

Digikröm Series Monochromator, AD131 Photodiode Detector Zero & Calibration Instruction

May, 2015



Spectral Products

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I. Introduction

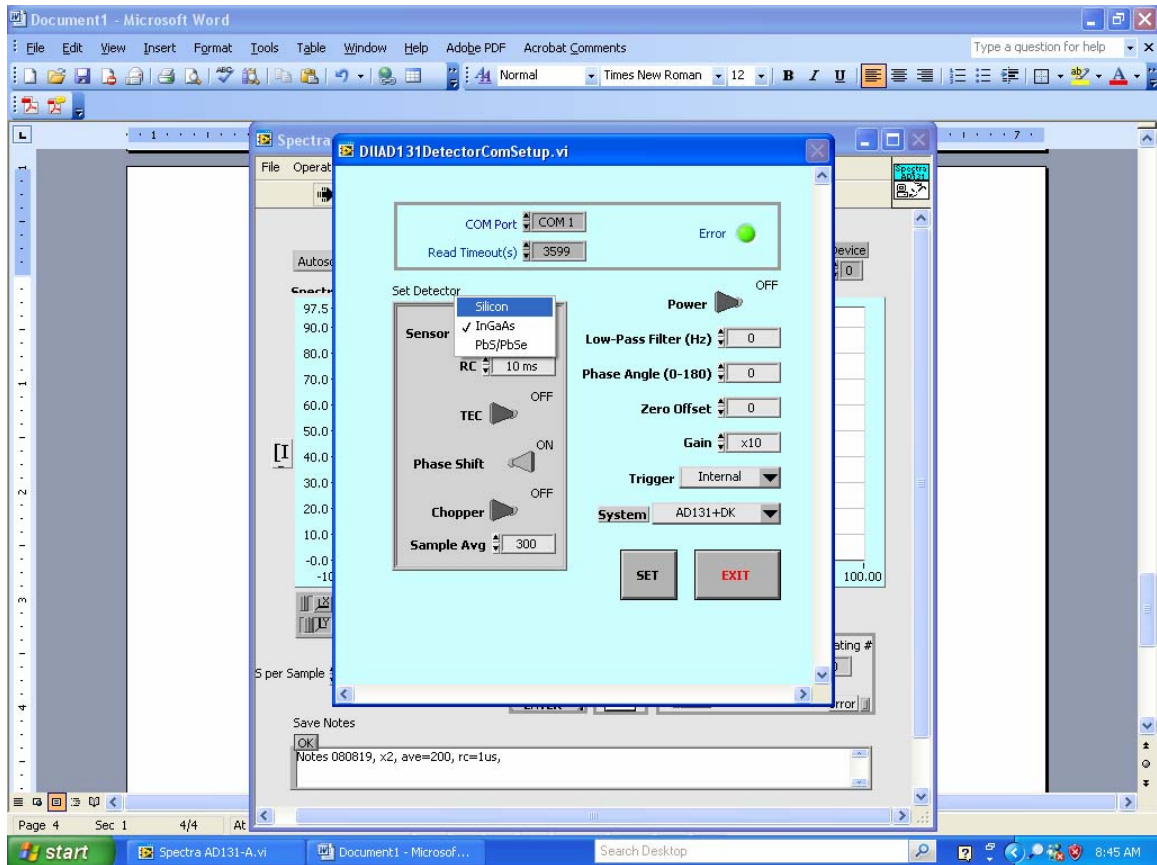
1. The purpose of this manual is to provide a step by step tutorial type of document allowing the user to quickly Zero and Calibrate their DK series monochromators' gratings, while familiarizing themselves with the operation of both the AD131 photodiode detector system and monochromator.
2. Often after shipment, it is necessary to re-zero the monochromators' gratings as some shifting of optical components is inevitable. Extremely minute shifts in the optical path can result in what seems to be quite large shifts in wavelength at the monochromator exit.
3. It is extremely important to first establish the Zero order offset of each grating **BEFORE** attempting to Calibrate the grating. The algorithm for each grating is based on the Zero offset value programmed into Ram (Novram).
4. Under most circumstances, once Zero order is established, no further calibration is necessary as the Calibration offset is based off of the Zero offset as stated above.
5. For Zero and Calibrate functions, it is most accurate if a point source, such as a HeNe laser, or a spectral line source, such as Spectral Products ASC series of calibration lamps is used. While Zero is possible if using a broadband source, Calibration would be quite inaccurate unless a notch filter is used in conjunction with the source.
6. For this tutorial, it is assumed communication has already been established with both the monochromator and AD131 detector.



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II. Zeroing and Calibrating a Grating

