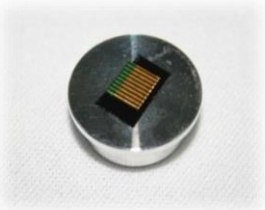
HIROX SYNERGIE 4

Draft. 2019-07

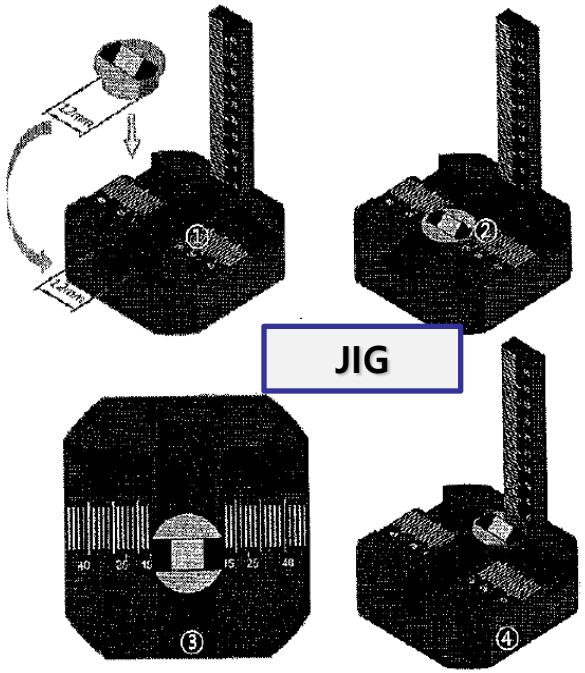
Quick User Guide Hirox SH-5500(P) Mini-SEM

Quick Manual (1) – Sample Preparation and Placement



1. Sample prepared. (15mm, 25mm Stub provided /aspect : 45°, 90° Tilt Stub provided)

2. Check the height and width of sample(mm) using "Jig."



3. Fill the measurement on Nano-eye "sample information" window and press Enter for both value,

Here we have a 15mm width / 1mm height sample

The stage must be calibrated and not tilted.

Do the calibration only if the door is open.

To ensure BSE security, is better to add 5mm to the measured height

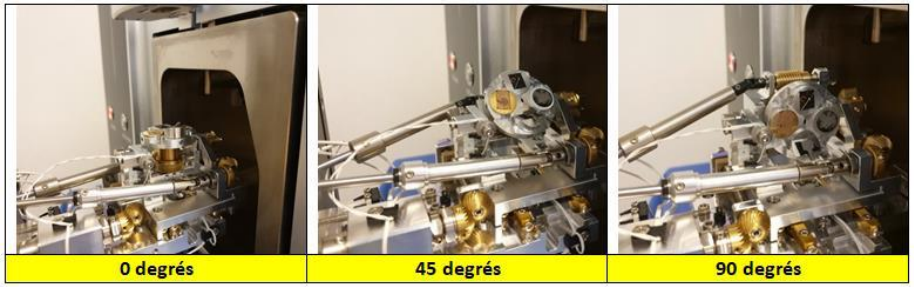
Enter W : 15 and H 1+5= 6 mm

* How to fix : to tighten screw (Wrench Size : 1.5mm)

4. Put you sample on the stage

5. Mid-close the door to place the sample under the camera and click on the camera icon

6. Close the door and press the exchange button to turn the pumping on



Quick Manual (2) – Equipment preparation, Start and Stop

1. Turn the power switch ON.

2. Start the program by double-clicking Nano-eye icon on the PC screen

2. Open the door and calibrate the stage first
When the stage is calibrated, unfasten the sample holder (Stub).
Then, change a sample and fasten it again, don't forget to go home and set the measured values as (p1) .
(See Quick Manual)

3. Mid-close the door to camera position, get your reference image and close the door.

4. Start vacuum mode by pressing "Exchange" button. (3min)
- Try to open the door to check vacuum created well.
- Once vacuum is created well, signal tone rings twice and LED blink stops.

※ If the signal tone continues, it's a bad vacuum alert push the door and press "Exchange" button again.

5. After inspection, click "Operation" mode to activate operation table, and then click "Stop" button to stop the high pressure.

