coupled to the pulsing source for receiving the pulsed signal to identify whether the pulsed signal is in the first state or the second state. The secondary generator further includes a first power controller coupled to the secondary processor to provide a first secondary power value to the secondary power supply when the pulsed signal is in the first state. The secondary generator also includes a second power controller coupled to the secondary processor to provide a second secondary power value to the secondary power supply when the pulsed signal is in the second state. The secondary generator includes a first AFC coupled to the secondary processor to receive the state identification from the secondary processor. The first AFC is configured to provide a frequency of the secondary RF signal when the pulsed signal is in the first state. The secondary generator includes a second AFC coupled to the secondary processor to receive the state identification from the secondary processor. The second AFC is configured to provide a frequency of the secondary RF signal when the pulsed signal is in the second state.

[0013] In one embodiment, a system includes a digital pulsing source for generating a pulsed signal. The system includes a primary generator. The primary generator also includes a primary power supply coupled to an electrode for supplying a primary radio frequency (RF) signal to the electrode. The primary generator includes a primary processor coupled to the digital pulsing source for receiving the pulsed signal. The primary processor is used for identifying a first one of two states of the pulsed signal and a second one of the two states. The primary generator includes a first primary power controller coupled to the primary processor to provide a first primary power value to the primary power supply when the pulsed signal is in the first state. The primary generator also includes a second primary power controller coupled to the primary processor to provide a second primary power value to the primary power supply when the pulsed signal is in the second state. The primary generator includes a first primary automatic frequency control (AFC) coupled to the primary

processor to receive the state identification from the primary processor. The first primary AFC is configured to provide a first primary frequency input to the primary RF signal when the pulsed signal is in the first state. The primary generator includes a second primary AFC coupled to the primary processor to receive the state identification from the primary processor. The second primary AFC is configured to provide a second primary frequency input to the primary RF signal when the pulsed signal is in the second state.

[0014] In this embodiment, the system includes a secondary generator. The secondary generator includes a secondary power supply coupled to the electrode for supplying a secondary RF signal to the electrode. The secondary generator further includes a secondary processor coupled to the digital pulsing source for receiving the pulsed signal to identify whether the pulsed signal is in the first state or the second state. The secondary generator includes a first secondary power controller coupled to the secondary processor to provide a first secondary power value to the secondary power supply when the pulsed signal is in the first state. The secondary generator includes a second secondary power controller coupled to the secondary processor to provide a second secondary power value to the secondary power supply when the pulsed signal is in the second state. The secondary generator includes a first secondary AFC coupled to the secondary processor to receive the state identification from the secondary processor. The first secondary AFC is configured to provide a first secondary frequency input to the secondary RF signal when the pulsed signal is in the first state. The secondary generator includes a second secondary AFC coupled to the secondary processor to receive the state identification from the secondary processor. The second secondary AFC is configured to provide a second secondary frequency input to the secondary RF signal when the pulsed signal is in the second state.

[0015] In one embodiment, a system includes a plasma chamber that includes a lower electrode with a surface for supporting a substrate. The plasma chamber includes an

upper electrode disposed over the lower electrode. The upper electrode is electrically grounded. The system includes a digital pulsing source for generating a pulsed signal. The pulsed signal transitions between two states. The system includes a primary generator. The primary generator includes a primary power supply coupled to the lower electrode for supplying a primary radio frequency (RF) signal to the lower electrode. The primary generator further includes a primary processor coupled to the digital pulsing source for receiving the pulsed signal. The primary processor is used for identifying a first one of the two states and a second one of the two states of the pulsed signal. The primary generator includes a first primary power controller coupled to the primary processor to provide a first primary power value to the primary power supply when the pulsed signal is in the first state. The primary generator further includes a second primary power controller coupled to the primary processor to provide a second primary power value to the primary power supply when the pulsed signal is in the second state. The primary generator also includes a first primary automatic frequency control (AFC) coupled to the primary processor to receive the state identification from the primary processor. The first primary AFC is configured to provide a frequency of the primary RF signal when the pulsed signal is in the first state. The primary generator includes a second primary AFC coupled to the primary processor to receive the state identification from the primary processor. The second primary AFC is configured to provide a frequency of the primary RF signal when the pulsed signal is in the second state.

