ELIONIX

ELS-7500EX
ECA Training Manual

3.Exposure Condition and Execution

Elionix Inc.

Starting the Program

User accounts are set by default as shown below.

1. Limited User
   Login account "ELS-7500"
   Password "ELS75"

2. Administrator
   Login account "Administrator"
   Password "ELS75"

Normally, the "ELS-7500" limited user account should be entered.
Note that WecaS cannot be started unless the SEM PC side system has been started. Always check before attempting to start WecaS.

1

Before actual exposure, there are several items that should be confirmed. These items are the exposure conditions. Electron beam current and dose time conditions must be decided based on the type of CAD pattern and sample.
In this training, you can determine optimal dose conditions when exposing with the following conditions.

   Pattern: L&S pattern used in the manual #1 "Pattern Designing by CAD"
   Sample: 3 inch Si wafer
   Resist: ZEP520A
   Beam current: 50pA

This document explains the procedures involved.

Determining appropriate dose time
The following two procedures are used to determine appropriate dose time.
(1) A dose calculator is used to estimate dose time.
(2) Several exposures with different dose time between over dose, estimate dose, and under dose is performed; the best result gives you the appropriate dose time.

The step (2) involves same pattern exposure with different dose time and SEM inspection of the exposure result.

The procedure is as shown below.

1. Use [WecaS] Calculation Software to Calculate Dose Time
2. Call the Pattern
3. Create the Schedule File
4. Set Option Configuration
5. Save Scheduling Data
6. Perform Exposure

Each of these steps is explained, in order.

2

Procedure:

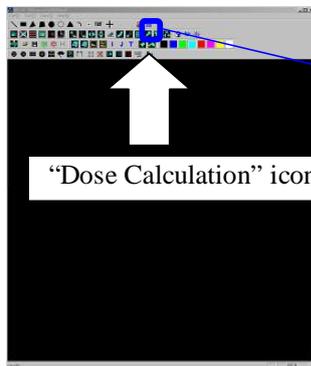1. Double-click the shortcut [icon] in the monitor.

: <sp>

Double-click this icon.

 Note If WecaS does not start:
If the SEM PC program has not been started up,
WecaS does not start up. Always check before
attempting to start WecaS.

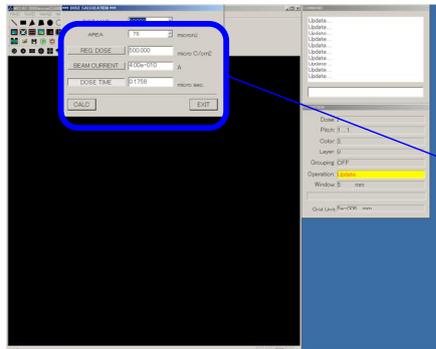2. WecaS starts up. Click the [icon] ("Dose Calculation" icon).
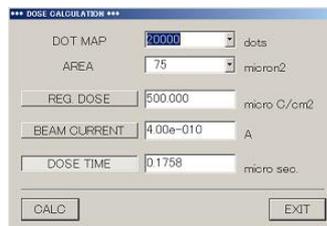

"Dose Calculation" icon

Click the "Dose Calculation" icon.
Perform dose time calculation.

3. The DOSE CALCULATION window appears.

DOSE CALCULATION window

3

4. Specify the number of chip divisions. From the "DOT MAP" drop-down list, select "60,000".

Number of dot in a chip selection

5. Set the chip size. From the "AREA" drop-down list, select "300".

Chip size selection

6. Type "70" for the "REG DOSE" .

[REG DOSE]
This value is determined by the resist sensitivity.

4

7.   Type "5.00e-011" for the "BEAM CURRENT".

DOT MAP   60000   ▼ dots
AREA   300   ▼ micron2
REG. DOSE   70   micro C/cm2
BEAM CURRENT   5.00e-011   A
DOSE TIME   0.1758   micro sec.

CALC   EXIT

[BEAM CURRENT]
For this example, use 50pA.
Type it in the unit of Ampere.

