

# APPLICATION NOTE

# LD12-1

## Greenhouse analysis with the PlasmaDetek

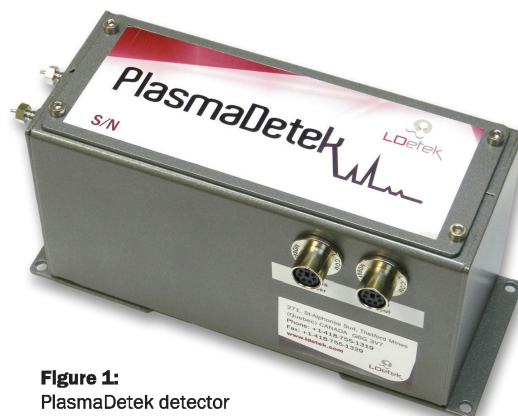
The popularity to measure greenhouse gases ( $\text{CH}_4$ ,  $\text{CO}_2$  and  $\text{N}_2\text{O}$ ) has increased considerably in the last years with the global warming concerns. Chromatography is the well known technique to measure them and different detectors are used to achieve this task. This application note will explain how we can effectively do it with a simple gas chromatograph configuration involving the PlasmaDetek detector.

### > PLASMADETEK CONFIGURATION

The PlasmaDetek has the advantage that it can be configured to be more sensitive on some compounds than the others. This selectivity configuration helps the chromatography to be more effective and easier to setup.

For this application, the detector system is configured to be selective on all three impurities with two dedicated outputs signal:

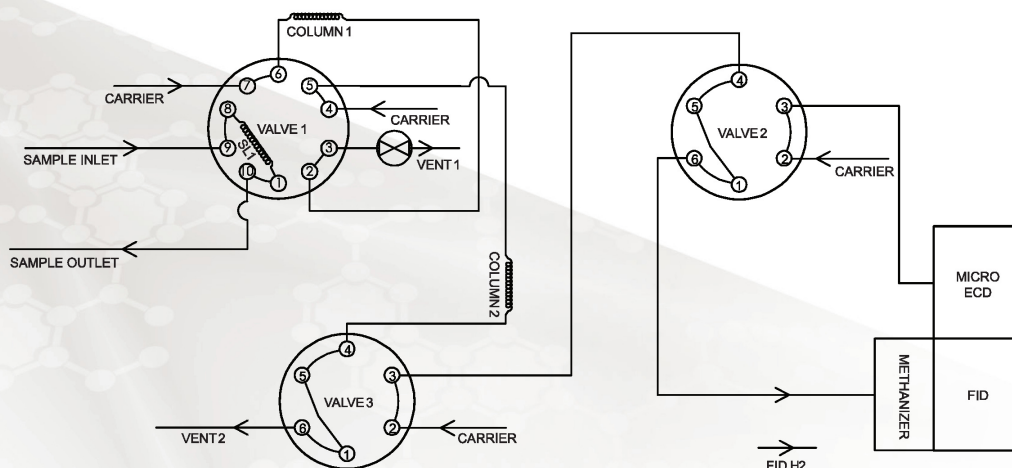
- **Output 1 :  $\text{N}_2\text{O}$**
- **Output 2 :  $\text{CH}_4$  and  $\text{CO}_2$**



