



## Principles of FTIR Operations

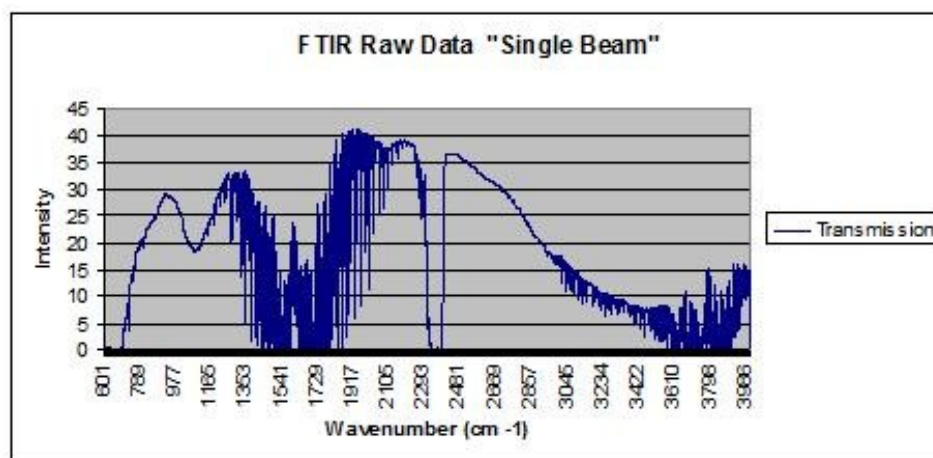
Cerex FTIR air monitoring systems use the optical principle that when exposed to light, numerous chemicals will absorb various wavelengths of the light at levels that are proportional to amount of gas in the light beam. In the case of the Cerex systems, it specifically refers to the measurement of light energy between 700 and 4200 wavenumbers (or approximately 2 to 14 microns) in the Infrared spectrum.

### The fundamental operations of the FTIR system are:

- Broadband infrared radiation is collected from a glowing source with focusing mirrors. The beam is collimated into a 12-inch Infrared beam of light
- An array of retroreflector cubes collects the light, and returns it to the main analyzer.
- The received light is focused onto a cryogenically-cooled IR detector element.
- The spectrometer analyzes the wavelengths and magnitudes of received light and determines the presence and concentration of interfering gases

### Principles of gas detection

Below, Figure 1 shows the typical output spectra of a Cerex FTIR system. The x-axis (the horizontal axis on the bottom) records the wavelength of light measured in wavenumbers. The y-axis (the vertical axis at left) records the amount of light at each wavelength. The graph also shows the approximate locations where various gases absorb light. Each gas has a unique spectral absorption "fingerprint" which results from its molecular configuration.

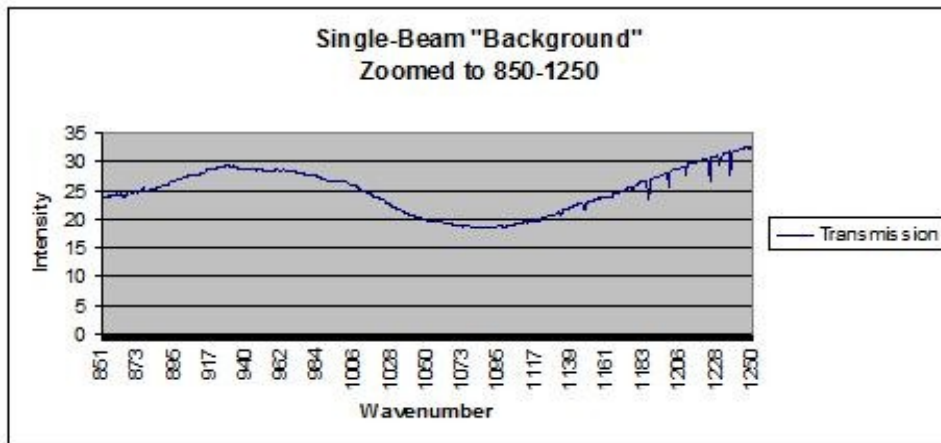


The single beam spectrum, that is, the plot of signal strength versus wavelength of light, contains all of the information needed to identify and quantify the gases that were presented in the light beam.

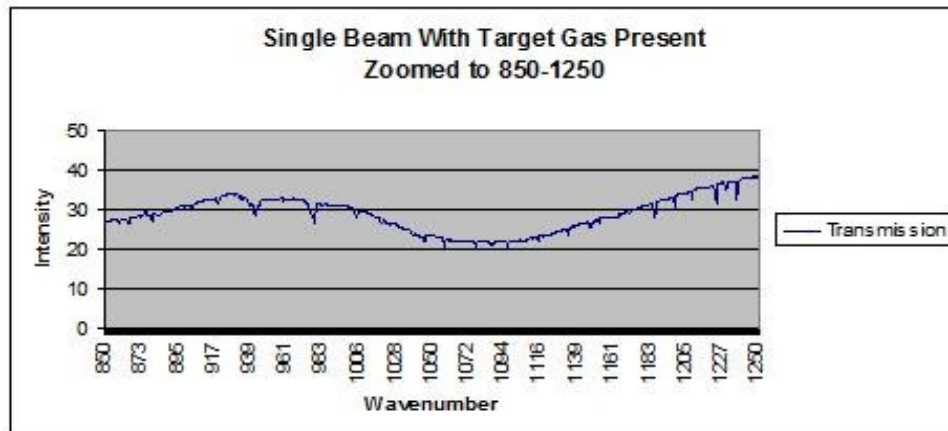
However, before quantitative analysis of the spectrum can take place a few more transformations of the single beam need to occur.

These transformations enable the end-user to see the actual absorbance features—the characteristic “fingerprints” that are unique to each chemical compound. The process is described next and shown in the quoted figures.

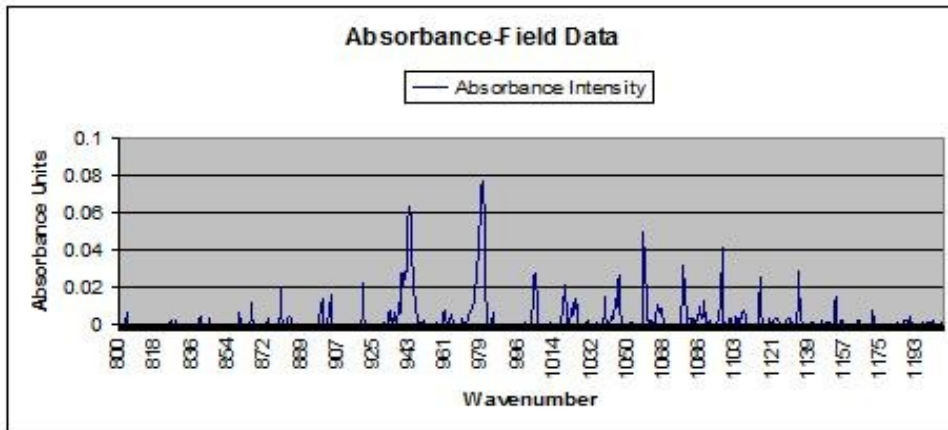
**Take a data spectrum in the atmosphere when the target gas is not present. Define this as the background spectrum.**



**Take a data spectrum in the atmosphere when the target gas is present. Define this as the data spectrum.**



Subtract the logarithms of the two spectra. This resulting spectrum is defined as an absorbance spectrum.



### Ammonia Field vs. Reference Comparison

