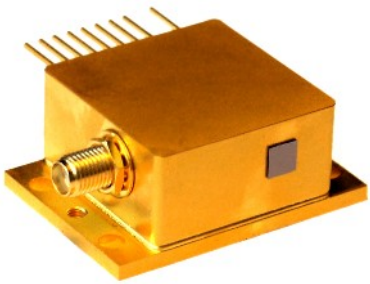
phocone

Laser Precision for Gas Detection



Continuously Tunable Laser Modules

Mid-infrared emission for multi-gas analysis

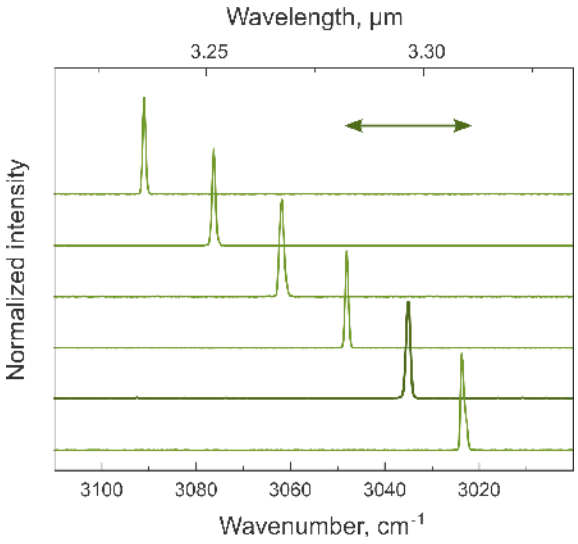
Summary

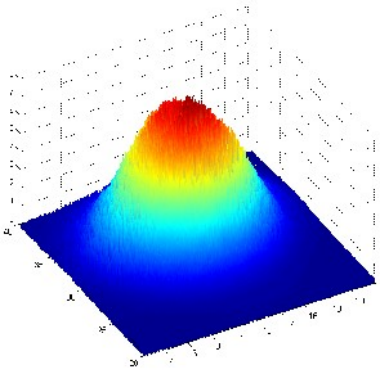
Phocone's mid-infrared laser modules are the new reference for broadly tunable laser sources. They are specifically designed for the precise and fast analysis of multi-component gas mixtures, including flammable and toxic gases.

The laser modules of Phocone feature a broadly tunable single-mode emission at mid-infrared wavelengths. This allows the quantification of multiple gases at once even at sub-ppm levels, particularly of hydro-carbons including the heavier molecules of this gas family. The extremely broad wavelength tuning in combination with operation in the mid-infrared atmospheric window allows fast and reliable sensing solutions even in uncontrollable real-world environments. Thanks to the quasi perfect emission beam, the integration into a measurement system is straight-forward.

Key Specifications

- TEM_{00} single-mode emission
- Mid-infrared wavelengths around 3.3 µm
- Continuous tuning of 3% or up to 100 nm
- Radial symmetric beam, < 4° divergence
- Pulsed operation, duty cycle up to 0.1%
- Output peak power > 10 mW_p
- Passive air cooling





Product Options & Accessories

- Full plug&play control electronics including laser pulser and driver, and TEC stabilization
- Capacitive feedback sensor for superior accuracy and long-term wavelength stability
- Other mid-infrared wavelengths available upon request in the range 3.0 - 4.5 µm
- Beam collimation or fiber coupling

Gas Sensing Applications

Phocone's technology provides a non-contact high precision method to detect flammable gases. This helps ensure process and product safety, and allows for process optimization.

- Safety and quality control in the oil and gas industries
- Quality control during refinement, fractioning, and polymerization
- Propellant leak testing of consumer products at full production line speed
- Process safety concerning flammable gases
- Volatile organic compounds (VOC) for food and health applications
- Miniaturized high-resolution spectrometer
- Security applications including explosives

Oil and Gas

- Safety during natural oil and gas production, refining, and leak testing of pipelines
- Quality control during refinement, fractioning, and polymerization
- Proof of origin allows differentiation of individual oil/gas sources
- Exclusion of the atmospheric background for the exploration of new oil and gas fields
- Wear-out of machine oil for on-time maintenance

Leak Test of Consumer Products

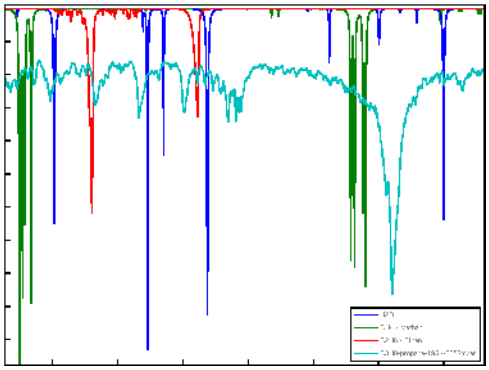
- Safety during production and transport, and for the end-customer
- All products using propellants and solvents: spray cans, gas bottles, paint, cosmetics, and pharmaceutical containers

Realized implementation

- Leak testing of spray cans according to norm UN/SCETDG/INF.93
- Full production line speed > 1000 cans / minute
- Cost reduction by a factor of 50

Miniaturized Spectrometer

- Multi-component analysis delivers composition at sub-ppm levels
- Simultaneous detection of methane, ethane, propane, butane, pentane, hexane, and the water background
- Rapid sampling speed to record full spectrum with up to 100 Hz



Specifications (05.2013)

Laser Emission	
Center wavelength	3.35 µm 2985 cm^{-1}
Center wavelengths, upon request	3.0 - 4.5 µm 3300 - 2200 cm^{-1}
Single emission mode	TEM_{00}
Continuous single mode tuning	3% around center wavelength ± 50 nm at 3.35 µm
Output peak power at center wavelength	> 10 mW_p
Output peak power over tuning range	> 1 mW_p
Line width for 10 ns pulses	< 0.5 cm^{-1}
Beam symmetry	Radial, Gaussian
Divergence half-angle, without collimation	< 4°
Polarization	Linear, random

Pulsed Operation	
Pulse length	5 - 25 ns
Repetition rate	up to 200 kHz
Duty cycle	up to 0.1 %
Pulse-to-pulse stability	*tbd.*

Physical Properties	
Weight	*100 g*
Dimensions, excluding electronics	3x4x2 cm

Operating Environment	
Power consumption	*< 3 W*
Heat dissipation	*< 1 W*

Operation at room temperature with passive air-cooling

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