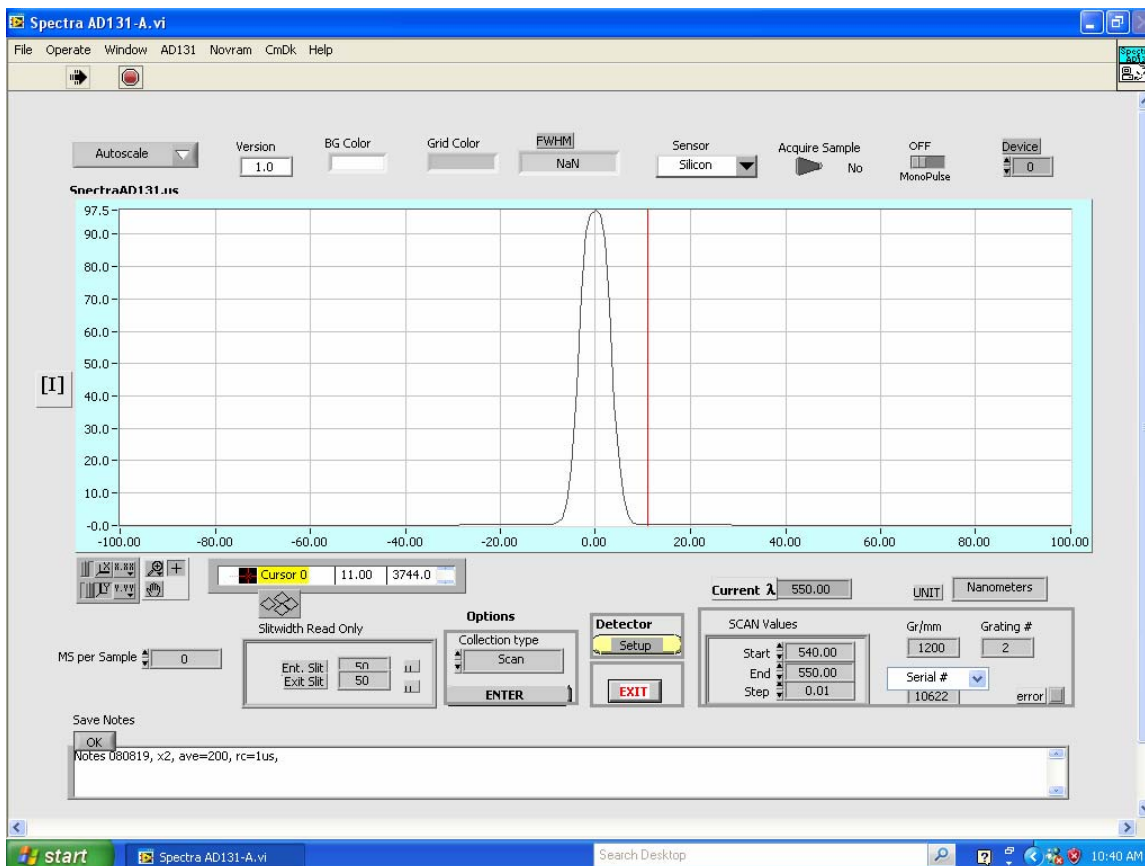


1. The first screen to pop up when opening the AD131 program is shown above. Several things to look for in this screen are:
 - a. Sensor – User select input to choose the correct sensor head in use.
 - b. TEC – Toggles on or off depending whether a thermoelectric cooler is in use or not.
 - c. Sample Average – User input value of 1-300. The higher the number of samples taken results in a smoother waveform profile.
 - d. Chopper – Toggles on or off depending whether an optical chopper is in use or not. Chopper must be used with PbSe sensors.
 - e. Gain – User select input of 1-10
 - f. System – The AD131 can be used as a stand alone system or with a monochromator. This tutorial is for use with DK monochromators.
2. Press **S**et and then **E**xit when satisfied with your settings.



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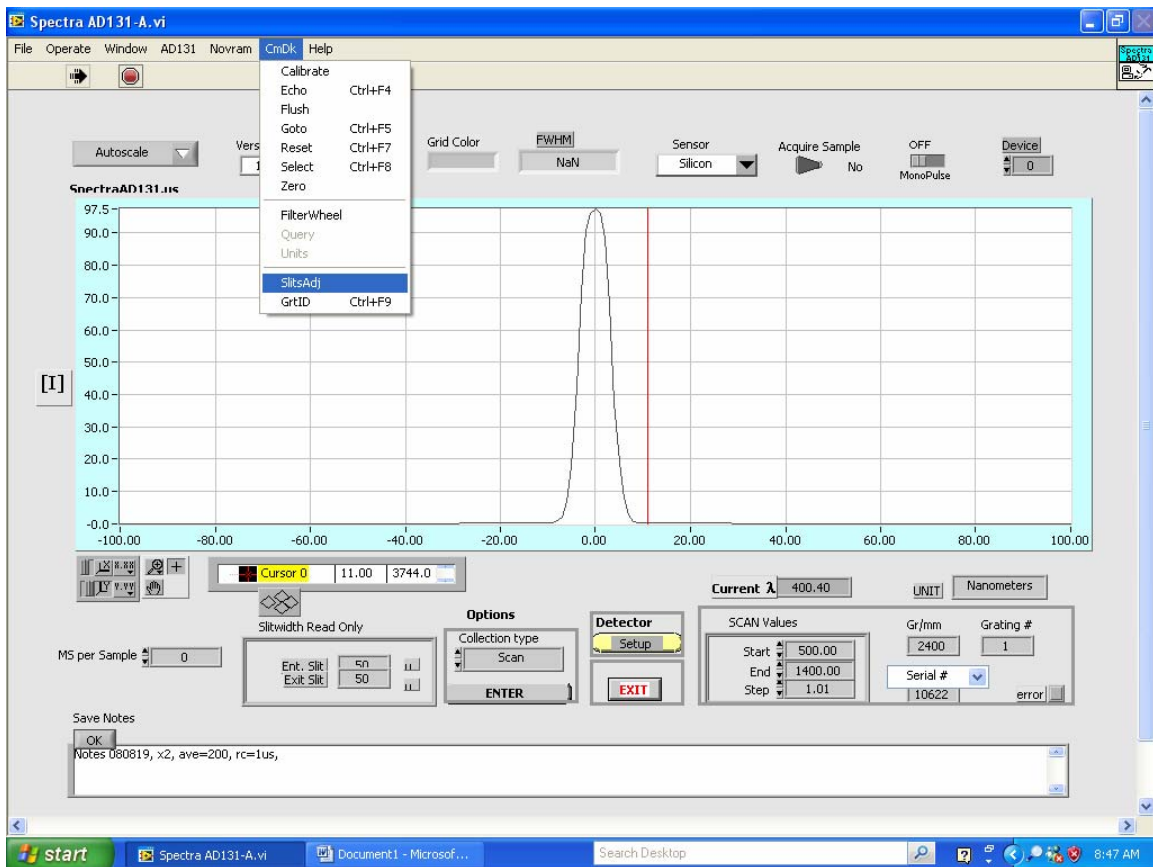


1. The screen above is the next one you will see after detector parameters are set. Several things about this screen:
 - a. Slitwidth – This is informational only. The monochromator slit width can not be changed in this window.
 - b. Options, Collection Type – This is user selected between Zero Scan or Wavelength Scan.
 - c. Detector – Pressing this button will open the detector parameters window.
 - d. SCAN Values – This window indicates parameters of scan, grating grooves/mm, the grating I.D. number within the monochromator, and the monochromator serial number.
 - e. EXIT – this button removes the power to the AD131. If this is pressed, you must restart the system.



