Supercontinuum sources in mid-IR OCT/Spectroscopy

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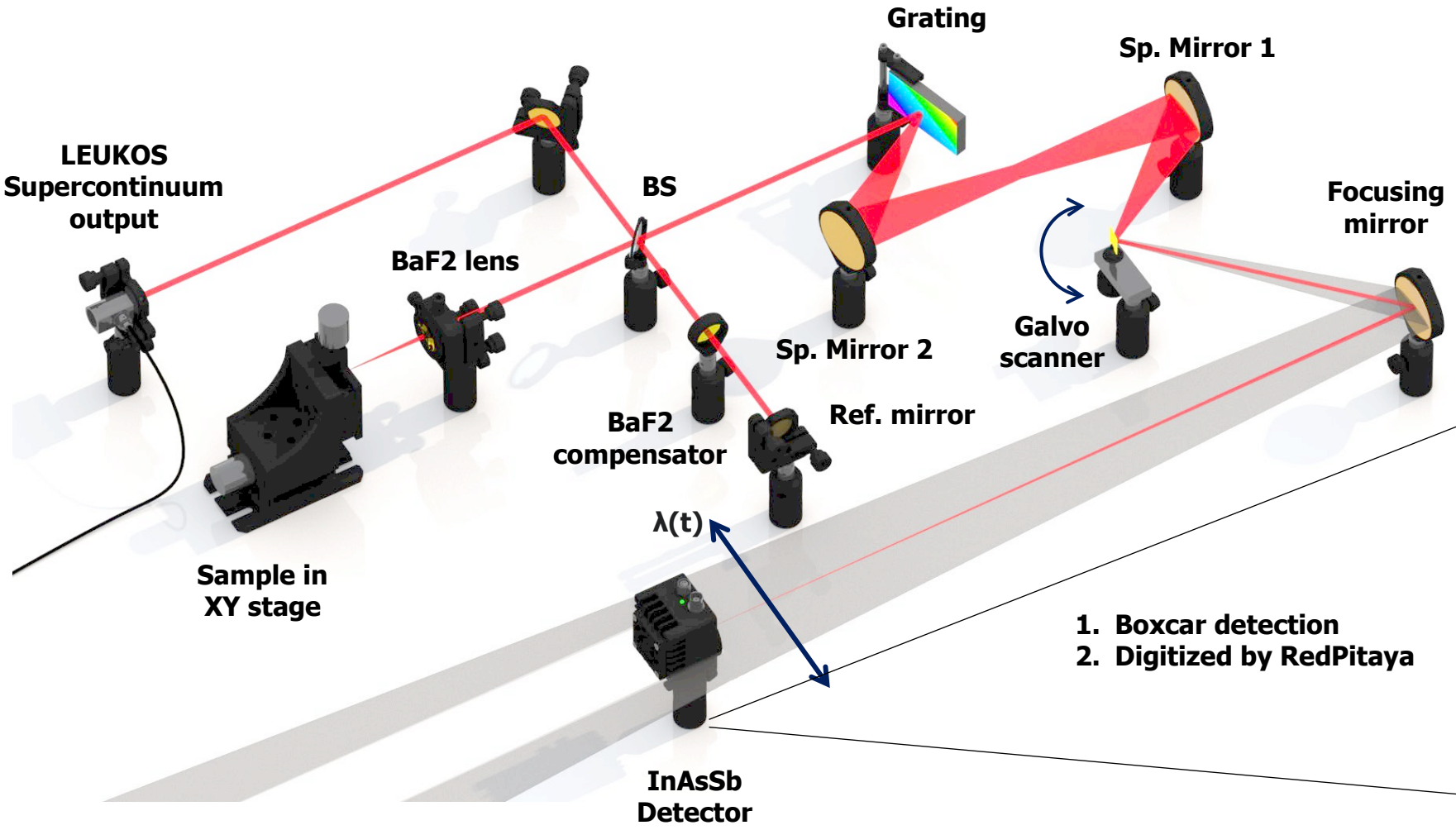
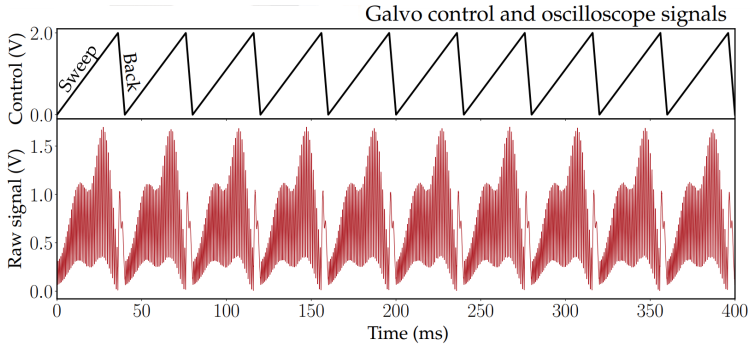
RESEARCH CENTER NON DESTRUCTIVE TESTING