[0016] In this embodiment, the system includes a secondary generator that further includes a secondary power supply coupled to the lower electrode for supplying a secondary RF signal to the lower electrode. The secondary generator includes a secondary processor coupled to the digital pulsing source for receiving the pulsed signal to identify whether the pulsed signal is in the first state or the second state. The secondary generator further includes a first secondary power controller coupled to the secondary processor to provide a first secondary

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] The embodiments may best be understood by reference to the following description taken in conjunction with the accompanying drawings.

[0021] Figure 1 is a block diagram of a system for reducing an amount of time to tune power controllers and/or frequency tuners according to a change in plasma impedance, in accordance with an embodiment described in the present disclosure.

[0022] Figure 2 is an embodiment of a table showing a change in states of radio frequency (RF) power signals with a change in states of the a transistor-transistor logic (TTL) signal and showing an adjustment in frequencies and/or power values of the power signals based on a change in gamma, in accordance with an embodiment described in the present disclosure.

[0023] Figure 3 is a diagram of a system for reducing an amount of time to tune power controllers and/or frequency tuners according to a change in plasma impedance, where the power controllers and/or the frequency tuners ~~do not~~ provide non-zero values, in accordance with an embodiment described in the present disclosure.

[0024] Figure 4A shows graphs with two RF signals in which one of the RF signals has a constant value or varying values, in accordance with an embodiment described in the present disclosure.

[0025] Figure 4B shows graphs with two RF signals in which both the RF signals have varying values, in accordance with an embodiment described in the present disclosure.

[0026] Figure 5A shows graphs with three RF signals in which one of the RF signals has a constant value and another one of the RF signals has a constant value or varying values, in accordance with an embodiment described in the present disclosure.

supplying power at the high power value. To reduce the impedance mismatch, the 60 MHz power supply starts tuning, e.g., converging, to a frequency value and to a power value. The convergence may be determined by the DSP 150 based on a standard deviation or another technique ~~technic~~. To allow the 60 MHz power supply more time to converge to the frequency value and the power value, the 2 MHz power supply is kept at the high power value for an extended period of time than a usual period of time. The usual period of time is an amount of time in which the impedance mismatch is not reduced, e.g., removed. An example of the usual period of time is equal to half cycle of the TTL signal 112. When the 60 MHz power supply converges to the frequency value and the power value, the converged frequency value is stored as the frequency value F21 within the AFT 118 and the ~~converted~~ converged power value is stored as the power value P21 within the power controller 152. Similarly, during the training routine, the frequency values F20 and F11 and the power values P11 and P20 are generated. The frequency value F20 is stored in the AFT 120, the frequency value F11 is stored in the AFT 114, the power value P11 is stored in the power controller 142, and the power value P20 is stored in the power controller 154.

[0047] When the state of the TTL signal 112 is S1, the power controller 142 provides the power value of P11 to the 2 MHz power supply and the power controller 152 provides the power value of P21 to the 60 MHz controller. During the state S1, the AFT 114 provides the frequency value of F11 to the 2 MHz power supply and the AFT 118 provides the frequency value of F21 to the 60 MHz power supply.

[0048] Moreover, in one embodiment, when the state of the TTL signal 112 is S1, the power controller 154 restricts itself from providing the power value of P20 to the 60 MHz power supply. Also, in this embodiment, the AFT 120 restricts itself from providing the frequency value of F20 to the 60 MHz power supply.

receive the TTL signal 112. The 27 MHz generator includes two power controllers, two AFTs, a DSP, an ADC, a sensor, and the 27 MHz power supply.

