23 September 2005

SXR TOMOGRAPHY

Handy book

SXR_MST_WRITE_PARAMETER

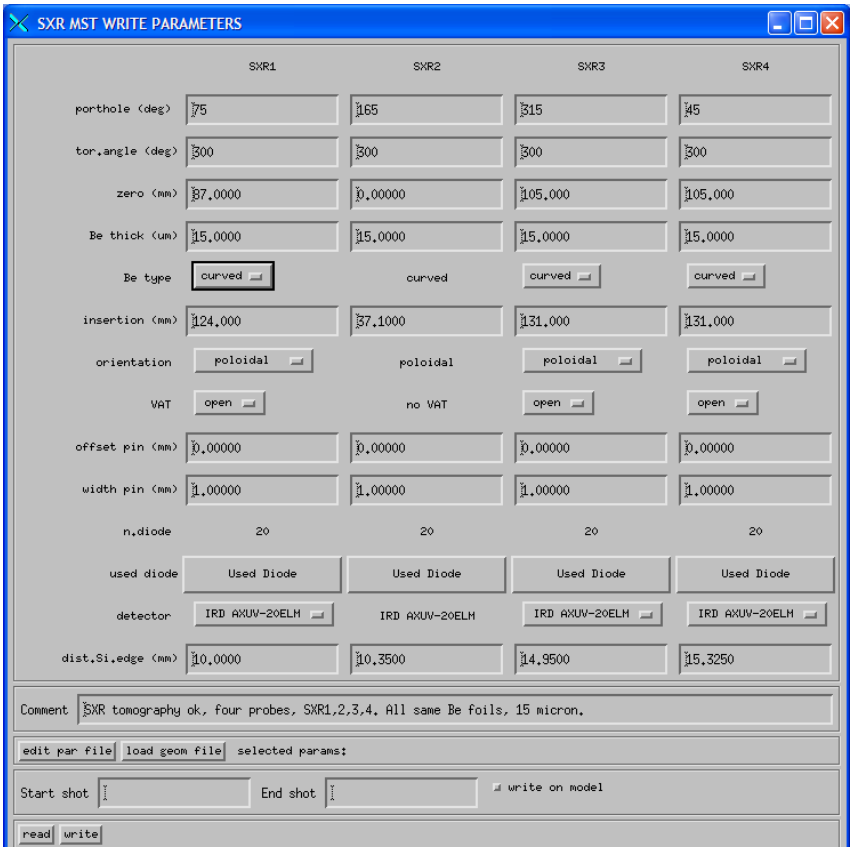
Target: to write SXR tomography geometrical parameters, acquisition settings and gain settings into the pulsefile.

How to open the program

1. Open a SSH (–X) connection at mstdata@aurora.wisc.physics.edu (this program can be opened also on JUNO, but in this case you cannot write the parameters into the pulsefile!).
2. Type `fd` and press `<enter>`.

   This changes the current directory, moving on "/home/mstdata/proc/sxr_tomo", and sets the alias defined for SXR tomography.
3. Open an IDL session.
4. From the IDL prompt, type `sxr_mst_write_par` and press `<enter>`.

   It opens a widget-window to set the geometrical parameters, acquisition and gain settings in the pulsefile:



What you find in the widget-window

In the widget-window you will find different sections (see figure 1). In the first one, at the top of the window, there are 4 columns of parameters, each one corresponding to an SXR probe: SXR1, SXR2, SXR3, SXR4. For each probe, the following parameters are defined:

- the poloidal position of the porthole which house the probes (SXR1=75deg, SXR2=165deg, SXR3=315deg, SXR4=45deg);
- the toroidal position of the portholes for the SXR diagnostic system (300deg, the same for all the probe);
- the "zero" position, that is the insertion position of the probe to enter the MST chamber (SXR1=87mm, SXR2=15mm, SXR3,4=105mm);
- the Beryllium foil thickness. At present, all the four probes have 15μm Be foil thickness;
- the type of Beryllium foil, that is curved or flat. At present, all the four probes have curved filters;
- the insertion position (in mm) of each probe. This parameter is always the same for SXR2 (the fixed probe, that is 37.100 mm), while for the other probes it can be either 0.0 mm (when the probes are extracted) or, if they are inserted in measurement position:
    - SXR1: 124 mm
    - SXR3: 131 mm
    - SXR4: 131 mm
- the orientation of the probes, that is poloidal for all of them (for SXR2 you cannot modifie this parameter);
- the status of the VAT valve for the probes SXR1,3,4 (SXR2 is fixed, that is no valve);
- the offset of the pinhole on the lid: at present it is 0.0mm for all the probes;
- the width of the pinhole (it is the same for all the probes: 1.0mm);
- the number of the diodes housed in the array detector system;
- the number of the diodes (*used diode*) of the array detector which are really working. At present, SXR1, 3 and 4 have all the 20 diodes working (that is D1,2,3…,19,20), while SXR2 have only 14 diodes working (that is D1,3,5,7,8,9…13,14,16,18,20).
- the type of detector (IRD, Hamamatsu, UDT, etc.). At present, all the four probes house an IRDAUX-20ELM array, with 20 diodes;
- the distance from the Silicon detector and the edge of the probe.

Following these table, a "Comment" section is present.

In the section following the comment, there are two buttons:

- "`edit file`": this button opens an other window in which you can select the file with the gain and the settings of the amplification chain and restoring data system for SXR tomography.

- "`load geometry`": this button allows to load a file with the geometrical characteristic of the status of the SXR probes. There are two files for the present configuration:
    - *open_geom._settings.dat*: it loads all the parameters for the SXR probes in the position measurements (with all the Be foil with the same thickness, 15μm)
    - *close_geom_settings.dat*: it loads all the parameters for the SXR probes in extracted positions.

At the bottom of the widget-window, you can insert the number shot (start shot number and end shot number) in which you can write the parameters selected (geometrical) and the gains. If you select the "`write_on_model`" button, you write also into the model (shot -1). The action of writing can be done only pressing the "`WRITE`" button.

If you want to read the parameters written in the pulse file for a particular shot, type the number of the shot in the "*Start shot*" section, and press the "`READ`" button: the parameters for that shot are therefore loaded in the widget window, both the geometric configuration and the gain settings.

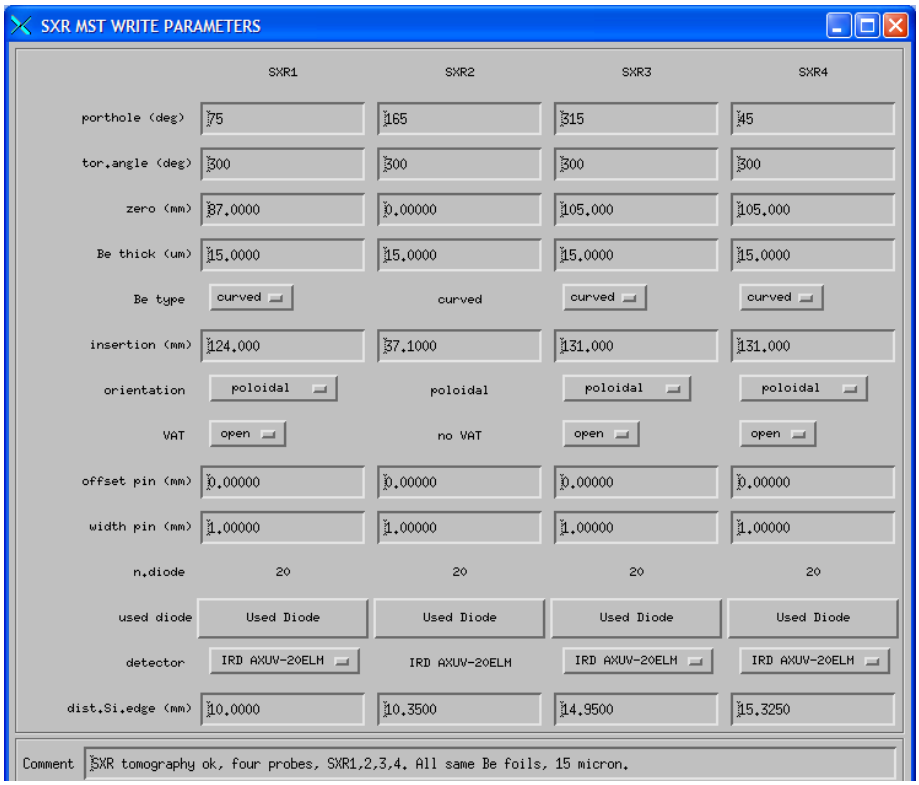
To exit the window, press on "`QUIT`".

