CLAIMS

1. An apparatus for imaging a target, comprising:

an ultrasound transducer array comprising:

one or more array elements of a first type, wherein the first type is a transducer configured to transmit acoustic waves; and

one or more array elements of a second type different from the first type, wherein the second type is an optical sensor,

wherein the array elements of the first and second types are configured to detect acoustic echoes corresponding to the acoustic waves.

2. The apparatus of claim 1, wherein the one or more array elements of the first type and the one or more array elements of the second type are in alternating rows.

3. The apparatus of claim 2, wherein at least a portion of the array elements of the first type is in a center row.

4. The apparatus of claim 2, wherein at least a portion of the array elements of the second type is in a center row.

5. The apparatus of claim 1, wherein the ultrasound transducer array includes an inner row and a row adjacent to the inner row, wherein the inner row comprises one or more array elements of the first type and the row adjacent to the inner row comprises one or more array elements of the second type.

6. The apparatus of claim 1, wherein the ultrasound transducer array comprises an inner row comprising one or more array elements of the first type, and a row adjacent to the inner row comprising one or more array elements of the second type.

7. The apparatus of claim 1, wherein the ultrasound transducer array comprises at least one row comprising at least one array element of the first type and at least one array element of the second type.

8. The apparatus of claim 7, wherein the at least one row comprising at least one array element of the first type and at least one array element of the second type is a center row.

9. The apparatus of claim 8, wherein the center row has a single array element of the second type.

10. The apparatus of claim 9, wherein the single array element of the second type is an optical sensor that is about equal to or smaller than a wavelength of the transmitted acoustic waves.

11. The apparatus of claim 8, wherein the center row comprises a plurality of array elements of the first type and a plurality of array elements of the second type.

12. The apparatus of claim 11, wherein the array elements of the second type are about equal to or smaller than a wavelength of the transmitted acoustic wave.

13. The apparatus of claim 7, wherein the ultrasound transducer array comprises two or more rows, each of the two or more rows comprising at least one array element of the first type and at least one array element of the second type.

14. The apparatus of claim 13, wherein the array elements of the second type are spatially distributed in a regular pattern.

15. The apparatus of claim 13, wherein the array elements of the second type are spatially distributed in an irregular pattern.

16. The apparatus of claim 13, wherein the ultrasound transducer array comprises at least 31 rows, at least some of the 31 rows comprising at least one array element of the first type and at least one array element of the second type.

17. The apparatus of claim 7, wherein the ultrasound transducer array comprises a single row, the single row comprising at least one array element of the first type and at least one array element of the second type.

18. The apparatus of claim 1, wherein the ultrasound transducer array comprises a plurality of sub-apertures.

19. The apparatus of claim 18, wherein each sub-aperture comprises at least one array element of the first type.

20. The apparatus of claim 19, wherein each sub-aperture further comprises at least one array element of the second type.

21. The apparatus of claim 1, wherein the optical sensor is an interference-based optical sensor.

22. The apparatus of claim 21, wherein the optical sensor comprises an optical resonator or an optical interferometer.

23. A method of ultrasound transducing comprising:

transmitting acoustic waves using an ultrasound probe, the ultrasound probe comprising an ultrasound transducer array having one or more array elements of a first type and one or more array elements of a second type different from the first type; and

receiving acoustic echoes in response to the acoustic waves, using the one or more array elements of the first type and the one or more array elements of the second type,

wherein the one or more array elements of the second type are optical sensors.

24. The method of claim 23, wherein the one or more array elements of the first type and the one or more array elements of the second type are in alternating rows.

25. The method of claim 24, at least a portion of the array elements of the first type is in a center row.

26. The method of claim 24, wherein at least a portion of the array elements of the second type is in a center row.

27. The method of claim 23, wherein the ultrasound transducer array includes an inner row and a row adjacent to the inner row and wherein the inner row comprises one or more array

elements of the first type and the row adjacent to the inner row comprises one or more array elements of the second type.

28. The method of claim 23, wherein the ultrasound transducer array comprises an inner row comprising one or more array elements of the first type, and a row adjacent to the inner row comprising one or more array elements of the second type.

29. The method of claim 23, wherein the ultrasound transducer array comprises at least one row comprising at least one array element of the first type and at least one array element of the second type.

30. The method of claim 29, wherein the at least one row comprising at least one array element of the first type and at least one array element of the second type is a center row.

31. The method of claim 29, wherein the center row has a single array element of the second type.

32. The method of claim 29, wherein the single array element of the second type is an optical sensor that is about equal to or smaller than a wavelength of the transmitted acoustic waves.

33. The method of claim 30, wherein the center row comprises a plurality of array elements of the first type and a plurality of array elements of the second type.

34. The method of claim 33, wherein the array elements of the second type are about equal to or smaller than a wavelength of the transmitted acoustic wave.

35. The method of claim 29, wherein the ultrasound transducer array comprises two or more rows, each of the two or more rows comprising at least one array element of the first type and at least one array element of the second type.

36. The method of claim 23, wherein the array elements of the second type are spatially distributed in a regular pattern.

37. The method of claim 23, wherein the array elements of the second type are spatially distributed in an irregular pattern.

38. The method of claim 23, wherein the ultrasound transducer array comprises at least 31 rows, at least some of the 31 rows comprising at least one array element of the first type and at least one array element of the second type.

39. The method of claim 23, wherein the ultrasound transducer array comprises a single row, the single row comprising at least one array element of the first type and at least one array element of the second type.

40. The method of claim 23, wherein the ultrasound transducer array comprises a plurality of sub-apertures.

41. The method of claim 40, wherein the plurality of sub-apertures comprises a first sub-aperture and a second sub-aperture, the first sub-aperture comprising a greater number of rows than the second sub-aperture.

42. The method of claim 41, wherein the first sub-aperture is a central sub-aperture and the second sub-aperture is adjacent to the central sub-aperture.

43. The method of claim 23, wherein the optical sensors are interference-based optical sensors.

44. The method of claim 43, wherein the optical sensors comprise at least one of an optical resonator and an optical interferometer.

45. The method of claim 44, wherein the optical sensors comprise an optical resonator that is a whispering gallery mode (WGM) optical resonator, a microbubble optical resonator, a microsphere resonator, a micro-toroid resonator, micro-ring resonators, or a micro-disk optical resonator.