gradual transition at the edges compared to the square configurations of the prior methodologies, thereby improving image fidelity. As such, any substantially circular mask pattern produced by the steps 202-208 that is described as polygonal in shape will not be perfectly polygonal because of the gradual transition at the edges forming a non-regular polygonal shape. In other embodiments, the mask writing process can also include a substantially circular mask pattern produced by the steps 202-208 with arc portions or segments formed along and defining the perimeter of the substantially circular mask pattern.

[0057] Moreover, it will be appreciated by those skilled in the art that the process flow depicted by the flow diagram 200 can be adjusted and repeated iteratively until the image produced on the wafer falls within an acceptable tolerance value.

[0058] Referring now to FIG. 3, therein is shown an exemplary process flow to generate a substantially circular mask aperture in accordance with an embodiment of the present invention. Although the current illustration is exemplified by a single feature (e.g., a contact hole design), it is to be understood that the process flow may apply to isolated, semi-dense, and/or dense configurations of the feature. It will be appreciated by those of ordinary skill in the art that the exemplary process flow represents a generalized schematic illustration and that other steps may be added or existing steps may be removed or modified.

[0059] Generally, in a step 302, the design data 203 can be generated describing an integrated circuit layout pattern. In at least one embodiment, the design data 203 may model and/or represent a contact hole design and/or pattern. In such cases, the contact hole design and/or pattern may include polygon shaped squares, rectangles and/or circular designs.

[0060] In a step 304, the substantially circular OPC target 207 can be generated based on the design and/or pattern information provided from the step 302. In at least one embodiment, the substantially circular OPC target 207 generated at the step 304 may include a polygon shaped feature and/or a substantially circular shaped polygon feature. It is to be understood that planar geometric and/or polygonal shapes categorized in hierarchical form can be used to create the substantially circular OPC target 207.

[0061] In a step 306, the substantially circular OPC target 207 generated in the step 304 can be partitioned by a radial segmentation method to form two or more equal or unequal partitions, such as a segment 307, within the substantially circular OPC target 207. In at least one embodiment, the substantially circular OPC target 207 generated in the step 304 can be segmented into substantially equal portions of the segment 307 that can be schematically represented as triangular shaped wedges emanating from the center of the substantially

circular OPC target 207 and terminating with the perimeter of the substantially circular OPC target 207.

[0062] In a step 308, selective biasing of one or more of the segment 307 of the partitioned form of the substantially circular OPC target 207 can be performed to form a biased segment 309. Generally, one or more of the segment 307 can be biased by extending the arc of the

segment 307 located along the perimeter of the circular OPC target in the radial direction. Stated another way, the segment 307 can be biased by extending the perimeter of the segment 307 outward from the center point of the substantially circular OPC target 207 while maintaining the dimensions of the segment 307 within the substantially circular OPC target 207. As such, in some embodiments, since only the perimeter of the circular OPC target and the associated sides of a biased one of the segment 307 are extended radially, the dimensions of each of the segment 307 within the substantially circular OPC target 207 can be maintained. In at least one embodiment, biased forms of the segment 307 can be located substantially equidistant from the other biased forms of the segment 307, although it is understood that other configurations are possible. It is to be understood that the selective biasing of the segment 307 can be implemented with reference to nearby feature distribution.

[0063] In a step 310, "GDS out" data can be generated for the mask system 110, of FIG. 1, based on the shape produced in the step 308. It will be appreciated by those skilled in the art that the image produced on the mask system 110 may include an aperture whose outline substantially mirrors the perimeter of the shape produced in the step 308. Generally, the "GDS out" data can be referred to as the mask data 209.

[0064] Referring now to FIG. 4, therein is shown an exemplary graphical representation of an aerial image intensity produced by a square pattern versus a substantially circular pattern. The exemplary graphical representation plots the intensity along the "Y" axis and the position in nanometers along the "X" axis. Generally, the exemplary graphical representation depicts how the aerial image intensity produced by the circular pattern of the present embodiments is higher than that of a square one produced by prior methodologies. In some instances, the aerial image intensity produced by the circular pattern shows an average of 30% improvement over that of a square one.