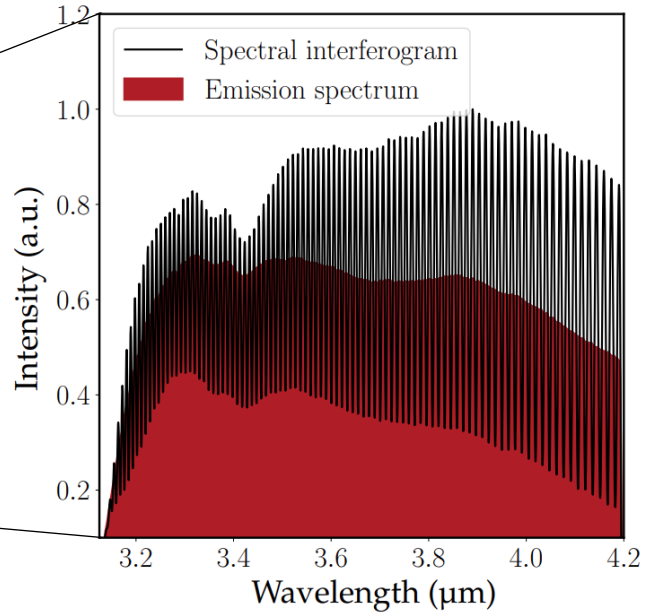
Free-space simplified scheme of the mid-IR teFD-OCT system



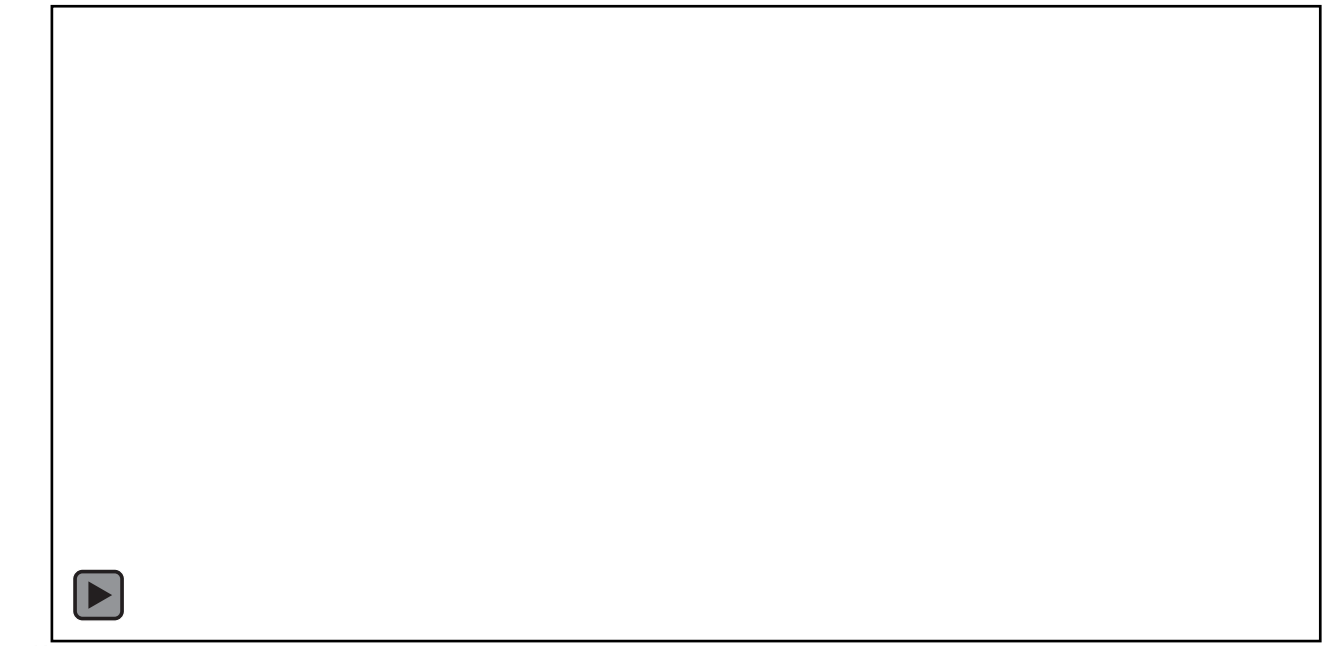
1. **Boxcar detection**
2. **Digitized by RedPitaya**

