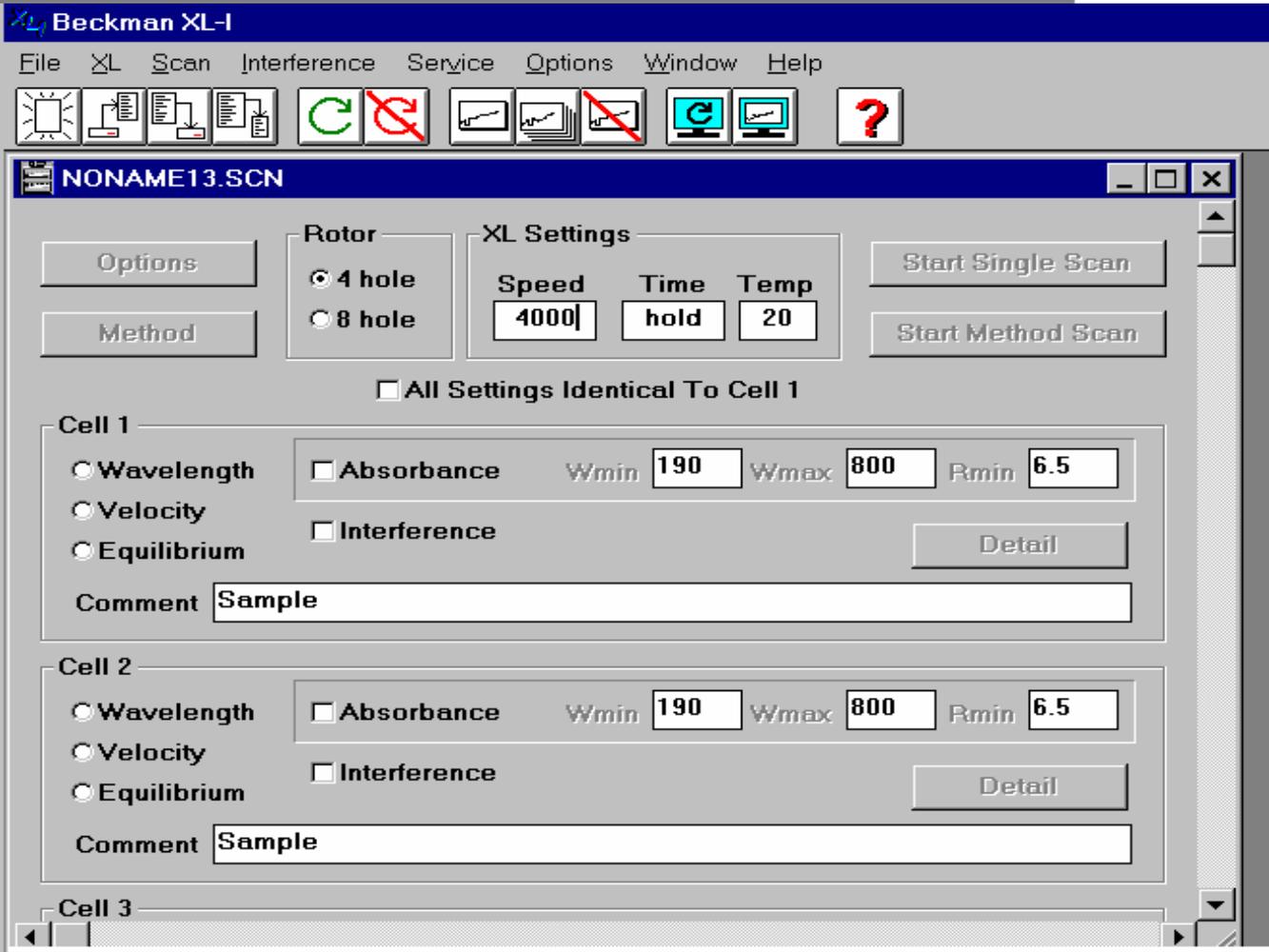


Samples are loaded and AUC has reached temperature equilibration.

Open a new file.



