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Ground calibration impact experiments on arrayed large-area dust detector for interplanetary space onboard IKAROS

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IKAROS (Interplanetary Kite-craft Accelerated by the Radiation of the Sun) was successfully operated beyond its nominal operational period of 3-6 months from its launch in May of 2010, in deep space between the Earth and Venus orbits. Arrayed Large-Area Dust Detectors in INterplanetray Space (ALADDIN) were attached on the anti-Sun face of its 7.5-micron thick polyimide sail membrane of IKAROS. The dust detectors are made up of 8 channels of 9-20 micron-thick PVDF (ALDN-S) with effective detection area of 0.54m2 to detect hypervelocity impacts of micrometeoroids. Impact signals from PVDF are sent to electronic unit which filters thermal and vibration noises and records impact time, peak voltage and relaxation duration of each impact signal.

ALADDIN continuously measured heliocentric flux variance of cosmic dust from inside the orbit of the Earth to the vicinity of Venus in 2010-2011. The flux trends is well consistent with the data of Helios in 1970's and Galileo in 1990's. We conducted ground calibration impact experiments to evaluate cosmic data from ALADDIN. Impact experiments simulating collision of micrometeoroids on ALDN-S were performed using two-stage light gas gun at JAXA. We obtained impact signals on PVDF at various particle sizes and impact velocities.