LabVIEW Program for Positioning the Gantry System of the Test Stand for Hall A's Large Area Picosecond Photodetector

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This note describes the LabVIEW program used for positioning the gantry system of the test stand for Hall A's Large Area Picosecond Detector (LAPPD), part of a larger program that also controls the signal generator that controls LED brightness.

The Zaber LC40 gantry positioning system—with a positional accuracy of 0.4 mm—for the LAPPD test stand consists of two motors with integrated encoders, a controller, *X-Y* belt drive guides with carriers, a 3D-printed LED box, and a custom-designed structure support, inside a dark box, Fig. 1. The gantry has a 1-mm diameter optical fiber, centered to a blue LED inside the LED box.

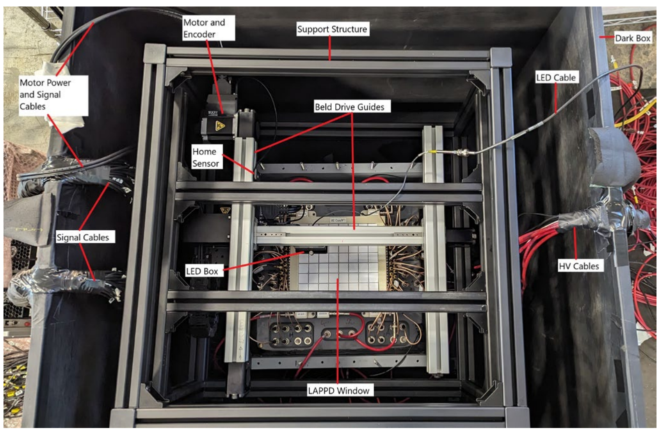

FIG. 1. LAPPD gantry positioning system inside the dark box.

The Zaber X-MCC2 controller located outside the dark box, Fig. 2, allows local and remote control of the motors for the two axes of motion. Local control is achieved by using the knobs with push switches located on the front panel of the controller, and remote controls via RS-232, USB 2.0, or Ethernet communication interface, which requires a customized program. LabVIEW was selected for the controller program because it allows generation of a user interface in parallel with graphical programming.

Drivers from Zaber Technologies were used in the program. The drivers include subVIs to control Zaber devices using ASCII protocol—the default protocol for the Zaber A-Series devices with firmware 6.06 or greater.

During the development of the program, there was a problem with setting the *X* and *Y* positions of the gantry by enabling a Boolean variable. The problem was solved by using a state machine inside an event case structure, Fig. 3. The Zaber driver to move the gantry in the *Y* direction is in the green box.

The LabVIEW front panel has three tabs—LAPPD Window, Expert Settings, and LED controls/Signal Settings (under development).

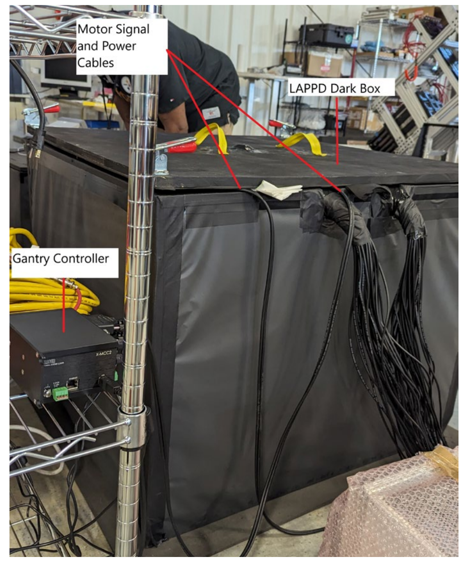

FIG. 2. The gantry's Zaber X-MCC2 controller located outside the dark box.