Fringe Display - Cell 1  
Acquire Zoom  
radius = 5.748 pixel column = 0

Beckman XL-I  
File XL Scan Interference Service Options Window Help

NONAME13.SCN

Options Method

Rotor  
 4 hole  
 8 hole

XL Settings  
Speed 4000 Time hold Temp 20

All Settings Identical To Cell 1

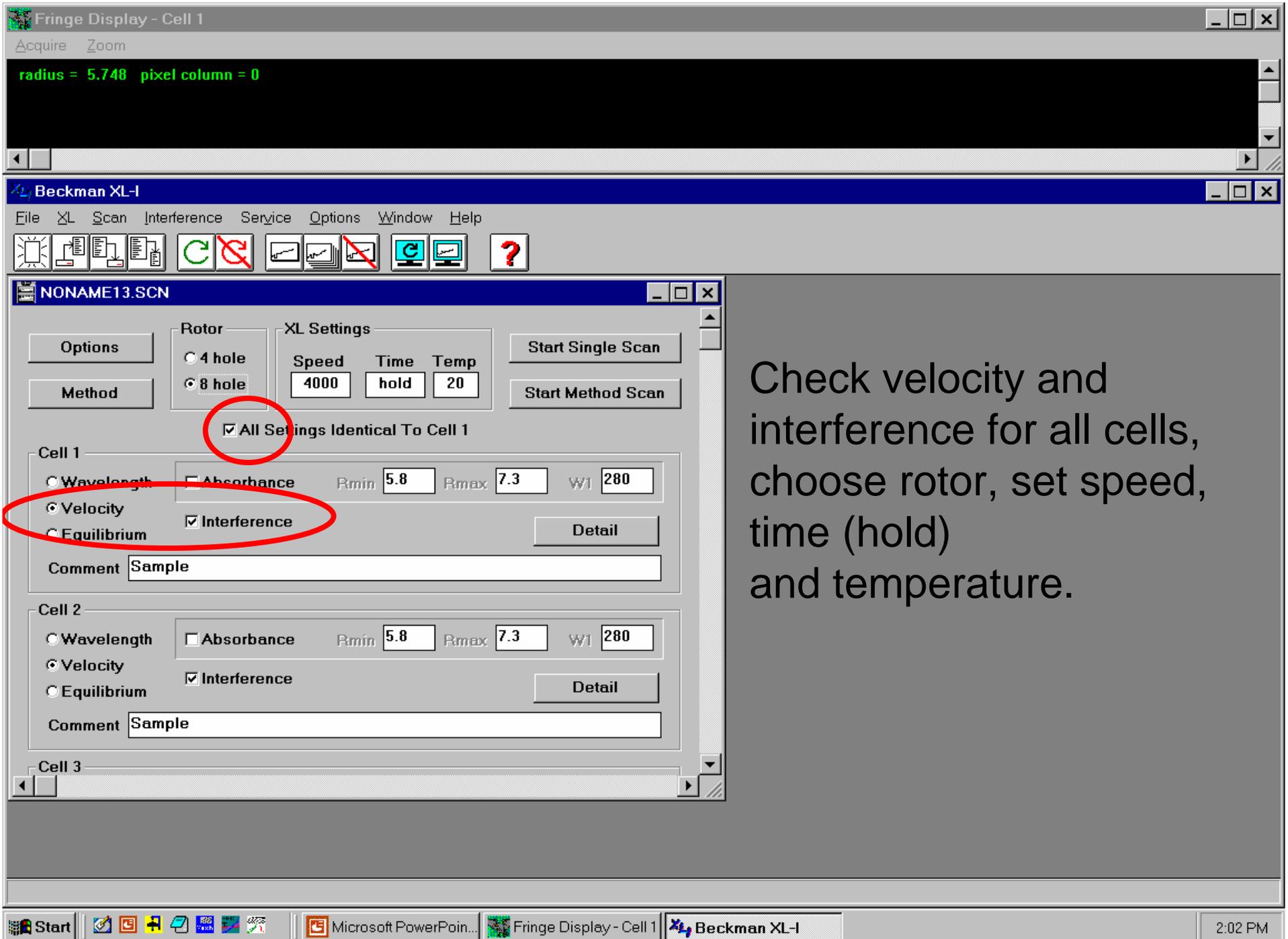
Cell 1  
 Wavelength  Absorbance Rmin 5.8 Rmax 7.3 W1 280  
 Velocity  Interference  
 Equilibrium Detail  
Comment Sample

Cell 2  
 Wavelength  Absorbance Rmin 5.8 Rmax 7.3 W1 280  
 Velocity  Interference  
 Equilibrium Detail  
Comment Sample

Cell 3

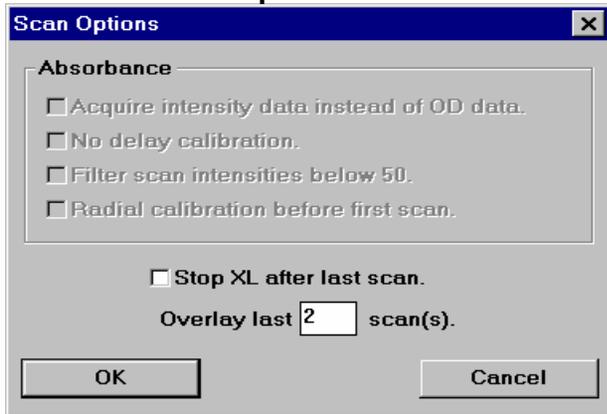
Start Single Scan Start Method Scan

Start Microsoft PowerPoin... Fringe Display - Cell 1 Beckman XL-I 2:02 PM

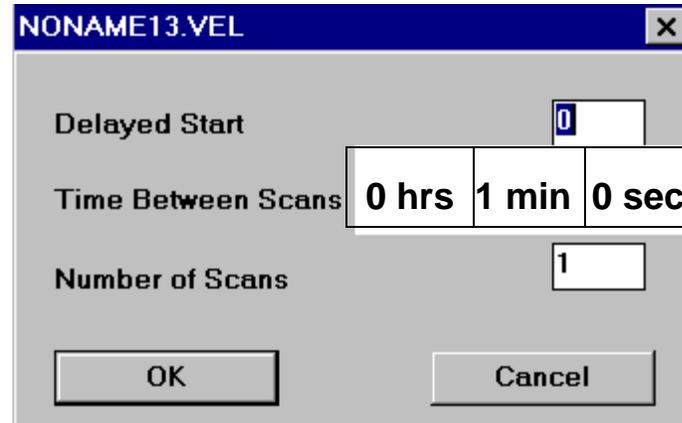


Check velocity and interference for all cells, choose rotor, set speed, time (hold) and temperature.

