Temperature, pressure, and gas gain monitoring system for the Straw Tracker SPD-NICA

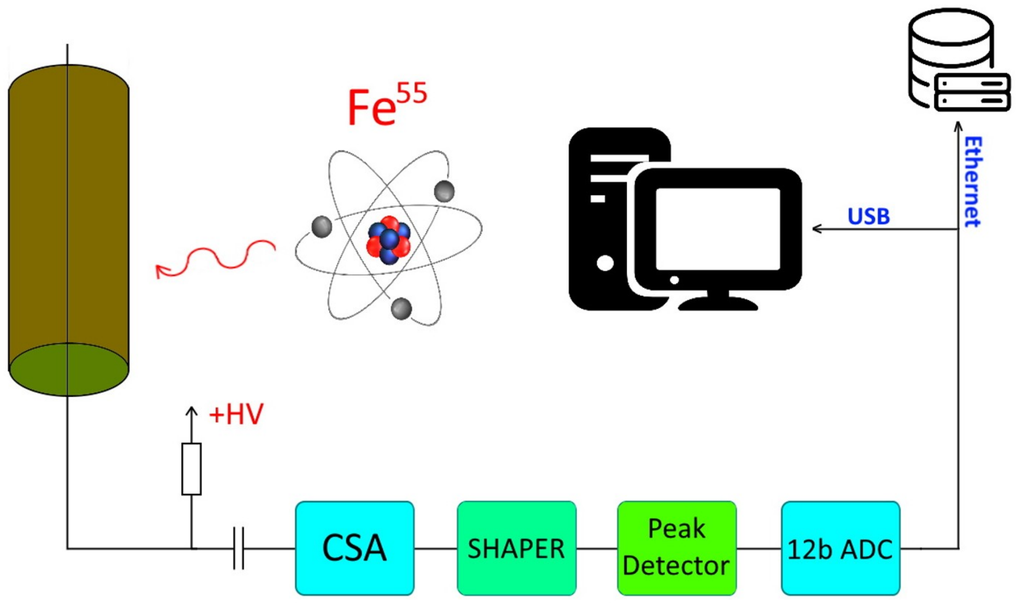
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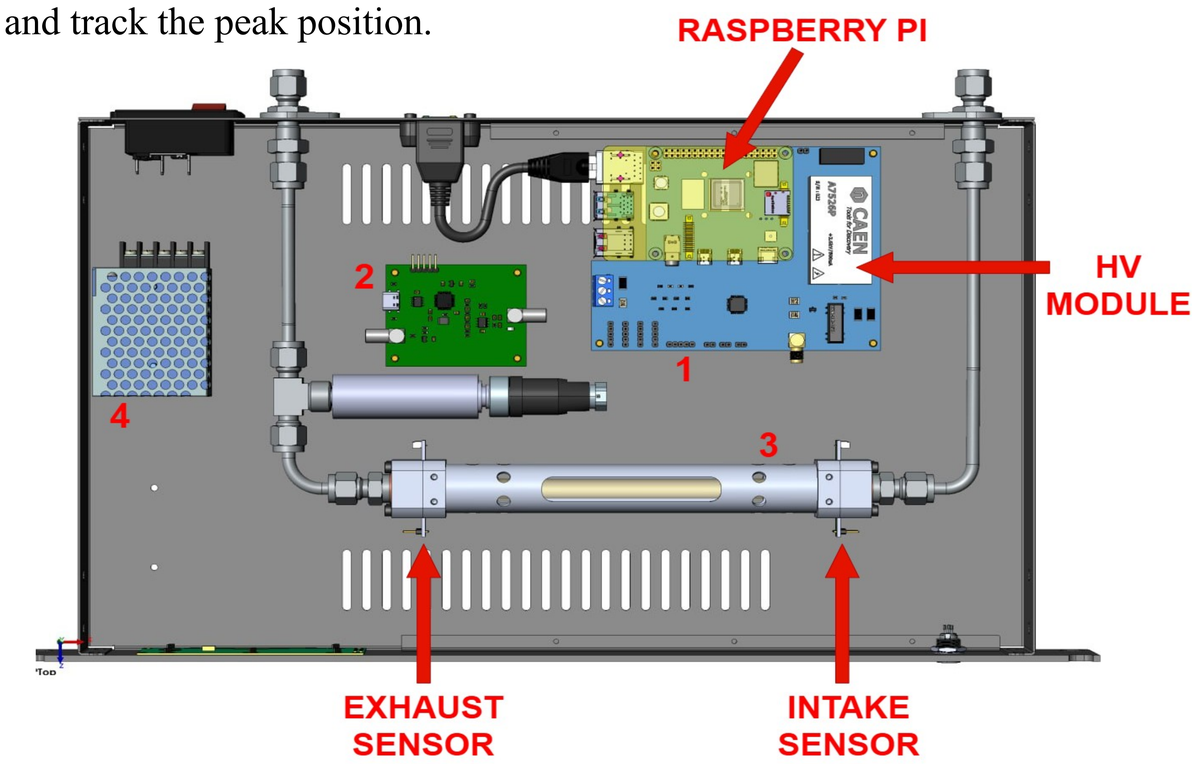
Motivation

