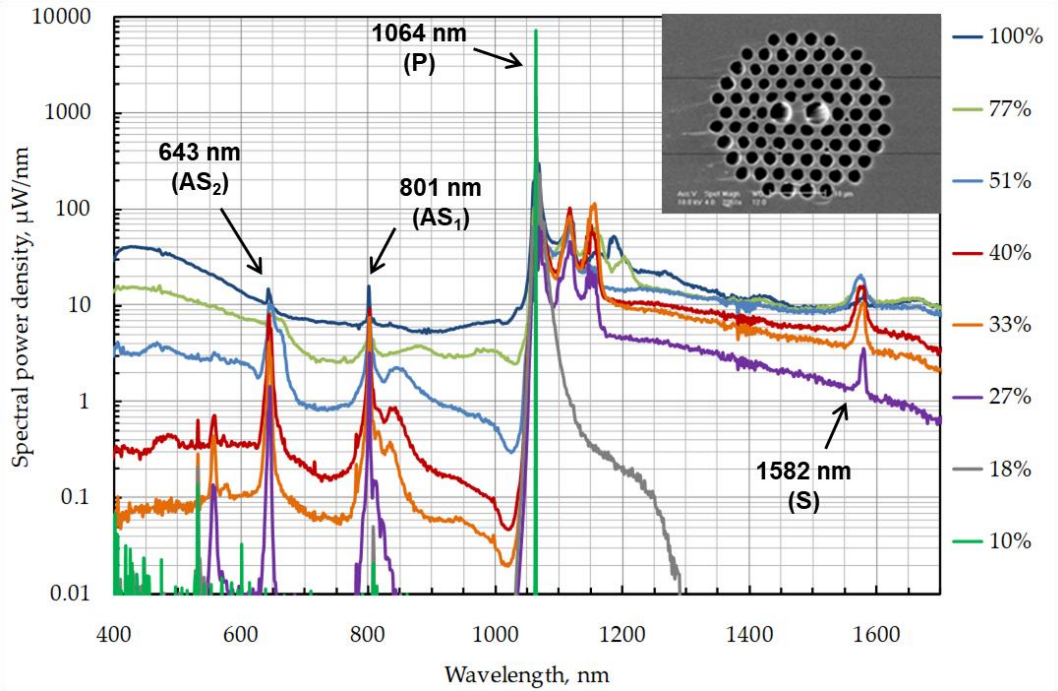




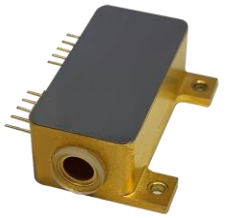
Supercontinuum generation based on intermodal four-wave mixing

