Contribution ID: **37** Type: **Poster**

Multichannel analyzer for alpha spectroscopy

The multichannel analyzer is used to identify the source of alpha radiation. Silicon detectors and scintillators are used for registration.
The system for alpha spectroscopy should consist of silicon detectors, NaI(Ti) crystal scintillators, charge-sensitive preamplifier units, a discriminator, an amplifier, a coincidence circuit and a multichannel analyzer[1,2,3]. The goal of the work is to create an alpha spectrometric system at low cost for use in experimental physics and in teaching students. For this purpose, microcircuits were selected and an analog signal processing circuit was created. Simulation of analog signal processing circuits was carried out on the NI MultiSim 14 program. The multichannel analyzer is created on the basis of the well-known, commercially available and cheap STM32 microcontroller.
The microcontroller has fast multichannel ADC's with sampling rates of 2.5 - 5 million samples per second. However, this speed is not sufficient to accurately measure the peak of a signal using digital signal processing methods such as in digitizers, where ADC speeds reach 250-500 million samples per second. The use of an analog peak detector circuit allows you to save the signal peak before recording the ADC, which allows you to use any slow ADC built into microcontrollers[4,5].

References:
1. Carboni, S., et al.(2012). Particle identification using the ΔE–E technique and pulse shape discrimination with the silicon detectors of the FAZIA project. Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, 664(1), 251–263.
2. J. Barney et al., "Experiment for Space Radiation Analysis, Energetic Charged Particle Sensor: a Charged Particle Telescope with Novel Sensors for Measuring Earth's Radiation Belts," 2022 IEEE Aerospace Conference (AERO), Big Sky, MT, USA, 2022, pp. 1-7.
3. Noga, K. M., & Palczynska, B. (2018). The simulation laboratory platform based on Multisim for electronic engineering education. 2018 International Conference on Signals and Electronic Systems (ICSES), 269–274.
4. Chierici, A., Ciolini, R., Malizia, A., & d'Errico, F. (2023). Resource Constrained Electronics and Signal Processing for UAV Radiation Sensors. EPJ Web of Conferences, 288, 10019.
5. Chierici, A., Malizia, A., Di Giovanni, D., Ciolini, R., & d'Errico, F. (2022). A high-performance gamma spectrometer for unmanned systems based on off-the-shelf components. Sensors, 22(3), 1078.

Section

Applications of nuclear methods in science, technology, medicine and radioecology

Primary author: TEMIRZHANOV, Alisher (Satbayev University, Almaty 050013, Kazakhstan and Insitute of Nuclear Physics, Almaty, Kazakhstan)

Co-authors: ZHOLDYBAYEV, Timur (Institute of Nuclear Physics, Almaty, Kazakhstan); USSABAYEVA, Gulnaz (Institute of Nuclear Physics, Almaty, Kazakhstan); SADYKOV, Bakhtiyar (Institute of Nuclear Physics, Almaty, Kazakhstan); DUISEBAYEV, Bek (Institute of Nuclear Physics, Almaty, Kazakhstan)

Presenter: TEMIRZHANOV, Alisher (Satbayev University, Almaty 050013, Kazakhstan and Insitute of Nuclear Physics, Almaty, Kazakhstan)

Session Classification: Poster session