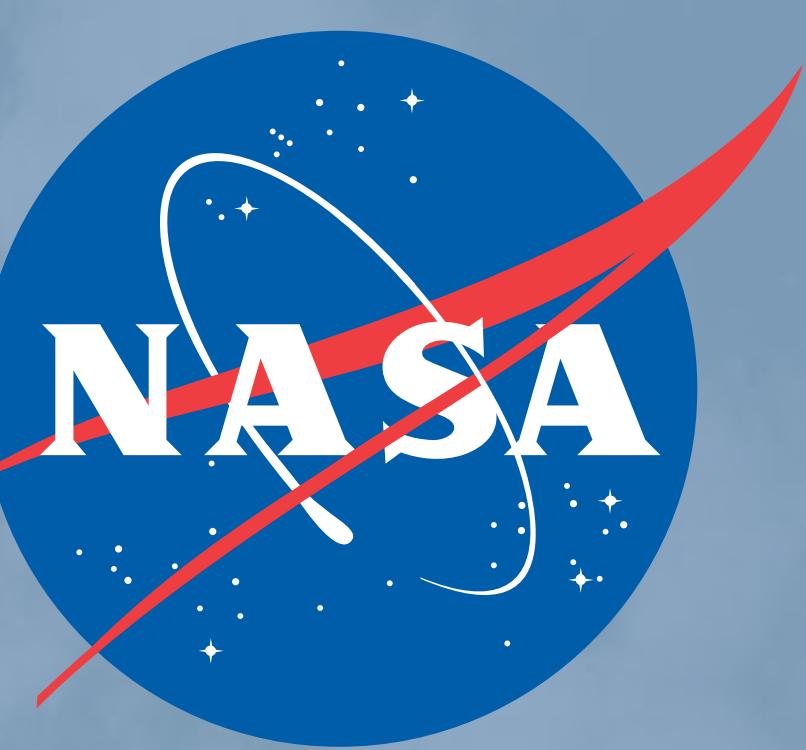


Restoration and Future Analysis of the Apollo Lunar Dust Detector Data

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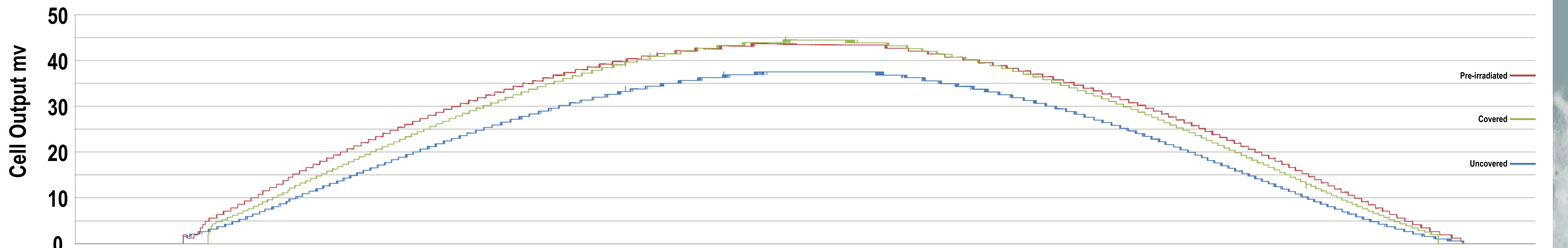
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The primary objective of the Dust, Thermal, and Radiation Engineering Measurements package (DTREM, also referred to as the Lunar Dust Detector Experiment) was to assess the long term effects of the lunar environment on silicon solar cells by measuring power output reduction caused by dust accumulation, temperature effects, and high-energy cosmic particle and ultraviolet radiation damage. Secondary objectives were to measure surface temperatures, to determine if pre-irradiation of the cells before deployment and irradiation on the lunar surface followed a simple superposition, and to quantify the effect of protective cover glass on the cells.

