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NOV 7 1963

File: P-2.4
T-25761
Test Completed 10/23/63

10/15/98
RB Cramer
10/26/98
WC Layne
OK for Opennet

TCG-V/H-1.

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CENTRAL RECORD FILE

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MR. R. D. WEHRLE - 1323
Attn: E. D. Zaffery

Re: Nuclear Radiation Tests on Five Radioisotope-Fueled Thermoelectric Generators, Serial No. 4, 5, 7, 8 and 10, Manufactured by Mound Laboratories

Object of Test

The object of this test was to determine the effect of nuclear radiation on the voltage output of five radioisotope-fueled thermoelectric generators.

Authorization for Test

This test was requested by Division 1323 in a Work Order Authorization received August 20, 1963. Mr. E. D. Zaffery was the consultant. The material for test was received August 30, 1963.

Summary

Voltage outputs, which were monitored during nuclear radiation tests, indicated that a total integrated neutron flux up to approximately 7×10^{13} NVT ($E \geq 0.01$ MEV) did not appreciably affect the voltage output of the thermoelectric generators tested.

Functional Measurements and Methods

The thermoelectric generators were subjected to nuclear radiation using the Sandia Pulse Reactor located in Area V.

Both high and low terminal voltages were measured on units Serial No. 5 and 10 during the tests. Only the high voltage terminals were monitored on the remainder of the units.

Two recording instruments were used for these voltage measurements. These were a Sanborn Model 320 with an input impedance of 1.0 megohm and a Brush Mark II Recorder with an input impedance of 5.0 megohms. A 45 K ohm load was hooked across terminals 1 and 3 of the generators during the tests.

Voltages were monitored during a period extending from 20 seconds before SPR burst to 10 minutes after SPR burst.

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Carmela Gallegos 10/26/98
PERSON CHANGING MARKING & DATE
WC Layne 10/28/98
PERSON CERTIFYING MARKING & DATE

AUTHORITY: WC Layne
RECORD ID: 99SN0194
DATED: 10/26/98

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Procedure and Results

Nuclear radiation tests on the five thermoelectric generators were performed in two phases.

During the first phase units Serial No. 4, 5 and 7 were subjected to four radiation bursts. During the first burst the bases of the units were approximately 5.5 inches from the reactor screen and facing the screen. Before the second burst the units were moved so that the bases of the units were approximately 0.5 inch from the reactor screen. During the third and fourth bursts on these three units the tops, or terminal ends, of the units were located nearest the reactor screen. The terminal ends of the units were located approximately 1/2 inch from the reactor screen during these two bursts.

The following table gives the voltages across terminals 1 and 3 obtained 20 seconds before SPR burst (initial) and 10 minutes after SPR burst (final). The radiation doses are given with respect to the geometric center of the units.

Burst No.	Dose Per Burst (NVT, E $\geq$ 0.01 MEV)	Total Dose (NVT, E $\geq$ 0.01 MEV)	Initial Voltage (Volts) For Unit No. #4	#5	#7	Final Voltage (Volts) For Unit No. #4	#5	#7
1	3.1×10^{12}	3.1×10^{12}	7.7	7.5	6.9	7.8	7.5	7.0
2	9.0×10^{12}	12.1×10^{12}	7.8	7.3	7.0	7.8	7.3	7.0
3	9.1×10^{12}	21.2×10^{12}	7.8	7.8	6.6	7.8	7.8	6.6
4	9.0×10^{12}	3.02×10^{13}	7.8	7.5	7.1	7.8	7.5	7.1

The following table gives the voltages between terminals 1 and 2 of Unit No. 5 during the first phase of testing.

Burst No.	Dose Per Burst (NVT, E $\geq$ 0.01 MEV)	Total Dose (NVT, E $\geq$ 0.01 MEV)	Initial Voltage (Volts)	Final Voltage (Volts)
1	3.1×10^{12}	3.1×10^{12}	2.6	2.6
2	9.0×10^{12}	12.1×10^{12}	2.7	2.7
3	9.1×10^{12}	21.2×10^{12}	2.9	2.9
4	9.0×10^{12}	30.2×10^{12}	2.8	2.8

During the second phase of testing units Serial No. 4, 8 and 10 were subjected to five radiation bursts. Unit No. 4 was thus subjected to a total of nine bursts during the two days of testing. During this second phase of

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operations the units were positioned with the axis of the cylinders parallel to the reactor centerline. During the first burst of Phase 2, the distance from the centerline of the units to the reactor screen was 5.5 inches. Before the second burst this distance was decreased to 1.75 inches. All further tests were performed at this distance. Between the second and third bursts of this phase of testing the units were rotated through 180 degrees about their cylindrical axes.

The following table gives the voltages across terminals 1 and 3 twenty seconds before (initial) and 10 minutes after (final) SPR burst for Phase 2 of the test. The radiation doses are given with respect to the cylindrical axes of the units.

Burst No.	Dose Per Burst (NVT, E $\geq$ 0.01 MEV)	Total Dose (NVT, E $\geq$ 0.01 MEV) #4	Total Dose (NVT, E $\geq$ 0.01 MEV) #8 & #10	Initial Voltage (Volts) For Unit No. #4	Initial Voltage (Volts) For Unit No. #8	Initial Voltage (Volts) For Unit No. #10	Final Voltage (Volts) For Unit No. #4	Final Voltage (Volts) For Unit No. #8	Final Voltage (Volts) For Unit No. #10
1	3.8×10^{12}	3.40×10^{13}	3.8×10^{12}	8.1	7.5	7.5	8.2	7.5	7.5
2	9.6×10^{12}	4.26×10^{13}	13.4×10^{12}	8.1	7.5	7.8	8.2	7.6	7.8
3	8.9×10^{12}	5.25×10^{13}	22.3×10^{12}	8.2	7.2	7.5	8.3	7.2	7.5
4	8.4×10^{12}	6.09×10^{13}	30.7×10^{12}	8.2	7.2	7.7	8.3	7.2	7.7
5	8.9×10^{12}	6.98×10^{13}	39.6×10^{12}	8.1	7.1	7.5	8.3	7.2	7.5

The following table gives the voltages between terminals 1 and 2 of unit No. 10 during the second phase of testing. The values given were again read 20 seconds before burst and 10 minutes after burst.

Burst No.	Dose Per Burst (NVT, E $\geq$ 0.01 MEV)	Total Dose (NVT, E $\geq$ 0.01 MEV)	Initial Voltage (Volts)	Final Voltage (Volts)
1	3.8×10^{12}	3.8×10^{12}	2.8	2.8
2	9.6×10^{12}	13.4×10^{12}	2.9	2.9
3	8.9×10^{12}	22.3×10^{12}	2.8	2.8
4	8.4×10^{12}	30.7×10^{12}	2.8	2.8
5	8.9×10^{12}	39.6×10^{12}	2.8	2.8

There were no abrupt voltage changes at any time during the radiation tests. The values given in the above tables are representative of the voltage output of the five units during the entire test period. At no time did the voltages between terminals 1 and 3 and 1 and 2 drop below the 4.5 volt and 1.25 volt

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levels (respectively) specified in the test request.

B. L. SCHMIDEMAN - 7332-3

S. D. MEYER - 7332-3

BLS:7332-3:bv

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