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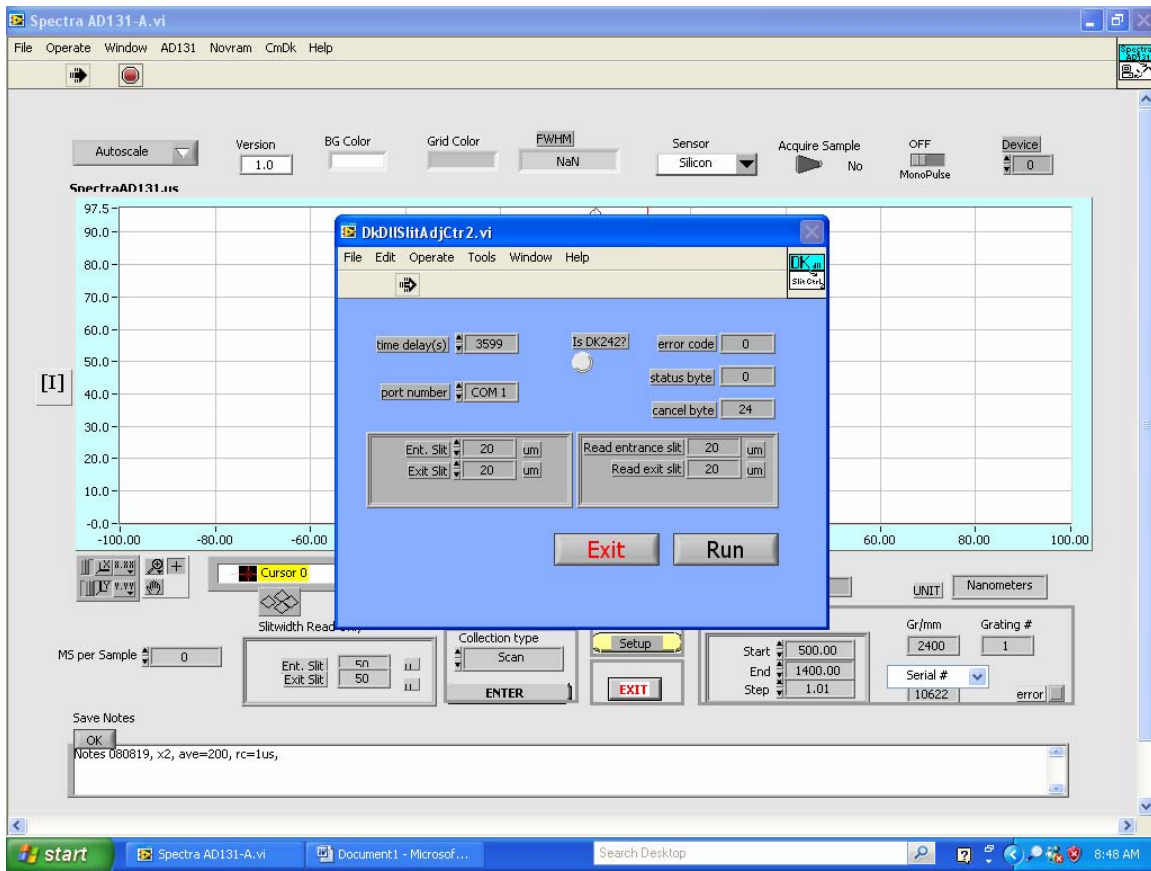


1. Pressing the CmDk button will open the drop down menu shown above. Options relevant to this tutorial are:
 - a. Calibrate – Calibrates the grating to a known wavelength. Note: this command changes the offset value stored in Ram.
 - b. Goto – Instructs the grating to slew to user defined wavelength. Note that this command only instructs the grating to move to a wavelength. It ***DOES NOT*** take a wavelength scan.
 - c. Reset – Can be used to reset the grating to default (100nm).
 - d. Select – User input to select grating if more than one is installed.
 - e. Zero – Calibrates the Zero order of the grating. Note: this command changes the offset value stored in Ram.
 - f. SlitsAdj – User input of 10-3000um slit widths. Can be adjusted separately, but it is recommended to have equal entrance and exit slit widths.



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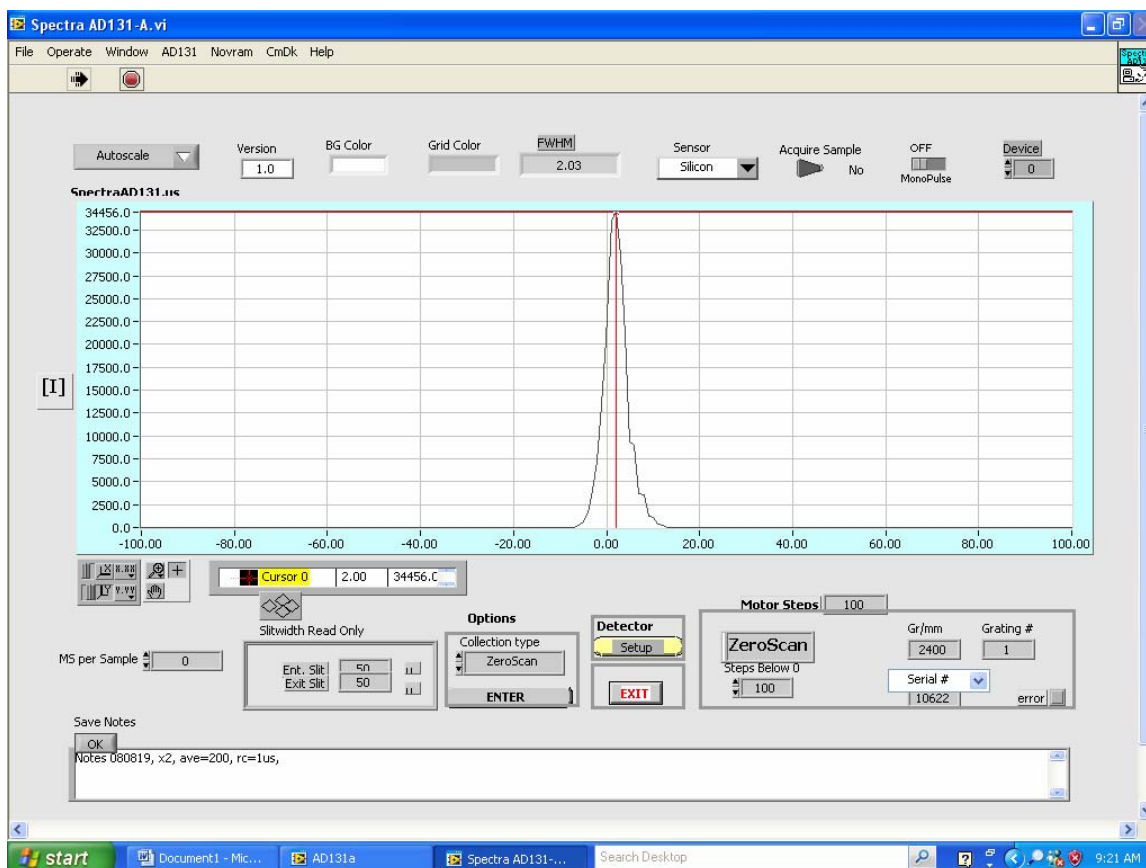


