



Sonic Echo/Impulse Response (SE/IR) Data Examples

When acquiring SEIR data, there are a few very important responses to look for. Some of these responses will indicate good data, while others are indicative of a poor trigger or a poor response from the transducers. The most common problem with SEIR data occurs during the impact. However, the field engineer may also encounter problems with the accelerometer and geophone responses. It should be noted that the size and diameter of the shaft can greatly affect data quality. In general short shafts with larger diameters yield the best quality data.

The impact on the shaft and the instrumented hammer connections are often the culprit of poor quality data. The impact on the shaft should be considered as a single well-coupled impact, not multiple impacts. The user will know if the impact is well-coupled if the transduc-

ers yield good quality data. Another issue that occasionally occurs is mis-triggering the hammer. This is due to poor connections on the instrumented hammer. These connections can become damaged due to the strain put on them by the impact. If shaking the connection at any contact results in a trigger, the connections need to be checked for damage and may need replacing.

The image displayed below is an example of a good quality hammer signal. This was determined by the single congruent event seen in the data that returns to zero signal after the impact. It should also be noted that it is essential that the signal originate at zero volts and continue in the positive voltage direction. If this does not occur, it is likely that the polarity parameters are not set correctly in the acquisition parameters.

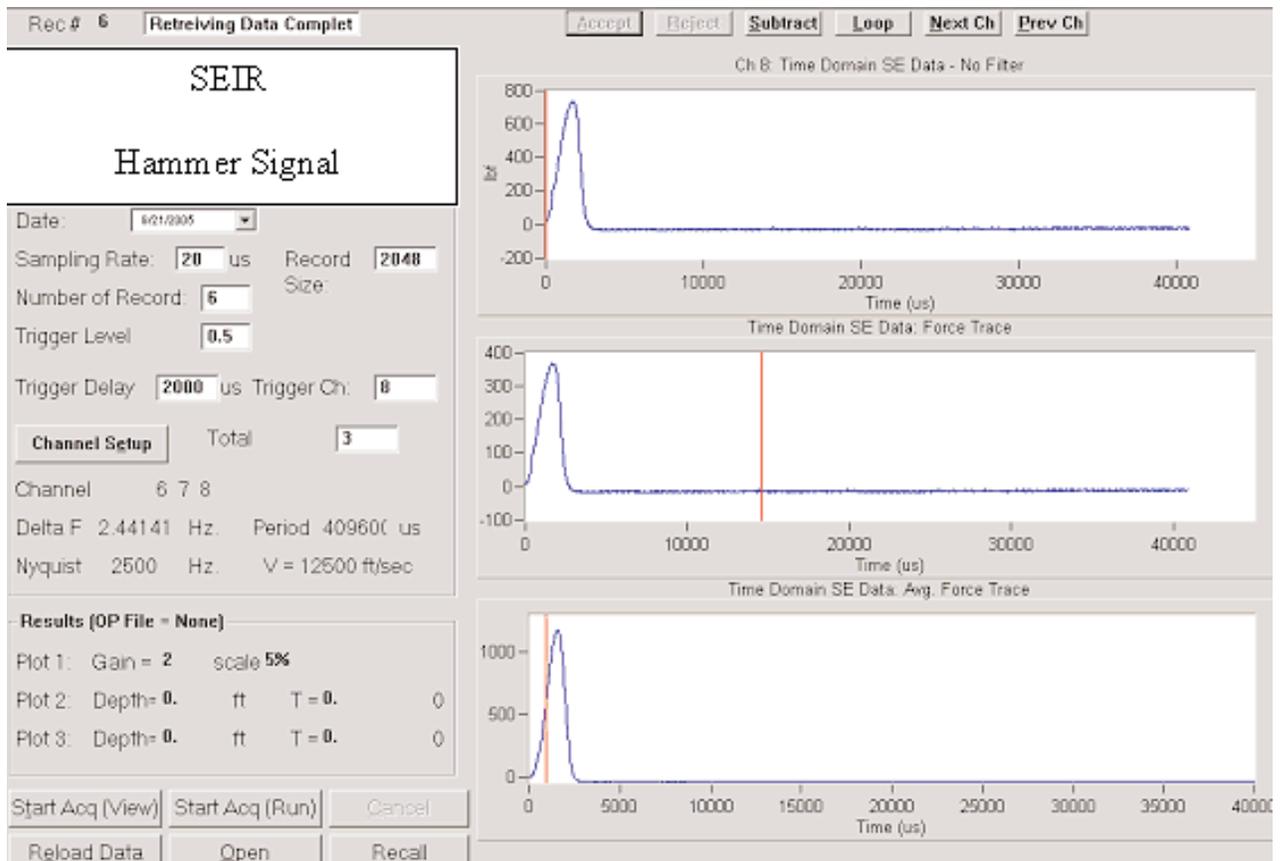


Figure 1. SE/IR results showing a good quality hammer signal



Concerning the problems associated with the accelerometer and geophone responses, coupling of these transducers is usually the reason behind poor quality data. The transducers should be mounted to the shaft with coupling grease so that gentle pulling on them does not result in movement. Coupling can be easily checked by recognizing a good signal once data acquisition is started.