8.   After confirming that the "DOSE TIME" button has been clicked, click
      the "CALC" button.

DOT MAP   60000   ▼ dots
AREA   300   ▼ micron2
REG. DOSE   70   micro C/cm2
BEAM CURRENT   5.00e-011   A
DOSE TIME   0.3500   micro sec.

CALC   EXIT

DOSE TIME   <=When button has been clicked

DOSE TIME   <=When button has not been clicked

When the "CALC" button is clicked, the
dose time is calculated.
In this case, a dose time of 0.35usec/dot
is calculated.

9.   Click the "Exit" button to finish.

DOT MAP   60000   ▼ dots
AREA   300   ▼ micron2
REG. DOSE   70   micro C/cm2
BEAM CURRENT   5.00e-011   A
DOSE TIME   0.3500   micro sec.

CALC   EXIT

EXIT

When the "EXIT" button is clicked,
the DOSE CALCULATION window
is closed.

5

: **\<sp\>**

Procedure:

1   Click the 📂 "Open File" icon and open the pattern file.
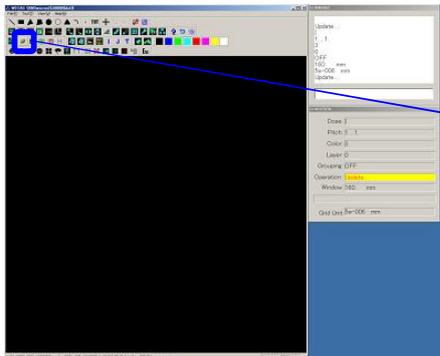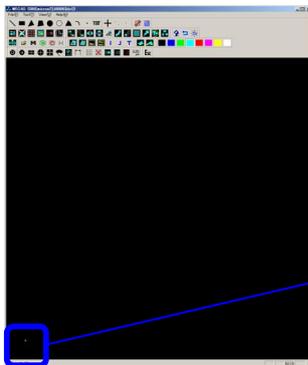

Click the "Open File" icon.

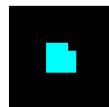2   The Open File window is shown. Open the "01TEST.CO6" file.
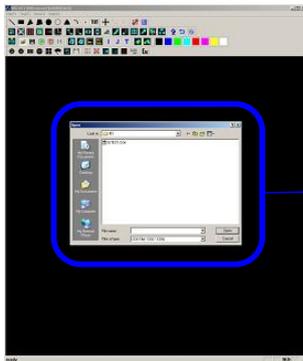
[Open File window]
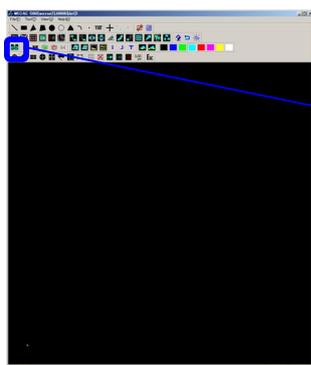
3   That file opens, and you can confirm the CAD pattern.

[The CAD pattern is opened]

6

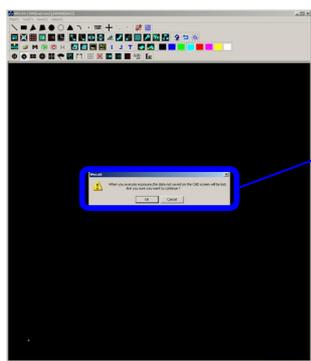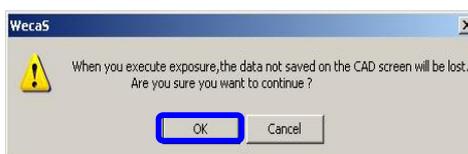4   The CAD pattern has been confirmed. Now, Click the "Perform Exposing" icon.

["Perform Exposing" icon]


5   A warning window appears. Click the "OK" button.

[Warning window]

WecaS

When you execute exposure, the data not saved on the CAD screen will be lost.
Are you sure you want to continue ?

OK   Cancel

[Reference]The warning window

This window appears to inform the user that changes which have been made is not saved. In this example, no changes have been made, so disregard the warning and continue with the procedure.

