CLAIMS

1. A metrology system comprising:

a metrology tool configured to selectively perform metrology measurements in a static mode in which one or more metrology targets on a sample are stationary during a measurement or a scanning mode in which one or more metrology targets are in motion during a measurement, wherein the metrology tool comprises a time delay integration (TDI) sensor including multiple pixel rows and a multi-channel imaging sub-system configured to sequentially provide **N** optical configurations for imaging a sample in an exposure window of a detector and generate **N** images of the sample during a readout phase of the detector associated with the exposure window, wherein **N** is an integer greater than one, wherein a particular image of the **N** images corresponds to a particular optical configuration of the **N** optical configurations, wherein one or more optics of the multi-channel imaging sub-system comprise a cylindrical lens array configured to direct the light emanating from the sample to every Nth pixel row of the TDI sensor,

wherein the metrology tool is configured to perform a scanning mode measurement by:

translating the sample at a charge transfer rate of the TDI sensor along a scan direction perpendicular to the pixel rows;

sequentially providing the **N** optical configurations for imaging the sample, wherein a switching time between successive optical configurations of the multi-channel imaging sub-system corresponds to the charge transfer rate of the TDI sensor:

generating, with the TDI sensor, an interleaved image including the **N** images during the exposure window; and

separating the interleaved image into the **N** images; and

a controller communicatively coupled to the translation stage and the TDI sensor, the controller including one or more processors configured to execute program instructions causing the one or more processors to:

receive locations of a plurality of metrology targets on the sample to be inspected; designate the plurality of metrology targets for inspection with the static mode or the scanning mode;

direct the metrology tool to perform metrology measurements on the plurality of metrology targets in the static mode or the scanning mode based on the designation; and

generate metrology data for the sample based on the metrology measurements on the plurality of metrology targets.

2. The metrology system of claim 1, wherein the one or more processors are configured to designate the plurality of metrology targets for inspection with the static mode or the scanning mode based on at least one of target type, target location, a proximity to one or more additional metrology targets of the plurality of metrology targets, or target density.

3. The metrology system of claim 1, wherein the one or more processors are configured to separate at least some of the plurality of metrology targets designated for inspection with the scanning mode into one or more scanning groups, wherein a particular scanning group of the one or more scanning groups includes at least two of the plurality of metrology targets to be measured in a common scan by the metrology tool.

4. The metrology system of claim 3, wherein the one or more processors are configured to separate at least some of the plurality of metrology targets designated for inspection with the scanning mode into one or more scanning groups based on at least one of target density along a scan direction.

5. The metrology system of claim 1, wherein the metrology tool includes a time delay integration (TDI) sensor, wherein the metrology tool is configured to perform a scanning mode measurement by:

exposing the sample with illumination from an illumination source during an exposure window;

synchronizing the TDI sensor with motion of the sample during the exposure window; and

generating an image row by row during the motion of the sample.

6. The metrology system of claim 5, wherein the metrology tool is configured to perform a static mode measurement by:

exposing the sample during the exposure window with the illumination from the illumination source while the sample is static without clocking the TDI sensor to transfer charge; and

clocking the TDI sensor to transfer charge row by row to generate an image when the sample is not exposed to the illumination from the illumination source.

7. The metrology system of claim 5, wherein the metrology tool further includes an imaging detector; wherein the metrology tool is configured to perform a static mode measurement by:

exposing the sample during the exposure window with the illumination from the illumination source while the sample is static; and

reading out an image of the sample with the imaging detector after the exposure window.

8. The metrology system of claim 1, wherein the one or more optics comprise a slit array positioned to block pixel rows of the TDI sensor not illuminated by the cylindrical lens array.

9. The metrology system of claim1, wherein the one or more optics comprise a slit array positioned to pass light to every Nth pixel row of the TDI sensor and block remaining

pixel rows of the TDI sensor, wherein the metrology tool is configured to perform a scanning mode measurement by:

translating the sample at a charge transfer rate of the TDI sensor along a scan direction perpendicular to the pixel rows;

sequentially providing the **N** optical configurations for imaging the sample, wherein a switching time between successive optical configurations of the multi- channel imaging sub-system corresponds to the charge transfer rate of the TDI sensor;

generating, with the TDI sensor, an interleaved image including the **N** images during the exposure window; and

separating the interleaved image into the **N** images.

10. The metrology system of claim1, wherein the detector further comprises:

a multi-tap imaging sensor for static mode measurements, the multi-tap imaging sensor having two or more taps suitable, wherein the metrology tool is configured to perform a static mode measurement by:

sequentially providing the **N** optical configurations for imaging the sample when the sample is static, wherein the multi-tap imaging sensor is synchronized to the multi-channel illumination source such that a different tap of the two or more taps receives charge for each of the **N** optical configurations during the exposure window; and

reading out the **N** images from the multi-tap imaging sensor during a readout phase.

