

# Transmission Electron Microscopy

Bio-TEM Operation  
Training Course



# Check the notice and error

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## Check the equipment before use

1. Column Vacuum –Program-Vacuum System
2. Error message

## Sample Loading

3. Sample loading on the specimen holder
4. Inserting and removing the specimen holder

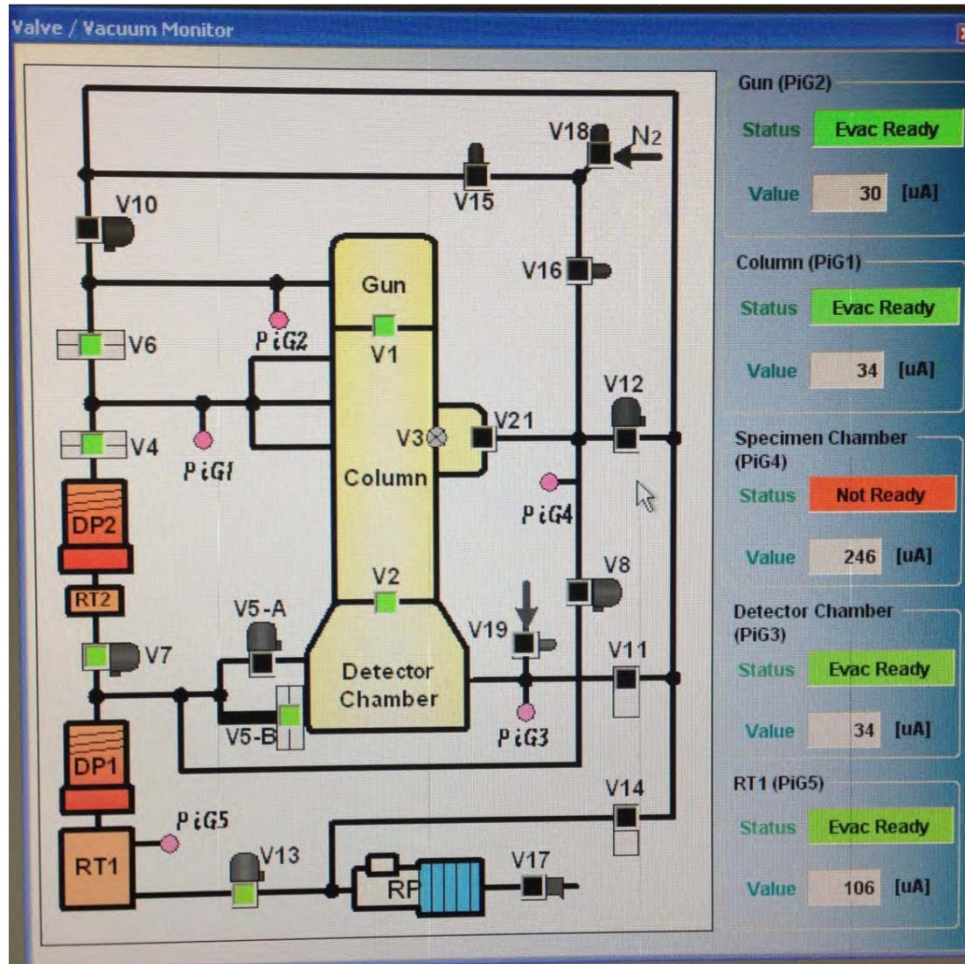
## Align

5. Flow chart of Alignment - CL aperture centering, CL astigmatism correction, Gun shift, High voltage centering, OL astigmatism correction
6. Astigmatic : Astigmatism correction
7. Deflection coil : Beam tilt and shift

