

WHAT IS CLAIMED:

1. A RF system comprising:

a first RF generator connected to a first electrode of a load ~~and having a first digital communication port and~~, the first RF generator configured to generate a first RF signal to the first electrode;

a second RF generator connected to a second electrode of ~~a~~the load ~~and having a second digital communication port~~, the second RF generator configured to generate a second RF signal to the second electrode, wherein the first and second RF generators provide a respective RF voltage to the first and second electrodes; and

a controller configured to control the second RF generator, the controller generating a control signal to at least one of the first RF generator or the second RF generator, and the controller includes a RF switch module and a phase shifter module, receiving a respective pulse control signal and a pulse amplitude control signal from a RF actuator module,

wherein the first RF generator and the second RF generator are configured to operate ~~at substantially a same frequency~~ in accordance with a RF control signal communicated from the first RF generator to the second RF generator,

wherein the second RF generator is configured to communicate a request to the first RF generator ~~via the second digital communication port~~ to request adjustment of pulsing of the second RF signal, and the first RF generator is configured to vary athe pulse control signal ~~applied to the second RF generator to adjust pulsing of the second RF signal, and~~

wherein the RF switch module receives the RF control signal and generates a pulsed RF signal in accordance with the pulse control signal and the phase shifter module controls the amplitude of the pulse in accordance with the pulse amplitude control signal.

2. The RF system of claim 1 further comprising a DC power supply configured to provide a DC rail voltage for driving a power amplifier of the second RF generator, wherein the controller varies the DC rail voltage in order to control a RF voltage at the second electrode.

3. The RF system of claim 2 wherein the controller is configured to determine a phase of the first RF signal and a phase of the second RF signal and controls a phase difference between the first RF signal and the second RF signal, wherein the controller is configured to vary the phase of the second RF signal in accordance with the phase difference.

4. The RF system of claim 1 wherein the first RF generator ~~and the second RF generator are~~ is configured to operate in one of a continuous wave mode of operation or a pulse mode of operation.

5. The RF system of claim 1, wherein the adjustment is one of amplitude or phase of the second RF signal.

~~6. The RF system of claim 1 wherein the second RF generator is configured to communicate a request to the first RF generator via the second digital communication port to request adjustment of pulsing of the second RF signal, and the first RF generator varies a pulse control signal applied to the second RF generator to adjust pulsing of the second RF signal.~~

~~7. The RF system of claim 6 wherein the adjustment is one of pulse repetition rate, power level, or duty cycle.~~

~~86. The RF system of claim 1 wherein the second RF generator further comprises:~~

~~a first sensor is configured to detect at least one first electrical characteristic of the first RF signal and generating in accordance with a first sensor output signal in accordance with the at least one first electrical characteristic; and the second RF generator further comprises:~~

a power amplifier; and

a DC generator configured to output a DC voltage to the power amplifier,

wherein the controller is configured to receive the at least one first electrical characteristic, the controller is configured to determine a setpoint for the DC generator, and the controller is configured to generate a DC control signal that varies in accordance with the setpoint and to communicate the DC control signal to the DC generator to vary the DC voltage.

97. The RF system of claim 86 wherein the second RF generator further comprises

an inductive clamp circuit arranged in the power amplifier; and

a variable resistance configured to communicate with the power amplifier, the variable resistance dissipating energy communicated by the inductive clamp circuit.

108. The RF system of claim 1 wherein the controller is configured to at least one of:

vary a phase of the second RF signal in accordance with a phase difference between the first RF signal and the second RF signal,

vary a DC rail voltage in order to control a RF voltage at the second electrode in accordance with an electrical characteristic of the second RF signal, wherein a DC power supply provides the DC rail voltage for driving a power amplifier of the second RF generator, or

vary a phase of the second RF signal and the DC rail voltage in order to control the RF voltage at the second electrode, wherein a DC power supply provides the DC rail voltage for driving the power amplifier of the second RF generator, in accordance with both the phase difference between first RF signal and the second RF signal and the electrical characteristic of the second RF signal.

119. A RF power system for supplying a first RF power to an electrode in a load, comprising:

a processor; and

a memory, wherein the memory stores instructions executable by the processor and configured to:

determine whether a voltage of the first RF power equals a predetermined power setpoint,

determine whether a phase difference between the first RF power and a second RF power equals a predetermined phase delta, and

generate a request, by a first power supply controller of the first RF power to a second power supply controller of the second RF power, to adjust a parameter of the first RF power to control at least one of:

a phase of the first RF power in accordance with the phase difference between the first RF power and a second RF power,

vary a DC rail voltage in order to control a RF voltage of the first RF power in accordance with an electrical characteristic of the first RF power, or

vary a phase of the first RF power and a DC rail voltage in order to control the first RF power in accordance with both the phase difference between first RF power and the second RF power and the electrical characteristic of the first RF power.

1210. The RF power system of claim 119 wherein a DC power supply provides the DC rail voltage for driving a power amplifier generating the first RF power.

1311. The RF power system of claim 119 wherein the second RF power varies in accordance with a control signal for the first RF power.

1412. The RF power system of claim 119 wherein the instructions are further configured to generate a control signal to a variable DC power supply providing the DC rail voltage.

1513. The RF power system of claim 149 wherein, the DC rail voltage varies in accordance with the control.

1614. A method of operating a RF power system, the method comprising:

- generating a first RF signal applied to a first electrode of a load;
- generating a second RF signal applied to a second electrode of the load;
- providing a DC rail voltage for driving a power amplifier generating the second RF signal and varying the DC rail voltage in order to control a RF voltage at the second electrode;
- communicating a request to the second RF signal to a controller of the first RF signal, wherein the controller of first RF signal generates a control signal to vary the second RF signal; and
- at least one of:
 - varying a phase of the second RF signal in accordance with a phase difference between the first RF signal and the second RF signal,
 - varying a DC rail voltage to control a RF voltage at the second electrode in accordance with an electrical characteristic of the second RF signal, wherein the DC rail voltage drives a power amplifier generating the second RF signal, or
 - varying a phase of the second RF signal and the DC rail voltage in order to control the RF voltage at the second electrode, wherein the DC rail voltage powers the power amplifier, in accordance with both the phase difference between first RF signal and the second RF signal and the electrical characteristic of the second RF signal.

1715. The method of claim 16-14 further comprising generating the second RF signal in one of a continuous wave mode of operation or a pulse mode of operation.

1816. The method of claim 1614 further comprising pulsing the second RF signal in accordance with a pulse control signal to adjust pulsing of the second RF signal.

1917. The method of claim 1416 further comprising:

detecting at least one first electrical characteristic of the first RF signal and generating a first sensor output signal in accordance with the at least one first electrical characteristic;

detecting at least one second electrical characteristic of the second RF signal and generating a second sensor output signal in accordance with the at least one second electrical characteristic; and

determining whether at least one of the second RF signal or a pulsing of a second RF signal requires adjustment and communicating a requested adjustment to a first RF generator.

2018. The method of claim 1416 further comprising:

providing an inductive clamp circuit arranged in the power amplifier generating the second RF signal; and

providing a variable resistance communicating with power amplifier, the variable resistance dissipating energy communicated by the inductive clamp circuit.