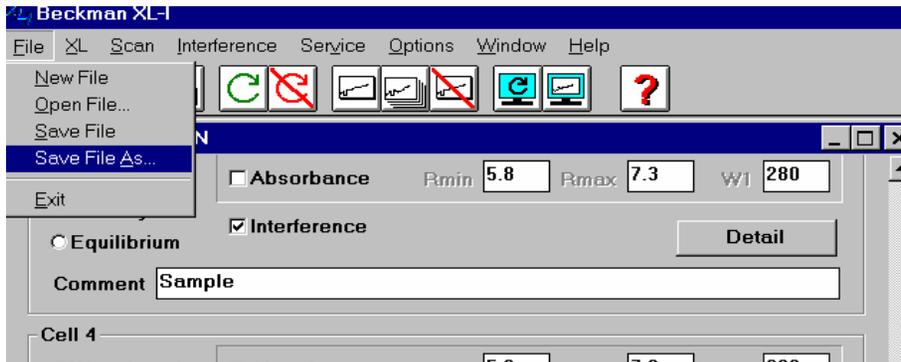
set scan options



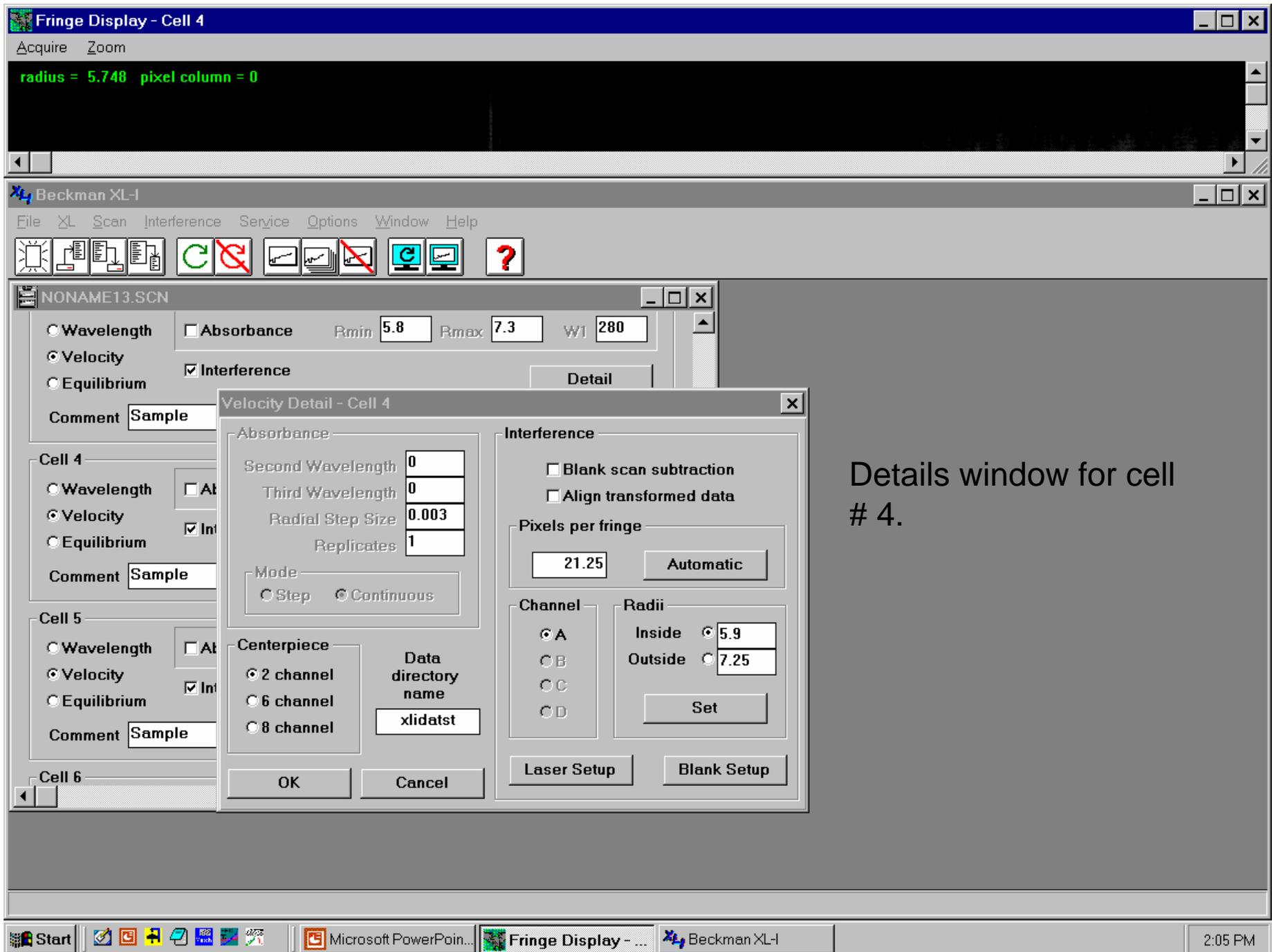
set scan method. Here is 1 min between scans



save scan file



Start the AUC and bring up to the desired speed.

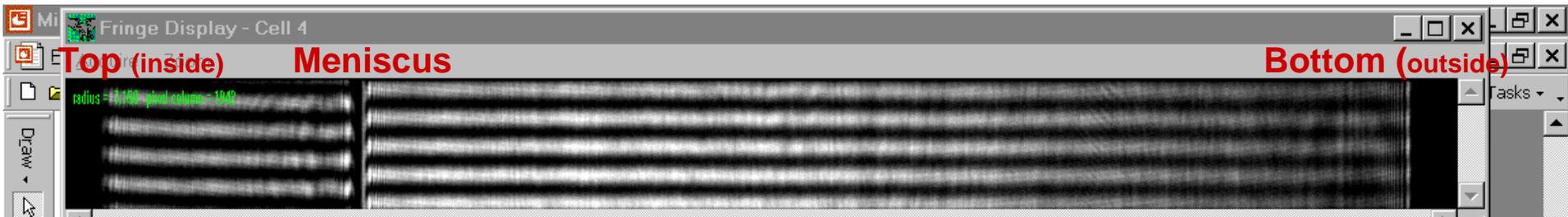


Details window for cell # 4.

Set zoom to 50% and move sliding bar to right side to visualize the entire fringe pattern.