1. Pressing the SlitsAdj will give the pop up window shown above. For **Z**ero and **C**alibration purposes, narrower slits will result in more accurate results. At power on, the DK defaults the slit width to 50um. For calibration at Spectral Products, 10-50um slits are routinely used.
2. These values can be changed either by use of the arrow buttons or by highlighting the value inside the box and typing in a new value.
3. Press Run to change to the desired value, then Exit to close the popup window and continue.



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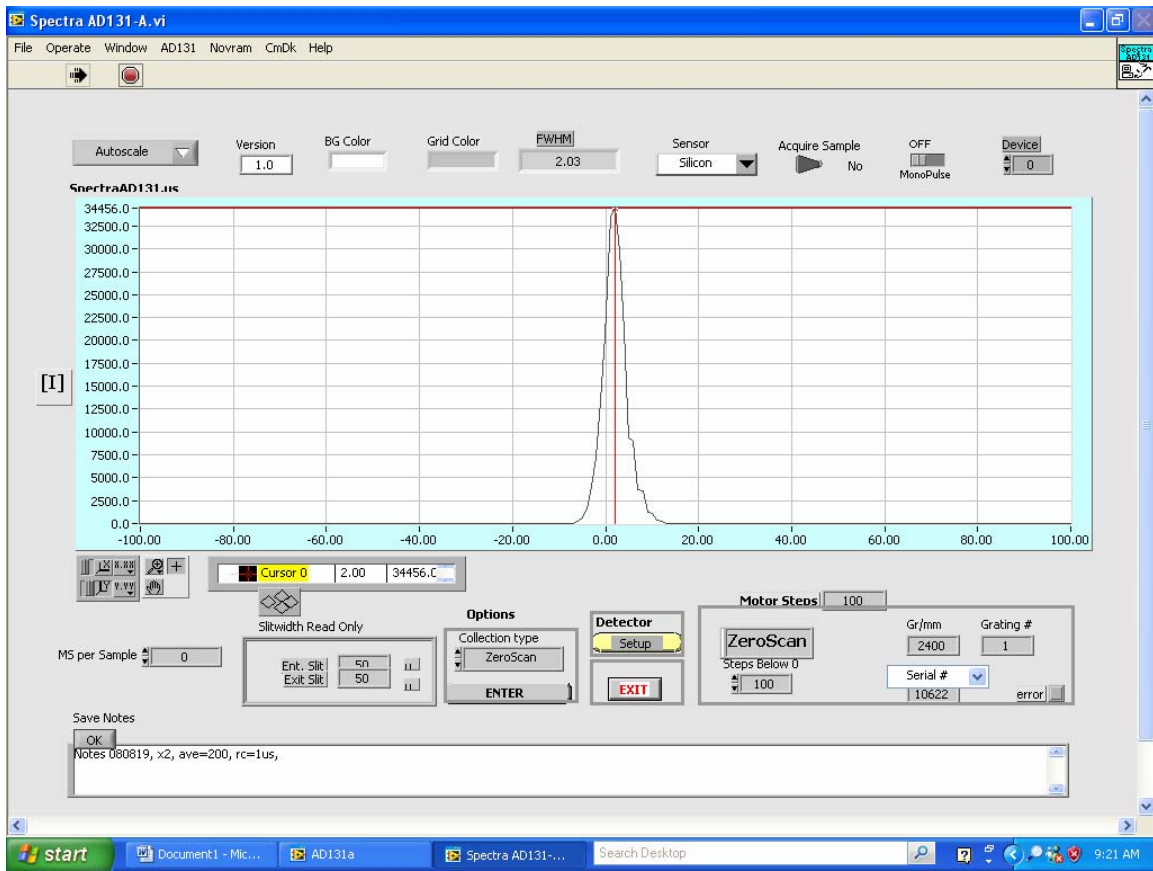


1. Click on the Scan/ZeroScan box in the Collection Type window and select ZeroScan. Note the SCAN Values will change to Zero Scan, and also show a Steps Below 0 box. This box indicates the number of motor steps below and above the last known Zero offset the monochromator will step.
2. Enter the desired length of Zero scan you would like to run (1-300 motor steps) in the Steps Below 0 box.
3. Press Enter in the Collection Type window to start the Zero scan. The Motor Steps box will indicate the real time progress of the scan.