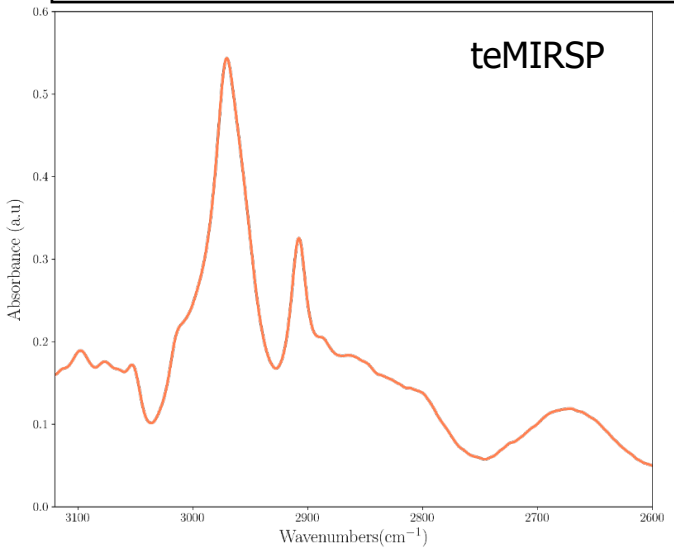
I(λ,t) – oscilloscope signal for real sample (asymmetric galvo scanning)