[0065] Referring now to FIG. 5, therein is shown a simulated critical dimension through pitch (aerial image) for a substantially circular pattern versus a square pattern. The exemplary graphical representation plots the critical dimension (CD) in nanometers along the "Y" axis and the pitch in nanometers along the "X" axis. Per this simulation, dimensional biasing was applied for both square and circular patterns, with a target critical dimension (CD) of 80nm. The optimized illumination condition for both square and circular contact arrays of 130nm was used and it is the same for both shapes. Per the results, it can be seen that the circular pattern of the present embodiments shows less fluctuation in CD and has better CD control through pitch. Accordingly, it has been shown that a substantially circular

pattern produced at the “GDS in”, OPC, “GDS out”, and/or mask level can improve the imaging performance for a contact array pattern as compared to a square target pattern of prior methodologies.

What is claimed is:

1. A method of manufacture of a mask system comprising:

providing design data;

generating a substantially circular optical proximity correction target from the design data;

biasing a segment of the substantially circular optical proximity correction target; and

generating mask data based on the shape produced by biasing the segment of the substantially circular optical proximity correction target.

2. The method as claimed in claim 1 wherein:

providing the design data includes providing a polygon shaped feature.

3. The method as claimed in claim 1 wherein:

generating the substantially circular optical proximity correction target includes generating a polygonal circular shape.

4. The method as claimed in claim 1 wherein:

biasing the segment of the substantially circular optical proximity correction target includes biased forms of the segment located substantially equidistant from the other biased forms of the segment.

5. The method as claimed in claim 1 wherein:

generating the mask data includes generating a graphic data system out pattern for the mask system.

6. A method of manufacture of a mask system comprising:

providing a contact hole design;

generating a substantially circular optical proximity correction target of the contact hole design;

segmenting the substantially circular optical proximity correction target;

biasing a segment of the substantially circular optical proximity correction target; and

generating mask data based on the shape produced by biasing the segment of the substantially circular optical proximity correction target.

7. The method as claimed in claim 6 wherein:

providing the contact hole design includes providing a circular shaped feature.

8. The method as claimed in claim 6 wherein:

segmenting the substantially circular optical proximity correction target includes segmenting the substantially circular optical proximity correction target into substantially equal partitions.

9. The method as claimed in claim 6 wherein:

biasing a segment of the substantially circular optical proximity correction target includes biasing more than one of the segment.

10. The method as claimed in claim 6 wherein:

generating the mask data based on the shape produced by biasing the segment of the substantially circular optical proximity correction target helps to prevent formation of a side lobe.

11. A method of manufacture of a mask system comprising:

providing a contact hole design;

generating a substantially circular optical proximity correction target of the contact hole design;

segmenting the substantially circular optical proximity correction target;

biasing a segment of the substantially circular optical proximity correction target by extending an arc of the substantially circular optical proximity correction target in a radial direction; and

generating mask data based on the shape produced by biasing the segment of the substantially circular optical proximity correction target.

12. The method as claimed in claim 11 wherein:

providing the contact hole design includes providing a polygon shaped feature.

13. The method as claimed in claim 11 wherein:

generating the substantially circular optical proximity correction target includes generating a polygonal circular shape.

14. The method as claimed in claim 11 wherein:

biasing the segment of the substantially circular optical proximity correction target includes biased forms of the segment located substantially equidistant from the other biased forms of the segment.

15. The method as claimed in claim 11 wherein:

generating the mask data includes generating a graphic data system out pattern for the mask system.

16. The method as claimed in claim 11 wherein:

biasing the segment of the substantially circular optical proximity correction target is done with reference to nearby features.

17. The method as claimed in claim 16 wherein:

providing the contact hole design includes providing a circular shaped feature.

18. The method as claimed in claim 16 wherein:

segmenting the substantially circular optical proximity correction target includes segmenting the substantially circular optical proximity correction target into substantially equal partitions.

19. The method as claimed in claim 16 wherein:

biasing a segment of the substantially circular optical proximity correction target includes biasing more than one of the segment.