The screenshot displays the 'Fringe Display - Cell 4' application window. A red circle highlights the 'Zoom' dropdown menu, which is currently set to '50%'. Another red circle highlights a horizontal sliding bar on the right side of the main display area, which has been moved to the right edge. Below the main window, three smaller windows are open: 'NONAME13.SCN' (showing 'Wavelength' and 'Velocity' options), 'Velocity Detail - Cell 4' (showing 'Absorbance' and 'Interference' settings), and 'Laser Setup - Cell 4' (showing 'Laser delay', 'Laser duration', 'Brightness', and 'Contrast' sliders, along with 'Rotor' and 'Location' options). The 'Laser Setup' window has 'Laser on' checked and 'Cell 4' selected in the 'Location' list. The Windows taskbar at the bottom shows the Start button, several application icons, and the time '2:08 PM'.

Laser set up window for cell # 4.



By re-setting zoom, we can now see the top, meniscus and bottom of the cell

Beckman XL-I

File XL Scan Interference Service Options Window Help

NONAME13.SCN

Comment Sample

Cell 3

- Wavelength
- Velocity
- Equilibrium

Comment Sample

Cell 4

- Wavelength
- Velocity
- Equilibrium

Comment Sample

Cell 5

- Wavelength
- Velocity
- Equilibrium

Velocity Detail - Cell 4

Absorbance

Second Wavelength 0

Third Wavelength 0

Radial Step Size 0.003

Replicates 1

Mode

- Step
- Continuous

Centerpiece

- 2 channel
- 6 channel
- 8 channel

Data directory name

xlidatst

Interference

- Blank scan subtraction
- Align transformed data

Pixels per fringe

Laser Setup - Cell 4

Laser delay 71.2

Laser duration 0.4

Brightness 52

Contrast 70

Rotor

- 4 Hole
- 8 Hole

Location

- Cell 1
- Cell 2
- Cell 3
- Cell 4
- Cell 5
- Cell 6
- Cell 7
- Cell 8
- Scallop

Laser on

Auto Adjust Laser Delay

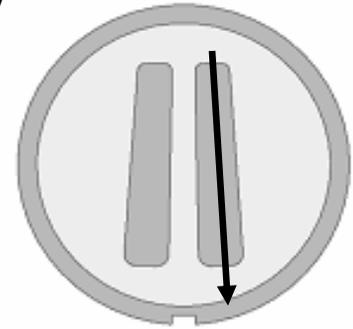
Simulate rpm   On

Exposure time 6.67 us

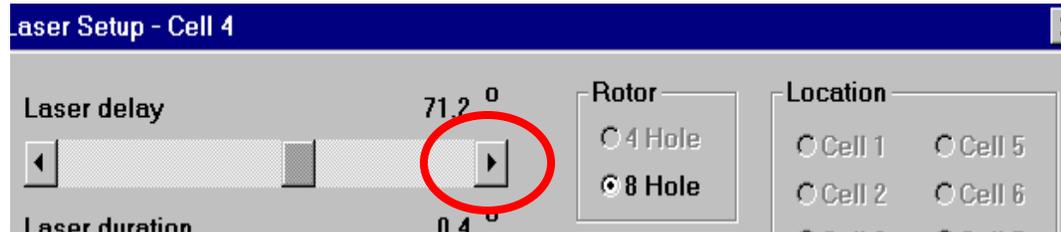
OK Cancel

Next, we have to adjust the Laser Delay.

Setting the laser delay aligns the laser beam so that it falls exactly down through the center of the center piece sector.

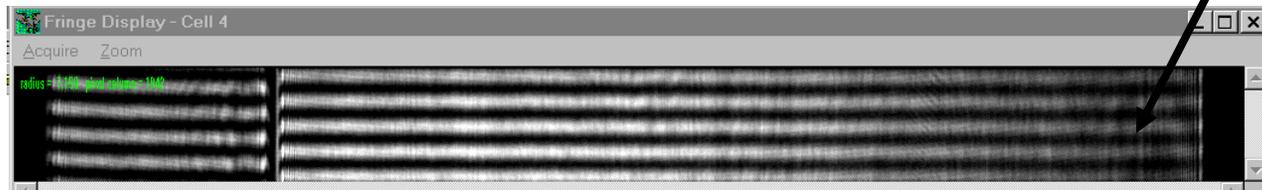


First, on the laser delay bar, left click on the right arrow box to move the laser.



As the laser moves out of alignment, the right end of the fringe pattern begins to darken. When it looks like the fringe pattern example below, stop and then, using the left arrow box, count each left click of the mouse (1 click = .1 degree) as you move the laser back through the middle and out of alignment in the other direction. Again, the right fringe pattern darkens as below.

Then, to bring the laser to mid-line, left click on the right arrow box and move the laser back one-half the counted distance.



The screenshot shows the Beckman XL-I software interface. At the top, a window titled "Fringe Display - Cell 4" displays a series of horizontal interference fringes. Below this, the main software window "Beckman XL-I" is visible, with a menu bar and a toolbar. A "NONAME13.SCN" window is open, showing various parameters for "Cell 4", "Cell 5", and "Cell 6". A "Velocity Detail - Cell 4" window is also open, showing "Absorbance" and "Interference" settings. In the foreground, a "Laser Setup - Cell 4" window is open, with the "Laser delay" value of 72.6 degrees circled in red. An arrow points from this circled value to the fringe display window. The Windows taskbar at the bottom shows the Start button, several application icons, and the taskbar itself with the following open applications: Microsoft PowerPoint, Fringe Display - Cell 4, and Beckman XL-I. The system clock shows 2:10 PM.

