Claims

1. A power receiver, comprising:

(i) a first electrode arranged to be electrically coupled to a body of a living being, the first electrode operable to receive an electrical signal via the body; and

(ii) a rectifier for converting the received electrical signal into a rectified electrical signal, the rectifier having a plurality of rectifier switches and operable in a bulk biasing mode in which selected rectifier switches of the plurality of rectifier switches are forward bulk biased.

2. A power receiver according to claim 1, wherein the power receiver has an input load impedance; the power receiver further comprising an L-C circuit, the input load impedance being dependent on a resonance response of the L-C circuit.

3. A power receiver according to claim 2, wherein the L-C circuit comprises a parallel L-C circuit.

4. A power receiver comprising:

(i) a first electrode arranged to be electrically coupled to a body of a living being, the first electrode operable to receive an electrical signal via the body, the electrical signal having a power level;

(ii) a rectifier for converting the received electrical signal into a rectified electrical signal, the rectifier having a plurality of rectifier switches and operable in a bulk biasing mode in which selected rectifier switches of the plurality of rectifier switches are forward bulk biased;

(iii) a DC-DC converter for converting the rectified electrical signal to an output electrical signal, the DC-DC converter having a number of selectable discontinuous mode (DCM) times and operable between a power transmission operation mode in which the electrical signal is transmitted by

a power transmitter; and a power harvesting operation mode in which the electrical signal is harvested ambient energy, in dependence on the power level of the electrical signal; and

(iv) a controller arranged to select a discontinuous mode (DCM) time from the number of selectable discontinuous mode (DCM) times for the DC-DC converter in response to the operation mode of the DC-DC converter.

5. A power receiver according to claim 4, wherein the controller is arranged to select between a plurality of power transmission discontinuous mode (DCM) times in response to the power transmission operation mode, and between a plurality of power harvesting discontinuous mode (DCM) times in response to the power harvesting operation mode, in dependence of a voltage of the rectified electrical signal.

6. A power receiver according to claim 4 or claim 5, wherein a switching frequency of the DC-DC converter in the power transmission operation mode is in the range 10 kHz to 500 kHz and a switching frequency of the DC-DC converter in the power harvesting operation mode is in the range 500 Hz to 6 kHz.

7. A power receiver according to any one of claims 4 to 6, wherein the controller is further arranged to adjust an inductor charging time of the DC-DC converter within a predetermined range until an input power of the DC-DC converter reaches a maximum value for the predetermined range.

8. A power receiver according to claim 7, wherein the controller is arranged to determine a direction of adjustment of the inductor charging time based on a corresponding inductor discharging time of the DC-DC converter.

9. A power receiver according to claim 7 or claim 8, wherein the inductor charging time of the DC-DC converter is between 100ns and 500ns.

10. A power receiver according to any one of the preceding claims, being formed as an integrated circuit (IC) chip.

11. A power receiver according to any one of the preceding claims, further comprising a floating ground node operable as a parasitic capacitive return path via an external ground for the electrical signal.

12. A power receiver according to any one of claims 1 to 10, wherein the first electrode comprises a receiving coil, the receiving coil being operable to receive the electrical signal via the body through magnetic resonance coupling with a transmitting coil.

13. A power receiver comprising:

(i) a first electrode arranged to be electrically coupled to a body of a living being, the first electrode operable to receive an electrical signal via the body;

(ii) a rectifier for converting the received electrical signal into a rectified electrical signal, the rectifier having a plurality of rectifier switches and operable in a bulk biasing mode in which selected rectifier switches of the plurality of rectifier switches are forward bulk biased; and

(iii) a second electrode arranged to be electrically coupled to the body of the living being, wherein the electrical signal is galvanic current.

14. Energy transfer apparatus, comprising:

(i) a power transmitter comprising: a signal generator operable to generate an electrical signal, and an electrode arranged to be electrically coupled to a living being body for transmission of the electrical signal via the living being body; and

(ii) a power receiver according to any one of claims 1 to 13.

15. Energy transfer apparatus according to claim 14, wherein the signal generator has an output load impedance, the power transmitter further comprising an L-C circuit, the output load impedance being dependent on a resonance response of the L-C circuit.

16. A method of receiving electrical power via an electrode coupled to a body of a living being, the method comprising:

receiving an electrical signal from the body via the electrode; and

rectifying the received electrical signal into a rectified electrical signal using a rectifier, the rectifier having a bulk biasing mode in which selected rectifier switches of a plurality of rectifier switches are forward bulk biased.

17. A method of receiving electrical power via an electrode coupled to the body of a living being according to claim 16, further comprising:

varying an input load impedance for receiving the electrical signal in accordance with a resonance response of an L-C circuit.

18. A method of receiving electrical power via an electrode coupled to the body of a living being, the method comprising:

receiving an electrical signal from the body via the electrode;

rectifying the received electrical signal into a rectified electrical signal using a rectifier, the rectifier having a bulk biasing mode in which selected rectifier switches of a plurality of rectifier switches are forward bulk biased

measuring a power level of the electrical signal;

converting the rectified electrical signal to an output electrical signal using a DC-DC converter, the DC-DC converter having a number of selectable discontinuous mode (DCM) times and operable between a power transmission operation mode in which the electrical signal is transmitted by a power transmitter; and a power harvesting operation mode in which the electrical signal is harvested ambient energy, in dependence on the power level of the electrical signal; and

selecting a discontinuous mode (DCM) time from the number of selectable discontinuous mode (DCM) times for the DC-DC converter in response to the operation mode of the DC-DC converter.

19. A method of receiving electrical power according to claim 18, further comprising: adjusting an inductor charging time of the DC-DC converter within a predetermined range to until an input voltage of the DC-DC converter reaches a maximum value for the predetermined range.

20. A method of receiving electrical power according to claim 19, further comprising:

determining an inductor discharging time of the DC-DC converter; and

determining a direction of adjustment of the inductor charging time, based on the inductor discharging time; and adjusting the inductor charging time of the DC-DC converter in the direction of adjustment.