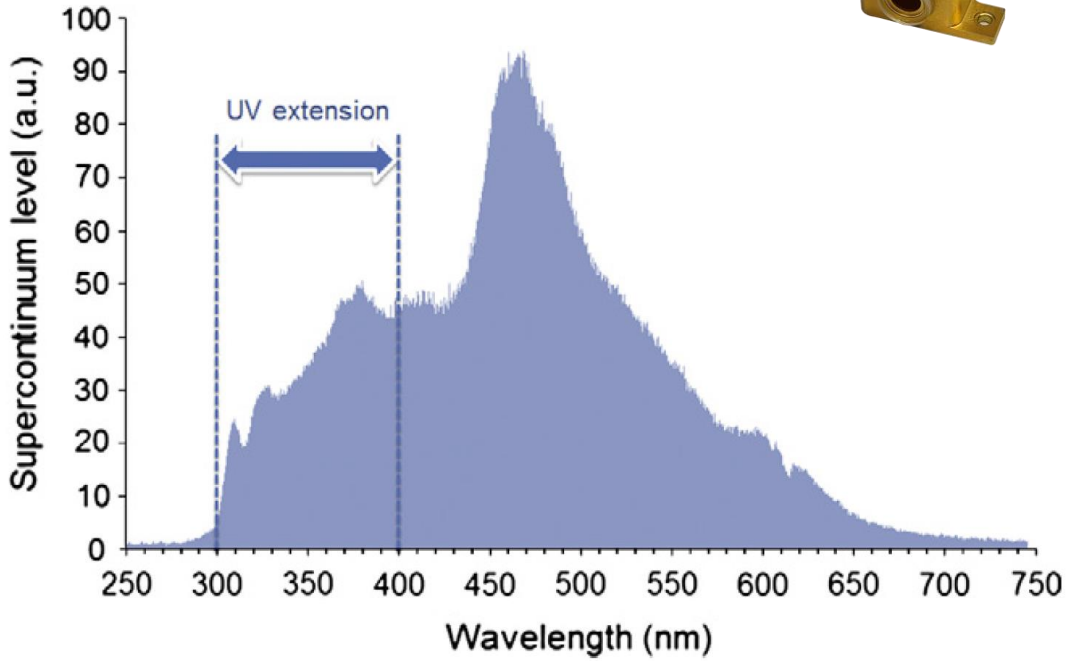
Extending wavelengths to UV

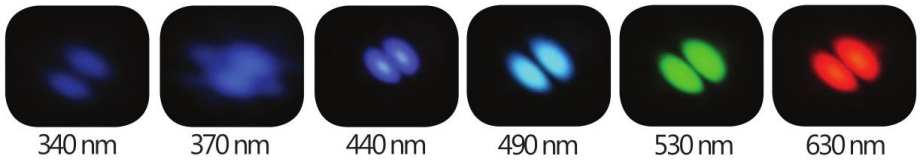
- Use of a highly birefringent PCF



pump power



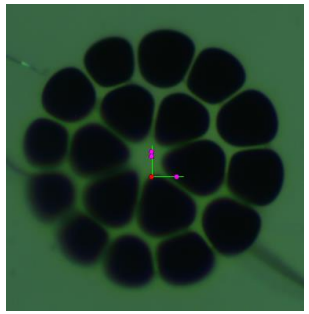


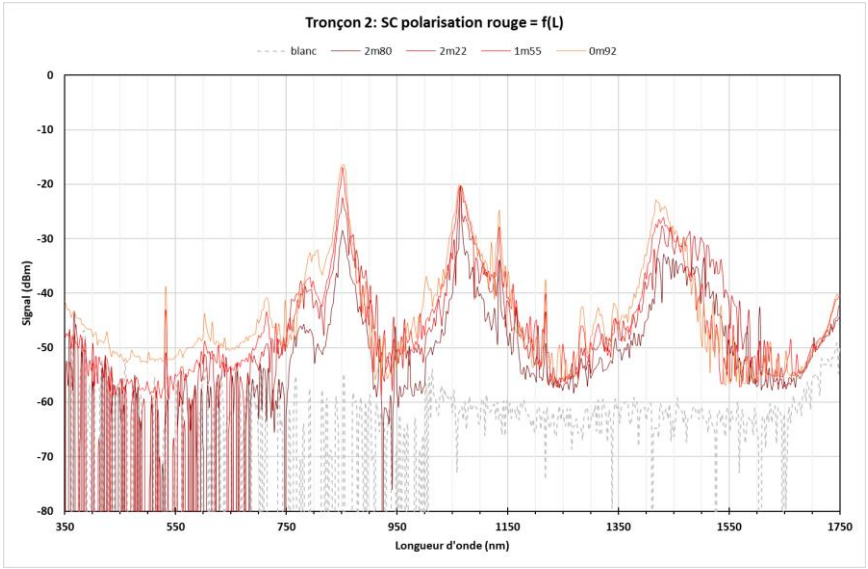


UV generation down to 310 nm

DUV supercontinuum using Zblan fibers

- Zblan is well-know for its transparency in Mid IR up to 4µm, but is also highly transparent in UV down to 200nm
- This work has been done between Leukos and Le Verre Fluoré
- Microstructured Zblan fibers have been manufactured and first spectrum have been obtained using a microchip laser pump

