KLA Instruments **MEMORANDUM**

Wafer Inspection Business Unit

July 1, 1996

TO: Distribution
FROM: Beth Topolovsky
SUBJECT: KLA 2551 PLC Minutes and Actions Items from the PLC meeting held June 25th
Next PLC: Tuesdays at 1:30, **CASE 3** Meetings: Fridays at 9:20. Both held **in Nameless**

Accomplishments:

- Joel, our Tech writer is making great progress with the v4.0 manual. **Thanks Joel, and everyone else in the group for helping out**. The manual's going to be another best seller!!!!!

Open Issues:

The following bullet items are focus areas in the 2552 group. These issues are have multiple ramifications with v4.0 release and sustaining efforts of the product.

- **1400 UPS incompatibility** The 1400 power supply code is not a plug-and-play with the 1200 code. Sharon and Lynne have been digging into the problems that branch into code sequencing errors, Sun O/S problems etc.
- **Printer** The HP1600 printer is not working correctly with the 25xx/21xx. The issues are to implement either postscript or PLC5 printer language, each having serious draw backs on speed or print quality. Raju, the 2552 contractor will be scoping the project.
- **IUNIX SunSoft patches** for v4.0 have been in the works for over a year. The impediments have been SunSofts lack of prioritization and working solutions. The 2552 engr team has received spotty patches that have taken many hours to install, and test only to find that the solution isn't viable. Sharon and I have successful escalated the attention at SunSoft (keep your fingers crossed).
- **v3.6*12** v3.6*12 is a patch including multiple fixes and enhancements. The patch has taken longer than expected to fix, test and document. The patch is now scheduled to be released and beta tested at HP and NEC on July 3rd.
- **2552 sustaining engr/manuf** I will be writing a proposal for sustaining engr for the 2552, given the transition of engineering staff to the KLArity product.
- **PC Qualification** A contractor for qualifying the new PC for the 2552 has be identified and will be ready to start June 24 on a part time basis.
- **Customer feedback** LSI and TI both have action items for the respective groups to work through. The majority of the issues are poor backups and non-responsiveness to bugs seen in the field.
- **V3.6 release to the field** v3.6 has been manufacturing released to the field for 4 months and we have not yet completed the distribution to the field. Mike Milos and Phil Desjandin are to be working this out.
- **Reliable backups** are still not resolved. New focus will be brought to the project.
- **V4.0 beta sites** We have 3 potential beta sites for v4.0. Now the key is reeling them in on time.

Attendees: V. Neil, A. Adams, Dan N., S. McCauley, L. Tran,

E-Mail Distribution:

Lauri Heath	Chuck Neilson	WISARD Defect Mktg.	L. Hirsch	J. Gutierrez
Dave Loring	Phil Desjardins	Art Schnitzer	Mike Milos	Vincent Kim
Stan Speelman	M. Bellanca	A. Kuwashima	Dale Jones	F. Carter
M. Mathews	Vicki Neil	N. Montgomery	Jeff Burns	D. Freeman
Lynne Tran	Bobby Bell	Beth Wiseman	Dave Abisia	Therese Kells
Dan Grasetti	Dave Fletcher	David Moezidis	Allen Liu	Ken WellsS.
Landstrom	Ernest Young	A. Kuwashima	Alan Loo	F. Tiu

Paper Distribution: D. McClintock, G. Dickerson, Robert Mathews, B. Bonnar, Ashok Kulkarni

Chapter 8 —The Analysis Process: Wafer Maps

This chapter gives instructions for performing wafer map analysis. Basic wafer map analysis includes the following step:

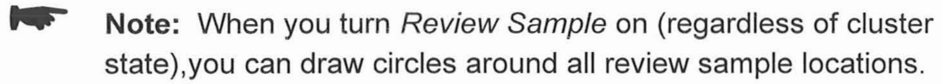
1. Creating a wafer map
2. (If desired,) deleting dice, defects, or clusters from map
3. Graphically selecting dice, defects, or clusters and continue analysis
4. (If desired,) printing wafer map or saving to file

Wafer Map Features

Unclustered defects are represented by black dots and clusters are green. Clustered and unclustered defects (with images saved) are shown in red. Comment window of single maps displays lot ID, wafer ID, and defect count. Comment window of stacked maps is empty.

