CLAIMS

1. An ultrasound treatment system for dithering multiple simultaneous focus points from an ultrasound transducer at multiple depths, comprising:

an ultrasonic probe comprising an ultrasound transducer with a single transduction element, the single transduction element comprising a concave side and a convex side,

in which the concave side comprises an annular array, the annular array adapted to simultaneously apply ultrasonic therapy at a frequency to tissue at a plurality of spaced focal depths, in which the application of ultrasonic therapy occurs within a time of 1 ms or less,

in which the convex side comprises stripes comprising a first poled region and a second poled region, in which the first poled region is poled with a first poling configuration, in which the second poled region is poled with a second poling configuration,

a control module coupled to the ultrasonic probe for controlling the ultrasound transducer,

in which the control module modifies the spacing between the spaced locations via dithering of a first focal zone at a first focal depth and a second focal zone at a second focal depth, in which the first focal depth is different than the second focal depth,

in which the first focal zone at the first focal depth delivers simultaneous first microcoagulation points at a first pitch,

in which the second focal zone at the second focal depth delivers simultaneous second microcoagulation points at a second pitch,

in which the first pitch is different than the second pitch to prevent stacking of the simultaneous first microcoagulation points with the simultaneous second microcoagulation points,

such that dithering via modulation of the frequency precisely moves a position of a beam focus point at the spaced locations.

2. A treatment system according to Claim 1, in which:

(a) the plurality of locations are positioned in a linear sequence within a cosmetic treatment zone, in which the spaced locations are separated with a spacing dithered via a frequency swing, in which the frequency swing varies the frequency; or

(b) a first set of locations is positioned within a first cosmetic treatment zone and a second set of locations is positioned within a second cosmetic treatment zone, the first zone being different from the second zone.

3. A treatment system according to Claim 1 or 2, in which:

(a) the ultrasound transducer is adapted to apply ultrasonic therapy using amplitude modulation whereby a plurality of portions of the ultrasound transducer are adapted to emit ultrasonic therapy at a plurality of amplitudes of acoustic intensity, in which a first amplitude is different than a second amplitude; or

(b) at least one portion of the ultrasonic transducer is adapted to emit ultrasonic therapy at two or more amplitudes of acoustic intensity, and in which the amplitude of ultrasonic therapy emitted by the at least one portion of the piezoelectric varies over time.

4. A treatment system according to Claim 1, 2 or 3, in which the ultrasound transducer comprises piezoelectric material and the plurality of portions of the ultrasound transducer are adapted to create a plurality of corresponding piezoelectric material variations in response to an electric field applied to the ultrasound transducer, preferably in which the plurality of piezoelectric material variations comprise at least one of expansion of the piezoelectric material and contraction of the piezoelectric material.

5. A treatment system according to any preceding claim, in which the ultrasound transducer is adapted to apply ultrasonic therapy via phase shifting whereby a plurality of portions of the ultrasound transducer are adapted to emit ultrasonic therapy at a plurality of phases of acoustic intensity, in which a first phase is different than a second phase, preferably in which the plurality of phases comprises discrete phase values.

6. A treatment system according to any preceding claim, in which the ultrasound transducer is adapted to:

apply ultrasonic therapy using amplitude modulation whereby a plurality of portions of the ultrasound transducer are adapted to emit ultrasonic therapy at a plurality of

amplitudes of acoustic intensity, in which a first amplitude is different than a second amplitude; and

apply ultrasonic therapy whereby a plurality of portions of the ultrasound transducer are adapted to emit ultrasonic therapy at a plurality of phases of acoustic intensity, in which a first phase is different than a second phase.

7. A treatment system according to any preceding claim, in which the ultrasonic treatment is at least one of: a face lift, a brow lift, a chin lift, an eye treatment, a wrinkle reduction, a décolletage improvement, a buttock lift, a scar reduction, a burn treatment, a skin tightening, a blood vessel reduction, a treatment of a sweat gland, a sun spot removal, a fat treatment, an abdominal laxity treatment, and a cellulite treatment.