## Check the equipment after use

8. Column Vacuum –Program-Vacuum System
9. Error message

# Check the Column Vacuum



1. V1, V2 line green On .

2. GUN, Column check

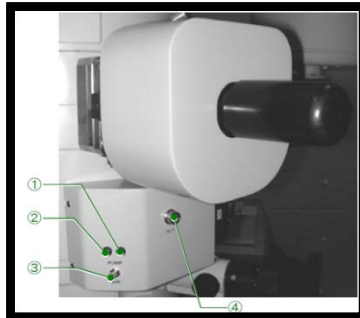
Status : Evac Ready

under 66uA

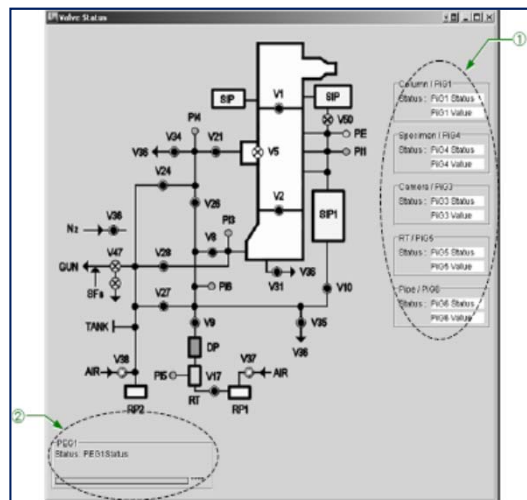
Only if there are something wrong, you can't use the equipment

# Removing the Specimen Holder

## 1. Removing the specimen holder



- 1) Pull the specimen holder straightly
- 2) Turn the holder anti-clockwise and pull and turn the holder anti-clockwise
- 3) Down the switch ③ of the pump to air
- 4) You have to wait until the value of specimen is over  $230\mu\text{A}$
- 5) Pull the specimen holder completely



**If you break the vacuum of TEM because you use inappropriate, you can't attend the training anymore.**

**You just fail, so be careful in use**

# Load the Specimen on the Specimen Holder

1. Loading the sample where the upside of target face is located on upside.
2. Put the spacer on the sample.
3. Put the plate on the spacer and screw on the plate.

Caution : If you tighten too much the screw, the screw line will be broken.

Single holder

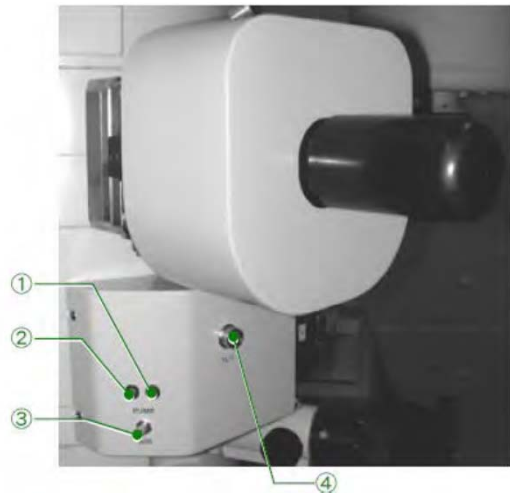


Don't touch with hand.

