Development of a control and testing system for HV power supply for the Straw Tracker SPD installation

S. Shilov, V. Bautin, Y. Kovalev, T. Enik for the **SPD Straw Tracker** team
Laboratory of High Energy Physics, JINR

Motivation:

The stability and accuracy of high-voltage power supplies are crucial for the proper operation of detector systems, particularly for the **SPD Straw Tracker**. This is because the stability of high voltage directly affects the gas amplification factor in the drift tubes and, consequently, the overall performance of the detector.

The internal monitoring systems built into the high-voltage power supplies provide basic parameter control, but the HV-monitor device has been developed for additional independent monitoring and verification of the output parameters.

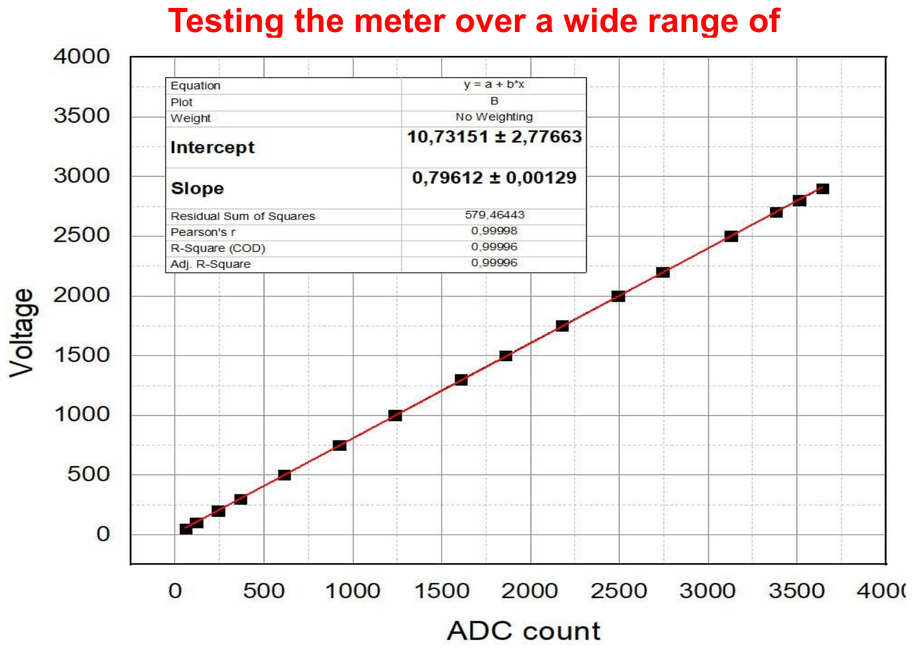
Tasks of the developed device

- Provide additional control of the output parameters of high-voltage power supplies for the **SPD Straw Tracker**;
- Verify the readings of internal monitoring systems of high-voltage power supplies for the **SPD Straw Tracker**;
- Increase the accuracy and stability of detector systems;

Testing the HV-monitor at various voltages

During testing of the HV-monitor in the voltage range from 50V to 2.9kV, it was found that the device demonstrates a linear relationship throughout the specified range

