Project Title:

Neutrino Simulation for JEM-EUSO

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JEM-EUSO is short for Extreme Space Observatory on board the Japanese Experimental Module. The project is built around the idea of a space-based mission observing air showers from the International Space Station.

Air showers are an evidence of cosmic rays, neutrinos, and gamma photons that arrive from outer space and interact with atmospheric atoms. Therefore, by observing air showers one can derive properties of the primary cosmic particle, such as type, energy and arrival direction. Before the realisation of such an instrument, simulation of the detection process is a reasonable step. Because neutrinos are elusive particles and interact only weakly, it is interesting to know how many of them could be detected and with which efficiency.

The simulation of the first interaction of a primary neutrino with an atmosperic nucleon is done with PYTHIA (Sjöstrand, Mrenna, Skands. "Pythia 6.4 Physics and Manual". Hep-ph/0603175). The development of the resulting shower is then simulated with CONEX (Bergman et al. "One-dimensional Hybrid Approach to Extensive Air Shower Simulation". Astro-ph/0606564). Finally, ESAF (short for EUSO Simulation and Analysis Framework) is a software used to model a space-based detector and its observation of an air shower.

During FY 2014 no mentionable employment of the RICC system took place. Samples of neutrino showers were generated using local resources to further study and verify the simulation cycle. Additionally, a trigger efficiency study for high zenith angles is in progress.

In the future, more extensive shower samples could be created. Allowing to investigate the trigger efficiency as a function of different parameters of the incoming particle. Moreover, a study of sensitivity and exposure of a space-based detector is an important imminent task.

In view of the ongoing renovation of Riken's Cluster and its limited resources during that time, the RICC system was not considerably utilised.