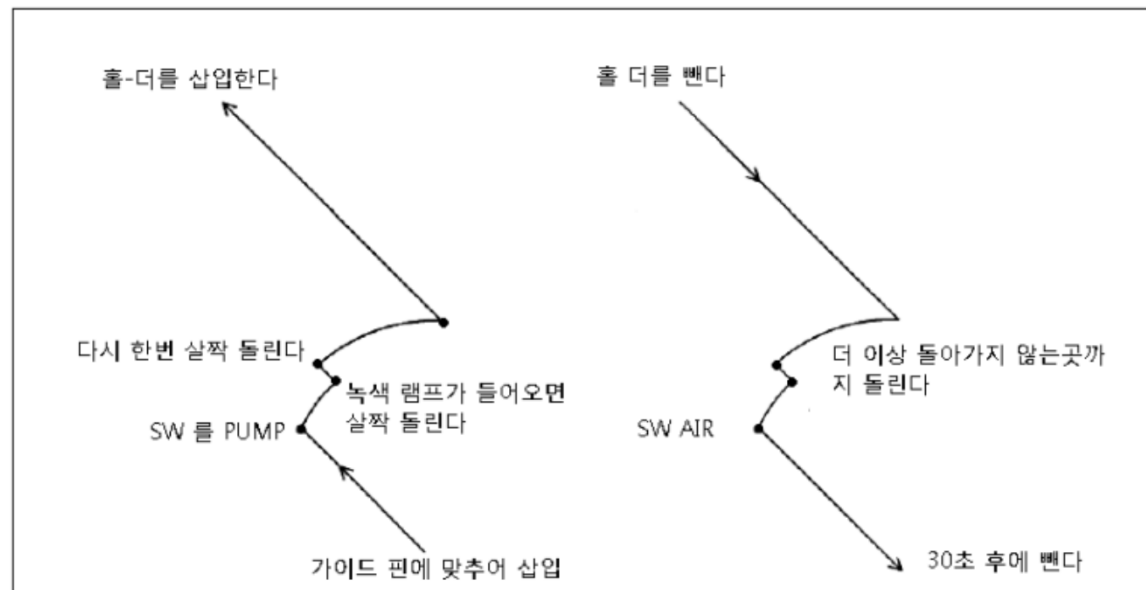
Sample loading on the specimen holder



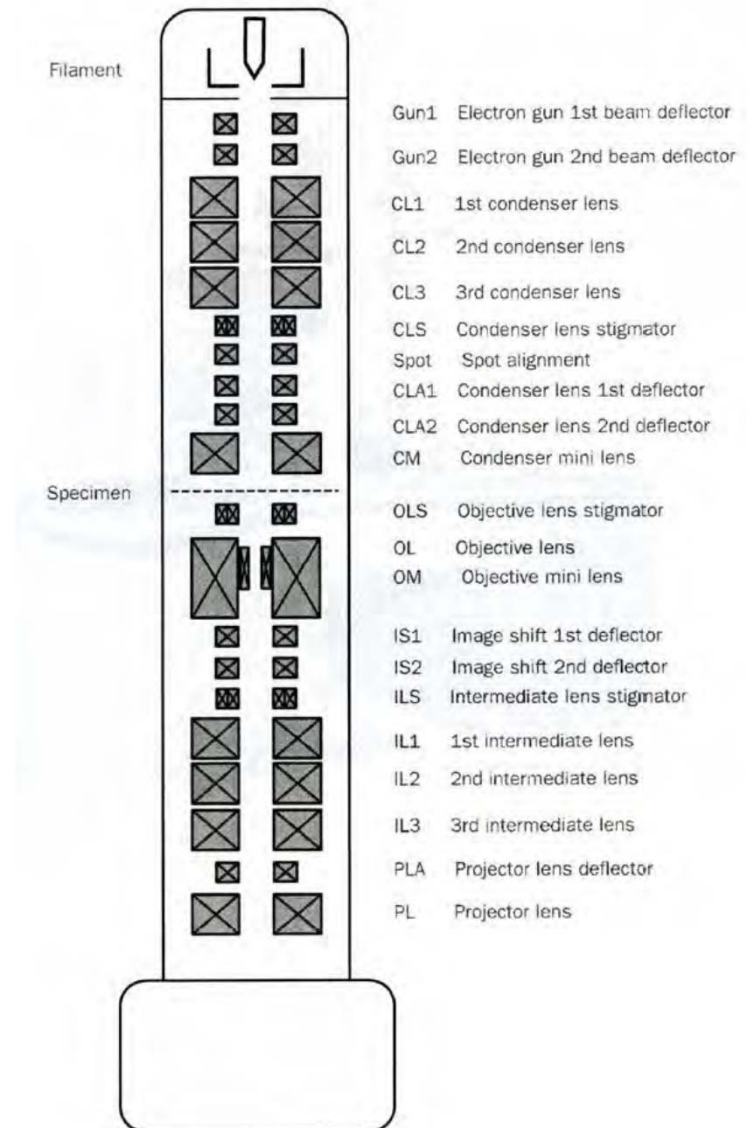
