A Slow Control System for the HADES RICH ◇

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The electron identification capability of the HADES Ring Imaging CHerenkov (RICH) detector [1] is of crucial importance for measurements aiming at lepton pair production in nuclear collisions induced by hadrons and relativistic heavy ions. To guarantee a secure and stable detector operation a variety of parameters including standard (U, I, T, etc.) sensor signals as well as pressure, flow, and purity of detector (CH_4) and radiator (C_4F_{10}) gases have to be controlled, monitored, and stored for off line data analysis.

For this purpose we have developed a new RICH **s**low **c**ontrol **s**ystem (SCS) [2] schematically shown in Fig.1. The hardware is based on the CAN (**c**ontroller **a**rea **n**etwork) communication protocol. This serial bus allows to arbitrate messages according to their priority and provides a maximum of reliability at minimum overhead. The visualization and communication monitoring of all slow control parameters is handled by EPICS (**E**xperimental **p**hysics and **I**ndustrial **c**ontrol **s**ystem) and relevant information will be stored in an ORACLE data base.

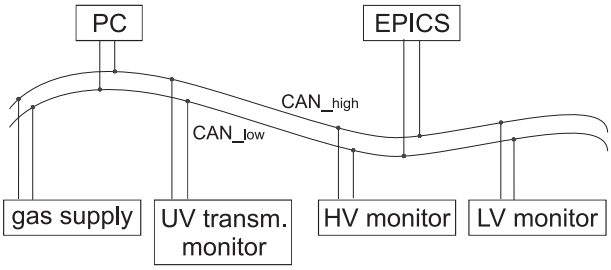

Fig. 1: Schematic diagram of the RICH SCS, showing the software level (upper part) and the hardware level (lower part).

The RICH photon detector requires the monitoring of 12 high voltages (HV), 6 leakage currents, 33 low voltages (elctronics power supplies), and 12 temperatures. A dedicated controller module (RICH CAN) with RS232 and CAN Bus interface was built allowing to read out these parameters from commercially available power supplies and sensors. The module, equipped with 128 kByte FLASH-ROM, is fully programmable via both interfaces (RS232 and CAN) and is capable of independent operation in distributed systems.

The recirculating RICH gas supply system consists of 13 magnetic valves, 7 pressure and differential pressure sensors, 2 compressors, 3 heaters, a fridge, a pump and several temperature sensors (for a description see [2]). All parameters are regulated by a commercially available stand alone system (PHYTEC IGAS) including a programmable system controller (SIEMENS C167CR) with CAN interface. The controller manages four different operating cycles necessary to fill, exchange and purify radiator and detector gases in stand by mode as well as for experiment runs. The programming is done in a language similar to PASCAL, according to the CAN conform standard IEC 1131-3.

As the gas quality has to be maintained on a ppm impurity level, a new device for remote controlled online transmission measurement (see Fig.2) in the VUV wavelength region (140nm$\leq \lambda \leq$ 250nm) was set up and integrated into the gas supply system. The standard method of sequential wavelength scan [3] was replaced by a position sensitive intensity measurement at the focal plane of the VUV monochromator. The silicon detector (linear CCD) was coated with the wavelength shifter sodiumsalicylat to obtain sensitivity in the VUV.

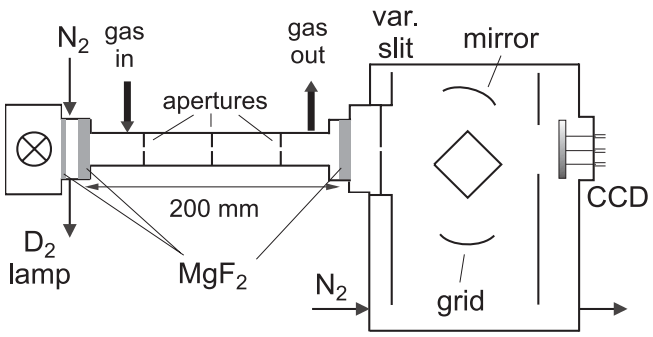

Fig. 2: Optical setup of the RICH gas transmission monitor.

Both, the gas system as well as the transmission monitor were successfully operated during the first commissioning run of the HADES detector in late 1999. The measured transmission spectra reflect the low gas content of oxygen, water and heavy hydrocarbons (see Fig.3).

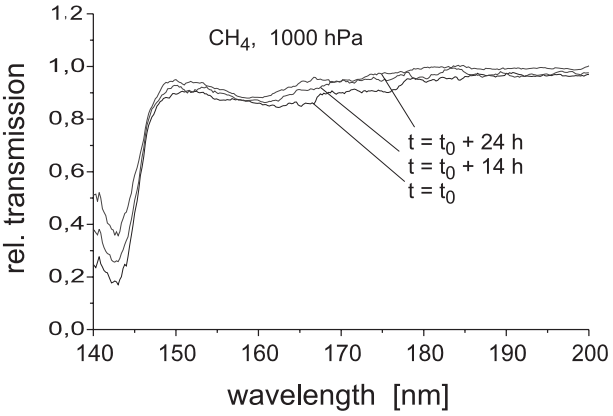

Fig. 3: Relative transmission of CH_4 in the far VUV for three different times after initial flushing

At very short wavelenghts the measurements suffered from a low signal to noise ratio. This has meanwhile been improved by implementation of the new RICH CAN controller module allowing for faster CCD readout ($t \leq 3\,ms$). Presently the assembly of the slow control system is finished and a full system test is under way.

References

[1] K. Zeitelhack *et al.*, Nucl. Instr. Meth. A433 (1999) 201
[2] C. Wallner, diploma thesis, TU München, 1999
[3] J. Lehnert, diploma thesis, Univ. Giessen, 1995

◇ supported by BMBF and GSI