



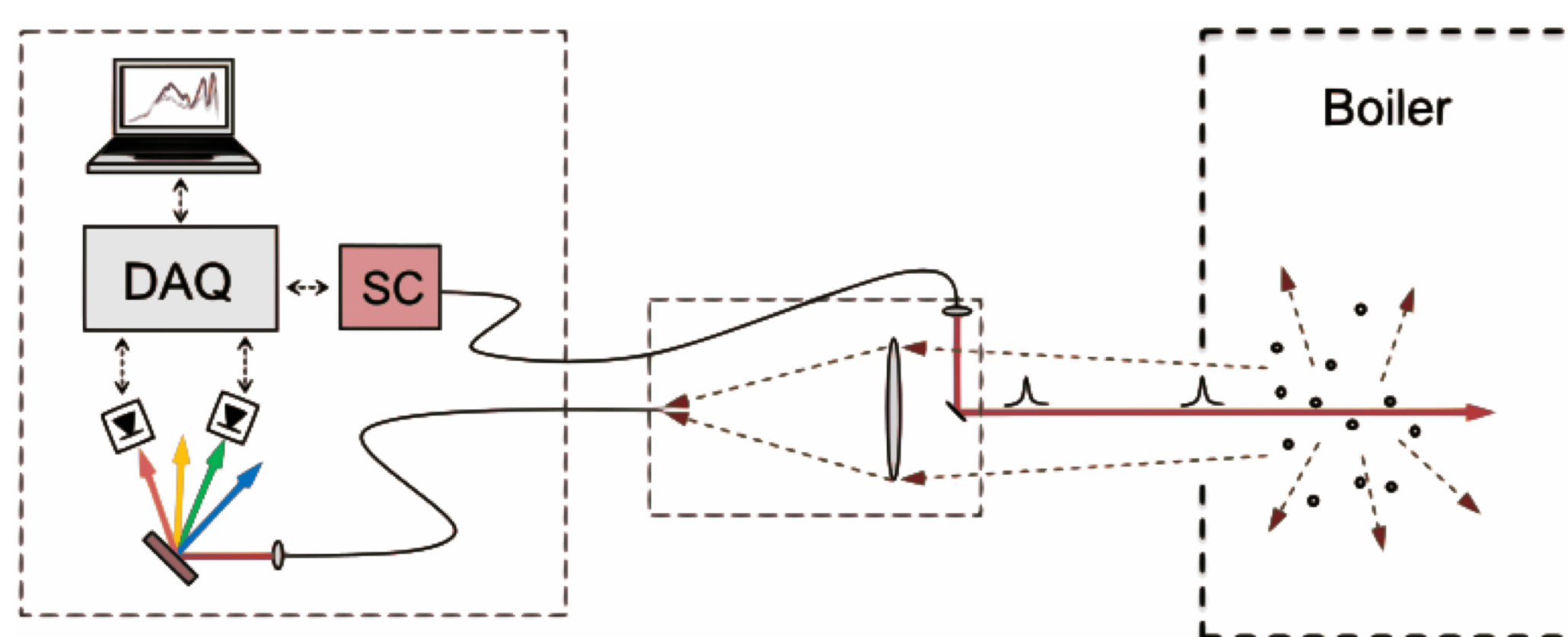
# Range – resolved supercontinuum-based LIDAR for spectroscopic gas sensing

Abba Saleh – ESR 13  
VALMET

**Objective(s):** Demonstration of a new type of SC-based LIDAR detection in industrial high-temperature process with range resolution < 1 m.