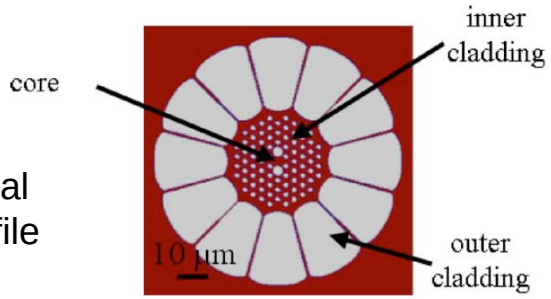




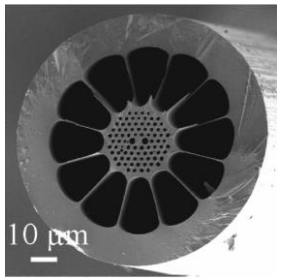
Increasing the visible power

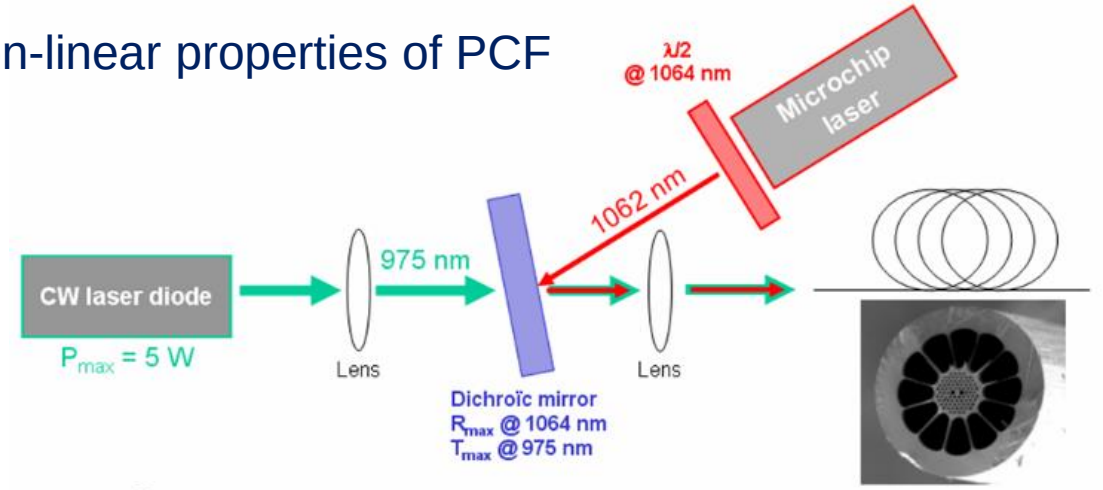
- Use of a Yb-doped core with air-clad PCF
- Use of combined amplification, dispersion and non-linear properties of PCF

