How to Calibrate Infrared Absorption Cells

One of the easiest ways to calculate the pathlength of a cell is by the interference fringe method. This can be done in any spectrometer. The interference fringe is caused by two parallel smooth surfaces in close proximity (less than 1mm) to each other.

Fringe Method

1. Collect a background file with the sample compartment empty.
2. Place the empty cell in the FTIR spectrometer on the usual sample slide.
3. Collect a sample file.
4. Display spectra in %Transmittance
5. Calculate the cell thickness by one of the following equations:

To calculate using wavenumbers:

$$L \text{ (in mm)} = \frac{n\,(10)}{2(W_1 - W_2)}$$

where L = cell thickness (in mm)
W_1 = starting wavenumber (cm^{-1})
W_2 = ending wavenumber (cm^{-1})
n = number of fringes between W_1 and W_2

To calculate using µm (microns):

$$L \text{ (in mm)} = \frac{n\,W_1 W_2}{2(W2 - W1)(1000)}$$

where L = cell thickness (in mm)
W_1 = starting wavelength (in µm)
W_2 = ending wavelength (in µm)
n = number of fringes between W_1 and W_2

Sample Calculation:
Data from the spectrum below
n = 10, W1 = 3640 W2 = 1370
Using the formula, calculate using wavenumbers, the thickness can be calculated by substituting the numbers.

$$L = \frac{n\,(10)}{2(W_1 - W_2)} \qquad \frac{10\,(10)}{2\,(3640 - 1370)}$$

$$L = \frac{100}{2\,(2270)}$$

L = 0.022 mm = 22 microns