6. Release the vacuum by pressing "Exchange" (within 4min)

Quick Manual (3) – SEM S/W start, condition set-up

1. . Run S/W by double-clicking Nanoeye Icon on the desktop

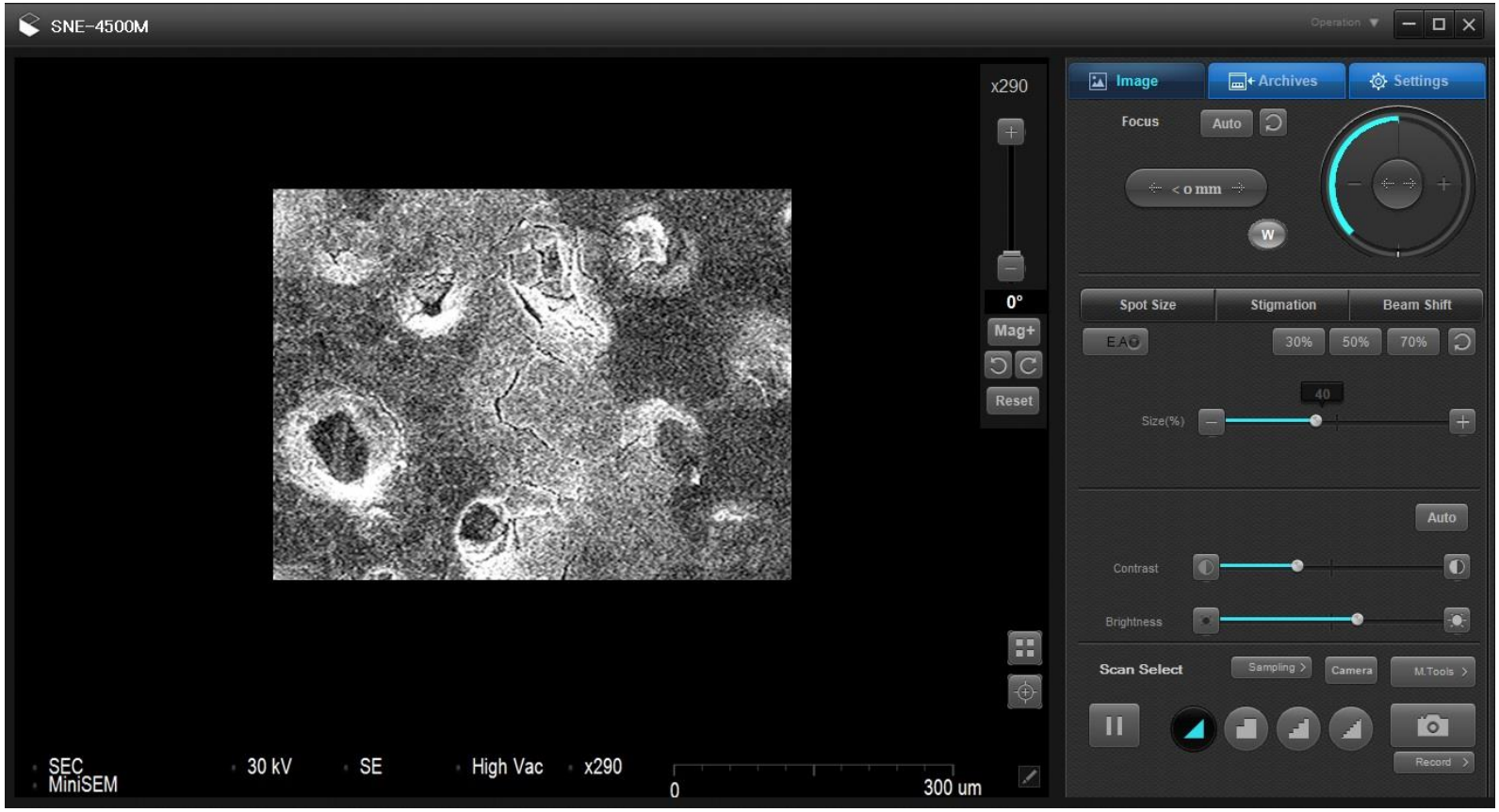
2. Select accelerating voltage to use in start set-up. (5~30kV)
- The higher accelerating voltage is, the better resolution SEM gets.

