Beamline 8.3.2 End Station Manual

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1. Data Acquisition Software Overview

Software is started using the "Tomography 2010" icon on the desktop. After the software finishes initialization, you are presented with the following set of windows (Figures 1 and 2). The boxes are self-explanatory. Points to note are:

1. "Command any Motor" box – toggle between Abs and Jog buttons
2. "Lens Calibration "box – input the lens you are using and the standard lens parameters will be added to the .sct file that contains all the standard scan parameters
3. "CCD settings" box. CCD is set to –10C. If the ccd was off it will take a few mins to reach temp. a. "Bright field" button – moves sample to the side (distance given in Scan settings box (Fig.4)), an image is taken for the exposure time selected b. "Dark field" button – Shutter is closed and image is taken c. "Attenuation" button – Image is taken, image is moved to the side and bright field is
taken, then shutter is closed and dard field taken. i. Attenuation = - Log ((mage-Dark)/(Bright-Dark))
4. CCD temperature should be set to –10C.
5. "ROI" box Region Of Interest selected manually or with box icon in upper left of Fig 2 screen.

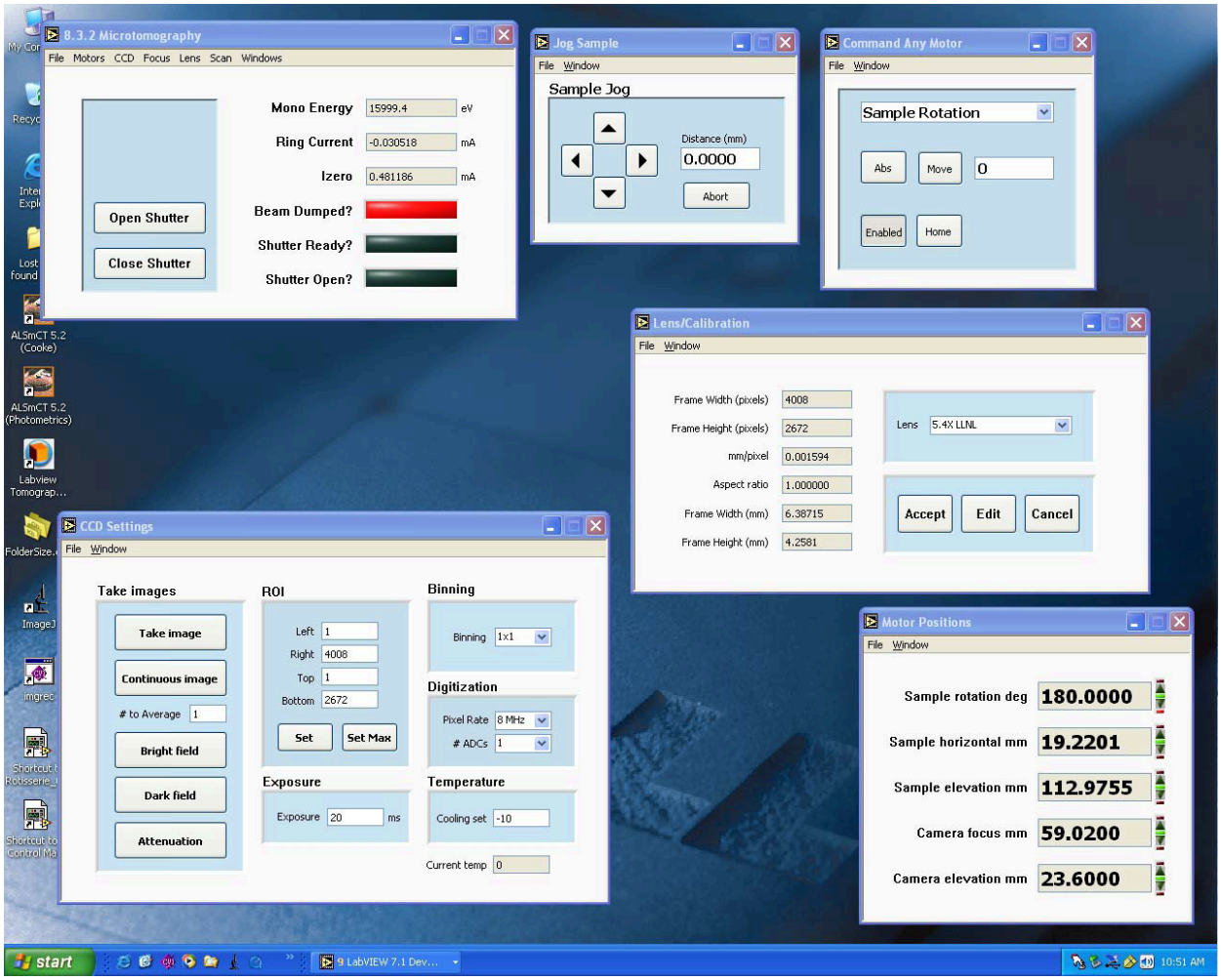

Figure 1. Left initial screen of data acquisition software (windows include: "8.3.2 Microtomography", "Jog Sample", "Command Any Motor", "CCD Settings", "Lens Change Tool", and "Motor Positions").