**Figure 1:**  
PlasmaDetek detector

### > CHROMATOGRAPHY CONFIGURATION

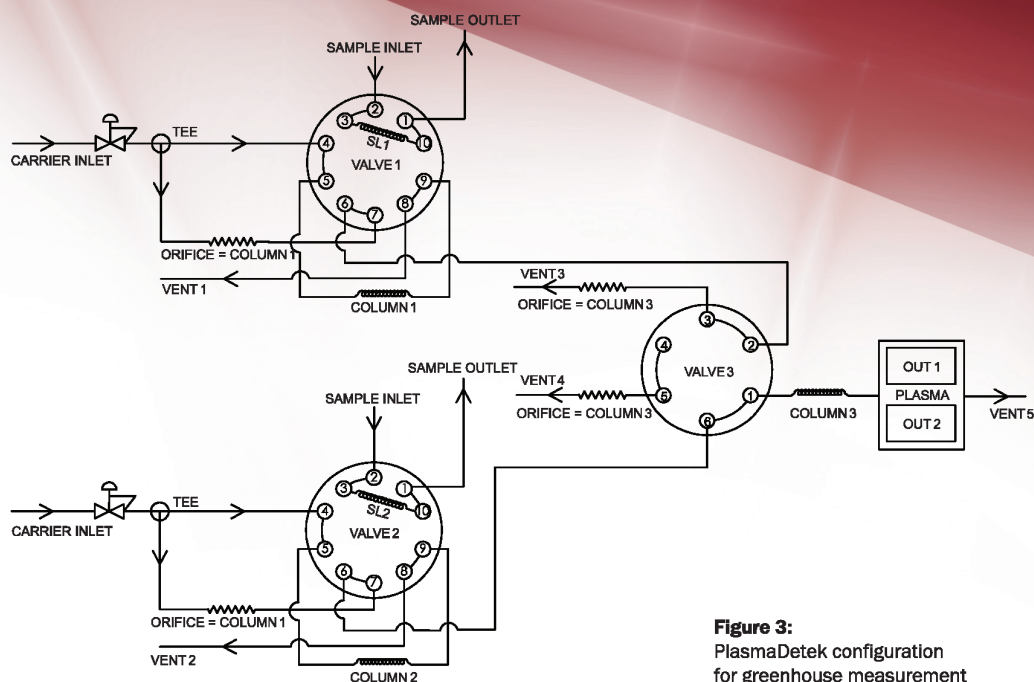
Typical configuration to make such measurement requires methanizer, FID and ECD detectors,  $\text{H}_2$  Fuel, make up gas and air supply.



**Figure 2:**  
Typical configuration  
for greenhouse measurement

With the PlasmaDetek, only one detector can be used to measure  $\text{CH}_4$ ,  $\text{CO}_2$  and  $\text{N}_2\text{O}$  in air. All three components elute in the same detector. That reduces cost and complexity of the system.

Another advantage is the use of argon or helium as carrier gas. Both carriers are suitable and give the performance desired.

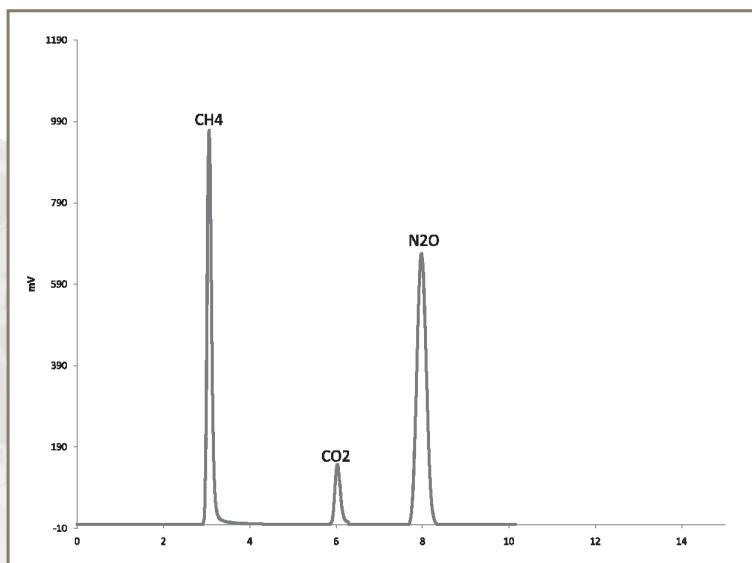


**Figure 3:**  
PlasmaDetek configuration  
for greenhouse measurement

Valve 1 is used for  $\text{CH}_4$  and  $\text{CO}_2$  measurement. The backflush to vent configuration vents out water from the sample with a HayeSep D 100/120 10' (column 1). Valve 3 is used to vent out air before going to the other HayeSep D 100/120 10' (column 3). This second column separates  $\text{CH}_4$  and  $\text{CO}_2$  from the remaining air.

