



*Keywords: Pathlength, Concentration, Absorbance, Beer's Law*

## Choice of Gas Cell for Pathlength/Concentration



In order to determine the pathlength of a gas cell for the concentration of gas to be measured, the measured absorbance (A) is related to the concentration of gas (C) by the usual Beer's Law relationship,

$$A = -\text{Log}_{10} (I/I_0) = a.C.L \quad (1)$$

Where a is the (frequency dependent) absorption co-efficient, C is usually expressed in parts-per-million (ppm) partial pressure in the atmosphere, and L is the absorbing path, usually expressed in meters.

The relationship between A and C is linear, although there can be deviations from linearity at higher concentrations. Atmospheric concentrations are usually defined in C.L units of ppm.m , the number of molecules which would be encountered by the infrared beam in a one meter path. By this definition, an infrared beam passing through 100 meters of a 0.1 ppm gas cloud would exhibit the same absorbance as that of a beam passing through 10 meters of a 1 ppm cloud, or one meter of a 10 ppm cloud.

From equation (1), in order to maximize the measured absorbance for a given gas concentration, the largest absorbing path L should be used. Specac Cyclone™ and Tornado™ Gas Cells cover a range of path lengths, up to a maximum of 20m (Tornado™ Cell) which is a good compromise between the needs to maximize path length, and to fit it into a laboratory FTIR spectrometer, without sacrificing optical 'throughput'.

**SPECAC LIMITED**  
RIVER HOUSE, 97 CRAY AVENUE, ORPINGTON, KENT, UK, BR5 4HE  
TELEPHONE: 01689 873134 FAX: 01689 878527 INTERNET: [www.specac.com](http://www.specac.com)