## Progress towards objectives and expected results

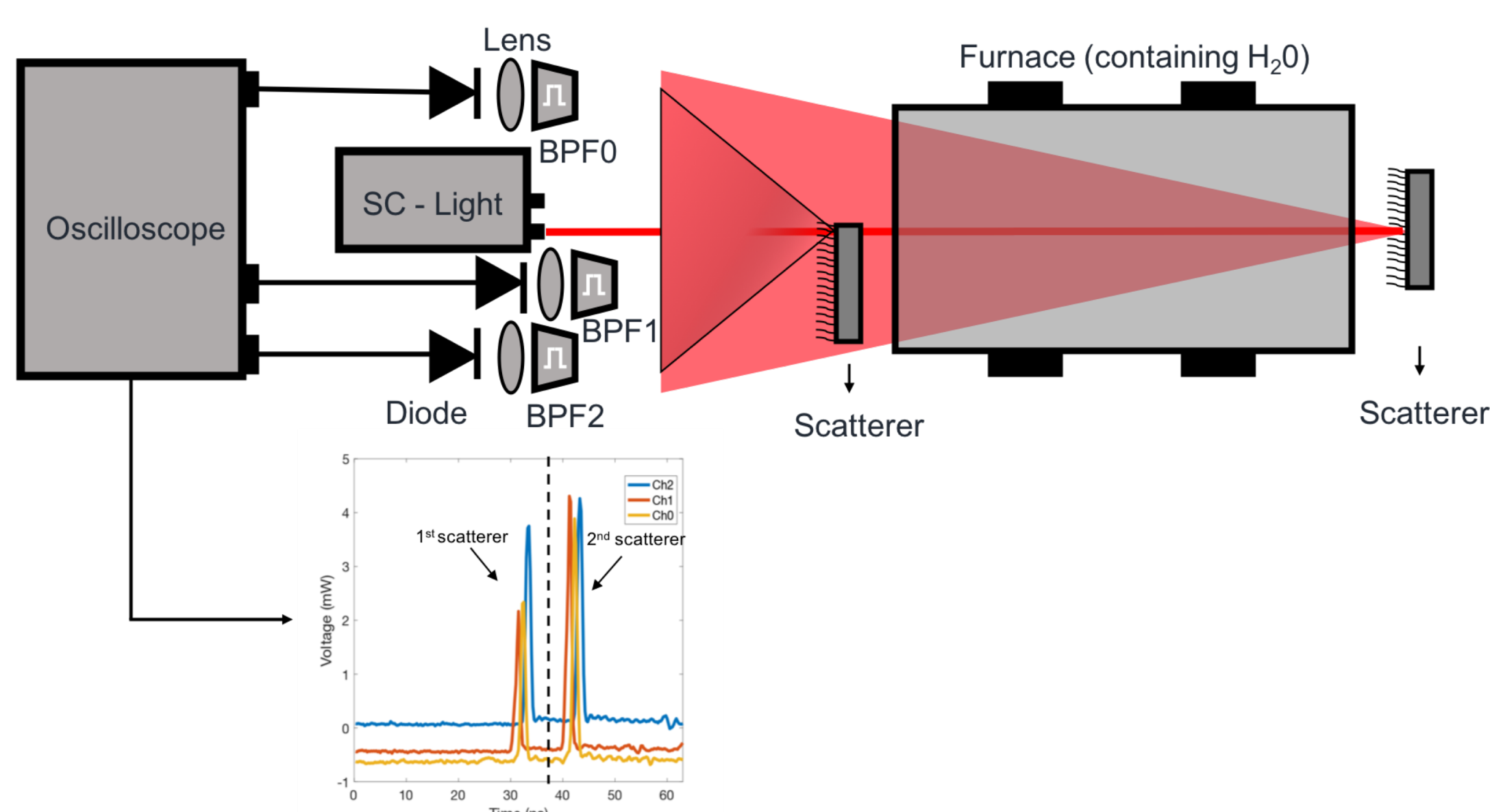
### Supercontinuum LIDAR



$$P(\lambda, R) = P_0 \left( \frac{A}{R^2} \right) \left( \frac{CT}{2} \right) \eta(\lambda, R) \beta(R) e^{-2 \int_0^R \alpha(r) dr}$$

