PROMETH2O

Metrology for trace water in ultra-pure process gases

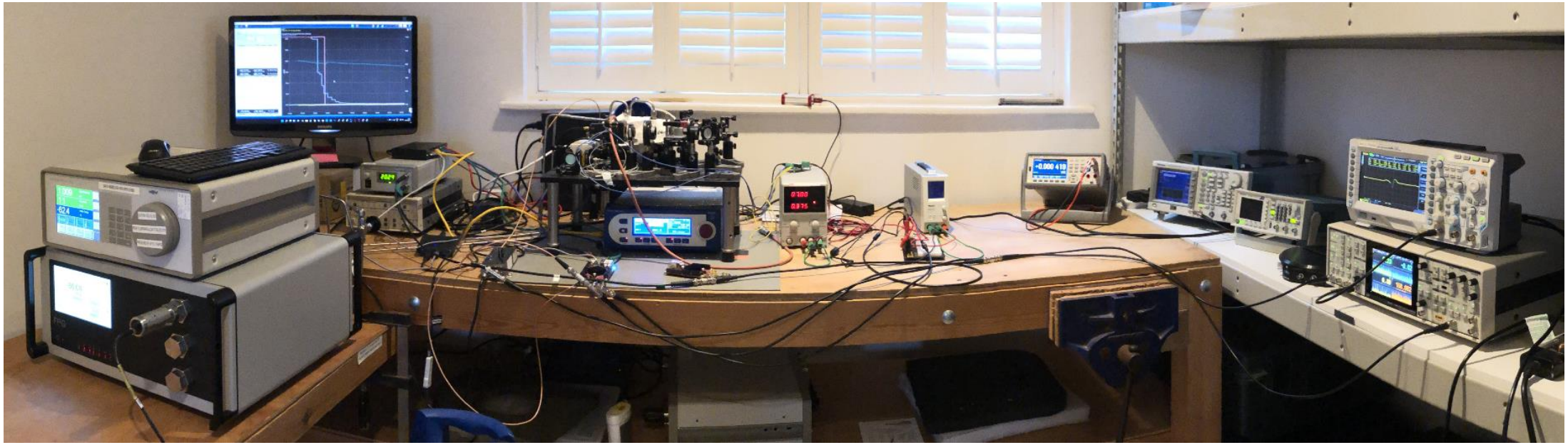
Project Progress Meeting at M18

VSL, Delft, The Netherlands

2-3 November 2022

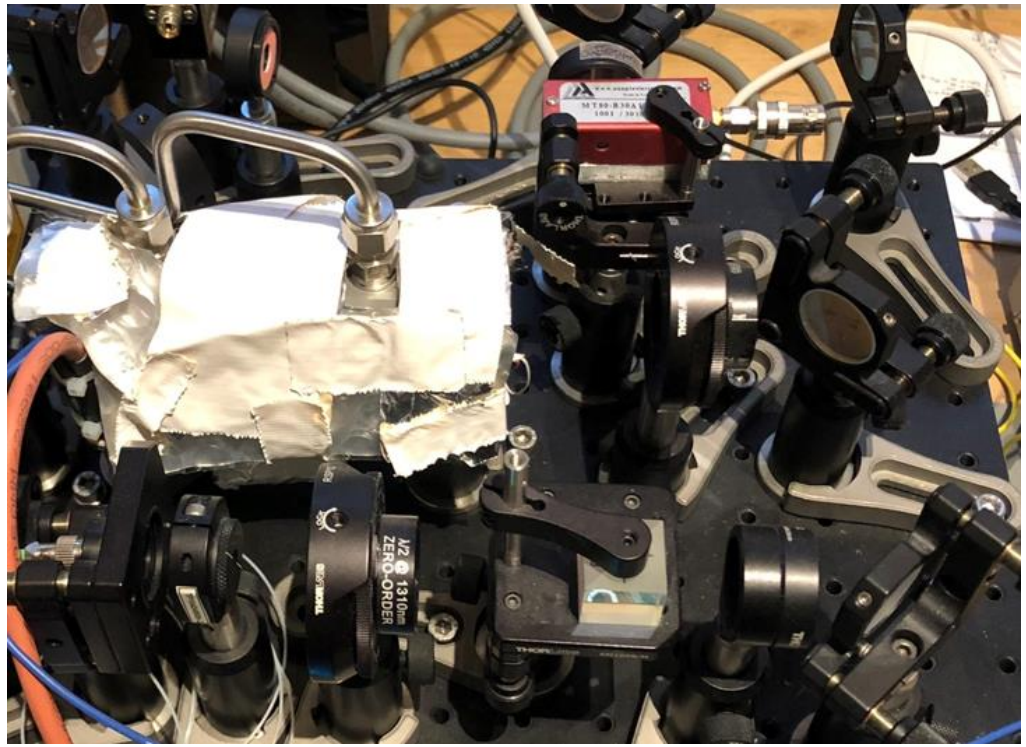
EMPIR
EURAMET
The EMPIR initiative is co-funded by the European Union's Horizon 2020 research and innovation programme and the EMPIR Participating States

