

CLAIMS

What is claimed is:

1. A radio frequency (RF) generator comprising:
a RF power source; and
5 a RF power controller coupled to the RF power source, the RF power controller generating a control signal to vary a first RF output from the RF power source to a load, the RF power controller configured to control at least one of the first RF output or a match network actuator in a first predetermined manner over a first predetermined segment of a second RF output applied to the load, the first predetermined segment of
10 the second RF output being less than a full cycle of the second RF output,
wherein the first predetermined manner includes controlling at least one of a power of the first RF output, a frequency of the first RF output, or the match network actuator associated with the first RF output to increase power delivered to the load during the first predetermined segment.
- 15 2. The RF generator of claim 1, wherein the first RF output is a source RF output signal applied to the load and the second RF output is a bias RF output signal applied to the load.
- 20 3. The RF generator of claim 1, wherein the RF power controller receives a synchronization signal that varies in accordance with the second RF output and wherein the synchronization signal indicates the first predetermined segment of the second RF output.
4. The RF generator of claim 1, wherein the first predetermined segment includes a negative voltage segment of the second RF output.
- 25 5. The RF generator of claim 1, wherein the RF power controller increases the power of the first RF output during the first predetermined segment of the second RF output.

6. The RF generator of claim 1, wherein the RF power controller turns off the RF power source during other than the first predetermined segment of the second RF output applied to the load.

5 7. The RF generator of claim 1, wherein the RF power controller applies a power adjustment to the power of the first RF output in accordance with a timing that varies in accordance with a trigger signal, wherein the trigger signal indicates a relative position of the first predetermined segment.

8. The RF generator of claim 7, wherein the power adjustment includes a plurality of power adjustments that the RF power controller applies to the RF output in
10 a predetermined order and timing in accordance with the trigger signal.

9. The RF generator of claim 7, wherein the power adjustment varies in accordance with the power delivered by the RF power source.

10. The RF generator of claim 7, wherein the RF power controller further comprises a playback module, the playback module configured to detect the trigger
15 signal, the playback module initiating introduction of the power adjustment to RF output.

11. The RF generator of claim 10, wherein the RF power controller further comprises a lookup table, the lookup table configured to store the power adjustment introduced by the playback module.

12. The RF generator of claim 11, wherein the RF power controller further
20 comprises an update module, the update module configured to update the power adjustment in accordance with an electrical characteristic of the RF output.

13. The RF generator of claim 12 wherein the electrical characteristic is power delivered to the RF generator by the RF power source.

14. The RF generator of claim 7 wherein the trigger signal is one of periodic,
25 non-periodic, synchronous to a predetermined event, or asynchronous.

15. The RF generator of claim 1, wherein the RF power controller controls the frequency by introducing a frequency offset to the first RF output in accordance with a timing that varies in accordance with a trigger signal, wherein the trigger signal indicates a relative position of the first predetermined segment.

5 16. The RF generator of claim 15, wherein the frequency offset includes a plurality of frequencies that the RF power controller applies to the first RF output in a predetermined order and timing in accordance with the trigger signal.

17. The RF generator of claim 15, wherein the frequency offset varies in accordance with an intermodulation distortion introduced by the second RF output.

10 18. A radio frequency (RF) generator comprising:
a first RF generator including a first power source generating a first RF signal applied to a load; and

a second RF generator including:

a second power source generating a second RF signal applied to the load;

15 and

a power controller coupled to the second power source, the power controller configured to respond to a trigger signal and to generate a RF control signal to vary at least one of the second RF signal or an actuator, wherein the RF control signal adjusts an electrical parameter of the second RF signal and wherein the actuator control
20 signal adjusts an actuator of a match network associated with the second RF signal, to increase power delivered to the load during a first predetermined segment,

wherein the trigger signal indicates the first predetermined segment of the first RF signal and the first predetermined segment is less than a full cycle of the first RF signal, and

25 wherein the electrical parameter includes at least one of a power of the second RF signal or a frequency of the second RF signal.

19. The RF generator of claim 18, wherein the second RF signal is a source signal applied to the load and the first RF signal is a bias signal applied to the load and wherein the load is a plasma chamber.

20. The RF generator of claim 18, wherein the trigger signal varies in accordance with the first RF signal and wherein the power controller is configured to vary the RF control signal to control the electrical parameter at a position of the second RF signal relative to the first RF signal.

5 21. The RF generator of claim 18, wherein an adjustment to the electrical parameter includes a sequence of adjustments that the power controller applies to the second RF signal in accordance with the first predetermined segment.

22. The RF generator of claim 21, wherein the power controller introduces the sequence of adjustments to the second RF signal with a fixed or variable interval
10 between each one of the sequence of adjustments.

23. The RF generator of claim 18, wherein the power controller updates adjustments in accordance with a property of the second RF signal.

24. The RF generator of claim 18, wherein the power controller generates the trigger signal in accordance with an impedance of the load.

15 25. The RF generator of claim 18, wherein the second RF generator further comprises a sensor for measuring an impedance at the load, the sensor generating a signal from which impedance fluctuations in the load are determined.

26. The RF generator of claim 18, wherein the first predetermined segment includes a negative voltage segment of the first RF signal.

20 27. The RF generator of claim 26 wherein the RF control signal at least one of increases the power of the second RF signal during the first predetermined segment of the second RF signal or turns off the second power source during other than the first predetermined segment of the second RF signal applied to the load.

28. The RF generator of claim 18, wherein the RF control signal introduces a frequency offset to the second RF signal in accordance with the first predetermined segment.

29. A method for generating a radio frequency (RF) signal comprising:
5 coupling a power controller to a RF power source;
controlling a first RF generator to output a first RF output signal; and
generating a control signal, the control signal varying an electrical characteristic of the first RF output signal in accordance with a first predetermined segment of a second RF output signal, the first predetermined segment of the second RF output
10 signal being less than a full cycle of the second RF output signal, and
wherein the electrical characteristic includes at least one of a power of the first RF output signal or a frequency of the first RF output signal.

30. The method of claim 29 wherein varying the power of the first RF output signal further comprises varying the power of the first RF output signal in accordance
15 with a negative segment of the second RF output signal.

31. The method of claim 30 wherein varying the frequency of the first RF output signal further comprises varying a frequency offset in accordance with the first predetermined segment of a second RF output signal.

32. The method of claim 30 further comprising introducing the frequency
20 offset into the first RF output signal in accordance with the first predetermined segment of a second RF output signal or an impedance fluctuation in a load receiving the first RF output signal.

33. The method of claim 32, further comprising determining where in the first RF output signal to vary the electrical characteristic of the first RF output signal.

34. The method of claim 29, further comprising coupling the first RF output
25 signal to a source electrode of a plasma chamber and coupling the second RF output signal to bias electrode of a plasma chamber.

35. The method of claim 29 further comprising updating an electrical parameter adjustment in accordance with one of the output of the second RF output signal or an impedance fluctuation in a load coupled to the first RF generator.

5 36. The method of claim 29 further comprising updating an electrical parameter adjustment in accordance with phase-locking to impedance fluctuations in a load.