Welcome to NICA days 2019 and IVth MPD Collaboration Meeting in Warsaw

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CZiITT

Book of Abstracts

Contents

TeFeNICA Session / **7**

Analysis of background radiation with a scintillation counter

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The project concerns an analysis of background radiation with a scintillation counter. It included a series of measurements in different external conditions and attitude of the device. The analysis and comparison of the results was carried out in terms of the use of the device in the NICA project. Conclusions pointed out some of device's flaws which should be taken into consideration during the final experiment.

TeFeNICA Session / **56**

Cable tester design for NICA-MPD Platform

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Such big experiments as NICA-MPD come along with a lot of multi-device connections. Therefore, the results of research may depend on quality and correct connection of signal cables. In this talk a complete design of cable tester for the NICA-MPD Platform will be shown, including software, electronical, and mechanical aspects of the device. The project layout has been optimized to provide possibility to check and validate the most popular signal cables. The device assembly process has been designed to meet the requirements of application in standard RACK cabinets.

TeFeNICA Session / **24**

Data Aquisition from spectrometry and dosimetry systems using LabView environment

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Presented work could be divided into two main tasks.
One of them was to modify existing software programs for three types of detectors: SiPM spectrometer, Geiger-Mueller counter and Gamma-Scout dosimeters.
All the programming was made in LabView graphical development environment.
Another assignment was to measure radiation intensity in three different surroundings: inside the rack, inside the building and outside the building. The aim was to examine the background radiation which would be needed for correct interpretation of the data aquired during NICA experiment. All the measurements were done using dosimeters connected to computers by USB interface. All the data was compared and statistically analysed.

TeFeNICA Session / 46

Design and heat transfer simulations for the MPD-TOF detector cooling system

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Electronic devices' overheating may cause functioning problems and production of inaccurate data in the experiment's detectors. The aim of the project was to design the most optimal and efficient way of cooling the MPD-TOF detector's module, to ensure the optimal operating condition for the Front End Electronics. The work cosisted of preparing detailed CAD model of the existing module and proposed cooling system, and performing CFD simulations of heat transfer inside the module.

TeFeNICA Session / 54

Embedded data processing using NI MyRIO and LabVIEW for magnetic field measurements

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The task concerned the improvement of operation of the magnetic field measurement system, containing the MAG3110 magnetometer. LCD screen has been connected to the system in order to display the measurement results. Data logging to the USB drive connected directly to the MyRIO system has been configured. The sensor has been calibrated.

TeFeNICA Session / 52

Heat transfer simulations for three TOF-MPD detector modules

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As is common knowledge, electronics produce heat while working. The tasks were to carry out simulations of heat transfer between three of 28 modules of MPD-TOF detector and also research a method to carry them out using results of a simulation for only one module. Simulations have been performed with a usage of CFD method.

TeFeNICA Session / 9

Integration of temperature monitoring software inside the Master and Slave 19 ” RACK cabinets for the Slow Control System of the MPD-TOF detector

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To avoid getting dust inside RACKs it was decided to close them as hermetically as possible and provide the closed air loop venntilation. In each cabinet there are temperature and humidity transducers , fans modules and radiators. Using RS-485 standard based on the MODBUS protocol and modules of logic outputs, fans are being switched on and off depending on temperature inside each RACK and their work time. The cabinets are working in master-slave configuration. Software is easy to adjust to load settings from database.

TeFeNICA Session / 40

Naming and Numbering Convention for the Equipment Database of the NICA project.

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In every big scientific project human influence creates disorder. For an investment as big as NICA it is crucial to organize all the elements and minimize the chaos. One of the ways to achieve this goal is to create an Equipment Database (EqDb). Each component in the EqDb will receive its individual Part Identifier. Naming and Numbering Convention is a document containing instructions for Part Identifier creation. It was based on the existing model from CERN \[1\]. These Part Identifiers will simplify component identification at the location.

\[1\] L. Betev EP/AIP, P.Chochula EP/AIT, Naming and Numbering Convention for the ALICE Detector Part Identification – Generic Scheme, ALICE-INT-2003-039, 2003

TeFeNICA Session / 35

Naming and numbering application development for Equipment Database

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Aim of our project was to create a multi-platform application which will enable identifying and stock-taking every single component used in NICA project. To achieve that we created Windows and Android mobile application which allows user to get acquaintance with NICA coding convention and generate or decode unique 10-character code of component given according to coding lists. Thanks to the application performing EqDb database shall become much more efficient and safer.

TeFeNICA Session / 61

Optimalization of the gas distribution system for the MPD-TOF detector module

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The MPD-TOF detector is a gas detector in which an optimized gas distribution system plays a key role. The main task of this system is to ensure an even, laminar flow of the working fluid throughout the detector volume. During the work, various variants of the gas distribution system were prepared inside the MPD-TOF detector module. Next, flow simulations were carried out for each variant using the CFD method. Based on the results obtained, the optimal option was selected.

