Claims

1. An electromagnetic imager (100) for imaging electromagnetic radiation from an object (101) including:

- entrance optics for allowing the electromagnetic radiation to enter the electromagnetic imager (100), including an image plane (107) onto which an image of the object (101) is to be imaged inside a sealed cell connected to a thermal controller (198);

- an unbalanced single-wavelength phase-shifting laser diode interferometer, including direct modulation of the output wavelength of the laser diode by its injection current, the unbalanced interferometer (106) having a measurement arm (108), wherein the thermally controlled sealed cell containing the image plane (107) is in the measurement arm (108), wherein at least the unbalanced interferometer (106) is arranged in a vacuum chamber (195);

- a transformation layer (120), contained in the thermally controlled sealed cell with an electromagnetic radiation input window and laser diode transparent output window, separated by a small distance from each other in a range of 1 micron to 100 micron, at the image plane (107), for transforming the electromagnetic radiation into a spatiotemporal variation of the refractive index of the transformation layer (120) for causing spatiotemporal optical phase differences in the measurement arm (108) of the unbalanced phase-shift interferometer representative of the image of the object (101), and wherein the transformation layer is a thin layer having a microns thickness of a solid, a liquid, a gas, or any combination thereof.

2. The electromagnetic imager of claims 1, wherein the transformation layer (120) includes a portion shielded from the electromagnetic radiation for generating a compensation signal from the portion.

3. The electromagnetic imager of claim 2, wherein the shielded portion is located at the image plane (107).

4. The electromagnetic imager of any one of claims 1-3, wherein the unbalanced interferometer is a phase-shifting Mach-Zehnder interferometer.

5. The electromagnetic imager of any one of claims 1-4, wherein the laser diode (112) of the unbalanced phase-shift interferometer (106) is configured to create phase shifts through direct modulation of its output wavelength by injection current modulation.

6. The electromagnetic imager of any one of claims 1-5, including a two-dimensional digital camera sensor (124) arranged for capturing an interference image generated by the unbalanced phase-shift interferometer (106).

7. The electromagnetic imager of claim 6, wherein the current modulated laser diode (112) is synchronized with the two-dimensional digital camera sensor (124, 224).

8. The electromagnetic imager of claim 6, including a processing unit (132) arranged for processing the camera signal of the digital camera (124, 224), such as for display on a display device (126).

9. The electromagnetic imager of any one of the preceding claims, wherein the transformation layer (120) comprises a polymer.

10. The electromagnetic imager of claim 9, wherein the polymer is a doped polymer.

11. The electromagnetic imager of any one of the preceding claims, wherein the transformation layer (120) includes a fluid mixture, such as a water and glycol.

12. The electromagnetic imager of any one of the preceding claims, wherein the transformation layer (120) includes a colloidal suspension.

13. The electromagnetic imager of any one of the preceding claims, wherein the transformation layer (120) is housed between two thermally controlled optical windows separated by a distance in a range of 1-100 micron.

14. Thermal camera including a device according to any one of claims 1-13.

15. Night vision camera including a device according to any one of claims 1-13.

16. Add-on device for a mobile device, such as a smartphone or tablet, including a device according to any one of claims 1-5 or 7-13, arranged for cooperating with the mobile device, such that a digital camera of the mobile device captures an interference image generated by the interferometer.

17. A method for imaging electromagnetic radiation from an object (101) including the steps of:

- imaging an electromagnetic radiation image of the object (101) on an image plane (107), wherein the image plane (107) is in a measurement arm of an unbalanced phase-shift interferometer (106);
- transforming, by a transformation layer (120) contained in a thermally controlled sealed cell, at the image plane (107), the electromagnetic radiation into a spatiotemporal variation of the refractive index of the transformation layer (120) for causing spatiotemporal optical phase differences

in the measurement arm (108) of the unbalanced interferometer (106) representative of the image of the object (101), wherein the transformation layer is a thin layer having a microns thickness of a solid, a liquid, a gas, or any combination thereof; and

- generating a visible image representative of the image of the object based on the optical phase differences.

18. The method of claim 17, including the step of:

- generating, in the unbalanced phase-shift interferometer, a compensation signal by shielding a portion of the transformation layer from the electromagnetic radiation.

19. The method of claim 17 or 18, including:

- generating a plurality of visible images wherein a phase of the illumination light of the unbalanced interferometer differs between individual images of the plurality of visible images; and
- generating a single visible image based on the plurality of visible images.

20. The method of any one of claims 17-19, wherein the transformation layer comprises a polymer, such as a doped polymer.

21. The method of any one of claims 17-20, wherein the transformation layer includes a colloidal suspension.