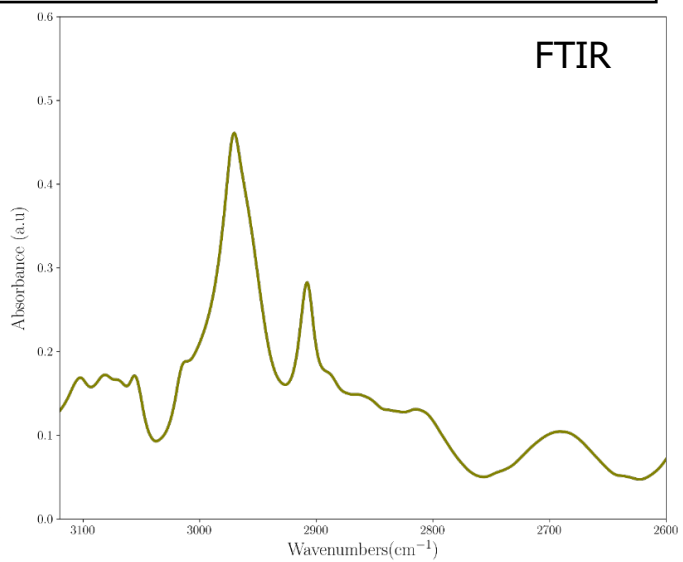


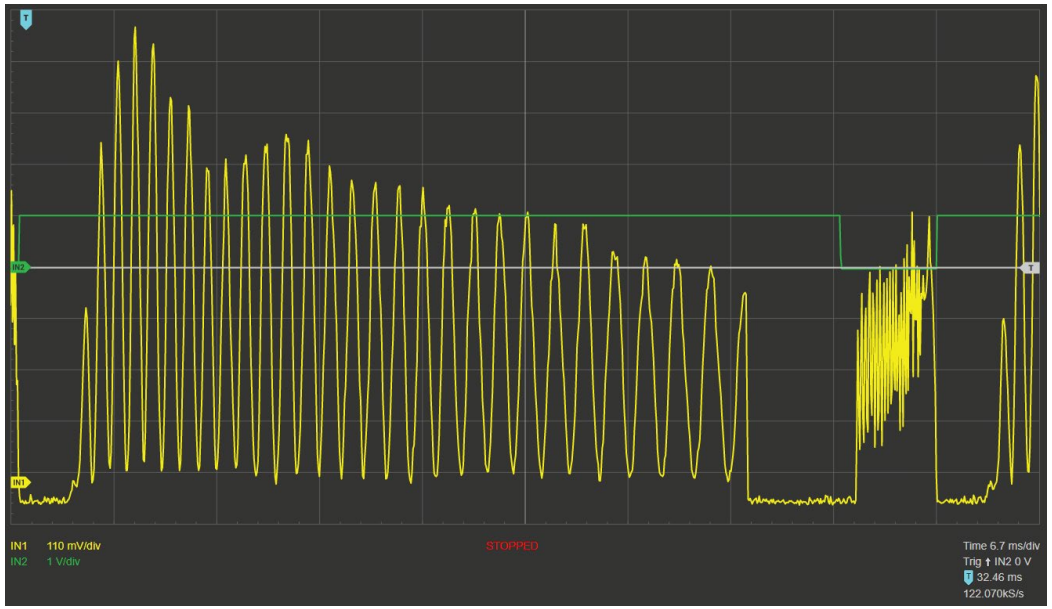


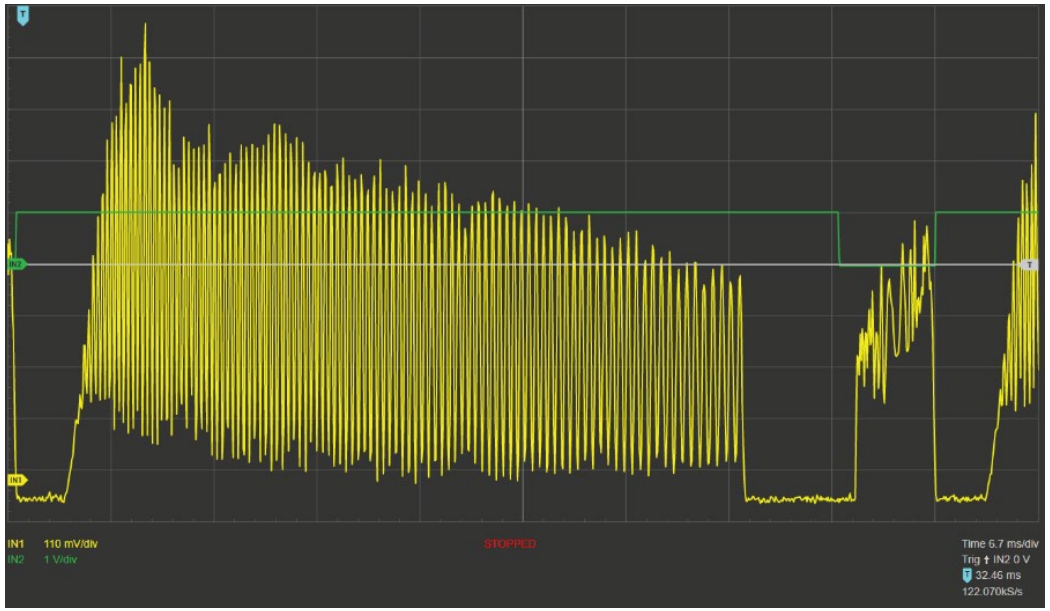
Time-encoded detection principles











teOCT performances/characterization