3. Select the detector to use in SE / BSE Detector mode.

4. Click START button, and then electron beam generates and inspection starts.

1. When SEM power is OFF or connection of SEM and PC Cable is bad, program may not run.
2. High Vacuum, but Low Vacuum possible according to the purpose of inspection (in BSE mode only)
3. Check if the current value in the top right corner goes up (higher than 100uA) / Using **40~60uA** shortens life of Filament (image not shown

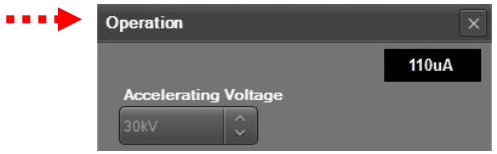
Quick Manual (4) – Live Mode, and Inspection Range



1. Initial screen starts in the small window (Live Mode – Real Time) as above.
   - When the image became dark, adjust "Spot Size (Quantity of Beam)." (The lower its value is, the brighter image is / 10~30%)

※ In case image is invisible completely

1) Check the filament value. (Click "Operation" in top right corner to check filament gone (Beam Current)
2) Adjust Variable Aperture Align on the right side of equipment
   - Turn Y-axis into clockwise or counterclockwise and check Beam Center Position (SEE an Appendix)



Quick Manual (5) – Magnification and Focus

1. Select the inspection position by using stage navigator or just by clicking on the picture

2. After inspection position selected, increase or decrease its magnification by scrolling mouse wheel up and down.

- Scrolling up : magnification increases.
- Scrolling down : magnification decreases.

3. Adjust focus by clicking mouse button in the focus area.

- Finding focus first in the range of min. 1,000 magnification, and then select adequate magnification based on size and resolution seen.

※ How to adjust focus (Click left button of mouse once – Never drag)

1) Coarse Focus : Find focus in the widest range (1st). Drag cursor to the left or right while clicking 

, and take it off at the clearest location.

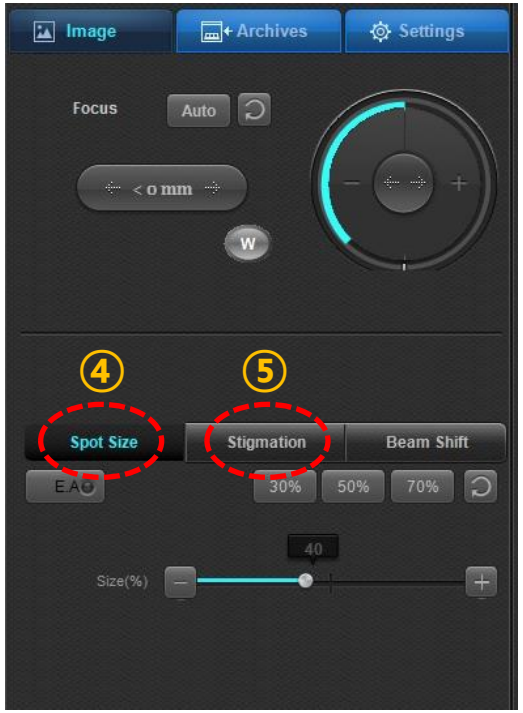
- This is just for the initial focusing, and followed by "Fine Focus."

2) Fine Focus : This function is for <u>detailed focusing</u>, which is usually used after "Coarse Focus" and has the same working procedure.

※ When you clicking Focus button, "↔" cursor appears and re-clicking mouse needs for release.

※ When image moves up, down/ to the left, right hard during focusing, adjust the Beam using (Wobble) (See Appendix)

Quick Manual (6) – Adjustment of Spot size, and Stigmation



4. Resolution, contrast, and brightness can be controlled by adjusting "Quantity and Size of beam" in Spot Size mode. (Click once left button of mouse, and additional click for release)

   1) 10~30% : The brightest image is shown, but limited focusing due to the high energy under high magnification (over 10,000x, edge droop).

   2) 30~50% : The most adequate level of image is shown. (with 10,000 to 30,000x)

   3) 50~90% : The highest resolution can be gotten (with about 50,000x), but image becomes dark.

※ Spot Size Mode might have some differences from the method above based on sample features and equipment condition, so set up Spot Size Mode to use depending on the inspection condition.

5. Stigmation mode is a function of "astigmatism correction." It gathers Beam and makes clearer and sharper edge by dragging x and Y-axis.

