Project Title:

Study on the performances of the JEM-EUSO mission

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The JEM-EUSO mission is a space based Ultra High Energy Cosmic Ray observatory planned to fly on the International Space Station between 2015 and 2020. This project sees the collaboration of more than 150 scientists from 12 countries. The Computational Astrophysics Laboratory led by Toshikazu Ebisuzaki plays a key role in developing the instrument and planning the mission.

In particular, we are collaborating with RIKEN on the development of the simulation framework for the JEM-EUSO mission (The Euso Simulation & Analysis Framework).

The ESAF software takes care of the simulation of the Cosmic Ray events, the propagation of light to the instrument and the simulation of the instrument itself.

Moreover it performs the data analysis on the detector response.

During the past year we performed studies on the trigger algorithms to filter the instrument background and on the electronics.

Other very important calculations on the detected flux of Cosmic Ray events and on their quality have been performed.

Also to mention is the study on the background robustness of the data analysis algorithms. For this last study the simulation of a huge background simulation is required. Preliminary simulations for that purpose have been started.

Trigger efficiency curves were produced for several different algorithms in order to assess the energy threshold of the instrument.

The most optimal configuration for the electronics as the integration time and pixel size has been found.

The background rejection capabilities have been also tested.

The results have been shown in internal collaboration meetings in the US and in Europe although no publication has been done yet.

The reason for that is in the fact that further studies on the data analysis are needed before we can publish this year's results.

Furthermore we have to specify that we didn't use all the resources since we are still in the development phase and before of starting really massive calculation the optimization of the software is needed.

In the next year (2011) we will perform studies on the angular and energy resolution in order to assess the capability to identify sources and reconstruct the energy spectrum of Ultra High Energy Cosmic Rays.

Once we will have those results an extensive simulation will be started on the RICC cluster to assess the number of detected events, the quality of the spectrum and the angular resolution accuracy.

Those results are of extreme importance for planing the construction of the instrument and for the future data analysis.