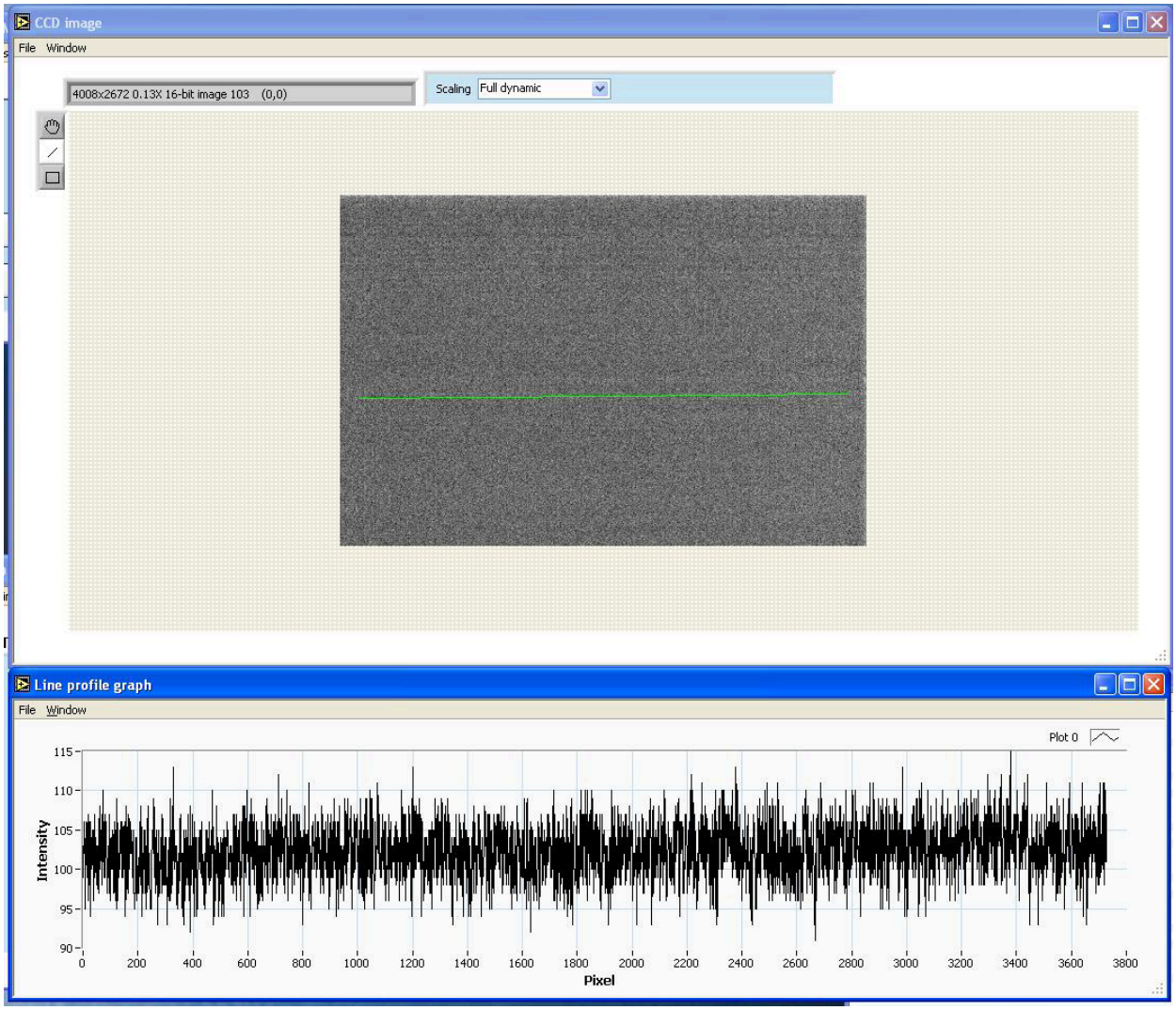

Figure 2. Right initial screen of data acquisition software (windows include "CCD Image" and "Line profile graph").

2. Lenses

The Mitutoyo long working distance Microscope lenses (2X, 5X, 10X) are the preferred lenses. A 1X tube relay is used with the objectives. A Nikon 1x macro lens is also available, but must be manually installed. The Cooke PCO4000 CCD camera has 9um square pixels (4008x2672), allowing calculation of microns/pixel.

Magnification	**Microns/pixel**