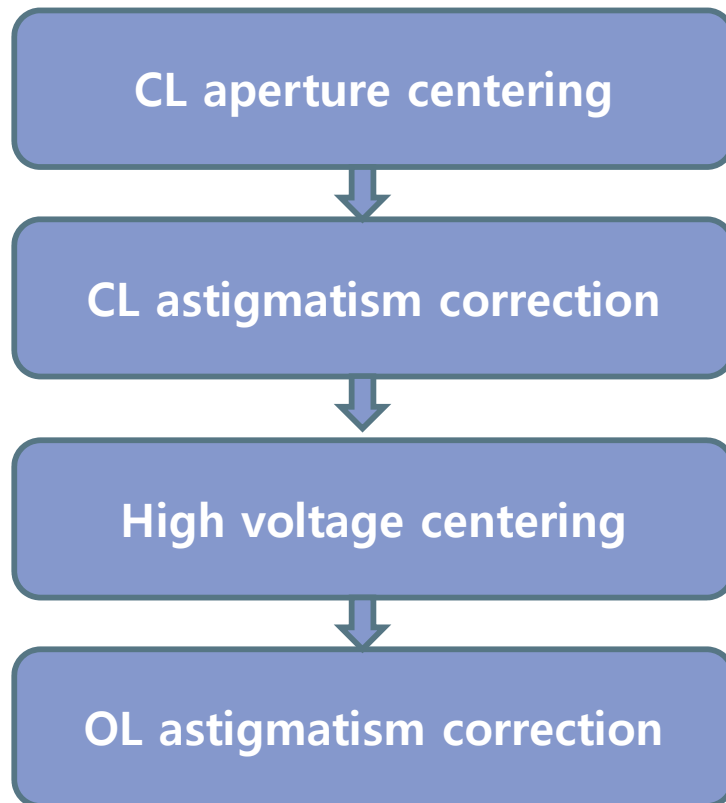
# Load the Specimen on the Specimen Holder