Cavity Enhanced Laser Hygrometer



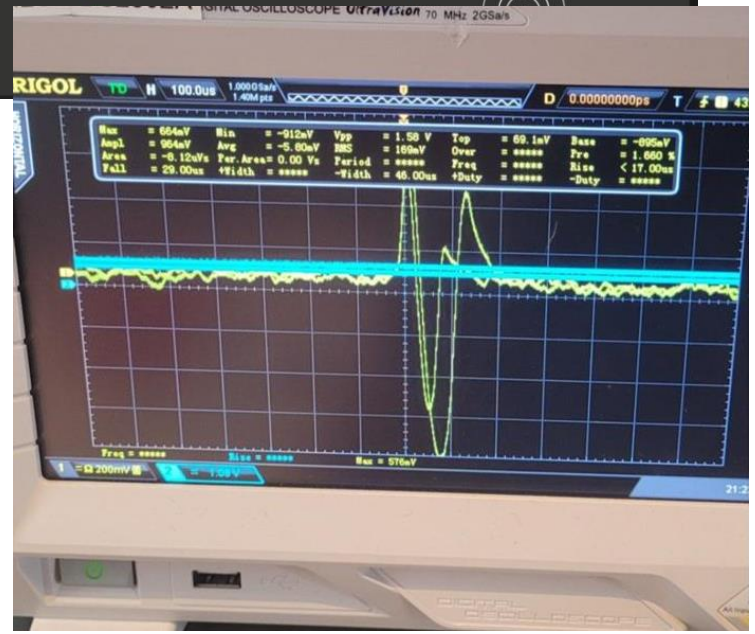
Achievements reported last meeting:

- Optical bench set up
- Test cavity constructed and thermally stabilised
- Gas connections
- Laser stabilised and locked to cavity
- Expected signal profiles achieved
- Test rig for hygrometric performance using FPG



What has taken place since:

- Added an amplifier circuit for greater scanning range
- Further tuned the cavity temperature controller PID for improved thermal stability



Cavity Enhanced Laser Hygrometer

- Conducted further tests with frost point generator
- Smooth gas flow
- Evaluated effects of pressure