1x	8.65
2x	4.4385
5x	1.7691
10x	.8830

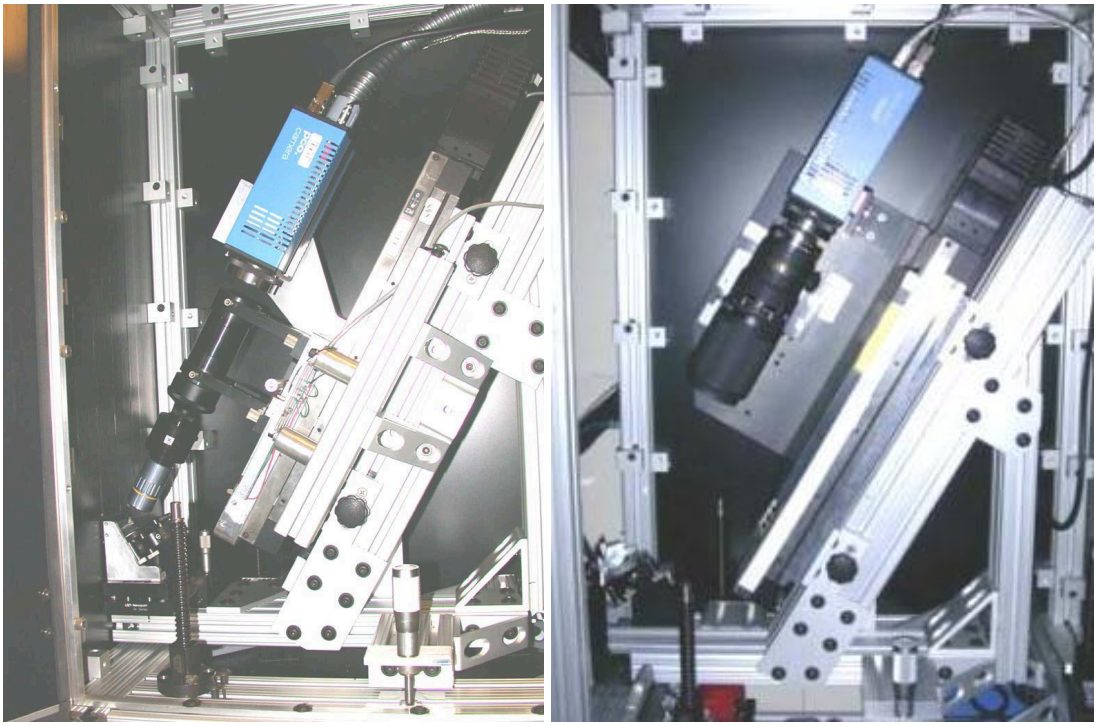

Figure 3. (left) Mitutoyo Long working Microscope lenses (2X, 5X, 10X). (right) Nikon 1x Macro lens

3. Focus Camera.

Put the Gold resolution test target ion beam and adjust camera focus motor. - Put Gold test target in position in beam - Close hutch, switch on X-rays. - Adjust test target so it is in the beam. - Main "Microtomography " Box – "Focus" yields the focus tool. Jog CCD focus to optimize.

