How can a liquid transmission cell be calibrated?

Liquid transmission cells used in the mid-infrared typically have very small pathlengths (1000 microns or less). Such pathlengths are required for reasonable absorbance values (around 0.5 or less) with the strongly absorbing organic compounds typically analyzed. Demountable liquid cells using spacers provide a convenient method of performing such analyses. However, for exact quantitative work, it is frequently necessary to verify the exact pathlength of the cell, even though the nominal spacer thickness may be given by the vendor. Determining the exact pathlength is readily accomplished without any special additional equipment, by using interference fringes.

The first step is to take a background spectrum with the cell removed from the sample compartment. Then take a sample spectrum with the cell in the compartment. The cell should be empty (i.e., only air should be in the cell). You will then obtain a spectrum with an interference fringe pattern. Choose two peaks at least 10 waves apart. Record the wavelength in microns of the two peaks, P_1 and P_2, where P_1 is the shorter wavelength. Record the number of fringes, n, between P_1 and P_2. Then the pathlength in microns, L, is given by:

$$L = \frac{nP_1P_2}{2(P_2 - P_1)}$$