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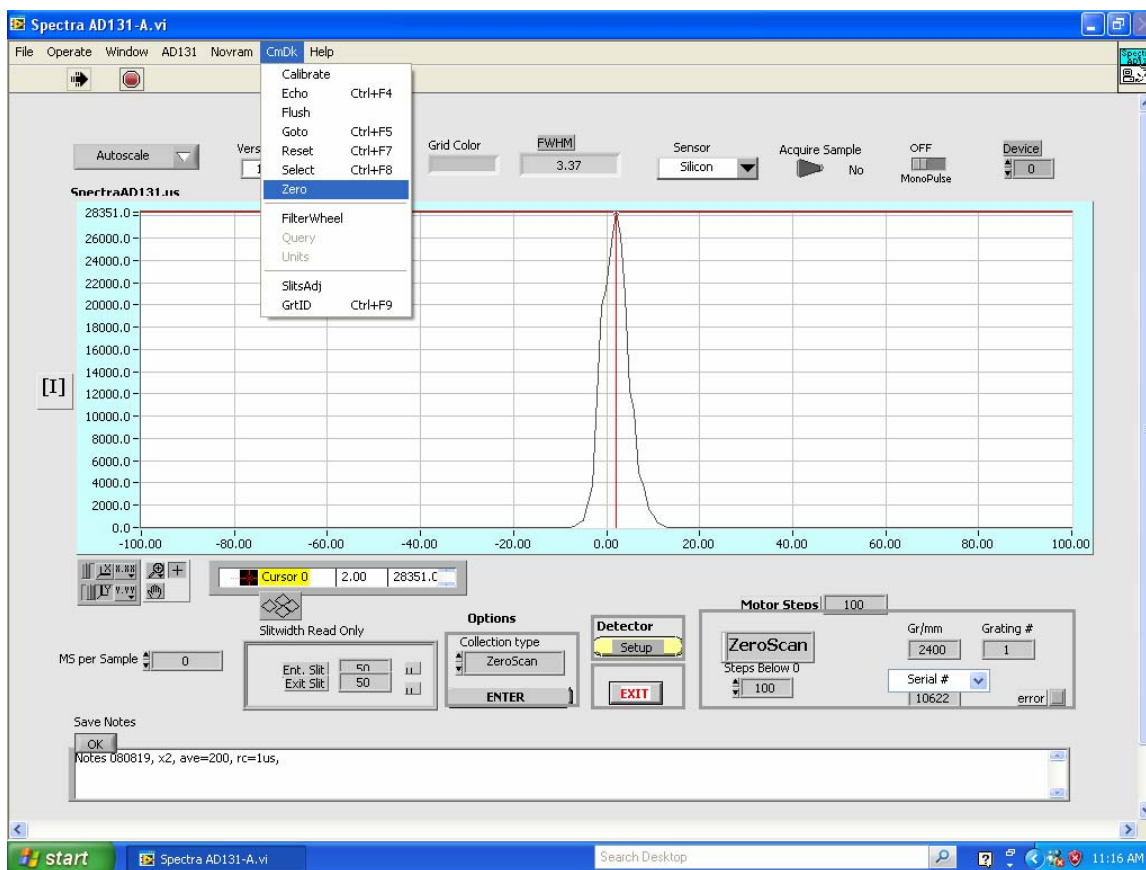


1. In the Zero scan taken, we stepped the grating from 100 steps below last known Zero to 100 steps above.
2. In this case, the Zero order peak is found at +2 motor steps. This, as well as peak intensity is indicated in the Cursor 0 box located directly under the scan area of the screen.



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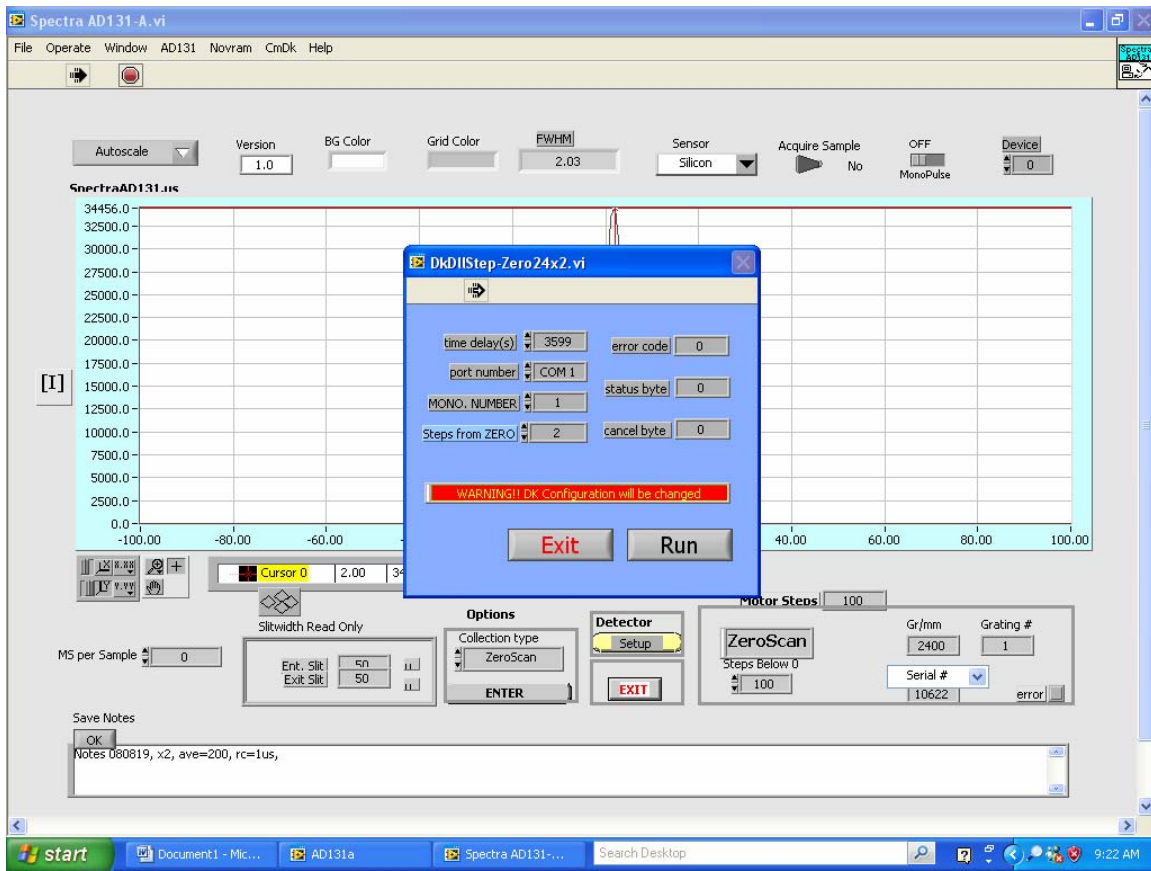


1. To **Z**ero the grating to its new offset, click the CmDk button.
2. Select the **Z**ero option. A new pop up window will appear as below.



