

# High Current ESD Test of Advanced Triple Junction Solar Array Coupon

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A test was conducted on an Advanced Triple Junction (ATJ) coupon that was part of a risk reduction effort in the development of a high-powered solar array design by SSL. The ATJ coupon was a small, 4-cell, two-string configuration that has served as the basic test coupon design used in previous SSL environmental aging campaigns. The coupon has many attributes of the flight design; e.g., substrate structure with graphite face sheets, integrated by-pass diodes, cell interconnects, RTV grout, wire routing, etc. The objective of the present test was to evaluate the performance of the coupon after being subjected to induced electrostatic discharge testing at two string voltages (100 V, 150 V) and four array current (1.65 A, 2.0 A, 2.475 A, and 3.3 A). An ESD test circuit, unique to SSL solar array design, was built that simulates the effect of missing cells and strings in a full solar panel with special primary arc flashover circuitry. A total of 73 primary arcs were obtained that included 7 temporary sustained arcs (TSA) events. The durations of the TSAs ranged from 50  $\mu$ s to 2.9 ms. All TSAs occurred at a string voltage of 150 V. Post-test Large Area Pulsed Solar Simulator (LAPSS), Dark I-V, and By-Pass Diode tests showed that no degradation occurred due to the TSA events. In addition, the post-test insulation resistance measured was  $> 50$  G-ohms between cells and substrate. These test results indicate a robust design for application to a high-current, high-power mission application.