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Radiation to Personnel from Activities Induced in Tank Armor for Enhanced-Radiation and Fission Nuclear Weapons

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RADIATION TO PERSONNEL FROM ACTIVITIES INDUCED IN TANK ARMOR FOR ENHANCED-RADIATION AND FISSION NUCLEAR WEAPONS

by

H. A. Sandmeier and M. E. Battat

ABSTRACT

On the nuclear battlefield, the armored-force commander must know the possible hazard to personnel who replace original crews that have been incapacitated by the very short initial prompt dose from neutrons and neutron induced gamma rays. After the initial prompt dose, the initial prompt neutrons will activate the chrome-nickel steel armor of the tank at $t = 0^+$, and the neutron-activated steel will have a time-dependent emission rate of gamma rays that will impinge on the tank crew. We evaluate this time-dependent dose on the replacement crew from induced activity for both a pure 1-kt fusion and a 1-kt fission nuclear weapon.

I. INTRODUCTION

Assuming a height of burst (HOB) of 200 m, we calculate the time-dependent activation dose rate and integral dose for a person inside a tank for the time $t = 0^+$ to 1000 h and time t = 1 to 1000 h. At time $t = 0^+$, the very short initial prompt neutron burst will impinge on the tank with an assumed chrome-nickel (Cr-Ni) steel thickness of 15 cm (6 in.). The crew will receive the prompt initial dose from neutrons and neutron induced gamma rays. In a previous report,¹ we showed that for a 1-kt burst at a 200-m HOB, a 16 000-rad free-field radiation dose to man occurs at 810-, 710-, and 440-m ground range for pure fusion, 50/50, and pure fission weapons. A free-field radiation dose of 16 000 rads produces about 8000 rads inside the tank, which means immediate incapacitation of the crew. The prompt initial

neutrons will activate the steel armor of the tank at $t = 0^+$ and the neutron-activated steel will have a time-dependent emission rate of gamma rays with varying energy that will impinge on the tank crew.

This report, more detailed than previous accounts of all radioactive isotopes in the tank armor, was made possible because additional and more detailed gamma production data are now available at Los Alamos.

To obtain the dose rates and quantities described here, several steps (11 through V) in our calculations are required.

The prompt initial gamma source from the weapon is negligible and is not considered here; that is, we consider only neutron induced gamma rays in the tank armor, which are subsequently transported to the tank crew, and the dose to the crew is evaluated. The prompt neutron dose inside and outside the armor is also obtained.

II. PROMPT NEUTRON FLUX IN TANK ARMOR FROM A 1-kt FUSION AND FISSION SOURCE

The neutron transport calculations were done assuming spherical geometry. The use of two- and threedimensional discrete-ordinates and/or Monte Carlo calculations cannot be justified at this stage of the investigation.

The spherical geometry specifications were

0-1.50 m Air

1.50-1.65 m Cr-Ni steel

1.65-200 m Air.

The source, either 1-kt, 14-MeV, D-T fusion, or fission,¹ was contained in a thin shell at a 200-m radius. The neutron source from these devices was

 1.48×10^{24} neutrons (D-T fusion)

or

 0.25×10^{24} neutrons (fission spectrum),

corresponding to 1-kt nuclear devices. As mentioned before, the prompt gamma source can be neglected.

The armor used was a typical Cr-Ni steel with a density of 7.87 g/cm³.

The neutron and subsequent gamma transport calculations were performed using the discrete-ordinates finiteelement ONETRAN code.² A coupled set of multigroup cross sections, 30 neutrons and 12 gamma-ray groups,³ generated at Los Alamos, was used in the calculations. From the results of the ONETRAN problems (fusion and fission source), we obtained the spatial and energy distribution of the neutron flux in the steel shell.

In Table 1, we list the prompt neutron and neutron induced gamma dose at the *outside* of the steel armor shell from a 1-kt fusion source.

Prompt neutron dose at outside of armor 1.36×10^6 rad Neutron induced gamma dose at outside 0.18×10^6 rad of armor

Total dose at *outside* of armor from 1.54×10^6 rad 1-kt fusion source

As a comparison, we obtain from Ref. 4 the same quantity. Here, an air/ground two-dimensional geometry was assumed.

Total air-over-ground dose 2.10×10^6 rad

In Table II, we list the prompt neutron and neutron induced gamma dose at the *center* of the steel armor shell from a 1-kt fusion source. Prompt neutron dose at center of armor 6.78×10^5 rad Neutron induced gamma dose at center 0.52×10^5 rad of armor

Total dose at *center* of armor from 7.30×10^5 rad 1-kt fusion source

The ratio $(1.54 \times 10^6)/(7.30 \times 10^5) = 2.054$ is the effectiveness of 15-cm (6-in.) tank armor to reduce the prompt fusion dose inside the tank; that is, the prompt outside dose has to be multiplied by 1/2.054 = 0.487 to obtain the dose *inside* the armor.

In Table III, we list the prompt neutron and neutron induced gamma dose at the *outside* of the steel armor shell from a 1-kt fission source.

Prompt neutron dose at outside of armor 1.40×10^{5} rad Neutron induced gamma dose at outside 0.01×10^{5} rad of armor

Total dose at *outside* of armor from 1.41×10^5 rad 1-kt fission source

As a comparison, we obtain from Ref. 4 the same quantity. Here an air/ground two-dimensional geometry was assumed.

Total air-over-ground dose 1.90×10^5 rad

In Table 1V, we list the prompt neutron and neutron induced gamma dose at the *center* of the steel armor shell from a 1-kt fission source.

Prompt neutron dose at center of armor 8.20×10^4 rad Neutron induced gamma dose at center 0.26×10^4 rad of armor

Total dose at *center* of armor 8.46×10^4 rad from 1-kt fission source

The ratio $(1.41 \times 10^5)/(8.46 \times 10^4) = 1.67$ is the effectiveness of 15-cm (6-in.) tank armor to reduce the prompt fission dose *inside* the tank; that is, the *outside* dose has to be multiplied by 1/1.67 = 0.60 to obtain the dose *inside* the armor.

