elevation at each gage position. The spacing between the gages is known, and wave celerity may be determined by

\[ C = \frac{\omega}{k} \]  \hspace{1cm} (4.3)

where

\[ \omega = \frac{2\pi}{T} \]  \hspace{1cm} (4.4)

where \( T \) is the wave period. Solving the implicit equation

\[ \omega^2 = gk \tanh kh \]  \hspace{1cm} (4.5)

for \( k \) iteratively, where \( g \) is the acceleration of gravity, \( k \) is the wave number, and \( h \) is the water depth, it is possible to calculate the phase relationships between the wave trains as they pass the probes.

Beginning by executing a Fourier transform on each signal,

\[ B(\omega) = \int_{-\infty}^{\infty} \eta(t)e^{-i\omega t}dt \]  \hspace{1cm} (4.6)

the discrete Fourier components may be resolved and written in polar form as

\[ B_{p,n} = A_{p,n}e^{i\alpha_{p,n}} \]  \hspace{1cm} (4.7)

or in rectangular form as

\[ B_{p,n} = A_{p,n}\cos \alpha_{p,n} + iA_{p,n}\sin \alpha_{p,n} \]  \hspace{1cm} (4.8)

where \( A_{p,n} \) is the amplitude of the \( n^{th} \) component at gage \( p \), and \( \alpha \) is the phase relative to the time origin of the record. The Fourier transform will enable the calculation of half as many frequency components as data points, \( N \).

These coexisting amplitude-phase spectra determined at the gage positions are a result, as stated above, of the superposition of the discrete frequency components, and are in fact, each a measurement of the same wave fields. The goal is now to separate out the two interacting fields, those being the incident and reflected wave fields. Making use of the