A single radio button in the wafer map window allows you to turn the Review Sample feature ON or OFF. A circle is drawn around each defect which is part of the review sample when this button is pushed in. To turn Review Sample off, click on the button again.

Review Sample is valid only for results from a KLA 21XX with clustering option. Review Sample cannot be used as a GDS. Since the review sample can be for all defects, you may see empty circles (without any defects) when the wafer map is in either *clustered* or *unclustered defects* state.



Note: When you turn *Review Sample* on (regardless of cluster state),you can draw circles around all review sample locations.

Create a Wafer Map

Menu Map

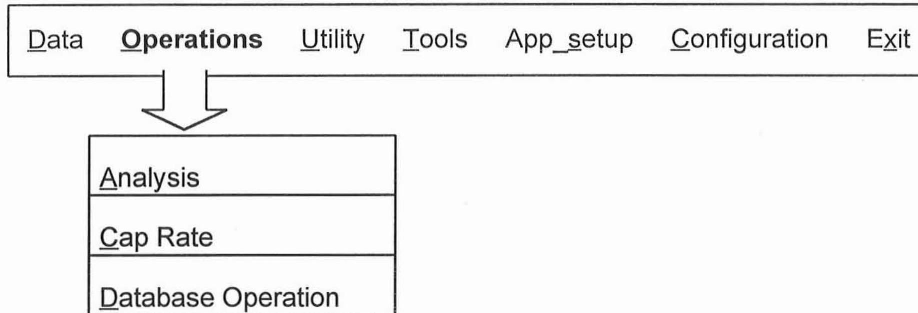


Figure 8-1. Operations Menu

To create a wafer map:

1. Select the data set you want to analyze.

2. From the main menu select **Operations**, then select *Analysis*. Click on the *Wafer Map* button—part of the Analysis Window on the left side of the screen (Figure 8-2).

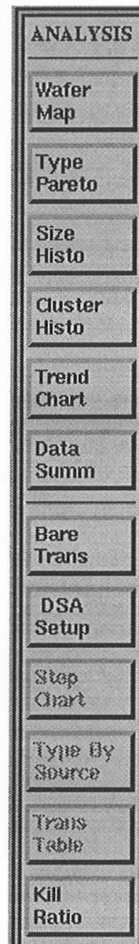


Figure 8-2 Operations Menu Produces Analysis Window

If there is only one wafer in the data set, the Wafer Map window appears (Figure 8-3). In this case, skip step 3 and go on to step 4.

For data sets with more than one wafer, select wafers you want to review from the Wafer Map list (See Figure 8-3). When you select multiple wafers in the current data set, a Wafer List box appears (Figure 8-3).

