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An upgraded TOF- $\Delta E1$ - $\Delta E2$ -E (DSSSD) based spectrometer for heavy-element research at the Dubna Gas-Filled Recoil Separator

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Two scenarios of modifying the DGFRS (the Dubna Gas Filled Recoil Separator) spectrometer of rare alpha decays are under consideration. Both of them imply use of integral 1M CAMAC analog-to-digital processor TekhInvest ADP-16 [1,2] as a basic unit in the spectrometer design. In scenario a) special unit (PKK-05) [3] will be used to measure horizontal position of the signal, without measuring its energy, whereas in scenario b) a complete amount (12 modules ADP-16 for 48x128 strips of DSSSD) are used to measure both energy and position signals. To measure signals of charged particles coming from cyclotron an upgraded gaseous low pressure TOF- $\Delta E1$ - $\Delta E2$ module is used. To store TOF- $\Delta E1$ - $\Delta E2$ information specific 1M module TekhInvest PA-3n-tof is used. First results of trial runs using the specific TekhInvest IMI-2011 pulser and test nuclear reaction $^{nat}Yb+^{48}Ca \rightarrow ^{Th}^*$ are presented. New algorithm to search for ER- α - α ... α (SF) sequences in a real-time mode is discussed taking into account commissioning in the nearest future of the new FLNR DC-280 cyclotron that is to provide beams of very high intensity [4]. An equivalent circuit for two neighbor strips of p-n junction side is proposed. It predicts a small non-linear ballistic effect for signals originating in inter-strip p-n junction area. Additionally, authors define abstract mathematical objects, like correlation graph and incoming event matrixes of a different nature to construct in a simple form a rare event detection procedure in a more exhaustive relatively the present one, using real-time detection mode. In that case one can use every from $n-(n-1)/2$ correlation graph edges are used as a "trigger" for beam irradiation pauses to provide a "background free" condition to search for ultra rare alpha decays. Here n is a correlation graph nodes number. Schematics of these algorithms are considered.

References

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