[0067] Figure 2 is an embodiment of a table 250 showing a change in states of RF power signals with a change in states of the TTL signal 112 and showing an adjustment in frequencies and/or power values of the power signals based on a change in gamma. When the TTL signal 112 is in the state S1, the power signals supplied by the 2 and 60 MHz power supplies also have the state S1. For example, the power signal supplied by the 2 MHz power supply changes it state from S1 to S0 or from S0 to S1 simultaneous with a change in state of the TTL signal 112. Also, in this example, the power signal supplied by the 60 MHz power supply changes its state from S1 to S0 or from S0 to S1 simultaneous with a change in state of the TTL signal 112. As another example, the power signal supplied by the 2 MHz power supply changes it state from S1 to S0 or from S0 to S1 at almost the same time as that during with a change in state of the TTL signal 112 occurs. Also, in this example, the power signal supplied by the 60 MHz power supply changes its state from S1 to S0 or from S0 to S1 at almost the same time as a change in state of the TTL signal 112 occurs.

[0068] Moreover, as shown in Figure 2, during the state S1, the frequency values F11 and F21 and the power value P21 are adjusted based on a gamma value that is generated during the state S1 and during the state S0, the frequency value F20 and the power value P20 are adjusted based on a gamma value that is generated during the state S0.

[0069] Figure 3 is a diagram of an embodiment of a system 262 for reducing an amount of time to tune power controllers and/or frequency tuners according to a change in plasma impedance, where the power controllers and/or the frequency tuners ~~do not~~ provide non-zero values. The system 262 is similar to the system 180 of Figure 1 except that the system 262 includes a power controller 172 and an AFT 264, each of which provide non-zero values.

that during which the power value of P20 and the frequency value of F20 are provided to the 60 MHz power supply.

[0074] In one embodiment, during the state S0, the power value of P10 and the frequency value of F10 are provided to the 2 MHz power supply at almost the same time as that of the provision of the power value of P20 and the frequency value of F20 to the 60 MHz power supply. For example, in the state S0, the power value of P10 and the frequency value of F10 are provided to the 2 MHz power supply within a fraction of a second before or after an occurrence of a clock edge of the TTL signal 112. In this example, the power value of P20 and the frequency value of F20 are provided to the 60 MHz power supply during the occurrence of the clock edge.

[0075] The 2 MHz power supply receives the frequency value of F10 and the power value of P10 during the state S0. Upon receiving the values F10 and P10, the 2 MHz power supply generates RF power at the frequency F10 and the RF power has the power value of P10. The amplifier of the 2 MHz power supply supplies forward power having a power value that is proportional to the power value P10 and having the frequency value F10 via the transmission line 230 and the impedance matching circuit 182 to the plasma chamber 102.

[0076] In an embodiment, during the state S0, the AFT 264 determines a frequency value based on the value of gamma received from the DSP 140. During the state S0, the AFT 264 adjusts the frequency value of F10 based on the frequency value that is generated from the gamma value and provides the adjusted frequency value to the 2 MHz power supply. Moreover, during the state S0, the power controller 172 determines a power value based on the value of gamma received from the DSP ~~150~~140. During the state S0, the power controller 172 adjusts the power value of P10 based on the power value that is generated based on the gamma value and provides the adjusted power value to the 2 MHz

[0088] It should be noted that in the graphs 302, 304, 306, 308, 310, 312, 314, 316, 318, 320, 322, 324, 326, 328, 330, 332, 334, 336, 338, 340, 342, 344, 346, 348, 350, 352, 354, 356, and 358 shown above, the 2 MHz signal is shown as a solid line, the 60 MHz signal is shown as a dashed line, and the 27 MHz signal is shown as a dotted line.

[0089] It is noted that in one embodiment, instead of synchronizing the states, e.g., high, low, etc., of the 2 MHz signal, the 27 MHz signal, and the 60 MHz signal with the states of the TTL signal 112, in one embodiment, the state of an RF signal, e.g., the 27 MHz signal, the 60 MHz signal, etc., is synchronized with a state of another RF signal, e.g., the 2 MHz signal, etc.

