CLAIMS

1. A catheter for treating an occlusion in a body lumen, the catheter comprising:

an outer elongate member including a fluid lumen;

a flexible enclosure secured to a distal region of the outer elongate member, the flexible enclosure being fillable with a conductive fluid via the fluid lumen;

an inner elongate member, positioned within the outer elongate member and extending through the flexible enclosure to a distal region of the flexible enclosure; and

a movable emitter member having an emitter assembly mounted thereon and connected to a power source, the movable emitter member located between the inner elongate member and the outer elongate member and movable in a longitudinal direction between the inner elongate member and the outer elongate member.

2. The catheter of claim 1, wherein, in a first configuration of the movable emitter member, the emitter assembly is at a first location, and, in a second configuration of the movable emitter member, the emitter assembly is at a second location more distal of the first location.

3. The catheter of claim 2, wherein the emitter assembly is located proximal of the flexible enclosure in the first configuration, and the emitter assembly is located within the flexible enclosure in the second configuration.

4. The catheter of claim 2, wherein:

the flexible enclosure has a working length *l*,

the emitter assembly comprises a plurality of shock wave emitters, and

a distance between the most proximal shock wave emitter and the most distal shock wave emitter is less than or equal to 0.5 *l*.

5. The catheter of claim 1, further comprising a proximal hub, wherein the outer elongate member, the inner elongate member, and the movable emitter member extend to the proximal hub and translation of the movable emitter member along the inner elongate member at the proximal hub moves the emitter assembly.

6. The catheter of claim 5, wherein translation of the movable member by a distance *d* at the proximal hub moves the emitter assembly by the distance *d* in the longitudinal direction.

7. The catheter of claim 5, wherein the proximal hub comprises a distal end opening fluidically sealed to a proximal end of the outer elongate member.

8. The catheter of claim 5, wherein the inner elongate member includes indicia that correlate to the longitudinal position of the emitter assembly within the flexible enclosure.

9. The catheter of claim 5, wherein:

the proximal hub comprises a distal diaphragm seal and a proximal diaphragm seal,

the inner elongate member and the movable emitter member each extend through the distal diaphragm seal, and

the inner elongate member extends through the proximal diaphragm seal.

10. The catheter of claim 5, wherein the proximal hub comprises a position stabilizer with a first anchor at a first location of the proximal hub and a second anchor at a second location of the proximal hub, more proximal of the first location, and the movable emitter member includes a proximal end translatable between the first anchor and the second anchor.

11. The catheter of claim 1, wherein at least one of the inner elongate member and the movable emitter member comprises a polytetrafluoroethylene.

12. The catheter of claim 1, wherein the inner elongate member has an outer diameter *d1* and the movable emitter member includes a lumen having a diameter *d2* that is at least 0.002 inch greater than *d1*.

13. The catheter of claim 1, wherein the emitter assembly comprises an emitter centering member including:

a proximal band;

a distal band; and

a plurality of flexible beams connecting the proximal band to the distal band, each beam having a central region that extends radially outward.

14. The catheter of claim 13, wherein, the flexible enclosure includes an inflated state and a deflated state, and, when the flexible enclosure is in the inflated state, the central region extends radially farther outward than when the flexible enclosure is in the deflated state.

15. The catheter of claim 13, wherein the emitter assembly comprises one or more shock wave emitters and the central regions of the plurality of beams space the one or more shock wave emitters from a wall of the flexible enclosure.

16. The catheter of claim 13, wherein the emitter centering member comprises one or more of a polymer and a metal.

17. The catheter of claim 1, wherein the flexible enclosure comprises an angioplasty balloon having a working length *l* of at least 50 mm.

18. An emitter centering member for an IVL catheter, the emitter centering member comprising:

a proximal band;

a distal band longitudinally spaced from the proximal band; and

a plurality of flexible beams connecting the proximal band to the distal band, wherein each flexible beam includes a center region that compressibly extends laterally outward.

19. A handle for an IVL device, the handle comprising:

a proximal end;

an elongate member extending from the proximal end;

a movable arm movably located on the elongate member and including a proximal diaphragm seal and a power port;

a distal arm located distal of the movable arm and including a distal diaphragm seal and a fluid port; and

a stabilizing bar that extends from the proximal end to the distal arm.

20. The handle of claim 19, wherein the movable arm includes a second fluid port.

21. The handle of claim 20, wherein the movable arm includes a third fluid port.

22. A catheter for treating an occlusion in a body lumen, the catheter comprising:

an elongate member including a fluid lumen;

a flexible enclosure secured to a distal region of the elongate member, the flexible enclosure being fillable with a conductive fluid via the fluid lumen and having a working length *l*; and

a movable emitter member having an emitter assembly mounted thereon and connected to a power source, the emitter assembly comprising a plurality of emitters,

wherein a distance from a most proximal emitter to a most distal emitter is less than or equal to *l*/2 and the movable emitter member is longitudinally translatable within the flexible enclosure.