

# Patch Radiator Characterization<sup>1</sup>

by

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## Abstract

Spacecraft engaged in interplanetary exploration often make provisions for micrometeoroid protection. Both Galileo and Cassini utilize Mylar standoffs to secure a 1.5" to 2.5" gap between the MLI blanket and the hardware surface. A patch radiator consists of a regular radiator covered by a single outer-layer blanket material (or equivalent), which is often spaced off with adjacent MLJ. The patch serves as a sun shield for the radiator, closes off the gaps to ward off contaminants or space debris, and allows additional flexibility in sizing the radiator. Both the Jupiter-bound Galileo and the Cassini spacecraft which is being developed for a Saturn mission, have patch radiators on board.

Thermal characterization tests were recently performed on a patch radiator in a thermal vacuum chamber on the heels of a series of MLI blanket characterization tests. As a matter of convenience, the exposed radiator (i. e., with the patch removed) was also tested for comparison, Figure 1 shows the test article (a heater-controlled aluminum box enclosed in an MLI blanket) suspended in the LN<sub>2</sub>-cooled chamber; Fig. 2 shows the MLI with a cut-out for the exposed-radiator configuration. The patch radiator test was done before the patch over this cut-out (i. e., the MLJ outer layer) was removed. The tests were conducted in four phases, with the box/sink temperatures controlled to the levels of 5/- 188°C, 20/- 188°C, 50/- 188°C, and 50/- 100°C. Input powers to the box, as well as temperatures on the box and MLI blanket at several locations, were recorded. Figure 3 gives an example of the temperature readings (at the patch and the radiator underneath) for three steady state segments. The power and temperature data were used to calculate a "patch coefficient". The exposed radiator tests were also conducted for several temperature combinations, including a low temperature (-92°C) condition for the box. These tests allow a comparison of heat losses from the spacecraft hardware through the patch radiator, the exposed radiator, and the MLI blankets.

The test results are in general agreement with expectations. Details of the tests, and the related calculations and interpretations will be documented in this technical note.

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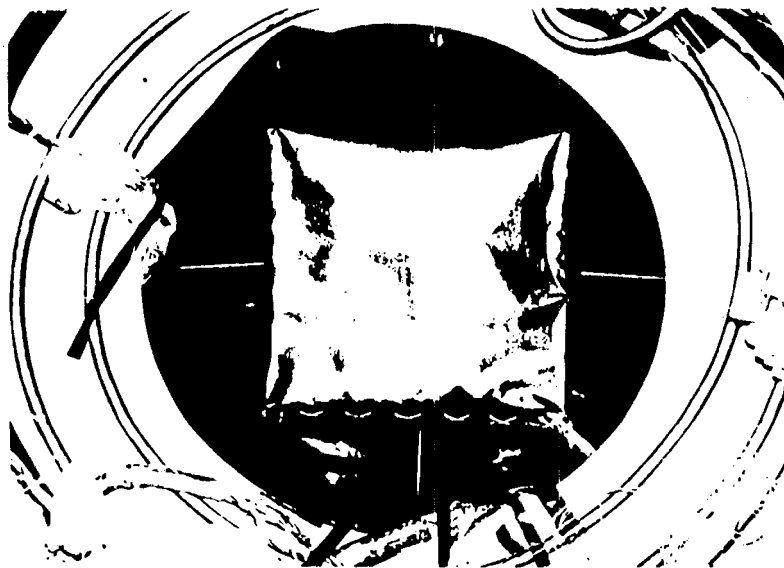


Figure 1

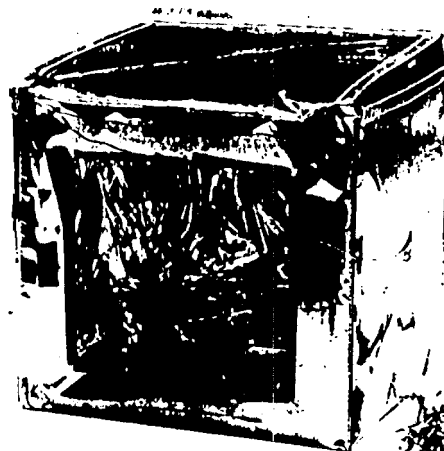


Figure 2

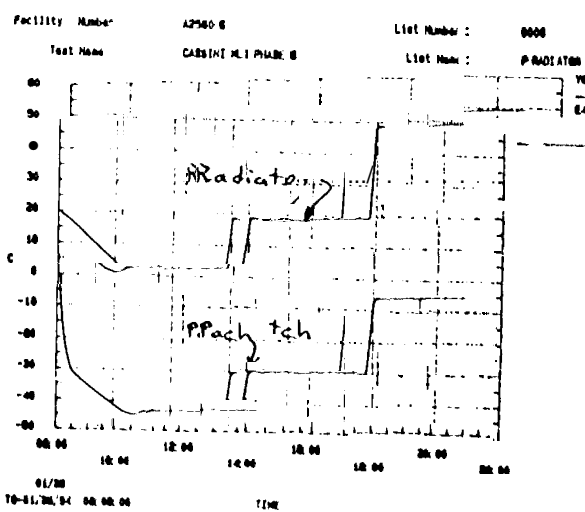


Figure 3