III. NEUTRON ACTIVATION OF TANK ARMOR FROM PROMPT NEUTRONS

The neutron flux in the armor itself in different armor shell regions is multiplied by the relevant neutron gamma-activation cross section, which produces gamma

Group	Flux ONETRAN Outside Armor (1-kt Fusion)	Dose Conv. Factor Neutron and Gamma NWEF 1102 (Ref. 3)	Rad Tissue Flux x Dose Factor (rad)
1	0	5.8(-9)	0
2	1.1(14)	5.7(-9)	6.1(5)
3	3.0(13)	5.6(-9)	1.7(5)
4	1.4(13)	5.4(-9)	7 6(4)
5	8.4(12)	5.1(-9)	4.3(4)
6	1.5(13)	4.8(-9)	7.2(4)
7	2.8(13)	4.3(-9)	1.2(5)
8	1.7(13)	3 6(-9)	6 1 (4)
9	17(13)	3.2(-9)	5 A(A)
10	13(13)	3.0(-9)	3.9(4)
11	1.1(13)	2.0(-9)	3.9(4)
12	1.1(13) 1.7(13)	2.9(-9)	5.2(4)
12	1.7(13)	2.0(-9)	4.4(4)
13	1.3(13) 9.1(12)	1.6(-9)	2.3(4)
14	6.1(12)	1.4(-9)	1.1(4)
15	4.9(12)	1.1(-9)	5.4(3)
10	0.4(12)	7.3(-10)	4.7(3)
17	3.3(12)	3.6(-10)	1.2(3)
18	2.0(12)	1.5(-10)	3.0(2)
19	1.4(12)	0.9(-10)	1.3(2)
20	9.8(11)	0	0
21	7.0(11)	0	0
22	5.2(11)	0	0
23	4.0(11)	0	0
24	3.1(11)	0	0
25	2.3(11)	0	0
26	1.7(11)	0	0
27	1.2(11)	0	0
28	7.8(10)	0	0
29	4.7(10)	0	0
30	3.3(10)	0	0
			1.36(6) neutron dose
31	3.8(10)	2.3(-9)	8.7(1)
32	1.2(12)	2.1(-9)	2,5(3)
33	9.2(12)	2.0(-9)	1.8(4)
34	1.3(13)	1.7(-9)	2.2(4)
35	8.9(12)	1.6(-9)	1.4(4)
36	1.1(13)	1.4(-9)	1.5(4)
37	1.2(13)	1.2(-9)	1,4(4)
38	1.7(13)	9.2(-10)	1,6(4)
39	1.2(13)	6.7(-10)	8.0(3)
40	1.9(13)	3.8(-10)	7.2(3)
41	4.2(13)	1.5(-10)	6.3(3)
42	1.2(13)	0.7(-10)	8.4(2)
	()		0.18(6) gamma dose

TABLE I. Prompt Neutron and Neutron Induced Gamma Dose at Outside of Armor from 1-kt D-T Fusion (ONETRAN Calculation)

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	Center Armor	Neutron and Gamma	Flux x Dose Factor
Group	(1-kt Fusion)	NWEF 1102 (Ref. 3)	(rad)
t	0	5.8(-9)	0
2	1.4(13)	5.7(-9)	8.04(4)
- 	5.0(12)	5.6(-9)	2.8(4)
4	2.0(12)	5.6(-9)	1 2(4)
5	1.6(12)	5.1(-9)	8 2(3)
6	2.1(12)	<i>A</i> 8(_9)	1.0(4)
7	$A_{5(12)}$	4.3(-9)	1.0(4)
8	3.9(12)	3 6(-9)	1.5(4)
0	5.9(12)	3.2(-9)	1.4(4)
10	7.7(12)	3.2(-9)	2 3(A)
11	9.6(12)	3.0(-9)	2.3(4)
12	2.3(12)	2.5(-9)	2.0(4) 9.6(4)
12	5.9(13)	1.9(-9)	1.0(5)
13	5.6(1 <i>5)</i> 9.7(12)	1.0(-9)	1.0(5)
14	0.7(13)	1:4(-9)	1.2(3)
15	2.3(13)	1.1(-9)	2.0(4)
10	9.8(13)	7.3(-10)	7.2(4)
17	7.6(13)	3.0(-10)	2.7(4)
18	1.4(13)	1.5(-10)	2.1(3)
19	1.3(13)	0.9(-10)	1.2(3)
20	8.7(12)	0	0
21	4.8(12)	0	0
22	3.6(12)	0	0
23	2.9(12)	0	0
24	2.3(12)	0	0
25	1.7(12)	0	0
26	1.1(12)	0	0
27	5.9(11)	0	0
28	2.5(11)	0	0
29	7.9(10)	0	0
30	1.4(10)	0	0
			6.78(5) neutron dose
31	2.8(11)	2.3(-9)	6.4(2)
32	4.9(11)	2.1(-9)	1.0(3)
33	1.7(12)	2.0(-9)	3.4(3)
34	1.6(12)	1.7(-9)	2.7(3)
35	1.8(12)	1.6(-9)	2.9(3)
36	2.4(12)	1.4(-9)	3.4(3)
37	4.2(12)	1.2(-9)	5.0(3)
38	6.3(12)	9.2(-10)	5.8(3)
39	1.3(13)	6.7(-10)	8.7(3)
40	3.0(13)	3.8(-10)	1.1(4)
41	5.1(13)	1.5(-10)	7.7(3)
42	5.2(11)	0.7(-10)	3.6(1)

TABLE II.	Prompt	Neutron	and	Neutron	Induced	Gamma	Dose	at C	Center o	of Arr	nor
	from 1-k	t D-T Fu	sion	(ONETR	AN Calc	ulation)					

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Total neutron + gamma dose = 7.30(5) rad prompt dose center of armor