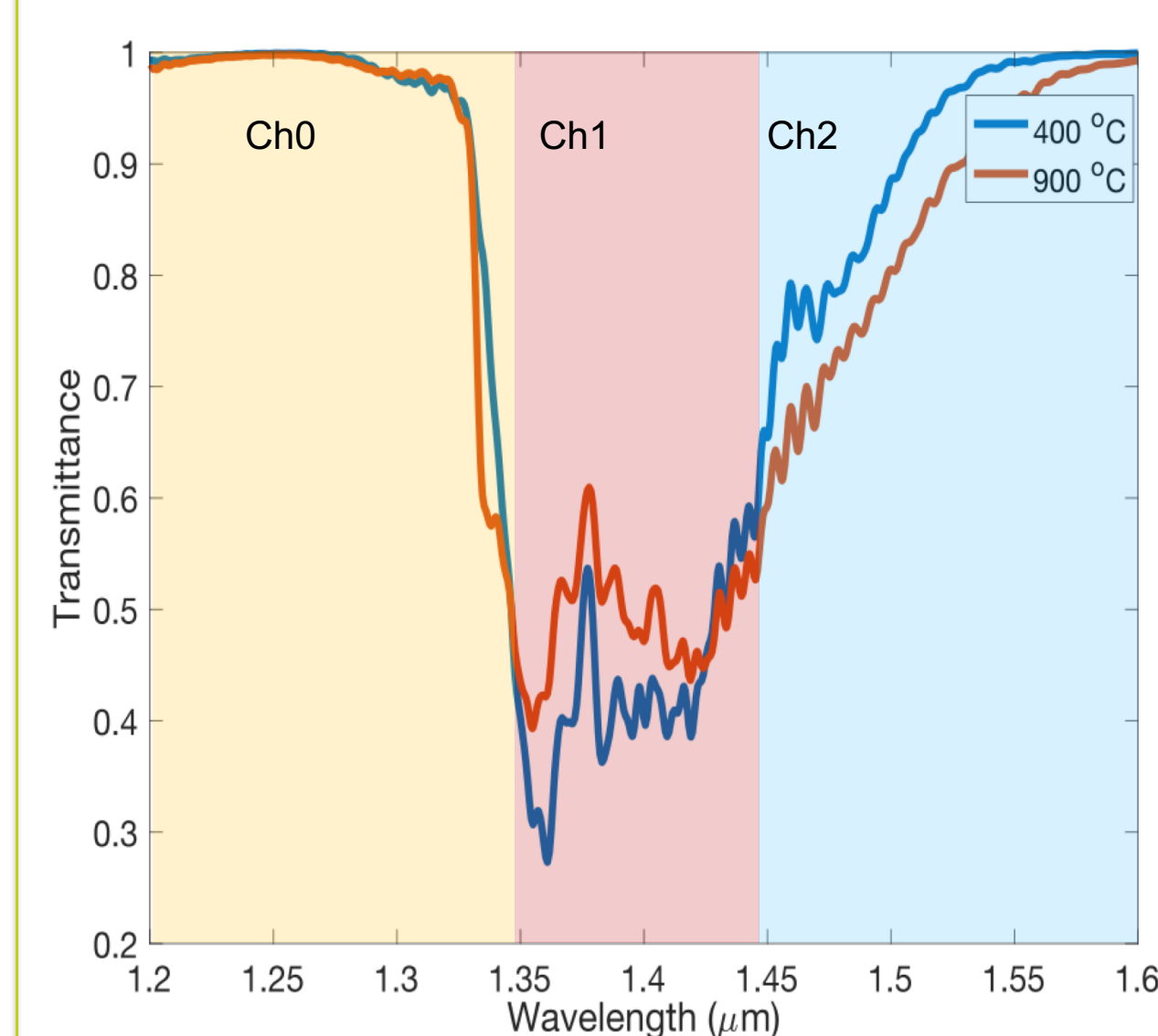
- Extremely strong scattering by aerosol particles.
- 3D gas concentration monitoring and temperature profiling

