CLAIMS

1. A light emitting diode (LED) communication device comprising:

a first housing part comprising:

a communication interface configured to couple with an electronic device; and

a second housing part comprising:

an electrical interface electrically coupled to the communication interface; and

a light emitting diode electrically coupled to the electrical interface;

wherein the electrical interface is configured to convert data signals received from the electronic device into driving signals transmitted to the light emitting diode during uplink, and to convert sensing signals received from the light emitting diode into data signals transmitted to the electronic device during downlink;

wherein the light emitting diode is configured to convert the driving signals received from the electrical interface into a plurality of light pulses during uplink, and to convert a plurality of light pulses received by the light emitting diode into the sensing signals during downlink; and

wherein the first housing part and the second housing part are configured to be rotatable relative to each other.

2. The light emitting diode (LED) communication device according to claim 1,

wherein the first housing part and the second housing part are configured to be rotatable to any value in a range from 0 ° to 360 ° relative to each other.

3. The light emitting diode (LED) communication device according to claim 1,

wherein the light emitting diode is configured to transmit green light and to receive white light.

4. The light emitting diode (LED) communication device according to claim 3,

wherein the white light is emitted from a phosphor-coated light emitting diode by exciting the phosphors coating with blue light emitting diode.

5. The light emitting diode (LED) communication device according to claim 1,

wherein the light emitting diode is configured to transmit one or more selected from a group consisting of a green light, a blue light, and a blue-green light; and

wherein the light emitting diode is configured to receive white light.

6. The light emitting diode (LED) communication device according to claim 5,

wherein the white light is emitted from a phosphor-coated light emitting diode by exciting the phosphors coating with UV or violet LED.

7. The light emitting diode (LED) communication device according to claim 3,

wherein the light emitting diode is configured to reject components of the received light having a wavelength of more than 500 nm; and

wherein the light emitting diode is configured to absorb components of the received light having a wavelength equal or less than 500 nm.

8. The light emitting diode (LED) communication device according to claim 1,

wherein the light emitting diode is configured to transmit one or more selected from a group consisting of a yellow light, an orange light, a red light, and an infrared light; and

wherein the light emitting diode is configured to receive white light.

9. The light emitting diode (LED) communication device according to claim 8,

wherein the light emitting diode is configured to absorb components of the received light having a wavelength less than 980 nm and reject components of the received light having a wavelength more than 980nm.

10. The light emitting diode (LED) communication device according to claim 1,

wherein the light emitting diode has a first area configured to convert the driving signals received from the electrical interface into the plurality of light pulses during uplink, and has a second area, the second area different from the first area, configured to convert the plurality of light pulses received by the light emitting diode into the sensing signals during downlink.

11. The light emitting diode (LED) communication device according to claim 10, wherein the first area overlaps with the second area.

12. The light emitting diode (LED) communication device according to claim 1, wherein the communication interface is a universal serial bus (USB) interface.

13. The light emitting diode (LED) communication device according to claim 1, wherein the light emitting diode (LED) communication device is a dongle.

14. The light emitting diode (LED) communication device according to claim 1, further comprising:

a lens structure over the light emitting diode, the lens structure configured to focus light into the light emitting diode.

15. The light emitting diode (LED) communication device according to claim 1, wherein a surface and/or substrate of the light emitting diode comprises a plurality of patterns.

16. The light emitting diode (LED) communication device according to claim 15, wherein the plurality of patterns comprises a plurality of V-shaped pits, cones or cylinders.

17. The light emitting diode (LED) communication device according to claim 1, comprising an optical communication array comprising a plurality of light emitting diodes.

18. An optical communication system comprising:

a light emitting diode (LED) communication device comprising:

a first housing part comprising:

a communication interface configured to couple with an electronic device; and

a second housing part comprising:

an electrical interface electrically coupled to the communication interface; and

a light emitting diode electrically coupled to the electrical interface;

wherein the electrical interface is configured to convert data signals received from the electronic device into driving signals transmitted to the light emitting diode during uplink, and to convert sensing signals received from the light emitting diode into data signals transmitted to the electronic device during downlink;

wherein the light emitting diode is configured to convert the driving signals received from the electrical interface into a plurality of light pulses during uplink, and to convert a plurality of light pulses received by the light emitting diode into the sensing signals during downlink; and

wherein the first housing part and the second housing part are configured to be rotatable relative to each other;

an optical source configured to transmit the plurality of light pulses to the light emitting diode to be converted into the sensing signals during downlink; and

a photodetector configured to receive the plurality of light pulses from the light emitting diode converted based on the driving signals during uplink.

19. A method of forming a light emitting diode (LED) communication device, the method comprising:

providing a first housing part comprising:

a communication interface for coupling with an electronic device;

providing a second housing part comprising:

an electrical interface electrically coupled to the communications interface;

a light emitting diode electrically coupled to the electrical interface;

wherein the electrical interface is configured to convert data signals received from the electronic device into driving signals transmitted to the light emitting diode during uplink, and to convert sensing signals received from the light emitting diode into data signals transmitted to the electronic device during downlink;

wherein the light emitting diode is configured to convert the driving signals received from the electrical interface into a plurality of light pulses during uplink, and to convert a plurality of light pulses received by the light emitting diode into the sensing signals during downlink; and

wherein the first housing part and the second housing part are configured to be rotatable relative to each other.