

Development of LabVIEW based Slit and Bender System Controlling Graphical User Interface (GUI)

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Abstract— In this paper work we developed LabVIEW™ based Graphical User Interface (GUI). This development interfaces and controls the operation of slit system and crystal bender system at Dispersive Extended X-ray Absorption Fine Structure (DEXAFS) beamline at Indus-2 Synchrotron Radiation Source (SRS) facility, RRCAT, Indore. Motor controller is used for controlling the slit and bender systems.

Index Terms— LabVIEW™, Slit System, Bender, GUI, PCI

I. INTRODUCTION

Slit system is used to give minimum and maximum size of the beam and translate the selected size horizontally along its axis. The slit system used in the beamline is procured from JJ X-Ray and it contains two motors, one for selecting slit aperture and other for translating the slit to any position. The crystal bender system is designed and developed by Centre for Design and Manufacturing, BARC. The system includes a chamber where the 460 mm long profiled crystal is mounted in such a way that the bending force can be applied at the two pivot end points [1].

II. DESCRIPTION OF SETUP

Slit system and the crystal bender are used to perform focussing operation in the DEXAFS beamline. Here 6-axis motor controller is used for controlling the slit and bender systems. Motor M1 is used for opening the slit and Motor M2 is used for translating the selected slit opening through its axis. As shown in fig 1, slit opening positions A and B correspond to minimum opening of slit (~300 μm when the flux is sufficient at the detector) and maximum opening of slit (~30 mm) respectively [5].

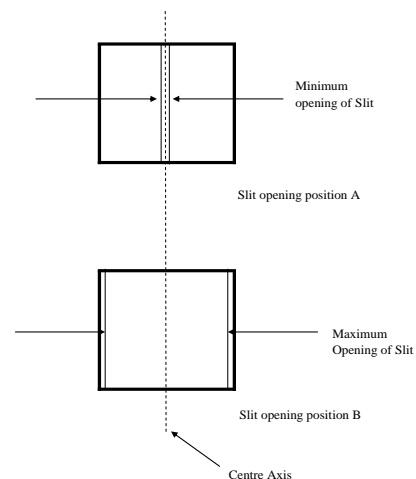


Fig 1: Minimum and maximum slit opening positions

Fig 2 shows the translation of the slit by Motor M2. Slit translation positions A and B correspond to the left and right extreme positions of the slit respectively at its minimum opening across its axis.

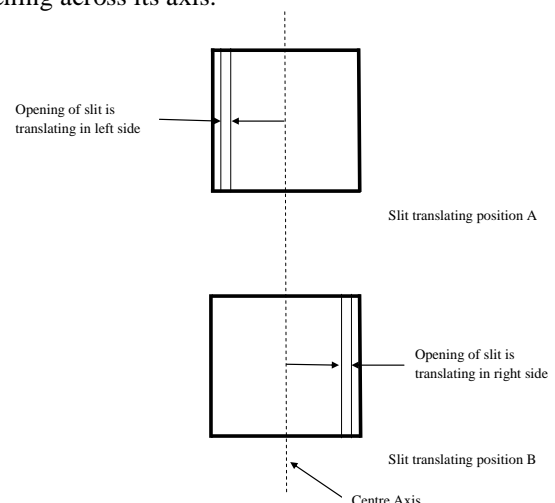


Fig 2: Left and right extreme positions of slit translation

III. PROPOSED METHODOLOGY

A GUI to interface the 6-Axis JJ X-Ray motor controller was developed and tested through CAN bus protocol. In this GUI, the motor controller parameters such as baudrate, clock frequency are initialized for CAN Communication. This is followed by configuring various motor parameters such as Peak Current, Starting Velocity, holding current, acceleration profile etc. The motors can then be moved for the specified pulses and their positions can be read from the

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motor controller. The GUI is capable of initializing, configuring and moving both the motors of slit system as well as two bender motors. A connection between PCI card and motors is shown in fig 3.

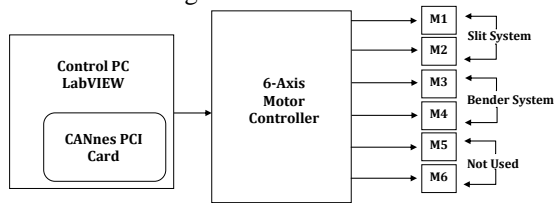


Fig 3: Connection between PCI card and Motors

There are three stages to perform the operation of motor controller,

1. Initialization of the Motor Controller

A GUI to interface the 6-Axis JJ X-Ray motor controller was developed through CAN bus protocol. In this GUI, the motor controller parameters such as Baud rate, Clock frequency are initialized for CAN Communication. The integrated CAN-Controller supports the full-CAN specifications 2.0A with 11 address bits. The address of the unit upper 8 address bits can be set. The lower 3 address bits are fixed to 000. Instructions with a fixed byte length of 8 bytes are used.

2. Configuration of Motor Parameters

Once the initialization of the controller is done, it is required to configure the parameters such as peak current, current reduction, starting velocity and acceleration of all motors individually.

3. Movement of the motor axis

The SIXpack 2 provides different manners in which the movement of the individual axis can be carried out. In particular, there is an option to either move the motor with a ramped acceleration profile or with a fixed velocity (or rotation) and their usage usually depends upon the application.

IV. SIMULATION/EXPERIMENTAL RESULTS

The developed GUI to configure and control individual motors of the controller is shown in fig 4. This GUI performs many functions for interfacing the controller such as selection of motor axis, setting the actual position of the motor, target /destination position of the motor movement. The current motor position of the selected axis is displayed throughout the motor movement which is activated by the “Move” button. It has the option to stop the moving motor at any time through “Stop” button. Further, it also gives the status of the board initialization, and indication for the successful configuration operations of all motor axis such as their movement, stop motor, and set actual position.



Figure 4: GUI for the 4-Axis motor Controller

V. CONCLUSION

The GUI for the beamline has been successfully developed, and implemented in the beamline. The GUI can be operated by any user.

REFERENCES

- [1] Optical Design Of An X-Ray Absorption Spectroscopy Beamline At Indus-2 Synchrotron Radiation Source By N.C. Das, Dr. S.N. Jha And A.P. Roy Spectroscopy Division, Bhabha Atomic Research Centre Mumbai, India.
- [2] Getting Started with LabVIEW, National Instruments Corporation
- [3] Basic Concepts of LabVIEW, Leonard Sokoloff, DeVry Technical Institute North Brunswick, New Jersey.
- [4] LabVIEW Fundamentals, National Instruments Corporation pdf manual
- [5] Manual LabVIEW Control Program for JJ X-Ray Ministepper Controller Ver.1.0 2011/02/25
- [6] <http://www.jjxray.com>

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