How to set the geometrical parameters of the SXR tomography system configuration

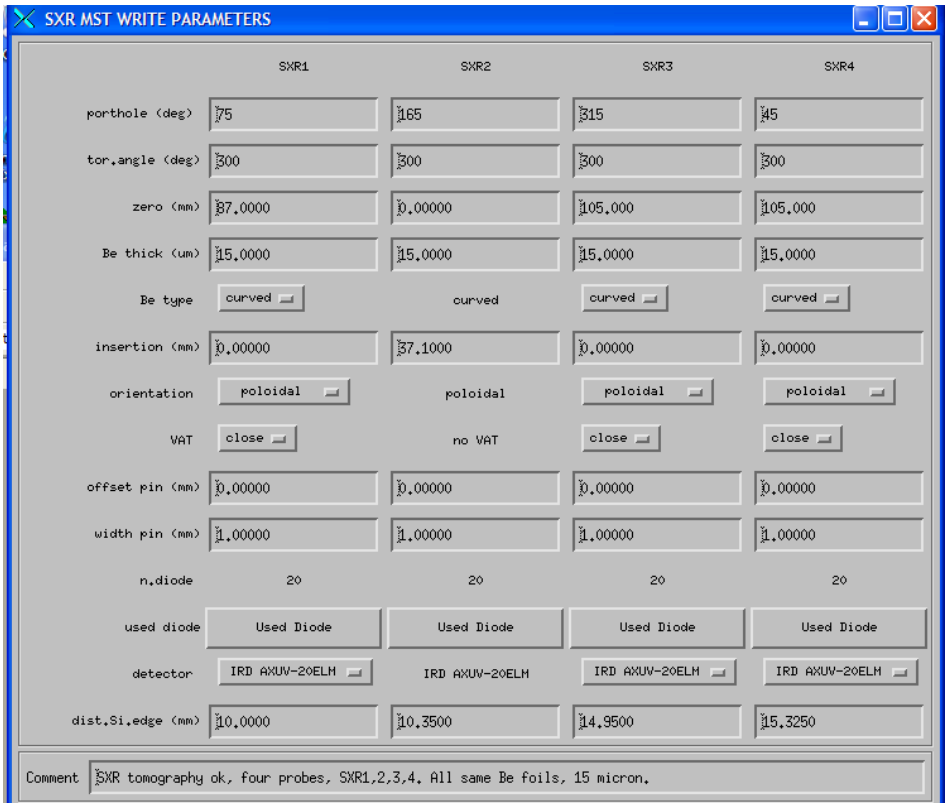
SXR2 geometrical parameters are fixed: the probe is always inserted and there is no VAT valve.

At present, you can set two configurations: SXR probes inserted in position measurement and SXR probes extracted. These are the parameters for these two configurations:

- SXR probes inserted in position measurements



- SXR probes extracted



How to select/change the gains in the pulsefile

- If you want to load the parameters for a particular shot, type the shot number in "Start shot" and press "READ": it loads the geometric configurations of the probes and open a new window for the corresponding gain settings.
- If you want to write/change the parameters, you MUST insert both the geometric configuration and the gain settings (by reading a previous shot and, eventually modifying the gain parameters, and saving them in a new file .dat, by using the "save as" button).

The file with the gain settings and the settings of the entire amplification chain and the restoring data system is divided in four sections, each one dedicated for an SXR probe. For each probe you find these parameters:

- the number of the SXR probe (1,2,3,4)
- the diode number (from 1 to 20): only for the diodes belonging to the array which really working
- the gains (ISO-AMP), that is 1, 2 or 5 if the external gains are set; it can be 1,2,5,10,20,200,1000 if the internal gains are set.

- the value of the trans-impendence (TLA), that is 5,6 or 7
- the divider (1 if there is no divider; 2 if there is the divider)
- the number assigned to the amplifiers (from 01 up to 74)
- the number assigned to the ISO-AMP
- the type of ADC (1612)
- the number of the ADC module (1,2,3,4)
- the number of the ADC channel for each module (from 1 to 16)

You can type on this file and then save the changes (use "save" or "save as").