[0090] Figure 6 is a block diagram of an embodiment of a system ~~310~~ 311 for selecting between AFTs 114 and 264 based on a state of the TTL signal 112. When the TTL signal 112 is in the state S1, a select logic 128 of the system ~~310~~ 311 selects the AFT 114 and when the TTL signal 112 is in the state S0, the select logic 128 selects the AFT 264. Examples of the select logic 128 include a multiplexer. When the select logic 128 includes the multiplexer, the TTL signal 112 is received at select inputs of the multiplexer. For example, the low state of the TTL signal is received at a first select input of the multiplexer and a high state of the TTL signal is received at a second select input of the multiplexer. In one embodiment, the select logic 128 includes a processor. In an embodiment, the select logic 128 is implemented within the DSP 140.

[0091] When the AFT 114 is selected, the AFT 114 provides the frequency value F11 to the 2 MHz power supply. Similarly, when the AFT 264 is selected, the AFT 264 provides the frequency value F10 to the 2 MHz power supply.

[0092] The 2 MHz power supply generates the 2 MHz signal synchronous with a clock signal that is received from a clock source ~~312~~ 313. In one embodiment, the clock

signal of the clock source ~~312~~ 313 is synchronous with the TTL signal 112. In an embodiment, the clock signal of the clock source ~~312~~ 313 has about the same phase as that of the TTL signal 112. For example, a leading edge of the clock signal of the clock source ~~312~~ 313 is a fraction of second behind or before a leading edge of the TTL signal 112. In one embodiment, instead of the clock signal from the clock source ~~312~~ 313, the TTL signal 112 is provided to the 2 MHz power supply.

[0093] In the embodiment illustrated using Figure 1, instead of the selection between the AFTs 114 and 264, during the state S1, the AFT 114 is selected and during the state S0, an AFT is not selected. For example, during the state S0, the select logic 128 does not select any AFT.

[0094] In one embodiment, the select logic 128 selects between the power controllers 142 and 172 (Figure 3) instead of the AFTs 114 and 264. When the power controller 142 is selected during the state S1, the power controller 142 provides the power value P11 to the 2 MHz power supply and when the power controller 172 is selected ruing the state S0, the power controller 172 provides the power value P10 to the 2 MHz power supply.

[0095] Moreover, in the embodiment illustrated using Figure 1, instead of the selection between the power controllers 142 and 172, during the state S1, the power controller 142 is selected and during the state S0, a power controller is not selected.

[0096] In an embodiment, the select logic 128 is implemented within the 60 MHz generator 276 (Figure 1). This embodiment is similar to the embodiment described using Figure 6 except that instead of selecting between the AFTs 114 and 264, the select logic 128 selects between the AFTs 118 and 120 (Figure 1). When the AFT 118 is selected during the state S1, the AFT 118 provides the frequency value F21 to the 60 MHz power supply and

1) receives the TTL signal 112 from the tool UI 190 and the DSP 150 (Figure ~~2~~ 1) receives the TTL signal ~~150~~ 112 from the tool UI 190.

[00103] In an operation 327, a DSP, e.g., the DSP 140, DSP 150, etc., determines whether a state of the TTL signal 112 is S1 or S0. For example, the DSP 140 determines whether a state of the TTL signal 112 is high or low. As another example, the DSP 150 determines whether a state of the TTL signal 112 is 1 or 0.

[00104] In response to determining that the state of the TTL signal 112 is S1, in an operation 329, the TTL signal 112, is sent by a DSP, e.g., the DSP 140, DSP 150, etc., to a corresponding AFT or power controller, e.g., AFT 114, AFT 118, power controller 142, power controller 152, etc. to achieve the state S1. For example, the identification of the state S1 is sent from the DSP 140 to the AFT 114 and to the power controller 142 to achieve the power value P11 and the frequency value F11 to further achieve the state S1. In this example, the AFT 114 provides the frequency value F11 based on a first look-up table that includes the state S1 corresponding to the frequency value F11. Moreover, in this example, the power controller 142 provides the power value P11 based on a second look-up table that includes the state S1 corresponding to the power value P11. In this example, the first look-up table is stored within the AFT 114 and the second look-up table is stored within the power controller 142.

