A gas system for the CBM-RICH prototype

L. Kotchenda[1], P. Kravtsov[1], J. Eschke[2], T. Mahmoud[3], and C. Höhne[3]

[1]PNPI, Gatchina, Russia; [2]GSI, Darmstadt, Germany; [1]Justus Liebig University, Giessen, Germany

The primary purpose of the gas system being designed for the CBM-RICH prototype (Fig. 1) is to provide pure CO_2 gas to the prototype at the correct differential pressure. Its design is based on the gas systems for the STAR and PHENIX experiments at BNL [1, 2]. The system operates nominally as a closed-circuit gas system with the majority of the gas recirculating through the prototype. During normal operation, fresh gas is added with a Burkert 8711 mass flow controller FM1. The gas flow through FM1 is used to stabilise the differential pressure, measured by PT4, at the level of 2 mbar. The gas system can be operated in an open configuration for purging.

A bypass valve (BMV1) is manually adjusted to enable the optimum flow rate through the prototype. The purity of recirculation gas is monitored using Panametrics Oxygen (O2X1) and Humidity (MMS35) analyzers. A fraction (up to 30 %) of the recirculation gas can be passed through the purifier and dryer to remove oxygen and moisture. There is the possibility to check the gas purity with the analyzers after the purifier and dryer to determine their saturation.

The purifier is filled with active copper. Its operating and regenerating temperature is 220°C. A Temperature Indicating Controller TIC1 supports this temperature level. A mixture of CO_2 + 5% H_2 can be used to regenerate the purifier. The oxygen content after the purifier is about 2-3 ppm.

The dryer is filled with NaX (13X) molecular sieves. Its normal operating temperature is 22°C. The water content in the output flow of the dryer at this temperature is 1-2 ppm. The regeneration of the dryer is performed at 350-400°C supported with Temperature Indicating Controller TIC2.

A computer-driven data acquisition/control system monitors all of the process variables and provides differential pressure stabilization. The computer system flags quantities which fall outside of predefined limits and initiates corrective action. Using data from the TT1, PT4 and BP (barometric pressure) sensors, the computer system estimates the CO_2 refraction index.

The gas system is assembled in a single 19" rack and can be easily transported with the RICH prototype. It can also be used in the future for the complete RICH detector with minor changes.

References

[1] L. Kotchenda *et al.*, Nucl. Instr. Meth. Phys. Res. **A 499** (2003) 703

[2] L. Kotchenda *et al.*, Nucl. Instr. Meth. Phys. Res. **A 578** (2007) 172

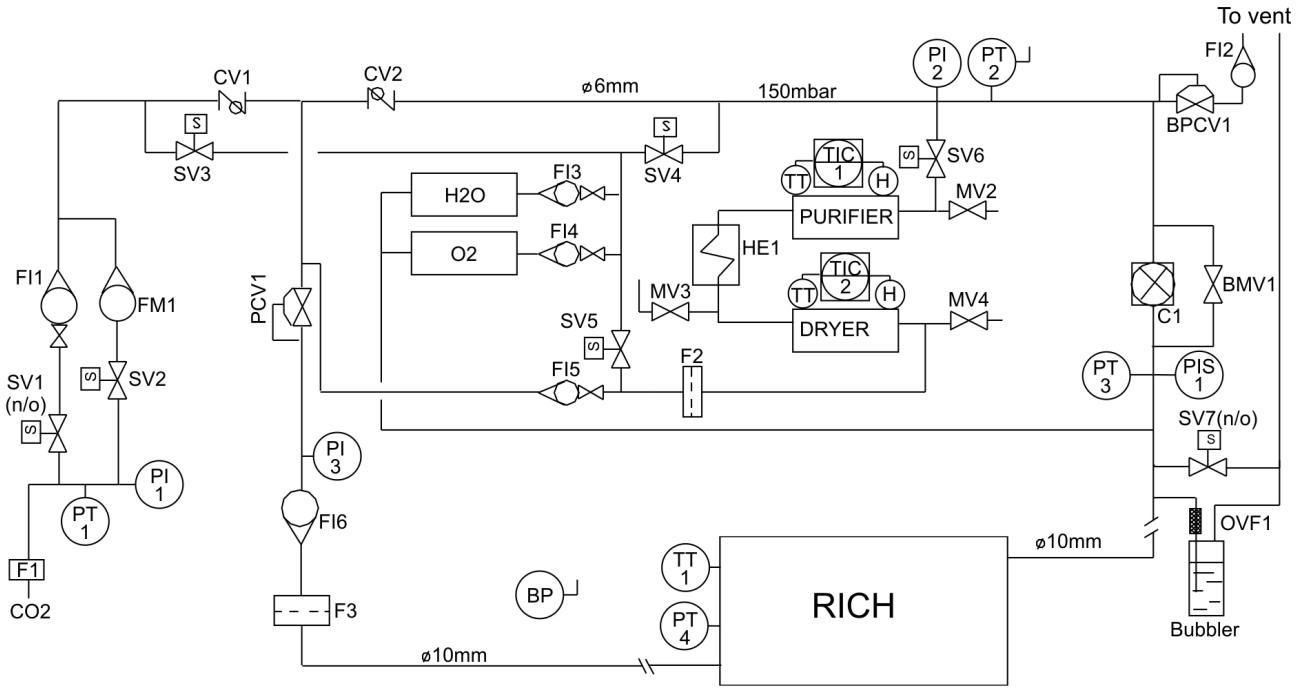

Figure 1: The gas system for the RICH prototype