The image displayed below is an example of good quality Accelerometer Data. This data is considered to be easily analyzed. Reasons for the quality determination

include: multiple reflections, the signal originates at a zero value, and because the initial signal breaks in a negative direction. The multiple reflections are noted in the bottom plot by red dots.

Another indicator of good quality Sonic Echo (SE) accelerometer data is the scale percentage displayed during acquisition. This scale percentage is displayed in the lower left hand corner of this display. Common acceptable values for scale percentage range from approximately 10% to 80%.

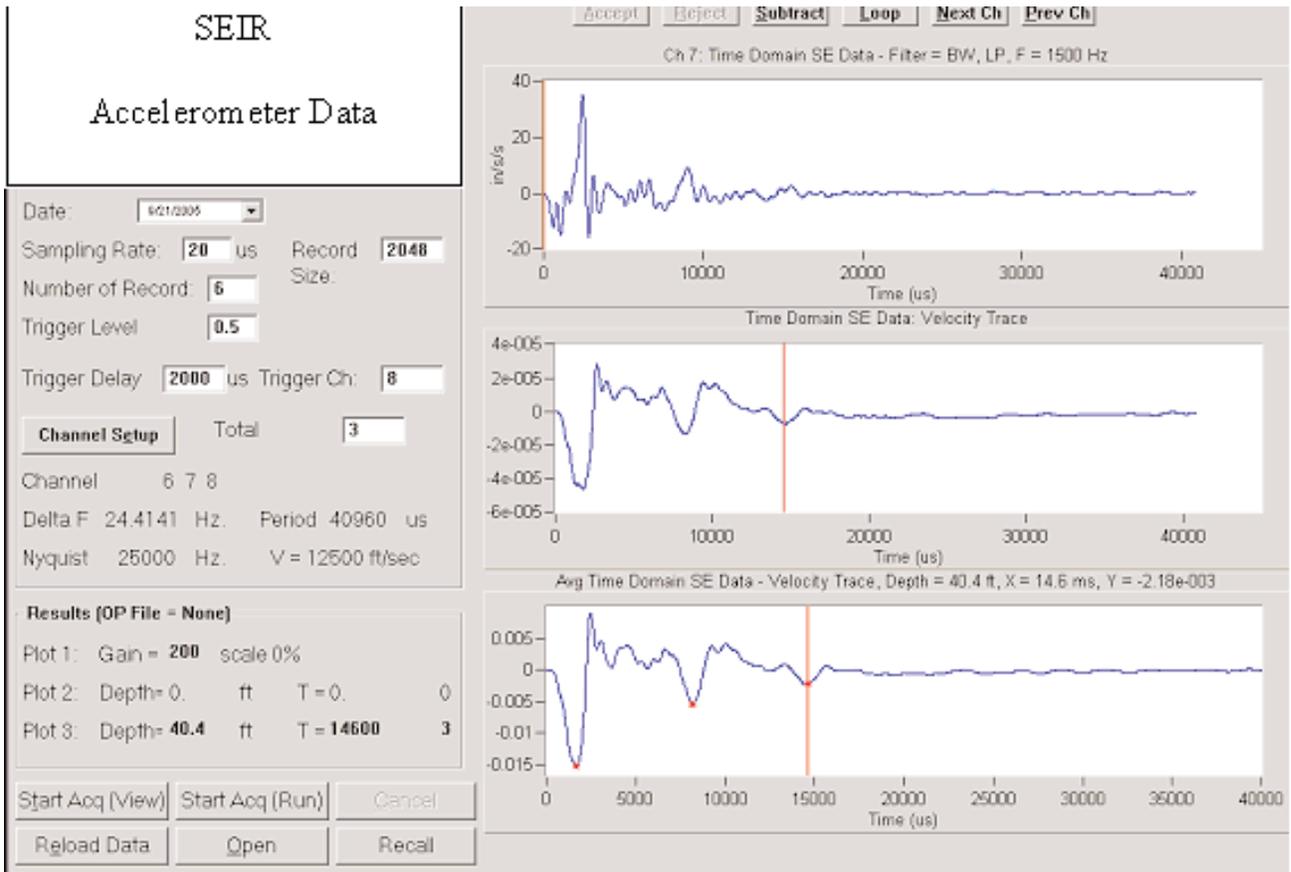


Figure 2. SE/IR results showing good quality accelerometer data



The plot shown is considered good quality SE Geophone Data. The same reasons that the accelerometer data was considered good quality apply to the geophone data. The only significant difference between the data sets is the ringing that occurs in the geophone data. This is an inherent quality that exists in geophone data. It should be noted that some geophones record more “ringy” data than others. Although the data is slightly “ringy”, the multiple reflections are still easily identified. The same comments concerning the scale percentage apply to the geophone data