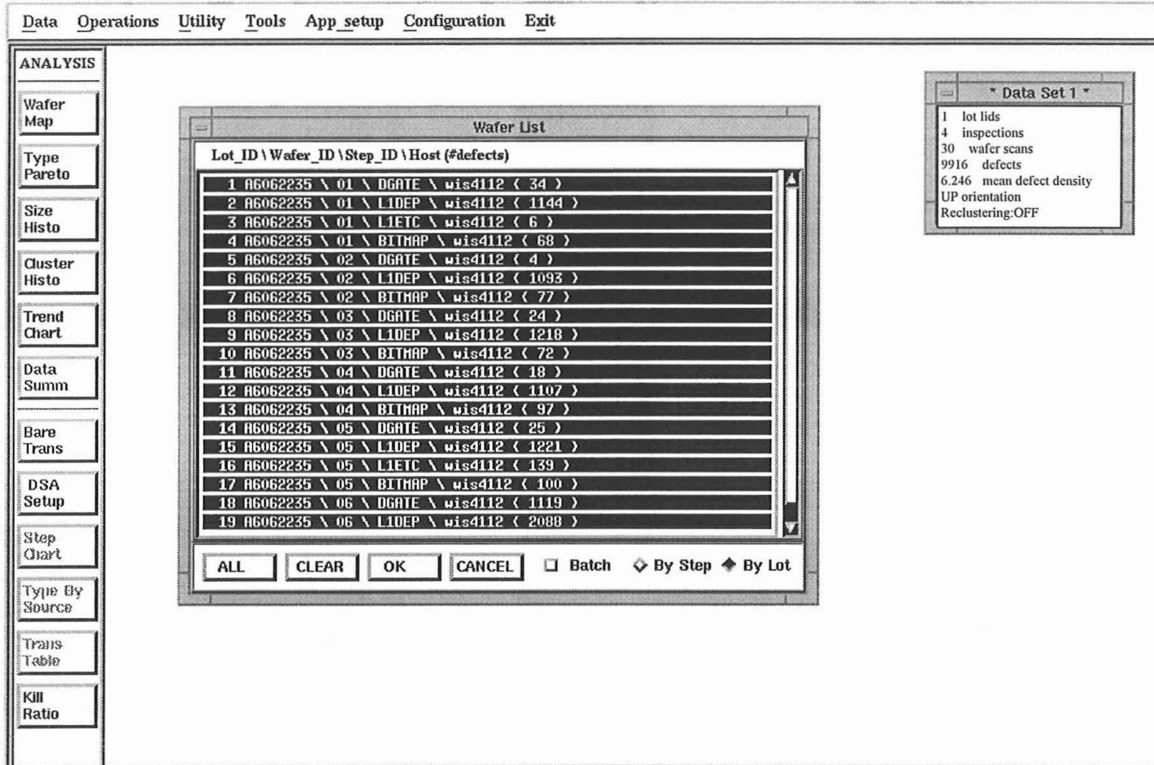


Figure 8-3. Wafer Map List

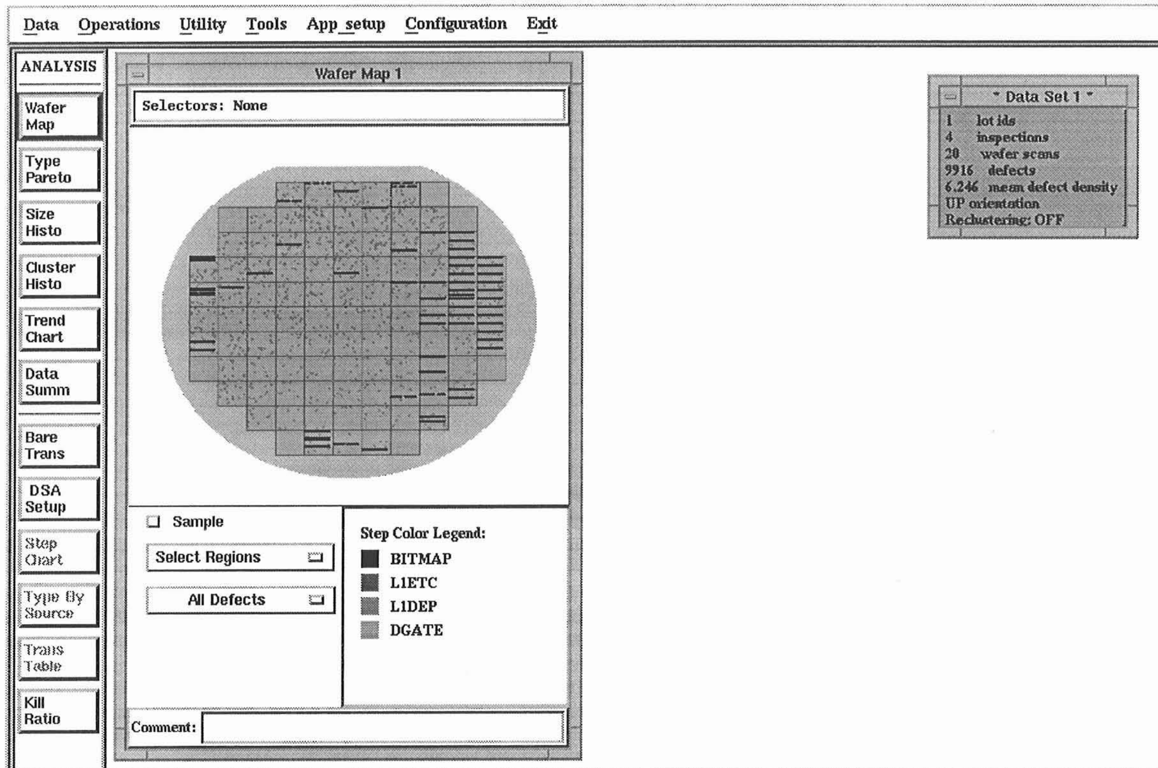


Figure 8-4. Wafer Map

Select more than one wafer on the list to combine data for several wafers into one map, or select a single wafer to view data for each map separately.

a. Select the wafers you want to include in the wafer map by clicking on them in the Wafer Map List box.