The detector equipment is sensitive to changes in temperature, pressure, high voltage stability and the composition of the gas mixture. Deviations in these parameters affect the gas gain coefficient, so ongoing monitoring is required.
In this regard, it is necessary to develop a system as an additional and independent verification of the existing gas supply system. This system is capable of ensuring stable operation of the **Straw Tracker**.

The methodology of measuring gas gain

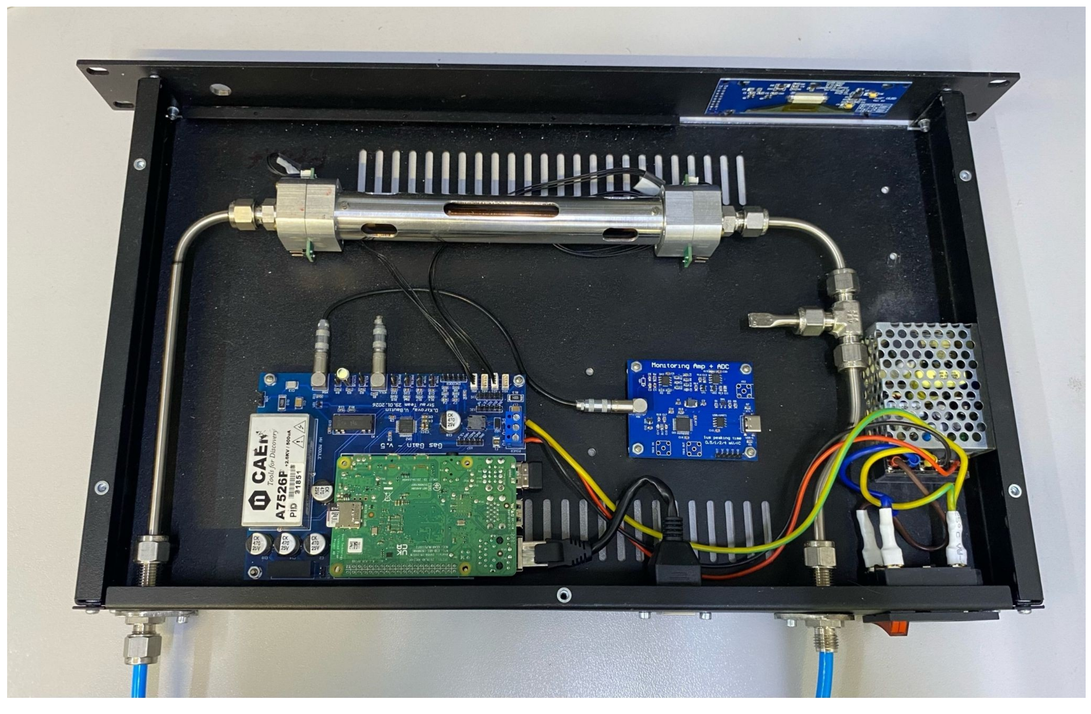


The device utilize a reference straw tube exposed to iron-55 radioactive source. The source provide stable 5.9keV photo-peak. The amplitude of the peak represent the gas gain. Our system constantly record the energy spectrum and track the peak position.