   1) When ess than 3,000 magnification, this is not used (No big change and difference)

   2) When clear image is not shown after adjustment of focus, select the clearest location by dragging X, Y bar long to the left or right.

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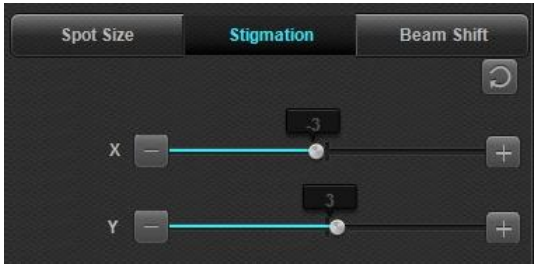
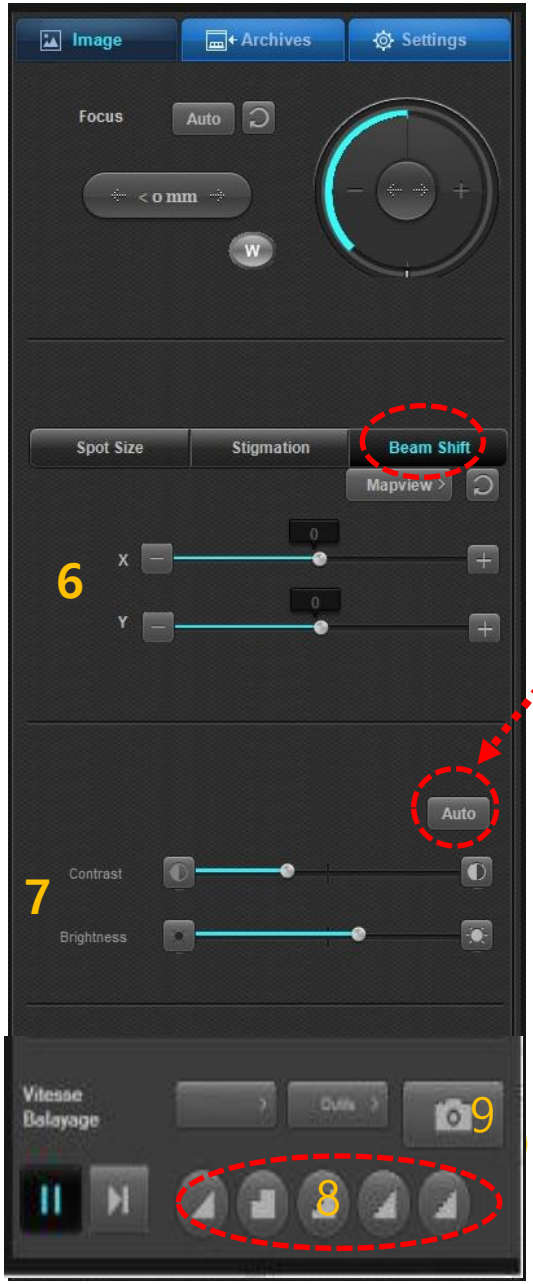


※ When only for "Stigmation", click the right side button of mouse

- Left button: for detailed movement
- Right button : for wide movement

Quick Manual (7) – Beam Shift, C/B, Image saving



6. Beam Shift function can move beam slightly to X and Y direction by clicking and moving bars to the left and right. (horizontal, vertical)
   - Stage(X, Y) : Beam fixed, move beam by using stage handles (40mm)
   - Beam(X, Y) : Stage fixed, move beam by adjusting Beam (100um)

   ※ Stage handles for wide movement, and Beam Shift for detailed movement, especially its magnification is more than 1,000x

7. The further they moves to the right, the brighter (and rougher) contrast and brightness of image become. And the further they moves to the left, the darker they are

