Claims

1. A optical metrology system, comprising:

a light engine comprising:

a light source disposed over one or more microlens arrays;

one or more condenser lens disposed under the one or more microlens arrays, wherein the one or more condenser lens are disposed over a reticle; and

a projection lens, having a first focal length, disposed under the reticle, wherein the projection lens is configured to align with an in-coupler of an optical device; and

a reflection detector comprising:

a camera lens, having a second focal length, wherein the camera lens is configured to align with an out-coupler of the optical device; and

a camera disposed over the camera lens, the camera configured to receive light from the camera lens,

wherein the first focal length and the second focal length are different.

2. The optical metrology system of claim 1, wherein the first focal length is less than the second focal length.

3. The optical metrology system of claim 1, wherein the first focal length is about 10 mm to about 20 mm, and the second focal length is about 20 mm to about 40 mm.

4. The optical metrology system of claim 1, wherein the light engine comprises a first condenser lens and a second condenser lens.

5. The optical metrology system of claim 4, wherein the first condenser lens is disposed over the one or more microlens arrays, and the second condenser lens is disposed under the one or more microlens arrays.

6. The optical metrology system of claim 4, wherein the first condenser lens comprises a third focal length of about 10 mm to about 60 mm, and the second condenser lens comprises a fourth focal length of about 10 mm to about 60 mm.

7. The optical metrology system of claim 1, wherein the one or more microlens arrays comprise a first microlens array and a second microlens array.

8. The optical metrology system of claim 7, wherein the first microlens array comprises a fifth focal length of about 0.2 mm to about 2 mm, and the second microlens array comprises a sixth focal length of 0.2 mm to 2 mm.

9. The optical metrology system of claim 1, further comprising a controller communicatively coupled to the light engine and the reflection detector, wherein the controller is configured to process a test pattern from the reflection detector.

10. A optical metrology system, comprising:

a light engine comprising:

a light source disposed over one or more microlens arrays;

one or more condenser lens disposed under the one or more microlens arrays, wherein the one or more condenser lens are disposed over a reticle; and

a projection lens, having a first focal length, disposed under the reticle, wherein the projection lens is configured to align with an in-coupler of an optical device; and

a reflection detector comprising:

a camera lens, having a second focal length, wherein the camera lens is configured to align with an out-coupler of the optical device; and

a camera disposed over the camera lens, the camera configured to receive light from the camera lens,

wherein the first focal length is about 10 mm to about 20 mm, and the second focal length is about 20 mm to about 40 mm.

11. The optical metrology system of claim 10, wherein the light engine comprises a first condenser lens and a second condenser lens.

12. The optical metrology system of claim 11, wherein the first condenser lens is disposed over the one or more microlens arrays, and the second condenser lens is disposed under the one or more microlens arrays.

13. The optical metrology system of claim 12, wherein the first condenser lens comprises a third focal length of about 10 mm to about 60 mm, and the second condenser lens comprises a fourth focal length of about 10 mm to about 60 mm.

14. The optical metrology system of claim 10, wherein the one or more microlens arrays comprise a first microlens array and a second microlens array.

15. The optical metrology system of claim 14, wherein the first microlens array comprises a fifth focal length of about 0.2 mm to about 2 mm, and the second microlens array comprises a sixth focal length of 0.2 mm to 2 mm.

16. The optical metrology system of claim 10, further comprising a controller communicatively coupled to the light engine and the reflection detector, wherein the controller is configured to process a test pattern from the reflection detector.

17. A method, comprising:

aligning a light engine with an in-coupler of an optical device, the light engine comprising one or more microlens arrays, one or more condenser lens disposed under the one or more microlens arrays, a reticle disposed under the one or more condenser lens, and a projection lens disposed under the reticle, wherein the projection lens comprises a first focal length;

projecting a test pattern onto the optical device using the light engine;

aligning a reflection detector with an out-coupler of the optical device, the reflection detector comprising a camera lens and a camera disposed over the camera lens, wherein

the camera lens comprises a second focal length, wherein the first focal length is less than the second focal length;

receiving a reflected test pattern from the optical device using the reflection detector; and

determining one or more metrology metrics for the optical device based on the reflected test pattern.

18. The method of claim 17, wherein the one or more metrology metrics comprise image sharpness, luminance uniformity, and distortion.

19. The method of claim 17, wherein projecting the test pattern comprises modulating the test pattern based on one or more optical device properties.

20. The method of claim 19, wherein the one or more optical device properties comprises physical dimensions, material composition, and internal structures.