   Organize the listing of lot/wafer IDs by lot number or process step by clicking on the *By Step* or *By Lot* button, respectively.

   Toggle the *All* button to select all wafers or click on *Clear* to clear all the wafers in the list.

b. Click the *OK* button to display the wafer map.

   If you selected more than one wafer, data for all selected wafers will be stacked and displayed in a single wafer map. If the wafer results being stacked come from different setups with different die sizes, defects will be displayed without die outlines.

   If the wafers are different sizes or some are notched and others are flatted, an error message will appear. A wafer map cannot be drawn in this case.

4. Display the Wafer Map pop-up menu by clicking on the right button of the trackball while the cursor is positioned over the wafer map.

5. Select *Next Wafer* or *Previous Wafer* to toggle the display to different maps in the data set. The Next Wafer and Previous Wafer commands are only enabled when you are viewing individual wafer maps from a multiple wafer data set. These selections are disabled if you are viewing data for more than one wafer on a single wafer map, or if you are viewing data for only one wafer.
6. To classify defects from a single wafer map, select *Classify* in the pop-up menu. Use GDS to select dice, clusters or individual defects and classify.
7. To display the wafer list, select *Wafer List* in the Wafer Map pop-up menu.

   The Wafer List displays data about current selections in the map. You cannot, however, use the Wafer List to change data displayed in the wafer map.
8. To view a die map for one of the dice in the wafer map:
   a. Click on the desired die with the left button of the trackball to display a die map (Figure 8-9).
   b. Select individual defects in the die map by clicking on them in the map, or by selecting them in the scrolling list at the bottom of the window.
   c. To review images, select *Image Review* from the pop-up menu of the Die Map or the Wafer Map. Refer to Chapter 8, <ins>Storing and Accessing Images</ins>, for additional details.
   d. When you are done viewing defects for the die map, click on the *Close Window* button to close the window.
   e. To print just the defect list, select *Output Defect List* from the pop-up menu.
   f. To print just the die map, select *Output Die Map* from the pop-up menu.
9. To delete dice, defects in a region, or clusters in a region from the wafer map:

Note: Once you delete a die from the wafer map, it is permanently deleted from the 255X database.

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   a. Select toggle switches for *Regions*, *Clusters* or *Die*. Click with the middle mouse button and drag around the regions of defects, clusters or dice to be deleted. Alternatively, you can click on individual dice, defects or clusters with the middle mouse button to select them. Or, you can choose *Select All* from the wafer map pop-up menu.

Note: If the wafer map is in the Clustered Defects state and you choose *Select All* from the pop-up menu, then click on *Delete*, only dice with clustered defects are deleted. The same is true for the Classify function. Defects which cannot currently be seen on the wafer are also affected by this action.

b. Select *Delete* in the Wafer Map pop-up menu.

10. If desired, use graphical data selectors to create a more specialized analysis:

    a. Select the regions, clusters or dice you want to use with the middle button of the trackball. To select a single cluster, defect or die, click once. To select more than one, click and drag or do multiple clicks. You can also use [Shift] + [click and drag] to ~~make multiple selections.~~ deselect areas.

