Spectral Analysis of Surface Waves (SASW) Data Examples

When discussing Spectral Analysis of Surface Waves (SASW) data, it is difficult to differentiate between good and poor quality data in the field unless time is taken to properly window the raw data which is discussed in the SASW software section. This is due to the very nature of SASW testing; different concrete qualities yield a variety of wave forms. In general it is important in the field to limit the accepted data to those wave forms that originate at zero volts with good repeatability.

Once the data is accepted it is important to note the coherence and the phase analysis of the data, which appear in the lower two plots. Good quality data on good quality concrete consists of high coherence and multiple saw-tooth cycles. The following example is considered to be good quality data taken on good quality concrete.

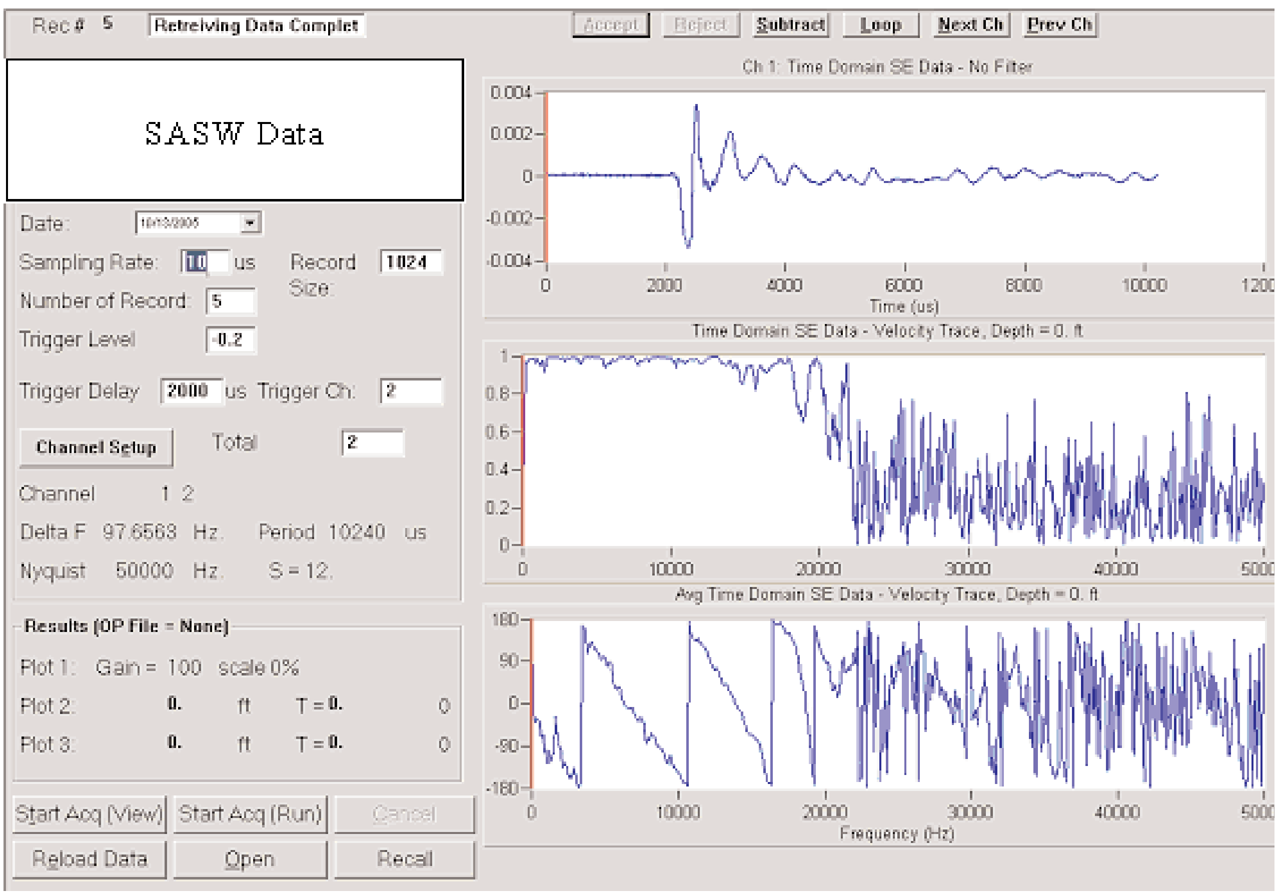


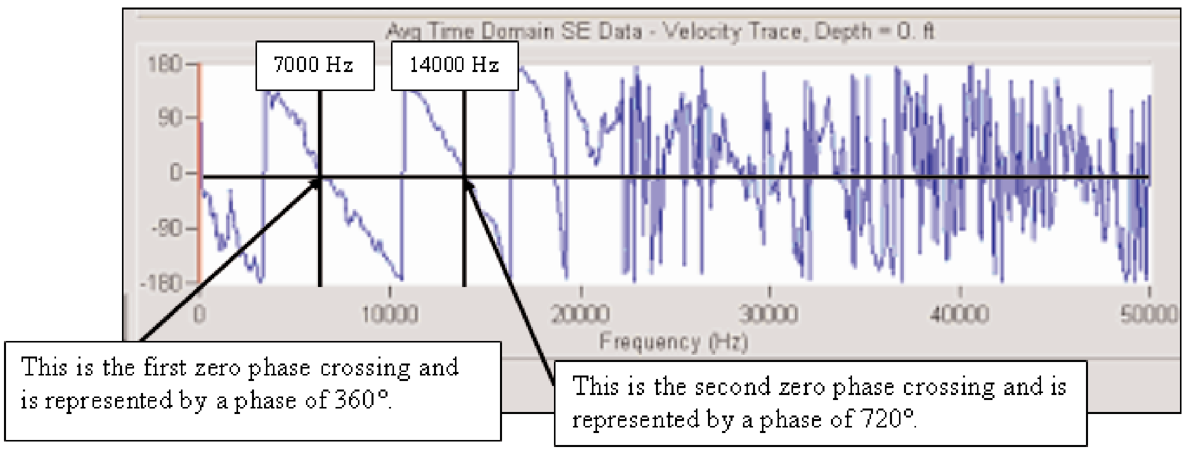
Figure 1. SASW results showing good quality data taken on good quality concrete

It is also important to make rough calculations in the field of the wave velocity. This can be done simply by utilizing two equations:

1) V_R = _*_

2) λ = (D/_) * 360°

In these equations V_R is equal to the wave velocity, λ is the wavelength, λ is the frequency, D is the distance between the receivers, and λ is the phase. The goal is to calculate a rough approximation of the wave velocity. This can be done by quickly analyzing the raw data. The distance between the receivers is known and the frequency and phase can be found in the lower plot of the raw data, see example below:



With the values shown on the graph and a receiver spacing of 0.3 meters, the calculation for the first zero phase crossing would be:

1) λ = (0.3/360°) * 360° = 0.3 meters

2) V_R = 0.3 m * 7000 Hz = 2100 meters/sec.

With the values shown on the graph and a receiver spacing of 0.3 meters, the calculation for the second zero phase crossing would be:

1) λ= (0.3/720°) * 360° = 0.15 meter

2) V_R = 0.15m * 14000 Hz = 2100 meters/sec.

Performing these simple calculations will allow the user to determine if the data is reasonable.

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Not all SASW data will look exactly as this data does. In fact data quality is not completely determined until the data has been processed. The final deciding factor is the dispersion curve that is calculated in the end. If the dispersion curve is relatively horizontal, meaning that it displays approximately the same velocity for each wavelength, then the data quality is considered good. The dispersion curve displayed below is considered to be of good quality.

