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GRAINE project: An overview and status of the 2015 balloon-borne experiment with emulsion gamma-ray telescope

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The observation of high-energy cosmic gamma-rays provides us with direct information of high-energy phenomena in the universe. Currently, AGILE and Fermi-LAT are observing gamma-ray sky and many understandings are being brought to us. However, past and current observations have significant limitations. The improvement of angular resolution and polarization sensitivity is one of keys for a breakthrough of the limitations.

We are pushing forward GRAINE project, 10MeV-100GeV cosmic gamma-ray observation with a precise (0.08deg@1-2GeV) and polarization sensitive large aperture area ($\sim$10m^2) emulsion telescope by repeated long duration balloon flights.

We demonstrated the feasibility and performance of the emulsion gamma-ray telescope using accelerator beams with gamma-rays/electrons/muons and atmospheric gamma-rays at mountain height.

In 2011, the first balloon-borne, emulsion gamma-ray telescope experiment was successfully performed with a 125cm^2 aperture area and 4.3 hour flight duration. We demonstrated the working and performance of the emulsion gamma-ray telescope at a balloon flight for the first time. And the first understanding of the background was obtained with the emulsion gamma-ray telescope at a balloon flight.

Based on the experience and achievements of the 2011 balloon experiment, we are planning a next balloon experiment on Japan-Australia scientific ballooning at Alice Springs with a 3600 cm^2 aperture area and $\sim$1day flight duration in May 2015. In the next balloon experiment, we aim to detect the Vela pulsar, a well-known bright gamma-ray source, with more than 5σ significance and to demonstrate the overall performance of the emulsion gamma-ray telescope. Then, we will start the observation with the highest imaging resolution and polarization sensitivity. And phase resolving of the pulse emission from the Vela pulsar will be also challenged.

An overview and status of the 2015 balloon experiment are presented.

Collaboration

– not specified –

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