

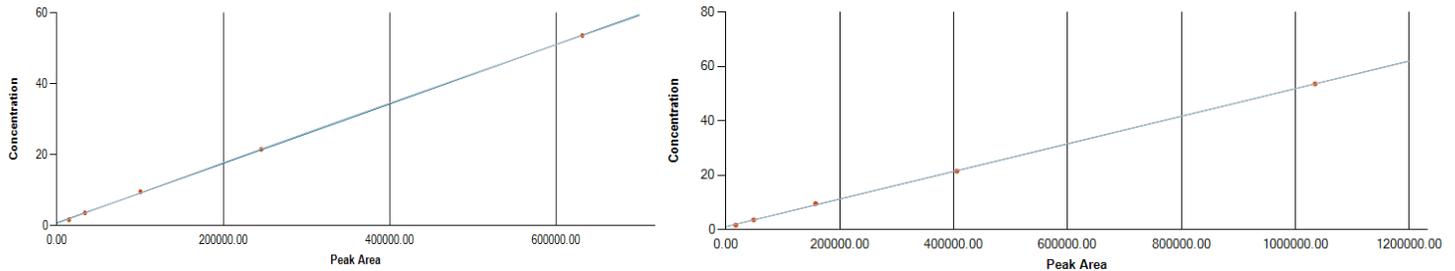


### Method Detection Limit for TCE and PCE in Air for the FROG-5000 Portable GC



A method detection limit study was performed to determine the method detection limit (MDL) for trichloroethene (TCE) and tetrachloroethene (PCE) in air samples when analyzed with the FROG-5000 portable gas chromatograph.

First, a five-point calibration was performed for TCE and PCE on a FROG-5000 GC from 1.65ppbv to 53.6ppbv. Both calibrations achieved a linear fit with  $R^2$  values of 0.99984 for TCE and 0.99980 for PCE:



Calibration Curves for TCE (left) and PCE (right) used to perform the Method Detection Limit study

After the calibration was complete, the instrument was then blanked to ensure a clean baseline prior to any replicate injections taking place. Once a clean baseline was achieved, seven replicate samples of TCE and PCE at 2.01ppbv (10.8 and 13.6  $\mu\text{g}/\text{m}^3$  respectively) were collected from Defiant’s vapor delivery system and analyzed. The results of each replicate are shown below:

	TCE (ppbv)	PCE (ppbv)	TCE ( $\mu\text{g}/\text{m}^3$ )	PCE ( $\mu\text{g}/\text{m}^3$ )
Replicate 1	2.09	1.90	11.2	12.9
Replicate 2	2.06	1.86	11.1	12.6
Replicate 3	2.23	1.85	12.0	12.5
Replicate 4	1.90	1.87	10.2	12.7
Replicate 5	1.98	1.83	10.6	12.4
Replicate 6	2.08	1.85	11.2	12.5
Replicate 7	1.94	1.82	10.4	12.3

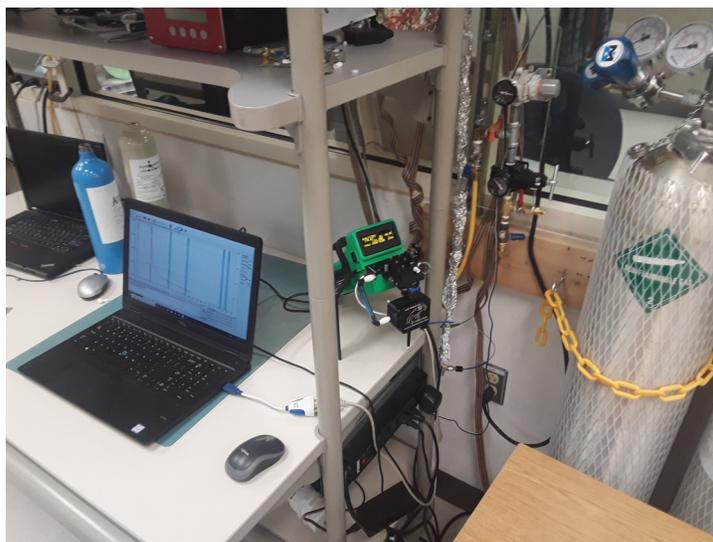
These results were then used to determine the standard deviation of the seven replicates for each compound, which is then used to determine the method detection limit. The method detection limit for a seven-replicate study is defined as the standard deviation of the seven replicates multiplied by the student t-value of 3.14:

	TCE (ppbv)	PCE (ppbv)	TCE ( $\mu\text{g}/\text{m}^3$ )	PCE ( $\mu\text{g}/\text{m}^3$ )
Standard Deviation	0.111	0.026	0.596	0.178
Method Detection Limit	<b>0.348</b>	<b>0.083</b>	<b>1.871</b>	<b>0.560</b>

Of course, the method detection limit only determines the concentration at which a positive detection can be relied upon with a high degree of certainty. It does not indicate the concentration at which reliable quantitation (or measurement) takes place. For that value, we calculated the Practical Quantitation Limit (PQL) for each of the compounds tested. We defined the PQL as the standard deviation of the seven replicates multiplied by 13:

	TCE (ppbv)	PCE (ppbv)	TCE ( $\mu\text{g}/\text{m}^3$ )	PCE ( $\mu\text{g}/\text{m}^3$ )
Standard Deviation	0.111	0.026	0.596	0.178
Method Detection Limit	0.348	0.083	1.871	0.560
Practical Quantitation Limit	<b>1.44</b>	<b>0.343</b>	<b>7.75</b>	<b>2.32</b>

The extremely low values for both the MDL and PQL when analyzing TCE and PCE in the vapor phase speak to the good reproducibility and high sensitivity of the FROG-5000 Portable GC. In the hands of a skilled operator, the FROG-5000 can produce reliable, lab-quality results in the field, allowing the user to make real-time decisions based on real-time data, saving time and money in the process.



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