CLAIMS

1. A method for non-destructively analyzing a weld in a sample comprising:

(1) ~~activating a pulsed, concentrated energy source to create~~ creating a line source pattern on the surface of the sample that generates ultrasonic waves in the sample;

(2) receiving the ultrasound waves with an ultrasound receiver;

(3) storing the signal generated by the ultrasound receiver on a computer readable medium;

(4) moving the sample a first predetermined distance;

repeating steps 1-4 until the sample has moved a second predetermined distance and a plurality of signals generated by the ultrasound receiver have been stored on the computer readable medium; ~~and~~

~~creating a model correlating the plurality of signals generated by the ultrasound receiver with empirical data for the sample~~

superimposing the plurality of signals received by the ultrasound receiver to create an amplified signal; and

storing the amplified signal on a computer readable medium.

~~2. The method of Claim 1, further comprising:~~

~~retrieving the signals stored on the computer readable medium; and~~

~~superimposing the signals that correspond to a first wavelength to create a first artificial narrowband ultrasound source; and~~

~~storing the first artificial narrowband ultrasound source on the computer readable medium.~~

~~3.~~2. The method of Claim 1, further comprising:

retrieving the ~~first artificial narrowband ultrasound source~~ amplified signal from the computer readable medium;

reducing the complexity of the ~~first artificial narrowband ultrasound source~~ amplified signal using a two-dimensional Fourier transform, producing a reduced complexity signal; and

storing ~~a~~ the ~~second narrowband ultrasound source with~~ reduced complexity signal on the computer readable medium.

~~4.~~3. The method of Claim 1, further comprising:

retrieving the ~~first artificial narrowband ultrasound source~~ amplified signal from the computer readable medium;

reducing the complexity of the first narrowband ultrasound source using a complex Morlet mother wavelet, producing a reduced complexity signal; and

storing ~~a~~ the ~~third narrowband ultrasound source with~~ reduced complexity amplified signal on a computer readable medium.

~~5.~~4. The method of Claim 1, wherein the first predetermined distance is smaller than ~~the~~ a predetermined first wavelength.

~~6.~~5. The method of Claim 1, wherein the amplified signal is used to perform a ~~model is created using~~ regression analysis.

~~7.~~6. The method of Claim ~~6~~5, wherein the regression analysis further comprises using Corrected Akaike's Information Criterion.

~~8.~~7. The method of Claim ~~7~~6, further comprising:

measuring a reinforcement height of the weld; and

including reinforcement height as a predictor to be included in the regression analysis.

~~9.~~8. The method of Claim ~~7~~6, further comprising:

measuring a bead width of the weld; and

including bead width as a predictor to be included in the regression analysis.

~~10.~~9. The method of Claim ~~7~~6, further comprising:

measuring one or more dimensions of the weld using a laser profilometer.

~~11.~~10. A system for non-destructively analyzing a weld in a sample comprising:

a concentrated energy source for ~~creating localized heating in the sample to cause~~ creating a line source pattern on the surface of a sample that generates ultrasonic waves;

an ultrasound receiver for receiving the ultrasonic waves;

a linear stage for moving the sample at a predetermined step interval;

a computer readable medium for storing one or more signals generated by the ultrasound receiver; and

~~a model for correlating the one or more signals generated by the ultrasound receiver to empirical data~~

a processor; and

logic stored in a computer readable medium that, when executed by the processor, is configured to:

superimpose a plurality of signals received by the ultrasound receiver to create an amplified signal; and

store the amplified signal on a computer readable medium.

~~12.~~11. The system of Claim ~~11~~10, wherein the concentrated energy source is a pulse width laser.

~~13.~~12. The system of Claim ~~11~~10, wherein the concentrated energy source is an electromagnetic acoustic transducer ("EMAT").

~~14.~~13. The system of Claim ~~11~~10, wherein the ultrasound receiver is an EMAT.

~~15.~~14. The system of Claim ~~12~~11, further comprising a cylindrical lens for converting the concentrated energy from the pulsed width laser to a line source narrowband ultrasound.

~~16.~~15. The system of Claim ~~11~~10, further comprising ~~a computer processor for~~ logic stored in a computer readable medium that, when executed by the processor, is configured to ~~superimposing~~ superimpose the one or more signals generated by the ultrasound receiver to reduce the complexity of the signals.

~~17.~~16. The system of Claim ~~16~~15, ~~wherein the computer processor further~~ further comprising logic stored in a computer readable medium that, when executed by the processor, is configured to ~~reduces~~ reduce the complexity of the signals using a complex Morlet mother wavelet.

~~18.~~17. The system of Claim ~~17~~15, ~~wherein the computer processor further~~ further comprising logic stored in a computer readable medium that, when executed by the processor, is configured to ~~reduces~~ reduce the complexity of the signals using a two-dimensional Fourier transform.

~~19.~~18. The system of Claim ~~11~~10, ~~wherein the~~ further comprising logic stored in a computer readable medium that, when executed by the processor, is configured to create a model correlating the amplified signal to empirical data for the ~~model comprises~~ sample comprising cutcheck data.

~~20.~~19. The system of Claim ~~11~~10, wherein the model is created using regression analysis.