PKL Technologies Inc.
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SPECTRA-1 TDLAS

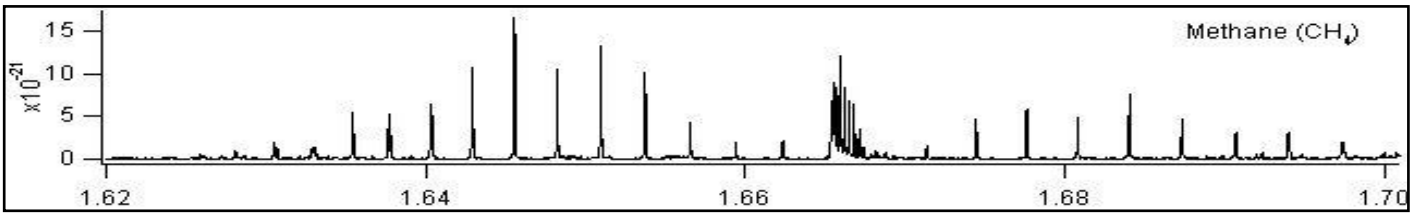
Open Path Gas Detection

Applications:

Environmental Monitoring
Fugitive Emission Work
Greenhouse Gas Reduction
Fertilizer Production
Confined Feeding Operations
Aluminum Manufacturing
Landfill Facilities