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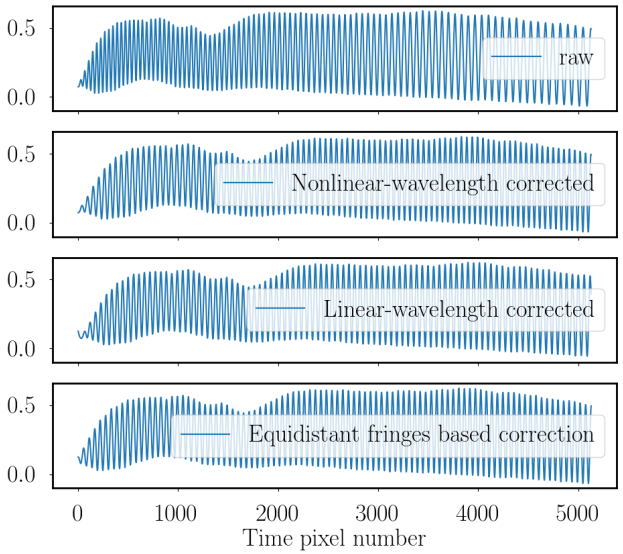
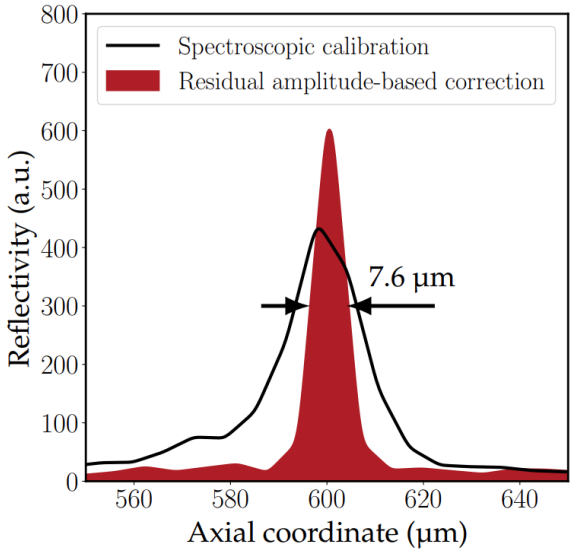
Post-processing



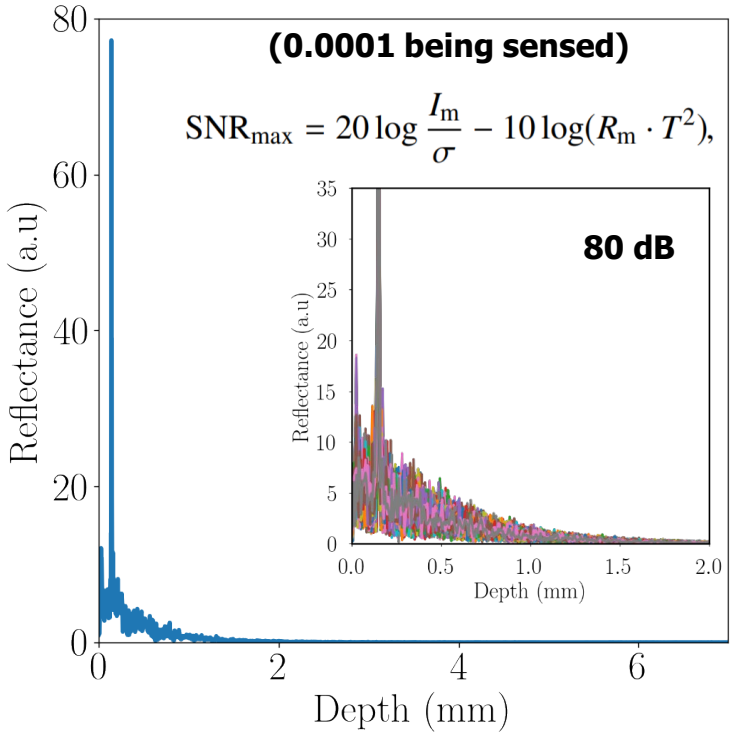
Axial resolution (7.6 um)



