Gas Controls and Monitoring for Testing the Radial Time Projection Chamber

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This note describes the LabVIEW controls and monitoring program developed, implemented, and tested for testing the prototype Radial Time Projection Chamber (RTPC) and the associated drift monitoring system (DMS).

The LabVIEW controls and monitoring developed for the gas system needed to test the prototype RTPC and DMS allows setting of flow rate F of the mass flow controller (MFC), a GE50a that has a maximum flow rate of 200 sccm for N_2, and selecting one of three available gases—20% He/80% CO_2, 10% CO_2/90% Ar, or N_2.

In the implemented gas system's gas panel, Fig. 1, PT1, a 1000 Torr MKS 627b capacitance manometer, measures the absolute pressure P in the RTPC, and PT2, a 10 Torr MKS 223b baratron, measures the differential pressure (ΔP) between DMS and RTPC. The accuracy of the transducers is 0.5% of full scale.

The GUI (Fig.2) displays in the upper left side the selected gas, the set F, the valve position, and the measured F. In the upper right side, the rightmost analog gauge displays PT1's measurement; PT2's measurement is displayed by the middle gauge. P in the DMS is calculated from these values and is shown in the leftmost gauge.

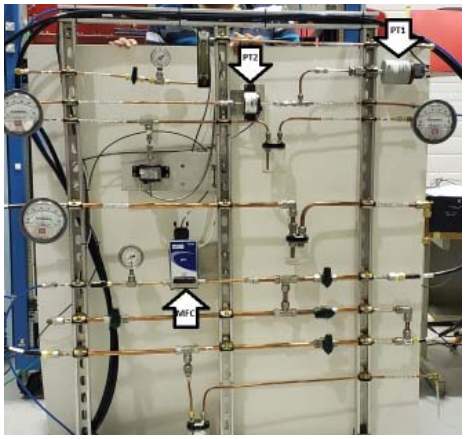

FIG. 1. Photograph of gas panel showing locations of PT1 and PT2.

The two graphs in the GUI's lower left corner display P vs time (t) in minutes. The red graph shows P vs t of the RTPC; the white graph shows the calculated P vs t in the DMS. The chart in the lower right corner of the GUI displays F vs t. An internal data-logger records P, ΔP, and F data.

To measure the maximum ΔP between the RTPC and the DMS of the system for He/CO_2 , F is automatically changed (5 to 230 sccm) and ΔP is recorded. The graph, Fig. 3, shows at maximum flow, ΔP is 0.055 Torr.

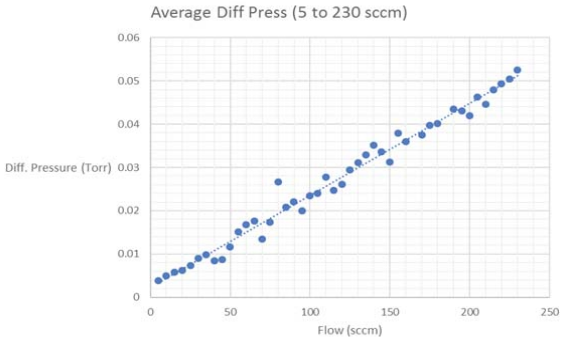

FIG. 3. Maximum flow step test (5 to 230 sccm) using He/CO_2.

The gas controls and monitoring system has been successfully developed, tested, and implemented.

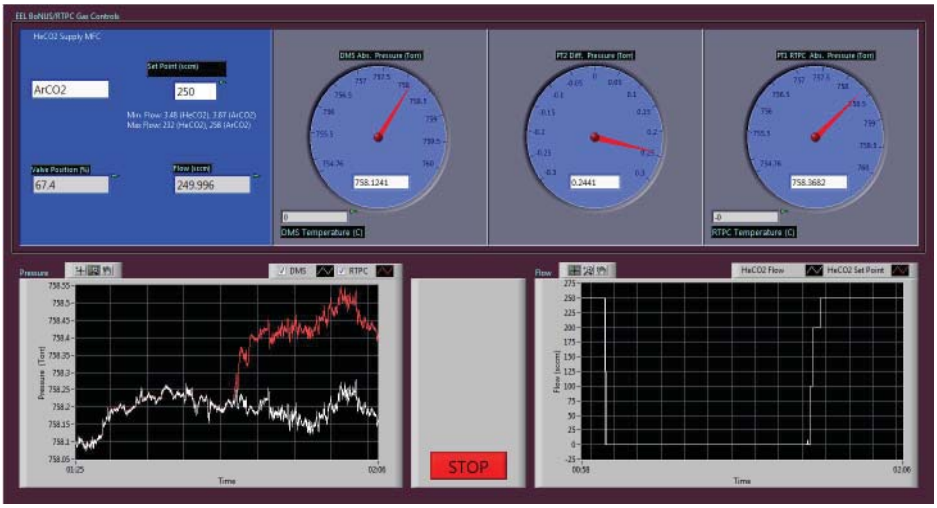

FIG. 2. RTPC gas controls GUI. Flow is set to 250 sccm using Ar/CO_2.