SPACE DEBRIS SYMPOSIUM (A6)
Measurements (1)

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DEVELOPMENT ON IN-SITU SENSORS FOR MICRO-METEOROID AND ORBITAL DEBRIS MEASUREMENT AT JAXA

Abstract

Research and development of in-situ sensors for micro-meteoroid and orbital debris (MMOD) measurement at Japan have not so long, but not short history. Research of active sensor is started for meteoroid observation experiment at the Hitten (Musses-A) of ISAS/JAXA. The "Hitten" was launched at 1990, and on-board sensor for micro meteoroid measurement was called "MDC (Munich Dust Counter)". The experiment was collaboration between Technische Universität München and ISAS/JAXA. Research of passive sensor was started mainly for the "SOCCOR" mission. The mission was planned to capture cometary dust and back to the Earth as a collaboration Japan with US in late 1980's. Although the plane was canceled, the heritage of researches were applied to micro debris sample return mission using "calibrated aerogel" at Space Shuttle and the International Space Station by JAXA. Not only these activities mentioned above, but also many important activities are known, and these important knowledge contribute JAXA's development of a new type active dust sensor. As a new type active dust sensor, JAXA and collaborators have been developing a simple in-situ sensor to detect dust particles ranging from a hundred micrometers to

several millimeters. The distribution and flux of the debris of the size range are not well understood. The size range is difficult to measure from the ground observation, although the impact risk evaluation on space system caused by the size range is important. The in-situ measurement of the size range is useful for; 1) verifications of meteoroid and debris environment models, 2) verifications of meteoroid and debris environment evolution models, 3) real time detection of unexpected events, such as explosions and/or collisions on an orbit. Multitudes of thin, conductive strips (material: copper) are formed with fine pitch (pitch: 100 um) on a thin film of nonconductive material (thickness: 12.5 um, material: polyimide). A MMOD particle impact is detected when one or more strips are severed by the perforation hole. The sensor is simple to produce and use and requires almost no calibration as it is essentially a digital system. JAXA's flight model for application satellite and/or the ISS will be ready soon and flight demonstration will be conducted on "KOUNOTORI" (HTV) in 2015. This paper introduces research and development on in-situ measurement MMOD sensors at JAXA and flight demonstration results of the active sensor.