radius = 5.749, pixel column = 0

Beckman XL-I

File XL Scan Interference Service Options Window Help

NONAME13.SCN

Wavelength Absorbance Rmin 5.8 Rmax 7.3 W1 280

Velocity Interference

Equilibrium

Comment Sample

Cell 4

Wavelength Absorbance

Velocity Interference

Equilibrium

Comment Sample

Cell 5

Wavelength Absorbance

Velocity Interference

Equilibrium

Comment Sample

Cell 6

Velocity Detail - Cell 4

Absorbance

Second Wavelength 0

Third Wavelength 0

Radial Step Size 0.003

Replicates 1

Mode

Step Continuous

Centerpiece

2 channel

6 channel

8 channel

Data directory name

xlidatst

OK Cancel

Interference

Blank scan subtraction

Align transformed data

Laser Setup - Cell 4

Laser delay 72.6

Laser duration 0.4

Brightness 52

Contrast 70

OK

Rotor

4 Hole

8 Hole

Location

Cell 1 Cell 5

Cell 2 Cell 6

Cell 3 Cell 7

Cell 4 Cell 8

Scallop

Auto Adjust Laser Delay

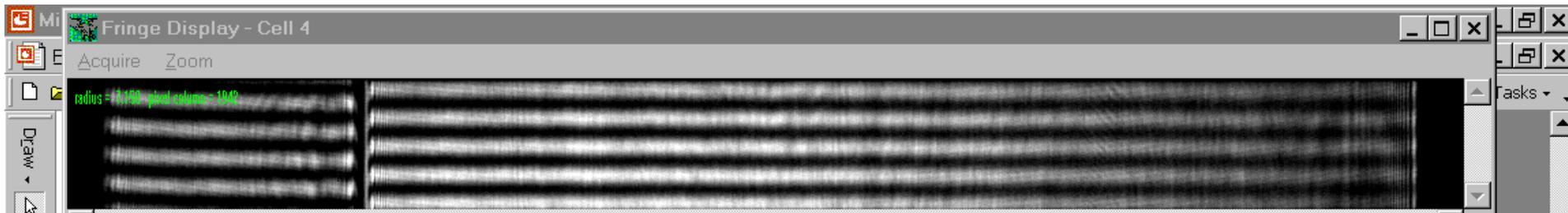
Simulate rpm On

Exposure time 6.67 us

Cancel

Start Microsoft PowerPoint Fringe Display - Cell 4 Beckman XL-I 2:10 PM

Laser out of alignment at 72.6 degrees.



Beckman XL-I  
File XL Scan Interference Service Options Window Help

NONAME13.SCN

Comment Sample

Cell 3

- Wavelength
- Velocity
- Equilibrium

Comment Sample

Cell 4

- Wavelength
- Velocity
- Equilibrium

Comment Sample

Cell 5

- Wavelength
- Velocity
- Equilibrium

Velocity Detail - Cell 4

Absorbance

Second Wavelength 0

Third Wavelength 0

Radial Step Size 0.003

Replicates 1

Mode

- Step
- Continuous

Centerpiece

- 2 channel
- 6 channel
- 8 channel

Data directory name

xlidatst

OK Cancel

Laser Setup - Cell 4

Laser delay 71.2 °

Laser duration 0.4 °

Brightness 52

Contrast 70

OK

Rotor

- 4 Hole
- 8 Hole

Location

- Cell 1
- Cell 2
- Cell 3
- Cell 4
- Cell 5
- Cell 6
- Cell 7
- Cell 8
- Scallop

Laser on

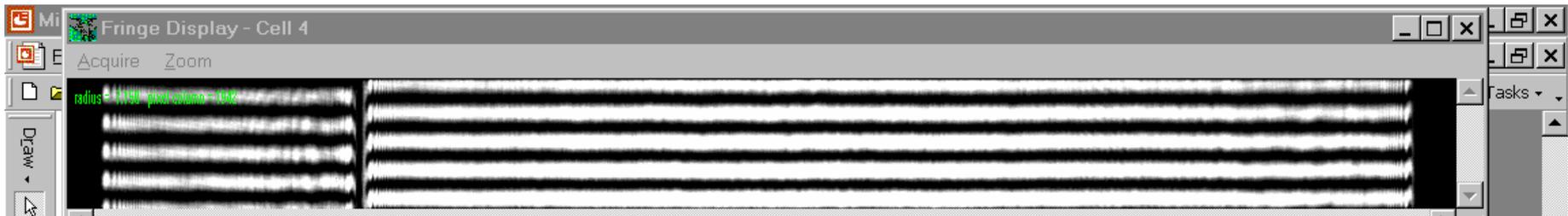
Auto Adjust Laser Delay

Simulate rpm   On

Exposure time 6.67 us

Cancel

Laser out of alignment at 71.2degrees.



NONAME13.SCN

Comment Sample

Cell 3

- Wavelength
- Velocity
- Equilibrium

Comment Sample

Cell 4

- Wavelength
- Velocity
- Equilibrium

Comment Sample

Cell 5

- Wavelength
- Velocity
- Equilibrium

Velocity Detail - Cell 4

Absorbance

Second Wavelength 0

Third Wavelength 0

Radial Step Size 0.003

Replicates 1

Mode

- Step
- Continuous

Centerpiece

- 2 channel
- 6 channel
- 8 channel

Data directory name

xlmdatst

OK Cancel

Laser Setup - Cell 4

Laser delay 71.9

Laser duration 0.4

Brightness 52

Contrast 70

OK

Rotor

- 4 Hole
- 8 Hole

Location

- Cell 1
- Cell 2
- Cell 3
- Cell 4
- Cell 5
- Cell 6
- Cell 7
- Cell 8
- Scallop

