

CLAIMS

What is claimed is:

1. A moveable edge ring system for a plasma processing system comprising:
5 a top edge ring;
a first edge ring arranged below the top edge ring; and
a second edge ring made of conductive material and including an upper portion, a middle portion and a lower portion,
wherein the top edge ring and the second edge ring are configured to move in a
10 vertical direction relative to a substrate support and the first edge ring when biased upwardly by a lift pin,
wherein the second edge ring is arranged below the top edge ring and radially outside of the first edge ring.
- 15 2. The moveable edge ring system of claim 1, wherein:
the lower portion of the second edge ring extends radially inwardly relative to the middle portion to define a first gap between the lower portion of the second edge ring and a radially outer surface of a substrate support,
the middle portion of the second edge ring defines a second gap between the
20 middle portion and the radially outer surface of the substrate support, and
the second gap is greater than or equal to two times the first gap.
3. The moveable edge ring system of claim 1, wherein the middle portion of the second edge ring moves parallel to a radially outer edge of the first edge ring as the lift
25 pin raises the second edge ring and the top edge ring.
4. The moveable edge ring system of claim 1, wherein the top edge ring has an inverted "U"-shape.
- 30 5. The moveable edge ring system of claim 1, wherein the top edge ring is made of conductive material.
6. The moveable edge ring system of claim 1, wherein the top edge ring is made of dielectric material.

7. The moveable edge ring system of claim 1, wherein the first edge ring is made of conductive material.

5 8. The moveable edge ring system of claim 1, wherein the first edge ring is made of dielectric material.

9. The moveable edge ring system of claim 1, wherein the middle portion of the second edge ring extends radially inwardly relative to the upper portion of the second
10 edge ring to define a first annular recess.

10. The moveable edge ring system of claim 9, wherein the first edge ring includes a second annular recess on an upper and radially outer surface thereof and wherein a radially inner leg of the top edge ring is located in the first annular recess and the second
15 annular recess when the top edge ring is in a lowered position.

11. The moveable edge ring system of claim 1 further comprising a third edge ring located below and radially outside of the first edge ring, the second edge ring and the top edge ring, wherein the third edge ring defines an annular recess on an upper and radially
20 inner surface and wherein a radially outer leg of the top edge ring is located in the annular recess when the top edge ring is in a lowered position.

12. The moveable edge ring system of claim 11, wherein the third edge ring includes a vertical bore to receive the lift pin.
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13. The moveable edge ring system of claim 1, wherein the second edge ring has a generally rectangular cross-section and a radially inner surface that is parallel to a radially outer edge of a substrate support.
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14. A moveable edge ring system for a plasma processing system, comprising:
a top edge ring; and
a first edge ring made of dielectric material and including an embedded conductor
that is fully embedded within the dielectric material,
5 wherein the first edge ring lies below the top edge ring, and
wherein the top edge ring and the first edge ring are configured to move in a
vertical direction relative to a substrate support when biased upwardly by a lift pin.
15. The moveable edge ring system of claim 14 further comprising:
10 a second edge ring arranged below the top edge ring,
wherein the first edge ring includes an upper portion, a middle portion and a lower
portion, and
wherein the first edge ring is arranged below the top edge ring and radially outside
of the second edge ring.
- 15 16. The moveable edge ring system of claim 15, wherein:
the lower portion of the first edge ring extends radially inwardly relative to the
middle portion and defines a first gap between the lower portion of the second edge ring
and a radially outer surface of the substrate support,
20 the middle portion of the first edge ring defines a second gap between the middle
portion and the radially outer surface of the substrate support, and
the second gap is greater than or equal to two times the first gap.
17. The moveable edge ring system of claim 16, wherein the middle portion of the first
25 edge ring moves parallel to a radially outer edge of the second edge ring as the lift pin
raises the first edge ring and the top edge ring.
18. The moveable edge ring system of claim 14, wherein the top edge ring has an
inverted "U"-shape.
- 30 19. The moveable edge ring system of claim 17, wherein the embedded conductor
includes a horizontal conductor arranged in the upper portion parallel to an upper surface
of the first edge ring.

20. The moveable edge ring system of claim 19, wherein the embedded conductor further includes a vertical conductor arranged in the lower portion parallel to a radially inner surface of the first edge ring.
- 5 21. The moveable edge ring system of claim 20, wherein the embedded conductor further includes a conductor connecting the vertical conductor and the horizontal conductor.
- 10 22. The moveable edge ring system of claim 14, wherein the top edge ring is made of conductive material.
23. The moveable edge ring system of claim 14, wherein the top edge ring is made of dielectric material.
- 15 24. The moveable edge ring system of claim 15, wherein the second edge ring is made of dielectric material.
25. The moveable edge ring system of claim 15, wherein the second edge ring is made of conductive material.
- 20 26. The moveable edge ring system of claim 15 further comprising a third edge ring located below and radially outside of the first edge ring, the second edge ring and the top edge ring.
- 25 27. The moveable edge ring system of claim 26, wherein the third edge ring defines an annular recess on an upper and radially inner surface and wherein a radially outer leg of the top edge ring is located in the annular recess when the top edge ring is in a lowered position.
- 30 28. The moveable edge ring system of claim 26, wherein the third edge ring includes a vertical bore to receive the lift pin.
29. The moveable edge ring system of claim 14, wherein the first edge ring is made of ceramic green sheets that include conductive traces and vias.