Wireless optogenetic device for remotely controlling neural activitiies

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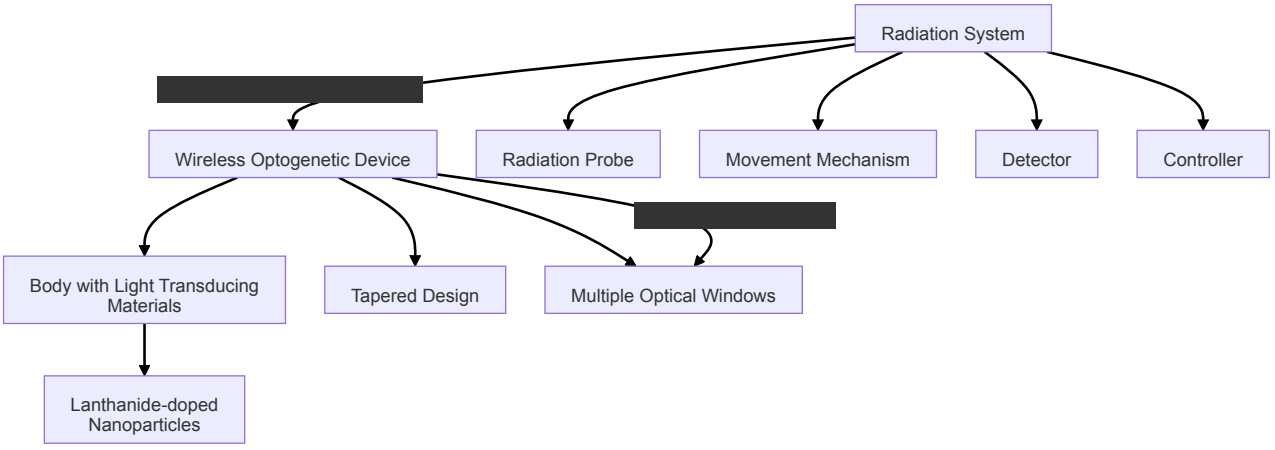
Claims

1. A wireless optogenetic device for remotely controlling neural activities, the device comprising:

a body holding light transducing materials capable of up-converting infrared or near-infrared electromagnetic radiation to visible light, wherein the body is made of biocompatible materials and is transparent and lightweight;

the light transducing materials being lanthanide-doped nanoparticles, capable of up-converting infrared or near-infrared to visible light;

the device is designed to be placed near a neural cell



of a subject, and having a tapered design for concentrated light emission;

the device further comprising multiple optical windows for complex neural activity control, and being sealed to enclose the light transducing materials.

2. The wireless optogenetic device of claim 1, wherein the biocompatible materials are glass or polydimethylsiloxane.

3. The wireless optogenetic device of claim 1, wherein the device is adaptable for both human and non-human subjects.

4. A radiation system for remotely activating the wireless optogenetic device of claim 1, the radiation system comprising:

a radiation probe, a movement mechanism, a detector, and a controller;

the radiation system being capable of tracking and irradiating the wireless device with infrared or near-infrared radiation, enabling real-time adjustment and precise targeting;

the radiation system being capable of altering properties of radiation including wavelength, intensity, and pulse duration, and being adaptable to various subject movement ranges.

5. The radiation system of claim 4, wherein the system's versatility allows for various experimental settings and subject conditions.

6. A method for remotely controlling neural activities, the method comprising the steps of:

placing the wireless optogenetic device of claim 1 near a neural cell of a subject;

activating the wireless optogenetic device using the radiation system of claim 4;

up-converting infrared or near-infrared electromagnetic radiation to visible light using the light transducing materials in the wireless optogenetic device;

controlling complex neural activity through the multiple optical windows in the wireless optogenetic device.

7. The method of claim 6, wherein the step of activating the wireless optogenetic device includes tracking and irradiating the wireless device with infrared or near-infrared radiation, enabling real-time adjustment and precise targeting.

8. The method of claim 6, wherein the step of activating the wireless optogenetic device includes altering properties of radiation including wavelength, intensity, and pulse duration.