4. Calibrate CCD pixel scale

Using Gold resolution test object select a pixel on its image and determine its horizontal and vertical pixel location. - Move sample a known distance to the opposite side of CCD field of view and determine the
horizontal pixel of the same edge. -The scale (microns/pixel) can be calculated and input in lens table. Both vertical and horizontal scales are assumed to be identical. - If the vertical pixel has shifted the roll of the sample stage is incorrect and you will need help.

5. Select X-ray Energy

Image sample, and position such that the approx area of interest is shown. - Take Attenuation image The aim is get the max value ~ 2000. - Increasing the x-ray energy reduces the attenuation and visa versa. To change the X-ray
energy enter the KeV in the beamline computer - Note that as you increase the energy the beam height reduces as per figs 6 and 7 for the Multilayer and Si(111) monochromator optics respectively. Adjust ROI to suit beam height
above).

6. Scan settings

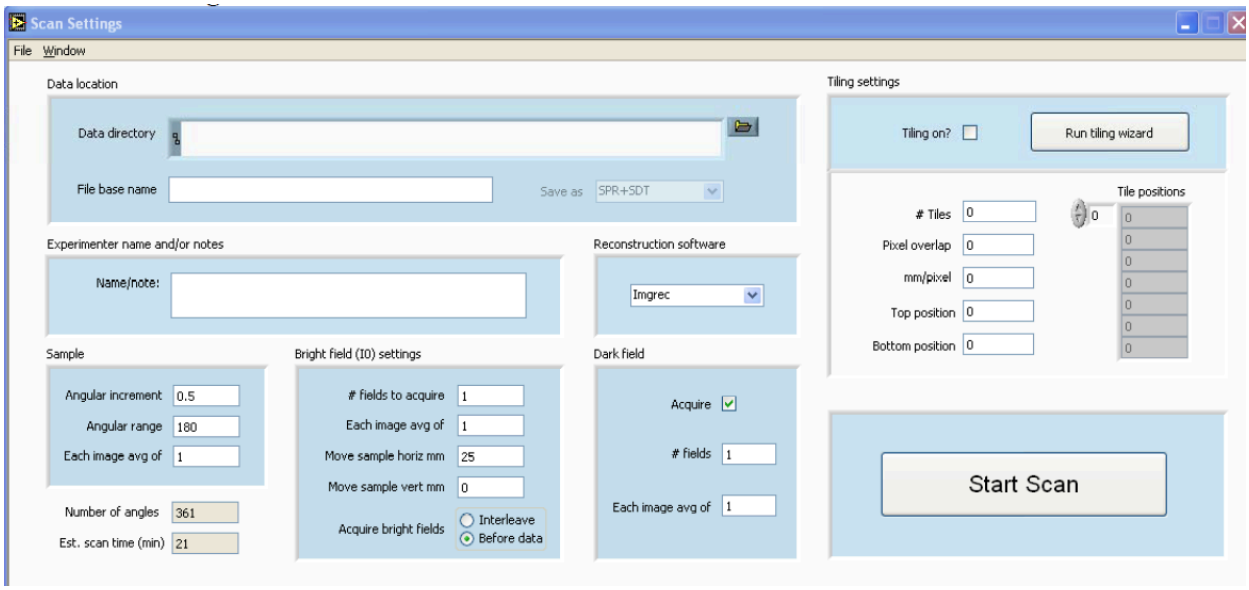

Figure 4. Scan settings window

Main "Microtomography " Box – Scan yields the "Scan settings" box – Fig 7. Mostly self explanatory. Note - "Data directory" use the 5TB raid array server S:yourname - "file base name" junk01
- "Reconstruction software" Choose the reconstruction code you wish to use – Imagrec or Octopus. There is a slight difference in the data structure. We will implement a fix to prevent this. Imagrec records Bright field interleaved throughout the data set. Octopus just takes bright fields at the start. Suggest you record 25 bright fields for Octopus, and 9 Dark fields. Imagrec data sets can be transcribed into Octopus sets, but not the other way round.
- "Sample" - 0.25 degree is a commonly used value for anular increment "Tiling setting" – seek help if you have questions – note you do nto need to overlap images. You need the correct lens in the input (Fig 5)