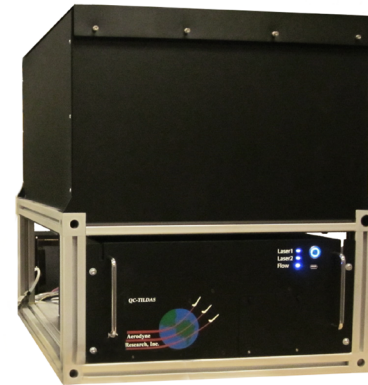


# TILDAS Dual Laser Clumped Isotope Analyzer for CH<sub>4</sub> Gas Samples

*Direct Non-Destructive Spectroscopic Measurement of <sup>13</sup>CH<sub>3</sub>D with No Isobaric Interference*

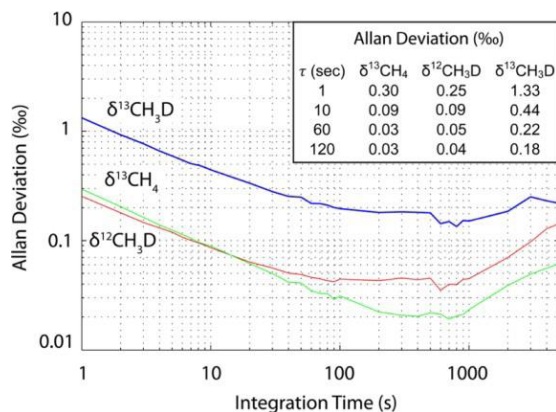


## Features

- Direct measurement of  $\delta^{13}\text{CH}_4$ ,  $\delta^{12}\text{CH}_3\text{D}$ , and  $\delta^{13}\text{CH}_3\text{D}$
- Precision for  $\delta^{13}\text{CH}_3\text{D}$  better than 0.2 ‰ (1 $\sigma$ ) in 60 minutes with 5 ml STP sample
- Low operating costs
- Suitable for pure CH<sub>4</sub> samples of any source

## TILDAS TECHNOLOGY

Aerodyne instruments use **tunable infrared laser direct absorption spectroscopy (TILDAS)** at mid-IR wavelengths to probe molecules at their strongest “fingerprint” transition frequencies. We further enhance sensitivity by employing a patented multi-pass broad-band absorption cell that provides optical path lengths up to 400 meters. Direct absorption spectroscopy allows for fast (<1 sec) absolute trace gas concentrations without need for elaborate calibration procedures. Moreover, TILDAS instruments are relatively free of measurement interference from other molecular species, enabling extremely specific detection.



*Rugged, field-ready instruments*

*Direct absorption spectroscopy allows for highly specific and accurate gas detection*

*Mid-IR detection enables maximum measurement sensitivity*

## Applications

- Clumped methane thermometry.
- Methane source attribution.
- Non-equilibrium clumped isotope signatures in microbial methane.

## Advantages

- Measurement precision comparable to much larger and more expensive IRMS instruments.
- Powerful TDLWintel software provides flexible instrument control and real-time data analysis.
- Valve control capable of complex scheduling and automatic background and calibrations.
- Optional automated sample handling systems.
- Turn-key design allows unattended operation.

# TILDAS Dual Laser Clumped Isotope Analyzer for CH<sub>4</sub> Gas Samples

## Specifications

### Discrete Sample Specifications for CH<sub>4</sub> Clumped Isotope Monitor

	CH <sub>4</sub>	$\delta^{13}\text{CH}_3\text{D}$
<b>One sample:</b> 22 $\mu$ -moles CH <sub>4</sub> 6 min measurement cycle	Pure 0.53 ml STP	0.6 ‰
<b>10 Samples:</b> 220 $\mu$ -moles CH <sub>4</sub> 60 min measurement cycle	Pure 5.3 ml STP	0.2 ‰

Note: These measurements are normalized to a working reference and the time to do so is included in the quoted measurement time. The working reference has a mixing ratio, pressure and matrix composition similar to the sample.

## Related Instruments

- Dual laser isotope monitor for  $\delta^{13}\text{CH}_4$  and  $\delta^{12}\text{CH}_3\text{D}$  of CH<sub>4</sub>
- Dual laser isotope monitor for  $\delta^{13}\text{CH}_4$  and  $\delta^{12}\text{CH}_3\text{D}$ ,  $\delta^{13}\text{CH}_3\text{D}$ ,  $\delta^{12}\text{CH}_2\text{D}_2$  of CH<sub>4</sub>

## Data Outputs

RS-232, USB drive, ethernet

## Size, Weight, Power

Dimensions: 560 mm x 770 mm x 640 mm

(W x D x H)

Weight: 75 kg

Electrical Power: 250-500 W, 120/240 V, 50/60 Hz

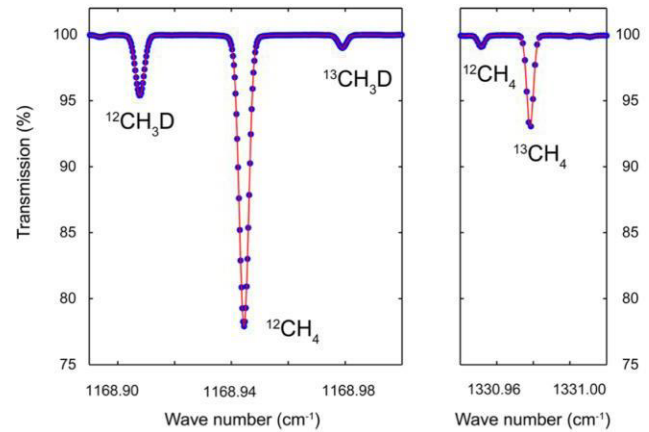
(without pump)

## REFERENCES

Ono, S., Wang, D. T., Gruen, D. S., Sherwood Lollar, B., Zahniser, M. S., McManus, B. J., Nelson, D. D., Measurement of a Doubly Substituted Methane Isotopologue, 13CH3D, by Tunable Infrared Laser Direct Absorption Spectroscopy. *Analytical Chemistry*, 86(13), pp. 6487-6494, 2014.

Gonzalez, Y., Nelson, D. D., Shorter, J. H., McManus, J. B., Dyroff, C., Formolo, M., Wang, D. T., Western, C. M., Ono, S., Precise Measurements of 12CH2D2 by Tunable Infrared Laser Direct Absorption Spectroscopy. *Analytical Chemistry*, 91(23), pp. 14967-14974, 2019.

## Infrared Spectroscopy for Clumped Isotope Determination



## Installation

Benchtop system

## Instrument Operations

Operating Temperature: -20 to +40 °C

## Instrument Components

Core instrument

Thermoelectric chiller

Keyboard, mouse, and monitor

Vacuum pump (customer specified)

Inlet sampling system (customizable)

*Aerodyne specializes in collaboration and custom design. Please contact us if you would like to discuss additional measurement options and applications.*