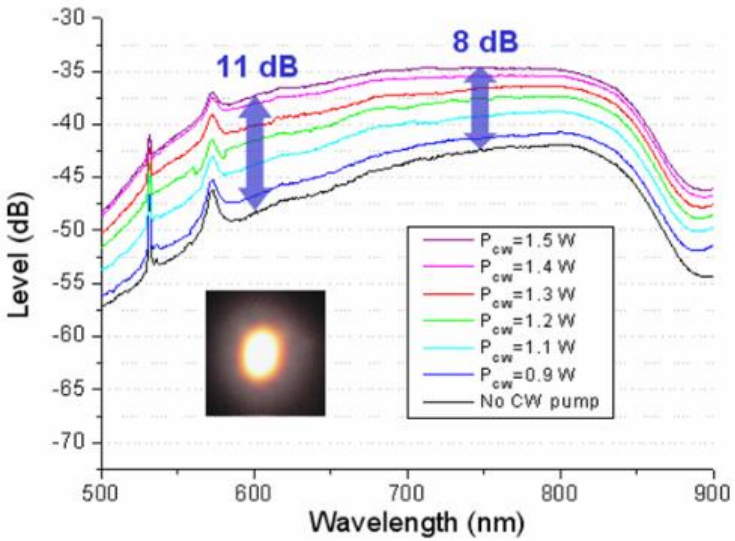
Ideal profile



Drawn fiber



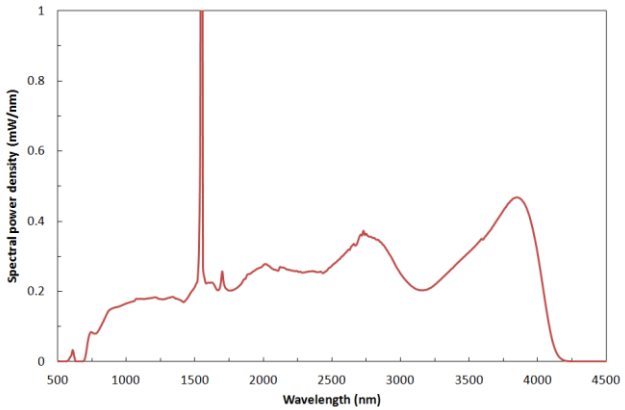




→ Increase of the visible power level with Pcw

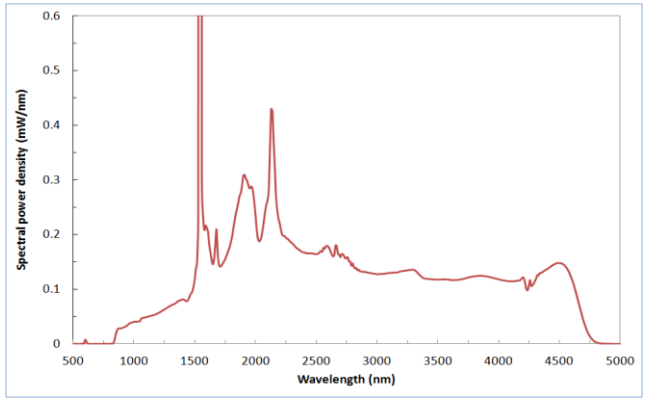
→ Interesting design for increasing power of supercontinuum laser

Extending wavelengths to Mid-IR



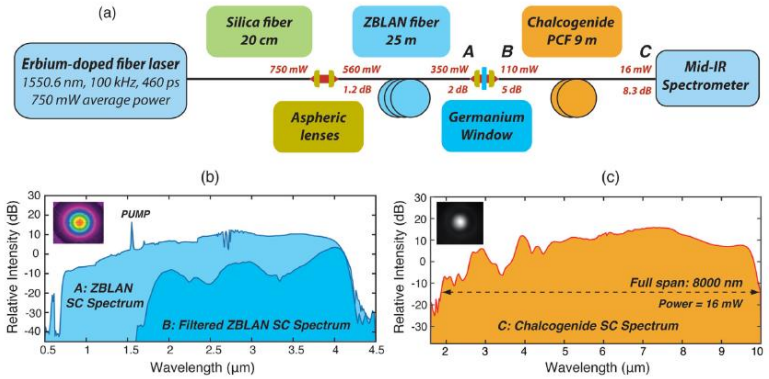
- ZBLAN
- >4.1 µm
- >1 W

LE VERRE FLUORÉ
INFRARED SOLUTIONS

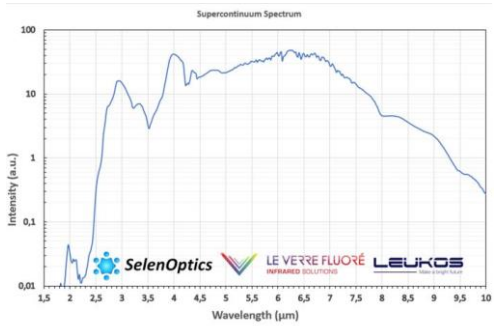


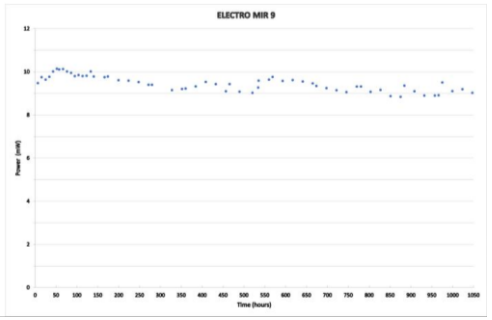
- Indium
- >4.8 µm
- >0,6 W

ELECTRO MIR



- ZBLAN + Chalcogénure
- >9.5 µm
- >10 mW





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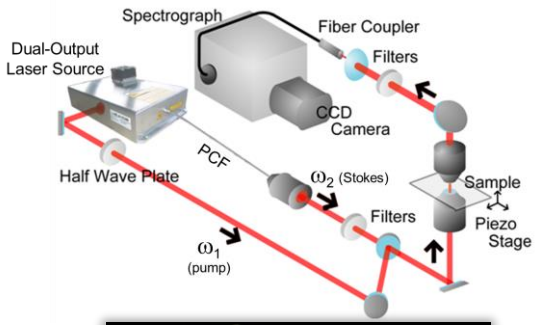
Dual-output laser for CARS application