Laser on

Auto Adjust Laser Delay

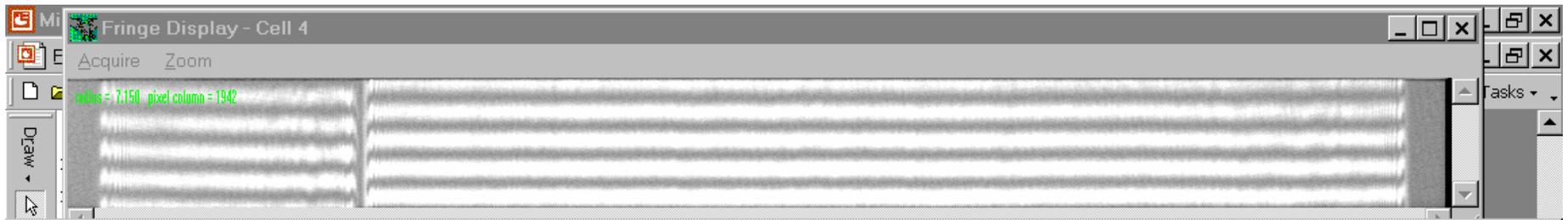
Simulate rpm   On

Exposure time 6.67 us

Cancel

Laser is centered at 71.9.

Now, duration, brightness and contrast need to be adjusted



NONAME13.SCN

Wavelength  Absorbance Rmin 5.8 Rmax 7.3 W1 280

Velocity  Interference

Comment Sample

Cell 3

Wavelength  Absorbance  Interference

Velocity  Interference

Equilibrium

Comment Sample

Cell 4

Wavelength  Absorbance  Interference

Velocity  Interference

Equilibrium

Comment Sample

Cell 5

For a starting point, set Laser duration to .2, bring down the brightness to 22 and set the contrast softer to 107

Velocity Detail - Cell 4

Absorbance

Second Wavelength

Third Wavelength

Radial Step Size

Replicate

Mode

Step  Cont

Centerpiece

2 channel

6 channel

8 channel

OK

Laser Setup - Cell 4

Laser delay 71.9

Laser duration 0.2

Brightness 22

Contrast 107

OK

Rotor

4 Hole

8 Hole

Location

Cell 1  Cell 5

Cell 2  Cell 6

Cell 3  Cell 7

Cell 4  Cell 8

Scallop

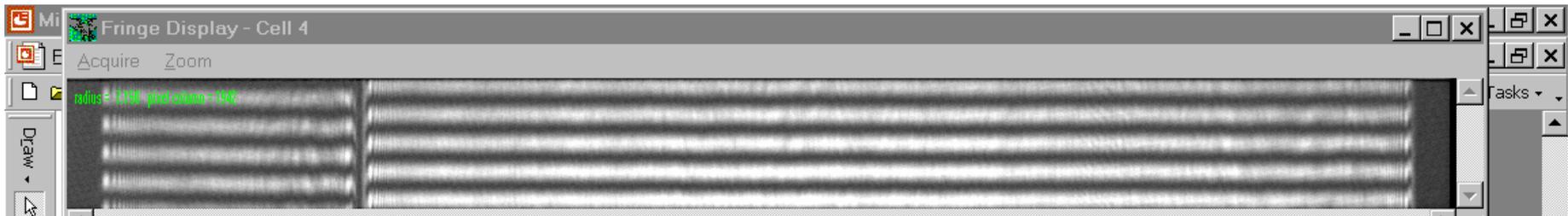
Laser on

Auto Adjust Laser Delay

Simulate rpm   On

Exposure time 3.33 us

Cancel



NONAME13.SCN

Comment Sample

Cell 3

Wavelength  At  In

Velocity  In

Equilibrium

Comment Sample

Cell 4

Wavelength  At  In

Velocity  In

Equilibrium

Comment Sample

Cell 5

Wavelength  At  In

Velocity  In

Equilibrium

To finish, bring down the contrast to 100 and increase brightness to 26.

Velocity Detail - Cell 4

Absorbance

Second Wavelength 0

Third Wavelength 0

Radial Step Size 0.003

Replicates 1

Mode

Step  Continuous

Centerpiece

2 channel

6 channel

8 channel

Data directory name

xldatst

OK Cancel

Laser Setup - Cell 4

Laser delay 71.9

Laser duration 0.2

Brightness 26

Contrast 100

OK

Rotor

4 Hole

8 Hole

Location

Cell 1  Cell 5

Cell 2  Cell 6

Cell 3  Cell 7

Cell 4  Cell 8

Scallop

Laser on

Auto Adjust Laser Delay

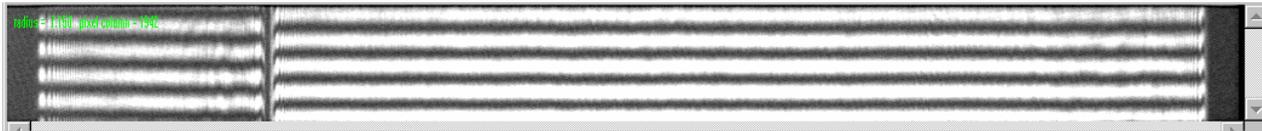
Simulate rpm   On

Exposure time 3.33 us

Cancel



Keep fringes and spaces so they are not too dark, and not too white so that you don't saturate the bright and dark range of the camera.



Too bright. Too much white space between fringes



Not bright enough and too much contrast. The black areas are too dark.



Too bright and not enough contrast. The black areas are not dark enough.