6   The Edit Schedule File window appears. Use this window to set write conditions.
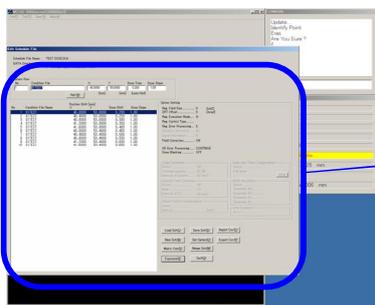
[Edit Schedule File window]

7
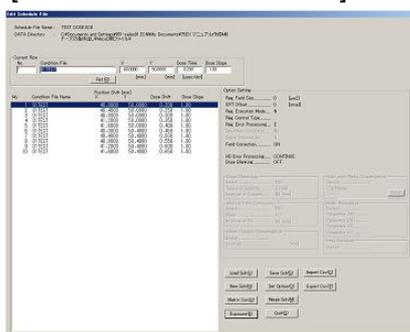
Procedure:

: <sp>

1. On the Edit Schedule File window, click New Sch(N) "New Sch(N)".
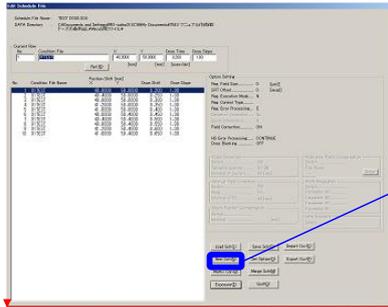
[Open File window]

New Sch(N)

: <sp>

Click "New Sch(N)" to create a new schedule file.

2. The present schedule file is cleared.
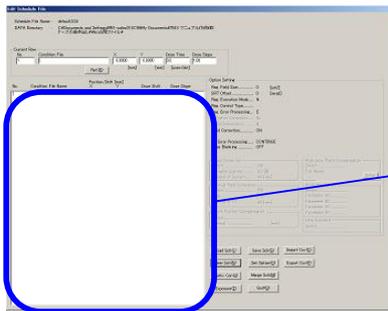
The schedule file is cleared so that a new schedule file can be created.

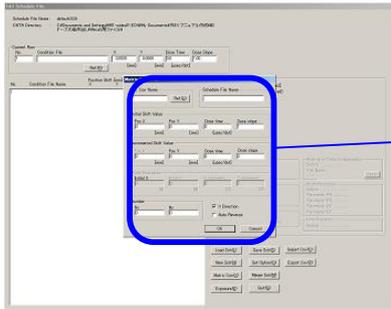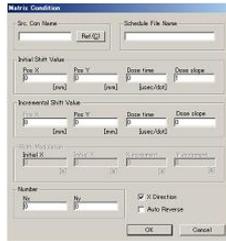3. On the Edit Schedule File window, click Matrix Con(X) "Matrix Con".
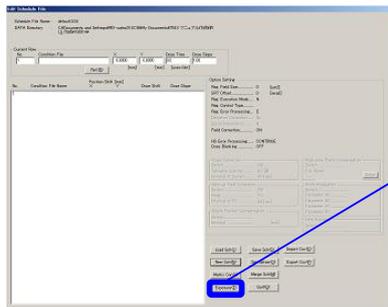
[Open File window]

Matrix Con(X)

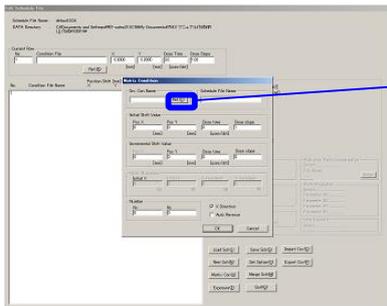Arrange drawing data in matrix form, assign dose conditions, and perform writing.

8

4. The Matrix Condition window is shown.

[Matrix Condition window]

5. Click the **Ref.(C)** "Ref" button in order to select a drawing file.

["Ref" button]

Ref.(C)

6. The Select Condition File window appears. Select "01TEST.CON" file.
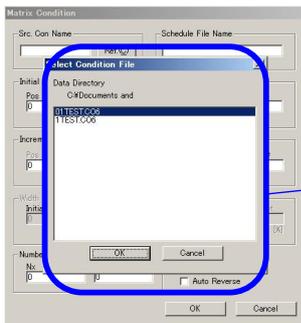
[Select Condition File window]

7.   Type the name of the schedule file. Type "test dose".

8.   Decide where to position the drawing data. Type "40" for "Pos X" and
        "40" for "Pos Y".

[Pos X and Pos Y (Initial Shift Value)]
Drawing data "01TEST.CO6" has the chip at the
(10mm, 10mm) of the global coordinate system. By
adding the Initial Shift Value of (40mm, 40mm), the
chip is placed at (50mm,50mm) where 3inch wafer
occupies the stage position.