### Experimental Setup

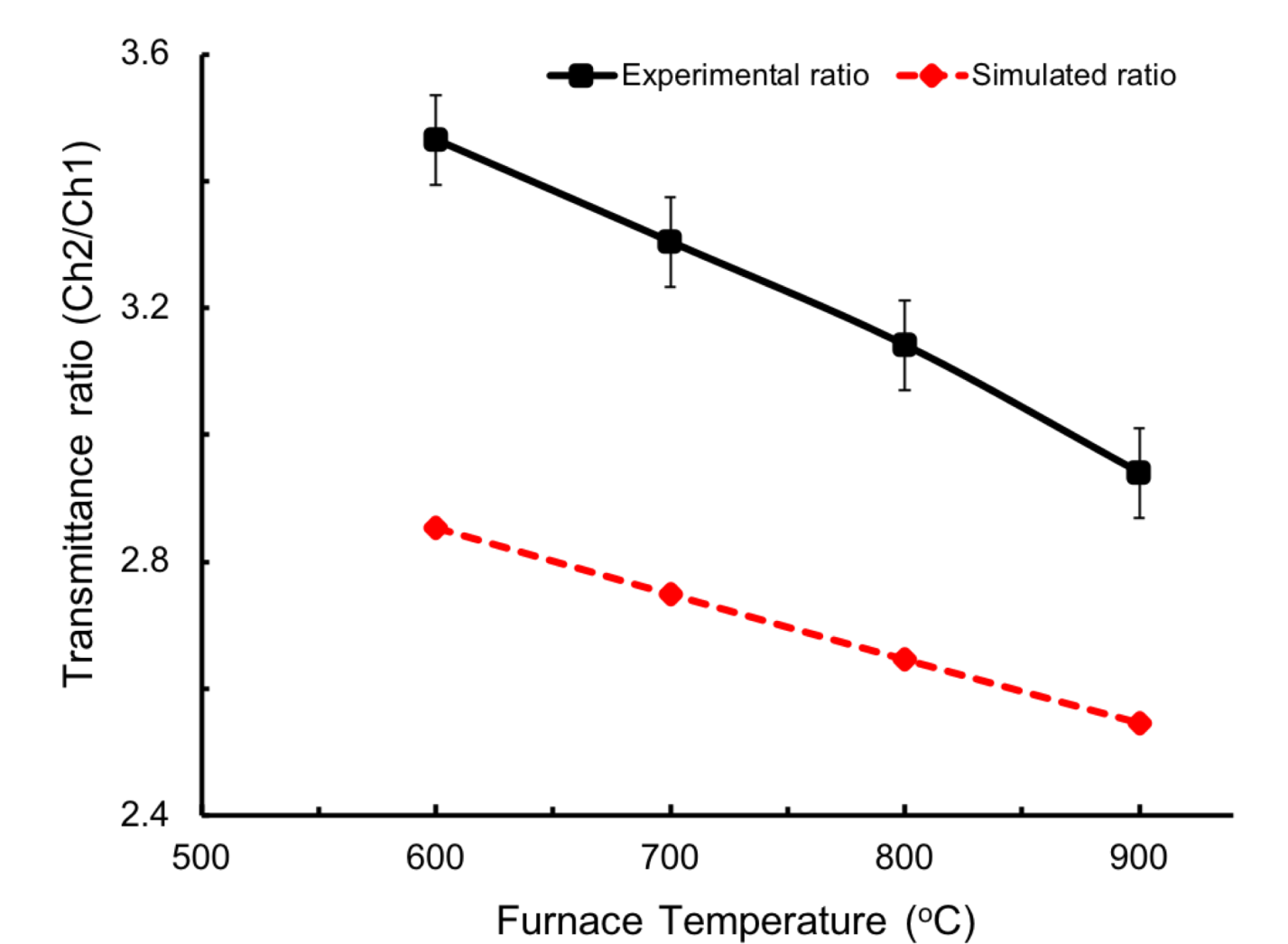


### Milestone & Deliverable

- Modelling of spectral absorption at different temperatures.
- setups for 1D temperature profiling - A new setup was built due to chromatic errors in the initial setup.
- ~30 cm spatial resolution achieved - adequate for industrial application.
- Construction on-going, field tests scheduled for Nov. 2018.

