

SPACE POWER SYMPOSIUM (C3)
Space Power Experiments Applications and Benefits (4)

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DEVELOPMENT OF THIN FILM SOLAR ARRAY FOR SMALL SOLAR POWER DEMONSTRATOR
“IKAROS”

Abstract

We developed a light weight and a flexible solar power generation system that is installed on the small solar power demonstrator “IKAROS” (Interplanetary Kite-craft Accelerated by Radiation Of the Sun). IKAROS will be launched on May 18 with “AKATSUKI” toward the Venus. IKAROS is a demonstrator for the future spacecraft driven with hybrid propellant system, called solar power sail, which utilizes two kinds of forces; one by solar photon from the sun and another by the high performance ion engine. IKAROS’s sail made of polyimide with a thickness of 7.5 micro meters has a square shape with the diagonal length of 20 m and is fitted with the thin film solar arrays, the steering devices and dust-counter sensors. This report describes the structural consideration of the solar array, the space environmental evaluation of the thin film solar cell using the ground irradiation facility and the preliminary report of the onboard data. The thin film solar array had multilayer structure in order to protect against the UV ray, generate electricity, and cool by radiation. Also, in order to prevent warpage of the thin film solar array, two sheets of the film solar cells were glued together. The three 220x320 mm sized solar arrays connected in series were utilized as a unit, and 48 units installed on IKAROS. The total generated power was estimated to be 360 W without any degradation due to ultra violet ray. We confirmed that temperature of the solar array could be controlled around 41 deg C with 1Sun and 100 deg C with 2Sun. The irradiation test with electron and proton beams and UV light were carried out. We evaluated a specific mass property of the thin film solar array based on the flight model of the solar array for IKAROS.