

## LabVIEW Control and Monitoring Software for the Neutral Particle Spectrometer

Mary Ann Antonioli and Aaron Brown; Peter Bonneau, Pablo Campero, Brian Eng, George Jacobs, Mindy Leffel, Tyler Lemon, Marc McMullen, and Amrit Yegneswaran  
 Physics Division, Thomas Jefferson National Accelerator Facility, Newport News, VA 23606  
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LabVIEW software was developed to control and monitor temperature, humidity, and dew point in the Neutral Particle Spectrometer (NPS). Measured values read by the LabVIEW program are shared with Phoebus user screens. This note discusses the LabVIEW software.

Values from the NPS temperature and humidity sensors are read by a Keysight measurement unit, Fig. 1. Using National Instruments' hardware and LabVIEW software, calculations are made and displayed on an expert user interface. The LabVIEW program also creates an EPICS server, which creates process variables (EPICS variables) that are used in Phoebus screens. Control values input to Phoebus user interfaces are shared with LabVIEW.

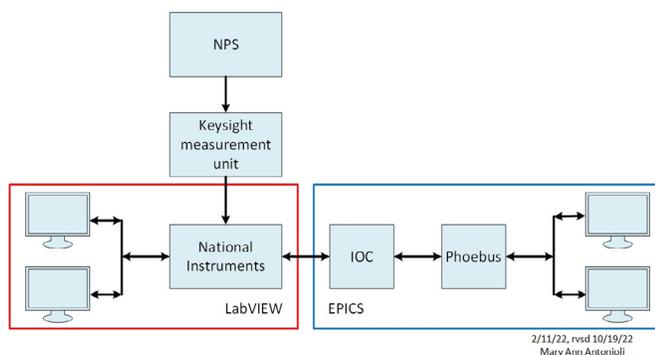


FIG. 1. Schematic of the NPS control and monitoring system.

Temperatures and voltages are read from the sensors. The voltages are used to calculate the relative humidity, using equations supplied by the sensor manufacturer. Dew points are calculated using the temperature and relative humidity values.

For all sensors with averaging enabled, Fig. 2, the temperature, relative humidity, and dew point values are used to calculate running averages, including in the calculation the user-input number of values to average. Standard deviation is also calculated. The actual values, averaged values, and standard deviations are shown on the LabVIEW user interface, portion shown in Fig. 3, and are read by the Phoebus user screens.

The averages are compared to high and low limits. An LED indicates an out-of-limit value.

The software also allows control and monitoring of the two chillers, one for the crystal zone and one for the electronics zone. Chiller monitoring values are supplied by LabVIEW to two Phoebus screens; control values are supplied by the Phoebus screens to LabVIEW.

An additional feature to be included in this software program will be to turn off low voltage, high voltage, and/or the chillers, as needed, dependent upon if the temperature, humidity, or dew point goes out of range.

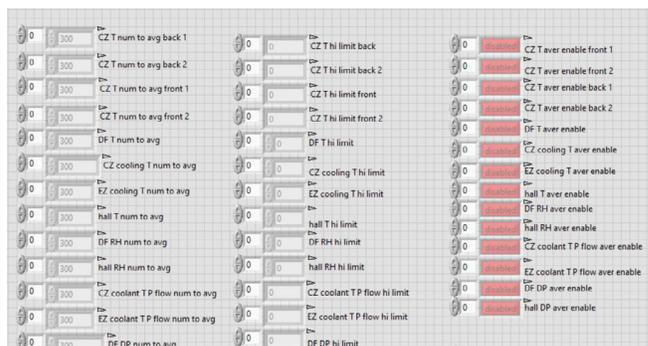


FIG. 2. The portion of the LabVIEW user screen for input of the number of values to average, high limits, and averaging enabling.

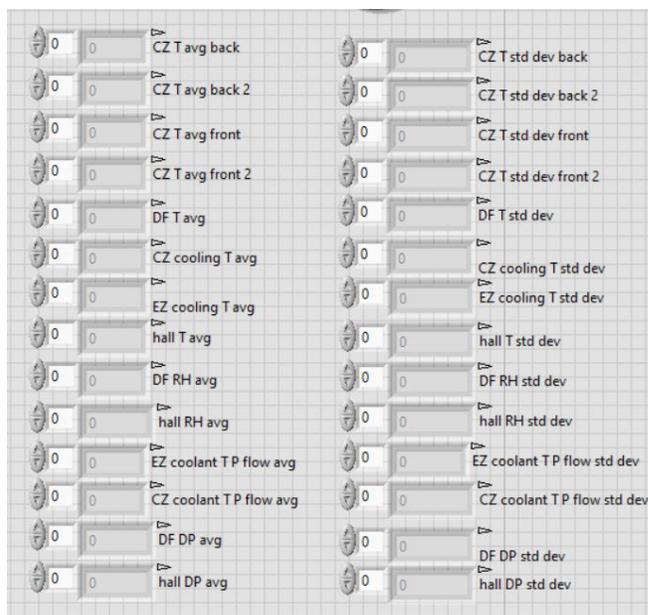


FIG. 3. The portion of the LabVIEW user screen showing averages and standard deviations.

To conclude, the LabVIEW program developed to control and monitor the NPS is being tested.