frequency, it became apparent that the reflection coefficient (as would the energy densities) would be significantly over or underestimated, unless the frequency picked was resolvable in both the full record and the quarter length cross correlation method, i.e.

\[ \omega_{\text{peak}} = m \Delta \omega \]  

(4.60)

if \( m = 4, 8, 12, \ldots \) in which case the reflection coefficient was identical using both resolutions. No particular pattern in over- or underestimation was readily apparent, except that the reflection coefficient spectrum in the vicinity of the chosen frequency would follow a general upward or downward trend rather smoothly. It is probable that this phenomena is due to leakage from the dominant frequency to adjacent frequencies. The mechanism by which this is working is not yet understood, but would involve the interaction of the leaked spectral data in the two Fourier spectra combined in estimating the cross-spectrum. See Figure 4.1.

The above explanation does not resolve the problem of obtaining a resultant reflection coefficient spectrum (as well as the incident and reflected spectral energy densities) that is smoothed or has the system noise and nonlinear effects filtered out, but rather compounds the problem. However, the potential for extracting a reasonable result did present itself when it was noticed that the reflection coefficient at the dominant frequency, as calculated by the full record analysis was between those at the frequencies directly on either side of the dominant frequency as calculated from the smoothed spectrum. See Figure 4.3. By performing a linear interpolation between the values at these two frequencies, it was found, for synthetic data, to yield a value very close to that calculated by the unsmoothed data. More precisely stated, for values of \( \omega = m \Delta \omega \) where \( m \) is equal to an integer multiple of 4, the reflection coefficients would be equal. But if \( m \) were other than a multiple of 4, a resonable estimate of the reflection may be calculated by linearly interpolating between the nearest resolved frequencies.

Assuming a monochromatic wave field, a dominant frequency may be picked out by finding the frequency with the greatest value of the power spectrum from a particular gage spectrum in the full record analysis. Then finding the frequencies between which it lies