CLAIMS

1. An optical device comprising:

    a radiation collimator configured to generate a directed light beam based on omni-directional light emission;

    one or more optical elements configured to change a parameter of the directed light beam; and

    an optical coupler configured to couple the directed light beam to the one or more optical elements,

    wherein the radiation collimator comprises:

        a first reflector;

        a second reflector; and

        a spacer between the first reflector and the second reflector;

    wherein the first reflector, the second reflector, and the spacer form a resonant cavity,

    wherein the one or more optical elements form a metasurface,

    wherein the optical coupler is a phase compensating layer configured to mediate interactions between the metasurface and the resonant cavity.

2. The optical device according to claim 1,

    wherein the optical coupler is further configured to adjust a phase of the directed light beam.

3. The optical device according to claim 1,

    wherein the first reflector is configured to allow at least a portion of the directed light beam to pass through to the one or more optical elements, and

    wherein the first reflector has a relatively lower reflection than the second reflector.

4. The optical device according to claim 1,

    wherein the first reflector is a Bragg reflector.

5. The optical device according to claim 1,

wherein the second reflector is a metal reflector or a Bragg reflector.

6. The optical device according to claim 1,

wherein the spacer comprises a semiconductor or a dielectric.

7. The optical device according to claim 1, further comprising:

one or more light emitters configured to generate the omni-directional light emission;

wherein the one or more light emitters are within the spacer.

8. The optical device according to claim 1,

wherein the parameter of the directed light beam is a direction of the directed light beam.

9. The optical device according to claim 1,

wherein the parameter of the directed light beam is an amplitude of the directed light beam.

10. The optical device according to claim 1,

wherein the parameter of the directed light beam is a phase of the directed light beam.

11. The optical device according to claim 1,

wherein the parameter of the directed light beam is a polarization of the directed light beam.

12. The optical device according to claim 1,

wherein the one or more optical elements are microstructures or nanostructures.

13. The optical device according to claim 1, wherein the one or more optical elements are a plurality of cylinders with varying diameters.

14. The optical device according to claim 13, wherein the one or more optical elements are the plurality of cylinders arranged in periodic supercells.

15. The optical device according to claim 14, wherein a supercell of the periodic supercells comprises several cells with increasing cylinder diameters along the supercell direction.

16. A method of forming an optical device, the method comprising:

forming a radiation collimator configured to generate a directed light beam based on omni-directional light emission;

forming one or more optical elements configured to change a parameter of the directed light beam; and

forming an optical coupler configured to couple the directed light beam to the one or more optical elements,

wherein the radiation collimator comprises:

a first reflector;

a second reflector; and

a spacer between the first reflector and the second reflector;

wherein the first reflector, the second reflector, and the spacer form a resonant cavity,

wherein the one or more optical elements form a metasurface,

wherein the optical coupler is a phase compensating layer configured to mediate interactions between the metasurface and the resonant cavity.

17. The method according to claim 16, further comprising:

forming one or more light emitters within the spacer, the one or more light emitters configured to generate the omni-directional light emission.