The screenshot shows the Beckman XL-I software interface. At the top, a window titled "Fringe Display - Cell 4" displays a fringe pattern with the text "radius = 5.986 pixel column = 230". Below this is the main software window "Beckman XL-I" with a menu bar (File, XL, Scan, Interference, Service, Options, Window, Help) and a toolbar. A dialog box titled "Velocity Detail - Cell 4" is open, showing settings for "Absorbance" and "Interference". The "Interference" section has a red circle around the "Inside" radius value of 5.986. A black arrow points from the "Inside" radius input field to the fringe display window. The Windows taskbar at the bottom shows the Start button, several application icons, and the taskbar itself with "Microsoft PowerPoin...", "Fringe Display - Cell 4", and "Beckman XL-I" open. The system clock shows "2:23 PM".

Velocity Detail - Cell 4

Absorbance

Second Wavelength 0  
Third Wavelength 0  
Radial Step Size 0.003  
Replicates 1

Mode  
 Step  Continuous

Centerpiece  
 2 channel  
 6 channel  
 8 channel

Data directory name  
xlidatst

Interference

Blank scan subtraction  
 Align transformed data

Pixels per fringe  
21.25 Automatic

Channel  
 A  
 B  
 C  
 D

Radius  
Inside  5.986  
Outside  7.209

Set

Laser Setup Blank Setup

OK Cancel

To set Inside radius, place pointer just before the meniscus and double left click with mouse.

The screenshot shows the Beckman XL-I software interface. At the top, a window titled "Fringe Display - Cell 4" displays a fringe pattern with the text "radius = 7.218 pixels column = 209". Below this is the main software window "Beckman XL-I" with a menu bar (File, XL, Scan, Interference, Service, Options, Window, Help) and a toolbar. The main area shows a configuration panel for "NONAME13.SCN" with options for Wavelength, Velocity, and Equilibrium. A "Velocity Detail - Cell 4" dialog box is open, showing settings for Absorbance and Interference. The "Interference" section has a "Radii" sub-section with "Inside" set to 5.986 and "Outside" set to 7.218. A red circle highlights the "Outside" value, and an arrow points from it to the fringe display window. The Windows taskbar at the bottom shows the Start button, several application icons, and the taskbar itself with "Microsoft PowerPoin...", "Fringe Display - Cell 4", and "Beckman XL-I" open. The system clock shows "2:23 PM".

Velocity Detail - Cell 4

Absorbance

Second Wavelength 0  
Third Wavelength 0  
Radial Step Size 0.003  
Replicates 1

Mode  
 Step  Continuous

Centerpiece  
 2 channel  
 6 channel  
 8 channel

Data directory name  
xldatst

Interference

Blank scan subtraction  
 Align transformed data

Pixels per fringe  
21.25 Automatic

Channel Radii  
 A  
 B  
 C  
 D

Inside  5.986  
Outside  7.218

Set

Laser Setup Blank Setup

OK Cancel

To set Outside radius, place pointer at right edge and double left click with mouse.

To begin radial calibration for IF scans, from the Interference top menu, open Radial Calibration.

The screenshot displays the Beckman XL-I software interface. The main window shows a fringe display with the text "radius = 1129 pixel radius = 209". The "Interference" menu is open, showing options: "Laser Setup...", "Radial Calibration...", "Fringe Rotation...", and "Save Fringe Data". The "Radial Calibration" dialog box is open, showing "Radii" with input fields for "5.85" and "7.15", radio buttons for "Inside" and "Outside", and buttons for "Set Radius", "Laser Setup", "OK", and "Cancel".

**This window opens. Hit the Laser Setup button.**

Set up a radial calibration

Start | Microsoft PowerPoin... | Fringe Display - Cell 4 | Beckman XL-I | 2:26 PM



Beckman XL-I

File XL Scan Interference Service Options Window Help

NONAME13.SCN

Wavelength  Absorbance Rmin 5.8 Rmax 7.3 W1 280

Velocity  Interference

Equilibrium

Comment Sample

Cell 7

Wavelength  Absorbance Rmi

Velocity  Interference

Equilibrium

Comment Sample

Cell 8

Wavelength  Absorbance Rmi

Velocity  Interference

Equilibrium

Comment Counterbalance

This window appears. Make sure Cell # 8 is checked. We calibrate the laser using the counter balance. Note Fringe pattern above.

Laser Setup

Laser delay 251.0

Laser duration 0.2

Brightness 10

Contrast 114

OK

Rotor

4 Hole

8 Hole

Laser on

Location

Cell 1  Cell 5

Cell 2  Cell 6

Cell 3  Cell 7

Cell 4  Cell 8

Scallop

Auto Adjust Laser Delay

Simulate rpm 3000  On

Exposure time 3.33 us

Cancel

## Fringe pattern of a counter balance.



hole in counter balance  
air vs air

solid area  
no transmitted light

opposite hole  
air vs air

A gray area appears as the border between the counter balance hole and the solid part.



Adjust Laser Delay as before, by moving laser out of alignment.



NONAME13.SCN

Wavelength  Absorbance Rmin 5.8 Rmax 7.3 W1 280

Velocity  Interference

Equilibrium

Comment Sample

Cell 7

Wavelength  Absorbance Rmin

Velocity  Interference

Equilibrium

Comment Sample

Cell 8

Wavelength  Absorbance Rmin

Velocity  Interference

Equilibrium

Comment Counterbalance

**Laser Setup**

Laser delay 252.8

Laser duration 0.2

Brightness 20

Contrast 104

OK

Rotor

4 Hole

8 Hole

Laser on

Location

Cell 1  Cell 5

Cell 2  Cell 6

Cell 3  Cell 7

Cell 4  Cell 8

Scallop

Auto Adjust Laser Delay

Simulate rpm 3000  On

Exposure time 3.33 us

Cancel



Beckman XL-I  
File XL Scan Interference Service Options Window Help  
? Laser out of alignment again.

