CLAIMS

What is claimed is:

1. A computer-readable non-transitory program storage medium executable by a processor and having computer readable code stored therein, the computer readable code being configured as a test program and when executed executes a process for causing a computer processor to perform testing regarding ~~test system for facilitating determining~~ whether a plasma processing chamber in a plasma processing system is ready for processing at least one wafers, the ~~plasma processing system including a plasma processing chamber, the test system comprising:~~

~~a computer-readable medium storing at least a~~ test program of the non-transitory~~, the test~~ program storage medium including at least:

code for receiving at least a plurality of electric parameter values, the plurality of electric parameter values being derived from signals detected by at least one sensor, the signals being detected by the at least one sensor when no plasma is present in the plasma processing chamber~~,~~;

code for generating a set of electric model parameter values using at least the plurality of electric parameter values and a mathematical model~~,~~;

code for comparing the set of electric model parameter values with a set of baseline model parameter value information~~, and~~;

code for determining readiness of the plasma processing system based on at least a result of the comparing; and

~~a set of circuit hardware for performing one or more tasks associated with the test program~~code for including at least a first capacitance a second capacitance and an inductance in the mathematical model;

code for associating the first capacitance with the plasma processing chamber;

code for associating the second capacitance with a transmission rod the transmission rod being coupled between the plasma processing chamber and a power generator; and

code for associating the inductance with the transmission rod.

wherein the set of electric model parameter values includes a value of the first capacitance a value of the second capacitance and a value of the inductance.

~~2. The test system of claim 1 further comprising:~~

~~code for including at least a first capacitance, a second capacitance, and an inductance in the mathematical model;~~

~~code for associating the first capacitance with the plasma processing chamber; and code for associating the second capacitance with a transmission rod, the transmission rod being coupled between the plasma processing chamber and a power generator;~~

~~code for associating the inductance with the transmission rod;~~

~~wherein the set of electric model parameter values includes a value of the first capacitance, a value of the second capacitance, and a value of the inductance.~~

~~3~~2. The ~~test system~~ computer-readable non-transitory program storage medium of claim ~~2~~ 1 further comprising:

code for determining that the plasma processing chamber is not ready for plasma processing when the value of the first capacitance is outside a predetermined capacitance value range defined in the set of baseline model parameter value information;

code for indicating the plasma processing chamber as being problematic when the value of the first capacitance is outside the predetermined capacitance value range; and

code for indicating the transmission rod as being problematic when at least one of the value of the second capacitance and the value of the inductance is outside at least one predetermined parameter value range defined in the set of baseline model parameter value information.

43. The ~~test system~~ computer-readable non-transitory program storage medium of claim 1, further comprising:

code for including at least a capacitance, a resistance, and an inductance in the mathematical model;

code for associating the capacitance with the plasma processing chamber;

code for associating the resistance with a coupling mechanism, the coupling mechanism being coupled between the plasma processing chamber and a power generator; and

code for associating the inductance with the coupling mechanism,

wherein the set of electric model parameter values includes a value of the capacitance, a value of the resistance, and a value of the inductance.

~~5~~4. The ~~test system~~ computer-readable non-transitory program storage medium of claim ~~4~~ 3, further comprising:

code for determining that the plasma processing chamber is not ready for plasma processing when the value of the capacitance is outside a predetermined capacitance value range defined in the set of baseline model parameter value information;

code for indicating the plasma processing chamber as being problematic when the value of the capacitance is outside the predetermined capacitance value range; and

code for indicating the coupling mechanism as being problematic when at least one of the value of the resistance and the value of the inductance is outside at least one

predetermined parameter value range defined in the set of baseline model parameter value information.

~~6~~5. The ~~test system~~ computer-readable non-transitory program storage medium of claim 1, further comprising:

code for determining whether at least a first current with a first frequency and a second current with a second frequency are available to the plasma processing chamber;

code for creating a multiple-step recipe for operating the plasma processing chamber if at least the first current with the first frequency and the second current with the second frequency are available to the plasma processing chamber, the multiple-step recipe including at least a first operating step and a second operating step, the first operating step being associated with the first frequency, the second operating step being associated with the second frequency;

code for gathering a set of sample data from at least the first operating step and the second operating step;

code for calculating a set of fitted parameter values using the set of sample data and the mathematical model; and

code for including the set of fitted parameter values in the baseline model parameter value information.

