DTU Fotonik Department of Photonics Engineering



SUPercontinuum broadband light sources covering UV to IR applications



Multi-tone supercontinuum sources for food control applications with IR spectroscopy

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OBJECTIVES

> Develop an SC source spanning 1000 nm - 4000 nm with an output average power > 1W.

> Such a source should be compact, all fiberized and commercially relevant.

PROGRESS TOWARDS EXPECTED RESULTS

 \succ High repetition rate 10ps, 10 KW used as pump and by employing cascading scheme we access longer wavelengths.

 \succ Various splice recipes developed for dissimilar fibers







- \succ Characterize the noise dynamics in the source
- > Develop setup for spectroscopy and initial tests be made on eating oil





 \succ Pulse to pulse fluctuation characterized out of the fiber with a proposed double beam setup to mitigate this problem



PLANNED SECONDMENTS AND PURPOSE

- > **TUT**: To learn about the pulse dynamics in fibers using FROG with ESR 12 – (3 weeks)
- > KU: To test various milk samples as well as glucose in water with my built source and the developed spectroscopic setup and make comparisons with other developed techniques – (**1 month**)

DISSEMINATION

Conference Proceedings

- > K. Kwarkye, D. Jain, C. R. Peterson and O. Bang, "Signal to noise ratio (SNR) enhancement by an intermediate Tm-doped fiber in a cascaded supercontinuum source (SC) for IR spectroscopy," EUROPHOTON 2018, Barcelona, Spain, 2-7 September 2018. (poster presentation, accepted)
- > K. Kwarkye, Manoj K. Dasa, Rasmus D. Engelsholm, Deepak Jain, Ivan B. Gonazalo, Mikkel Jensen, Christian R. Petersen and Ole Bang, "Pulse to pulse characterization of a cascaded intermediate Thulium doped Supercontinuum source for absorption spectroscopy applications," SPIE LASE, Photonic West 2019, San Francisco, USA. (submitted 14 July 2019)

> Manoj K. Dasa, Christos Markos, Patrick Bowen, Peter M. Moselund, Benjamin O. Efunbajo, K. Kwarkye, Christian R. Petersen and Ole Bang, "Single Mode Fiber based Supercontinuum Lasers for Multispectral Photoacoustic Imaging of Lipids," SPIE BIOS, Photonic West 2019, San Francisco, USA. (submitted 14 July 2019)

* Planned Publication

- > K. Kwarkye, Manoj K. Dasa, Rasmus D. Engelsholm, Deepak Jain, Ivan B. Gonazalo, Mikkel Jensen, Christian R. Petersen and Ole Bang, "Pulse to pulse characterization of a broadband cascaded all fiber mid-infrared supercontinuum source. (Yet to be submitted)
- > Comparison of Supercontinuum based absorption spectroscopy and photoacoustic spectroscopy with ESR 3.
- Supercontinuum based IR spectroscopy of milk samples at different probing wavelengths

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