Group	Flux ONETRAN Outside Armor (1-kt Fission)	Dose Conv. Factor Neutron and Gamma NWEF 1102 (Ref. 3)	Rad Tissue Flux x Dose Factor (rad)
1	5.6(8)	5.8(-9)	3.2(0)
2	1.6(9)	5.7(–9)	9.1(0)
3	5.0(9)	5.6(-9)	2.8(1)
4	2.6(10)	5.4(–9)	1.4(2)
5	1.5(11)	5.1(-9)	7.7(2)
6	5.0(11)	4.8(-9)	2.4(3)
7	2.6(12)	4.3(-9)	1.1(4)
8	2.7(12)	3.6(-9)	9.7(3)
9	4.3(12)	3.2(-9)	1.4(4)
10	4.6(12)	3.0(-9)	1.4(4)
11	5.0(12)	2.9(-9)	1.5(4)
12	1.1(13)	2.6(-9)	2.9(4)
13	1.1(13)	1.8(-9)	2.0(4)
14	6.8(12)	1.4(-9)	9.5(3)
15	5.1(12)	1.1(-9)	5.6(3)
16	6.6(12)	7.3(-10)	4.8(3)
17	4.1(12)	3.6(-10)	1.5(3)
18	2.8(12)	1.5(-10)	4.2(2)
19	2.1(12)	0.9(-10)	1.9(2)
20	1.5(12)	0	>(_)
21	1.1(12)	0	ů N
22	8 7(11)	õ	0
22	6.7(11)	0	0
23	5 2(11)	0	0
27	3.2(11)	ů O	0
25	2.9(11)	0	0
20	2.5(11) 2.1(11)	0	0
29	$\frac{2.1(11)}{1.4(11)}$	0	0
20	9.2(10)	0	0
20	5.2(10)	0	0
30	5.9(10)	U	1 40(5) neutron dose
21	2 0/0)	22(0)	£ 0/0)
22	3.U(Y)	2.3(-7) 2.1(-0)	0.9(0)
34 33	1.7(9)	2.1(-y) 2.0(-0)	3.0(0)
33	1.5(10)	2.U(-Y)	3.0(1)
34	2.3(10)	1.7(-9)	3.9(1)
35	3.9(12)	1.6(-9)	6.2(1)
36	3.1(10)	I.4(-9)	4.3(1)
37	2.7(10)	1.2(-9)	3.2(1)
38	2.0(11)	9.2(-10)	1.8(2)
39	1.3(11)	6.7(-10)	8.7(1)
40	2.3(11)	3.8(-10)	8.7(1)
41	3.5(11)	1.5(-10)	5.3(1)
42	6.9(10)	0.7(-10)	4.8(0)

 TABLE III. Prompt Neutron and Neutron Induced Gamma Dose at Outside of Armor from 1-kt Fission (ONETRAN Calculation)

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_	Flux ONETRAN Center Armor	Dose Conv. Factor Neutron and Gamma	Rad Tissue Flux x Dose Factor
Group	(1-kt Fission)	NWEF 1102 (Ref. 3)	(rad)
	7 6(7)	5 9(0)	
1	7.5(7)	5.8(-9)	4.4(-1)
2	2.1(8)	5.7(-9)	1.2(0)
3	6.8(8)	5.6(-9)	3.8(0)
4	3.2(9)	5.4(-9)	1.7(1)
5	1.6(10)	5.1(-9)	8.2(1)
6	4.5(10)	4.8(-9)	2.2(2)
7	2.0(11)	4.3(-9)	8.6(2)
8	2.5(11)	3.6(-9)	9.0(2)
9	5.4(11)	3.2(-9)	1.7(3)
10	7.9(11)	3.0(-9)	2.4(3)
11	1.1(12)	2.9(-9)	3.2(3)
12	4.6(12)	2.6(-9)	1.2(4)
13	9.2(12)	1.8(-9)	1.7(4)
14	1.4(13)	1.4(-9)	2.0(4)
15	4.3(12)	1.1(-9)	4.7(3)
16	1.9(13)	7.3(-10)	1.4(4)
17	1.5(13)	3.6(-10)	5.4(3)
18	3.4(12)	1.5(-10)	5.1(2)
19	3.2(12)	0.9(-10)	2.9(2)
20	2.3(12)	0	0
21	1.3(12)	0	0
22	1.0(12)	0	0
23	9.1(11)	0	0
24	7.7(11)	0	0
25	5.8(11)	0	0
26	3.9(11)	0	0
27	2.2(11)	0	0
28	9.5(10)	0	0
29	3.1(10)	0	0
30	5.3(9)	0	0
			8.20(4) neutron dose
31	2.5(10)	2.3(-9)	5.8(1)
32	3.0(10)	2.1(-9)	6.3(1)
33	2.3(11)	2.0(-9)	4.6(2)
34	7.1(10)	1.7(-9)	1.2(2)
35	7.8(10)	1.6(-9)	1.2(2)
36	9.6(10)	1.4(-9)	1.3(2)
37	1.4(11)	1.2(-9)	1.7(2)
38	2.0(11)	9.2(-10)	1.8(2)
39	3.4(11)	6.7(-10)	2.3(2)
40	1.7(12)	3.8(-10)	6.5(2)
41	2.8(11)	1.5(-10)	4.2(2)
42	3.2(10)	0.7(-10)	2.2(0)
	• •	• •	

 TABLE IV. Prompt Neutron and Neutron Induced Gamma Dose at Center of Armor from 1-kt Fission (ONETRAN Calculation)

rays. The neutron activation cross sections and gammaray data used in this study were extracted from the GAMMON Activation Library.⁵ In our calculations, we considered a total of 60 reactions listed in Table V. As an example, the first entry lists cross-section data for the neutron activation reaction

 ${}^{28}\text{Si}_{14}(n,p) {}^{28}\text{Al}_{13}$.

Aluminum-28 will decay with 1.7788-MeV gamma/ disintegration and a half-life $T_{1/2}$ of 2.24 min. The 30 neutron activation cross sections (in barns) are listed first, followed by 12 gamma yields per 100 disintegrations. For the decay of ²⁸Al, we get 100 gamma rays per 100 disintegrations in gamma group 9 (1-2 MeV).

In a previous steel activation analysis,⁶ we considered only seven reactions:

 ${}^{56}Fe_{26} (n,p) \, {}^{56}Mn_{25} \\ {}^{58}Fe_{26} (n,\gamma) \, {}^{59}Fe_{26} \\ {}^{58}Ni_{28} (n,p) \, {}^{58}Co_{27} \\ {}^{98}Mo_{42} (n,\gamma) \, {}^{99}Mo_{42} \\ {}^{63}Cu_{29} (n,\gamma) \, {}^{64}Cu_{29} \\ {}^{55}Mn_{25} (n,\gamma) \, {}^{56}Mn_{25} \\ {}^{50}Cr_{24} (n,\gamma) \, {}^{51}Cr_{24} \end{array}$

More is not necessarily better, but we used the newest additional, more updated, detailed gamma production data in the GAMMON Activation Library.⁵ All the activation analyses in Ref. 6 were done by hand computer. Here, we have 60 reactions to consider and the handling of such a large amount of data must be done on a full-scale computer.