[00105] As another example, the state S1 is sent from the DSP 150 to the AFT 118 and to the power controller 152 to achieve the power value P21 and the frequency value F21 to achieve the state S1. In this example, the AFT 118 provides the frequency value F21 based on a third look-up table that includes the state S1 corresponding to the frequency value F21. Moreover, in this example, the power controller 152 provides the power value P21 based on a fourth look-up table that includes the state S1 corresponding to the power value

[00113] Moreover, in the operation 343, the gamma is provided by the DSP 150 to the AFT 120 to adjust the frequency value F20 and is provided by the DSP 150 to the power controller 154 to adjust the power value P20. As an example, the AFT 120 retrieves a frequency value, other than the frequency value F20, from a look-up table corresponding to the gamma that is measured based on signals on the transmission line 232 for the state S0 and provides the other frequency value to the 60 MHz power supply. The 60 MHz power supply generates an RF signal having the other frequency value. Moreover, in the operation 343, the gamma is provided by the DSP 150 to the power controller 154 to adjust the power value P20. As an example, the power controller 154 retrieves a power value, other than the power value ~~P21~~ P20, from a look-up table corresponding to the gamma that is measured based on signals on the transmission line 232 for the state S0 and provides the other power value to the 60 MHz power supply. The 60 MHz power supply generates an RF signal having the other power value. The method ~~320~~ 321 repeats the operation 325 after the operation 343.

[00114] In one embodiment, the operations 331, 333, 335, 339, 341, and 343 are optional. For example, the operation 325 is repeated after the operations 329 and 337 and the operations 331, 333, 335, 339, 341, and 343 are not performed.

[00115] It should be noted that although the above-described embodiments relate to providing the 2 MHz RF signal and/or 60 MHz signal and/or 27 MHz signal to the lower electrode 104 and grounding the upper electrode 110, in several embodiments, the 2 MHz, 60 MHz, and 27 MHz signals are provided to the upper electrode 110 while the lower electrode 104 is grounded.

[00116] It is further noted that in an embodiment, a change in impedance of the plasma is not used to generate the states S1 and S0 of the TTL signal 112. The states S1 and S0 are independent of the change in the impedance of plasma.

CLAIMS

1. A system comprising:

a primary generator coupled to an electrode, the primary generator including a primary power supply for supplying a primary radio frequency (RF) signal to the electrode, the primary generator further including an automatic frequency control (AFC) to provide a first frequency input to the primary power supply when a pulsed signal is in a first state;

a secondary generator coupled to the electrode, the secondary generator including a secondary power supply for supplying a secondary RF signal to the electrode, the secondary generator including an AFC to provide a second frequency input to the secondary power supply when the pulsed signal is in the first state, the secondary generator including an AFC to provide a third frequency input to the secondary power supply when the pulsed signal is in a second state; and

a digital pulsing source for generating the pulsed signal.

2. The system of claim 1, wherein the secondary generator includes a selector to transfer the second frequency input that is received from a digital signal processor to the secondary power supply or the third frequency input that is received from the digital signal processor to the secondary power supply.

3. A system comprising:

a plasma chamber including a lower electrode with a surface for supporting a substrate and an upper electrode disposed over the lower electrode, the upper electrode being electrically grounded;

a primary generator coupled to the lower electrode, the primary generator including a primary power supply for supplying a primary radio frequency (RF) signal to the lower electrode;

a secondary generator coupled to the lower electrode, the secondary generator including a secondary power supply for supplying a secondary RF signal to the lower electrode;

a digital pulsing source for generating a pulsed signal, the digital pulsing source coupled to the primary generator and the secondary generator, wherein the pulsed signal transitions between two states,

the primary generator including a first automatic frequency control (AFC) to provide a first frequency input to the primary power supply when the pulsed signal is in the first state;

the secondary generator including a second AFC to provide a second frequency input to the secondary power supply when the pulsed signal is in the first state;

the secondary generator including a third AFC to provide a third frequency input to the secondary power supply when the pulsed signal is in the second state.