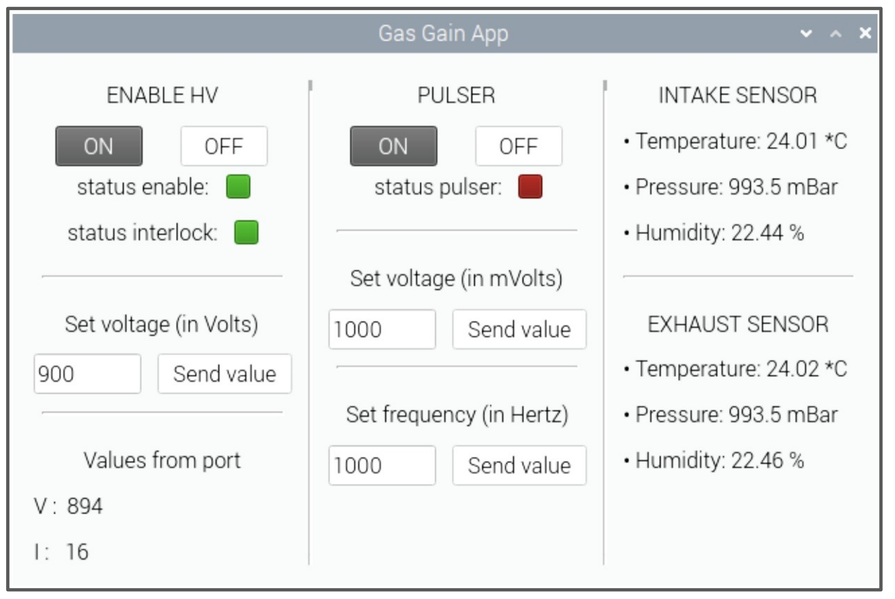
Control board **[1]** – to collect data from CSA and sensors
– control of the high voltage supply to the detector
Amplifier **[2]** – amplification and processing of the detector signals
Straw tube **[3]** – the detector used in the system
Power supply **[4]** – converting the 220V supply to 5V to power the system