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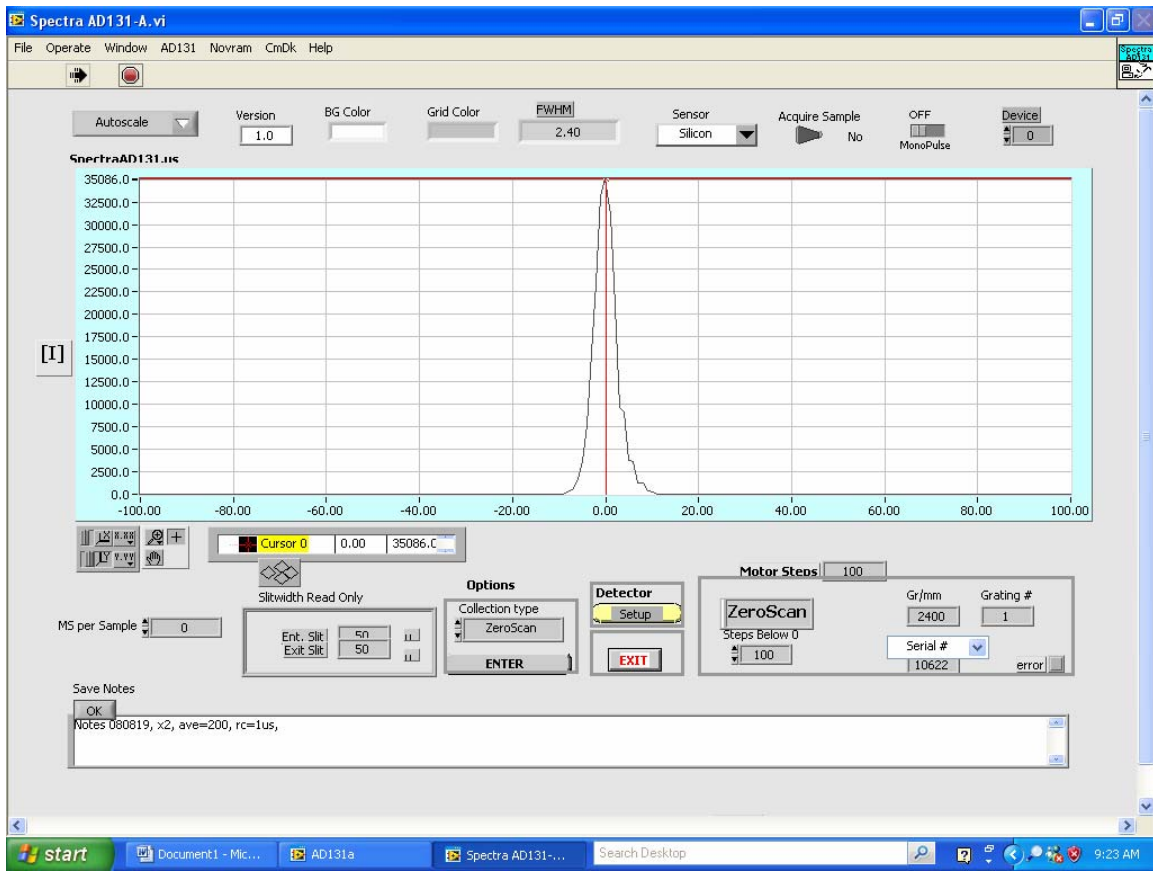
1. Enter 2 in the Steps from Zero box.
2. Press Run to enter the value.
3. Press Exit to return to the scan screen.

Note: there is no grating reset when issuing a Zero command.



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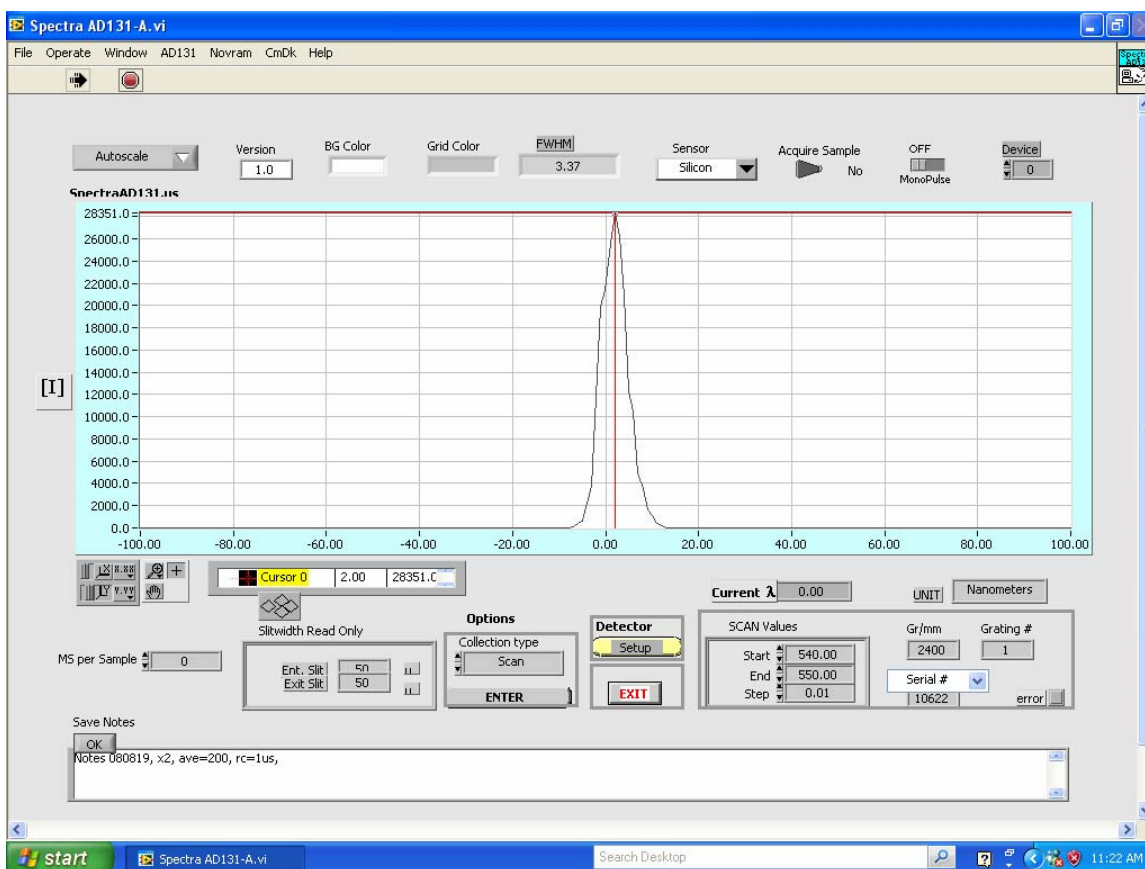


1. Press the Enter button to run the Zero scan once again to check the new grating Zero offset.
2. It may be necessary to repeat the above procedure if the Zero wavelength was far from the desired offset. In this case, Zero is now set perfectly.
3. Once satisfied with the position of the Zero waveform, you can now take a wavelength scan and calibrate to your wavelength of interest if necessary.