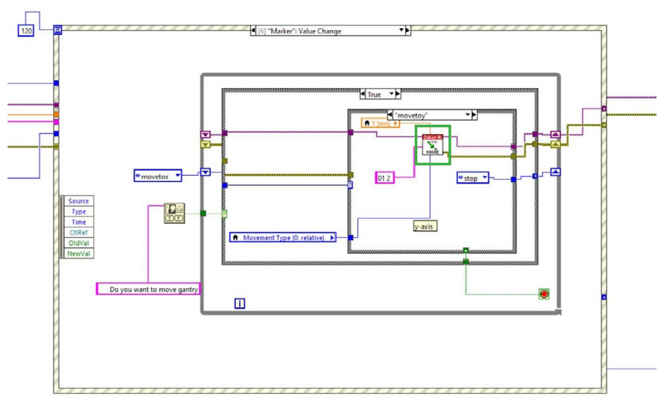

FIG. 3. LabVIEW code with the state machine running inside the event case structure to allow *X* and *Y* position commands to be sent to the controller by enabling a Boolean.

The LAPPD Window tab, Fig. 4, allows the user to connect to the gantry controller and control the gantry position, using a representation of the LAPPD readout board with numbered pixels (each ~24 mm x 24 mm) and null areas—data acquisition not possible because of an X-spacer. To enable the movement of the gantry, the mouse cursor is clicked in the desired pixel. Tracking of the position in real time and homing of the gantry (move to the 0,0 position) is available in the *Position* box.

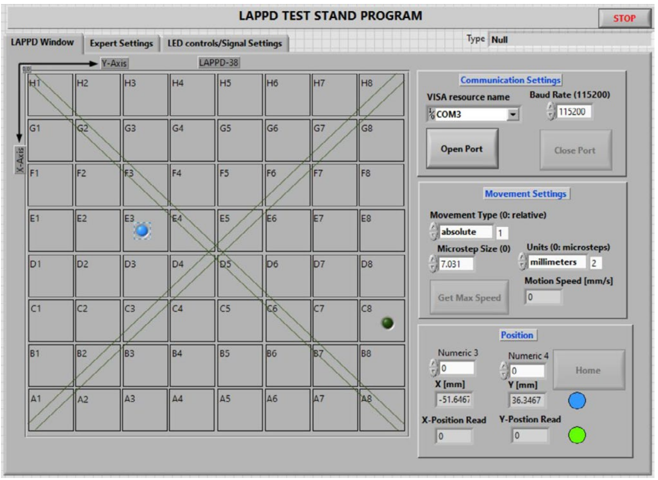

FIG. 4. LabVIEW user interface showing LAPPD Window tab used to control and track the position of the gantry.

The Expert Settings tab, Fig. 5, is used to send commands and receive responses, which helps with troubleshooting, adjust the size of the front panel while running the program, move and track the position of the gantry by axis, and monitor the program loop cycle and errors.

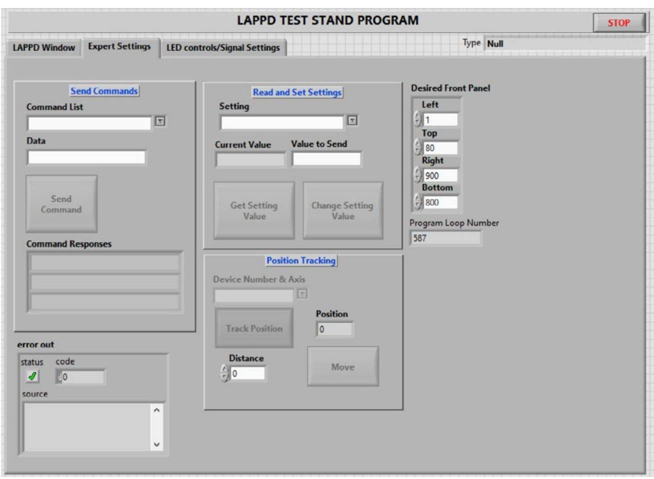

FIG. 5. LabVIEW user interface showing Expert Settings tab.

In conclusion, the first version of the LabVIEW program to control and monitor the gantry has been completed and tested.