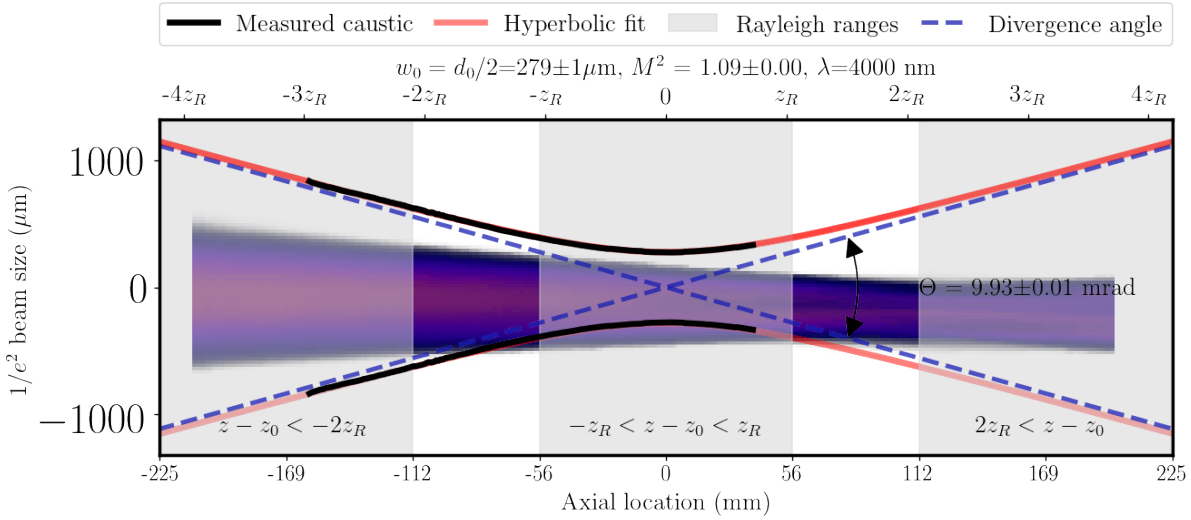
A-scan - mirror behind ND filter

(0.0001 being sensed)

$$\mathrm{SNR_{max}} = 20\log\frac{I_m}{\sigma} - 10\log(R_m \cdot T^2),$$



Beam quality (M2=1.09)