The general expression for the activity $A_o(dis/cm^3 \cdot s)$ induced in a material containing N atoms/cm³, with activation cross section σ_{act} , and exposed to a flux of ϕ neutrons/cm² · s, is

 $A_{o} = \lambda n = \sigma_{act} N \phi (1 - e^{-\lambda t}) , \qquad (1)$

where

If σ_{act} is in barns, N is in units of atoms/barn·cm. For a neutron burst, $t \ll T_{1/2}$, and the expression reduces to

$$A_{o} = \lambda \sigma_{act} N(\phi t) . \qquad (2)$$

In general, at time T after the burst, the activity is

$$A_{o} = \lambda \sigma_{act} N(\phi t) e^{-\lambda T} , \qquad (3)$$

with (ϕt) equal to the neutron fluence. Of course, to obtain the total activity, Eqs. (2) and (3) must be summed over the fluxes in the 30 neutron groups and over the number of reactions specified in the calculations.

To give an indication of the activities induced in the steel armor, we tabulated A_o in Tables VI (fusion) and VII (fission). The data shown are for the *outermost* mesh point in the armor steel and at a time immediately after the burst ($t = 0^+$ explosion time).

In addition to the neutron activation cross sections supplied, it was also necessary to supply spectral data (photons/dis) in each of the 12 photon groups and for each reaction. These data, together with the calculated activities, provided the source terms for the gamma-ray transport calculations.

In the fusion neutron problem, Table VI, some of the more important reactions leading to decay half-lives $(T_{1/2})$ of a *few minutes* are

$${}^{28}\text{Si}_{14} (n,p) \, {}^{28}\text{Al}_{13} \\ {}^{52}\text{Cr}_{24} (n,p) \, {}^{52}\text{V}_{23} \\ {}^{53}\text{Cr}_{24} (n,p) \, {}^{53}\text{V}_{23} \\ {}^{63}\text{Cu}_{29} (n,2n) \, {}^{62}\text{Cu}_{29} \\ {}^{100}\text{Mo}_{42} (n,\gamma) \, {}^{101}\text{Mo}_{42} \\ {}^{51}\text{V}_{23} (n,\gamma) \, {}^{52}\text{V}_{23} \\ {}^{51}\text{V}_{23} (n,p) \, {}^{51}\text{Ti}_{22} \\ \end{array}$$

However, the dominant activity for times one hour after the burst was the ${}^{56}Fe_{26}$ (n,p) ${}^{56}Mn_{25}$ reaction with a halflife of 2.58 h.

In the case of fission, Table VII, the important shortlived products are

$${}^{28}Si_{14} (n,p) \, {}^{28}Al_{13} \\ {}^{52}Cr_{24} (n,p) \, {}^{52}V_{23} \\ .\\ {}^{100}Mo_{42} (n,\gamma) \, {}^{101}Mo_{42} \\ .\\ {}^{51}V_{23} (n,\gamma) \, {}^{52}V_{23}$$

As in the D-T fusion case, the dominant long-lived activity was the 2.58-h $^{56}Mn_{25}$ produced by the $^{55}Mn_{25}$ (n, γ) reaction.

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26		0.00000 0	0.00000	0.0	00000 0		0.00000	0.00000	0.00000		
28	CR	50 (N G)		92.(51	27 71	9.90000	BNI - 325	03137		24502	0
29	0	00 (11)	CR	51	. 80E - (77	.00500			24002	Ŭ
30		15853E-02	. 15853E-	02	. 17308E	-02 .19	945E-02 .	23653E-02	. 27654E-02		
31		33741E-02	. 40340E -	02	.44349E	02 .48	650E - 02	52696E-02	.59828E-02		
32		81105E-02	. 10594E -	01	. 13084E	-01 .16	517E-01 .	24989E-01	.62318E-01		
34		87181F+00	364216+	00	81546F		541F+02	439282+00	12512F+02		
35		0.00000 (0.00000	ŏ.	00000 0	0.00000	0.00000	0.00000	0.00000		
36		0.00000	0.00000	ō.(00000	9.80000	0.00000				
37	CR	50 (N.P)	v	50	4. E	16 Y	THRESH	1.32273		24503	0
38		222205400	V 2442654	50	. 10E - ()9	. 12000	222405400	250265400		
40		14481E+00	.50693E-	01	.94877E	-02 .14	344E-02	20813E-03	.12151E-04		
41	0.		0.		0.	0.	0.	0	•		
42	0	. (0.	0	0.	ο.	0.	. 0	•		
43	0.		0.	~	0.	0.	0.				
45				30.0			0.00000	0.00000	0.00000		
46	CR	50 (N.T)	v	48	15.98	D	THRESH	2.91406		24507	ο
47			v	48	. 20E - 0	38	. 14700				
48	_ •	27300E-06	. 27300E -	06	. 25697E	-09 0.	0.	. 0	·.		
49	0.		0.	9	0.	0.	0.	. 0			
50 5 t	0. 0		0.		0.	0.	0.	. 0	•		
52	ŏ		0. 0.	ò	0. 0.	0. 0.	Ő.	. o	•		
53		0.00000	0.00000	0.0	00000 (0.00000	0.00000	0.00000	0.00000		
54	~~	2.50000 9	8.12000 2	07.3	20000 0	0.00000	0.00000				~
35 56	CR	52 (N.2N		51	27.71	ט דר	BNL - 325	.03137		24521	0
57		25776E+00	.25776E+	00	.59696F	01 0.	00000.	. 0) .		
58	0		0.	. (0.	0 .	Ő.	. õ	۱.		
59	0	. (0.		Ο.	Ο.	0.	. о).		
60 64	õ	. (0.	9	0.	0.	0	. 0			
62	U	0.00000	0.00000	0	0.		0.0000	. 0,0000	0.00000		
63		0.00000	0.00000	ō.	00000	9.80000	0.00000	0.00000	5.00000		
64	CR	52 (N,P)	v	52	3.76	M	BNL - 325	1.44694		24523	0