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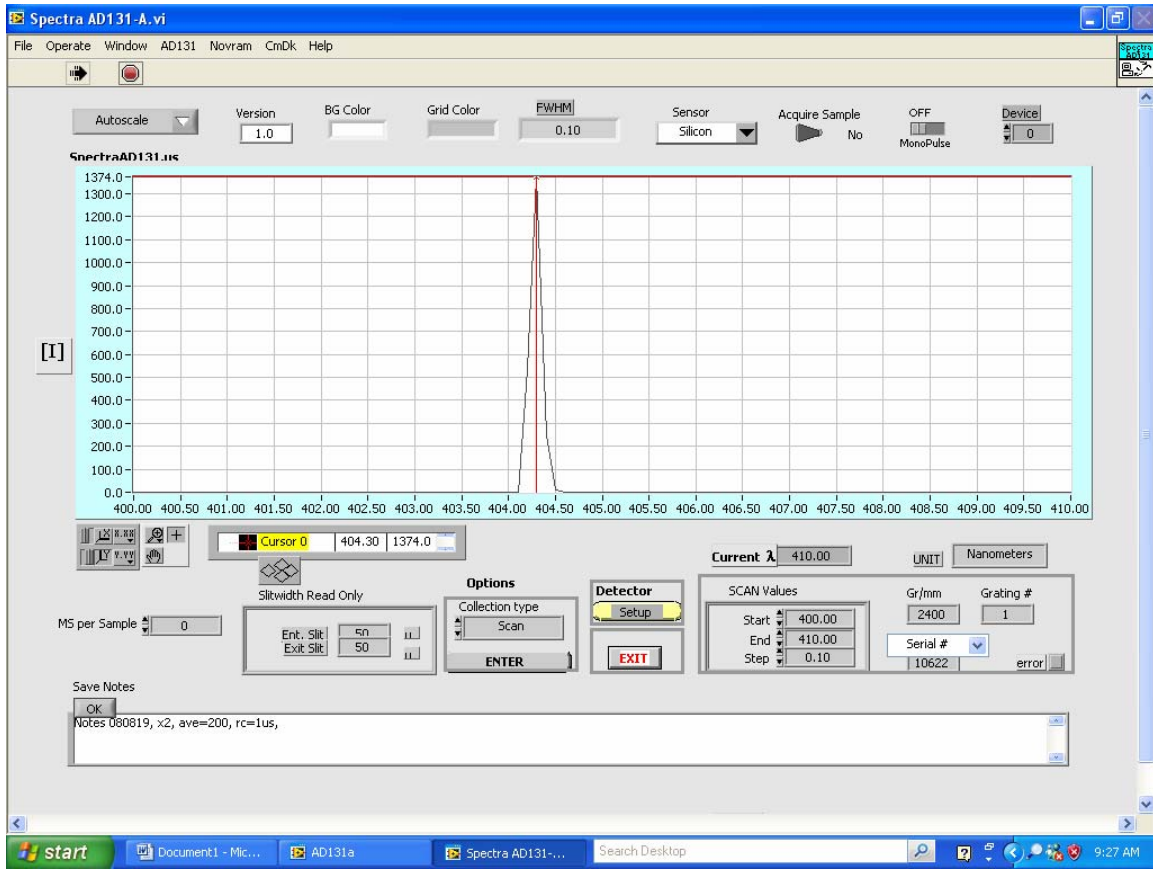
1. In the Collection Type box, select Scan. You will notice the information window to the right has changed.
2. Enter the wavelength you would like your scan to start and end in the appropriate boxes.
3. Enter the step size you would like to scan. As a rule, the smallest step size acceptable for the grating in use will yield the most accurate reading. Minimum step size is determined by grating g/mm. Following is a list of common gratings & minimum step size:

<u>Grating</u>	<u>uStep</u>	<u>½ step</u>
2400 g/mm	.01 nm	.1 nm
1200 g/mm	.01 nm	.1 nm
600 g/mm	.02 nm	.2 nm
300 g/mm	.04 nm	.4 nm
150 g/mm	.08 nm	.8 nm
100 g/mm	.12 nm	1.2 nm
75 g/mm	.16 nm	1.6 nm
50 g/mm	.24 nm	2.4 nm