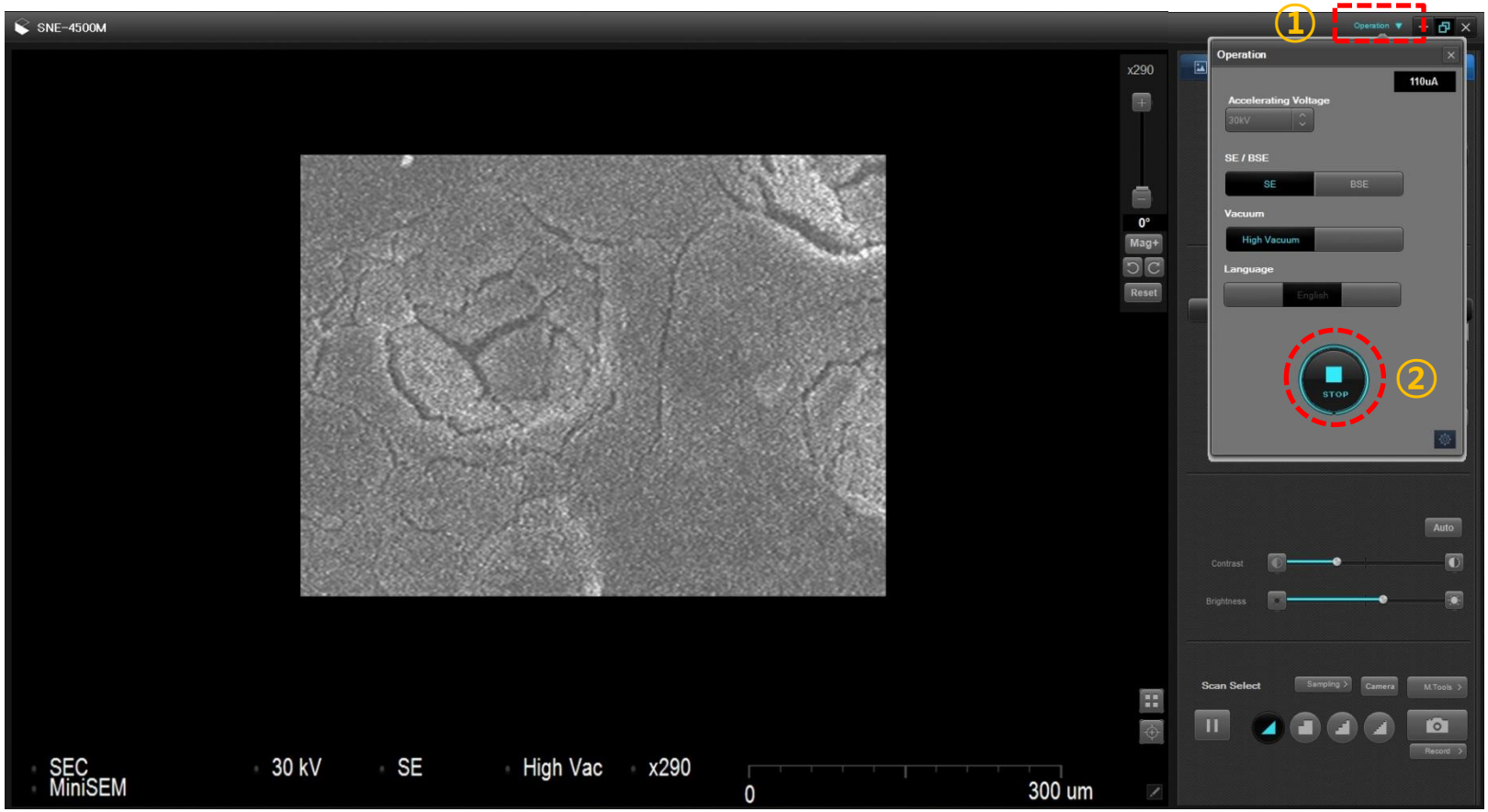
   Frequent usage of Auto button will help get the median value of image quickly.

8. Image observation (Scanning) modes :
   1) Fast scan (Real Time 320x240 : 0 sec) = Focusing and movement.
   2) Slow scan (Whole Scan 640x480 : 3 sec) = Checking and revision before saving image
   3) Fast Photo 1 (Picture Save 1280x960 : 30 sec) = saving High resolution image
   4) Slow Photo 2 (Picture Save 2560x1920 : 60 sec) = saving Highest resolution image

9. When saving the image, click the Camera button after Save Mode above
   - Save Method #1: Click the Camera button after Save mode
   - Save Method #2: Click the Camera button after Temporary mode  or stop after scanning 

   (when using Measuring)

Quick Manual (8) – Closing Image Analysis (Closing Equipment)