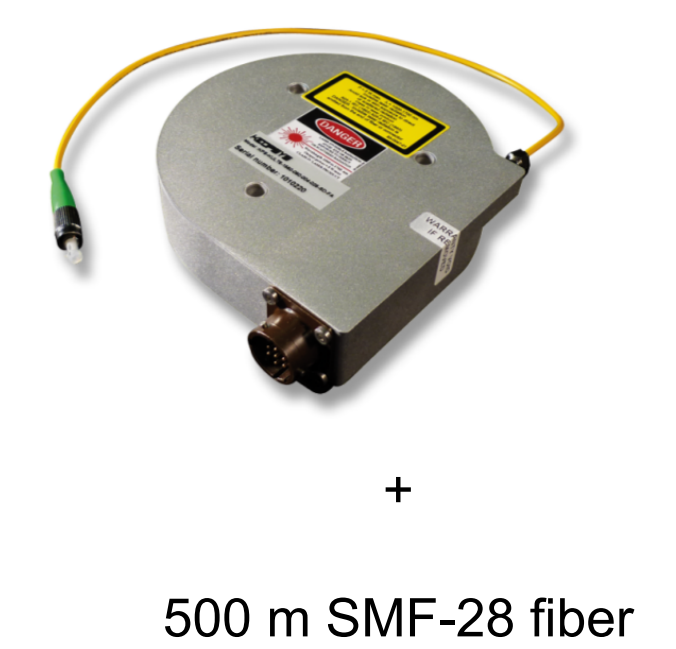
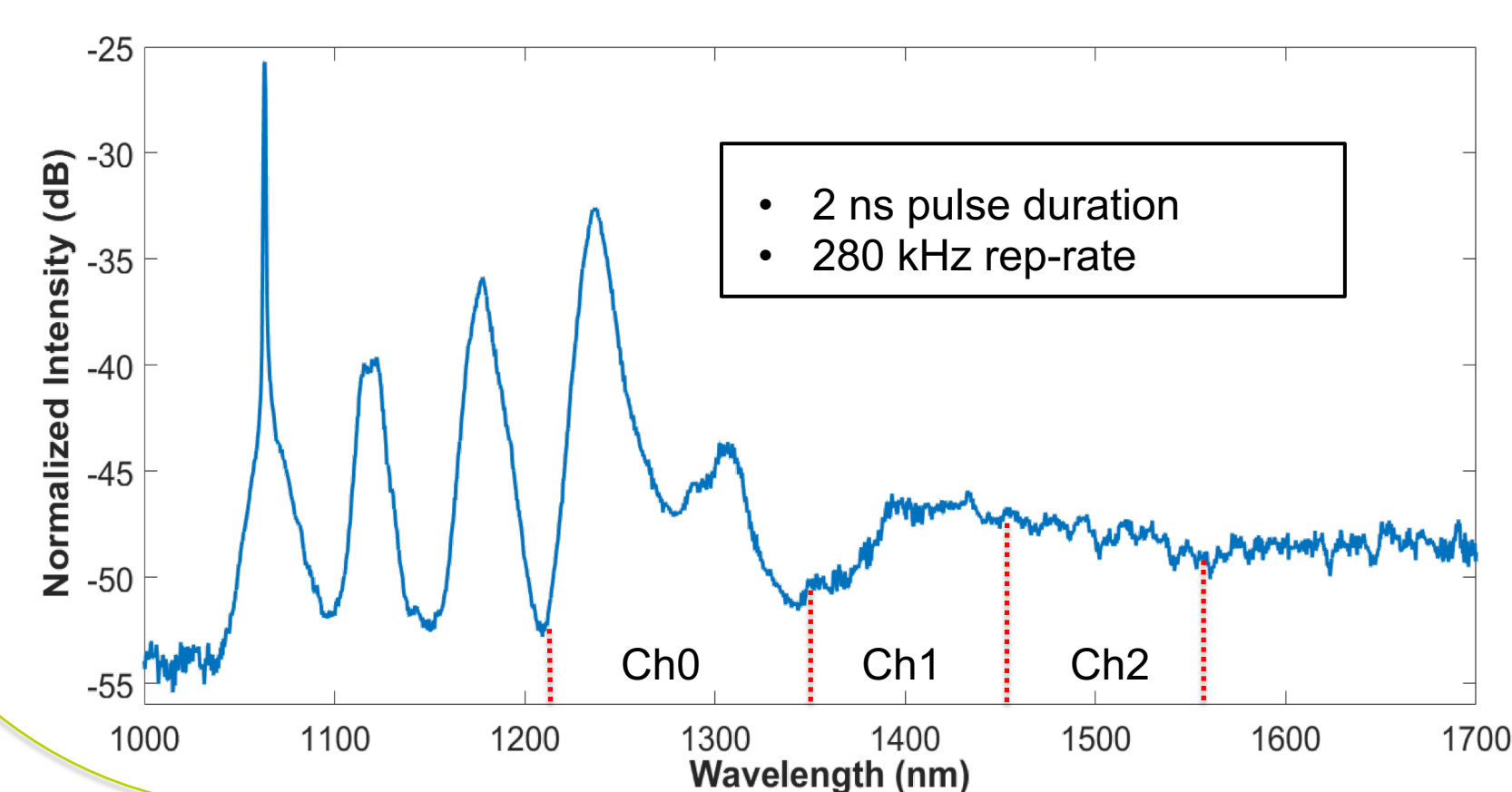


