TEMPERATURE MEASUREMENT SYSTEM FOR ELECTRONIC DEVICES BASED ON THE PXI CONFIGURATION FOR THE SLOW CONTROL SYSTEM AT THE MPD-TOF DETECTOR*

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Temperature measurement system for electronic devices for the Slow Control System was software in LabVIEW environment in order to efficient integrate with the hardware from National Instruments. Developed program supports LUMEL P19 sensors, which can measure not only temperature but also humidity. In order to keep right condition in RACKs, there was also installed a closed air cooling system. The whole process of temperature measurement will be a part of data acquisition system. Everything is integrated in one environment and can be developed by other coworkers.

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1. Introduction

The Slow Control System, these words most frequently mean a set of electronic devices, a software managing them and a technical documentation of a system designed to control a second measuring, production or research system. Therefore, for a set: hardware, software and book-ware, we use the term Slow Control System(SCS) [1].

SCS is a part of the experimental NICA (**N**uclotron-based **I**on **C**ollider f**A**cility) complex which is being built in Dubna, Russia. It will be used to accelerate and collide ions and protons to conduct research on quark–gluon plasma [2].

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2. Physical layer

The NICA Collider will be unique in comparison to the other accelerators not because of the high energy per nuclei in collisions, but due to the very high baryon density [3].

The element of the NICA complex is Multi-Purpose Detector (MPD) within which the particles are collided and then their detection and recognition are performed. MPD consists of many detectors, one of them is Time-of-Flight detector (TOF) [4], its operation parameters must be strictly set and constantly monitored, which is performed by advanced electronic devices in the form of SCS.

3. Programming

In order for SCS to work properly, the electronics involved in it must work at a strictly defined temperature, which is constantly monitored for efficiency, but also for safety [1]. The first task was to design a temperature measurement system in which the LUMEL P19 sensors were used. The system was programmed in the LabVIEW environment, which is used within SCS electronics. The advantage of this solution is the possibility of quickly implementing new components and effective cooperation of IT specialists with electronics engineers.

The next step was to implement the cooling system in RACK cabinets, to keep correct conditions in RACKs.

3.1. Analysis of results

In the chart shown in Fig. 1, there are three plots, which represent temperature in Rack Master cabinet and outside, measured by LUMEL sensor.

On the "Temp OUTSIDE" measuring series, which is a graph temperature *versus* time, the temperature is noticeably lower than on the another measuring series, due to the fact that, this series comes from a room thermometer, outside the RACK cabinet, where the air temperature is clearly lower.

The next series of "Temp DOWN" shows the temperature inside, at the bottom of the RACK cabinet, where the air is colder and then it will be used to cool electronic devices.

On the "Temp UP" measuring series, a noticeably higher temperature can be seen compared to other series, and temperature fluctuations are also visible. The higher temperature is caused by the fact that the thermometer of this series is placed at the top of the cabinet, where the air after receiving heat from the electronics has a higher temperature.

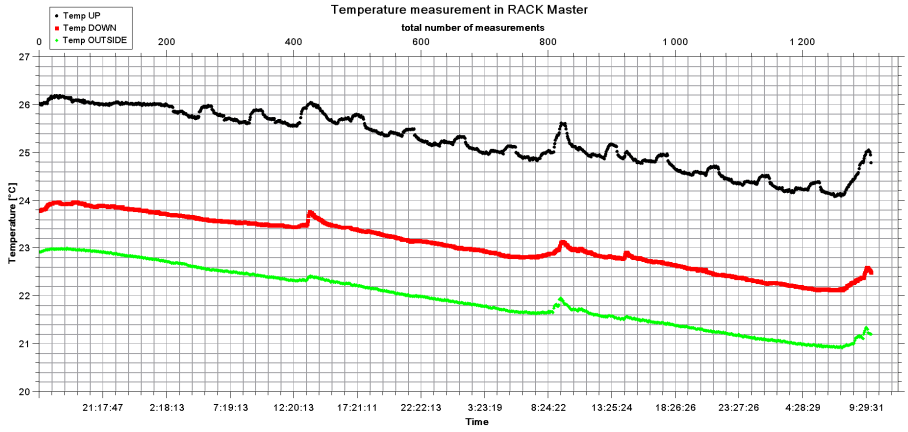

Fig. 1. Temperature measurement chart.

Temperature fluctuations are associated with switching on and off the fans, depending on the number of fans that are part of the cooling system.

4. Conclusions

Based on received results, it can be concluded that the described system works correctly and connects not only the function of temperature measurement, but also the function of fan service. For most of the measurement time, only one or two fans were working, from a maximum of four, which indicates that the cooling system is completely efficient. An important issue is the fact that it was decided to use a closed air circulation to eliminate the dust problem, which is harmful to electronic devices. Fans that have been used are working alternately for the purpose of equal equipment consumption.

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