

The list of the control commands for URD-6 goniometer with explanations and using examples :



We can set any measurement !

Theta Angle Correction

- `THC s` - set THeta angle Correction = shift Theta value per 's' degrees

Device working mode setting

- `MOD 1` - set Theta angle only scan MODE (2Theta angle = constans)
- `MOD 2` - set 2Theta angle only scan MODE (Theta angle = constans)
- `MOD 3` - set Theta & 2Theta angles simultaneously moving scan MODE

Work parameters setting

- `INT t` - set counting time (INTerval) per 't' seconds
- `STP p` - at MOD 1 - set STeP scan Theta angle per 'p' value
- at MOD 2 and MOD 3 - set step scan 2Theta angle per 'p' value

Angles setting

- `STH a` - **Set THeta** angle per 'a' value (2Theta angle not moving)
- `STT a` - **SeT 2THeta** angle per 'a' value (Theta angle not moving)
- `SAN a` - **Set 2theta ANgle** per 'a' value, set Theta angle per 'a/2' value

Scanning

- `SSC r` - **Start SCanning** with a given step (`STP`) Theta angle only (`MOD 1`) either 2Theta angle only (`MOD 2`) either simultaneously Theta & 2Theta angles (`MOD 3`) from the current position (`STH` , `STT` , `SAN`) by 'r' degrees distance

Using examples :

The diffraction measurement within 3 angle's ranges, with difference steps, with the time interval = 5 s

- `MOD 3` - simultaneously scanning of 2Theta & Theta angles
- `INT 5` - counting time = 5 seconds

- `SAN 23` - set 2Theta angle = 23° & Theta angle = 11.5°
- `STP 0.05` - set 2Theta angle step for scanning = 0.05°
- `SSC 10` - make a step scan from current position for a 10°

- `SAN 44.5` - set 2Theta angle = 44.5° & Theta angle = 22.25°
- `STP 0.02` - set 2Theta angle step for scanning = 0.02°
- `SSC 2` - make a step scan from current position for a 2°

- `SAN 90` - set 2Theta angle = 90° & Theta angle = 45°
- `STP 0.1` - set 2Theta angle step for scanning = 0.1°
- `SSC 20` - make a step scan from current position for a 20°

The diffraction measurement within 2 angles ranges, with the same steps and with the time interval = 2.5 s

- `MOD 3` - simultaneously scanning of 2Theta & Theta angles
 - `INT 2.5` - counting time = 2.5 sec
 - `STP 0.04` - set 2Theta angle step for scanning = 0.04°

 - `SAN 25` - set 2Theta angle = 25° & Theta angle = 12.5°
 - `SSC 10` - make a step scan from current position for a 10°

 - `SAN 50`
 - `SSC 1.5`
-

The diffraction measurement within 1 angles range, with a shift of Theta angle

- MOD 3 - simultaneously scanning of 2Theta & Theta angles
- INT 5 - counting time = 5 sec
- SAN 30 - set 2Theta angle = 30° & Theta angle = 15°
- STH 14 - set Theta angle = 14°
- STP 0.05 - set 2Theta angle step for scanning = 0.05°
- SSC 2 - make a step scan from current position for a 2°

The measurement with Theta moving only

- MOD 1 - Theta angle scanning only
- INT 5 - counting time = 5 sec
- SAN 30 - set 2Theta angle = 30° & Theta angle = 15°
- STH 14 - set Theta angle = 14°
- STP 0.05 - set **Theta** angle step for scanning = 0.05°
- SSC 2 - make a step scan from current position for a 2°

The measurement with 2Theta moving only

- MOD 2 - 2Theta angle scanning only
- INT 5 - set counting time = 5 sec
- SAN 26 - set 2Theta angle = 26° & Theta angle = 13°
- STT 25 - set 2Theta angle = 25°
- STP 0.05 - set **2Theta** angle step for scanning = 0.05°
- SSC 2 - make a step scan from current position for a 2°

The short description of the software and hardware for URD-6 diffractometer steering

How to begin the work ?

