How to run Autograin on the NanoSIMS

Frank Gyngard

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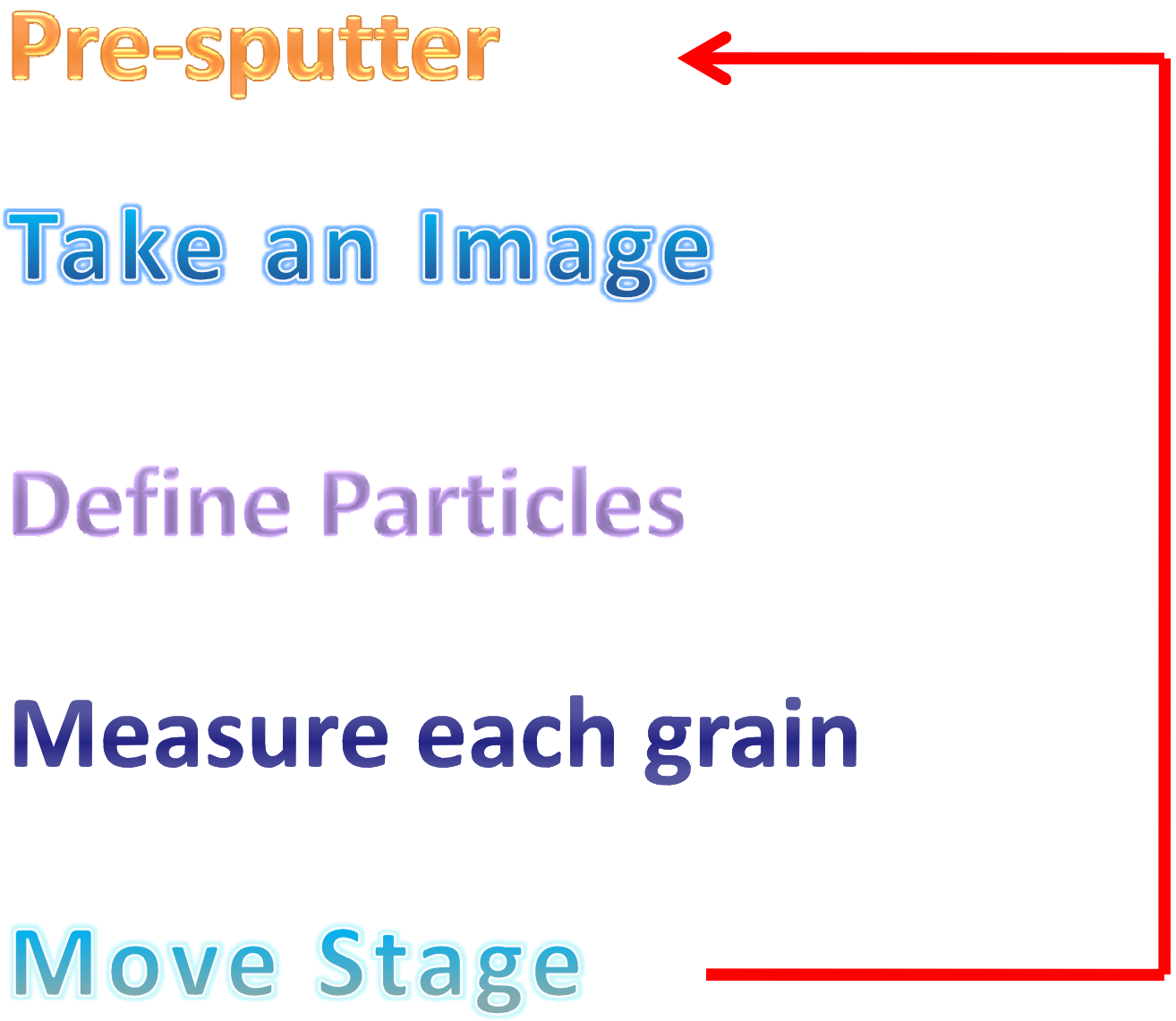
Pre-sputter
Take an Image
Define Particles
Measure each grain
Move Stage

Setup the following:

1. Create a presputter image file
2. Setup and run grain mode image
3. Start IDL & test the grain mode image
4. Run at least 1 grain mode isotope measurement on a defined particle
5. Load both the presputter image file and the isotope measurement file into chain mode
6. Setup up Chain Mode and pray it works

Create presputter image file:

1. Get high beam current: Larger D1; increase L0 and L1; or some combination

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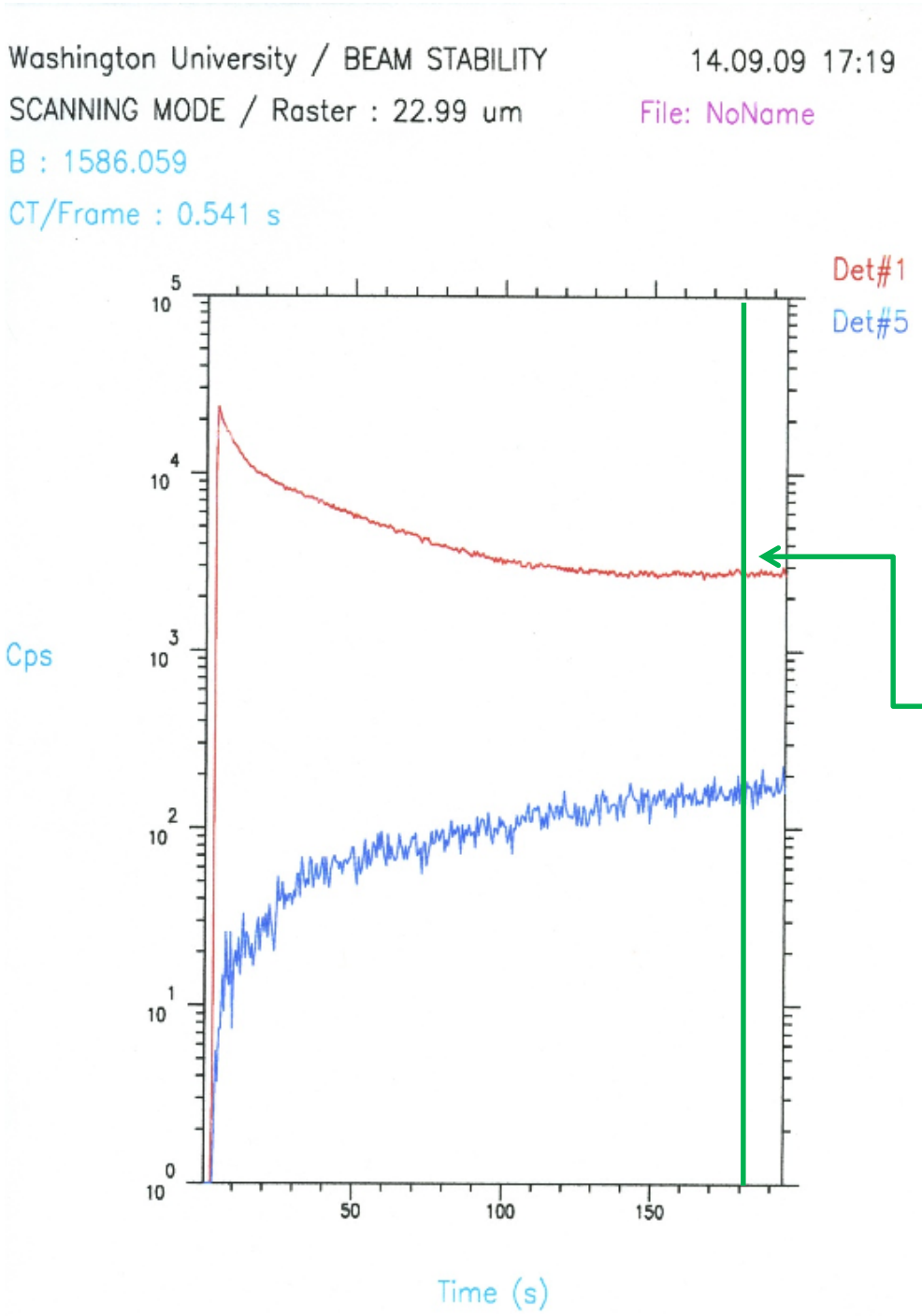
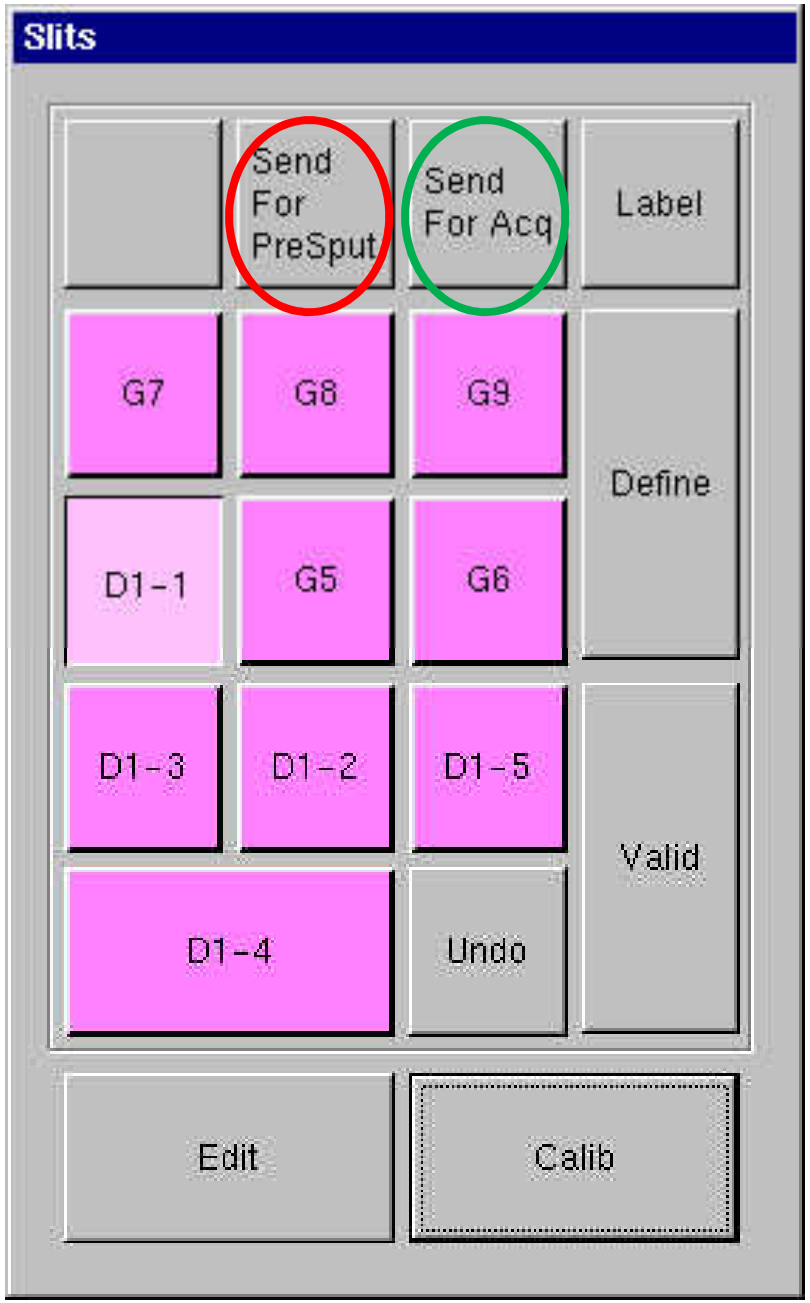
1. Get high beam current: Larger D1; increase L0 and L1; or some combination
2. Run Beam Stability on pristine area similar to actual measurement place till signal stabilizes