Modelled H<sub>2</sub>O transmittance with 100% concentration at varying temperatures.



Transmittance ratio of Ch2 to Ch1 with 100% H<sub>2</sub>O concentration at varying temperatures

### Supercontinuum Source



500 m SMF-28 fiber

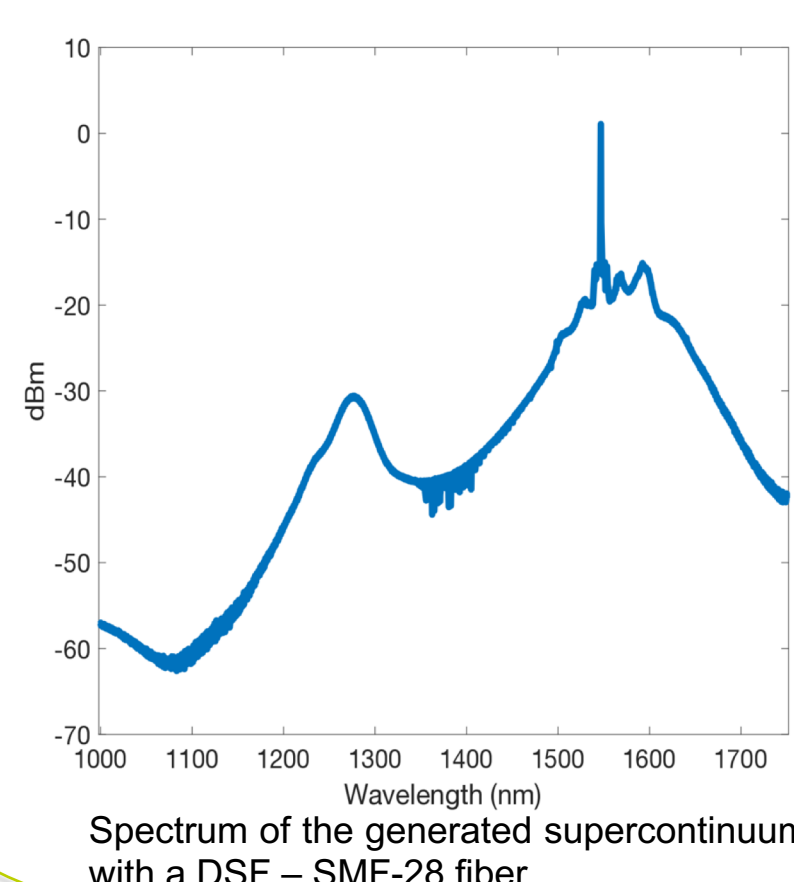
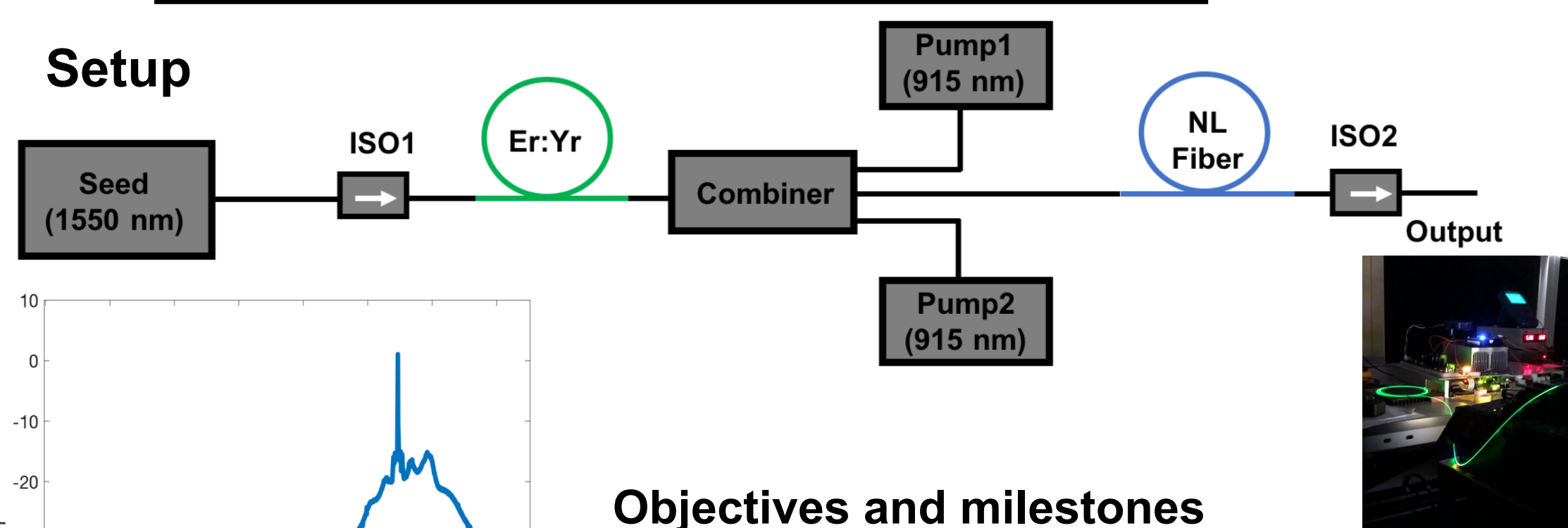
## Secondments course work (ECTS) and future plans

### Secondments

Original plan:

- NKT (Leick), m12, SCG at near-IR and mid-IR and noise
- CNRS (Sylvestre), m22, UV SC sources and applications

### Three weeks secondment at NKT – M23



Spectrum of the generated supercontinuum with a DSF - SMF-28 fiber

### Objectives and milestones

- Familiarize with available Mid-IR SC sources for gas sensing at the same power plant conditions.
- Hands on experience with building a fiber laser system and high power SCG.
- Generated SC is intended to be used for power plant measurements.

### Course work (ECTS)

- 40 ECTS required by graduate school at TUT (35 ECTS completed)

### Project timeline