11. A metrology method comprising:

receiving, with one or more processors, locations of a plurality of metrology targets on a sample to be inspected;

designating, with one or more processors, the plurality of metrology targets for inspection with a static mode in which one or more metrology targets on the sample are stationary during a measurement or a scanning mode in which one or more metrology targets are in motion during a measurement;

directing, with one or more processors, the metrology tool to perform metrology measurements on the plurality of metrology targets in the static mode or the scanning

mode based on the designation via one or more drive signals, wherein the metrology tool comprises a time delay integration (TDI) sensor including multiple pixel rows, wherein a sample stage is configured to translate the sample along a scan direction perpendicular to the pixel rows at a charge transfer rate of the TDI sensor, wherein a switching time between successive **N** optical configurations of the multi-channel imaging sub-system corresponds to the charge transfer rate of the TDI sensor; and

generating, with one or more processors, metrology data for the sample based on the metrology measurements on the plurality of metrology targets.

12. A metrology system comprising:

a multi-channel imaging sub-system comprising:

an illumination source;

one or more illumination optics configured to direct illumination from the illumination source to a sample;

one or more collection optics configured to collect light emanating from the sample in response to the illumination from the illumination source; and a detector configured to generate two or more images of the sample in an exposure window, wherein the detector comprises a time delay integration (TDI) sensor including multiple pixel rows, wherein a sample stage is configured to translate

the sample along a scan direction perpendicular to the pixel rows at a charge transfer rate of the TDI sensor, wherein a switching time between successive **N** optical configurations of the multi-channel imaging sub-system corresponds to the charge transfer rate of the TDI sensor; and

a controller communicatively coupled to the detector, the controller including one or more processors configured to execute program instructions causing the one or more processors to:

generate one or more drive signals for at least one of the illumination source, the one or more illumination optics, the one or more collection optics, or the detector to sequentially provide **N** optical configurations of the multi-channel imaging sub-system within the exposure window of the detector, wherein **N** is selected integer greater than

one, wherein the detector generates **N** images of the sample during a readout phase associated with the exposure window, wherein a particular image of the **N** images corresponds to a particular optical configuration of the **N** optical configurations; and

generate metrology data associated with the sample based on the N images of the sample.

13. The metrology system of claim12, wherein the one or more collection optics comprise a cylindrical lens array configured to direct the light emanating from the sample to every Nth pixel row of the TDI sensor, wherein the TDI sensor generates an interleaved image containing the **N** images during the exposure window.

14. The metrology system of claim13, wherein the one or more collection optics comprise a slit array positioned to block pixel rows of the TDI sensor not illuminated by the cylindrical lens array.

15. The metrology system of claim12, wherein the one or more collection optics comprise a slit array positioned to pass light to every Nth pixel row of the TDI sensor and block remaining pixel rows of the TDI sensor, wherein the TDI sensor generates an interleaved image containing the **N** images during the exposure window.

16. The metrology system of claim15, wherein the slit array is positioned on the TDI sensor.

17. The metrology system of claim15, wherein the slit array is positioned in a field plane of the metrology system.

18. The metrology system of claim12, wherein the one or more collection optics comprise a slit array positioned to block pixel rows of the TDI sensor not illuminated by the cylindrical lens array.

19. The metrology system of claim12, wherein the detector comprises:

a multi-tap imaging sensor having two or more taps suitable for generating at least **N** images in the exposure window, wherein the multi-tap imaging sensor is synchronized to the multi-channel illumination source such that the multi-tap imaging sensor generates a separate image associated with each of the **N** optical configurations during the exposure window.

20. The metrology system of claim12, wherein a particular optical configuration of the **N** optical configurations comprises:

a spectrum of illumination.

21. The metrology system of claim20, wherein the multi-channel illumination source comprises:

a broadband light source; and

at least one spectral filter.

22. The metrology system of claim21, wherein the at least one spectral filter is tunable.

23. The metrology system of claim20, wherein the multi-channel illumination source comprises:

two or more illumination sources having different spectra.

24. The metrology system of claim12, wherein the multi-channel illumination source includes at least one spectral filter, wherein a particular optical configuration of the **N** optical configurations comprises:

a spectrum of illumination.

25. The metrology system of claim12, wherein the multi-channel illumination source includes at least one polarizer, wherein a particular optical configuration of the **N** optical configurations comprises:

a polarization of illumination.

26. The metrology system of claim12, wherein the multi-channel illumination source includes a variable lens, wherein a particular optical configuration of the **N** configurations comprises:

a location of an imaging plane with respect to a surface of the sample.

27. The metrology system of claim26, wherein the variable lens comprises:

at least one of a variable-focus lens or a translation stage configured to adjust a position of a lens.

28. The metrology system of claim12, wherein the multi-channel illumination source comprises:

two or more channels having different optical paths, wherein each of the two or more channels includes one or more optical components to provide illumination having a particular optical configuration of the **N** optical configurations.

29. The metrology system of claim28, wherein the multi-channel illumination source further comprises:

a beam combiner to route illumination in each of the two or more channels to the common optical column, wherein the two or more channels have different optical paths prior to entry into the single common optical column; and

one or more shutters to selectively block illumination in at least one of the two or more channels from reaching the common optical column.

30. The metrology system of claim29, wherein the one or more shutters comprise:

at least one of a mechanical shutter, an electro-optic shutter, or an acousto-optic shutter.

31. The metrology system of claim12, wherein a particular optical configuration of the **N** optical configurations comprises:

an imaging configuration of the detector.

32. The metrology system of claim31, wherein the imaging configuration of the detector comprises:

at least one of a gain or an exposure time.