COSMIC DUST DETECTION BY THE IKAROS-ARRAYED LARGE-AREA DUST DETECTORS IN INTERPLANETARY SPACE (ALADDIN) FROM THE EARTH TO VENUS. H. Yano[1,2], M. Tanaka[3], C. Okamoto[2], T. Hirai[1,4], N. Ogawa[2], S. Hasegawa[1], T. Iwai[5], and K. Okudaira[6], [1]JAXA/ISAS, (3-1-1 Yoshinodai, Chuo-ku, Sagamihara, Kanagwa 252-5210, JAPAN, e-mail: yano.hajime@jaxa.jp), [2] JAXA/JSPEC, [3] Tokai University, [4] HIT/University of Tokyo, [5]University of Aizu.

Introduction: IKAROS (Interplanetary Kite-craft Accerelated by the Radiation Of the Sun), a 20-m-across solar sail demonstration spacecraft launched in May 2010, carries ALADDIN (Arrayed Large-Area Dust Detectors in INterplanetary space) dust detector made of 0.54 m^2 PVDF sensors deployed on its 7.5 micron polyimid sail membrane. As the first deep space dust detectors developed and built in Japan, ALADDIN continuously measures dust flux in the viscity of the Earth to that of Venus within its 6-month cruising.

ALADDIN Description: In May of 2010, the world's first interplanetary solar sail demonstrator called the Interplanetary Kite-craft Accelerated by the Radiation of the Sun (IKAROS) was launched by an H-IIA rocket. On its thin sail membrane, a large-area but still light-weight dust detector made of 8 channels of 9-20 micron-thick PVDF were attached. This detector is called the Arrayed Large-Area Dust Detectors in INterplanetray Space (ALADDIN) and has effective detection area of 0.54 m^2 with in order to count and time hypervelocity impacts by micrometeoroids larger than micron size during its interplanetary cruise. The sensors filter electronic, thermal and vibration noises and record time, peak hold value, and relax duration of signals of micrometeoroid impacts.

The first objective of ALADDIN is to test this large PVDF array system on thin sail membrane in the interplanetary operation and the second objective is to measure heliocentric flux variance inside the orbit of the Earth (~1.0 AU) down to the vicsinity of Venus (~0.7 AU), and opportunistic detections of possible fine dust structures (flux uxanisotropy) such as the infrared dust enhancement in the trailing edge of the Earth, unknown cometary dust trails, and a possible flux enhancement near Venus.

During the 6-month cruising, ALADDIN has successfully measured abundant dust flux each of which separated by a 24-hour bin, thus enabling to discuss heliocentric dependency of the flux variation around >10^-12 g mass range in the finest detail among any previous spacecraft such as Helios-1/2 and Galileo. This paper reports its first result. The ALADDIN dust flux in 2010 is generally consistent with flux trends of Helios in 1980's and Galileo in 1990's but some fine structures are observed.

Acknowledgements: Authors are thankful to Kureha Co., Ltd., and Elmec Denshi Coop., and AD-sha Coop. for support of the detector development. JAXA/ISAS-LGG, HIT-Van de Graaf and MPI-Heidelberg-Van de Graaf are used for the detector calibration.

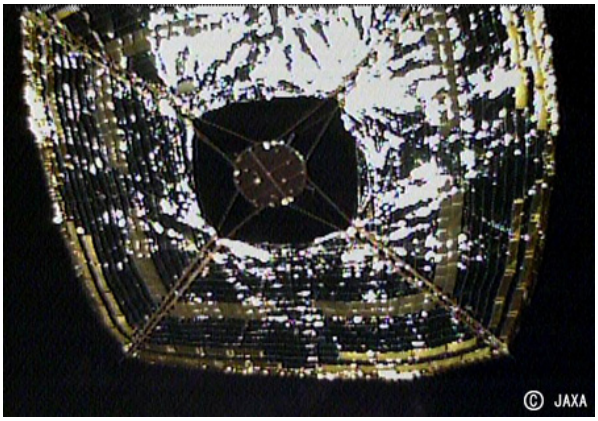

Fig.1 ALADDIN onboard the polyimid membrane of IKAROS solar sail spacecraft (Courtesy: JAXA)

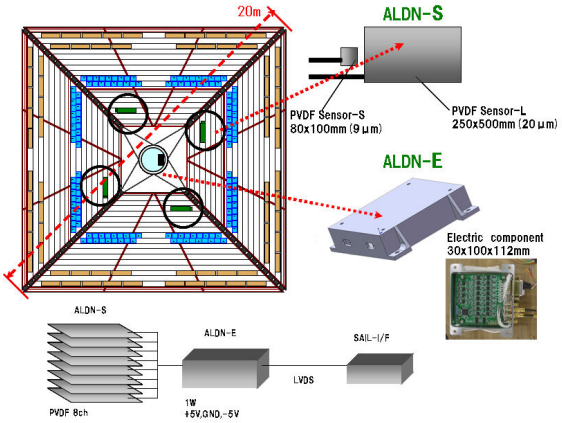

Fig.2 ALADDIN System: all sensors weighed in 39 g and electronic box in 210 g in total