After RP pump on, you should have to wait for the vacuuming in the specimen chamber.  
(over 15min, FIG 4: below 32uA)



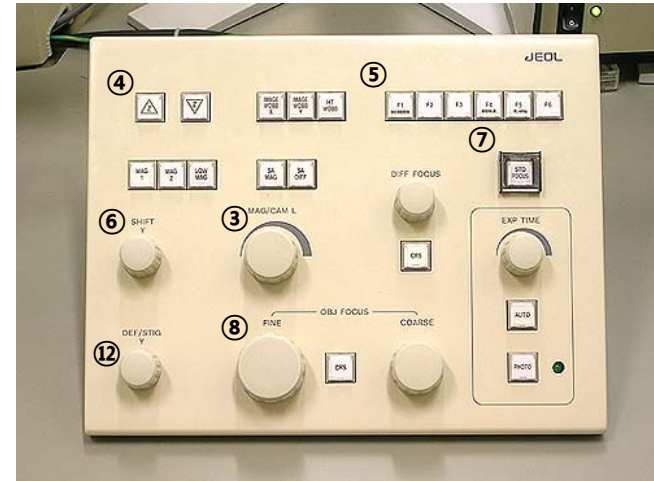
# Flow Chart of Alignment



# Control Panel



Left panel

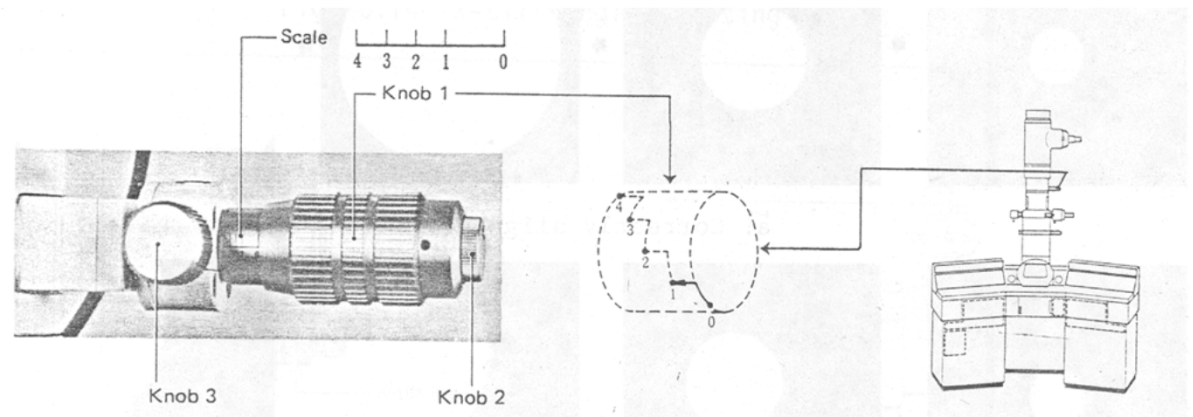
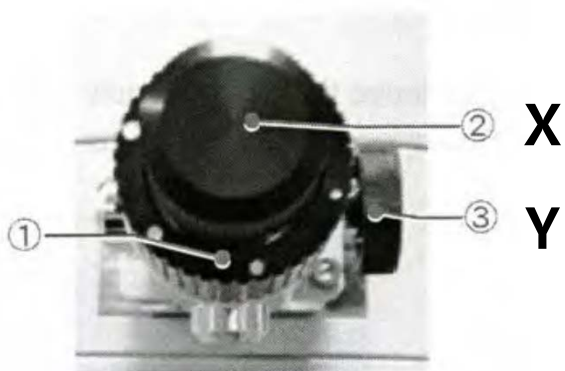
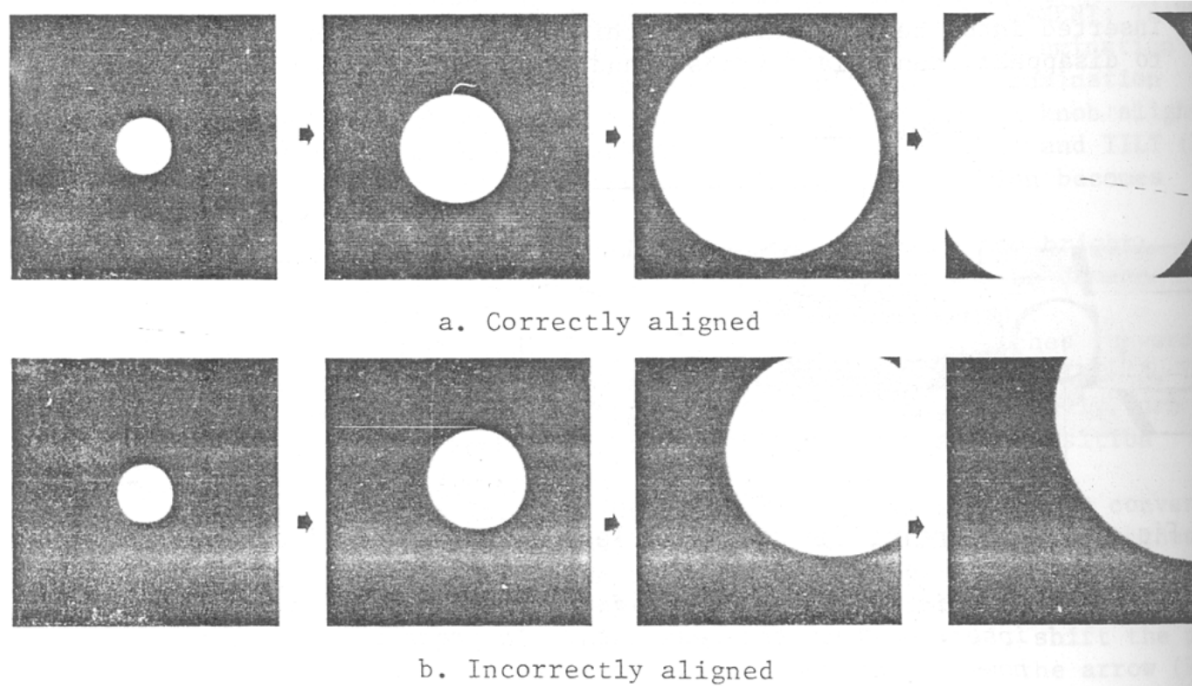
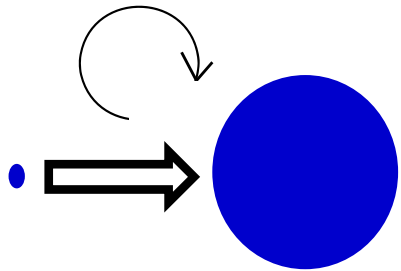


