

GRAINE precise γ -ray observations: latest results on 2018 balloon-borne experiment and prospects on next/future scientific experiments

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We are developing a GRAINE project, 10 MeV –100 GeV cosmic γ -ray observations with a precise (0.08 degree @ 1 –2 GeV) and polarization sensitive large-aperture-area ($\sim 10 \text{ m}^2$) emulsion telescope repeated long duration balloon flights. We demonstrated a feasibility and performance of the balloon-borne emulsion γ -ray telescope experiment with various test experiments and developments on the ground and balloon-borne experiments in 2011 and 2015. In 2018, a balloon-borne experiment was performed with a 0.38 m^2 aperture area and 17.4 hour flight duration in Australia to demonstrate an overall performance of the telescope with a detection and imaging of a known γ -ray source, Vela pulsar. By the flight data analysis, we achieved a firm detection and highest imaging for the Vela pulsar and established the emulsion γ -ray telescope with a highest angular resolution in the γ -ray telescopes in the energy region. Based on the experiences and achievements, we aim to start scientific observations expanding an aperture area and flight duration repeated balloon flights. In 2022, we have a plan of twice balloon-borne experiments in Australia by JAXA Scientific Ballooning with a 2.5 m^2 aperture area and a flight duration above 15 hours aiming, e.g., to observe galactic center region with a highest imaging resolution. An overview and status of the GRAINE project, especially the latest results on the 2018 balloon-borne experiment and the prospects on the next/future scientific experiments are presented.

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Primary author: TAKAHASHI, Satoru

Co-author: COLLABORATION, GRAINE

Presenter: TAKAHASHI, Satoru

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