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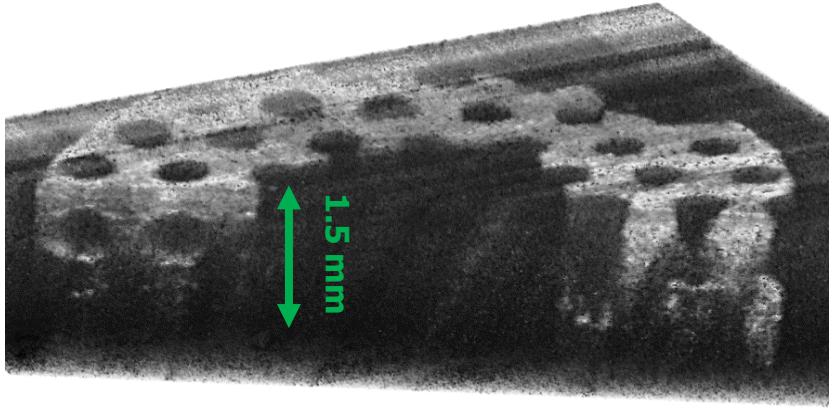
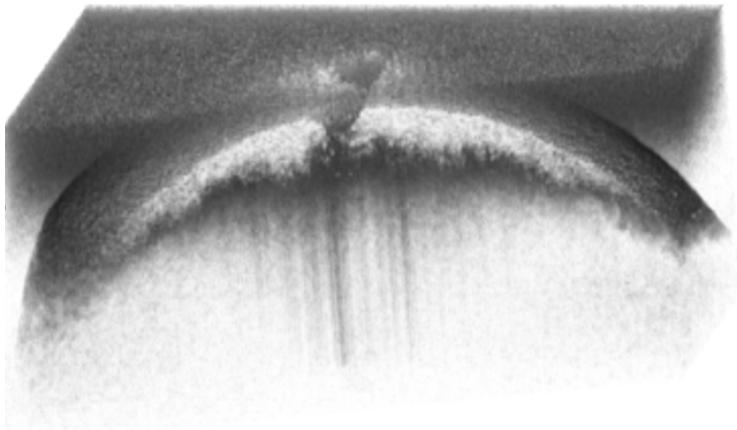
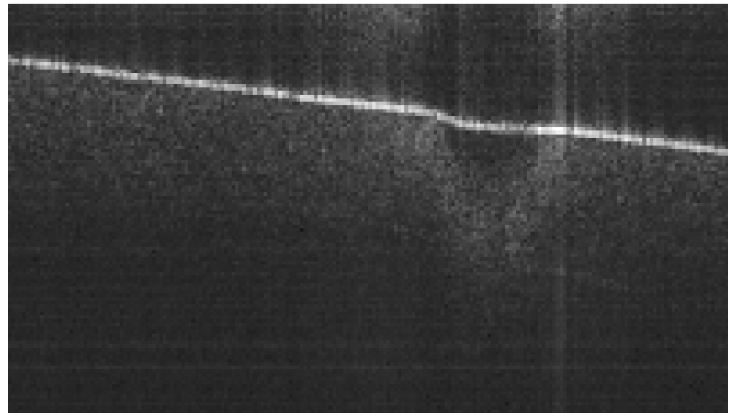
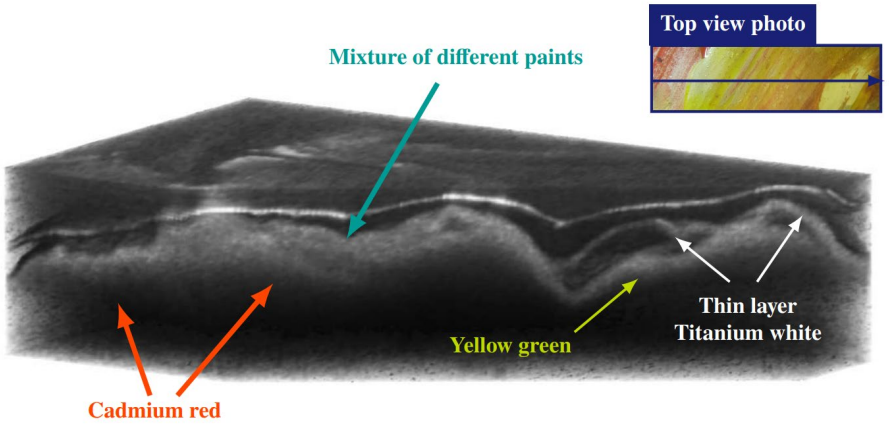
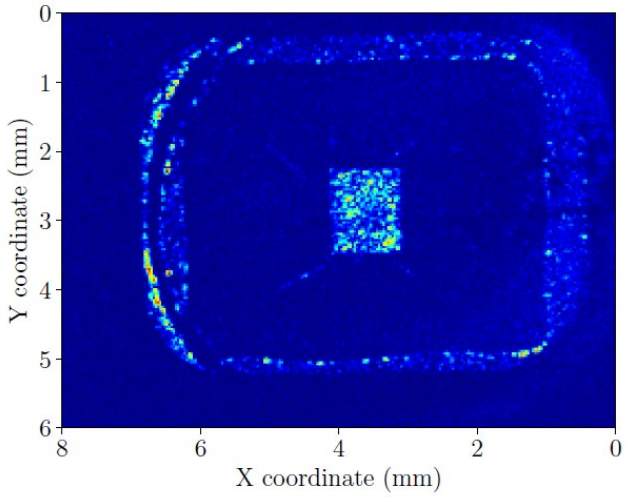
Potentials for investigation of materials/samples formerly problematic due to scattering

