The status of the URAN array

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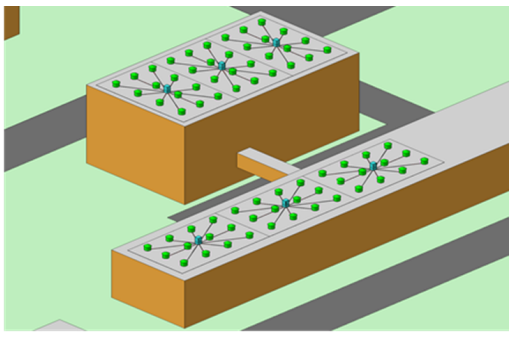
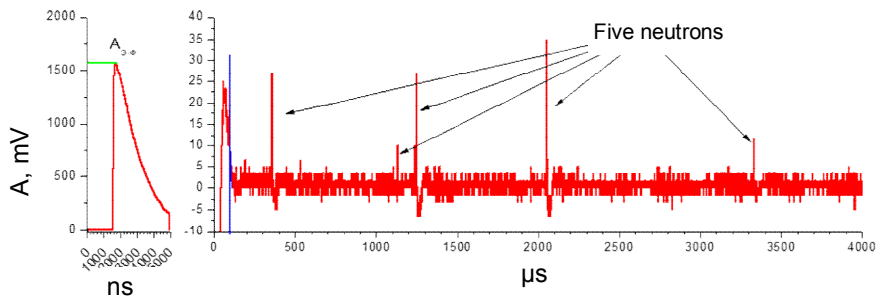
A description of the URAN array, composition and capabilities of the hardware and software part is given. The results of measurements of the temporal distribution of the neutron component of EAS and the dependence of the number of neutrons on the number of charged particles in registered EAS are presented.

In 2018, the experiment on the registration of thermal neutrons from EAS began in the EC NEVOD (MEPhI). The experiment is being carried out on the URAN array [1], specially designed for this purpose, the work on the creation and deployment have been conducted since 2015.

The URAN array consists of 72 en-detectors and has a cluster structure, with 12 detectors per cluster. It is located on the two roofs of the EC NEVOD, with three clusters each, and has an area of about 10^3 m^2.

The URAN array registers two EAS components, thanks to the use of the specialized ZnS (Ag) + B_2O_3 scintillator [2], which is capable of detecting the group passage of charged particles and delayed thermal neutrons. A trigger to start recording an EAS event in a cluster is a 200 MHz digitized signal with a duration of up to 5 μs from the charged component, then information is stored for a duration 20 ms with a frequency of 1 MHz.

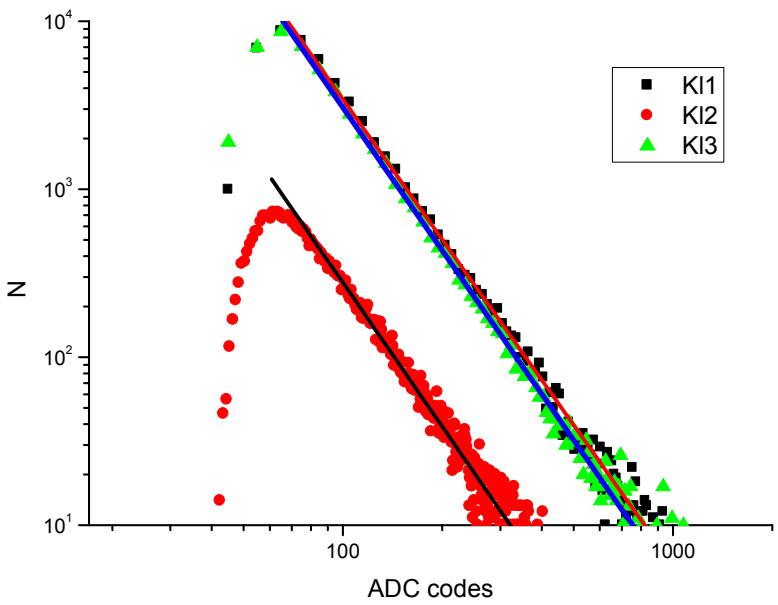




Amplitude response spectrum of the URAN array from the charged EAS component

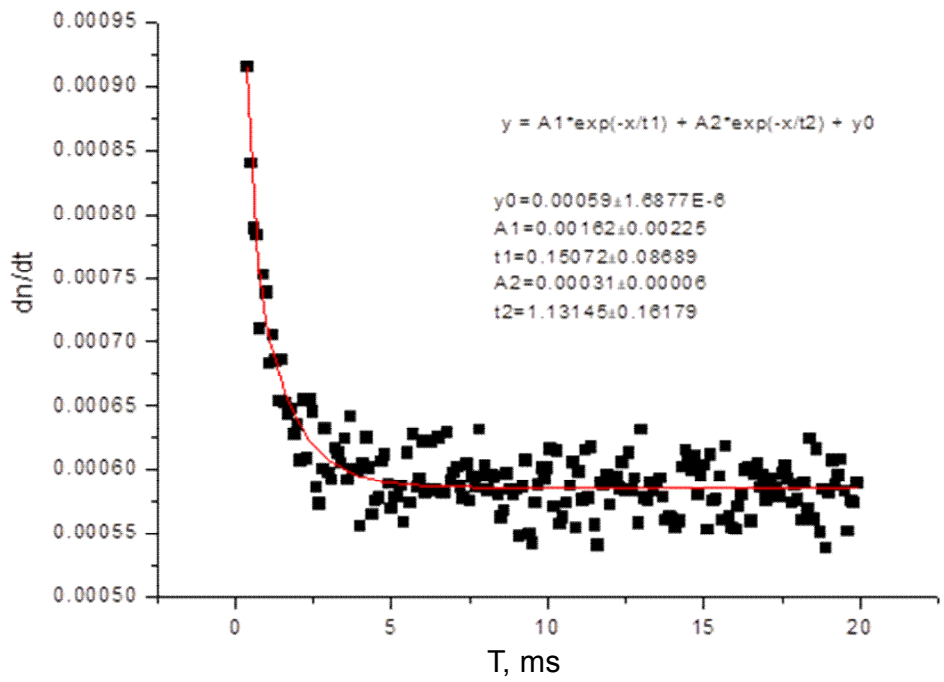
According to the data of the three clusters of the URAN array for the six-month period, the amplitude spectrum of the response of the URAN array to the passage of charged EAS particles was obtained.

Each cluster was considered separately and a spectrum of amplitudes was constructed for it. The values of the slope are 2.77 ± 0.04 for the first cluster, 2.85 ± 0.03 for the second cluster and 2.83 ± 0.05 for the third cluster.



The time distribution of neutron EAS

An important result of the experiment on registration of EAS neutrons is the time distribution of the URAN facility, which is described by the double exponential function $y(t) = A_1 * \exp(-t / t_1) + A_2 * \exp(-t / t_2) + y_0$ with $t_1 = 0.15 \pm 0.09$ ms and $t_2 = 1.13 \pm 0.16$ ms.



Conclusion

The URAN installation allows obtaining information about the neutron component and neutron component of extensive air showers and, accordingly, their hadronic structure. The URAN installation will become an integral part of the unique scientific facility "NEVOD Experimental Complex", which already includes NEVOD, DECOR, CTS, PRISMA-32 detectors, NEVOD-EAS and TREK detectors.

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References

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