1. Turn on the computer
2. Start the URD-6 software
3. Turn on the CAMAC crate
4. Turn on the DRONEK-3. This text will appear inside the URD-6 software window :

```
URD-6 GONIOMETER CONTROLLER
ver. October 2007
by Waclaw Musial
"ELEKTRONIKA JADROWA" tel. +48 12 266-94-74

ul. Kobierzynska 93/43 30-382 Krakow Poland

C=
```

5. Press ENTER key. This text will appear inside the URD-6 software window :

```

2THETA : not synchronized
THETA  : not synchronized
MOD    : 3
INT    : 1.00
STP    : 0.0500
TH Corr : 0.0000

```

C=

6. Set the radiation detector high voltage supply. The HV Power Supply type 1904 have a special protection, so after the main power switch on you have to set the null (0) output voltage before you set any other HV value. Check if the red LED marked "OUTPUT" is shining.
7. Turn on the RTG tube power supply
8. Make the synchronization of the goniometer's axes passing **up through the 4.5° positions** :
 - choose the *Hardware / Status* menu option. The *Status* command begins sending continuously to the Dronek
 - using the switches on the Dronogur CAMAC block move the goniometer's axes down to the 2Theta/Theta = circa 4°/2°
 - using the 2Th switch move the 2Theta axis fast up for circa 2 seconds (to the 6° position)
 - using the Th switch move the Theta axis fast up for circa 4 seconds (to the 6° position)
 - Check the message from the Dronek. It should be like :

```

C=Status
      2THETA : 6.9260
      THETA  : 6.5345
      MOD    : 3
      INT    : 1.00
      STP    : 0.0500
      TH Corr : 0.0000

```

C=

- Close the URD-6 Status window
- choose the *Hardware / Send TH Corr.* menu option. The *THC* command with the adequate parameter sends to the Dronek

How to go on the work ?

9. Prepare the sample and fit it on the sample holder
10. Prepare the command file to carry out the measurement
11. Choose the *Measurement / Commands / Load* menu option and select the proper file. Next you can correct the measurement algorithm choosing the *Measurement / Commands / Edit* menu option
12. Open the X-ray shutter
13. Choose the *Measurement / Run* menu option
14. You can also make a measurement directly typing the commands on the keyboard
15. Check the proper run of the measurement looking at the goniometer and the URD-6 software windows (text and diagram). If there is any improper command at the command file (bad syntax or parameter out of range), the measurement breaks
16. You can break the measurement at any time choosing the *Measurement / Break* menu option

17. The measurement's data are drawing on line. You can select a lot of manners of drawing it:

- 2Theta, Theta or Point Number at the horizontal scale

View / F(2Theta)

View / F(Theta)

View / F(Point)

- linear or logarithmic vertical scale

View / Log/Lin Ctrl+G

The logarithmic vertical scale is very useful to represent a small and a high peaks together