The power output of each cell and the temperatures were polled every 54 seconds, digitized, and sent back to Earth in the central station housekeeping telemetry stream as an 8-bit word. The Apollo 12, 14, and 15 DTREMs operated from deployment until the ALSEPs were turned off on 30 September 1977. The raw data were stored with the ALSEP housekeeping data from the central station. A set of translated and calibrated data were produced and sent to the National Space Science Data Center (NSSDC) where it was microfilmed and archived. These records are now the only known existing processed dust detector data from Apollos 14 and 15.



A sample of one typical lunar day measured by the Apollo 15 DTREM. The plot shows output in millivolts from the three solar cells from just before local sunrise on 10 December 1975 until just after local sunset on 25 December 1975. The solar cells were facing upwards, the curves show the slow increase in solar cell output with increasing solar angle with a maximum at solar noon. The uncovered cell (blue) has the lowest output due to being unprotected from radiation damage over time. The normal covered cell (green) and the pre-irradiated cell (red) are very close in output. At deployment the normal cell had a higher output than the pre-irradiated cell, but the normal cell has presumably been affected more by radiation than the pre-irradiated cell after over 4 years of exposure to the lunar environment.

TIME	DAY	CELL 1	CELL 2	CELL 3	INNER TEMP	OUTER TEMP	WEST TEMP
00:00:00	344	34.4	34.4	34.4	55.4	55.4	55.4
00:00:15	344	34.4	34.4	34.4	55.4	55.4	55.4
00:00:30	344	34.4	34.4	34.4	55.4	55.4	55.4
00:00:45	344	34.4	34.4	34.4	55.4	55.4	55.4
00:01:00	344	34.4	34.4	34.4	55.4	55.4	55.4
00:01:15	344	34.4	34.4	34.4	55.4	55.4	55.4
00:01:30	344	34.4	34.4	34.4	55.4	55.4	55.4
00:01:45	344	34.4	34.4	34.4	55.4	55.4	55.4
00:02:00	344	34.4	34.4	34.4	55.4	55.4	55.4
00:02:15	344	34.4	34.4	34.4	55.4	55.4	55.4
00:02:30	344	34.4	34.4	34.4	55.4	55.4	55.4
00:02:45	344	34.4	34.4	34.4	55.4	55.4	55.4
00:03:00	344	34.4	34.4	34.4	55.4	55.4	55.4
00:03:15	344	34.4	34.4	34.4	55.4	55.4	55.4
00:03:30	344	34.4	34.4	34.4	55.4	55.4	55.4
00:03:45	344	34.4	34.4	34.4	55.4	55.4	55.4
00:04:00	344	34.4	34.4	34.4	55.4	55.4	55.4
00:04:15	344	34.4	34.4	34.4	55.4	55.4	55.4
00:04:30	344	34.4	34.4	34.4	55.4	55.4	55.4
00:04:45	344	34.4	34.4	34.4	55.4	55.4	55.4
00:05:00	344	34.4	34.4	34.4	55.4	55.4	55.4
00:05:15	344	34.4	34.4	34.4	55.4	55.4	55.4
00:05:30	344	34.4	34.4	34.4	55.4	55.4	55.4
