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A Project of a Complex Setup at the Pamirs for Multi-Component Study of EAS and Parent PCRs in a Wide Energy Range Around the “Knee”.

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A recommencement of CR researches with a unique X-Ray emulsion chamber (XREC) located at a high-altitude experimental site at the Pamirs (4360 m a.s.l.) in the framework of the Pamir-Chacaltaya International Scientific Research Center, recently established by the Governments of the Russian Federation and Tajikistan (2008), opens up a possibility for deep upgrading of the experimental setup and for deployment on its basis of a new complex one of 1 km² in area for EAS multi-component study including electron, muon, optic and hadron components, as well as a fine structure of EAS cores. The main purpose of the project is a detailed and per elemental study of the PCR spectrum in a wide range of primary energies E₀=30 x 10⁶ TeV partially overlapping that of direct observations and containing the “knee” and other close intriguing irregularities of the spectrum. In addition, the designed setup will make it also possible to research a defuse γ-ray radiation with energy above 30 TeV in all northern hemisphere of the sky.

The proposed project is based on a positive worldwide experience of creation of hybrid setups at mountain elevations which combines technique of EAS study by means of an array of spaced electronic detectors of charged particles with that of XRECs permitting to study a structure of EAS cores due to its high spatial resolution.
A unique astronomical climate and high elevation of the Eastern Pamirs plateau provide excellent conditions for effective detecting of EAS Čerenkov light and particularly for detailed study of its space-angle characteristics, especially sensitive to the PCR composition. A spaced Čerenkov detector array of 245 x 245 m² in area complemented with 4 wide field-of-view (≥20°) imaging atmospheric Čerenkov telescopes (IACT) of 3-4 m in diameter with angular resolution 0.5-1.0° will be employed for determining of space-angle distributions of individual EAS. The atmosphere quality control will be performed with lidar technique. One more Čerenkov light telescope with ring-like system of mirrors (R=80 m) and cylindric mosaic of PMT in the center of the ring, which is specially designed for detection of Čerenkov radiation of the PCR nuclei, is under simulation now.

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