CLAIMS

1. A computer-implemented method for generating a defect sample for a wafer, comprising:

acquiring inspection results for the wafer, wherein the inspection results comprise information for defects detected on the wafer by an inspection process, and wherein the information comprises information for at least a first set of one or more first attributes for the defects and a second set of one or more second attributes for the defects;

identifying values of the one or more first attributes having the most diversity in the values of the one or more first attributes;

generating a set of bins for the defects based on the identified values such that each of the bins corresponds to only a portion of the values and such that the values corresponding to the bins have diversity in the one or more first attributes, wherein generating the set of bins does not include sampling any of the defects, wherein diversification of the set of bins in the one or more first attributes is controlled by a number of the bins in the set, and wherein the number of the bins in the set is received from a user prior to the generating step;

separating the defects into the bins based on the values of the one or more first attributes corresponding to the defects, wherein separating the defects into the bins is not performed until after the set of bins have been generated;

selecting, from one of the bins, defects within the one of the bins based on diversity in values of the one or more second attributes;

repeating said selecting for at least one of the bins; and

creating a defect sample for the wafer comprising the defects selected from the one of the bins and the at least one other of the bins, wherein said acquiring, said identifying, said generating, said separating, said selecting, said repeating, and said creating are performed by a computer system.

2. The method of claim **1**, wherein the one or more first attributes comprise one or more attributes of background of the defects on the wafer.

3. The method of claim **1**, wherein the one or more second attributes comprise one or more characteristics of a signal detected for the defects in the inspection process.

4. The method of claim **1**, wherein the wafer has unknown defectivity.

5. The method of claim **1**, wherein the one or more first attributes are selected by a user.

6. The method of claim **1**, further comprising determining one or more characteristics of the bins based on the defects separated into the bins, displaying the one or more characteristics to a user prior to said selecting, and requesting from the user a validation of the one or more characteristics.

7. The method of claim **1**, further comprising determining one or more characteristics of the defects selected from the bins, displaying the one or more characteristics to a user prior to said creating, and requesting from the user a validation of the one or more characteristics.

8. The method of claim **1**, further comprising determining a first characteristic of the bins based on the defects separated into the bins, determining a second characteristic of the defects selected from the bins, wherein the first characteristic is not the same as the second characteristic, displaying the first and second characteristics to a user prior to said

creating, and requesting from the user a validation of the first and second characteristics.

9. The method of claim **1**, wherein said selecting is performed based on the diversity such that the defects selected from the one of the bins have the most diversity in the values of the one or more second attributes.

10. The method of claim **1**, wherein said selecting is performed based on the diversity and one or more sample biasing parameters.

11. The method of claim **1**, further comprising separately selecting, from the one of the bins, defects within the one of the bins based on diversity in values of one or more third attributes of the defects, further comprising repeating said separately selecting for the at least one other of the bins, and wherein creating the detect sample comprises adding the defects separately selected from the one of the bins and the at least one other of the bins to the defect sample.

12. The method of claim **1**, further comprising generating a set of sub-bins for a bin from which the defects were selected based on the values of the one or more second attributes such that each of the sub-bins corresponds to only a portion of the values of the one or more second attributes and such that the values of the one or more second attributes corresponding to the sub-bins have diversity in the one or more second attributes.

13. The method of claim **12**, further comprising separately selecting, from one of the sub-bins, defects within the one of the sub-bins based on diversity in values of one or more third attributes of the defects, further comprising repeating said separately selecting for at least one other of the sub-bins, and wherein creating the defect sample comprises adding the defects separately selected from the one of the sub-bins and the at least one other of the sub-bins to the defect sample.

14. The method of claim **1**, wherein the same number of defects are selected from each of the bins from which defects are selected.

15. The method of claim **1**, wherein said selecting is performed independently for each of the bins from which defects are selected.

16. The method of claim **1**, further comprising storing information for the bins into which the defects are separated as a bin attribute for each of the defects that is separated into a bin, wherein said selecting and said repeating are performed based on the bin attributes of the defects.

17. The method of claim **1**, wherein the method and said generating do not comprise tuning cutlines separating the bins from each other.

18. The method of claim **1**, wherein the method is performed for one or more other wafers, and wherein the set of bins generated for the wafer is not used as a set of bins for the one or more other wafers.

19. A non-transitory computer-readable medium, storing program instructions executable on a computer system for performing a computer-implemented method for generating a defect sample for a wafer, wherein the computer-implemented method comprises:

acquiring inspection results for the wafer, wherein the inspection results comprise information for defects detected on the wafer by an inspection process, and wherein the information comprises information for at least a first set of one or more first attributes for the defects and a second set of one or more second attributes for the defects;

identifying values of the one or more first attributes having the most diversity in the values of the one or more first attributes;

generating a set of bins for the defects based on the identified values such that each of the bins corresponds to only a portion of the values and such that the values corresponding to the bins have diversity in the one or more first attributes, wherein generating the set of bins does not include sampling any of the defects, wherein diversification of the set of bins in the one or more first attributes is controlled by a number of the bins in the set, and wherein the number of the bins in the set is received from a user prior to the generating step;

separating the defects into the bins based on the values of the one or more first attributes corresponding to the defects, wherein separating the defects into the bins is not performed until after the set of bins have been generated;

selecting, from one of the bins, defects within the one of the bins based on diversity in values of the one or more second attributes;

repeating said selecting for at least one other of the bins; and

creating a defect sample for the wafer comprising the defects selected from the one of the bins and the at least one other of the bins.

