CLAIMS

1. An extraction assembly, comprising:

an extraction plate for placement along a side of a plasma chamber, the extraction plate having an extraction aperture, elongated along a first direction, and having an extraction aperture height, extending along a second direction, perpendicular to the first direction, the extraction plate defining an inner surface along the extraction aperture, lying in a first plane; and

a beam blocker, disposed over the extraction aperture, and having an outer surface, disposed in a second plane, different than the first plane, toward an inner side of the extraction plate,

wherein the beam blocker overlaps with the extraction plate along a first edge of the extraction aperture by a first overlap distance, and overlaps with the extraction plate along a second edge of the extraction aperture by a second overlap distance, so as to define a first extraction slit, along the first edge, and a second extraction slit along the second edge, and

wherein the beam blocker comprises a first ridge, disposed along a first end of the beam blocker along the first direction, and a second ridge, disposed along a second end of the beam blocker along the first direction.

2. The extraction assembly of claim 1, wherein the extraction plate and the beam blocker comprise a dielectric material.

3. The extraction assembly of claim 1, wherein the first plane and the second plane define an extraction slit width for the first extraction slit and the second extraction slit, the extraction slit width being a separation distance between the first plane and the second plane along a perpendicular to the first plane and the second plane.

4. The extraction assembly of claim 3, wherein the first overlap distance and the second overlap distance equal 10 % to 100 % of the extraction slit width.

5. The extraction assembly of claim 4, wherein the extraction slit width is equal to 5% to 40% of the extraction aperture height.

6. The extraction assembly of claim 1, further comprising a shim assembly, the shim assembly comprising a first set, disposed between the extraction plate and the first ridge, and further comprising a second set, disposed between the extraction plate and the second ridge.

7. The extraction assembly of claim 1, wherein the extraction plate and the beam blocker are interoperative to extract a first ion beamlet from the first extraction slit and a second ion beamlet from the second extraction slit, wherein the first ion beamlet and the second ion beamlet generate a beam angular spread of less than 10 degrees.

8. The extraction assembly of claim 7, wherein the first ion beamlet from the first extraction slit and the second ion beamlet define a beam mean angle of less than 20 degrees with respect to a perpendicular to the first plane and the second plane.

9. A processing apparatus, comprising:

a plasma chamber to house a plasma;

an extraction plate arranged along a side of a plasma chamber, the extraction plate having an extraction aperture, elongated along a first direction, and having an extraction aperture height, extending along a second direction, perpendicular to the first direction, the extraction plate defining an inner surface along the extraction aperture, lying in a first plane; and

a beam blocker, disposed over the extraction aperture, and having an outer surface, disposed in a second plane, different than the first plane, toward an inner side of the extraction plate,

wherein the beam blocker overlaps with the extraction plate along a first edge of the extraction aperture by a first overlap distance, and overlaps with the extraction plate along a second edge of the extraction aperture by a second overlap distance, so as to define a first extraction slit, along the first edge, and a second extraction slit along the second edge, and

wherein the beam blocker comprises a first ridge, disposed along a first end of the beam blocker along the first direction, and a second ridge, disposed along a second end of the beam blocker along the first direction.

10. The processing apparatus of claim 9, wherein the extraction plate and the beam blocker comprise a dielectric material.

11. The processing apparatus of claim 9, wherein the first plane and the second plane define an extraction slit width for the first extraction slit and the second extraction slit, the extraction slit width being a separation distance between the first plane and the second plane along a perpendicular to the first plane and the second plane.

12. The processing apparatus of claim 11, wherein the first overlap distance and the second overlap distance equal 10 % to 100 % of the extraction slit width.

13. The processing apparatus of claim 11, wherein the extraction slit width is equal to 5% to 40% of the extraction aperture height.

14. The processing apparatus of claim 9, further comprising a shim assembly, the shim assembly comprising a first set, disposed between the extraction plate and the first ridge, and further comprising a second set, disposed between the extraction plate and the second ridge.

15. The processing apparatus of claim 9, wherein the extraction plate and the beam blocker are interoperative to extract a first ion beamlet from the first extraction slit and a second ion beamlet from the second extraction slit, wherein the first ion beamlet and the second ion beamlet generate a beam angular spread of less than 10 degrees.

16. The processing apparatus of claim 15, wherein the first ion beamlet from the first extraction slit and the second ion beamlet define a beam mean angle of less than 20 degrees with respect to a perpendicular to the first plane and the second plane.

17. A compact angled ion beam apparatus, comprising:

a plasma chamber to house a plasma; and

an extraction assembly, disposed adjacent to the plasma chamber, and comprising:

an extraction plate arranged along a side of a plasma chamber, the extraction plate having an extraction aperture, elongated along a first direction, and having an aperture height, extending along a second direction, perpendicular to the first direction, the extraction plate defining an inner surface along the extraction aperture, lying in a first plane;

a beam blocker, disposed over the extraction aperture, and having an outer surface, disposed in a second plane, different than the first plane, toward an inner side of the extraction plate; and

a coupling assembly, reversibly connecting the beam blocker to the extraction plate,

wherein the coupling assembly is configured to adjust an overlap distance between the extraction plate and the beam blocker along the second direction, and to adjust a slit width of the extraction assembly, the slit width comprising a distance between the extraction plate and beam blocker along a third direction, perpendicular to the first plane and the second plane, and

wherein the beam blocker comprises a first ridge, disposed along a first end of the beam blocker along the first direction, and a second ridge, disposed along a second end of the beam blocker along the first direction.

18. The compact angled ion beam apparatus of claim 17, the coupling assembly comprising:

a shim assembly, the shim assembly comprising a first set, disposed between the extraction plate and the first ridge, and further comprising a second set, disposed between the extraction plate and the second ridge.