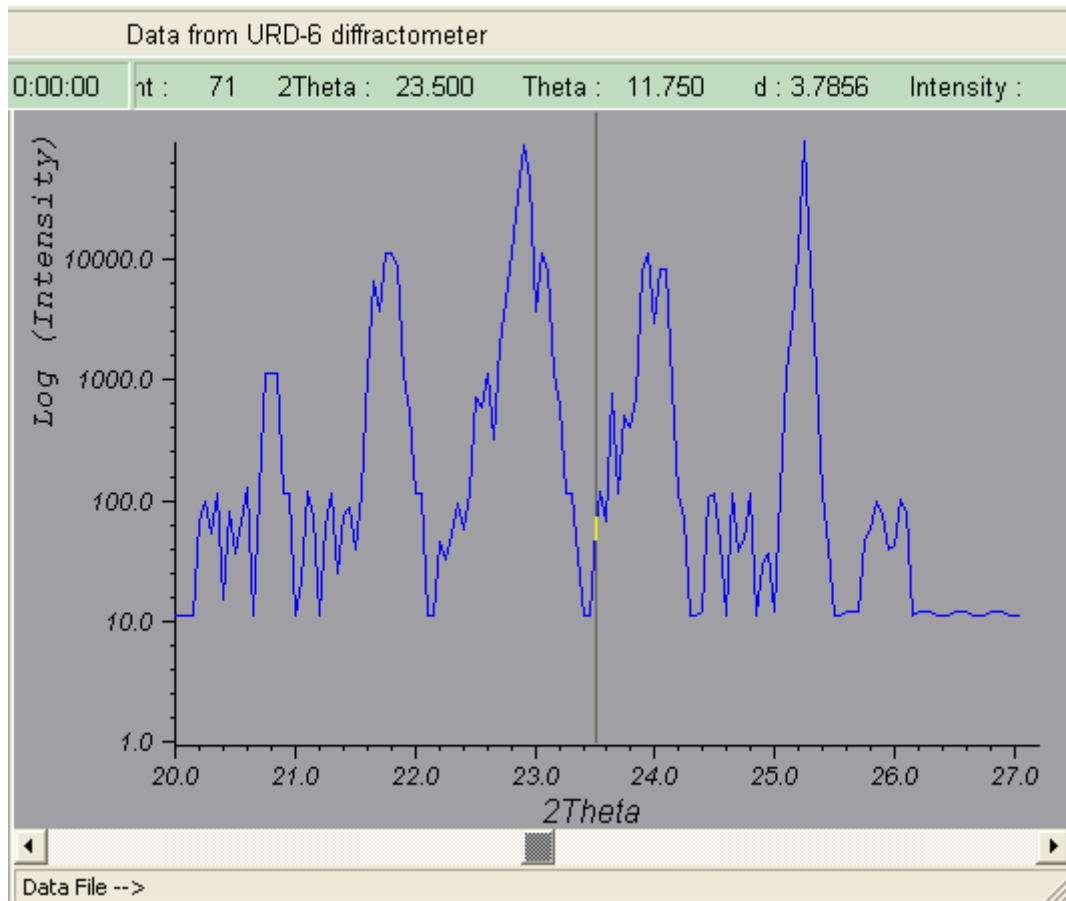


Illustration 1 Logarithmic Y scale

- with or without the background cutting

View / Background Ctrl+B

You can also switch on/off the movable marker to easy assign the digital values to the diagram point.

View / Scan

18. You can magnify the fragment of the diagram :

- View / Scan - the movable marker appears on the diagram. You can check every data point for the point's number, 2Theta angle, Theta angle, interplanar distance (d), intensity. Move the thumb tab of the scroll bar to change the marker position

