CLAIMS

1. A high-frequency emission module, comprising:

a solid state high-frequency power source;

an applicator for propagating high-frequency electromagnetic radiation from the power source; and

a thermal break coupled between the power source and the applicator, wherein the thermal break comprises:

a substrate;

a conductive trace on the substrate;

a ground plane, wherein the substrate is intervening between the trace and the ground plane; and

a thermal block beneath the ground plane, wherein the ground plane is intervening between the substrate and the thermal block, the thermal block comprising a plurality of fins pointing in a direction away from the ground plane,

wherein the thermal break is configured to provide impedance matching between the power source and the applicator by controlling the shape of the trace.

2. The high-frequency emission module of claim 1, wherein the thermal block is directly attached to the ground plane.

3. The high-frequency emission module of claim 1, wherein the trace extends from a first end of the substrate to a second end of the substrate.

4. The high-frequency emission module of claim 3, wherein a portion of the trace over the first end of the substrate is coupled to the power source by a coaxial cable.

5. The high-frequency emission module of 3, wherein the trace comprises one of:

a uniform width from the first end of the substrate to the second end of the substrate to create a rectangular shape;

a first width at the first end of the substrate and a second width at the second end of the substrate to create a trapezoidal shape;

a serpentine pattern; and

a plurality of conductive stubs extending from a main body of the trace.

6. A processing tool, comprising:

a processing chamber; and

a modular high-frequency emission source, comprising:

a plurality of high-frequency emission modules, wherein each high frequency emission module comprises:

an oscillator module;

an amplification module coupled to the oscillator module;

a thermal break coupled to the amplification module, wherein the thermal break comprises a substrate, a conductive trace across the substrate, a ground plane, and a thermal block, wherein the substrate is intervening between the trace and the ground plane, the thermal block beneath the ground plane, wherein the ground plane is intervening between the substrate and the thermal block, the thermal block comprising a plurality of fins pointing in a direction away from the ground plane; and

an applicator, wherein the applicator is coupled to the amplification module by the thermal break, and wherein the applicator is positioned opposing a chuck in the processing chamber on which one or more substrates are processed,

wherein the thermal break is configured to provide impedance matching between the amplification module and the applicator by controlling the shape of the trace.

7. The processing tool of claim 6, wherein the thermal block is directly attached to the ground plane.

8. A thermal break for a high-frequency plasma source, comprising:

a substrate having a first surface and a second surface opposite the first surface, wherein the substrate comprises one or more dielectric layers;

a connector coupled to the substrate, wherein the connector is configured to receive a coaxial cable;

a conductive trace interfacing with the connector, wherein the trace extends from the connector towards an edge of the substrate opposite from the connector;

a ground plane embedded in the substrate, wherein the ground plane is not electrically coupled to the trace, wherein the substrate is intervening between the trace and the ground plane; and

a thermal block thermally coupled to the substrate, the thermal block beneath the ground plane, wherein the ground plane is intervening between the substrate and the thermal block, the thermal block comprising a plurality of fins pointing in a direction away from the ground plane,

wherein the thermal break is configured to be coupled between a power source and an applicator; and

wherein the thermal break is configured to provide impedance matching between the power source and the applicator by controlling the shape of the trace.