TABLE V. Activation Data: 30 Neutron Groups, 12 Gamma Groups (60 Reactions)

TABLE V. (cont)

65			v	52	. 35E	-06 DK	. 73300				
66		98305E-01	. 11280E+	00	. 12172	E+00 .11	B57E+00 .	99731E-01 .	833856-01		
67		44744E-01	. 37594E -	02	0.	0.	0.	0.			
68	0.				0.	0.	0.	0.			
70	0.				0.	0.	0.	0.			
71	0.	0.00000 0	. 00000	ο.	00000	0.00000	0.00000	0.00000	0.00000		
72		0.00000 100	.92000	Ο.	00000	.04000	0.00000				
73	CR	52 (N.T)	V	50	4.	E+16 Y	THRESH	1.32273	245	527	0
74			V	50	. 10E	-09	. 12000	_			
75		13500E-07	. 13500E-	07	. 12707	E-10 0.	0.	0.			
70	0.	0	•		0.	0.	0.	0.			
78	0.				0.	0.	0.	0.			
79	ŏ.	õ).		0 .	Ö.	0.	0. 0.			
80	-	0.00000 0	.00000	Ο.	00000	0.00000	0.00000	0.00000	0.00000		
81		0.00000 70	.00000	30.	00000	0.00000	0.00000				
82	CR	53 (N.P)	V	53	1.55	M	THRESH	1.03990	245	533	0
83			V	53	. 30E	-05	1.00000	ar7705 04			
84 05	•	35300E-01	- 55JUUE-		. 23481	E-01 .49	2916-01 .	J5//0E-01 .	192955-01		
86	0	272930-02		00	0.	0.	0.	0.			
87	ŏ.	ŏ).		ŏ.	ö.	0.	0. 0.			
88	Ō.	Ō).		ō.	0 .	0.	Ō.			
89		0.00000 0	.00000	Ο.	00000	0.00000	0.00000	0.00000	0.00000		
90		0.00000 100	.00000	<u>o</u> .	00000	.76000	0.00000				_
91	CR	53 (N,NP+		52	3.76	M	THRESH	1.44694	245	535	0
92		116005-01	116005-	52	. 356	-06 UK	7065-01 0	0			
93	۰. ۱	230906-01	.230906-	01	0	0	/902-02 0.	0.			
95	ŏ.).		0.	0.	0. 0.	0.			
96	ŏ.	. č).		ŏ.	ō.	ō.	Ö.			
97	ο.	0).		ο.	ο.	ο.	0.			
98		0.00000 0	. 00000	Ο.	00000	0.00000	0.00000	0.00000	0.00000		
99		0.00000 100	. 92000	_0.	.00000	.04000	0.00000				_
100	CR	54 (N,P)	v	54	43.	5	THRESH	4.04000	245	543	0
101		26400F-01	26400E-	01	22076	-05 F-01 13	0605-01	28205F-02	11356F-04		
103	o.			· ·	0.	0.	0.000	0.			
104	Ō.	. Ō).		ō.	ο.	0.	0.			
105	Ο.	. 0).		ο.	Ο.	0.	0.			
106	0.	C).	_	0.	0.	0.	0.			
107		0.00000 0	0.00000	0.	.00000	0.00000	0.00000	0.00000	0.00000		
108	20	54 (N A)	.00000 2	54	5 75	0.00000		35055	245	544	0
110	C.R.	54 (11.47	ŤĨ	51	. 30E	-05	. 62000		2-1		v
111		13400E-01	. 13400E -	01	. 99420	E-02 .46	448E-02	13702E-02	12119E-03		
112		22318E-07 C).		Ο.	Ο.	Ο.	0.			
113	ο.	. C).		ο.	Ο.	0.	0.			
114	<u>o</u> .	. 0	2.		0.	0.	0.	0.			
115	0.		, , , , , , , , , , , , , , , , , , , ,	~	0.	0.	0.00000	0.00000	0.0000		
110				е	50000	95 00000	0.00000	0.00000	0.00000		
118	CR	54 (N.NP+	·D) V	53	t.55	M	THRESH	1.03990	245	545	0
119	••••	• • • • • • • •	v	53	. 305	-05	1.00000				-
120		10700E-01	. 10700E -	01	.21774	E-02 .22	380E-05 O.	0.			
121	Ο.	. c).		ο.	0.	Ο.	0.			
122	0.	. 0).		0.	0.	0.	Q.			
123 124	0.	. C	<i>.</i>		0.	υ.	0.	0.	•		
124	0.			0		0.0000	0.00000	0.00000	0 00000		
126		0.00000 100	. 00000	ŏ	.00000	.76000	0.00000	0.00000			
127	CR	54 (N,T)	v	52	3.76	M	THRESH	1.44694	245	547	ο
128			v	52	. 35E	-06 DK	.73300				