~~7~~6. The ~~test system~~ computer-readable non-transitory program storage medium of claim ~~6~~ 5, further comprising:

code for creating a single-step recipe for operating the plasma processing chamber if only one single frequency is available to the plasma processing chamber, the single-step recipe including at most one single operating step associated with the single frequency;

code for gathering a second set of sample data from the single operating step;

code for calculating a second set of fitted parameter values using the second set of sample data and the mathematical model; and

code for including the second set of fitted parameter values in the baseline model parameter value information.

87. A plasma processing system for processing at least a wafer, the plasma processing system comprising:

a plasma processing chamber for containing at least the wafer;

at least one sensor for sensing a plurality of electric characteristics related to operation of the plasma processing system;

a processor;

a computer-readable non-transitory program storage medium ~~storing at least~~ having computer readable code stored therein and executable by the processor, the computer readable code being configured as a test program so that when executed executes a process for causing the processor to perform testing regarding whether the plasma processing chamber in the plasma processing system is ready for processing the at least one wafer, the test program of the non-transitory program storage medium including at least:

code for receiving at least a plurality of electric parameter values, the plurality of electric parameter values being derived from signals detected by the at least one sensor, the signals being detected by the at least one sensor when no plasma is present in the plasma processing chamber~~,~~;

code for generating a set of electric model parameter values using at least the plurality of electric parameter values and a mathematical model~~,~~;

code for comparing the set of electric model parameter values with a set of baseline model parameter value information~~, and~~;

code for determining whether the plasma processing system is ready for processing wafers based on at least a result of the comparing; ~~and~~

~~a set of circuit hardware for performing one or more tasks associated with the test program~~code for including at least a first capacitance, a second capacitance, and an inductance in the mathematical model;

code for associating the first capacitance with the plasma processing chamber;

code for associating the second capacitance with a transmission rod, the transmission rod being coupled between the plasma processing chamber and a power generator;

code for associating the inductance with the transmission rod,

wherein the set of electric model parameter values includes a value of the first capacitance, a value of the second capacitance, and a value of the inductance; and

a set of circuit hardware responsive to the test program for performing one or more tasks associated with the test program for facilitating testing readiness of the plasma processing system for processing a wafer in the plasma processing chamber.

~~9. The plasma processing system of claim 8 further comprising:~~

~~code for including at least a first capacitance, a second capacitance, and an inductance in the mathematical model;~~

~~code for associating the first capacitance with the plasma processing chamber; and~~

~~code for associating the second capacitance with a transmission rod, the transmission rod being coupled between the plasma processing chamber and a power generator.~~

~~code for associating the inductance with the transmission rod,~~

~~wherein the set of electric model parameter values includes a value of the first capacitance, a value of the second capacitance, and a value of the inductance.~~

~~10~~8. The plasma processing system of claim ~~9~~ 7 further wherein the computer-readable non-transitory program storage medium further comprises~~comprising~~:

code for determining that the plasma processing system is not ready for plasma processing when the value of the first capacitance is outside a predetermined capacitance value range defined in the set of baseline model parameter value information;

code for indicating the plasma processing chamber as being problematic when the value of the first capacitance is outside the predetermined capacitance value range; and

code for indicating the transmission rod as being problematic when at least one of the value of the second capacitance and the value of the inductance is outside at least one predetermined parameter value range defined in the set of baseline model parameter value information.

