Claims

1. A system for characterizing a sample using second harmonic generation, the system comprising:

a sample holder configured to support a sample;

at least one optical source configured to direct a light beam onto said sample to produce second harmonic generation (SHG) signals;

an optical detection system comprising at least one optical detector configured to receive the SHG signals emitted from said sample and generate detected SHG signals;

one or more hardware processors in communication with the optical detection system, the one or more hardware processors configured to:

receive at least one detected SHG signal;

determine a geometric feature of the sample or a variation in a geometric feature of the sample based on the at least one detected SHG signal;

identify an unplanned variation in the geometric feature of the sample; and

output an indication of the unplanned variation.

2. The system of Claim 1, wherein the geometric feature of the sample is determined at least in part based on a mapping of the detected SHG signals with geometric features of one or more structures on the sample that are either completed or yet to be completed.

3. The system of Claim 1, wherein the one or more hardware processors receives the at least one detected SHG signal after a first fabrication step performed on the sample.

4. The system of Claim 3, wherein the system is included in-line in a fabrication system.

5. The system of Claim 4, wherein the first fabrication step is a step in a fabrication process performed by the fabrication system.

6. The system of Claim 4, wherein the one or more hardware processors are configured to output an indication of the unplanned variation to a sample processing tool in the fabrication system to adjust the unplanned variation in the sample.

7. The system of Claim 6, wherein the one or more hardware processors are configured to output the indication of the unplanned variation to a sample processing tool used for

performing a second fabrication step on the sample after the first fabrication step, to adjust the unplanned variation in the sample.

8. The system of Claim 1, wherein the one or more hardware processors are configured to output the indication of the unplanned variation to a user via a user interface of the system.

9. The system of Claim 1, wherein said geometric feature comprises a dimension for one or more devices or one or more parts of devices that are either completed or yet to be completed.

10. The system of Claim 1, wherein said geometric feature comprises a critical dimension for one or more devices or part of one or more devices that are either completed or yet to be completed.

11. The system of Claim 1, wherein said geometric feature comprises a shape of one or more devices or part of one or more devices that are either completed or yet to be completed.

12. The system of Claim 1, wherein said geometric feature comprises a lateral dimension comprising a width or length for one or more devices or part of one or more devices that are either completed or yet to be completed.

13. The system of Claim 1, wherein said geometric feature comprises a height for one or more devices or part of one or more devices that are either completed or yet to be completed.

14. The system of Claim 1, wherein said geometric feature comprises a lateral spacing between a plurality of devices or a plurality of parts of devices that are either completed or yet to be completed.

15. The system of Claim 1, wherein said geometric feature comprises a tilt or slope of one or more devices or part of one or more devices that are either completed or yet to be completed.

16. The system of Claim 1, wherein said geometric feature comprises a sidewall tilt or slope of for one or more devices or part of one or more devices that are either completed or yet to be completed.

17. The system of Claim 1, wherein said one or more hardware processors are configured to determine a geometric feature of the sample based on the at least one detected SHG signal.

18. The system of Claim 1, wherein said one or more hardware processors are configured to determine a variation in a geometric feature of the sample based on the at least one detected SHG signal.

19. The system of any one of Claims 1-18, wherein the geometric feature comprises a feature of one or more semiconductor devices or part of one or more semiconductor devices that are either completed or yet to be completed.