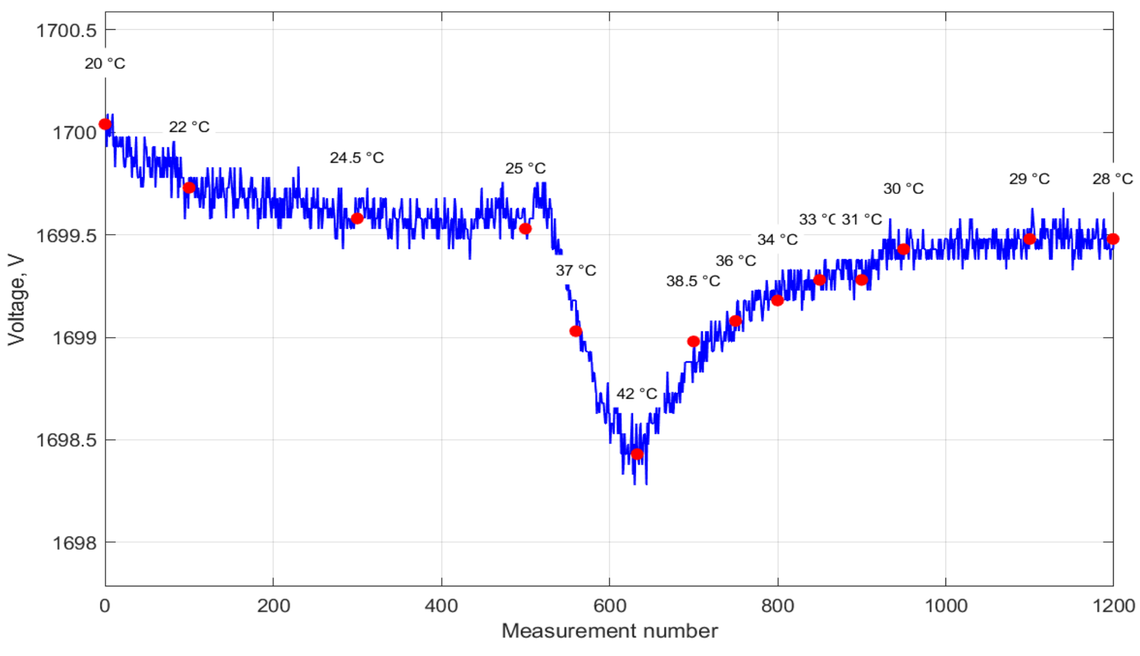
Testing the meter over a wide range of



Testing the HV-monitor at various temperature

Next, the HV-monitor was tested at various temperatures within the operating range to assess the device's thermal stability. As a result, the voltage deviation was no more than 1.5V in the temperature range of 20°C to 40 °C.

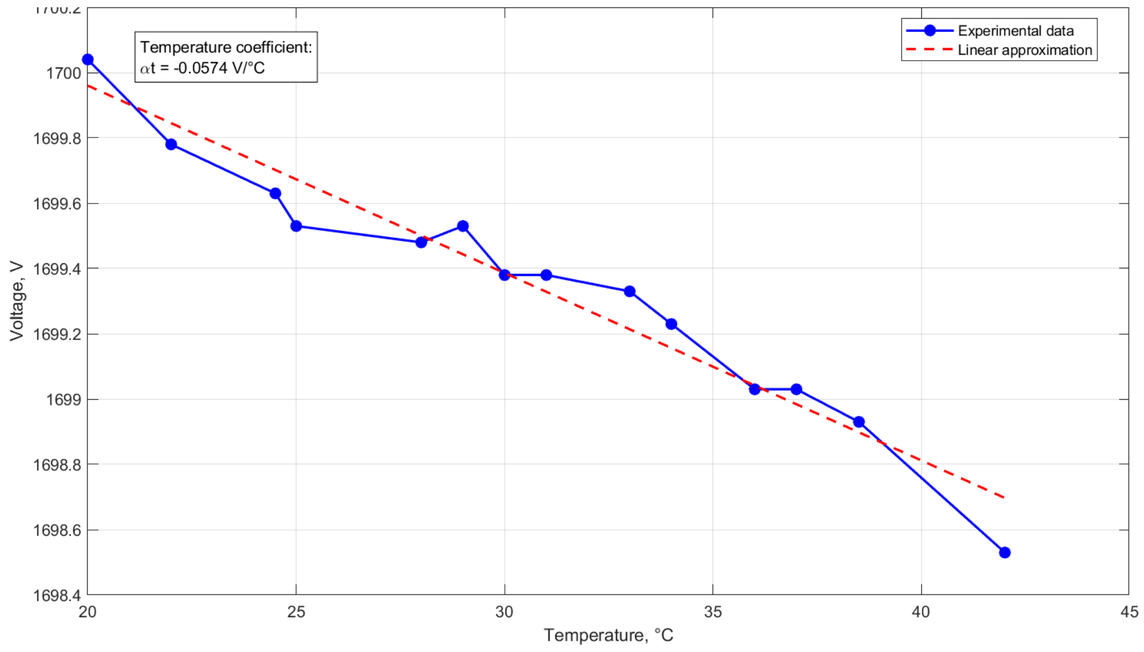
Thermal stability testing



As a result, the voltage meter shows a linear relationship over the entire operating temperature range.