Right panel

- ① BEAM switch : Turn on the beam
- ② BRIGHTNESS knob : Converges and spreads the electron beam
- ③ MAG knob : Varies the magnification
- ④ Z switches : Shift the specimen in the vertical(up/down) direction
- ⑤ F1 switch : Screen up/down
- ⑥ SHIFT X, Y knobs : Shift the electron beam in the X, Y direction
- ⑦ STD FOCUS : The objective lens current to the original reference value
- ⑧ OBJ/FOCUS : Focuses the image
- ⑨ COND STIG button : Adjusts the condenser lens stig when correcting the beam shape

# CL Aperture Centering

Bright knob

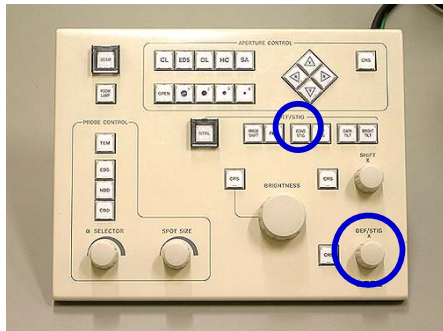


# CL Astigmatism Correction

## 2. Condenser lens astigmatism correction

- 1) Adjust the magnification to over x60k
- 2) Beam centering
- 3) Make the shape of the electron beam to be circular triangle

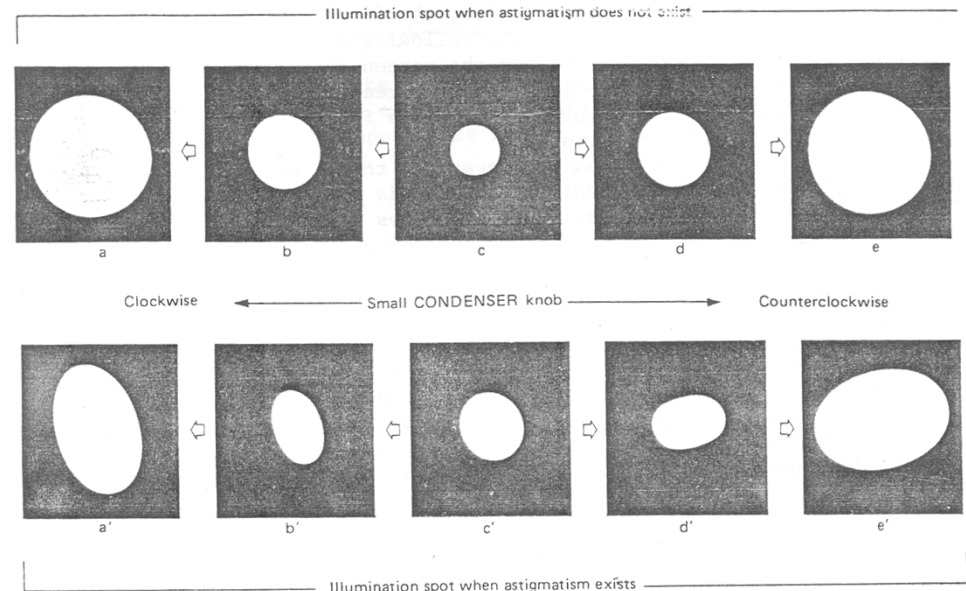
CL Stig button +  
DEF/STIG X/Y knobs



Left panel



Right panel



# High Voltage Centering

## 3. High voltage centering

- 1) Adjust the magnification to over x100k
- 2) Beam centering
- 3) Find the sharp edge of sample, and locate it the large screen center
- 4) Down the small screen
- 5) Let's make the edge point of the sample do wobbling at the small screen center
- 6) Make the movement of the edge point of the sample minimize