▶ 2008

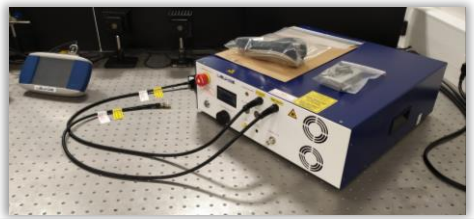
0,8 ns | 33 kHz



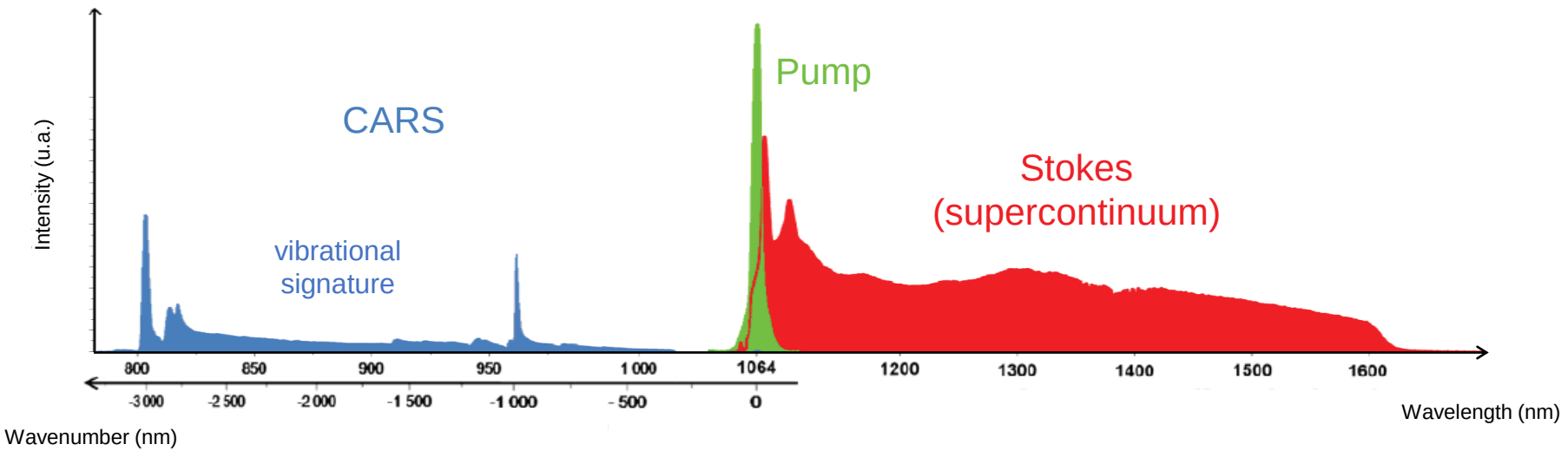
▶ 2018

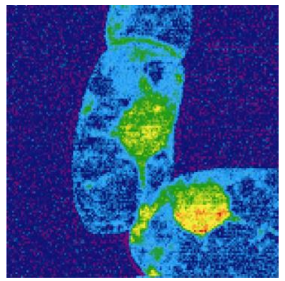
50 ps | 1-5 MHz

Fiber-amplified laser diode
(no need for delay line)

