CLAIMS

1. A placement device (100) for placement in a medium (10), comprising:

an elongated optical transmission guide (110) for transmission of electromagnetic energy (20) between a first end (112) and a second end (114) of the elongated optical transmission guide (110);

a photoacoustic transducer (200) attached to the second end (114) of the elongated optical transmission guide (110),

wherein the photoacoustic transducer (200) comprises a first surface (202) facing away from the second end (114) of the elongated optical transmission guide (110),

wherein the photoacoustic transducer (200) comprises a 3-Dimensional shape configured to produce an acoustic signal (30) upon absorption of electromagnetic energy (20) received from the elongated optical transmission guide (110);

wherein the photoacoustic transducer (200) comprises a core (224) and a coating (226) on the core (224), and wherein the first surface (202) is a surface of the coating (226),

wherein the coating (226) contacts or at least partially surrounds the core (224) and is configured to convert electromagnetic energy (20) into a heat and wherein the core (224) is configured to convert the heat into sound for providing the acoustic signal (30).

2. The placement device (100) of claim 1, wherein the 3-Dimensional shape is a disk (220) having a cylindrical shape wherein a height is smaller than a diameter.

3. The placement device (100) of claim 1, wherein the first surface (202) is convex (232).

4. The placement device (100) of claim 1, wherein the first surface (202) is concave (252).

5. The placement device (100) of claim 1, wherein the 3-Dimensional shape is a cylinder (240) having a cylindrical shape wherein a height is equal to or larger than a diameter.

6. The placement device (100) of claim 1, wherein the 3-Dimensional shape is a pattern of the coating (226) on the core (224).

7. The placement device (100) of any one of the previous claims, wherein the Grüneisen constant of a material of the core (224) is greater than a Grüneisen constant of a material of the coating (226).

8. The placement device (100) of any one of the previous claims, wherein the coating (226) comprises an absorption coefficient greater than an absorption coefficient of the core (224) for a same pre-determined wavelength of the electromagnetic energy (20).

9. The placement device (100) of any one of the previous claims, wherein the electromagnetic energy (20) is laser light, and wherein the laser light is applied as a modulated signal, optionally as a pulsed signal.

10. The placement device (100) of any one of the previous claims, wherein the elongated optical transmission guide (110) is an optical fibre.

11. The placement device (100) of claim 10, wherein the optical fibre is a multimode optical fibre.

12. The placement device (100) of claim 10 or claim 11, wherein the optical fibre is comprised in an optical fibre bundle.

13. The placement device (100) of any one of the previous claims, wherein the photoacoustic transducer (200) is non-removable from the elongated optical transmission guide (110).

14. The placement device (100) of any one of the previous claims, wherein the medium (10) is biological tissue, the placement device (100) is configured to be placed into biological tissue, and an outer layer of at least a portion of the placement device (100) comprising the photoacoustic transducer (200) is biocompatible with the biological tissue.

15. The placement device (100) of claim 14, wherein the biological tissue is human or animal tissue.

16. A medical or veterinary device (300) configured to be inserted into human or animal tissue, respectively, wherein the medical or veterinary device (300) integrally comprises the placement device (100) of claim 15.

17. The medical or veterinary device (300) of claim 16 being selected from:
a catheter;
an introducer guide wire;
a needle;
an endoscopy probe;
a feeding tube;
a combination thereof.

18. A placement tracking system (400) for tracking an object in a medium (10), the placement tracking system (400) comprising:
the placement device (100) of any one of claims 1 to 13 or the medical or veterinary device (300) of claim 16 or claim 17;
a light source (410) configured to couple electromagnetic energy (20) into the first end (112) of the elongated optical transmission guide (110);
an ultrasound detector (420) configured to detect the acoustic signal (30) produced by the photoacoustic transducer (200) of the placement device (100) receiving electromagnetic energy (20) via the second end (114) of the elongated optical transmission guide (110).

19. The placement tracking system (400) of claim 18, wherein an energy peak of the electromagnetic magnetic energy overlaps with an absorption band of the photoacoustic transducer (200).