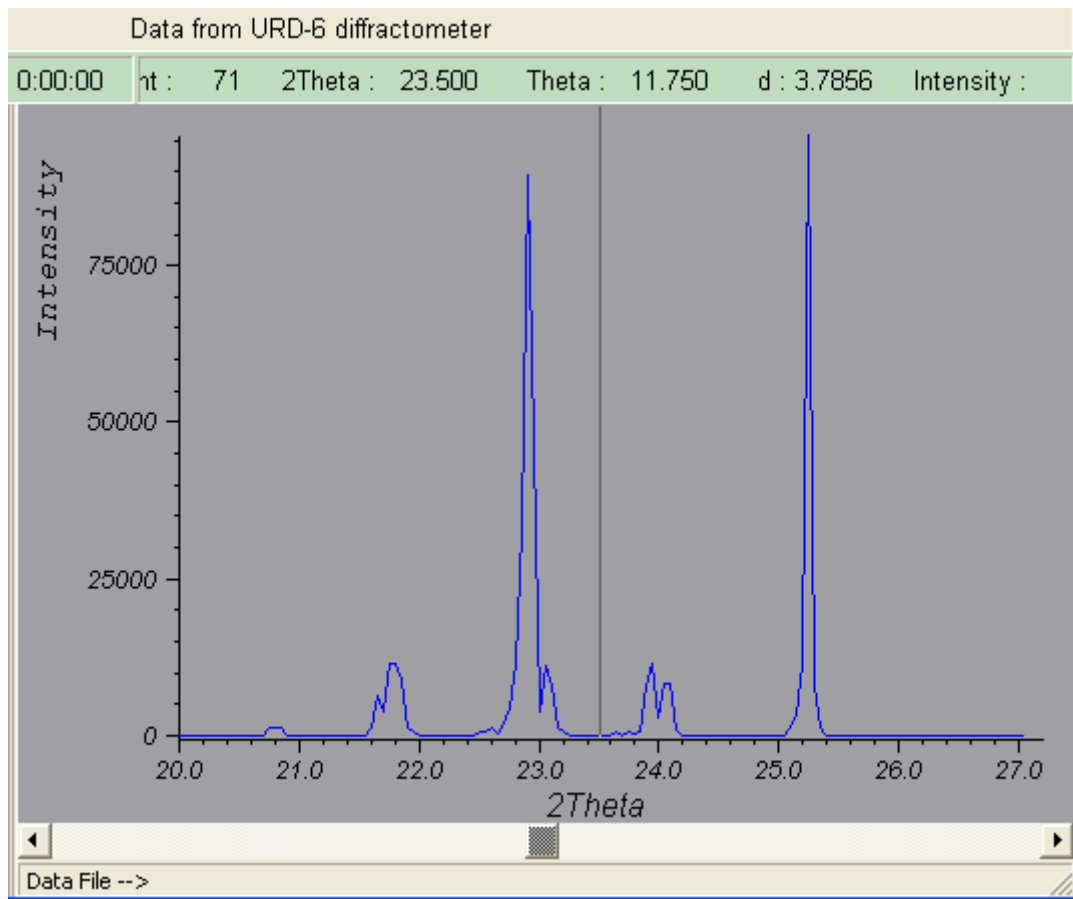


Illustration 2 The whole data diagram with the movable marker

The marker's position determines the centre of the zooming sector. Now you can manipulate with zooming :

- View / Zoom In *Ctrl + I* the sector grows big twice
- View / Zoom Out *Ctrl + O* the sector grows smaller twice