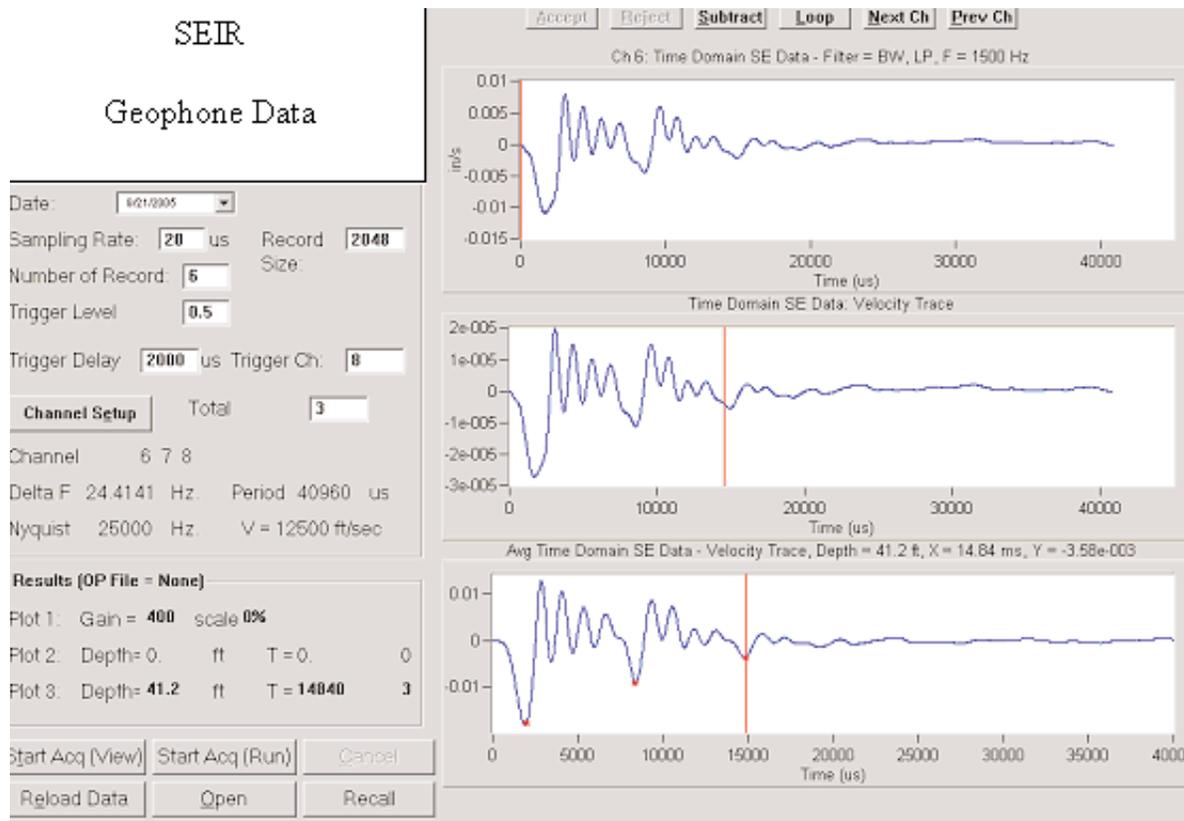


Figure 3. SE/IR results showing good quality Sonic Echo (SE) geophone data

The last plot displayed in this discussion is representative of good quality Impulse Response (IR) data. This data is considered easy to process and interpret. It should be noted that although SE testing can be performed without the use of an instrumented hammer, generation of IR data requires the hammer with a load cell.

This IR data is considered good quality data because there is high coherence (middle plot) over the peaks seen in the lower plot. These peaks are displayed in the frequency domain rather than the time domain as

in SE data. Another reason for the quality determination is that the multiple peaks are clear and easy to identify. Once these peaks are identified, then a length or depth of the bottom of the shaft will be calculated.

SE/IR data can often be difficult to process and interpret. If you have further questions concerning data quality or interpretation for more difficult data sets, please feel free to contact Olson Engineering technical support at 303.423.1212.



Figure 4. SE/IR results showing good quality Impulse Response (IR) data