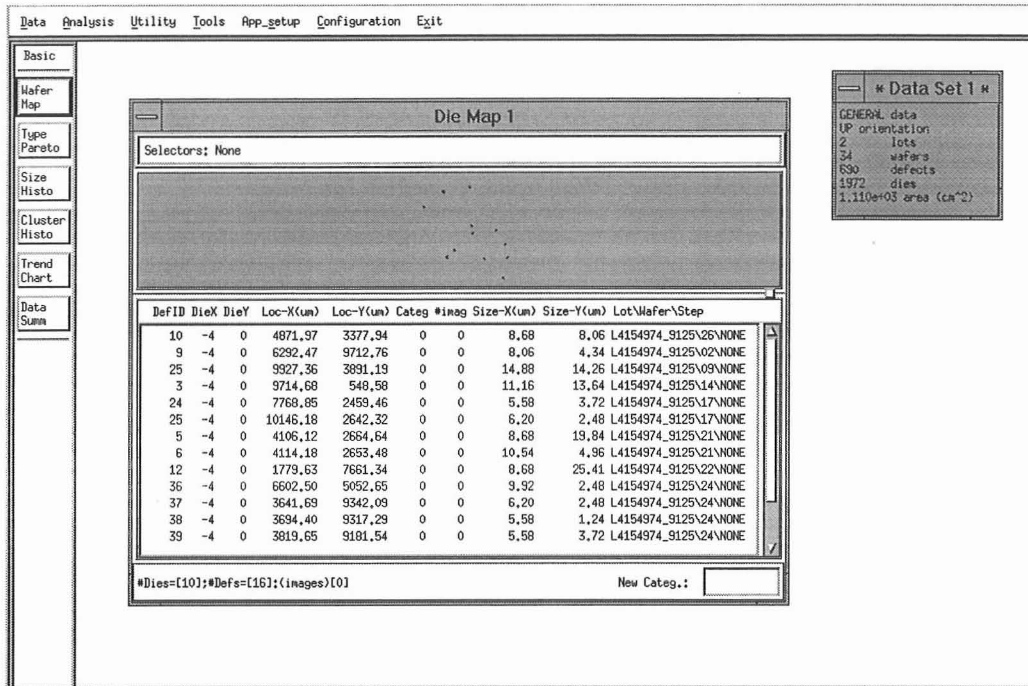
    b. Click on one of the analysis buttons in the left column of the main application window (such as *Pareto Chart*).

    c. If desired, you can further specialize the data by repeating steps 10a–b to create a "second generation" analysis with graphical data selectors.

11. Look at Details. If desired you can look at details related to your selection. Select *Details* from the pop-up window to view the following information:

    - Total defects
    - Unclustered defects
    - # of clusters
    - # of defective dice
    - # of dice with clusters
    - Cluster threshold
    - Minimum cluster size

Defect deletion is limited to the "Super user" group.



DefID	DieX	DieY	Loc-X(um)	Loc-Y(um)	Categ	#imag	Size-X(um)	Size-Y(um)	Lot\Wafer\Step
10	-4	0	4871.97	3377.94	0	0	8.68	8.06	L4154974_9125\26\NONE
9	-4	0	6292.47	9712.76	0	0	8.06	4.34	L4154974_9125\02\NONE
25	-4	0	9927.36	3891.19	0	0	14.88	14.26	L4154974_9125\09\NONE
3	-4	0	9714.68	548.58	0	0	11.16	13.64	L4154974_9125\14\NONE
24	-4	0	7768.85	2459.46	0	0	5.58	3.72	L4154974_9125\17\NONE
25	-4	0	10146.18	2642.32	0	0	6.20	2.48	L4154974_9125\17\NONE
5	-4	0	4106.12	2664.64	0	0	8.68	19.84	L4154974_9125\21\NONE
6	-4	0	4114.18	2653.48	0	0	10.54	4.96	L4154974_9125\21\NONE
12	-4	0	1779.63	7661.34	0	0	8.68	25.41	L4154974_9125\22\NONE
36	-4	0	6602.50	5052.65	0	0	9.92	2.48	L4154974_9125\24\NONE
37	-4	0	3641.69	9342.09	0	0	6.20	2.48	L4154974_9125\24\NONE
38	-4	0	3694.40	9317.29	0	0	5.58	1.24	L4154974_9125\24\NONE
39	-4	0	3819.65	9181.54	0	0	5.58	3.72	L4154974_9125\24\NONE

Figure 8-4. Die Map

Pop-up Menu and Common Chart Features

For more information on options and features common to all charts (i.e., GDS, outputting charts, chart annotation, etc.), see the sections at the beginning of this chapter titled: Pop-up Menu Features and Common Chart Features.

Customizing a Wafer Map

To customize the Wafer Map Display:

1. Place the cursor over the wafer map you want to customize; click the right trackball button; select *Set Parameters* from the pop-up menu
2. Standard Color Coding shows unclustered defects as black dots, clustered defects as green dots, defects with images as red dots.

3. Color Coding by Common/Added/Removed is available for Wafer Maps which have been through DSA calculation and where only two steps are in the map. The three colors in display represent:

   - Defects common to both steps
   - Defects seen only on the earlier step
   - Defects seen only on the later step

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