

Simultaneous detection of zero gas impurities – quantification of CO₂ and H₂O by TDLAS –

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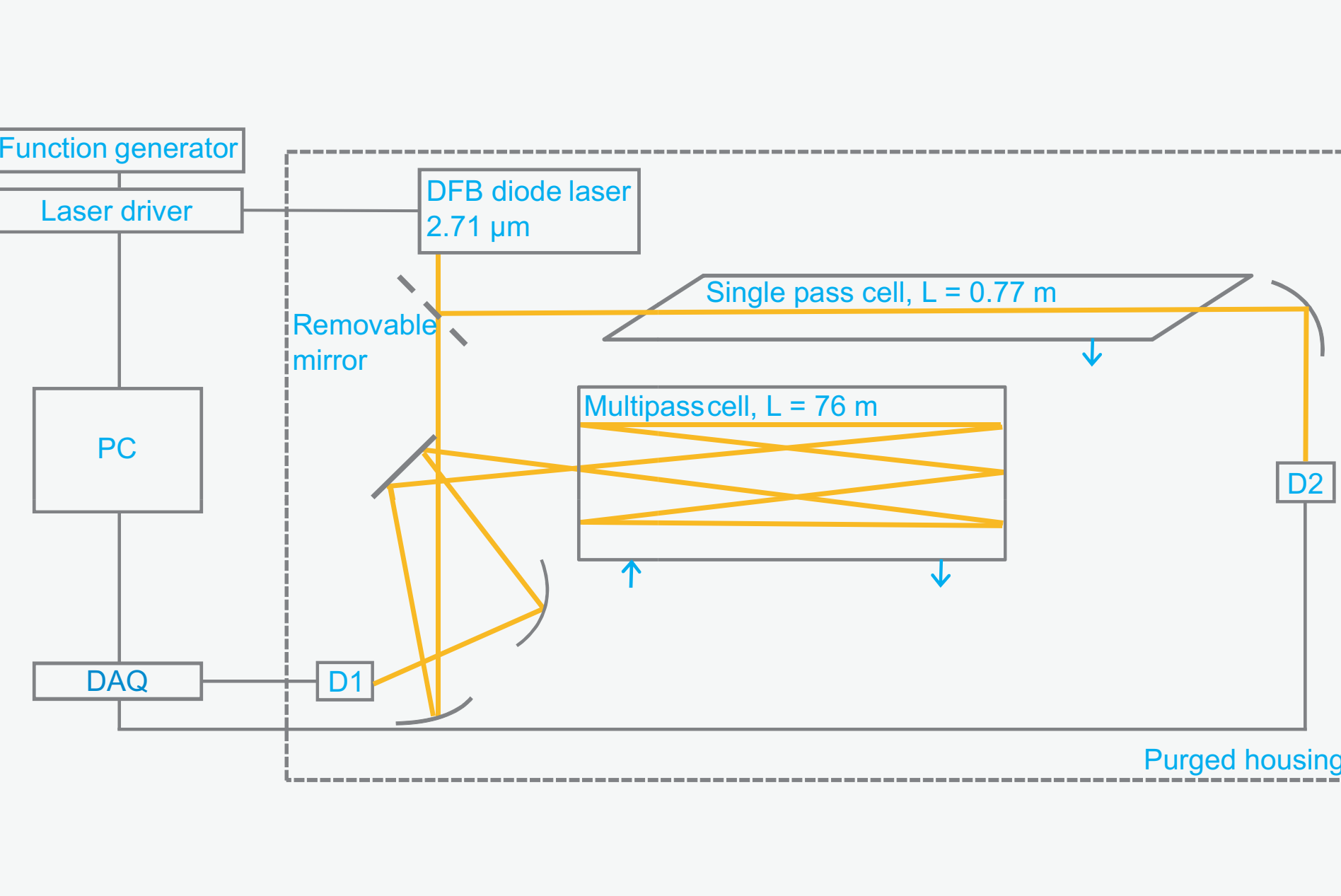
Motivation

EMRP project:
MACPoll – Metrology for chemical pollutants in air
WP2: zero gas standards

PTB's task in the project: development of a sensor based on low-cost near-infrared diode lasers for traceable detection of H₂O and CO₂ in zero gas standards (i.e. <150ppm H₂O, <4ppm Co₂)

Impurity	Concentration limit*	Objectives of the project for zero gas measurement:
H ₂ O	150 ppm	<ul style="list-style-type: none">- detection limits of lower than half of the limit values- simultaneous detection of the analytes- absolute measurements- traceability
CO ₂	4 ppm	
H ₂ S	0.1 ppm	
NO	1 ppb	
NO ₂	1 ppb	
SO ₂	1 ppb	

Experimental setup



Laser

- DFB diode laser @ 2.71 μm, ~ 2mW power

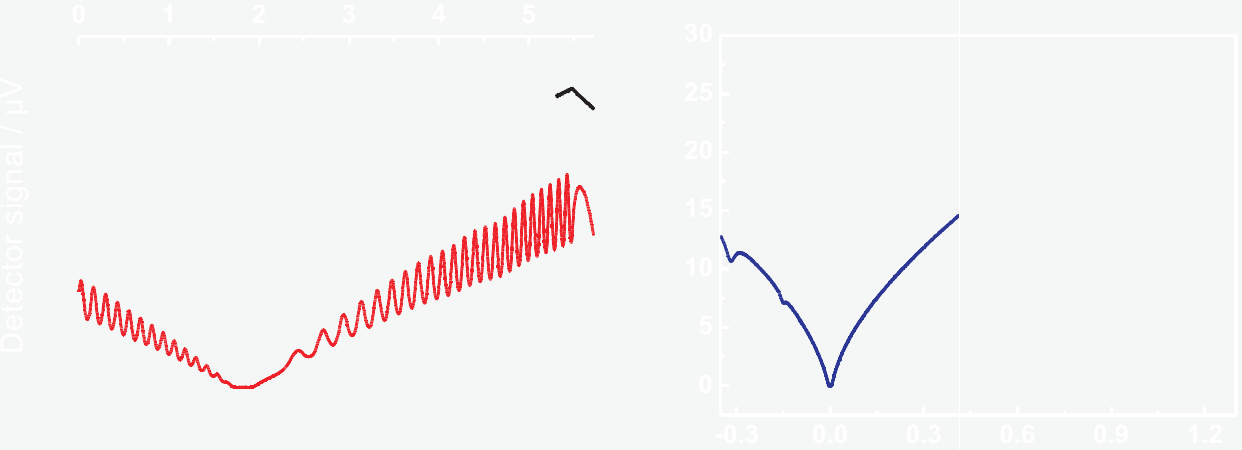
Detector

- InAs photodiode λ: 1-3.4 μm, d=1mm

Gas handling

- two gas cells:
 - Single pass cell, 77 cm, 60 cm³
 - Multipass Herriott cell, 76 m, 500 cm³
- 500 cm³/min flow rate through the cells, pressure of the gas sample kept at 200 hPa
- measurement carried out at room temperature

Traceability and uncertainty assessment



1 A. Pogány, O. Ott, O. Werhahn, V. Ebert: J. Quantit. Spectr. Rad. Transf. 2013. 130: 147–157

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