8. A treatment system according to any preceding claim, in which the ultrasonic probe:

(a) comprises a movement mechanism adapted to direct ultrasonic treatment in at least one pair of simultaneous sequences of individual thermal cosmetic treatment zones;

(b) is configured for both ultrasonic imaging and ultrasonic treatment; or

(c) comprises a transducer module adapted to apply ultrasonic therapy.

9. A method of simultaneously dithering a focused ultrasound beam at multiple depths, comprising:

providing an ultrasonic probe comprising a single transduction element and a control module,

in which the single transduction element comprises a concave side and a convex side,

in which the convex side comprises an annular array, in which the annular array is adapted to apply ultrasonic therapy to tissue at a frequency at a focal zone at a plurality of focal depths,

in which the concave side comprises stripes comprising a first poled region and a second poled region, in which the first poled region is poled with a first poling configuration at a first focal zone at a first focal depth, in which the second poled region is poled with a second poling configuration at a second focal zone at a second focal depth,

in which the first focal zone at the first focal depth delivers simultaneous first microcoagulation points at a first pitch,

in which the second focal zone at the second focal depth delivers simultaneous second microcoagulation points at a second pitch,

in which the first pitch is different than the second pitch to prevent stacking of the simultaneous first microcoagulation points with the simultaneous second microcoagulation points,

in which the control module is coupled to the ultrasonic probe for controlling the single transduction element, and

dithering the focal zone via modulation of the frequency to alter a size of the focal zone at the tissue with the control module.

10. A method according to Claim 9, in which:

(a) the relative position of the focal zone is dithered in a range of between 1 to 50%;

(b) a second focal zone is emitted simultaneously from the single transduction element; or

(c) the modulation of the frequency is in a range of between 1 to 50%.

11. A method according to Claim 9 or 10, further comprising imaging the focal zone with an ultrasound imaging element.

12. A treatment system configured for use according to a method according to Claim 9, 10 or 11, in which the system is designed to work non-invasively to treat tissue or the method functions in a non-invasive manner to treat tissue.

13. An ultrasound treatment system for delivering simultaneous multi-focus treatment at a plurality of depths with an electrostrictor, comprising:

a module comprising an ultrasound transducer,

in which the ultrasound transducer is adapted to simultaneously apply ultrasonic therapy at a frequency to tissue at a plurality of spaced depths in tissue with the application of an electrostrictor, in which the application of ultrasonic therapy occurs within a time of 1 ms or less,

in which the ultrasound transducer is adapted to apply a first ultrasonic therapy at a first focal zone at a first focal depth,

in which the ultrasound transducer is adapted to apply a second ultrasonic therapy a second focal zone at a second focal depth,

in which the first focal depth is different than the second focal depth,

in which the first focal zone at the first focal depth delivers simultaneous first microcoagulation points at a first pitch,

in which the second focal zone at the second focal depth delivers simultaneous second microcoagulation points at a second pitch,

in which the first pitch is different than the second pitch to prevent stacking of the simultaneous first microcoagulation points with the simultaneous second microcoagulation points,

in which the module modifies the first pitch via dithering of the first focal zone and the second focal zone, such that dithering via modulation of the frequency precisely moves a position of the first ultrasonic therapy and the second ultrasonic therapy,

in which the module further comprises an interface guide designed to for removable coupling to a hand wand to provide electronic communication and power between the module and the hand wand.

14. A treatment system according to Claim 13, in which:

(a) the ultrasound transducer is adapted to apply ultrasonic therapy using amplitude modulation whereby a plurality of portions of the ultrasound transducer are adapted to emit ultrasonic therapy at a plurality of amplitudes of acoustic intensity, in which a first amplitude is different than a second amplitude; or

(b) the ultrasound transducer is adapted to apply ultrasonic therapy whereby a plurality of portions of the ultrasound transducer are adapted to emit ultrasonic therapy at a plurality of phases of acoustic intensity, in which a first phase is different than a second phase.

15. A treatment system according to Claim 13 or 14, in which the ultrasound transducer comprises piezoelectric material and the plurality of portions of the ultrasound transducer are

adapted to create a plurality of corresponding piezoelectric material variations in response to an electric field applied to the ultrasound transducer.