4. The system of claim 3, further comprising a selector coupled between the digital pulsing source and the second and third AFCs to select between the second AFC and the third AFC for providing the second frequency input or the third frequency input to the secondary power supply, the selector configured to select between the second AFC and the third AFC based on the states of the pulsed signal.

5. The system of claim 3, wherein one of the two states is an on state and another one of the two states is an off state.

6. The system of claim 3, wherein the primary RF signal has a lower frequency than the secondary RF signal.

7. The system of claim 3,

wherein the primary RF signal is at a first power level when the pulsed signal is in the first state and is at a second power level when the pulsed signal is in the second state, wherein the first power level is greater than the second power level,

wherein the secondary RF signal is at a third power level when the pulsed signal is in the first state and at a fourth power level when the pulsed signal is in the second state, the third power level is lower than the fourth power level.

8. The system of claim 7, wherein the third power level is zero or positive.

9. The system of claim 3,

wherein the primary RF signal is at a first power level when the pulsed signal is in the first state and is at a second power level when the pulsed signal is in the second state, wherein the first power level is greater than the second power level,

wherein the secondary RF signal is at a third power level when the pulsed signal is in the first state and at a fourth power level when the pulsed signal is in the second state, the third power level the same as the fourth power level.

10. The system of claim 9, wherein the third power level is positive.

11. The system of claim 3,

wherein the primary RF signal is at a first power level when the pulsed signal is in the first state and is at a second power level when the pulsed signal is in the second state, wherein the first power level is greater than the second power level,

wherein the secondary RF signal is at a third power level when the pulsed signal is in the first state and at a fourth power level when the pulsed signal is in the second state, the third power level is greater than the fourth power level.

12. The system of claim 11, wherein the third power level is zero or positive.

13. The system of claim 3, wherein the digital pulse source includes a clock oscillator or a transistor-transistor logic (TTL).

14. The system of claim 3, wherein the first frequency input is different from the second frequency input and the third frequency input.

15. The system of claim 3, wherein the select includes a multiplexer.

16. A system comprising:

a digital pulsing source for generating a pulsed signal;

a primary generator including:

a primary power supply coupled to an electrode for supplying a primary radio frequency (RF) signal to the electrode;

a primary processor coupled to the pulsing source for receiving the pulsed signal, the primary processor for identifying a first one of two states of the pulsed signal and a second one of the two states;

a power controller coupled to the primary processor to determine whether to provide a primary power value to the primary power supply based on whether the pulsed signal is in the first state or the second state; and

an automatic frequency control (AFC) coupled to the primary processor to receive the state identification from the primary processor, the AFC configured to provide a frequency of the primary RF signal when the pulsed signal is in the first state;

a secondary generator including:

a secondary power supply coupled to the electrode for supplying a secondary RF signal to the electrode;

a secondary processor coupled to the pulsing source for receiving the pulsed signal to identify whether the pulsed signal is in the first state or the second state;

a first power controller coupled to the secondary processor to provide a first secondary power value to the secondary power supply when the pulsed signal is in the first state;

a second power controller coupled to the secondary processor to provide a second secondary power value to the secondary power supply when the pulsed signal is in the second state;

a first AFC coupled to the secondary processor to receive the state identification from the secondary processor, the first AFC configured to provide a first frequency input of the secondary RF signal when the pulsed signal is in the first state; and

a second AFC coupled to the secondary processor to receive the state identification from the secondary processor, the second AFC configured to provide a

second frequency input of the secondary RF signal when the pulsed signal is in the second state.