0	. 30200E - 05 . 30	200E-05 . 28427E-0	BO. 0	. 0		
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ŏ	, 0.	0.	0. 0	. 0	•	
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•	0.00000 0.00	000 0.0000 0.0	$\overline{0000}$ $\overline{00000}$	່ ດຸດດດດດັ້	0,00000	
	0.00000 100.92	2000 0.00000	04000 0.00000	0.00000	0.00000	
MN	55 (N.2N)	MN 54 312.5	D ENDF/8-1	V .83463	25551	0
		MN 54 . 10E-08	.00560		2000	v
	. 10119E+01 .78	739E+00 .60043E+00	0 . 14427E+00 0	. 0	_	
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	0.00000 0.00	000 0.00000 0.0	00000 0.00000	0.00000	0.00000	
	0.00000 0.00	000 99.97800 0.0	0.0000 0.0000			
MN	55 (N.G)	MN 56 2.580	H ENDF/B-I	V 1.78233	25552	0
		MN 56 .20E-07	. 80000			
	80849E-03 .80	849E-03 .68550E-0	3 .62693E-O3	. 63560E-03	. 77787E-03	
	10679E-02 .14	765E-02 . 17219E-02	2 .19222E-02	. 22466E-02	. 27200E - 02	
	.35732E-02 .51	1290-02 .853420-02	2 .16589E-01	. 37149E-01	. 77543E -01	
	46565E-01 .23	992E+00 . 15057E+0	1.85957E+01	. 41068E+00	. 4 1358E+00	
	.59598E+00 .93	949E+00 . 15235E+0	1.24969E+01	.40992E+01	. 10546E+02	
	0.00000 0.00	000 0.00000 0.0	0.0000 0.0000	0.00000	. 28000	
	7.96000 30.00	000 99.00000 0.0	0.0000 0.00000			
MN	55 (N.P)	CR 55 3.55	M ENDF/B-I	V .00078	25553	0
		CR 55 .30E-05	1.00000			
•	46797E=01 .46	797E-01 .43009E-0	1.32202E-01	.27197E-01	.23476E-01	
_ •	70980E-02 .42	308E-04 .35006E-05	5 .73924E-06 O	. 0.	•	
0.	0.	0.	0. 0	. 0.		
0.	· O.	0.	0. 0	. 0	•	
υ.	0.	0.	0. 0	. 0.		
	0.00000 0.00	000 0.00000 0.0	0.0000	0.00000	0.00000	
	.00430 .04	450 0.00000 .0	0.00000			_
MIN	55 (N,A)	V 52 3.76	M ENDF/B-IN	V 1,44694	25554	0
	221105-01 22	V 52 .35E-06	UK .73300		0.47.4FF 00	
•	925925-04 44	501E-0E REDECT OF	1 .18/10E-01	.93591E-02	24/45E-02	
•	32393E-04 .11	0925-02 .829265-06	. 59824E-06	.41028E-06	20224E-06	
۰. ۱	240572-07 0.	0.	0. 0.	. 0.	•	
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	0.00000 0.00	000 0.00000 0.0	0. 0. 00000 0.00000	0.00000	0.00000	
FF	0.00000 0.00 0.00000 100.92 54 (N P)	000 0.00000 0.0 000 0.00000 .0 MN 54 312 5	0. 0. 00000 0.00000 04000 0.00000	0.00000	0.00000	0
FE	0.00000 0.00 0.00000 100.92 54 (N,P)	000 0.00000 0.0 000 0.00000 .0 MN 54 312.5 MN 54 10E-08	0. 0. 00000 0.00000 04000 0.00000 D ENDF/B-IV 00560	0.00000 0.00000 0.83463	0.00000 26543	0
FE	0.00000 0.00 0.00000 100.92 54 (N,P) 22218E+00 .35	000 0.00000 0.0 000 0.00000 .0 MN 54 312.5 MN 54 .10E-08 093E+00 .43889E+00	0. 0. 00000 0.00000 04000 0.00000 D ENDF/B-11 .00560 0.52870F+00	0,00000 0,00000 / ,83463	0.00000 26543 56664E+00	0
FE	0.00000 0.00 0.00000 100.92 54 (N,P) 22218E+00 .35 38437E+00 .17	000 0.00000 0.0 000 0.00000 .0 MN 54 312.5 MN 54 .10E-08 093E+00 .43889E+00 781E+00 .75476E-01	0. 0 00000 0.00000 04000 0.00000 D ENDF/B-11 .00560 0.52870E+00 1.14297E-01	. 0.00000 . 83463 .58200E+00 .12518E-02	0.00000 26543 56664E+00 64341E-05	0
FE 0.	0.00000 0.00 0.00000 100.92 54 (N,P) 22218E+00 .35 38437E+00 .17 0.	000 0.00000 0.0 000 0.00000 .0 MN 54 312.5 MN 54 .10E-08 093E+00 .43889E+00 781E+00 .75476E-01 0.	0. 0 00000 0.00000 04000 0.00000 D ENDF/B-11 .00560 0.52870E+00 1.14297E-01 0. 0	. 0.00000 0.00000 0 .83463 .58200E+00 .12518E-02 . 0	0.00000 26543 56664E+00 64341E-05	0
FE 0. 0.	0.00000 0.00 0.00000 100.92 54 (N,P) 22218E+00 .35 38437E+00 .17 0.	000 0.00000 0.0 000 0.00000 .0 MN 54 312.5 MN 54 .10E-08 093E+00 .43889E+00 781E+00 .75476E-01 0. 0.	0. 0.00000 04000 0.00000 D ENDF/B-11 .00560 0.52870E+00 1.14297E-01 0. 0	0.00000 0.83463 .58200E+00 .12518E-02	0.00000 26543 56664E+00 64341E-05	o
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FE 0. 0.	0.00000 0.00 0.00000 100.92 54 (N,P) 22218E+00 .35 38437E+00 .17 0. 0. 0. 0.00000 0.00	000 0.00000 0.0 000 0.00000 .0 MN 54 312.5 MN 54 .10E-08 093E+00 .43889E+00 781E+00 .75476E-01 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	0. 0 00000 0.00000 04000 0.00000 D ENDF/B-11 .00560 0.52870E+00 1.14297E-01 0. 0 0. 0 0. 0 0. 0 0. 0 0.00000	. 0.00000 . 83463 .58200E+00 . 12518E-02 . 0 . 0 . 0 . 0 . 0 . 0 . 0 . 0	0.00000 26543 56664E+00 64341E-05	o
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FE 0. 0. 0. FE	0.00000 0.00 0.00000 100.92 54 (N,P) 22218E+00 .35 38437E+00 .17 0. 0. 0.00000 0.00 0.00000 0.00 54 (N,A)	000 0.00000 0.0 000 0.00000 .0 MN 54 312.5 MN 54 .10E-08 093E+00 .43889E+00 781E+00 .75476E-01 0. 0. 0. 000 0.00000 0.0 000 99.97800 0.0 CR 51 27.71	0. 0 00000 0.00000 0 ENDF/B-11 .00560 0 .52870E+00 1 .14297E-01 0. 0 0.	. 0.00000 . 83463 .58200E+00 . 12518E-02 . 0 . 0 . 0 . 0 . 00000 . 03137	0.00000 26543 56664E+00 64341E-05 0.00000 26544	0