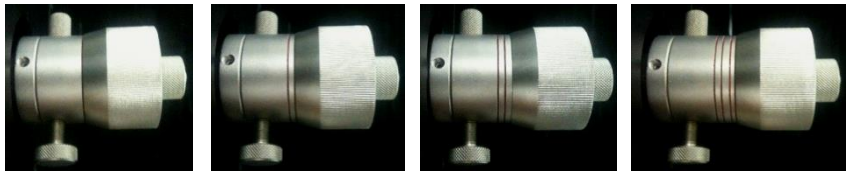
10. Click “Operation” button in the upper part of SEM Software to end analysis. After that, operation table above is activated and stop the system by clicking “STOP” button. (Turning off the electron beam)

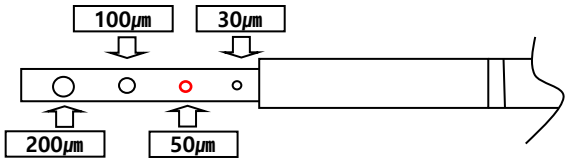
- Changing Accelerating Voltage during inspection, click “STOP” button (turning off the electron beam) and change “Accelerating Voltage”s, and click “Start” button

※ Release vacuum by pressing “Exchange” button on the door to take a sample out and replace.

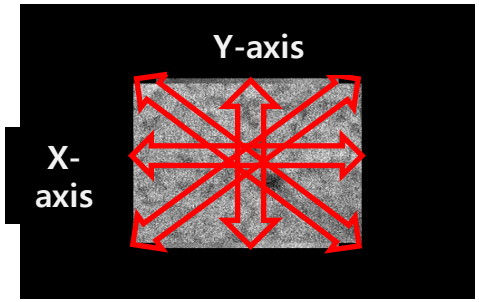
Quick Manual (9) – Appendix : Variable Aperture

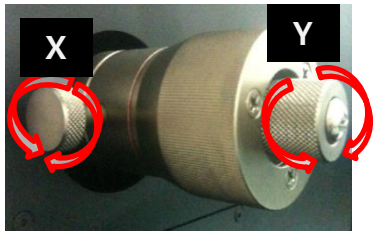
Variable Aperture (4 Stages)





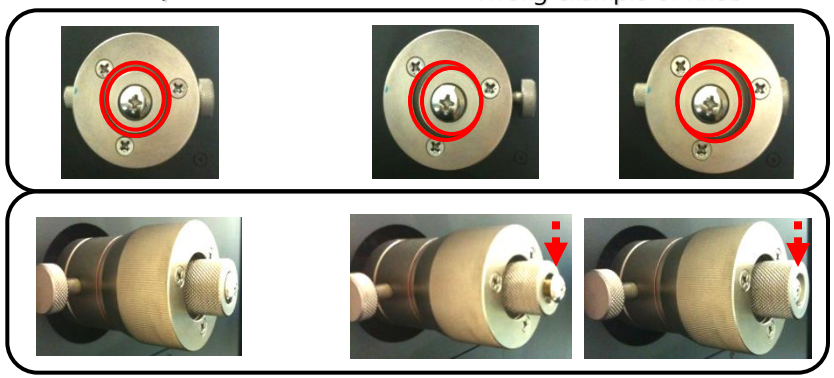
Aperture
The smaller hole size is, the higher resolution it has
- 30 or 50um recommended





Correct example of Knob

Wrong example of Knob



1)When image on live mode window moves during focusing, activate program by place cursor on W (Wobble) and clicking right button of mouse