NONAME13.SCN

Wavelength  Absorbance Rmin 5.8 Rmax 7.3 W1 280

Velocity  Interference

Equilibrium

Comment Sample

Cell 7

Wavelength  Absorbance Rmi

Velocity  Interference

Equilibrium

Comment Sample

Cell 8

Wavelength  Absorbance Rmi

Velocity  Interference

Equilibrium

Comment Counterbalance

**Laser Setup**

Laser delay 251.2 °

Laser duration 0.2 °

Brightness 20

Contrast 104

OK

Rotor  
 4 Hole  
 8 Hole

Location  
 Cell 1  Cell 5  
 Cell 2  Cell 6  
 Cell 3  Cell 7  
 Cell 4  Cell 8  
 Scallop

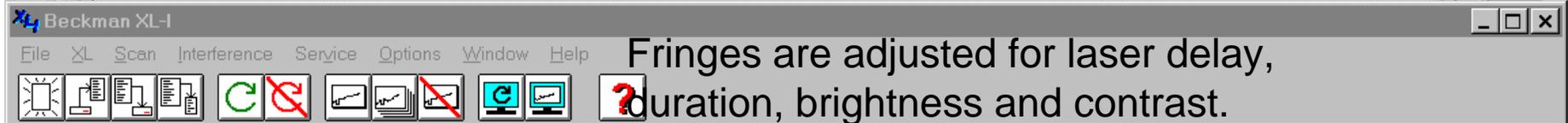
Laser on

Auto Adjust Laser Delay

Simulate rpm 3000  On

Exposure time 3.33 us

Cancel



NONAME13.SCN

Wavelength  Absorbance Rmin 5.8 Rmax 7.3 W1 280

Velocity  Interference

Equilibrium

Comment Sample

Cell 7

Wavelength  Absorbance Rmi

Velocity  Interference

Equilibrium

Comment Sample

Cell 8

Wavelength  Absorbance Rmi

Velocity  Interference

Equilibrium

Comment Counterbalance

### Laser Setup

Laser delay 252.0 °

Laser duration 0.2 °

Brightness 32

Contrast 96

OK

Rotor  
 4 Hole  
 8 Hole

Location  
 Cell 1  Cell 5  
 Cell 2  Cell 6  
 Cell 3  Cell 7  
 Cell 4  Cell 8  
 Scallop

Laser on

Auto Adjust Laser Delay

Simulate rpm 3000  On

Exposure time 3.33 us

Cancel



Beckman XL-I

File XL Scan Interference Service Options Window Help

NONAME13.SCN

Wavelength  Absorbance R<sub>min</sub> 5.8 R<sub>max</sub> 7.3 W1 280

Velocity  Interference

Comment Sample

Cell 7

Wavelength  Absorbance R<sub>min</sub>

Velocity  Interference

Comment Sample

Cell 8

Wavelength  Absorbance R<sub>min</sub>

Velocity  Interference

Comment Counterbalance

**Radial Calibration**

Radii

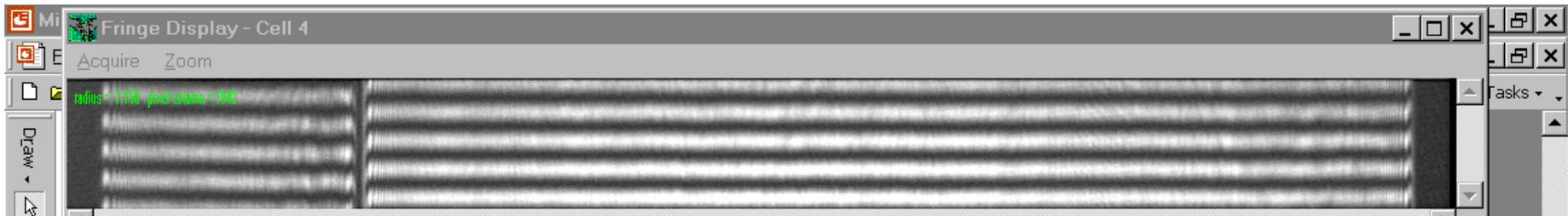
5.85  Inside

7.15  Outside

To set inside radius, left click on the border between air and gray space.

The image shows a screenshot of the Beckman XL-I software interface. The main window displays a fringe pattern with the text "radius = 7.150 pixel radius = 1944". A "Radial Calibration" dialog box is open, showing two radii: 5.85 and 7.15. The "Outside" radio button is selected. The dialog box also includes a "Set Radius" button, a "Laser Setup" button, and "OK" and "Cancel" buttons. An arrow points from the "Outside" radio button to the fringe pattern in the background.

To set outside radius, left click on the border between air and gray space.



Beckman XL-I

File XL Scan Interference Service Options Window Help

Icons: [Lightbulb] [Microscope] [Document] [Refresh] [X] [Graph] [Graph] [X] [Monitor] [Monitor] [Question Mark]

NONAME13.SCN

Comment

Cell 3

Wavelength  At

Velocity  In

Equilibrium

Comment

Velocity Detail - Cell 4

**Absorbance**

Second Wavelength

Third Wavelength

Radial Step Size

Replicates

Mode

Step  Continuous

**Centerpiece**

2 channel

6 channel

8 channel

Data directory name

OK Cancel

Cell 4

Wavelength  At

Velocity  In

Equilibrium

Comment

Cell 5

Wavelength  At

Velocity  In

Equilibrium

Laser Setup - Cell 4

Laser delay

Laser duration

Brightness

Contrast

OK

**Rotor**

4 Hole

8 Hole

Laser on

Auto Adjust Laser Delay

Simulate rpm   On

Exposure time

Cancel