20. The method as claimed in claim 16 wherein:

generating the mask data based on the shape produced by biasing the segment of the substantially circular optical proximity correction target helps to prevent formation of a side lobe.

What is claimed is:

1. A method of manufacture of an integrated circuit device comprising:

providing design data;

generating a substantially circular optical proximity correction target from the design data;

biasing a segment of the substantially circular optical proximity correction target by extending an arc of the substantially circular optical proximity correction target, while maintaining a dimension of a different segment within the substantially circular optical proximity correction target;

generating mask data, based on the shape produced by biasing the segment of the substantially circular optical proximity correction target, by using a computer aided design system; and

making a mask from the mask data.

2. The method as claimed in claim 1 wherein:

providing the design data includes providing a polygon shaped feature.

3. The method as claimed in claim 1 wherein:

generating the substantially circular optical proximity correction target includes generating a substantially circular shape.

4. The method as claimed in claim 1 wherein:

biasing the segment of the substantially circular optical proximity correction target includes biased forms of the segment located substantially equidistant from the other biased forms of the segment.

5. The method as claimed in claim 1 wherein:

generating the mask data includes generating a graphic data system out pattern for the mask.

6. A method of manufacture of an integrated circuit device comprising:

providing a contact hole design;

generating a substantially circular optical proximity correction target of the contact hole design;

segmenting the substantially circular optical proximity correction target;

biasing a segment of the substantially circular optical proximity correction target by extending an arc of the substantially circular optical proximity correction

target, while maintaining a dimension of a different segment within the substantially circular optical proximity correction target;

generating mask data based on the shape produced by biasing the segment of the substantially circular optical proximity correction target, by using a computer aided design system; and

making a mask from the mask data.

7. The method as claimed in claim 6 wherein:

providing the contact hole design includes providing a circular shaped feature.

8. The method as claimed in claim 6 wherein:

segmenting the substantially circular optical proximity correction target includes segmenting the substantially circular optical proximity correction target into substantially equal partitions.

9. The method as claimed in claim 6 wherein:

biasing a segment of the substantially circular optical proximity correction target includes biasing more than one of the segment.

10. The method as claimed in claim 6 wherein:

generating the mask data based on the shape produced by biasing the segment of the substantially circular optical proximity correction target helps to prevent formation of a side lobe.

11. A method of manufacture of an integrated circuit device comprising:

providing a contact hole design;

generating a substantially circular optical proximity correction target of the contact hole design;

segmenting the substantially circular optical proximity correction target;

biasing a segment of the substantially circular optical proximity correction target by extending an arc perimeter of the substantially circular optical proximity correction target in a radial direction, while maintaining a dimension of a different segment within the substantially circular optical proximity correction target;

generating mask data based on the shape produced by biasing the segment of the substantially circular optical proximity correction target, by using a computer aided design system; and

making a mask from the mask data.

12. The method as claimed in claim 11 wherein:
providing the contact hole design includes providing a circular design.

13. The method as claimed in claim 11 wherein:
generating the substantially circular optical proximity correction target includes generating a substantially circular shape.

14. The method as claimed in claim 11 wherein:
biasing the segment of the substantially circular optical proximity correction target includes biased forms of the segment located substantially equidistant from the other biased forms of the segment.

15. The method as claimed in claim 11 wherein:
generating the mask data includes generating a graphic data system out pattern for the mask.

16. The method as claimed in claim 11 wherein:
biasing the segment of the substantially circular optical proximity correction target is done with reference to nearby features.

17. The method as claimed in claim 16 wherein:
providing the contact hole design includes providing a circular shaped feature.

18. The method as claimed in claim 16 wherein:
segmenting the substantially circular optical proximity correction target includes segmenting the substantially circular optical proximity correction target into substantially equal partitions.

19. The method as claimed in claim 16 wherein:
biasing a segment of the substantially circular optical proximity correction target includes biasing more than one of the segment.

20. The method as claimed in claim 16 wherein:
generating the mask data based on the shape produced by biasing the segment of the substantially circular optical proximity correction target helps to prevent formation of a side lobe.