CLAIMS

~~What is claimed is:~~

1. A system comprising:

at least one optical microcavity sensor configured to detect features on a wafer, and

a controller configured to measure distances between features of device and features of overlay targets by moving the at least one optical microcavity sensor therebetween~~.~~,

~~2. The system of claim 1, wherein the at least one optical microcavity sensor comprises at least one microcavity configured to provide evanescent radiation extending beyond the at least one microcavity and to interact with the detected features, and wherein the at least one microcavity is further configured to provide radiation which is indicative of interaction between an evanescent field of the at least one microcavity and the detected features.~~

~~3. The system of claim 2, wherein the at least one microcavity is configured to yield a high quality factor greater than 100 and a tight confinement of optical energy less than~~ ~~λ^3 in the at least one microcavity.~~

~~4. The system of claim 3, wherein the at least one microcavity is formed as a micro-toroid, a micro sphere, a micro disc, or a ID or 2D (one or two dimensional) photonic crystal cavity.~~

~~5. The system of claim 1, wherein the controller is further configured to control a horizontal position of the at least one optical microcavity sensor.~~

~~6. The system of claim 1, wherein the controller is further configured to control a vertical position of the at least one optical microcavity sensor.~~

~~7. The system of claim 6, wherein the controller is further configured to maintain the at least one optical microcavity sensor at a specified scanning height.~~

~~8. The system of claim 6, further comprising at least one auxiliary optical microcavity sensor configured to provide scanning height data to the controller.~~

~~9. The system of claim 1 ,~~ wherein the at least one optical microcavity sensor is loaded with a broad-bandwidth fluorescent medium selected to provide a specified optical gain in a range covered by cavity resonance.

~~10~~2. The system of claim 1, wherein the at least one optical microcavity sensor is mounted on a transparent substrate.

~~11~~3. The system of claim ~~10~~2, wherein the transparent substrate further comprises registration marks from registering optical metrology measurements with microcavity measurements.

~~12~~4. A method comprising:

using optical microcavity probes to map a wafer topography by near-field interactions therebetween, ~~and~~

configuring illumination to and detection by the optical microcavity probes to perform high volume metrology~~.~~, and

~~13. The method of claim 12, further comprising using broadband illumination and spectrally sensitive detection to directly detect line shifts sensed by the optical microcavity probes.~~

~~14. The method of claim 12, further comprising using tunable illumination and detecting wavelength-dependent intensities of signals from the optical microcavity probes.~~

~~15. The method of claim 12, further comprising using narrowband illumination at a transmission line slope of the optical microcavity probes and detecting a signal intensity thereof by a fast detector.~~

~~16. The method of claim 12, further comprising~~ coupling the optical microcavity probes with a fluorescent medium to enhance detection.

~~17. The method of claim 12, wherein the optical microcavity probes comprise microcavities coupled to respective fibers, the method further comprising configuring the microcavities to provide evanescent radiation extending beyond the respective cavities to interact with wafer features provide interference with radiation in the fiber.~~

~~18. The method of claim 12, further comprising controlling a scanning height of the microcavity probes.~~

~~19. The method of claim 18, further comprising scanning multiple wafers at a fixed scanning height, adjusting for optical and/or topographic variation of the wafers.~~

~~20. The method of claim 12, further comprising measuring a position of overlay target structures with respect to device structures in the wafer topography.~~

~~21. The method of claim 20, further comprising co-registering signals from the optical microcavity probes and corresponding optical metrology measurements.~~