CLAIMS

1. An ultrasound treatment and imaging system configured for reducing imaging misalignment, comprising:

an ultrasonic probe comprising an ultrasound therapy transducer adapted to apply ultrasonic therapy to tissue, an ultrasound imaging transducer adapted for imaging the tissue, and a motion mechanism for moving the ultrasound imaging transducer in a first direction and a second direction,

in which the ultrasound imaging transducer is mechanically attached to the motion mechanism,

in which the first direction is opposite the second direction,

in which the ultrasound imaging transducer images with a focal zone sequence order (f_1, …, f_N), where N>1 when travelling in the first direction,

in which the ultrasound imaging transducer images with a second focal zone sequence order (f_N,…, f_1) when travelling in the second direction,

in which a spatial registration between the first direction imaging and the second direction imaging is improved by staggering a triggering location,

in which the ultrasound treatment and imaging system employs a directionally dependent focal zone sequencing with alternating between (f_1-…-f_N) and (f_N- … -f_1) on consecutive A-lines; and

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

2. An ultrasound treatment and imaging system according to Claim 1, in which the first direction of motion of the transducer is any one or more of the group consisting of: linear, rotational, and curved; in which the second direction is the reversed path of the first direction.

3. An ultrasound treatment and imaging system according to Claim 1, in which the first direction of motion occurs in multiple dimensions and the second direction is the reversed path of the first direction.

4. An ultrasound treatment and imaging system according to Claim 1, in which the ultrasound imaging transducer images with the first focal zone sequence order is specified as (f_1, …, f_N), where N>2.

5. An ultrasound treatment and imaging system according to Claim 1, in which the ultrasound therapy transducer is configured for treatment of tissue at a first set of locations that is positioned within a first cosmetic treatment zone and a second set of locations that is positioned within a second cosmetic treatment zone, the first zone being different from the second zone.

6. An ultrasound treatment and imaging system according to any preceding claim, in which the ultrasound therapy 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.

7. An ultrasound treatment and imaging system according to Claim 6, 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 piezoelectric varies over time.

8. An ultrasound treatment and imaging system according to Claim 6, 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.

9. An ultrasound treatment and imaging system according to Claim 8, in which the plurality of piezoelectric material variations comprise at least one of expansion of the piezoelectric material and contraction of the piezoelectric material.

10. An ultrasound treatment and imaging system according to any of Claims 1 to 5, 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.

11. An ultrasound treatment and imaging system according to Claim 10, in which the plurality of phases comprises discrete phase values.

12. An ultrasound treatment and imaging system according to any of Claims 1 to 5, 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.

13. An ultrasound treatment and imaging system according to any of Claims 1 to 5, 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, a cellulite treatment, a vaginal rejuvenation, and an acne treatment.

14. An ultrasound treatment and imaging system according to any of Claims 1 to 5, in which the ultrasonic treatment is a treatment for abdominal laxity.

15. An ultrasound treatment and imaging system according to any of Claims 1 to 5, in which the ultrasound imaging transducer images with the first focal zone sequence order is specified as (f1, …, fN), where N>3.

16. An ultrasound treatment and imaging system according to any of Claims 1 to 5, in which the ultrasound imaging transducer images with the first focal zone sequence order is specified as (f1, …, fN), where N = 4.

17. An ultrasound treatment and imaging system according to any of Claims 1 to 5, in which the ultrasound imaging transducer images with the first focal zone sequence order is specified as (f1, …, fN), where N = 10.

18. A method of using a system according to any of Claims 1 to 5, the method comprising staggering the triggering location of the spatial registration between the first direction imaging and the second direction imaging with the ultrasonic probe.

19. A method according to Claim 18, in which N = any one of the group consisting of: 2, 3, 4, 5, 6, 7, 8, 9, and 10.

20. A method according to Claim 18, in which N = 2.

21. A method according to Claim 18, in which N = 4.

22. A method according to Claim 18, in which N = 6.

23. A method according to Claim 18, in which N = 8.

24. Use of a system according to any of Claims 1 to 5 to tighten skin.

25. Use of a system according to any of Claims 1 to 5 to lift the brow.

26. Use of a system according to any of Claims 1 to 5 to lift lax tissue.

27. Use of a system according to any of Claims 1 to 5 to lift lax submental and neck tissue.

28. Use of a system according to any of Claims 1 to 5 for improving lines and wrinkles of the décolleté.

29. Use of a system according to any of Claims 1 to 5 for reducing fat.

30. Use of a system according to any of Claims 1 to 5 for reducing the appearance of cellulite.

31. Use of a system according to any of Claims 1 to 5 for focusing ultrasound to produce localized, mechanical motion within tissues and cells for the purpose of producing either localized heating for tissue coagulation or for mechanical cellular membrane disruption intended for non-invasive aesthetic use.

32. A method of reducing imaging misalignment in a moving ultrasound probe, comprising:

staggering a triggering location of a spatial registration between a first direction imaging and a second direction imaging with an ultrasonic probe,

the ultrasound probe comprising an ultrasound therapy transducer adapted to apply ultrasonic therapy to tissue, an ultrasound imaging transducer adapted for imaging the tissue, and a motion mechanism for moving the ultrasound imaging transducer in the first direction and the second direction,

in which the ultrasound imaging transducer is mechanically attached to the motion mechanism,

in which the first direction is opposite the second direction,

in which the ultrasound imaging transducer images with a first focal zone sequence order (f_1, …, f_N), with N>2, when travelling in the first direction,

in which the ultrasound imaging transducer images with a second focal zone sequence order (f_N, …, f_1) when travelling in the second direction.

33. The method of Claim 32, in which N = any one of the group consisting of: 3, 4, 5, 6, 7, 8, 9, and 10.

34. A method according to Claim 18, in which N = 4.

35. A method according to Claim 18, in which N = 5.

36. A method according to Claim 18, in which N = 7.

37. A method according to any of Claims 18 to 36, in which the ultrasound 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 vaginal rejuvenation, and an acne treatment.

38. A method according to any of Claims 18 to 36, in which the ultrasound treatment is a treatment of abdominal laxity.

39. An ultrasound module configured for reducing imaging misalignment, comprising:

an ultrasound therapy transducer adapted to apply ultrasonic therapy to tissue,

an ultrasound imaging transducer adapted for imaging the tissue, and

a motion mechanism for moving the ultrasound imaging transducer in a first direction and a second direction,

in which the ultrasound imaging transducer is mechanically attached to the motion mechanism,

in which the first direction is opposite the second direction,

in which the ultrasound imaging transducer images with a focal zone sequence order (f_1, …, f_N), where N>1 when travelling in the first direction,

in which the ultrasound imaging transducer images with a second focal zone sequence order (f_N,…, f_1) when travelling in the second direction,

in which a spatial registration between the first direction imaging and the second direction imaging is improved by staggering a triggering location,

in which the ultrasound module employs a directionally dependent focal zone sequencing with alternating between (f_1-…-f_N) and (f_N- … -f_1) on consecutive A-lines.