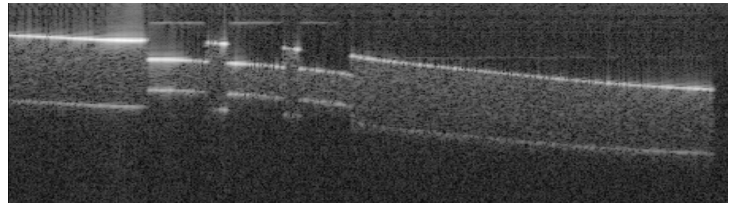


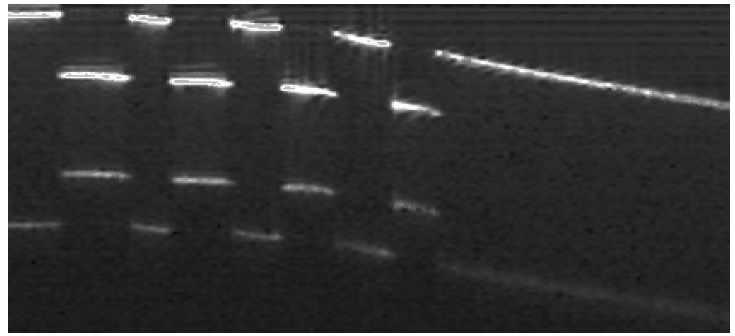








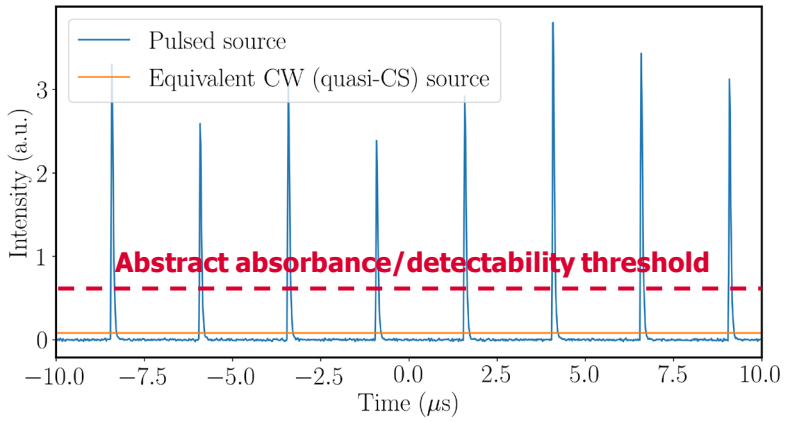


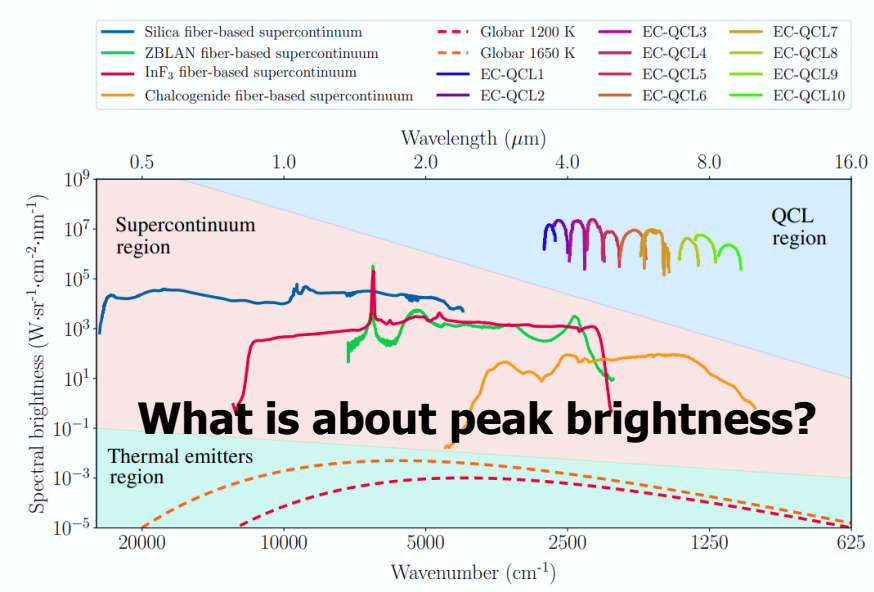


Outlook – feature potentials

….apart from standard power increase and bandwidth extension

Peak power – Peak power advantage





High peak power/low average power sources

(low repetition rate emitters):

1. Low **thermal load** on the samples
2. Increased **detectability** (send a lot of photons in one packet)
3. **What will outweigh** in case of supercontinuum generation? High repetition rate – more averaging of pulse noise (lower noise) but approaching quasi-CW range the signals are also lower.