00:05:45	344	34.4	34.4	34.4	55.4	55.4	55.4
00:06:00	344	34.4	34.4	34.4	55.4	55.4	55.4
00:06:15	344	34.4	34.4	34.4	55.4	55.4	55.4
00:06:30	344	34.4	34.4	34.4	55.4	55.4	55.4
00:06:45	344	34.4	34.4	34.4	55.4	55.4	55.4
00:07:00	344	34.4	34.4	34.4	55.4	55.4	55.4
00:07:15	344	34.4	34.4	34.4	55.4	55.4	55.4
00:07:30	344	34.4	34.4	34.4	55.4	55.4	55.4
00:07:45	344	34.4	34.4	34.4	55.4	55.4	55.4
00:08:00	344	34.4	34.4	34.4	55.4	55.4	55.4
00:08:15	344	34.4	34.4	34.4	55.4	55.4	55.4
00:08:30	344	34.4	34.4	34.4	55.4	55.4	55.4
00:08:45	344	34.4	34.4	34.4	55.4	55.4	55.4
00:09:00	344	34.4	34.4	34.4	55.4	55.4	55.4
00:09:15	344	34.4	34.4	34.4	55.4	55.4	55.4
00:09:30	344	34.4	34.4	34.4	55.4	55.4	55.4
00:09:45	344	34.4	34.4	34.4	55.4	55.4	55.4
00:10:00	344	34.4	34.4	34.4	55.4	55.4	55.4
00:10:15	344	34.4	34.4	34.4	55.4	55.4	55.4
00:10:30	344	34.4	34.4	34.4	55.4	55.4	55.4
00:10:45	344	34.4	34.4	34.4	55.4	55.4	55.4
00:11:00	344	34.4	34.4	34.4	55.4	55.4	55.4
00:11:15	344	34.4	34.4	34.4	55.4	55.4	55.4
00:11:30	344	34.4	34.4	34.4	55.4	55.4	55.4
00:11:45	344	34.4	34.4	34.4	55.4	55.4	55.4
00:12:00	344	34.4	34.4	34.4	55.4	55.4	55.4
00:12:15	344	34.4	34.4	34.4	55.4	55.4	55.4
00:12:30	344	34.4	34.4	34.4	55.4	55.4	55.4
00:12:45	344	34.4	34.4	34.4	55.4	55.4	55.4
00:13:00	344	34.4	34.4	34.4	55.4	55.4	55.4
00:13:15	344	34.4	34.4	34.4	55.4	55.4	55.4
00:13:30	344	34.4	34.4	34.4	55.4	55.4	55.4
00:13:45	344	34.4	34.4	34.4	55.4	55.4	55.4
00:14:00	344	34.4	34.4	34.4	55.4	55.4	55.4
00:14:15	344	34.4	34.4	34.4	55.4	55.4	55.4
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00:14:45	344	34.4	34.4	34.4	55.4	55.4	55.4
00:15:00	344	34.4	34.4	34.4	55.4	55.4	55.4
00:15:15	344	34.4	34.4	34.4	55.4	55.4	55.4
00:15:30	344	34.4	34.4	34.4	55.4	55.4	55.4
00:15:45	344	34.4	34.4	34.4	55.4	55.4	55.4
00:16:00	344	34.4	34.4	34.4	55.4	55.4	55.4
00:16:15	344	34.4	34.4	34.4	55.4	55.4	55.4
00:16:30	344	34.4	34.4	34.4	55.4	55.4	55.4
00:16:45	344	34.4	34.4	34.4	55.4	55.4	55.4
00:17:00	344	34.4	34.4	34.4	55.4	55.4	55.4
00:17:15	344	34.4	34.4	34.4	55.4	55.4	55.4
00:17:30	344	34.4	34.4	34.4	55.4	55.4	55.4
00:17:45	344	34.4	34.4	34.4	55.4	55.4	55.4
00:18:00	344	34.4	34.4	34.4	55.4	55.4	55.4
00:18:15	344	34.4	34.4	34.4	55.4	55.4	55.4
00:18:30	344	34.4	34.4	34.4	55.4	55.4	55.4
00:18:45	344	34.4	34.4	34.4	55.4	55.4	55.4
00:19:00	344	34.4	34.4	34.4	55.4	55.4	55.4
00:19:15	344	34.4	34.4	34.4	55.4	55.4	55.4
00:19:30	344	34.4	34.4	34.4	55.4	55.4	55.4
00:19:45	344	34.4	34.4	34.4	55.4	55.4	55.4
00:20:00	344	34.4	34.4	34.4	55.4	55.4	55.4
00:20:15	344	34.4	34.4	34.4			