Presputter with high beam for about this long (~180s in this case)

Create presputter image file:

1. Get high beam current: Larger D1; increase L0 and L1; or some combination
2. Run Beam Stability on pristine area similar to actual measurement place till signal stabilizes
3. Setup presets for presputter and acquisition



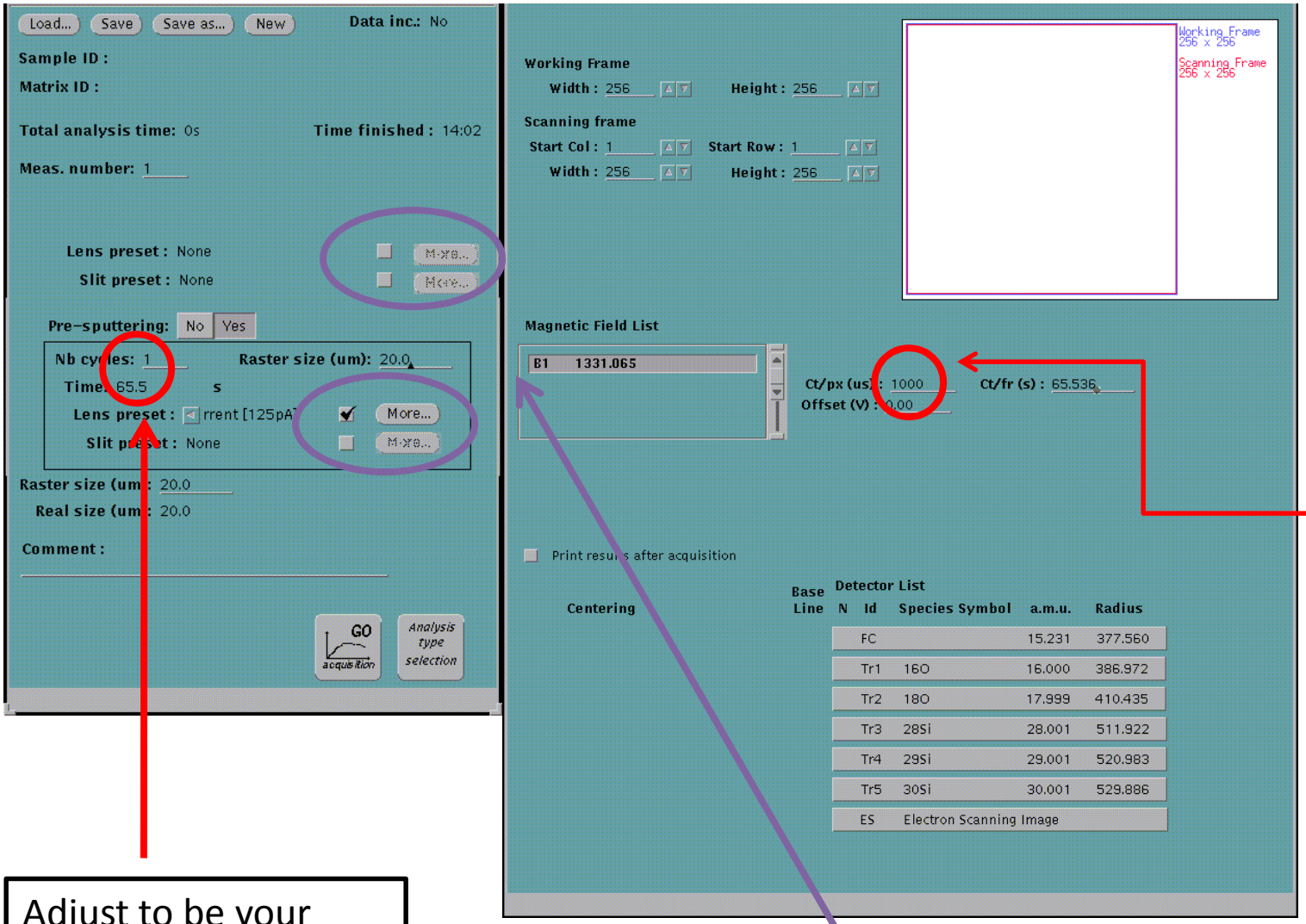
Presets

1. Presputter: Should contain both lens & slit settings for your high beam. Set ALL EM HVs to ZERO (add them by clicking *Define* if not available)

2. Acquisition: Should contain actual measurement settings for the grain mode image and isotope files. Set all EM HVs back to original values.

Create presputter image file:

1. Get high beam current: Larger D1; increase L0 and L1; or some combination
2. Run Beam Stability on pristine area similar to actual measurement place till signal stabilizes
3. Setup presets for presputter and acquisition
4. Setup typical image measurement: 256x256, 100µs/pix (or something similar), turn on presputtering & adjust # of cycles to match amount you want to presputter