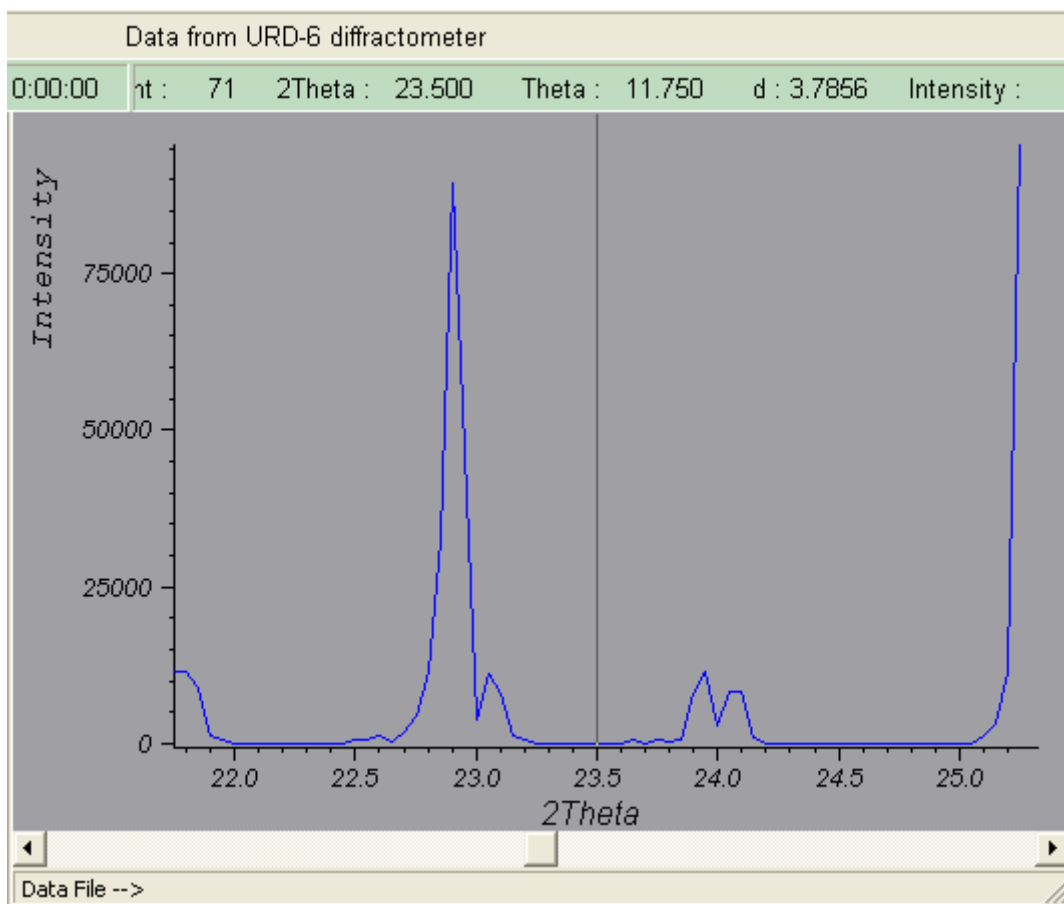


Illustration 3 Zoom 2X

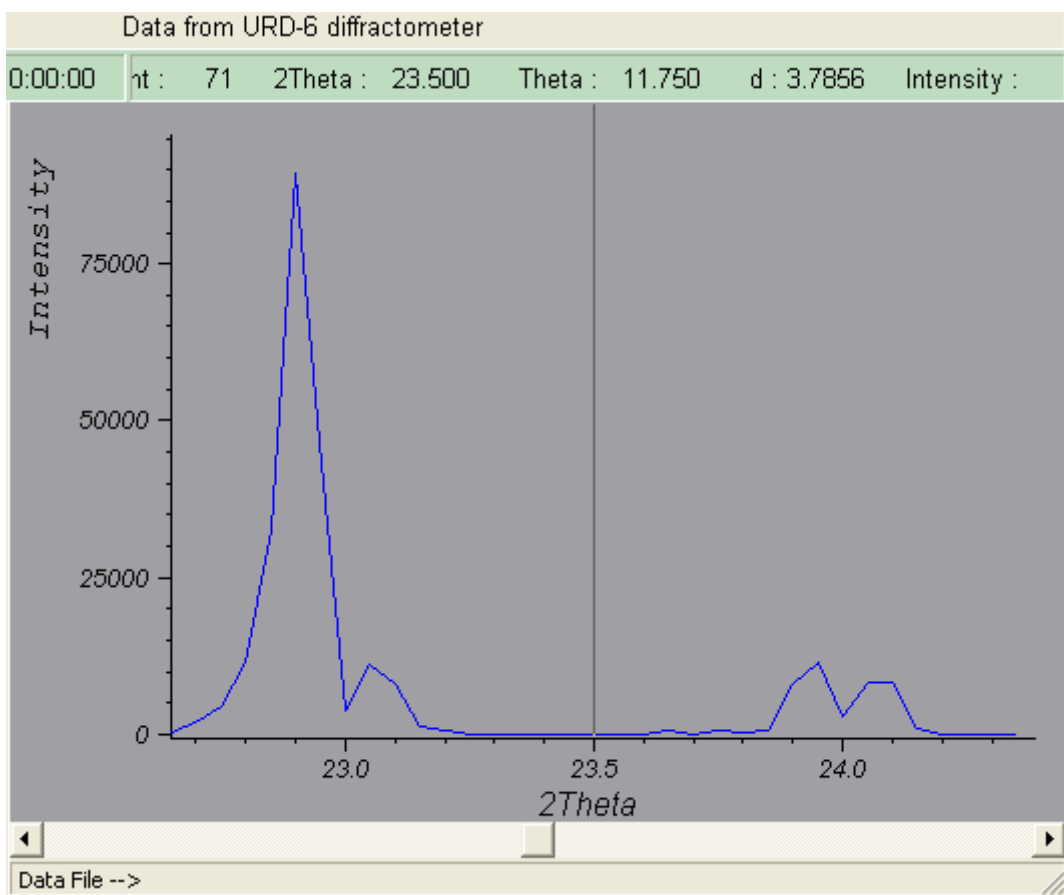


Illustration 4 Zoom 4X

– View / Zoom Center

Ctrl + C the sector shifts to place the marker is in the center of the diagram

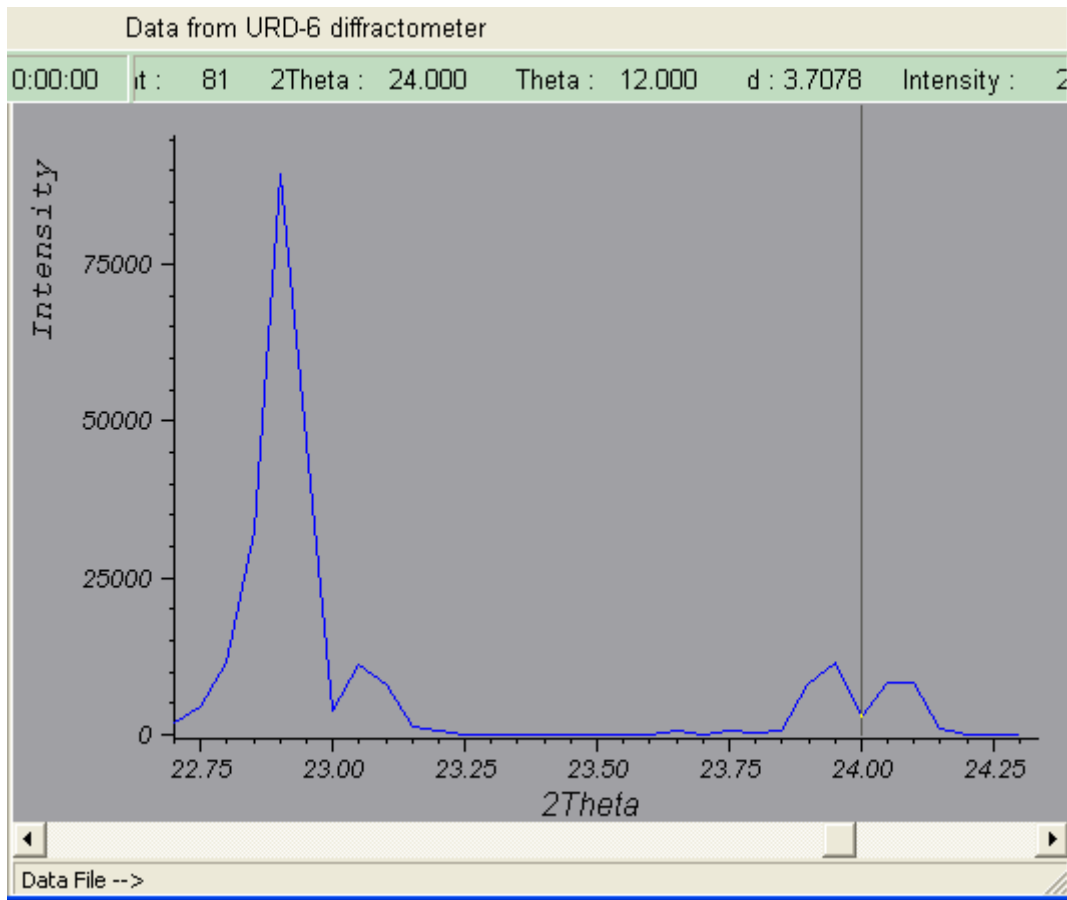


Illustration 5 The marker's position before Zoom Center

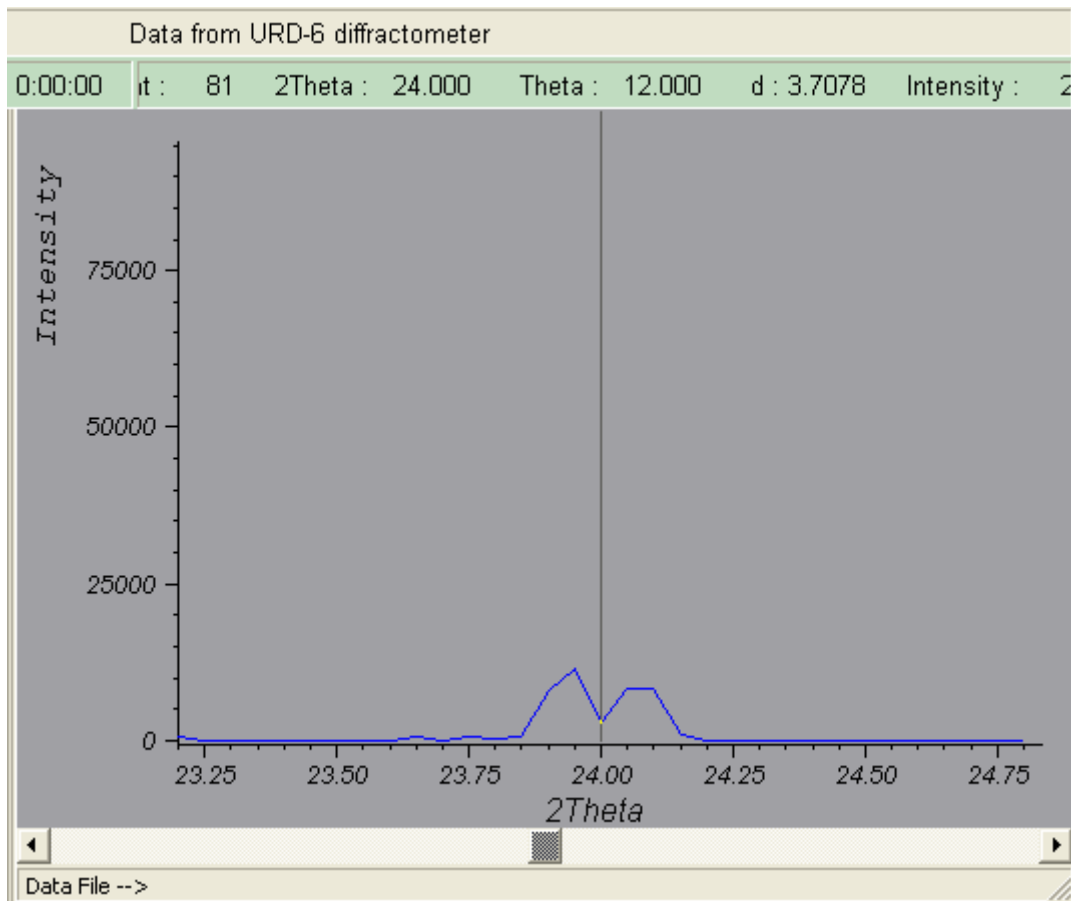


Illustration 6 The marker's position after Zoom Center

- View / Zoom AutoScale *Ctrl + Y* - the vertical scale is stretched automatically in every sector

60.100	30.050	18752
60.150	30.075	18485
60.200	30.100	1763
60.250	30.125	342

Be careful : you lose your complex measurement's data, if you save it in the simple *Diffraction* format !

Remember : There is the **interval time information** in the DataFile. To ensure the proper recognition of the set up interval time in the Dronek device you have to enter the INT or the STATUS command at least one time per session.

21. You can switch on or off the Data File Autosaving clicking on the *File / AutoSaving* menu
At every new data point the data file will be updated.

