

CLAIMS

1. A radio frequency (RF) system comprising:

a first RF generator including a first power source, the first RF generator generates a control signal; and

5 a second RF generator including a second power source, the second RF generator receives the control signal from the first RF generator, the control signal including phase and frequency information, the second RF generator including a signal processing unit, the signal processing unit generating at least one of a phase or a power command applied to the second power source that varies in accordance with the control signal.

10 2. The RF system of claim 1 wherein the signal processing unit further includes a phase determination processor, the phase determination processor receives a phase signal from a harmonic/IMD processor and generates the control signal to the second power source, the control signal varies the phase or frequency of a signal output by the second power source, wherein the harmonic/IMD processor analyzes spectral emissions
15 from a load powered by one of the first RF generator or the second RF generator.

3. A radio frequency (RF) power delivery system comprising:

a first power supply that generates a first RF output signal;

a second power supply that generates a second RF output signal;

a sensor that detects spectral emissions from a load, the spectral emissions

5 including at least one of a harmonic of the first or second power supply and
intermodulation distortion (IMD) between the first RF signal and the second RF signal;
and

a controller that varies the second RF output signal in accordance with at least one
of a control signal from the first power supply, or at least one of the harmonic or the IMD.

10 4. The power delivery system of claim 3 wherein one of the first power supply
or second power supply is a master power supply, and the other of the first power supply
or the second power supply is a slave power supply.

5. The power delivery system of claim 3 wherein the load is an inductively
coupled plasma (ICP) system .

15 6. The power delivery system of claim 3 wherein the first power supply and the
second power supply operate at substantially the same frequency.

7. The power delivery system of claim 6 wherein the controller varies the
second RF output signal in accordance with the harmonic.

8. The power delivery system of claim 3 wherein the first power supply and the second power supply operate at different frequencies.

9. The power delivery system of claim 8 wherein the controller varies the second RF output signal in accordance with the harmonic and the IMD.

5 10. The power delivery system of claim 8 wherein one of the first power supply or the second power supply operate at a harmonic frequency of the other of the first power supply or the second power supply.

11. The power delivery system of claim 10 wherein the controller varies the second RF output signal in accordance with the harmonic and the IMD.

10 12. The RF system of claim 11 further comprising a signal processing unit including a harmonic/IMD processor, the harmonic/IMD processor analyzes spectral emissions from the load, wherein the signal processing unit generating at least one of a phase or a power command applied to the second power supply.

13. The RF system of claim 12 wherein one of the first power supply or second
15 power supply is a master power supply, and the other of the first power supply or the second power supply is a slave power supply.

14. A method for controlling a radio frequency (RF) generator comprising:
detecting spectral emissions from a load, the spectral emissions including at least
one a harmonic and intermodulation distortion (IMD); and

5 varying an output signal of a RF power source in accordance with one of the
harmonic or the IMD detected in the spectral emissions; and

one of:

operating a first power supply and a second power supply at substantially
the same frequency, or

10 operating the first power supply and the second power supply at different
frequencies.

15 15. The method of claim 14 further comprising varying operation of one of the
first power supply or the second power supply in accordance with the harmonic when the
first power supply and the second power supply operate at substantially the same
frequency.

16. The method of claim 14 further comprising varying operation of one of the
first power supply or the second power supply in accordance with the harmonic and the
IMD when the first power supply and the second power supply operate at different
frequencies.

17. The method of claim 14 further comprising operating one of the first power supply or the second power supply at a harmonic frequency of the other of the first power supply or the second power supply when the first power supply and the second power supply operate at different frequencies.

5 18. The method of claim 17 further comprising varying operation of one of the first power supply or the second power supply in accordance with the harmonic and the IMD.