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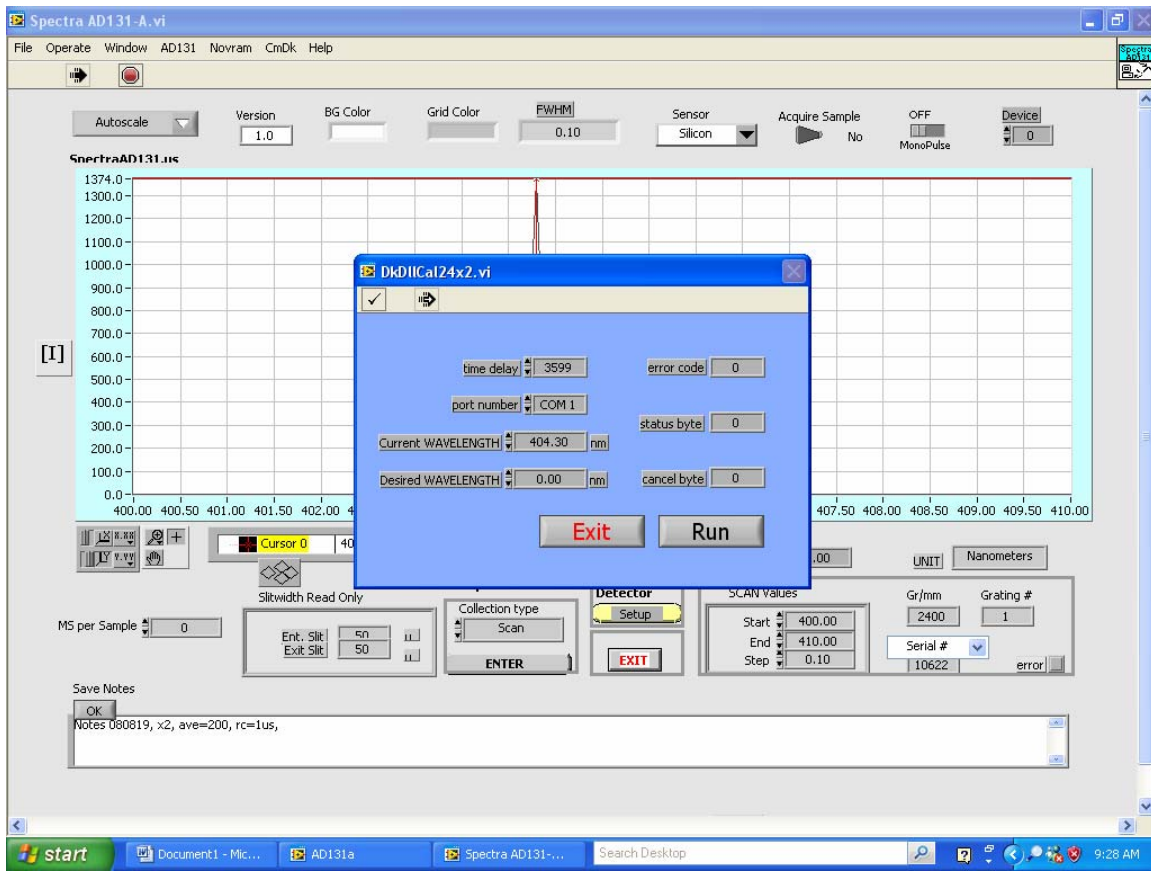


1. Note that this monochromator is a 1/2 step. Most DK series monochromators are uStep. The difference between the two types is the uStep is approximately 10 times more precise in its step and thus calibration can be made to a finer wavelength (i.e. 404.66nm vs. 404.7nm)
2. In the scan above, the grating was scanned from 400-410nm to look at the 404.66nm Hg line. The line was found at 404.30nm as indicated in the Cursor 0 box.
3. Open the CmDk drop down menu and select Calibrate if you wish to calibrate the grating. A new pop up window will appear as below.



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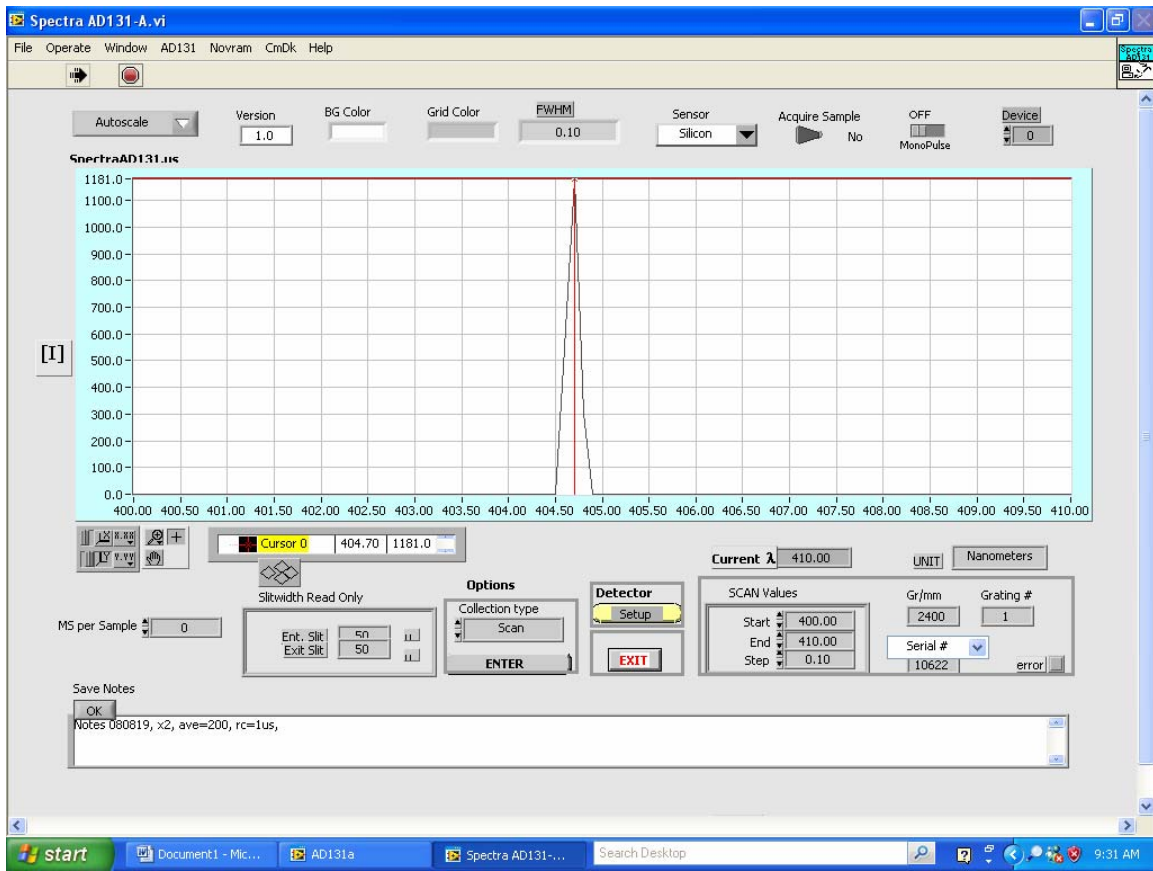


1. In the Current Wavelength box, you will see it has indicated the peak is at 404.30nm.
2. Enter the desired wavelength. This is the wavelength you would like to Calibrate the peak to be – in this case 404.66nm, but since we have a ½ step machine, we enter 404.70nm.
3. Press the Run button to program the monochromator with the new calibration offset.
4. The monochromator will now go through a reset as the new offset is written to Ram and a new grating map is built.
5. Once the reset is complete, press Exit to return to the scan window.



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1. Scan the same wavelength set to ensure the new offset was taken correctly.



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