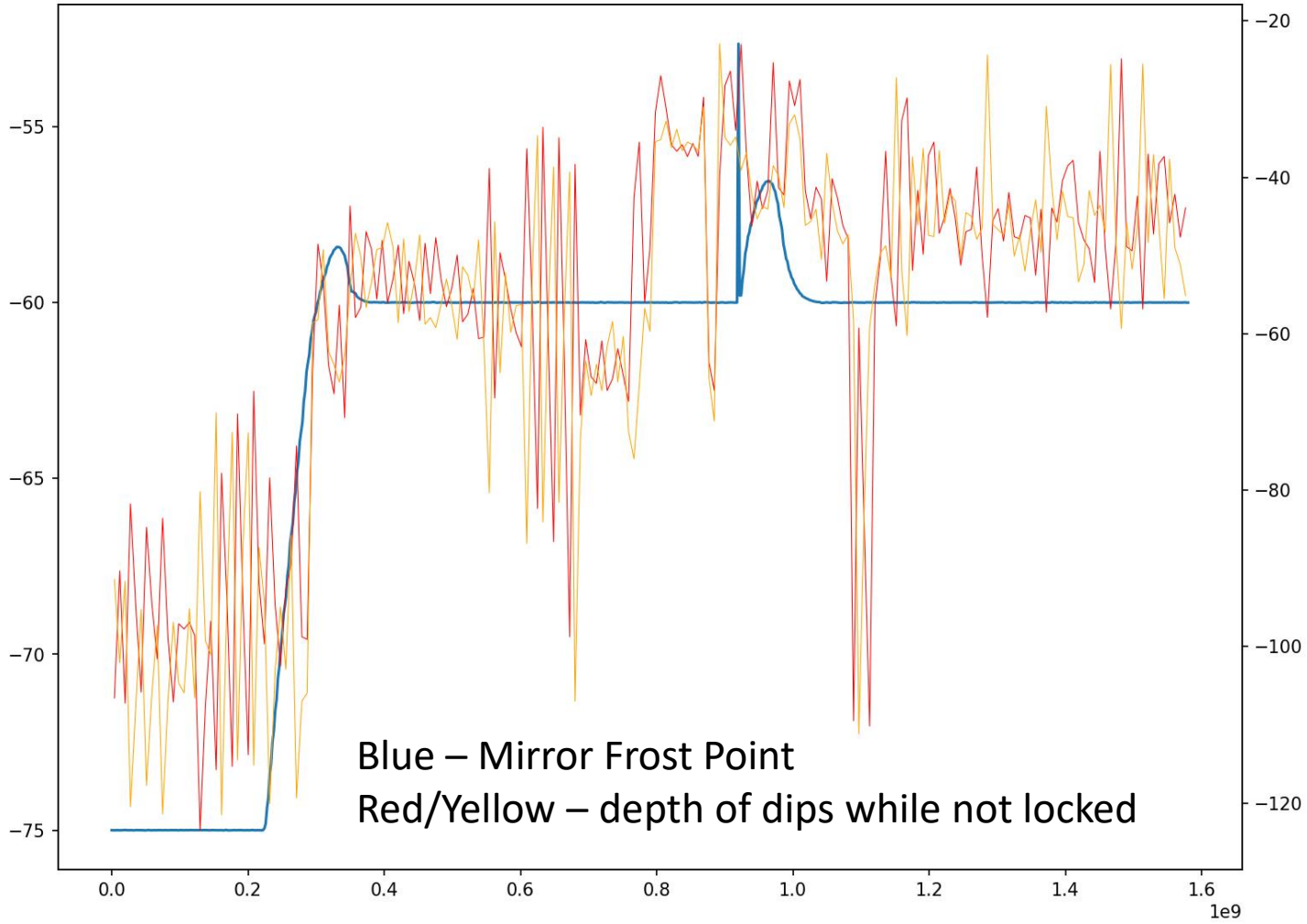
Cavity Enhanced Laser Hygrometer

- Found a method to record long High Res Red Pitaya Datasets (200kHz @ 16bit)
  - Converted the binary file to csv
  - File size Limit is 11 Gb (2-3 hours of recording)
  - 10,000,000,000 rows per File
  - Timestamps need to be applied post-recording (currently)

- Found a way of opening and processing these files quickly; now opening and processing 11Gb file in 10s.

Cavity Enhanced Laser Hygrometer

- Investigated the possibility of not needed to lock



Linien spectroscopy lock 0.4.3: Laser lock (rp-F0695D.local)

Home Actions View Communicate Files & Extras

Ramp Amplitude: Ramp Position: < > Ramp: 0.303V to 1.000V

Reset view

0.04 0.03 0.02 0.01 0 -0.01 -0.02 -0.03 -0.04

0 0.003 0.007 0.010 0.013 0.02 0.020 0.023 0.026 0.029 0.03

time (s)

Channel 1: -12.70 Channel2: error signal monitor

Devices Close client

Export settings Import settings

Noise analysis

Shutdown server

General

Modulation, Ramp & Spectroscopy

Optimization

View

Locking

P,I and D of fast control

P 100 0-8191

I 1 0-8191

D 0 0-8191

Auto Manual

Select target line

Autolock algorithm

Auto-detect

Determine signal offset

Adapt offset such that lock is in the middle between minimum and maximum. Note: this setting may reduce reproducability of absolute frequency

MiniTerm: Qrometric | FPG-100 | SN QrometricFPG100-0

Request PCT=1

Response 2022-07-24 17:24:01.516 TX PC

2022-07-24 17:24:02.168 RX 0

-

Enlarge window Script Auto clear Save c

11 items

What next:

- Timestamp validations
- Installing new Piezo Driver
- Improve locking reliability while using FPG
- Demonstrate repeatability using chilled mirror hygrometer

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Thank you for your attention

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