9.   Type the dose time. Type "0.2".

[Dose time]
Type the dose time for exposure. Type "0.2" even though the
dose time calculated earlier is "0.35". In this example, you are
going to expose several chips with different dose time of "0.2,
0.25,0.30, and so on" to find appropriate dose time. So, the
dose time "0.2" is just a starting value.

10

10. Type the amounts to shift CON file(or a chip in this example) in the X and Y directions in order to position in matrix form. Type "0.4" for both "Pos X" and "Pos Y".

[Pos X and Pos Y (Incremental Shift Value)]
Type the amount by which to shift the drawing data to position it in matrix form. In this example, a chip size is 300um; the shift value of 0.4mm is sufficient to form matrix chip.

11. Type the dose time incremental shift amount. Type "0.05".

[Dose time (Incremental Shift Value)]
The dose time is also in matrix form. Thus, starting from a chip with the initial value of 0.2usec/dot(see step9), the following chips bear the dose time of 0.25, 0.30, 0.35usec/dot, and so on. (incremented by 0.05usec/dot).

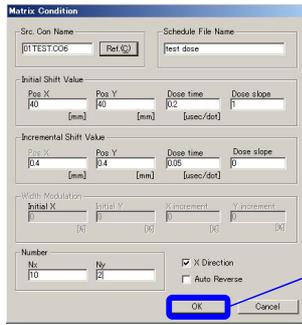12. Specify the number of CON file to be drawn in the matrix. Type "10" for "Nx", and "2" for "Ny".

[Number]
This specifies the number of CON file is to be drawn. In this example, 10 peaces in the X direction, and 2 peaces in the Y direction becomes the total of 20 copies.

11

13. Close the Matrix Condition window. Click the [OK] "OK" button.

"OK" button

14. Confirm that the schedule file registered in the Edit Schedule File window appears.
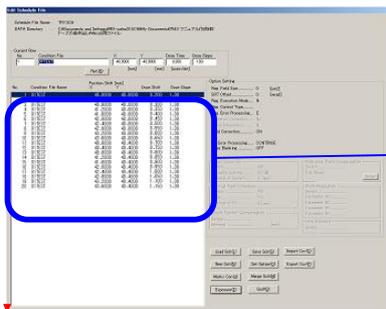
1	01TEST	40.0000	40.0000	0.200	1.00
2	01TEST	40.4000	40.0000	0.250	1.00
3	01TEST	40.8000	40.0000	0.300	1.00
4	01TEST	41.2000	40.0000	0.350	1.00
5	01TEST	41.6000	40.0000	0.400	1.00
6	01TEST	42.0000	40.0000	0.450	1.00
7	01TEST	42.4000	40.0000	0.500	1.00
8	01TEST	42.8000	40.0000	0.550	1.00
9	01TEST	43.2000	40.0000	0.600	1.00
10	01TEST	43.6000	40.0000	0.650	1.00
11	01TEST	40.0000	40.4000	0.700	1.00
12	01TEST	40.4000	40.4000	0.750	1.00
13	01TEST	40.8000	40.4000	0.800	1.00
14	01TEST	41.2000	40.4000	0.850	1.00
15	01TEST	41.6000	40.4000	0.900	1.00
16	01TEST	42.0000	40.4000	0.950	1.00
17	01TEST	42.4000	40.4000	1.000	1.00
18	01TEST	42.8000	40.4000	1.050	1.00
19	01TEST	43.2000	40.4000	1.100	1.00
20	01TEST	43.6000	40.4000	1.150	1.00

: <sp>

12

Procedure:

