CLAIMS

1. A disinfection device comprising

a housing for receiving a plurality of light emitting diode (LED) units capable of emitting a radiation for disinfection, the housing having an internal surface coated with a light reflective material, the internal surface arranged to reflect radiation emitted from each of the LED units;

wherein each of the plurality of LED units comprises a corresponding lens unit arranged to focus or collimate radiation emitted by the LED unit.

2. The device of claim 1, wherein the light reflective material comprises polished aluminium, polished aluminium alloy and/or Polytetrafluoroethylene.

3. The device of claim 1 or 2, wherein at least one of the plurality of light emitting diode (LED) units is operable to emit an ultraviolet-A (UV-A) radiation.

4. The device of claim 1 or 2, wherein at least one of the plurality of light emitting diode (LED) units is operable to emit an ultraviolet-C (UV-C) radiation.

5. The device of claim 4, wherein the at least one UV-C emitter is operable to emit a wavelength of 270 nanometers to 280 nanometers.

6. The device of claim 2, wherein the polished aluminium alloy comprises at least 80% aluminium, and preferably is an aluminium alloy comprising aluminium, chromium, and magnesium.

7. The device of any one of the preceding claims, wherein the housing is formed from a die-cast process or an additive manufacturing process.

8. The device of any one of the preceding claims, further comprises at least one heat sink module.

9. The device of any one of the preceding claims, wherein the device comprises at least one intensity sensor arranged to detect the intensity of the radiation emission.

10. The device of any one of the preceding claims, wherein each of the lens unit is formed of or from optically transparent polymers, preferably liquid silicone rubber (LSR).

11. The device of any one of the preceding claims, wherein the device comprises a transparent cover, the transparent cover formed at least in part of quartz glass.

12. The device of any one of the preceding claims, further comprising a driver configured to produce electrical current having less than 5% fluctuations.

13. The device of any one of the preceding claims, wherein the device is in the form of a downlight, and wherein each downlight has a diameter of between 60 millimeters (mm) to 210 mm.

14. A system for disinfection of an enclosed area comprising

a plurality of disinfection devices, each disinfection device comprises a housing for receiving a plurality of light emitting diode (LED) units capable of emitting a radiation for disinfection, the housing having an internal surface coated with a light reflective material, the internal surface arranged to reflect radiation emitted from each of the LED units; each of the plurality of LED units comprises a corresponding lens unit arranged to focus or collimate radiation emitted by the LED unit; and

a processor configured to toggle each of the plurality of LED units between an off state and an on state.

15. The system of claim 14, further comprises a motion sensor arranged to detect presence of one or more human being within the enclosed area, wherein upon detecting of the presence of one or more human beings, the processor is configured to toggle at least one LED unit to the off state.

16. The system of claim 15, wherein the plurality of LED units comprise a first LED unit capable of emitting a UV-C radiation and a second LED unit capable of emitting a UV-A radiation, wherein when the first LED unit is toggled to the on state, the second LED unit is toggled to the off state, and vice versa.

17. The system of claim 16, wherein the upon detecting the presence of one or more human beings, the processor is configured to toggle the first LED unit to the off state and the second LED unit to the on state.

18. The system of any one of claims 14 to 17, further comprises an air disinfection device in the form of a collimator mounted on a first wall surface at a height from a ceiling of the enclosed area; the collimator containing an UV-C emitter and operable to emit a narrowed beam of UV-C radiation through a nozzle opening; and

a plurality of UV-C radiation sensors mounted on a second wall surface for detection the UV-C radiation emitted from the collimator;

wherein the plurality of UV-C radiation sensors is arranged to detect at least two levels of UV-C radiation corresponding to two different regions on the second wall.

19. The system of claim 18, wherein the processor is operable to control the collimator at a continuous on state unless the UV-C radiation is detected at one of the two regions on the second wall.

20. A method for providing disinfection to an enclosed area having walls and a ceiling, comprising the steps of:

providing a disinfection device mounted on a ceiling of the enclosed area to provide surface disinfection of at least one object in the enclosed area; the disinfection device comprises a housing for receiving a plurality of light emitting diode (LED) units capable of emitting a radiation for disinfection, the housing having an internal surface coated with a light reflective material, the internal surface arranged to reflect radiation emitted from each of the LED units, each

of the plurality of LED units comprises a corresponding lens unit arranged to focus or collimate radiation emitted by the LED unit; and

providing a processor to toggle each of the plurality of LED units between an on state and an off state.

21. The method of claim 20, further comprises the step of switching one of the plurality of LED units to the on state and switching another one of the plurality of LED units to the off state.

22. The method of claim 20 or 21, further comprising the steps of providing an air disinfection device comprising an UV-C emitter operable to emit a narrowed beam of UV-C radiation through a nozzle opening; and providing a plurality of UV-C radiation sensors mounted on a second wall surface for detecting the UV-C radiation emitted from the UV-C emitter; wherein the plurality of UV-C radiation sensors are arranged to detect at least two levels of UV-C radiation corresponding to two different regions on the second wall.

23. The method of claim 22, wherein the step of arranging the plurality of UV-C radiation sensors corresponds to detecting three levels of UV-C radiation corresponding to three different regions on the second wall.

24. The method of claim 23, wherein the three different regions correspond to a germicidal zone, a stray zone, and a no-radiation zone.