Valve 2 is also configured in a backflush to vent with a HayeSep D 100/120 10' (column 2). A different sampling loop size is used to be able to measure  $\text{N}_2\text{O}$ . Valve 3 is used to vent out air and  $\text{CO}_2$ .  $\text{N}_2\text{O}$  is then brought to the detector by itself and can be measured in very low concentration.

## > RESULTS AND PERFORMANCE

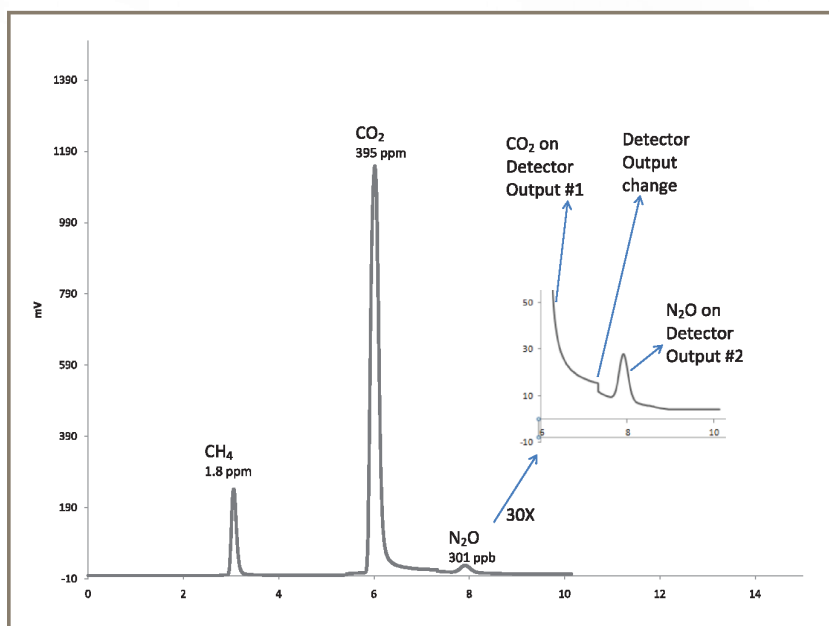


**Figure 4:** 8 ppm  $\text{CH}_4$ , 50 ppm  $\text{CO}_2$  and 10 ppm  $\text{N}_2\text{O}$  in helium

**Figure 4** shows the chromatogram obtained with the LDetek configuration described above, with a 8 ppm  $\text{CH}_4$ , 50 ppm  $\text{CO}_2$  and 10 ppm  $\text{N}_2\text{O}$  standard. This result was used to calculate the LOQ and LOD of each compounds shown in **figure 5**.

Component	Concentration (ppm)	Peak Height	Noise	S/N	LOD (ppb) S/N=3	LOQ (ppb) S/N=5
CH <sub>4</sub>	8	965	0,04	24125	1	1,65
CO <sub>2</sub>	50	143	0,04	3575	42	70
N <sub>2</sub> O	10	671	0,04	16775	1,8	3

**Figure 5:** LOQ and LOD calculation



**Figure 6:** CH<sub>4</sub>, CO<sub>2</sub> and N<sub>2</sub>O in ambient air

All three components are measured without interference in air providing accurate and very sensitive detection. The LOD of N<sub>2</sub>O ensures that its measurement in air is detected easily.

Those results and performances depend on the chromatographic system and conditions of operation.

## > CONCLUSION

This technique is simple and cost effective compared to the most common configurations that can be found on the market. No make-up gas, fuel, air, FID and ECD radioactive detector are required to make this measurement. Only one PlasmaDetek detector with two outputs using argon or helium as carrier gas can be used to achieve level of sensitivity needed. The ease of installation and startup of the PlasmaDetek makes it perfectly suitable for this environmental application.