Remember: for each particular modification during a run session, please save the file changing its name (by putting a progressive number version for that file), in order to have a temporal trace of the modification history of the gain settings.

Not close the gain settings windows before writing the parameters in the pulse file: in this case, all the parameters are loose and are not written in the pulsefile.

How to write into the pulsefile

In order to write in the pulse file, you must introduce both the geometrical configuration of the SXR probes (by loading one of the files *close_geom_settings.dat* or *open_geom_settings.dat*) and the gain settings (by pressing "*edit par file*" and selecting one of the file already created or creating and saving a new one).

You must also introduce the number of shots in the pulsefile in which to write into. The action of writing is done by pressing the "`WRITE`" button.

How to exit the program

At the end of work, exit pressing the `QUIT` button; close the IDL session and quit from mstdata@aurora.physics.wisc.edu .

SXR_MST_CHECK_PARAMETER

Target: to check if the gain settings (for a selected shot) written in the pulsefile correspond to those calculated by the encoder system.

- This is an IDL procedure. You can make the program start either in JUNO or AURORA, but after typing "`fd`".
- From the IDL prompt, type:

  sxr_mst_check_parameter, shot=shot, /only
- The program will run and check if the gains written in the pulsefile (in the left) and the gains calculated from the encoder system (in the right) are the same. If they are different, an "*" symbol appears at the end of the raw.
- If you want to check only the gains of a single probe, type

  sxr_mst_check_parameter, shot=shot, /only, probe=probe
- If you want to check the entire path of the amplification chain, type

  sxr_mst_check_parameter, shot=shot

An example for the checking the gains for the probe SXR3, for the shot=10510923045

```
IDL>
IDL> sxr_mst_check_par, /only, shot=1050923045, probe=3

reading data...
Time=10.612780 s
ok

--------------------------------------------------------------------------------
probe SXR3
diode 01: gain=-5x10^5 div=1.000 enc= 450.744 mV g_enc=-5x10^5
diode 02: gain=-5x10^5 div=1.000 enc= 453.895 mV g_enc=-5x10^5
diode 03: gain=-2x10^5 div=1.000 enc= 179.082 mV g_enc=-2x10^5
diode 04: gain=-2x10^5 div=1.000 enc= 178.664 mV g_enc=-2x10^5
diode 05: gain=-2x10^5 div=1.000 enc= 178.967 mV g_enc=-2x10^5
diode 06: gain=-2x10^5 div=1.000 enc= 179.846 mV g_enc=-2x10^5
diode 07: gain=-2x10^5 div=1.000 enc= 180.761 mV g_enc=-2x10^5
diode 08: gain=-2x10^5 div=1.000 enc= 180.752 mV g_enc=-2x10^5
diode 09: gain=-2x10^5 div=1.000 enc= 179.135 mV g_enc=-2x10^5
diode 10: gain=-2x10^5 div=1.000 enc= 181.336 mV g_enc=-2x10^5
diode 11: gain=-2x10^5 div=1.000 enc= 179.952 mV g_enc=-2x10^5
diode 12: gain=-2x10^5 div=1.000 enc= 172.084 mV g_enc=-2x10^5
diode 13: gain=-2x10^5 div=1.000 enc= 178.390 mV g_enc=-2x10^5
diode 14: gain=-2x10^5 div=1.000 enc= 179.304 mV g_enc=-2x10^5
diode 15: gain=-2x10^5 div=1.000 enc= 177.648 mV g_enc=-2x10^5
diode 16: gain=-2x10^5 div=1.000 enc= 179.544 mV g_enc=-2x10^5
diode 17: gain=-2x10^5 div=1.000 enc= 178.351 mV g_enc=-2x10^5
diode 18: gain=-2x10^5 div=1.000 enc= 179.302 mV g_enc=-2x10^5
diode 19: gain=-5x10^5 div=1.000 enc= 425.777 mV g_enc=-5x10^5
diode 20: gain=-5x10^5 div=1.000 enc= 448.106 mV g_enc=-5x10^5
IDL>
IDL>
IDL>
IDL>
IDL>
Connected to aurora.physics.wisc.edu
```