17. The system of claim 16, wherein the secondary generator includes a selector to transfer the first frequency input that is received from the secondary processor to the secondary power supply or the second frequency input that is received from the secondary processor to the secondary power supply.

18. A system comprising:

a plasma chamber including a lower electrode with a surface for supporting a substrate and an upper electrode disposed over the lower electrode, the upper electrode being electrically grounded;

a digital pulsing source for generating a pulsed signal, wherein the pulsed signal transitions between two states;

a primary generator including:

a primary power supply coupled to the lower electrode for supplying a primary radio frequency (RF) signal to the lower electrode;

a primary processor coupled to the pulsing source for receiving the pulsed signal, the primary processor for identifying a first one of the two states and a second one of the two states of the pulsed signal;

a power controller coupled to the primary processor to determine whether to provide a primary power value to the primary power supply based on whether the pulsed signal is in the first state or the second state; and

an automatic frequency control (AFC) coupled to the primary processor to receive the state identification from the primary processor, the AFC configured to

provide a frequency of the primary RF signal when the pulsed signal is in the first state; and

a secondary generator including:

a secondary power supply coupled to the lower electrode for supplying a secondary RF signal to the lower electrode;

a secondary processor coupled to the pulsing source for receiving the pulsed signal to identify whether the pulsed signal is in the first state or the second state;

a first power controller coupled to the secondary processor to provide a first secondary power value to the secondary power supply when the pulsed signal is in the first state;

a second power controller coupled to the secondary processor to provide a second secondary power value to the secondary power supply when the pulsed signal is in the second state;

a first AFC coupled to the secondary processor to receive the state identification from the secondary processor, the first AFC configured to provide a frequency of the secondary RF signal when the pulsed signal is in the first state; and

a second AFC coupled to the secondary processor to receive the state identification from the secondary processor, the second AFC configured to provide a frequency of the secondary RF signal when the pulsed signal is in the second state.

19. The system of claim 18, wherein one of the two states is an on state and another one of the two states is an off state.

20. The system of claim 18,

wherein the primary RF signal is at a first power level when the pulsed signal is in the first state and is at a second power level when the pulsed signal is in the second state, wherein the first power level is greater than the second power level,

wherein the first secondary power value is lower than the second secondary power value.

21. The system of claim 18,

wherein the primary RF signal is at a first power level when the pulsed signal is in the first state and is at a second power level when the pulsed signal is in the second state, wherein the first power level is greater than the second power level,

wherein the first secondary power value is same as the second secondary power value.

22. The system of claim 18,

wherein the primary RF signal is at a first power level when the pulsed signal is in the first state and is at a second power level when the pulsed signal is in the second state, wherein the first power level is greater than the second power level,

wherein the first secondary power value is greater than the second secondary power value.

23. The system of claim 18, wherein the primary power value is a positive power value when the pulsed signal is in the first state.

24. The system of claim 18, wherein the first secondary power value is lower than, same as, or greater than the second secondary power value.

~~25.~~1. A system comprising:

a digital pulsing source for generating a pulsed signal;

a primary generator including:

a primary power supply coupled to an electrode for supplying a primary radio frequency (RF) signal to the electrode;

a primary processor coupled to the digital pulsing source for receiving the pulsed signal, the primary processor for identifying a first one of two states of the pulsed signal and a second one of the two states;

a first primary power controller coupled to the primary processor to provide a first primary power value to the primary power supply when the pulsed signal is in the first state;

a second primary power controller coupled to the primary processor to provide a second primary power value to the primary power supply when the pulsed signal is in the second state;

a first primary automatic frequency control (AFC) coupled to the primary processor to receive the state identification from the primary processor, the first primary AFC configured to provide a first primary frequency input to the primary RF signal when the pulsed signal is in the first state; and

a second primary AFC coupled to the primary processor to receive the state identification from the primary processor, the second primary AFC configured to provide a second primary frequency input to the primary RF signal when the pulsed signal is in the second state;

a secondary generator including:

a secondary power supply coupled to the electrode for supplying a secondary RF signal to the electrode;