22. You can have a look at the data file choosing the *File / List Data* menu option

How to make the next measurement ?

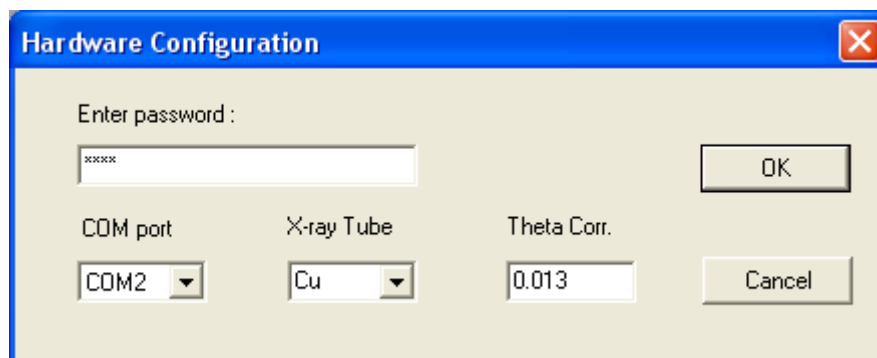
23. Save the old measurement data
24. Close the X-ray shutter
25. Choose the *Measurement / New* menu option and confirm it.
26. Enter the title for the new measurement
27. Select the new command file
28. Prepare the sample and fit it on the sample holder
29. Continue from the 12 item of this instruction

How to finished the work ?

30. Close the X-ray shutter
31. Save the last measurement data
32. Choose the *File / Exit* menu option and confirm it
The *SAN 4* command will be automatically send to the goniometer controller. It is for the future to facilitate the goniometer's axes synchronisation and the sample fitting
33. Set the null (0) output voltage for the radiation detector (also for the future - see item 6)

How to install the URD-6 software ?

1. Create the new directory on the hard disk named **\URD-6**
2. Create the subdirectory **\URD-6\DATA**
3. Copy the files : **URD6.EXE** and **MANUAL_URD6.PDF** to the **\URD-6** directory
4. Create the shortcut on the desktop to the **URD6.EXE**
5. Click on the shortcut by right mouse button
6. Set the *Properties / Working Directory* to **\URD-6\DATA**
7. Click on the shortcut by left mouse button
8. Choose the *Hardware / Config* menu option



9. Select the proper COM port
10. Select the proper X-ray tube
11. Enter the Theta Correction value. Note : this value **adds** to the current Theta Angle value to reduce the Theta Synchronization Error to nil.
But you have to use the *Hardware / Send TH Corr.* menu option to send this value to Dronek
12. Enter the current password
13. The password is the 4-digit number calculated on the following manner :
 $Password = day + month + year$ for example: $30 + 08 + 2007 = \underline{2045}$
14. Click OK button

How to get the better URD-6 software ?



Simply write an e-mail to me with detailed description of your problems. I will try to find a remedy and I will send you the new version of the URD-6.EXE file

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