applications, to thereby enable others skilled in the art to best utilize the invention and various embodiments with various modifications as are suited to the particular use contemplated. It is intended that the scope of the invention be defined by the following claims and their equivalents.

What is claimed is:

1. An apparatus for identifying damage to an in-service conductor associated with the delivery of electric power, comprising:

a transmitting electro-magnetic acoustic transducer configured for engagement with said in-service conductor, said transmitting electro-magnetic acoustic transducer applying a transmitted signal to said in-service conductor;

a receiving electro-magnetic acoustic transducer configured for engagement with said conductor, said receiving electro-magnetic acoustic transducer acquiring a return signal from said in-service conductor that corresponds to said transmitted signal; and

a feature extraction module to identify selected attributes of said return signal.

2. The apparatus of claim **1** wherein said transmitting electro-magnetic acoustic transducer generates acoustic signals with a predetermined frequency, shape, and amplitude.

3. The apparatus of claim **1** further comprising a classification module to classify selected attributes of said return signal and thereby identify damage to said in-service conductor.

4. The apparatus of claim **3** wherein said classification module classifies said selected attributes of said return signal with respect to a predetermined set of feature profiles, each feature profile characterizing a signal associated with a predetermined fault at a selected location of said in-service conductor.

5. The apparatus of claim **3** wherein said classification module includes a neural network module to classify said selected attributes of said return signal and thereby identify damage to said in-service conductor.

6. The apparatus of claim **3** wherein said classification module includes a fuzzy logic module to classify said selected attributes of said return signal and thereby identify damage to said in-service conductor.

7. The apparatus of claim **3** wherein said classification module includes a combined neural network and fuzzy logic module to classify said selected attributes of said return signal and thereby identify damage to said in-service conductor.

8. The apparatus of claim **3** wherein said classification module includes a combined Adaptive Resonant Theory neural network and fuzzy logic module to classify said selected attributes of said return signal and thereby identify damage to said in-service conductor.

9. The apparatus of claim **1** wherein said transmitting electro-magnetic acoustic transducer includes a set of magnets configured to define an axial aperture.

10. The apparatus of claim **9** wherein said transmitting electro-magnetic acoustic transducer includes a coil positioned between said set of magnets and said axial aperture.

11. The apparatus of claim **10** wherein said set of magnets includes a hinge to facilitate the re-positioning of a portion of said magnets, thereby allowing the positioning of said set of magnets around said in-service conductor, such that said in-service conductor is positioned within said axial aperture defined by said set of magnets.

12. The apparatus of claim **1** further comprising a display unit to view said return signal.

13. The apparatus of claim **1** wherein said transmitting electro-magnetic acoustic transducer and said receiving electro-magnetic acoustic transducer are positioned in a common housing.

14. The apparatus of claim **13** further comprising a positioning mechanism to selectively position said common housing at a desired location on said in-service conductor.

15. The apparatus of claim **1** wherein said return signal is routed through a wireless transmitter to said feature extraction module.

16. The apparatus of claim **1** wherein said feature extraction module is connected to a display module.

17. A method of identifying damage to an in-service conductor associated with the delivery of electric power, comprising the steps of:

generating electro-magnetic acoustic energy in an in-service conductor associated with the delivery of electric power;

measuring return electro-magnetic acoustic energy in said in-service conductor; and

extracting features within said return electro-magnetic acoustic energy that characterize damage to said in-service conductor.

18. The method of claim **17** wherein said extracting step includes the step of extracting selected wavelets characterizing said return electro-magnetic acoustic energy.

19. The method of claim **18** wherein said extracting step includes the step of classifying said selected wavelets to identify damage to said in-service conductor.

20. The method of claim **19** wherein said extracting step includes the step of classifying said selected wavelets with respect to a predetermined set of feature profiles, each feature profile characterizing a signal associated with a predetermined fault at a selected location of said in-service conductor.

21. The method of claim **19** wherein said extracting step includes the step of classifying said selected wavelets through a neural network to identify damage to said in-service conductor.

22. The method of claim **19** wherein said extracting step includes the step of classifying said selected wavelets through fuzzy logic to identify damage to said in-service conductor.

23. The method of claim **17** wherein said generating step includes the step of positioning an electro-magnetic acoustic transducer around said in-service conductor.

24. The method of claim **23** wherein said generating step includes the step of positioning an electro-magnetic acoustic transducer around said in-service conductor in the form of a twisted bundle of conductors.

25. The method of claim **17** wherein said measuring step includes the step of positioning an electro-magnetic acoustic transducer around said in-service conductor.

26. The method of claim **17** further comprising the step of displaying said return electro-magnetic acoustic energy.

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