: **\<sp\>**

1. Set the conditions related to exposure. Click the [Set Option(O)] button.
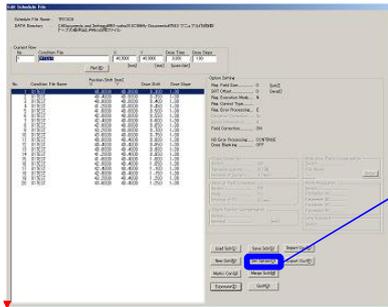
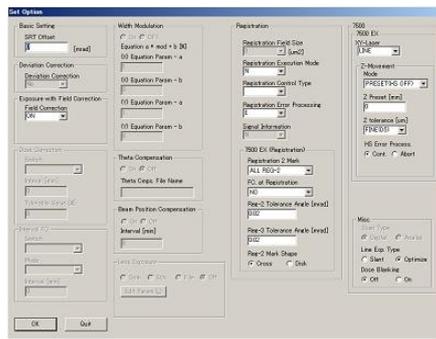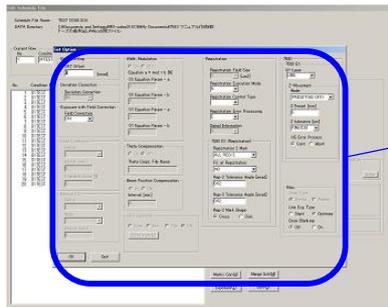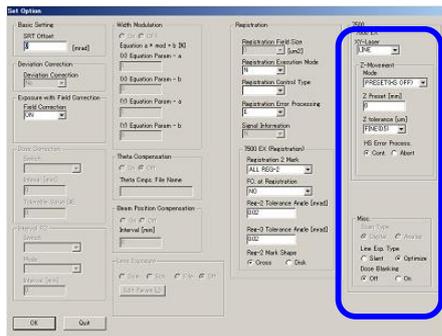
["Set Option" button]

[Set Option(O)]

: **\<sp\>**

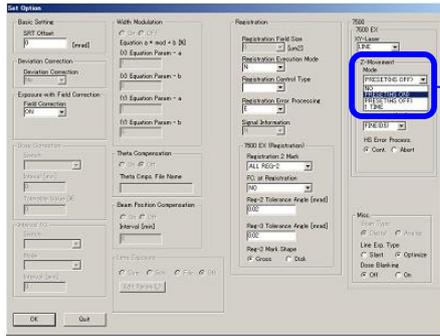2. The Set Option window is shown.

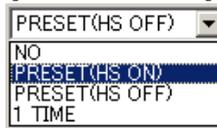3. Set the items in the 7500 section of the Set Option window.

[7500 items]

13

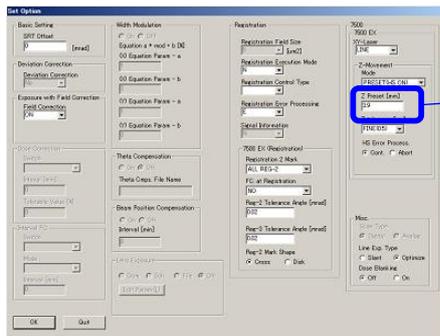4   Select "PRESET(HS ON)" under the "Z Movement" and "Mode".

[Mode selection]

This turns on the height sensor during exposing.


5   Type "3.9" for the "Z Preset" .

[Z Preset]

Z Preset [mm]

3.9

[Z Preset]
When exposure starts, the stage moves to the 1st chip (X, Y) position, and Z position specified here. Then, height sensing begins. As for A 3 inch wafer, the wafer's top surface is approximately the 3.9mm, and this preset contributes reducing height sensing time.

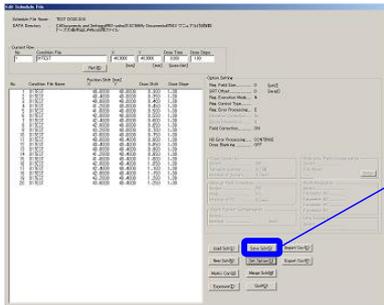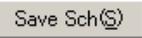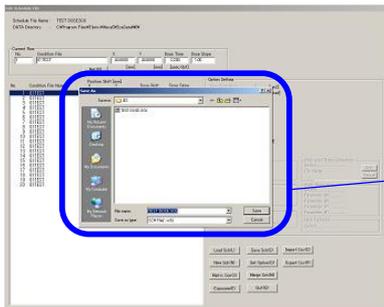6   This completes the configuration process. Click the [OK] button.