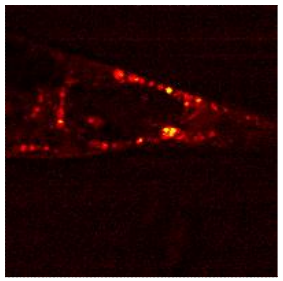


- Multiplex CARS microspectroscopy

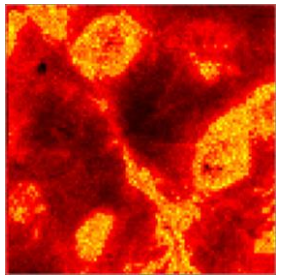




Tobacco cell



C. elegans



Human skin

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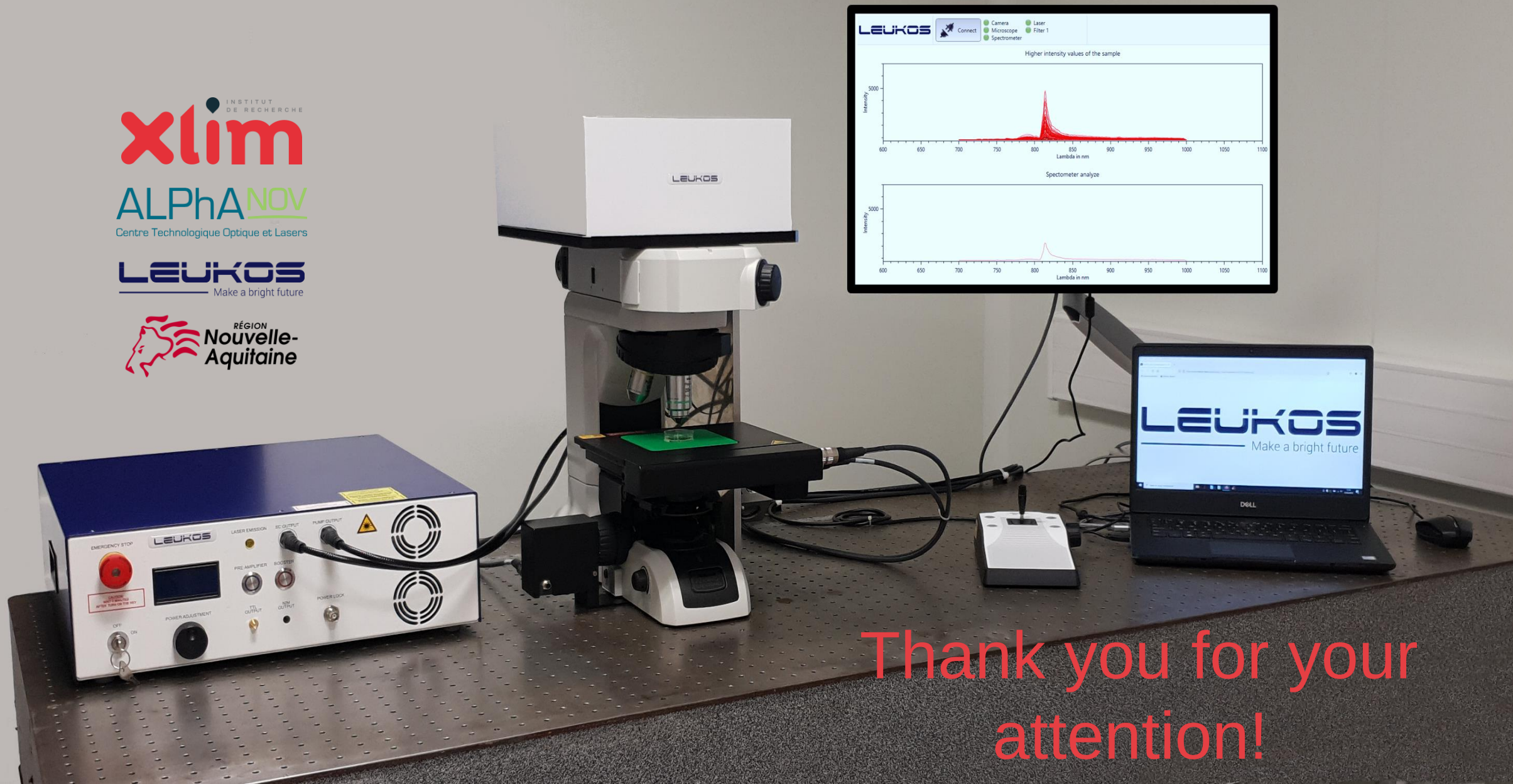
CARS microscope



Thank you for your attention!