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FE	0.00000 0.00 0.00000 100.92 54 (N,P) 22218E+00 .35 38437E+00 .17 0. 0. 0.00000 0.00 0.00000 0.00 54 (N,A) 92043E-01 .92	000 0.00000 0.0 000 0.00000 .0 MN 54 312.5 MN 54 .10E-08 093E+00 .43889E+00 781E+00 .75476E-01 0. 0. 0. 0. 0. 000 0.00000 0.0 000 99.97800 0.0 CR 51 27.71 CR 51 .80E-07 043E-01 .80317E-01	0. 0 00000 0.00000 04000 0.00000 D ENDF/B-1V .00560 0.52870E+00 1.14297E-01 0. 0 0. 0 0	. 0.00000 	0.00000 26543 56664E+00 64341E-05 0.00000 26544 21235E-01	0
FE 	0.00000 0.00 0.00000 100.92 54 (N,P) 22218E+00 .35 38437E+00 .17 0. 0.00000 0.00 0.00000 0.00 54 (N,A) 92043E-01 .92 85474E-02 .38	000 0.00000 0.0 000 0.00000 .0 MN 54 312.5 MN 54 .10E-08 093E+00 .43889E+00 781E+00 .75476E-01 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	0. 0 0000 0.00000 04000 0.00000 D ENDF/B-IN .00560 0.52870E+00 1.14297E-01 0. 0 0. 0 0. 0 0. 0 0.0000 0.00000 D BNL-325 .00500 1.61857E-01 2.19256E-02	. 0.00000 . 83463 .58200E+00 . 12518E-02 . 0. 0.00000 . 03137 .39932E-01 . 11125E-02	0.00000 26543 56664E+00 64341E-05 0.00000 26544 21235E-01 24236E-03	0
FE 0. 0. 0. FE	0.00000 0.00 0.00000 100.92 54 (N,P) 22218E+00 .35 38437E+00 .17 0. 0. 0.00000 0.00 0.00000 0.00 54 (N,A) 92043E-01 .92 85474E-02 .38 43314E-07 0.	000 0.00000 0.0 000 0.00000 .0 MN 54 312.5 MN 54 .10E-08 093E+00 .43889E+00 781E+00 .75476E-01 0. 0. 0. 0. 000 0.00000 0.0 000 99.97800 0.0 CR 51 27.71 CR 51 .80E-07 043E-01 .80317E-01 863E-02 .28434E-02 0.	0. 0. 0. 00000 0.00000 04000 0.00000 D ENDF/B-1N .00560 . 0.52870E+00 . 1.4297E-01 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00500 0.00000 0.00500 0.00000 0.00500 0.00500 0.00500 0.00500 0.00500 0.00500	. 0.00000 . 83463 .58200E+00 . 12518E-02 . 0 . 0.00000 . 03137 .39932E-01 . 11125E-02 . 0	0.00000 26543 56664E+00 64341E-05 0.00000 26544 21235E-01 24236E-03	0
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NI 0 0 0 0 0 0 0 0 0 0 0 0 0	0.000 0.000 58 63900	(N, NF JE+00 000 (N, T) DE-03	······································	00000 00000 00000 00000 00000 00000 0000	57 57 +00 0. 56 56 -03.	271. .60E .10623 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	0.00 0.00 96.20 -09 E-05	D .51 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	0.00000 THRESH .02230 096E-01 0 0.00000 9.50000 THRESH .11000 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	. 12 1 . 73 103E - 0	48 2 0 0 0 2 7 0 0 0 0 0 0 0 0 0 0 0 0 0 0	. 24219E-04). 0. 0.00000	28585 28587	0
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NI 000000000000000000000000000000000000	0.000 58 0.000 58 63900 0.000	(N, NF SE+00 000 (N, T) DE-03		00000 00000 00000 00000 00000 63900E	57 57 +00 56 56 -03	271. .60E .10623 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	0.00 96.20 96.20 0.00 0.00 .10	D .51 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	0.00000 THRESH .02230 096E-01 0 0.00000 9.50000 THRESH .11000 0 0 0.00000 0.00000 0.00000	. 12 1 . 73 103E - 0	48 2 0 0 0 27 0 0 0 0 0 0 0 0 0 0 0 0 0 0	. 24219E-04). 0.00000). 0.00000	28585 28587	0
NI 00000 NI 000000000000000000000000000	0.000 58 0.000 58 63900 0.000 28.855 60	(N, NF (E+00 000 (N, T) 0E-03 000 (C, P)	· · · · · · · · · · · · · · · · · · ·	00000 00000 00000 00000 00000 63900E 00000 11200 00000	57 57 +00 0 56 56 -03	271. .60E .10623 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	0.00 96.20 96.20 -09 96.05	D .51 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	THRESH .02230 096E-01 0 0.00000 9.50000 THRESH .11000 0 0.00000 0.00000 ENDF/B-1	. 12 1 . 73 103E - 0	48 2 2 2 7 2 7 0 0 2 7 0 0 0 0 2 7 0 0 0 0	. 24219E-04). 0.00000 0.00000	28585 28587 28603	0 0
NI 00000 00000 000000000000000000000000	0.000 58 0.000 58 63900 0.000 28.855 60	(N, NF (E+00)000 (N, T))0E-03)000 (N, P) (N, P)		00000 00000 00000 00000 00000 00000 11200 00000 11200 00000 126925	57 57 57 +00 0 56 56 56 60 60	271. .60E .10623 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	0.00 96.20 96.20 -09 96.05	D .51 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	0.00000 THRESH .02230 096E-01 0 0.00000 9.50000 THRESH .11000 0 0 0 0 0 0 0 0 0 0 0 0	. 12 1 . 73 103E - 0	48 2 0 2 2 7 0 0 2 7 0 0 0 4 3	. 24219E-04	28585 28587 28603	0 0
NI 0000 NI 0000 NI	0.000 58 0.000 58 63900 0.000 28.855 60 11021 86282	(N, NF E+00 000 (N, T) 0E-03 000 (N, P) E+00		00000 00000 00000 00000 00000 00000 00000 11200 00000 11200 00000 11200 00000 11200 00000 11200 00000 11200 000000	57 57 57 +00 56 56 56 56 60 60 +00	271. .60E .10623 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	0.00 96.20 96.20 -09 96.05 0.00 .10 -09 0.00	D .51 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	0.00000 THRESH .02230 096E-01 0 0.00000 9.50000 THRESH .11000 0 0 0 0 0 0 0 0 0 0 0 0	. 12 1 . 73 103E - 0	48 2 0 0 27 0 0 0 27 0 0 0 0 0 0 0 0 0 0 0	. 24219E-04	28585 28587 28603	0 0