a secondary processor coupled to the digital pulsing source for receiving the pulsed signal to identify whether the pulsed signal is in the first state or the second state;

a first secondary power controller coupled to the secondary processor to provide a first secondary power value to the secondary power supply when the pulsed signal is in the first state;

a second secondary power controller coupled to the secondary processor to provide a second secondary power value to the secondary power supply when the pulsed signal is in the second state;

a first secondary AFC coupled to the secondary processor to receive the state identification from the secondary processor, the first secondary AFC configured to provide a first secondary frequency input to the secondary RF signal when the pulsed signal is in the first state; and

a second secondary AFC coupled to the secondary processor to receive the state identification from the secondary processor, the second secondary AFC configured to provide a second secondary frequency input to the secondary RF signal when the pulsed signal is in the second state.

~~26.~~2. The system of claim ~~25~~1, wherein the primary generator includes a selector, the selector configured to transfer the first primary frequency input that is received from the primary processor to the primary power supply or the second primary frequency input that is received from the ~~secondary~~ primary processor to the primary power supply,

wherein the secondary generator includes a selector, the selector configured to transfer the first secondary frequency input that is received from the secondary processor to the secondary power supply or the second secondary frequency input that is received from the secondary processor to the secondary power supply.

~~27.~~3. A system comprising:

a plasma chamber including a lower electrode with a surface for supporting a substrate and an upper electrode disposed over the lower electrode, the upper electrode being electrically grounded;

a digital pulsing source for generating a pulsed signal, wherein the pulsed signal transitions between two states;

a primary generator including:

a primary power supply coupled to the lower electrode for supplying a primary radio frequency (RF) signal to the lower electrode;

a primary processor coupled to the digital pulsing source for receiving the pulsed signal, the primary processor for identifying a first one of the two states and a second one of the two states of the pulsed signal;

a first primary power controller coupled to the primary processor to provide a first primary power value to the primary power supply when the pulsed signal is in the first state;

a second primary power controller coupled to the primary processor to provide a second primary power value to the primary power supply when the pulsed signal is in the second state;

a first primary automatic frequency control (AFC) coupled to the primary processor to receive the state identification from the primary processor, the first primary AFC configured to provide a frequency of the primary RF signal when the pulsed signal is in the first state; and

a second primary AFC coupled to the primary processor to receive the state identification from the primary processor, the second primary AFC configured to

provide a frequency of the primary RF signal when the pulsed signal is in the second state; and

a secondary generator including:

a secondary power supply coupled to the lower electrode for supplying a secondary RF signal to the lower electrode;

a secondary processor coupled to the digital pulsing source for receiving the pulsed signal to identify whether the pulsed signal is in the first state or the second state;

a first secondary power controller coupled to the secondary processor to provide a first secondary power value to the secondary power supply when the pulsed signal is in the first state;

a second secondary power controller coupled to the secondary processor to provide a second secondary power value to the secondary power supply when the pulsed signal is in the second state;

a first secondary AFC coupled to the secondary processor to receive the state identification from the secondary processor, the first secondary AFC configured to provide a frequency of the secondary RF signal when the pulsed signal is in the first state; and

a second secondary AFC coupled to the secondary processor to receive the state identification from the secondary processor, the second secondary AFC configured to provide a frequency of the secondary RF signal when the pulsed signal is in the second state.

~~28.~~4. The system of claim ~~27~~3, wherein the first primary power value is equal to, greater than, or lower than the second primary power value.

29. A method comprising:

receiving a digital pulsing signal, the digital pulsing signal having two states;

switching from applying a first frequency input to a primary RF power supply when the digital pulsing signal is in a first one of the two states to applying a second frequency input to the primary RF power supply when the digital pulsing signal is in a second one of the two states;

determining a third frequency input to apply to a secondary RF power supply when the digital pulsing signal is in the first state.

30. The method of claim 29, wherein the method is used to process semiconductor wafers to make integrated circuits.