~~11. The plasma processing system of claim 8 further comprising:~~

~~code for including at least a capacitance, a resistance, and an inductance in the mathematical model;~~

~~code for associating the capacitance with the plasma processing chamber;~~

~~code for associating the resistance with a coupling mechanism, the coupling mechanism being coupled between the plasma processing chamber and a power generator; and~~

~~code for associating the inductance with the coupling mechanism,~~

~~wherein the set of electric model parameter values includes a value of the capacitance, a value of the resistance, and a value of the inductance.~~

~~12. The plasma processing system of claim 1 1 further comprising:~~

~~code for determining that the plasma processing system is not ready for plasma processing when the value of the capacitance is outside a predetermined capacitance value range defined in the set of baseline mode] parameter value information;~~

~~code for indicating the plasma processing chamber as being problematic when the value of the capacitance is outside the predetermined capacitance value range; and~~

~~code for indicating the coupling mechanism as being problematic when at least one of the value of the resistance and the value of the inductance is outside at least one~~

~~predetermined parameter value range defined in the set of baseline model parameter value information.~~

~~13~~9. The plasma processing system of claim ~~8~~ 7, further wherein the computer-readable non-transitory program storage medium further comprises~~comprising~~:

code for determining whether at least a first current with a first frequency and a second current with a second frequency are available to the plasma processing chamber; code for creating a multiple-step recipe for operating the plasma processing chamber if at

least the first current with the first frequency and the second current with the second frequency are available to the plasma processing chamber, the multiple-step recipe including at least a first operating step and a second operating step, the first operating step being associated with the first frequency, the second operating step being associated with the second frequency;

code for gathering a set of sample data from at least the first operating step and the second operating step;

code for calculating a set of fitted parameter values using the set of sample data and the mathematical model; and

code for including the set of fitted parameter values in the baseline model parameter value information.

~~14~~10. The plasma processing system of claim ~~8~~ 7, further comprising:

a power generator for providing at least a current to the plasma processing chamber;

a transmission rod disposed between the power generator and the plasma processing chamber for transmitting the current;

a coupling mechanism disposed between the transmission rod and the plasma processing chamber for coupling the transmission rod with the plasma processing chamber;

a voltage-current sensor coupled between the power generator and the transmission rod for measuring a first set of electric characteristics related to the operation of the plasma processing system; and

a voltage sensor coupled between the coupling mechanism and the plasma processing chamber for measuring a second set of electric characteristics related to the operation of the plasma processing system,

wherein the at least one sensor includes the voltage-current sensor and the voltage sensor.

11. The plasma processing system of claim 7, further wherein the computer-readable non-transitory program storage medium further comprises:

code for including at least a capacitance, a resistance, and an inductance in the mathematical model;

code for associating the capacitance with the plasma processing chamber;

code for associating the resistance with a coupling mechanism, the coupling mechanism being coupled between the plasma processing chamber and a power generator; and

code for associating the inductance with the coupling mechanism,

wherein the set of electric model parameter values includes a value of the capacitance, a value of the resistance, and a value of the inductance.

12. The plasma processing system of claim 11, further wherein the computer-readable non-transitory program storage medium further comprises:

code for determining that the plasma processing system is not ready for plasma processing when the value of the capacitance is outside a predetermined capacitance value range defined in the set of baseline model parameter value information;

code for indicating the plasma processing chamber as being problematic when the value of the capacitance is outside the predetermined capacitance value range; and

code for indicating the coupling mechanism as being problematic when at least one of the value of the resistance and the value of the inductance is outside at least one predetermined parameter value range defined in the set of baseline model parameter value information.

~~15~~13. A computer-implemented method for facilitating determining whether a plasma processing system is ready for processing at least one wafer~~s~~ in a plasma processing chamber of the plasma processing system, the method comprising:

receiving at least a plurality of electric parameter values, the plurality of electric parameter values being derived from signals detected by at least one sensor, the signals being detected by the at least one sensor when no plasma is present in the plasma processing chamber;

generating a set of electric model parameter values using at least the plurality of electric parameter values and a mathematical model;

comparing the set of electric model parameter values with a set of baseline model parameter value information; and

determining readiness of the plasma processing system, ~~based on at least a result of~~ by using a processor responsive to the comparing for facilitating testing readiness of the at least one wafer when no plasma is present in the plasma processing chamber;

including at least a first capacitance, a second capacitance, and an inductance in the mathematical model;

associating the first capacitance with the plasma processing chamber;

associating the second capacitance with a transmission rod the transmission rod being coupled between the plasma processing chamber and a power generator; and

associating the inductance with the transmission rod,

wherein the set of electric model parameter values includes a value of the first capacitance, a value of the second capacitance, and a value of the inductance.