16. A treatment system according to Claim 13, 14 or 15, in which at least one portion of the ultrasonic transducer is adapted to emit ultrasonic therapy at two or more amplitudes of acoustic intensity, and in which the amplitude of ultrasonic therapy emitted by the at least one portion of the ultrasonic transducer remains constant over time.

17. A treatment system according to any of Claims 13 to 16, in which the ultrasonic treatment is at least one of a face lift, a brow lift, a chin lift, an eye treatment, a wrinkle reduction, a décolletage improvement, a buttock lift, a scar reduction, a burn treatment, a tattoo removal, a skin tightening, a vein removal, a vein reduction, a treatment on a sweat gland, a treatment of hyperhidrosis, a sun spot removal, a fat treatment, a cellulite treatment, an abdominal laxity treatment, a vaginal rejuvenation, and an acne treatment.

18. An ultrasound system for dithering multiple simultaneous focus points from an ultrasound transducer at multiple positions, comprising:

an ultrasonic probe comprising an ultrasound transducer with a single transduction element adapted to simultaneously focus ultrasound at a frequency at a plurality of spaced focal positions,

in which the plurality of spaced focal positions comprises a first focal zone at a first focal depth and a second focal zone at a second focal depth,

in which the first focal depth is different than the second focal depth,

in which the first focal zone at the first focal depth delivers simultaneous first microcoagulation points at a first pitch,

in which the second focal zone at the second focal depth delivers simultaneous second microcoagulation points at a second pitch,

in which the first pitch is different than the second pitch to prevent stacking of the simultaneous first microcoagulation points with the simultaneous second microcoagulation points,

in which the single transduction element comprises a concave side and a convex side,

in which the concave side comprises an annular array, in which the annular array is adapted to simultaneously apply the ultrasound to tissue at a frequency at a focal zone at a plurality of focal depths

in which the convex side comprises stripes comprising a first poled region and a second poled region, in which the first poled region is poled with at least a first poling configuration, in which the second poled region is poled with a second poling configuration,

a control module coupled to the ultrasonic probe for controlling the ultrasound transducer,

in which the control module modifies the spacing between the spaced locations via dithering of a first focal zone and a second focal zone, such that dithering via modulation of the frequency precisely moves a position of a beam focus point at the spaced positions.

19. An ultrasound system according to Claim 18, in which the plurality of locations are positioned in a linear sequence, in which the spaced locations are separated with a spacing dithered via a frequency swing, in which the frequency swing varies the frequency.

20. An ultrasound system according to Claim 18, in which the ultrasound transducer is adapted to apply ultrasound using amplitude modulation whereby a plurality of portions of the ultrasound transducer are adapted to emit ultrasound at a plurality of amplitudes of acoustic intensity, in which a first amplitude is different than a second amplitude.

21. An ultrasound system according to Claim 20, in which at least one portion of the ultrasonic transducer is adapted to emit ultrasound at two or more amplitudes of acoustic intensity, and in which the amplitude of ultrasound emitted by the at least one portion of the piezoelectric varies over time.

22. An ultrasound system according to Claim 20, in which the ultrasound transducer comprises piezoelectric material and the plurality of portions of the ultrasound transducer are adapted to create a plurality of corresponding piezoelectric material variations in response to an electric field applied to the ultrasound transducer.

23. An ultrasound system according to Claim 22, in which the plurality of piezoelectric material variations comprise at least one of expansion of the piezoelectric material and contraction of the piezoelectric material.

24. An ultrasound system according to any of Claims 18, 19 or 20, in which the ultrasound transducer is adapted to apply ultrasound via phase shifting whereby a plurality of portions of the ultrasound transducer are adapted to emit ultrasound at a plurality of phases of acoustic intensity, in which a first phase is different than a second phase.

25. An ultrasound system according to Claim 24, in which the plurality of phases comprises discrete phase values.

26. An ultrasound system according to any of Claims 18, 19 or 20, in which the ultrasound transducer is adapted to:

apply ultrasound using amplitude modulation whereby a plurality of portions of the ultrasound transducer are adapted to emit ultrasound at a plurality of amplitudes of acoustic intensity, in which a first amplitude is different than a second amplitude; and

apply ultrasound whereby a plurality of portions of the ultrasound transducer are adapted to emit ultrasound at a plurality of phases of acoustic intensity, in which a first phase is different than a second phase.