20. A system configured to generate a defect sample for a wafer, comprising:

an inspection subsystem configured to acquire inspection results for the water, wherein the inspection results comprise information for defects detected on the wafer by an inspection process, and wherein the information comprises information for at least a first set of one or more first attributes for the defects and a second set of one or more second attributes for the defects; and

a computer subsystem configured for:

identifying values of the one or more first attributes having the most diversity in the values of the one or more first attributes;

generating a set of bins for the defects based on the identified values such that each of the bins corresponds to only a portion of the values and such that the values corresponding to the bins have diversity in the one or more first attributes, wherein generating the set of bins does not include sampling any of the defects, wherein diversification of the set of bins in the one or more first attributes is controlled by a number of the bins in the set, and wherein the number of the bins in the set is received from a user prior to the generating step;

separating the defects into the bins based on the values of the one or more first attributes corresponding to the defects, wherein separating the defects into the bins is not performed until after the set of bins have been generated;

selecting, from one of the bins, defects within the one of the bins based on diversity in values of the one or more second attributes;

repeating said selecting for at least one other of the bins; and

creating a defect sample for the wafer comprising the defects selected from the one of the bins and the at least one other of the bins.

21. The system of claim **20**, wherein the one or more first attributes comprise one or more attributes of background of the defects on the wafer.

22. The system of claim **20**, wherein the one or more second attributes comprise one or more characteristics of a signal detected for the defects in the inspection process.

23. The system of claim **20**, wherein the wafer as unknown defectivity.

24. The system of claim **20**, wherein the one or more first attributes are selected by a user.

25. The system of claim **20**, wherein the computer subsystem is further configured for determining one or more characteristics of the bins based on the defects separated into the bins, displaying the one or more characteristics to a user prior to said selecting, and requesting from the user a validation of the one or more characteristics.

26. The system of claim **20**, wherein the computer subsystem is further configured for determining one or more characteristics of the defects selected from the bins, displaying the one or more characteristics to a user prior to said creating, and requesting from the user a validation of the one or more characteristics.

27. The system of claim **20**, wherein the computer subsystem is further configured for determining a first characteristic of the bins based on the defects separated into the bins, determining a second characteristic of the defects selected from the bins, wherein the first characteristic is not the same as the second characteristic, displaying the first and second characteristics to a user prior to said creating, and requesting from the user a validation of the first and second characteristics.

28. The system of claim **20**, wherein said selecting is performed based on the diversity such that the defects selected from the one of the bins have the most diversity in the values of the one or more second attributes.

29. The system of claim **20**, wherein said selecting is performed based on the diversity and one or more sample biasing parameters.

30. The system of claim **20**, wherein the computer subsystem is further configured for separately selecting, from

the one of the bins, defects within the one of the bins based on diversity in values of one or more third attributes of the defects, wherein the computer subsystem is further configured for repeating said separately selecting for the at least one other of the bins, and wherein creating the defect sample comprises adding the defects separately selected from the one of the bins and the at least one other of the bins to the defect sample.

31. The system of claim **20**, wherein the computer subsystem is further configured for generating a set of sub-bins for a bin from which the defects were selected based on the values of the one or more second attributes such that each of the sub-bins corresponds to only a portion of the values of the one or more second attributes and such that the values of the one or more second attributes corresponding to the sub-bins have diversity in the one or more second attributes.

32. The system of claim **31**, wherein the computer subsystem is further configured for separately selecting, from one of the sub-bins, defects within the one of the sub-bins based on diversity in values of one or more third attributes of the defects, wherein the computer subsystem is further configured for repeating said separately selecting for at least one other of the sub-bins, and wherein creating the defect sample comprises adding the defects separately selected from the one of the sub-bins and the at least one other of the sub-bins to the defect sample.

33. The system of claim **20**, wherein the same number of defects are selected from each of the bins from which defects are selected.

34. The system of claim **20**, wherein said selecting is performed independently for each of the bins from which defects are selected.

35. The system of claim **20**, wherein the computer subsystem is further configured for storing information for the bins into which the defects are separated as a bin attribute for each of the defects that is separated into a bin, and Wherein said selecting and said repeating are performed based on the bin attributes of the defects.

36. The system of claim **20**, wherein the steps performed by the computer subsystem do not comprise tuning cutlines separating the bins from each other.

37. The system of claim **20**, wherein the set of bins generated for the wafer is not used as a set of bins for one or more other wafers.