~~16. The method of claim 15 further comprising:~~

~~including at least a first capacitance, a second capacitance, and an inductance in the mathematical model;~~

~~associating the first capacitance with the plasma processing chamber; and~~

~~associating the second capacitance with a transmission rod, the transmission rod being coupled between the plasma processing chamber and a power generator,~~

~~associating the inductance with the transmission rod,~~

~~wherein the set of electric model parameter values includes a value of the first capacitance, a value of the second capacitance, and a value of the inductance.~~

~~17~~14. The method of claim ~~16~~ 13, further comprising:

determining that the plasma processing chamber is not ready for plasma processing when the value of the first capacitance is outside a predetermined capacitance value range defined in the set of baseline model parameter value information;

indicating the plasma processing chamber as being problematic when the value of the first capacitance is outside the predetermined capacitance value range; and

indicating the transmission rod as being problematic when at least one of the value of the second capacitance and the value of the inductance is outside at least one predetermined parameter value range defined in the set of baseline model parameter value information.

~~18. The method of claim 15 further comprising:~~

~~including at least a capacitance, a resistance, and an inductance in the mathematical model;~~

~~associating the capacitance with the plasma processing chamber;~~

~~associating the resistance with a coupling mechanism, the coupling mechanism being coupled between the plasma processing chamber and a power generator; and~~

~~associating the inductance with the coupling mechanism,~~

~~wherein the set of electric model parameter values includes a value of the capacitance, a value of the resistance, and a value of the inductance.~~

~~19. The method of claim 18 further comprising.~~

~~determining that the plasma processing chamber is not ready for plasma processing when the value of the capacitance is outside a predetermined capacitance value range defined in the set of baseline model parameter value information;~~

~~indicating the plasma processing chamber as being problematic when the value of the capacitance is outside the predetermined capacitance value range; and~~

~~indicating the coupling mechanism as being problematic when at least one of the value of the resistance and the value of the inductance is outside at least one predetermined parameter value range defined in the set of baseline model parameter value information.~~

~~20~~15. The method of claim ~~15~~ 13, further comprising:

determining whether at least a first current with a first frequency and a second current with a second frequency are available to the plasma processing chamber~~,~~;

creating a multiple-step recipe for operating the plasma processing chamber if at least the first current with the first frequency and the second current with the second frequency are available to the plasma processing chamber, the multiple-step recipe including at least a first operating step and a second operating step, the first operating step being associated with the first frequency, the second operating step being associated with the second frequency;

gathering a set of sample data from at least the first operating step and the second operating step;

calculating a set of fitted parameter values using the set of sample data and the mathematical model; and

including the set of fitted parameter values in the baseline model parameter value information.

16. The method of claim 13, further comprising:

including at least a capacitance, a resistance, and an inductance in the mathematical model;

associating the capacitance with the plasma processing chamber;

associating the resistance with a coupling mechanism, the coupling mechanism being coupled between the plasma processing chamber and a power generator; and

associating the inductance with the coupling mechanism,

wherein the set of electric model parameter values includes a value of the capacitance, a value of the resistance, and a value of the inductance.

17. The method of claim 16, further comprising:

determining that the plasma processing chamber is not ready for plasma processing when the value of the capacitance is outside a predetermined capacitance value range defined in the set of baseline model parameter value information;

indicating the plasma processing chamber as being problematic when the value of the capacitance is outside the predetermined capacitance value range; and

indicating the coupling mechanism as being problematic when at least one of the value of the resistance and the value of the inductance is outside at least one predetermined parameter value range defined in the set of baseline model parameter value information.