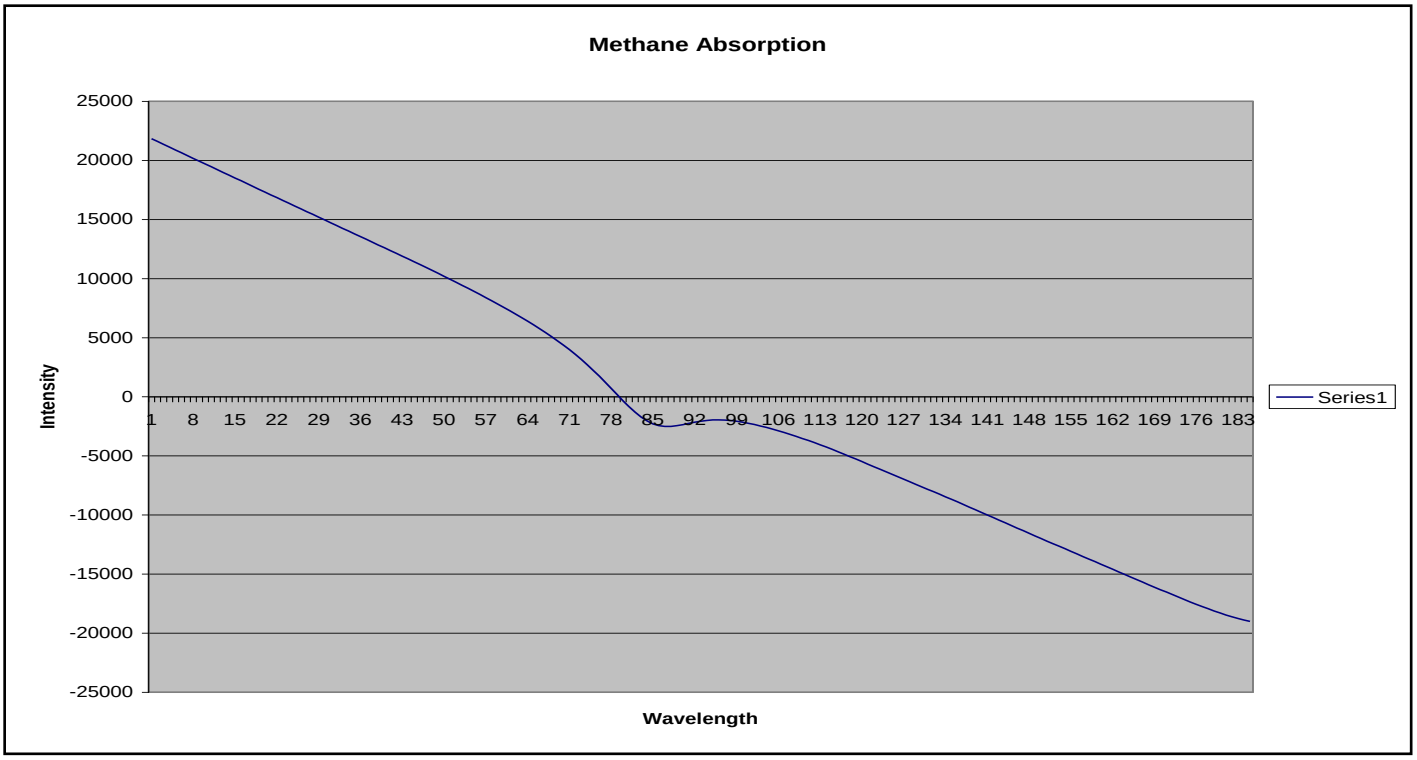
TDLAS Gas Detection Principles

Most laser gas detection monitors are based on tuneable diode laser absorption spectroscopy (TDLAS). The identification of gas species by absorption spectroscopy goes back several decades. A molecule can be identified by its characteristic absorption spectra. If the frequency (or wavelength) of the infrared (IR) light source matches the vibrational frequency of the molecule, then light will be absorbed. The Beer-Lambert law is the linear relationship we use to calculate molecule concentration (ppm) from the characteristic absorption a molecule exhibits.



Infrared Absorption spectra of Methane (Absorbance vs. Wavelength (µm))

One of these absorption features is chosen that does not coincide with any other molecule absorption spectra.
The wavelength of the tuneable laser is set very close to the absorption feature we want to measure. A laser is ideally suited for this - as the light output is monochromatic. The laser wavelength is then scanned back and forth over this absorption feature. The resulting change in laser intensity when scanned over the absorption feature provides the information required to calculate the molecule concentration.



Laser intensity scan over 100ppm-m Methane @1.645µm absorption feature

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PPM-M and PPM Discussion

Open path monitors measure the total amount of a specific molecule (gas) in the path between the laser source and the reflector. The result of this "total path" measurement is given as ppm-m. A reading of 100 ppm-m is converted to ppm by dividing by the path length. A path-average concentration measurement is provided by the open-path gas monitor. If one requires more information (Is the concentration of gas uniformly distributed?) shorter optical paths may be chosen to determine distribution of the monitored gas species.

Sensitivity and MDL's

Sensitivity and MDL are determined by the particular molecule absorption line chosen, and the optical path length. Absorption line widths and line strengths are different for each absorption line, and molecular species. We have the ability to increase or decrease the optical path length to increase or decrease our sensitivity to the molecular species we are monitoring.

Detectable Gases: HF, CH_4, NH_3, CO_2, CO, HCN, C_2H_2, C_2H_4, C_2H_6, H_2S and others.

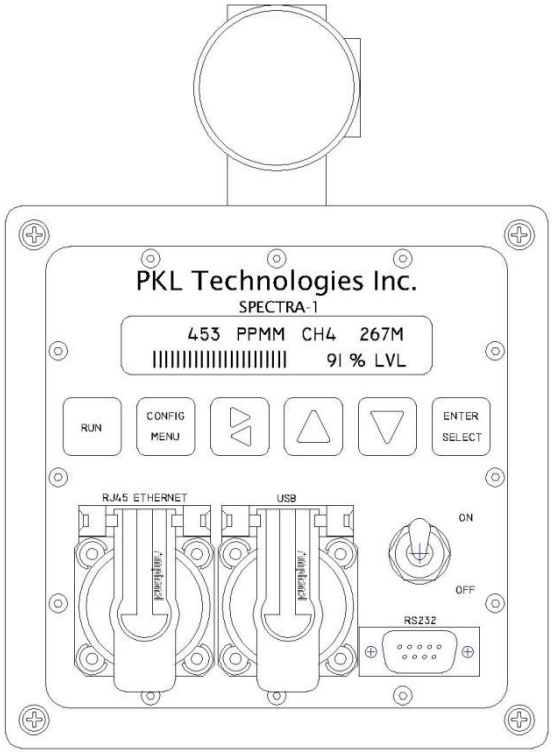
SPECTRA-1 Details:

Spotting scope:

- Spectra-1 alignment with retro-reflector

2 X 20 character LCD display:

- gas concentration
- distance to retro-reflector
- signal level % reading
- ppm or ppm-m
- signal level bar graph
- configuration/menu display



Keypad for system configuration:

- distance to retro-reflector
- gas concentration - ppm or ppm-m
- averaging time 1 to 60 seconds
- maximum signal level set (i.e. 90%)
- minimum signal level set (i.e. 5%)
- RS232 com port setting (baud rate)
- logging options
- logged data transfer – USB memory stick
- calibration settings
- Spectra-1 settings output
- display IP address

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