

SOFTWARE FOR DEVICE DESIGNED TO MEASURE RADIATION ABSORPTION OF VARIOUS MATERIALS*

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Software designed to control the device that measures radiation absorption of various materials made during Slow Control Summer Practice 2019, lets the user make measures without the hazard of being exposed to the ionizing radiation.

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1. Introduction

As it is visible in Fig. 1, on the device there are 19 different absorbents mounted on a rounded plastic plate. Absorbents are made of aluminium,



Fig. 1. Top view of the device.

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copper and iron of different thickness. One more absorbent represents reference measurement, which means no absorption of the radiation. The user can connect the device with a computer via USB (Universal Serial Port). The computer communicates with a microprocessor installed in the device using the UART (Universal Asynchronous Receiver-Transmitter) protocol [1].

2. Assumptions and aims

The main aim of the project was to create a software using National Instruments **LabVIEW** that enables the control of the device from a safe distance. At first, offline operating was inspected to ensure that the device is working as intended. In the next step, the online control system was created which is hoped to be used further in the Online Laboratorium by students of the Physics Faculty of the Warsaw University of Technology.

3. Documentation

List of commands:

- AT + W = minutes : seconds , absorbent [CR] — set the measurement,
- AT + S = 1 [CR] — start the measurement,
- AT + RS [CR] — read the data from the device,
- AT + RST [CR] — reset the device.

4. Tests and control measurements

Firstly, the manual controls and commands were tested to ensure the proper work of the device. Then, two measurements were made. Initial — background radiation evaluation, next — banana emission. Bananas are slightly radioactive because they contain potassium K-40 [2] which decays slowly, thus outcomes of both measurements were different and it was experimentally confirmed that the Geiger counters worked as intended.

5. Offline control panel

As it can be seen in Fig. 2, the offline control panel allows the user to set absorbent, measure time, start and stop measure, and read counts from the Geiger counter. Performing these actions with a radiation source mounted in the device is dangerous.



Fig. 2. Offline control panel in front of the device.

6. Engineering control panel

6.1. Main motive for this panel

The main motive for this panel was to make a working panel in National Instruments LabVIEW that would allow the user to control all device functions. Using this panel, the user should be able to make operations such as: start and stop the device, set absorbent position and measure time. In addition, the panel should allow the user to read measure data and save it to the file.

6.2. Realization of the task

As it can be seen in Fig. 3, the admin panel allows the user to perform all necessary actions. In addition, the panel generates a graph of radiation and

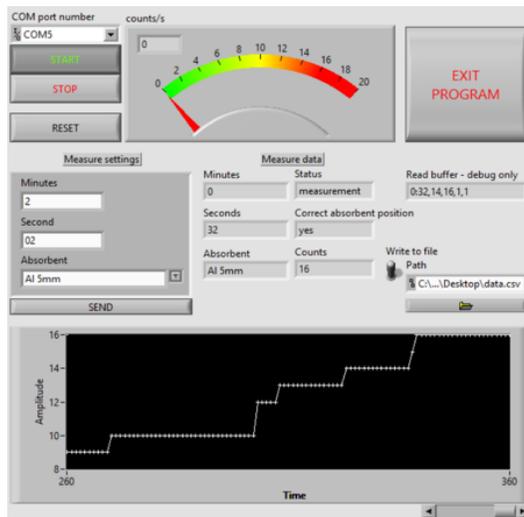


Fig. 3. Admin Panel in LabVIEW.

shows counts per second in the upper side of the panel. The user can also push the emergency button to instantly stop the device in case of danger.

7. User Panel

7.1. Main motive for User Panel

The main point of the User Panel was to make a properly working panel in National Instruments LabVIEW which should allow to queue the measurements and send collected data to the text file, so data could be processed later. The User Panel gives the operator functionality of: queuing the measurements, starting and stopping the measurement.

7.2. Realization of the task

As it can be seen in Fig. 4, the User Panel allows the user to perform actions necessary for the measurements. Some of the functionalities were disabled to reduce the risk of damaging the device. In addition, it shows counters per second to ensure the correct course of measurement and give brief data of radiation absorption.

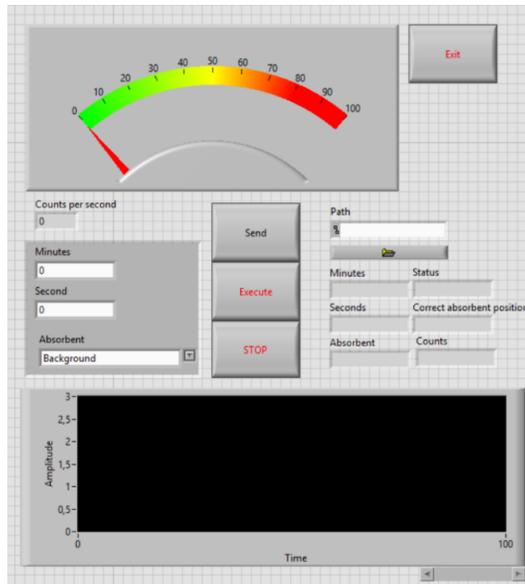


Fig. 4. User Panel in LabVIEW.

8. Conclusion

As mentioned before, the software works well, has all functionalities that were demanded. All of the documentation and code were given to be further developed.

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REFERENCES

- [1] Y. Fang, X. Chen, «Design and Simulation of UART Serial Communication Module Based on VHDL», in: «3rd International Workshop on Intelligent Systems and Applications, Wuhan, China», 2011.
- [2] P. Frame, «General information about K-40», <https://www.ornl.gov/ptp/collection/consumer%20products/potassiumgeneralinfo.htm>