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Author: Mr. Ishio Haruta
Japan

Dr. Tatsuo Shimizu
Kyushu Institute of Technology, Japan
Prof. Kazuhiro Toyoda
Kyushu Institute of Technology, Japan
Prof. Mengu Cho
Kyushu Institute of Technology, Japan

# MITIGATION METHOD OF PREVENTING SECONDARY ARCING ON SOLAR ARRAY BY USING CAPACITOR AND INDUCTOR

**Abstract**

In recent years, sizes of spacecraft solar arrays have become large in order to support growing spacecraft functions. For the high power solar array, using higher array voltage is advantageous, because it can reduce a power loss in transmission line. Hence, the higher array voltage can contribute to reduction of the harness mass by using smaller cable and the solar array mass by reducing power losses. For example, at present, a typical generating power of such highly functional satellites (i.e. including satellites in Low Earth Orbit and Geostationary Earth Orbit) has reached the order of 10kW or more, and the array voltage of the satellite has reached over 100V to transfer such high electric power from the solar array to the payload with high efficiency.

However, the solar array voltage cannot be simply increased, because higher array voltage increases susceptibility to electrical discharges (i.e. arc) caused by interaction with space plasma environment. In particular, secondary arcs (i.e. sustained arcs) are the major cause of the degradation in power generation capacity of the solar array, and this degradation will eventually cause the complete loss of the function of the satellite. Here, sustainability of the secondary arc mainly depends on solar cell current (i.e. generated current) and gap spacing between spaces, in which the solar cell current has been increased because of improvements in efficiencies. Evidently, accidents in arcing have increasingly been occurred on the solar arrays due to the increased array voltage –i.e. around 100V. Therefore, a compromise between array voltage (i.e. arcing) and the transmission efficiency is required in the solar array design. The aim of this research is to increase the solar array voltage and the solar cell current with mitigating the sustained arc.

At the moment, "Grouting" method has been commonly applied to mitigate the sustained arc. This method uses an adhesive, which is buried in the gap between solar cell strings –i.e. where high voltage is applied. However, this method has several issues. Therefore, this research has developed new mitigation method with uses capacitors and inductors inserted between these solar cell strings. The circuit (i.e. RLC) is oscillated when the secondary arc is occurred, and the oscillation current is superimposed on the solar cell current that causes the sustained arc. Thus, adjusting this superimposed current to zero can mitigate the sustained arc. This paper presents the overview of this method with simulation and experimental results.