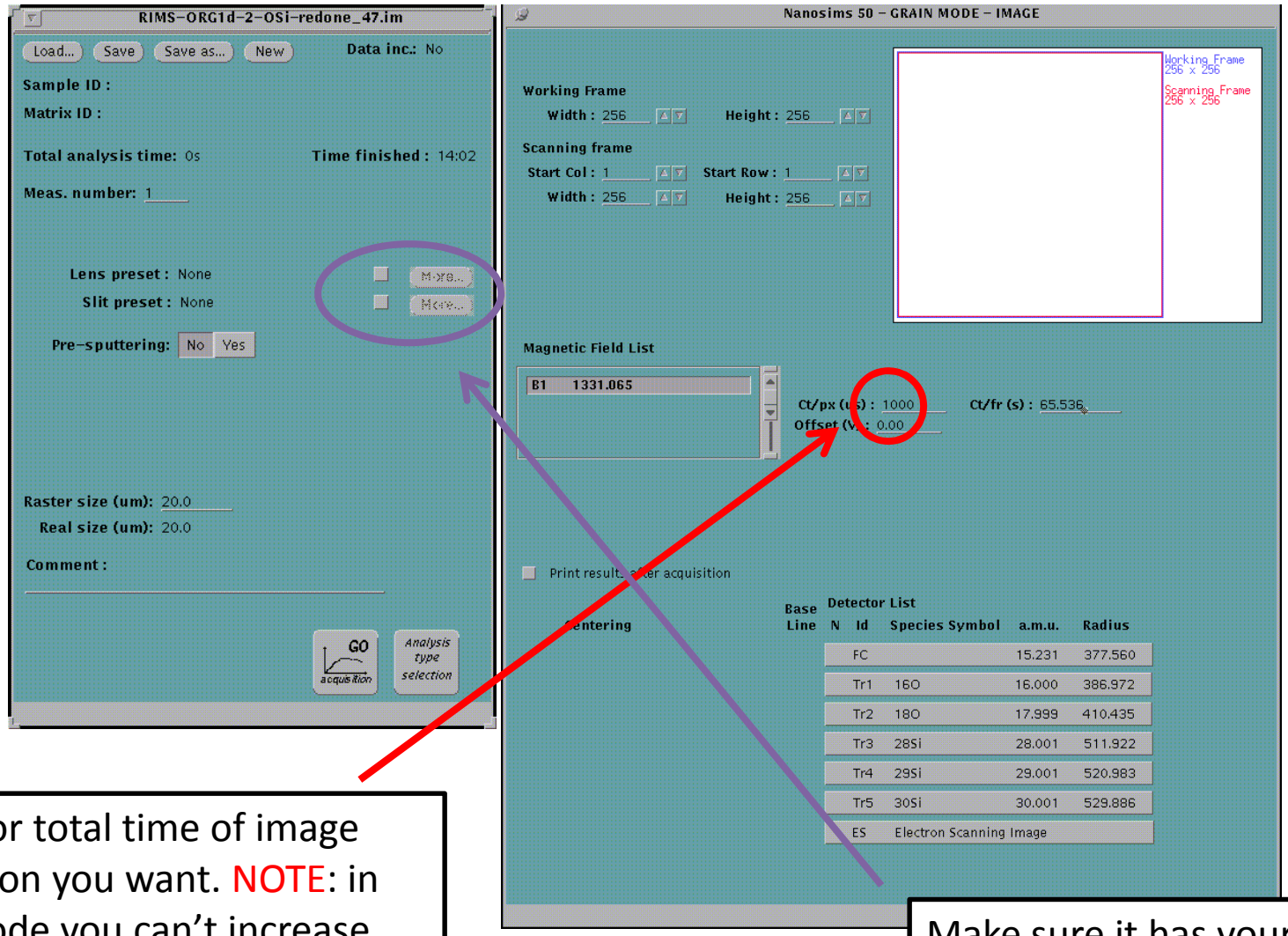


Change to:
~100µs/pix

Adjust to be your presputter time

Make sure it has your presets!

Setup Grain Mode image file:



Adjust for total time of image acquisition you want. NOTE: in grain mode you can't increase the # of frames!

Make sure it has your presets!

Start & run IDL:

1. Right click on desktop & click on:

   Files -> Programs -> Shell Tool
2. Type: idl -vm=/space/ims/frankg/autograin.sav

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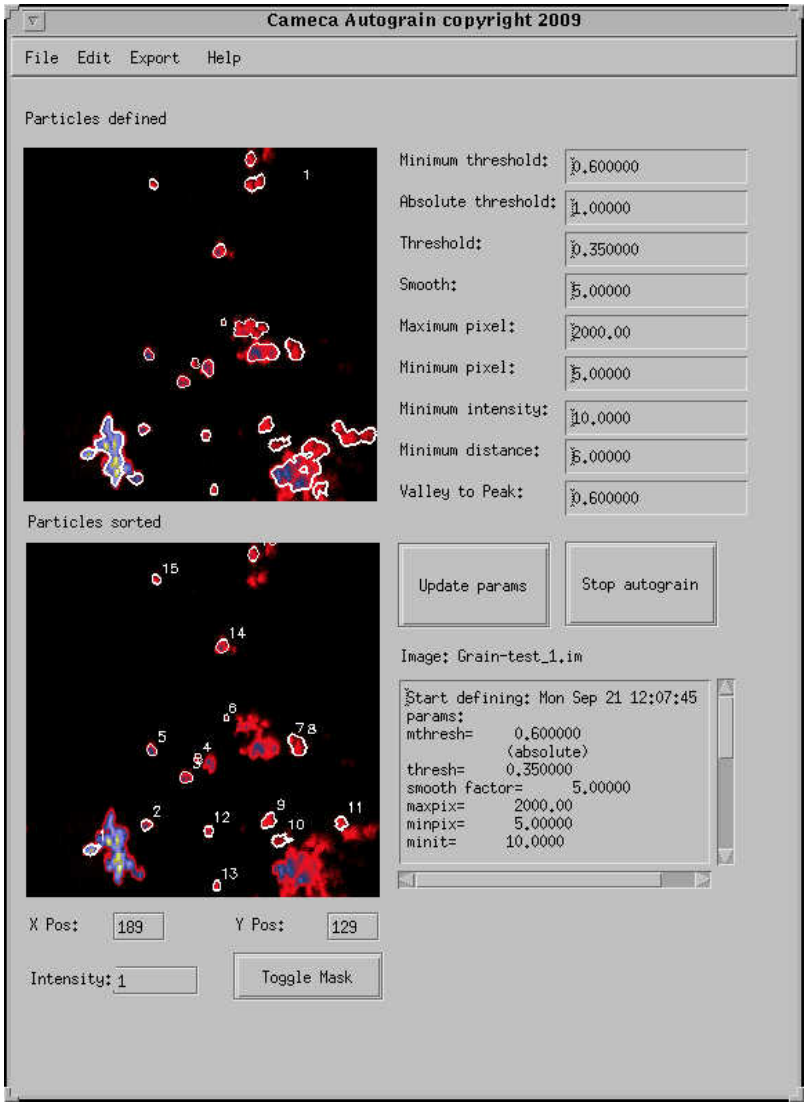
1. Right click on desktop& click on:

   Files -> Programs -> Shell Tool
2. Type: idl -vm =/space/ims/frankg/autograin.sav
3. Click anywhere on Splash Screen

Start & run IDL:

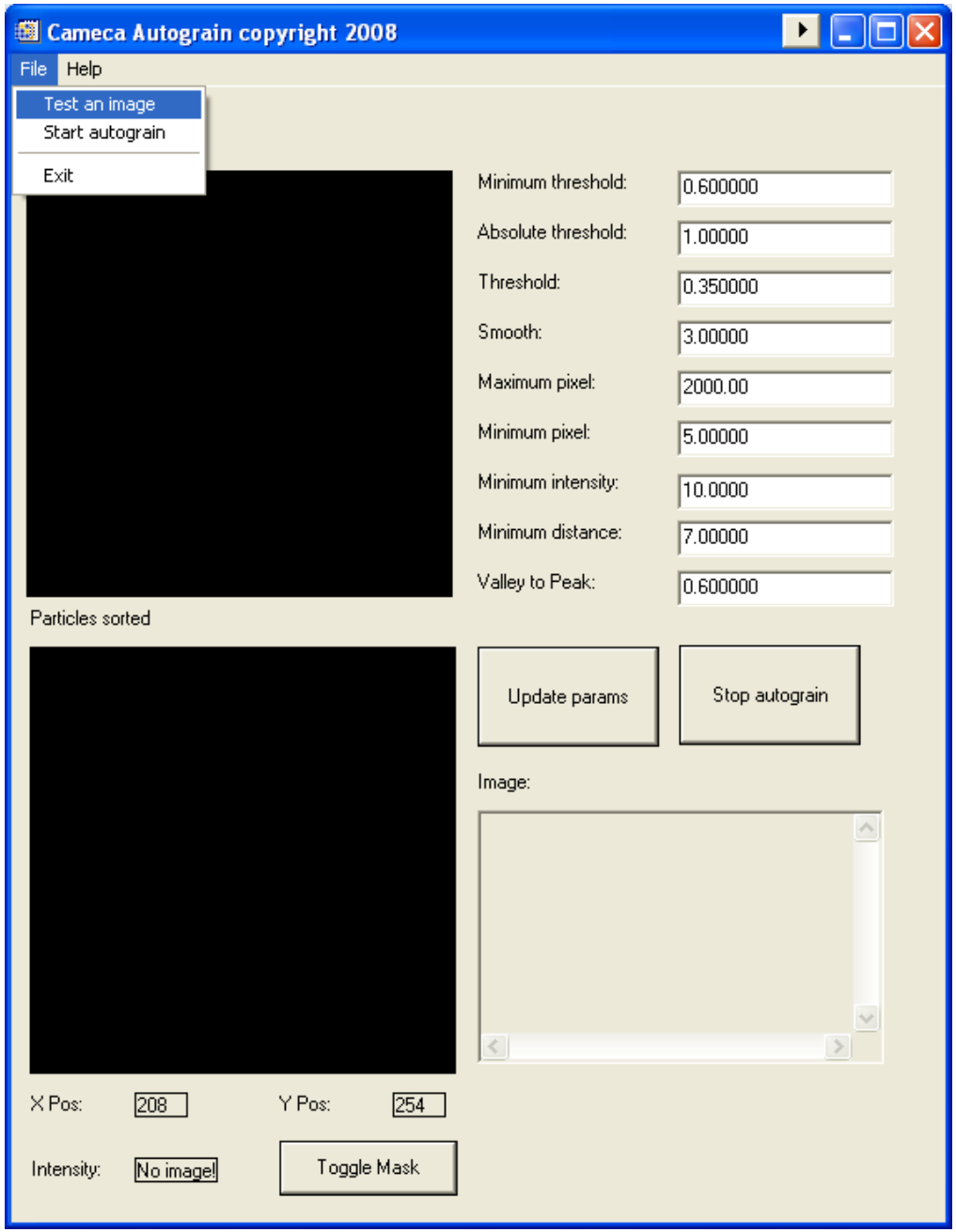


Start & run IDL:

1. Right click on desktop& click on:

   Files -> Programs -> Shell Tool
2. Type: idl -vm =/space/ims/frankg/autograin.sav
3. Click on Splash Screen
4. Once the Grain Mode image has finished, test it in the autograin program:

   File -> Test an image


Cameca Autograin copyright 2008
File
Help
Test an image
Start autograin
Exit
Minimum threshold:
0.600000
Absolute threshold:
1.00000
Threshold:
0.350000
Smooth:
3.00000
Maximum pixel:
2000.00
Minimum pixel:
5.00000
Minimum intensity:
10.0000
Minimum distance:
7.00000
Valley to Peak:
0.600000
Particles sorted
Update params
Stop autograin
Image:
X Pos:
208
Y Pos:
254
Intensity:
No image!
Toggle Mask

Start & run IDL:

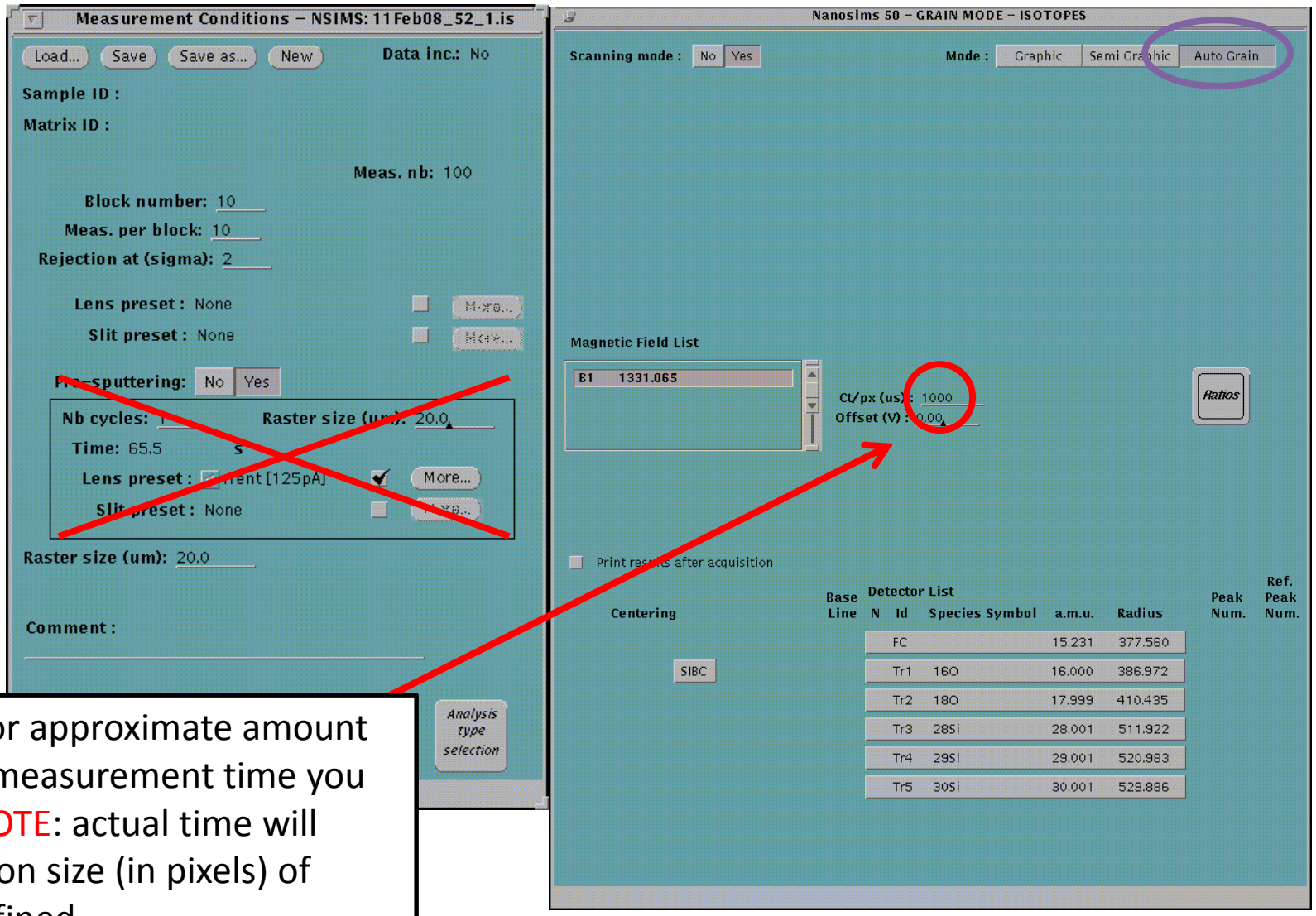
1. Right click on desktop& click on:

   Files -> Programs -> Shell Tool
2. Type: idl -vm =/space/ims/frankg/autograin.sav
3. Click on Splash Screen
4. Once the Grain Mode image has finished, test it in the autograin program:

   File -> Test an image
6. Once finished, start autograin by going to:

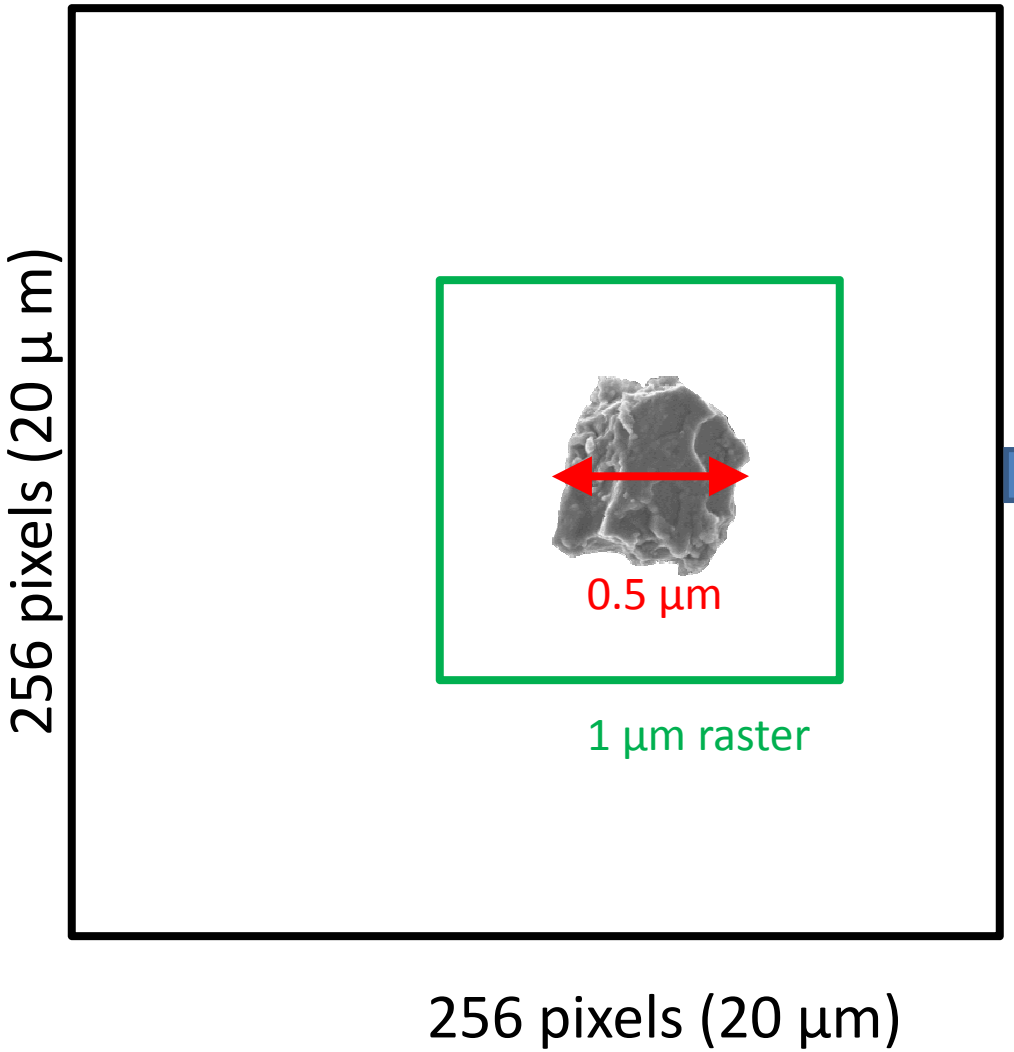
   File -> Start autograin

Setup Grain Mode isotope file:



Adjust for approximate amount of total measurement time you want. NOTE: actual time will depend on size (in pixels) of grain defined

How many µs/pix?



The software calculates a raster size roughly twice the grain diameter.

For a 0.5 µm grain, this leads to a raster size of 1 µm(12.8 pixels in this example).

Total number of pixels $=12.8^2 = 164$.

For counting time of 1000 us/pixel, acquisition time per cycle= 164 ms

For 10 blocks of 10 cycles = 16.4s. Probably way too short.

NOTE: Some grains may be smaller, some may larger. Optimize counting time per pixel to achieve sufficient statistics for the size of the average grain.

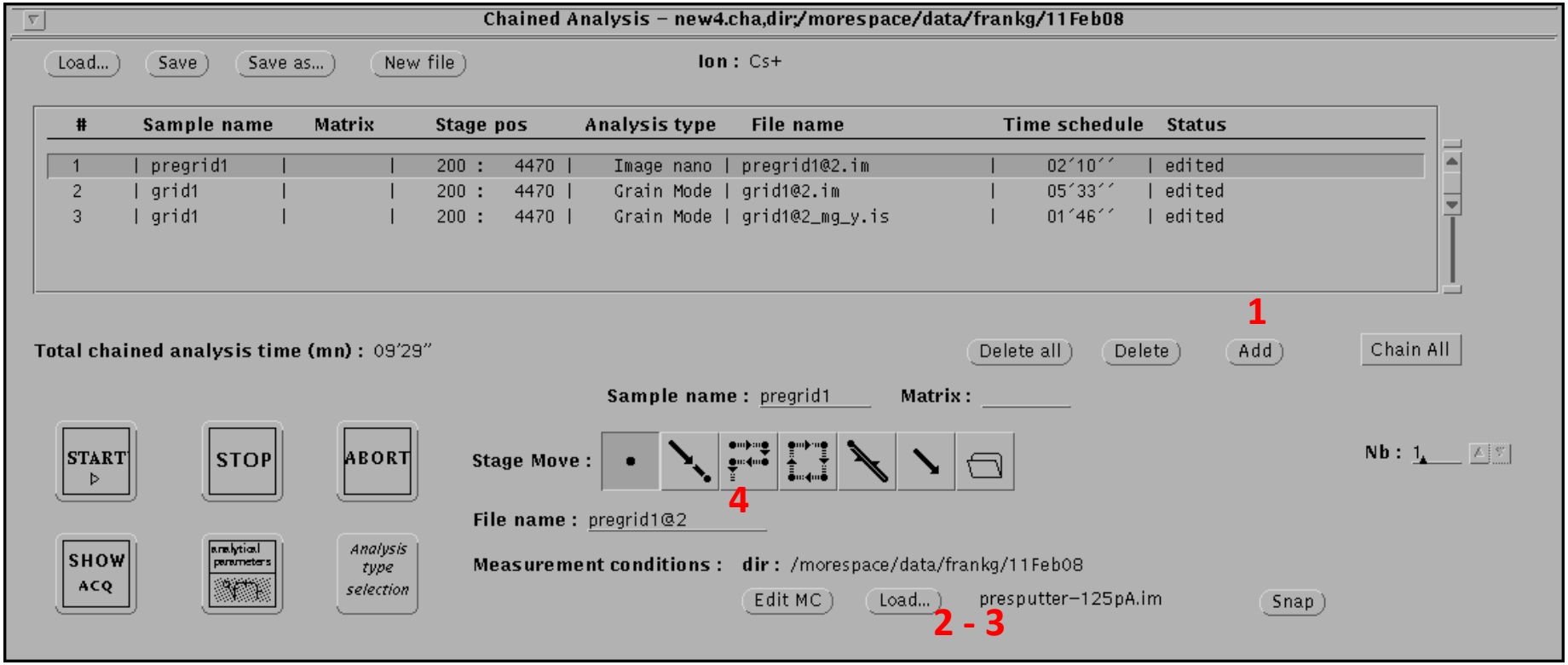
Setup Chain Mode:

1. Click *Add...* to make a second line.
2. With first line selected, click 

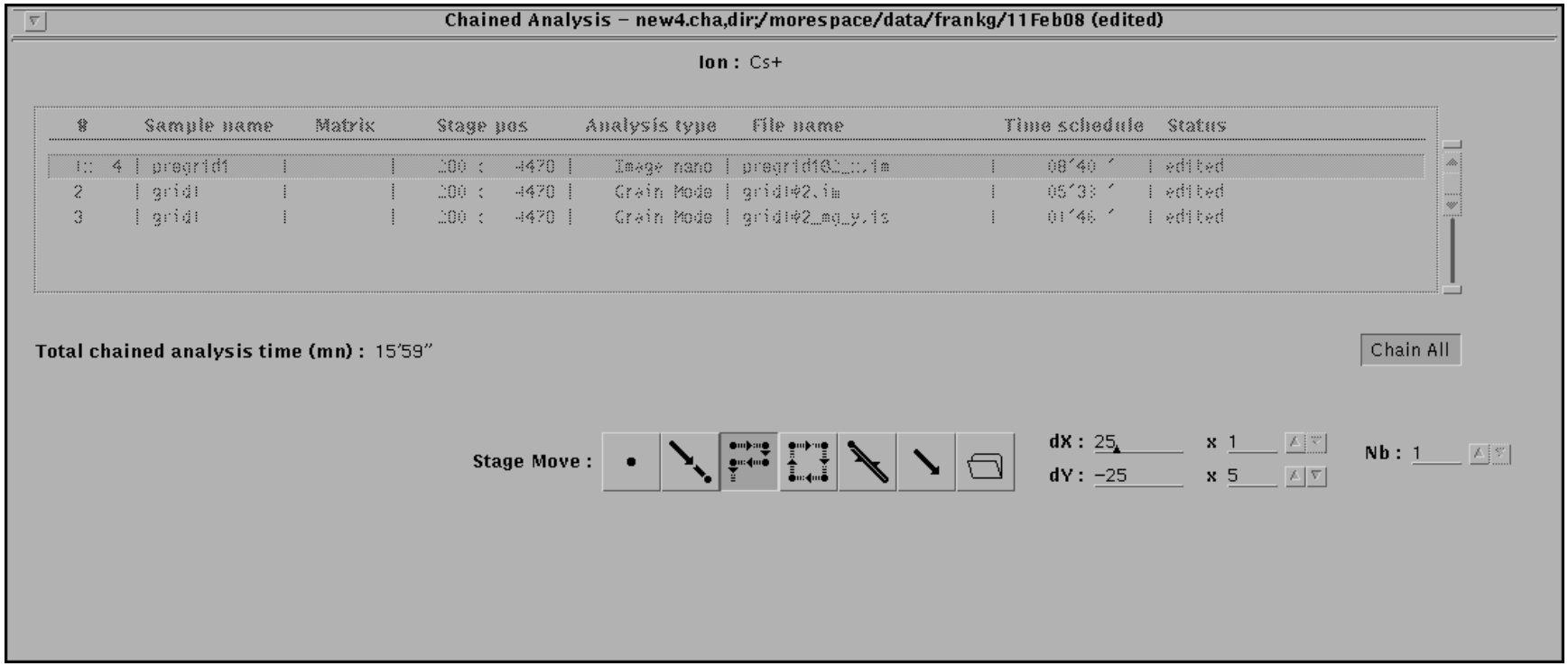
and select your presputter file (e.g., presputter.im)
3. With second line selected, click 

and select your grain mode isotope file ONLY(e.g., grain_mode.is). The grain mode image file associated with it will be automatically loaded too
4. Click on the snake ()movement scheme and click *Chain all* button and put in parameters

Setup Chain Mode:



Setup Chain Mode:



Future Improvements: IDL

1. Increase general software stability
2. Add ability to define grains to measure based on isotopic ratios
3. Add a log file that records/exports everything: all variables, file names, actions taken, etc
4. Add export of images with raster boxes overlaid
5. Better optimize the sorting algorithm for grains that are too close to each other.
6. Enhance cross-platform compatibility

Future Improvements: Cameca

1. Allow dynamic measurement termination
2. Allow multiple frames in the grain mode image
3. Create a more streamlined/integrated incorporation of grain mode into chain mode
4. Fix the quirkiness of the measurement presets

Technical stuff

DIRECTORY AND FILE INFORMATION

Here is a list of the directory and files used for communication:

/space/ims/data/raw_ima/	Directory for communication files
.AutoGrainIsOn	File saying IDL software is on and running
.AutoGrainImage	2 line text file: 1st line flag (0 or 1) whether image is done being acquired, 2nd line is full path of image for IDL to analyze
.AutoGrainList	Text file list of grains to analyze
.AutoGrainDPPARS	Text file list of particle definition parameters
.AutoGrainResults	Text results file that is displayed in the result window
.AutoGrainCompleted	Text file IDL creates when it is done creating the grainlist file

GRAIN DEFINITON PARAMETERS

The following is a table of what the particle definition parameters mean. It is best to just play around with them for a given image to see what effect they have.

Minimum threshold	minimum intensity pixel must have to be considered a center of a particle
Absolute threshold	if equal 1 then minimum threshold is absolute value, otherwise it is fraction of maximum image intenstiy
Threshold	pixels > threshold*maximum intensity are included in particle
Smooth	images smoothed by this amount before defining
Maximum Pixel	maximum number of pixels allowed in a particle
Minimum Pixel	minimum number of pixels allowed in a particle
Minimum Intensity	minimum intensity for pixel to be included in particle
Minimum Distance	minimum radius between adjacent grains
Valley to peak	valley to peak intensity ratio allowed of adjacent grains