["OK" button]

OK

14

: **<sp>**
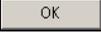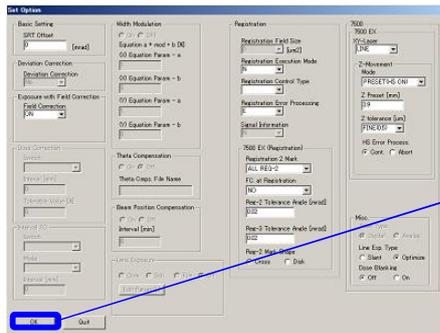
Procedure:

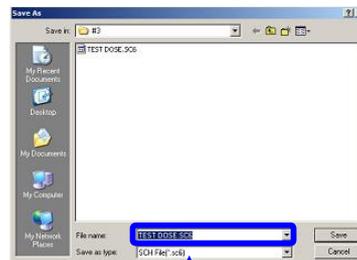1.   Save the scheduling data which has been created. Click the [Save Sch(S)] button.

["Save Sch" button]

2.   "Save As..." window appears. Type "TEST DOSE" in the file name box.

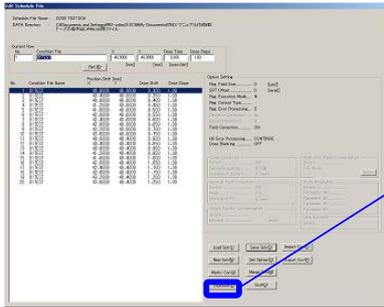[Save As... window]

File name box

3.   Click the [Save] "Save" icon.

["Save" button]

15

: <sp>

Procedure:

1.   Click the [Exposure(E)] button to perform writing.

["Exposure" button]

Exposure(E)
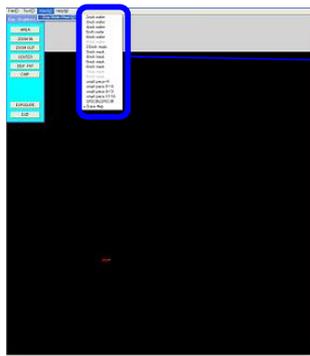
2.   The WecaS screen is displayed.

3.   On the menu, click "View(V)", and select "Disp Wafer/Mask".

[Menu bar VIEW(V) command]

View(V)   Help(H)

Disp Wafer/Mask(D)   ▶

16

4.   On the menu, click "3inch wafer".

[Select "3inch wafer" from the menu]

2inch wafer
3inch wafer
4inch wafer
5inth wafer
6inch wafer
8inch wafer
2.5inch mask
3inch mask
4inch mask
5inch mask
6inch mask
7inch mask
8inch mask
small piece-R
small piece 5-10
small piece 8-13
small piece 13-18
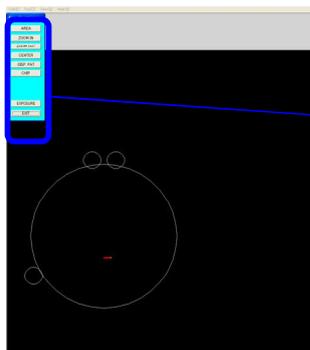SPECIALSPEC.#1
✓ Erase Map