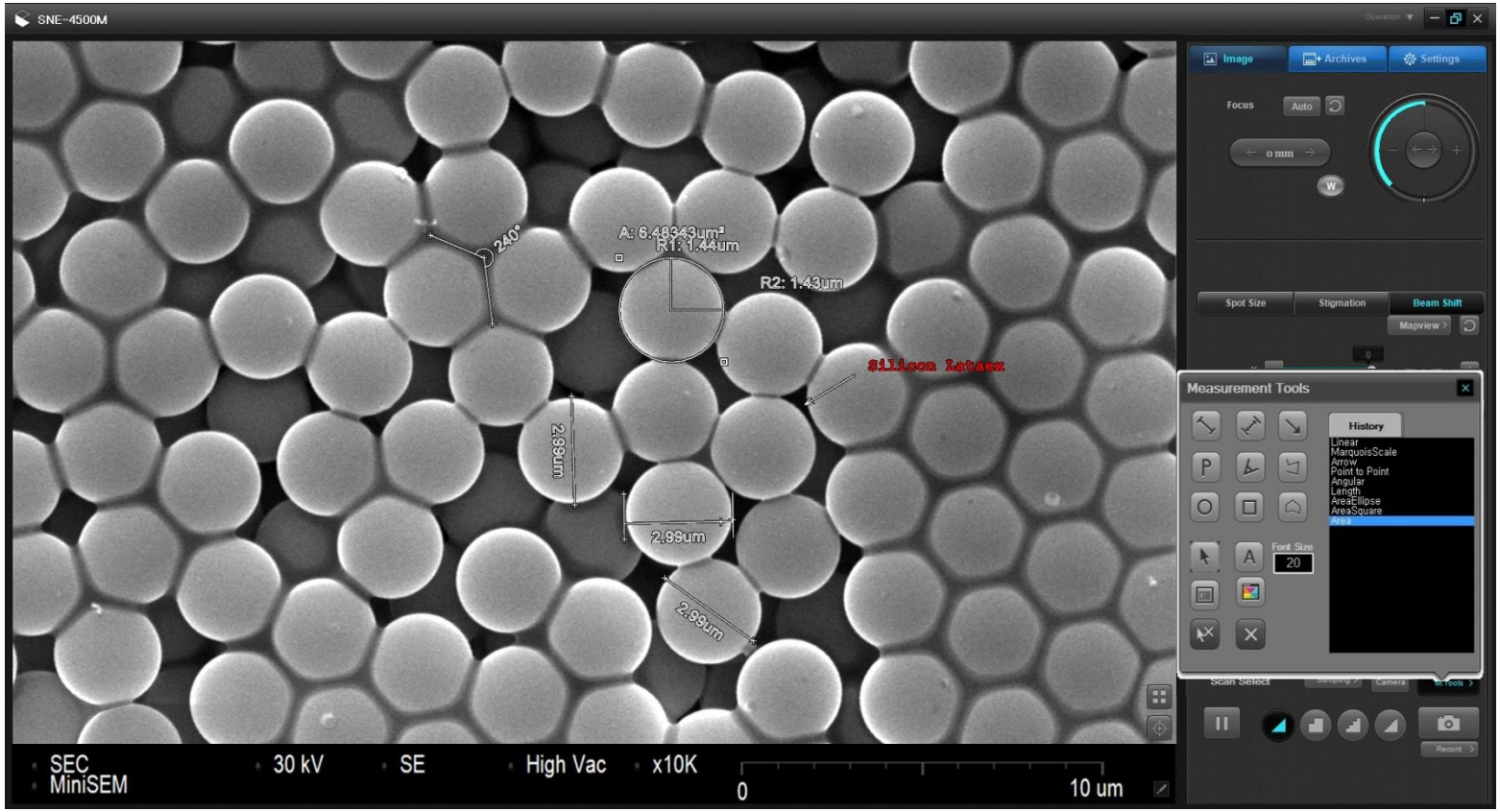
- "W" Bar Setting Range : F (Max), A(1~5times) "▶" button click.
  * F (Freq.) : Change of frequency speed which shakes image
  * A (Ampl.) : Power which shakes image and changes range of movement

2) When image moves up, down / to the left, or right, find the location where image almost doesn't move by turning Knob (start first in the location where image moves a lot)
- It is the best to use Wobble function under 1,000x of magnification first, and then 10,000x of magnification later.
- You can get good image if it doesn't move under high magnification than low magnification.

3) When image doesn't move any more, stop Wobble by placing cursor on W , and then clicking left button of mouse on it. (the end of Beam shaking)

※ If variable aperture is adjusted in some degree, the bottom side of Knob bolt of Y-axis almost meets the outside surface of Knob of Y-axis handle

Quick Manual (10) – APPENDIX :Measuring



1. Using measurement function, you can save length, angle, area, diameter values and text while marking them on the screen.

   - When image scanning reaches to the data bar after Scan Mode (Photo Mode 1 or 2), click the pause button  , and click 

※ If you click  on the data bar, you can delete and edit.