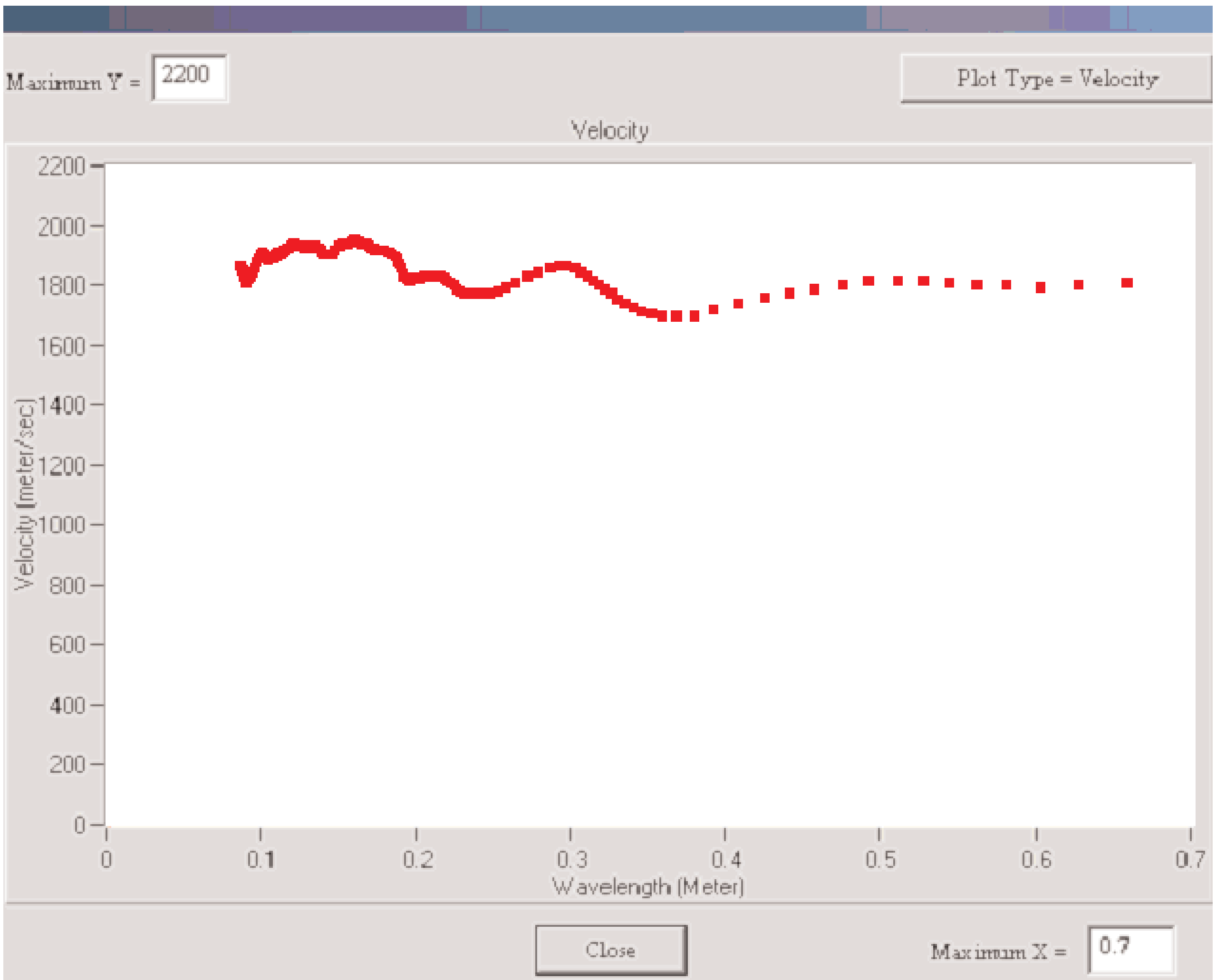

Figure 2. SASW results showing good quality data taken on good quality concrete

SPECTRAL ANALYSIS OF SURFACE WAVES

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