The assembled system unit

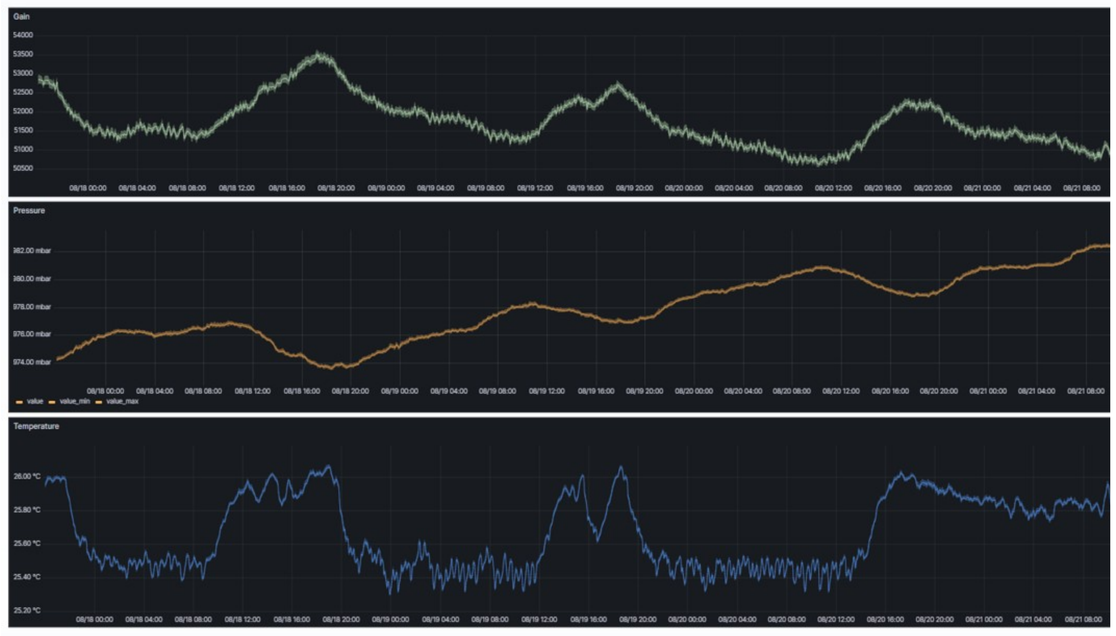


The case is designed for installation in a 19-inch rack.

Software

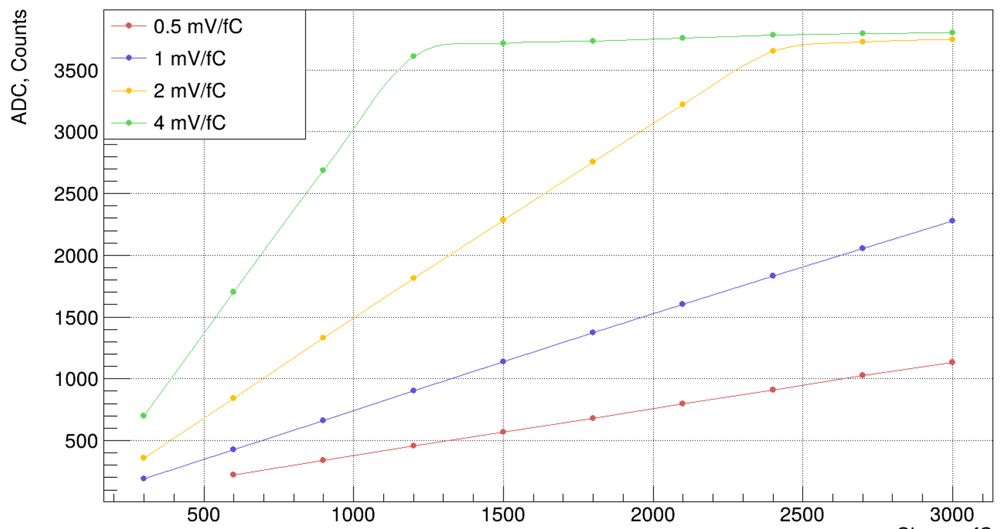


Graphics User Interface (GUI) has been developed to operate the system. The High Voltage (HV) could be adjusted and monitored. Test pulses could be applied. Temperature and pressure could be observed. All data is sent to the database as well.



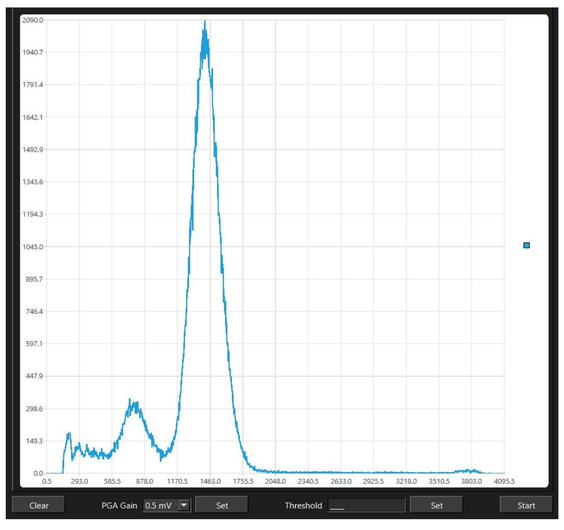
Calibration

Calibration was performed to test the system, and a linear relationship is observed over the entire range.



Fe55 Spectra

On the plot to the right is shown the data sample collected by our system with real straw tube Fe55 source.
Peak position of the distribution is found and written to the database.



Conclusion

An online gas quality monitor has been created. The device is necessary for independent verification of output parameters in comparison with internal monitoring systems. The monitor guarantees reliable operation of the straw tracker throughout all experimental runs.