Claims

1. A metrology system comprising:

a controller, the controller including one or more processors configured to execute program instructions configured to cause the one or more processors to:

generate optical tool error adjustments for a hybrid overlay target including optically-resolvable features and device-scale features, by measuring a difference between an optical overlay measurement based on the optically-resolvable features and a device-scale overlay measurement based on the device-scale features;

generate target-to-device adjustments for the hybrid overlay target based on positions of features within a device area; determine device-relevant overlay measurements for one or more locations in the device area based on at least one of the optical overlay measurement, the optical tool error adjustments, or the target-to-device adjustments; and

provide overlay correctables for the device area to a lithography tool to modify exposure conditions for at least one subsequent exposure based on the device-relevant overlay measurements.

2. The metrology system of claim 1, wherein the positions of the features within the device area for determining the target-to-device adjustments comprise: pattern placement distances between the hybrid overlay target and the features within the device area for two or more layers of the sample.

3. The metrology system of claim 2, wherein the pattern placement distances between the hybrid overlay target and the features within the device area are received from an edge-placement metrology tool comprising: a translation stage for securing the sample, wherein the translation stage has a range of motion at least equal to a separation between the hybrid overlay target and the device-scale features within the device area; and an imaging system, wherein the pattern placement distances include distances measured by the translation stage between the hybrid overlay target and the device-scale features.

4. The metrology system of claim 3, wherein the edge-placement metrology tool is integrated within at least one of an optical metrology tool or a particle-beam metrology tool.

5. The metrology system of claim 1, wherein the positions of the features within the device area for determining the target-to-device adjustments comprise: overlay measurements within the device area.

6. The metrology system of claim 5, wherein the overlay measurements within the device area comprise: overlay measurements of device features within the device area.

7. The metrology system of claim 5, wherein the overlay measurements within the device area comprise: overlay measurements of device-scale overlay targets within the device area.

8. The metrology system of claim 1, wherein the optically-resolvable features are segmented to include periodically-distributed features providing multiple measurement locations, wherein the optical overlay measurement includes overlay determined based on the multiple measurement locations.

9. The metrology system of claim 1, wherein the device-scale features are segmented to include periodically-distributed features providing multiple measurement locations, wherein the device-scale overlay measurement includes overlay determined based on the multiple measurement locations.

10. The metrology system of claim 1, wherein the controller receives the optical overlay measurement from an optical metrology tool.

11. The metrology system of claim 10, wherein the optical metrology tool is an image-based overlay tool, wherein the optical overlay measurement is an image-based overlay measurement.

12. The metrology system of claim 10, wherein the optical metrology tool is a scatterometry-based overlay tool, wherein the optical overlay measurement is a scatterometry-based overlay measurement.

13. The metrology system of claim 1, wherein the controller receives the device-scale overlay measurement from a particle-beam metrology tool.

14. The metrology system of claim 13, wherein the particle-beam metrology tool comprises: a scanning electron microscope metrology tool.

15. The metrology system of claim 14, wherein the scanning electron microscope metrology tool comprises: a critical-dimension scanning electron microscope.

16. The metrology system of claim 13, wherein the particle-beam metrology tool comprises: a focused ion beam metrology tool.

17. The metrology system of claim 1, wherein the device area is a die of the sample.

18. The metrology system of claim 1, wherein the hybrid overlay target is located in a scribe line of the sample.

19. The metrology system of claim 1, wherein at least one of the optical overlay measurement of the hybrid overlay target, the device-scale overlay measurement of the hybrid overlay target, or measurements of the positions of the features within the device area for determining the target-to-device adjustments comprise: after development inspection data.

20. The metrology system of claim 1, wherein at least one of the optical overlay measurement of the hybrid overlay target, the device-scale overlay measurement of the hybrid overlay target, or measurements of the positions of the features within the device area for determining the target-to-device adjustments comprise: after etch inspection data.

21. The metrology system of claim 1, wherein the optically-resolvable features and the device-scale features of the hybrid overlay target are physically separated.

22. The metrology system of claim 1, wherein at least some of the optically-resolvable features are segmented, wherein the device-scale features form segments of the optically-resolvable features.

23. The metrology system of claim 1, wherein the device-scale features of the hybrid overlay target are compatible with design rules of device features within the device area.

