



Cosmic ray detector for diagnostics of the Earth's atmosphere and magnetosphere (URAGAN)

D. A. Timashkov (1), N. S. Barbashina (1), R. P. Kokoulin (1),
K. G. Kompaniets (1), G. Mannocchi (2), A. A. Petrukhin (1), O. Saavedra (3),
V. V. Shutenko (1), G. Trincherò (2), I. I. Yashin (1)

(1) Moscow Engineering Physics Institute, 115409, Russia

(2) Istituto di Fisica dello Spazio Interplanetario - INAF, 10133, Italia

(3) Università degli Studi di Torino, 10125, Italia

A large area coordinate detector URAGAN for muon diagnostics of the Earth's atmosphere and magnetosphere is described. The detector is composed of separate horizontal supermodules, each with an area of 11.5 m², located on the top of water Cherenkov detector NEVOD (Moscow, MPhI). Each supermodule consists of eight layers of gas-discharge chambers equipped with X–Y system of external readout strips. Such assembly allows to detect high energy charged particles (at the Earth surface mainly cosmic ray muons) with 90 % efficiency. The muon track parameters (two projection angles) are reconstructed in a real time regime and are accumulated in a 2D directional array. Such data array (matrix) is a “muon photograph” of the upper hemisphere during a 1-min exposure. Detector URAGAN allows to detect muon flux variations simultaneously from thousands of directions and gives a possibility to film the celestial hemisphere in "muon light". This approach is analogous of X-raying but with use of natural cosmic ray radiation and allows to detect disturbed regions in the atmosphere and to trace their movement above the area of thousands sq. km.

At present, three URAGAN supermodules with total area 34.5 sq. m. are under operation, and continuous muon monitoring of atmosphere above Moscow region being carried out. Preliminary data analysis shows a presence of wave-like modulations in muon flux before and during of powerful atmospheric processes (thunderstorms and

hurricanes).