27. An ultrasound system according to any of Claims 18, 19 or 20, in which the ultrasonic probe comprises a movement mechanism adapted to direct ultrasonic treatment in at least one pair of simultaneous sequences of individual thermal cosmetic treatment zones.

28. An ultrasound system according to any of Claims 18, 19 or 20, in which the ultrasonic probe is configured for both ultrasonic imaging and ultrasonic treatment.

29. A method of simultaneously dithering a focused ultrasound beam at multiple positions, comprising:

providing an ultrasonic probe comprising a single transduction element and a control module,

in which the single transduction element comprises a concave side and a convex side,

in which the convex side comprises an annular array, in which the annular array is adapted to apply ultrasonic therapy to tissue at a frequency,

in which the single transduction element is adapted to deliver the ultrasonic therapy to a first focal zone at a first focal depth and a second focal zone at a second focal depth,

in which the first focal depth is different than the second focal depth,

in which the first focal zone at the first focal depth delivers simultaneous first microcoagulation points at a first pitch,

in which the second focal zone at the second focal depth delivers simultaneous second microcoagulation points at a second pitch,

in which the first pitch is different than the second pitch to prevent stacking of the simultaneous first microcoagulation points with the simultaneous second microcoagulation points,

in which the concave side comprises stripes comprising a first poled region and a second poled region, in which the first poled region is poled with a first poling configuration, in which the second poled region is poled with a second poling configuration,

in which the control module is coupled to the ultrasonic probe for controlling the single transduction element, and

dithering the first focal zone via modulation of the frequency to alter the first pitch.

30. A method according to Claim 29, in which:

the relative position of the focal zone is dithered in a range of between 1 to 50%;

a second focal zone is emitted simultaneously from the single transduction element;

the method further comprises imaging the focal zone with an ultrasound imaging element; or

in which the modulation of the frequency is in a range of between 1 to 50%.

31. An ultrasound system for delivering simultaneous multi-focus ultrasound at a plurality of positions with an electrostrictor, comprising:

a module comprising an ultrasound transducer,

in which the ultrasound transducer is adapted to simultaneously apply ultrasound at a frequency at a plurality of spaced positions with the application of an electrostrictor,

in which the module modifies a spacing between the plurality of spaced positions via dithering of a first focal zone and a second focal zone, such that dithering via modulation of the frequency precisely moves a beam focus point at the plurality of spaced positions,

in which the electrostrictor is adapted for modulating a first pitch between the simultaneously applied ultrasound to produce simultaneous first microcoagulation points having electronic steering with electrostrictor stripes at an angle of 5 º to 45 º with respect to each other,

in which the module further comprises an interface guide designed to for removable coupling to a hand wand to provide electronic communication and power between the module and the hand wand.

32. An ultrasound system according to Claim 31, in which the ultrasound transducer is adapted to apply ultrasound using amplitude modulation whereby a plurality of portions of the ultrasound transducer are adapted to emit ultrasound at a plurality of amplitudes of acoustic intensity, in which a first amplitude is different than a second amplitude.

33. An ultrasound system according to Claim 31, in which the ultrasound transducer is adapted to apply ultrasound whereby a plurality of portions of the ultrasound transducer are adapted to emit ultrasound at a plurality of phases of acoustic intensity, in which a first phase is different than a second phase.

34. An ultrasound system according to Claim 31, in which the ultrasound transducer comprises piezoelectric material and the plurality of portions of the ultrasound transducer are adapted to create a plurality of corresponding piezoelectric material variations in response to an electric field applied to the ultrasound transducer.

35. An ultrasound system according to Claim 31, in which at least one portion of the ultrasonic transducer is adapted to emit ultrasound at two or more amplitudes of acoustic intensity, and in which the amplitude of ultrasound emitted by the at least one portion of the ultrasonic transducer remains constant over time.