24. The metrology system of claim 1, wherein the metrology system is configured as an overlay metrology system.

25. The metrology system of claim 1, wherein the metrology system is configured as an edge placement metrology system.

26. A metrology system comprising: an optical metrology tool configured to generate an optical overlay measurement based on optically-resolvable features of a hybrid overlay target on a sample; a particle-beam metrology tool configured to generate a device-scale overlay measurement based on device-scale features of the hybrid overlay target; an edge-placement metrology tool configured to measure positions of features within a device area of the sample with respect to the hybrid overlay target; and a controller communicatively coupled to the optical metrology tool and the particle-beam metrology tool, the controller including one or more processors configured to execute program instructions configured to cause the one or more processors to: generate optical tool error adjustments for the hybrid overlay target based on a difference between the optical overlay measurement received by the optical metrology tool and the device-scale overlay measurement received by the particle-beam metrology tool; generate target-to-device adjustments for the hybrid overlay target based on positions of features within the device area received by the

edge-placement metrology tool; determine device-relevant overlay measurements for one or more locations in the device area based on at least one of the optical overlay measurement, the optical tool error adjustments, or the target-to-device adjustments; and provide overlay correctables for the device area to a lithography tool to modify exposure conditions for at least one subsequent exposure based on the device-relevant overlay measurements.

27. The metrology system of claim 26, wherein the positions of the features within the device area for determining the target-to-device adjustments comprise: pattern placement distances between the hybrid overlay target and the features within the device area for two or more layers of the sample.

28. The metrology system of claim 27, wherein the edge-placement metrology tool comprises: a translation stage for securing the sample, wherein the translation stage has a range of motion at least equal to a separation between the hybrid overlay target and the device-scale features within the device area; and an imaging system, wherein the pattern placement distances include distances measured by the translation stage between the hybrid overlay target and the device-scale features.

29. The metrology system of claim 26, wherein the edge-placement metrology tool is integrated within at least one of the optical metrology tool or the particle-beam metrology tool.

30. The metrology system of claim 26, wherein the positions of the features within the device area for determining the target-to-device adjustments further comprise: overlay measurements within the device area measured using at least one of the optical metrology tool or the particle-beam metrology tool.

31. The metrology system of claim 30, wherein the overlay measurements within the device area comprise: overlay measurements of device features within the device area.

32. The metrology system of claim 30, wherein the overlay measurements within the device area comprise: overlay measurements of device-scale overlay targets within the device area.

33. The metrology system of claim 26, wherein the optically-resolvable features are segmented to include periodically-distributed features providing multiple measurement locations, wherein the optical overlay measurement includes overlay determined based on the multiple measurement locations.

34. The metrology system of claim 26, wherein the device-scale features are segmented to include periodically-distributed features providing multiple measurement locations, wherein the device-scale overlay measurement includes overlay determined based on the multiple measurement locations.

35. The metrology system of claim 26, wherein the optical metrology tool is an image-based overlay tool, wherein the optical overlay measurement is an image-based overlay measurement.

36. The metrology system of claim 26, wherein the optical metrology tool is a scatterometry-based overlay tool, wherein the optical overlay measurement is a scatterometry-based overlay measurement.

37. The metrology system of claim 26, wherein the particle-beam metrology tool comprises: a scanning electron microscope metrology tool.

38. The metrology system of claim 37, wherein the scanning electron microscope metrology tool comprises: a critical-dimension scanning electron microscope.

39. The metrology system of claim 26, wherein the particle-beam metrology tool comprises: a focused ion beam metrology tool.

40. The metrology system of claim 26, wherein the metrology system is configured as an overlay metrology system.

41. The metrology system of claim 26, wherein the metrology system is configured as an edge placement metrology system.

42. A metrology method comprising: measuring an optical overlay of a hybrid overlay target on a sample based on optically-resolvable elements of the hybrid overlay target; measuring a device-scale overlay of the hybrid overlay target based on device-scale elements of the hybrid overlay target; determining optical tool error adjustments for the hybrid overlay target based on a difference between the optical overlay and the device-scale overlay; measuring target-to-device placement errors for one or more features within a device area with respect to the hybrid overlay target; generating one or more target-to-device adjustments for the device area based on the target-to-device placement errors; determining device-relevant overlay measurements for one or more positions within the device area based on the optical overlay, the optical tool error adjustments, and the target-to-device adjustments; and providing overlay correctables for the device area to a lithography tool to modify exposure conditions for at least one subsequent sample based on the device-relevant overlay measurements.