TeFeNICA Session / 11

R&D of the r, φ scanner mechanical construction for the scintillator detector background radiation measurements

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The aim of this project is the introduction to research and development of a prototype drive system for various sensors in the r, φ coordinate system. The device was designed for extensive solutions, but in this case, the focus was particularly on the cosmic ray measurement system. An extremely important issue was the easiest possible adaptatability to various applications, therefore the proposed solution was made mostly in the technology of aluminum profiles. The designed solution is expected to study areas up to 1m in length and 2π angle. After auspicious prototype tests and meeting the primary assumptions, the final device is assumed to examine the expanse up to 3m in length and 2π angle. The continuation and further progress of the project will consist of the manual preparation of the measuring device, software development and real cosmic ray measurements performance.

TeFeNICA Session / 48

Setup of the heat transfer inside the TOF-MPD detector

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Time of Flight (TOF) detector is a part of Multi Purpose Detector (MPD), crucial element of the NICA complex. The detector generates signal that carries information needed for the particle identification. Complex physical proces of forming output signal requires maintaining the amplifier circuits at specific temperature. Overheating may induce major signal distorsions and - in worst case – damage of the detector. To avoid that scenario, many thermal simulations were performed.
The aim of this work was to build instrument for multipoint temperature measurement inside the TOF module and collect the essential data to verify the simulations. To assemble this setup, Pt100 type RTD sensors and LUMEL SM1 modules were used. Next, in order to multiply input channels, custom multiplexer circuit were built. Afterward, specialised LabVIEW software was created for circuit control and data aquisition.
The presentation presents the design concepts, problems encountered and obtained results during the described work.

TeFeNICA Session / 39

Setup of the heat transfer inside the TOF-MPD detector.

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The presentation presents the design concepts, problems encountered and obtained results during the described work.

TeFeNICA Session / 21

Status of the Temperature Stabilisation System for NICA-MPD

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The Multi Purpose Detector (MPD) at Nuclotron based Ion Collider fAcility (NICA), which is under construction at the Laboratory of High Energy Physics at the Joint Institute for Nuclear Research, will be studying relativistic heavy-ion collisions. Such detector consists of high amount of electronic devices. Each of sub-detectors, modules, devices, being a part of NICA-MPD produces a specific amount of heat. Overheating may cause damage of electronics or even spontaneous combustion. Also, in case of specific sub-detectors (eg. MPD-TPC), the temperature gradient will be the main cause of measurement uncertainty (PID).This paper shows the design brief of the Temperature Stabilisation System for NICA-MPD.

TeFeNICA Session / 12

The prototype of an air based cooling system for the Slow Control System of the MPD-TOF detector

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In order to keep RACKs clean of any dust and other particles, the decision has been made to hermetically close them off from the environment. This however can lead to overheating of electronic devices inside. Due to that, a special cooling system was designed. It consists of two sets of fans, two transducers (measuring temperature and humidity) and radiators. All the elements are connected to a computer with the usage of RS-485 wires and the MODBUS protocol. The main goal of this project was to prepare, assemble and install all of the aforementioned equipment.

TeFeNICA Session / 29

α, β, γ radiation monitoring in the working area of the MPD Slow Control electronic equipment.

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Project focuses on α, β, γ radiation monitoring. Firstly, three Gamma-Scout detectors were tested if the measurements taken in the same location are equal within 5% uncertainty. Next, detectors where

moved to three different locations. Data collected from those locations in three available working modes (detection of γ, β+γ and α+β+γ radiation) was analyzed to determine potential influence of the rack's case on radiation levels. Also, based on received data of radioactive sources (Eu-152 and Thorium) tested using Radateh photoelectronic detector three spectrograms were generated and compared, to conclude best utility of each type of detector. Further tasks involved developing software for a self-built Geiger-Müller counter using NI myDAQ and LabVIEW environment.

TeFeNICA Session / 25

α, β, γ radiation monitoring in the working area of the MPD Slow Control electronic equipment.

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Project focuses on α, β, γ radiation monitoring. Firstly, three Gamma-Scout detectors were tested if the measurements taken in the same location are equal within 5% uncertainty. Next, detectors where moved to three different locations. Data collected from those locations in three available working modes (detection of γ, β+γ and α+β+γ radiation) was analyzed to determine potential influence of the rack's case on radiation levels. Also, based on received data of radioactive sources (Eu-152 and Thorium) tested using Radateh photoelectronic detector three spectrograms were generated and compared, to conclude best utility of each type of detector. Further tasks involved developing software for a self-built Geiger-Müller counter using NI myDAQ and LabVIEW environment.