5.   An illustration of the 3inch wafer is displayed on-screen. You can see
      that the chip, displayed in red, falls within the 3inch wafer area.
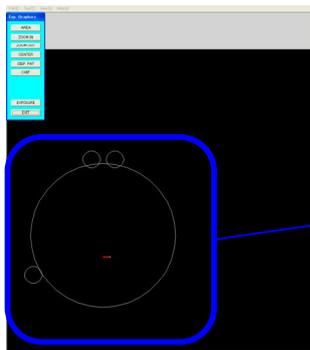
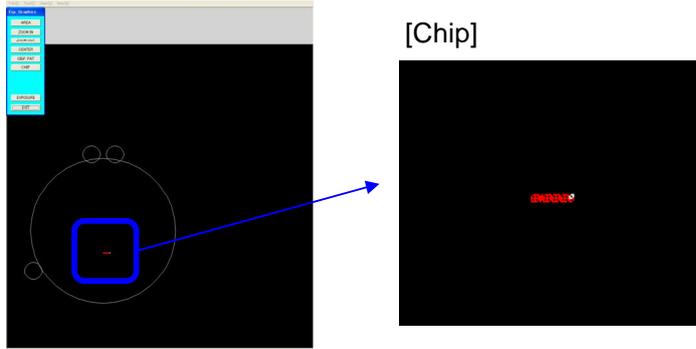[An illustration of the 3inch wafer is displayed on-screen]
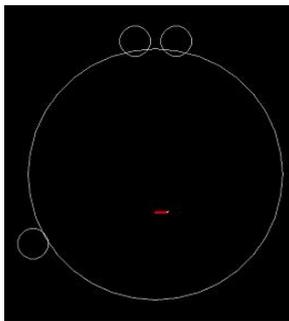
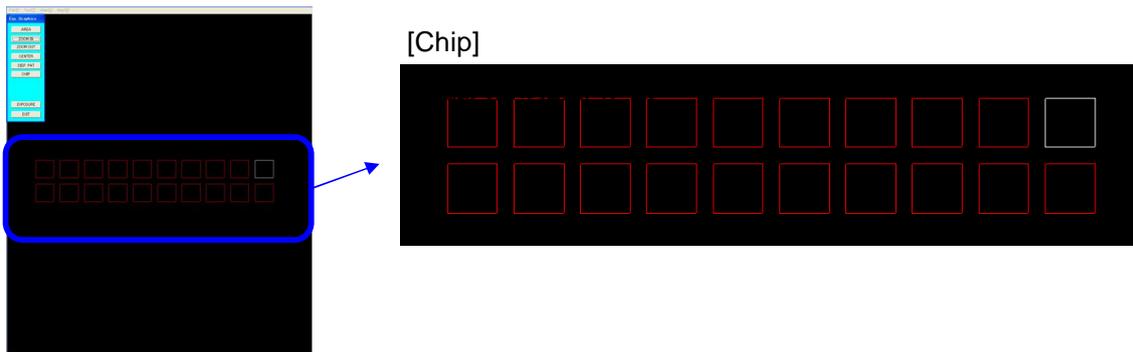6.   Click the "ZOOM IN" button on the Exp. Graphics window.
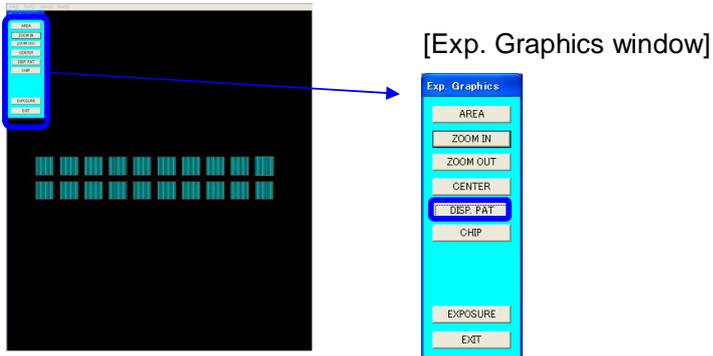
[Exp. Graphics window]

Exp. Graphics
AREA
ZOOM IN
ZOOM OUT
CENTER
DISP. PAT
CHIP

EXPOSURE
EXIT

17

7. Click around the chip in red.

[Chip]

8. Click several times on the figure, until the entire display area is filled by the pattern.

[Chip]

9. Clicking on the "DISP. PAT" button on the Exp. Then, Graphics window causes the pattern to be displayed in the chip.

[Exp. Graphics window]

18

10. Click the "EXPOSURE" button on the Exp. Graphics window. Then,
     drawing begins with specified conditions.

[Exp. Graphics window]

: <sp><sp><sp>

19

: <sp><sp><sp>