The obtained data on the temperature dependence will help to calibrate the device more accurately and improve the accuracy of voltage measurement.

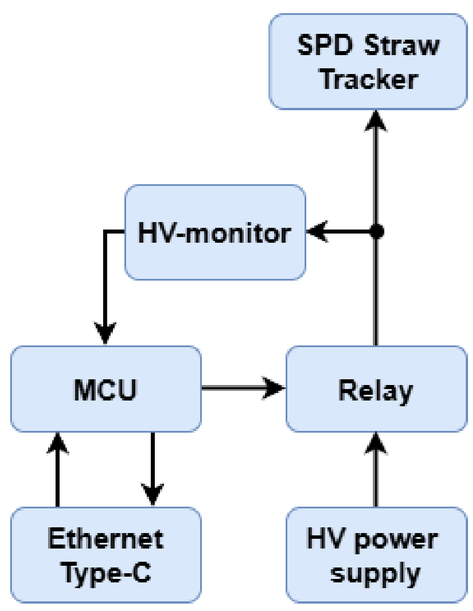
Dependence of voltage measurement on temperature

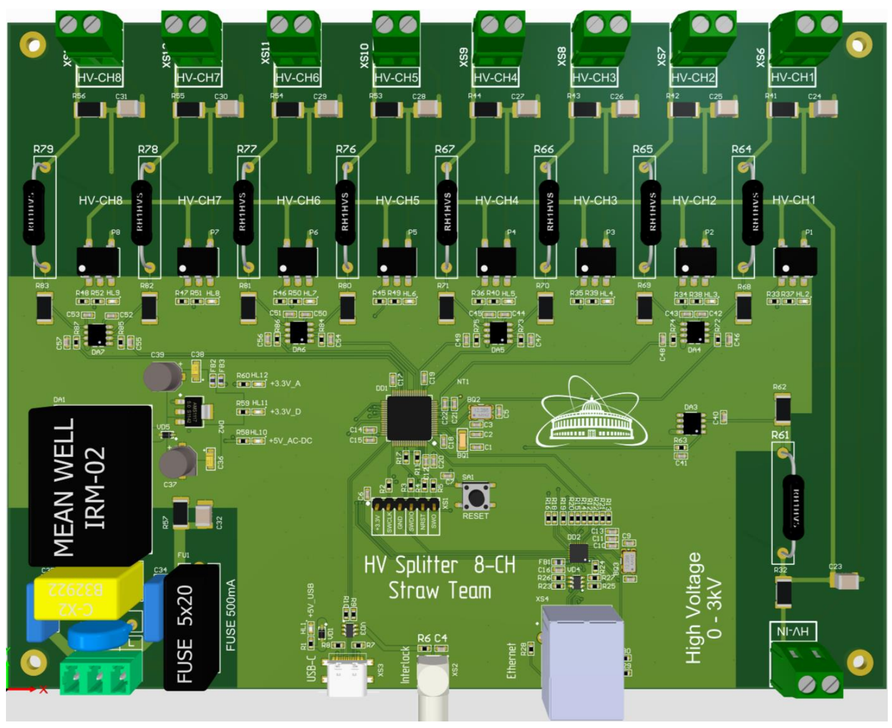


Further development

Development of a new device designed to distribute high-voltage power to 8 independent channels. Each output and input channel will be equipped with an independent voltage monitoring function based on the circuit tested in the HV-monitor device. In the future, we will add the ability to record data in the DCS database.

HV-Splitter 8-Channel





Conclusions:

- The HV-monitor provides additional control of the output parameters of high-voltage power supplies for the **SPD Straw Tracker**.
- The use of the HV-monitor improves the accuracy and stability of detector systems.
- The device demonstrates a linear relationship in the voltage range from 50 V to 2.9 kV.
- During testing in the temperature range of 20°C to 40°C, the voltage deviation did not exceed 1.5V, which confirms the thermal stability of the device.
- The development of a new device for distributing high voltage over 8 independent channels with voltage monitoring function on each channel is planned.

64th meeting of the PAC for Particle Physics, 15 June 2026, Dubna, Russia