HT wobbler button +  
Bright button + DEF/STIG X/Y knobs



Left panel



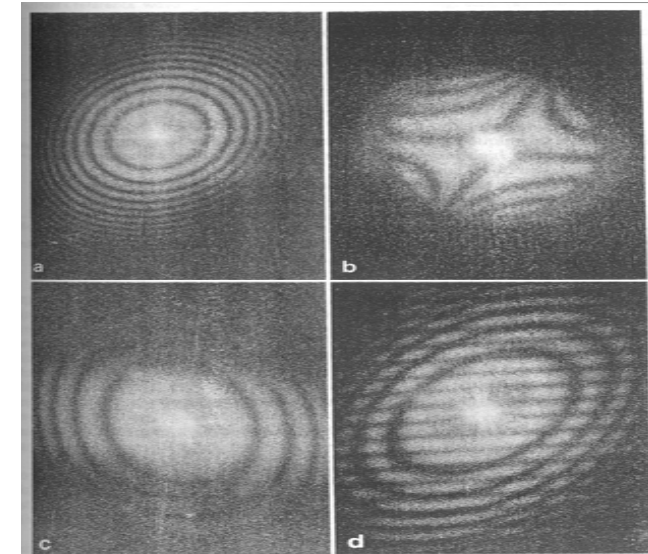
Right panel

- If HV centering is well aligned, beam is wobbling at the beam center

# OL Astigmatism Correction

## 4. Objective lens astigmatism correction

- 1) Adjust the magnification over x100k
- 2) You can use the amorphous phase of the sample or amorphous carbon grid
- 3) Make Cur.den to under 60pA/mm<sup>2</sup>  
- Spread the beam with brightness knob
- 4) Up the large screen with F1 button
- 5) Start view and Process-Live-FFT
- 6) Make the FFT image to be perfect circle

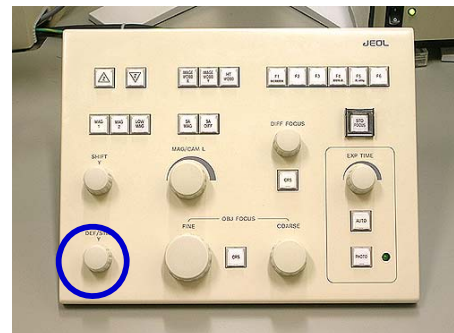


When OL lens is well aligned, FFT shape is circular

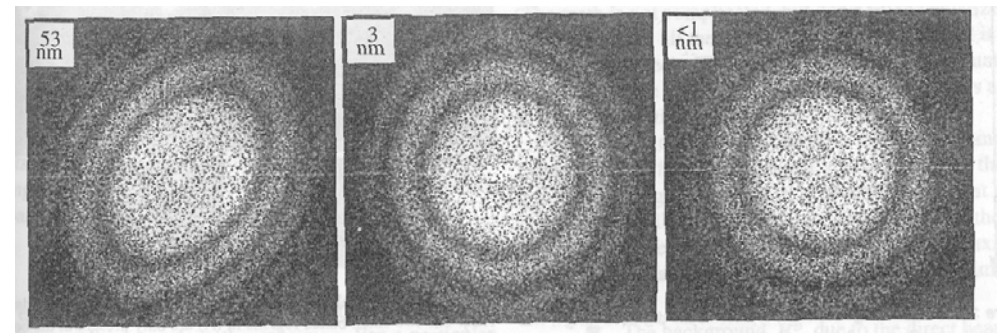
OL Stig button +  
DEF/STIG X/Y knobs



Left panel

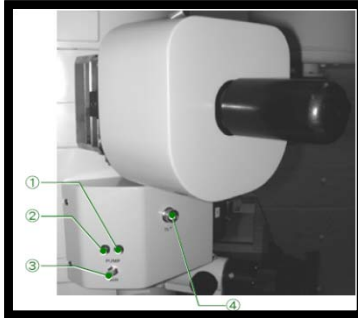


Right panel

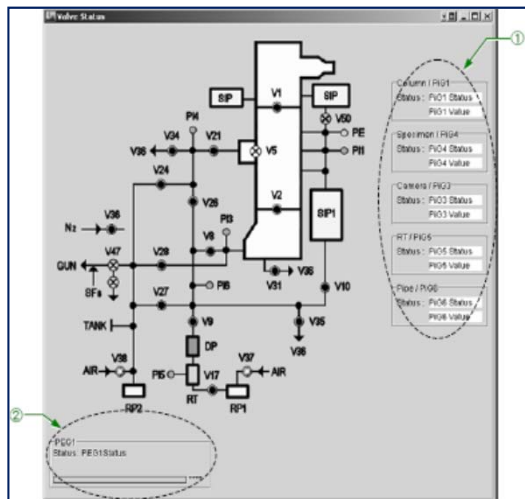


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