NI 0000 NI 0000 0000 0000 00000 00000000	0.000 58 0.000 58 63900 0.000 58 63900 0.000 28.855 60 11021 86282	(N, NF E+00 000 (N, T) 0E-03 000 (N, T) 0E-03 000 (N, P) E+00 E+00		00000 00000 00000 00000 00000 00000 00000 00000 11200 00000 11200 00000 12692E 41114E	57 57 57 +00 0 56 56 56 56 -03 (0 (0 0 (0 0 -03)	271. .60E .10623 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	0.00 96.20 96.20 -09 9E-05 0.00 .10 -09 E-04	D .51 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	THRESH .02230 096E-01 0 0.00000 9.50000 THRESH .11000 0 0.00000 0.00000 ENDF/B-1 .09670 933E+00 012E-08 0	. 12 1 . 73 103E - 0	48 2 0 0 0 2 7 0 0 0 0 0 0 0 0 0 0 0 0 0 0	. 24219E-04	28585 28587 28603	0 0
NI 00000 NI 00000 NI	0.000 58 0.000 58 63900 0.000 58 63900 0.000 28.855 60 11021 86282	(N, NF E+00 000 (N, T) 0E-03 000 (N, P) E+00 E+00		00000 00000 00000 00000 00000 00000 0000	57 57 57 +00 0 56 56 56 -03 0 150 60 +00 -03	271. .60E .10623 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	0.00 96.20 -09 E-05 0.00 .10 -09 E-05	D .51 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	THRESH .02230 096E-01 0 0.00000 9.50000 THRESH .11000 0 0.00000 0.00000 ENDF/B-1 .09670 933E+00 012E-08 0	. 12 1 . 73 103E - 0	48 2 0 2 2 7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	. 24219E-04	28585 28587 28603	0 0
NI 00000 NI 00000 NI	0.000 58 0.000 58 63900 28.855 60 11021 86282	(N, NF E+00 000 (N, T) 0E-03 000 (N, P) E+00 E+00 E+02		00000 00000 00000 00000 00000 00000 0000	57 57 +00 56 56 56 56 56 56 56 56 50 .03	271. .60E .10623 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	0.00 96.20 96.20 -09 9E-05 0.00 .10 :-09 E+00 E-04	D .51 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	THRESH .02230 096E-01 0 0.00000 9.50000 THRESH .11000 0.00000 0.00000 ENDF/B-1 .09670 933E+00 012E-08 0 0	. 12 1 . 73 103E - 0	48 2 0 2 2 7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	. 24219E-04	28585 28587 28603	0 0
NI 0000 NI 0000 NI 0000	58 2 1394 0.000 58 63900 28.855 60 11021 86282 0.000	(N, NF SE+00 000 (N, T) DE-03 000 10 (N, P) E+00 E+00		00000 00000 00000 00000 00000 00000 00000 00000 11200 00000 11200 00000 11200 00000 112692E 41114E	57 57 +00 0 56 56 56 56 56 56 -03 0 -03	271. .60E .10623 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	0.00 96.20 96.20 0.00 .10 -09 E+00 E+00	D .51 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	THRESH .02230 096E-01 0 0.00000 9.50000 THRESH .11000 0.00000 ENDF/B-1 .09670 933E+00 012E-08 0 0.00000	. 12 1 .73 103E - 0	48 12 12 12 12 12 12 12 12 12 12	. 24219E-04	28585 28587 28603	0 0
NI 0000 NI 0000 NI	0.000 58 63900 0.000 28.855 60 11021 86282	(N, NF (N, NF (N, NF (N, NF) (N, T) (N, T) (N, T) (N, P) (N, P) (E+00 (N, P) (E+00 (N, P) (E+00 (N, P) (E+00 (N, NF) (N,		000000 15074E 000000 00000 00000 00000 1200 12692E 41114E 000000 88000	57 57 +00 0. 56 56 -03 0. 150 60 +00 -03	271. .60E .10623 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	0.00 96.20 96.20 0.00 .10 .10 .10 .09 .00 .00	D .51 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	THRESH .02230 096E-01 0 0.00000 9.50000 THRESH .11000 0.00000 ENDF/B-1 .09670 933E+00 012E-08 0 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000	. 12 1 .73 103E - 0	48 12 10 12 12 12 12 12 12 12 12 12 12	. 24219E-04	28585 28587 28603	0000
NI 0000 00 NI 0000 00 NI	0.000 58 0.000 58 63900 0.000 28.855 60 11021 86282 0.000 0.001 61	(N, NF (N, NF (N, NF (N, NF (N, T) (N, T)		000000 15074E 000000 00000 00000 00000 1200 12692E 41114E 000000 88000 00000	57 57 57 +00 0. 56 56 -03. 0. 60 +00 -03 0. 61	271. .60E .10623 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	0.00 96.20 96.20 0.00 .10 09 E+00 E+00 E-04	D .51 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	THRESH .02230 096E-01 0 0.00000 9.50000 THRESH .11000 0.00000 0.00000 ENDF/B-1 .09670 933E+00 012E-08 0 0.00000 0.00000 THRESH	. 12 1 . 73 103E - 0	48 12 10 12 12 12 10 12 12 10 10 10 10 10 10 10 10 10 10	. 24219E-04	28585 28587 28603 28613	0 0 0
NI 0000 00 NI 0000 00 NI	0.000 58 0.000 58 63900 0.000 28.855 60 11021 86282 0.000 61 91300	(N, NF SE+00 000 (N, T) 000 (N, T) 000 (N, T) 000 (N, T) 000 (N, P) 12+000 12+0		000000 15074E 000000 00000 00000 00000 11200 00000 11200 00000 12692E 41114E 000000 88000 000000	0. 57 57 +00 0. 56 56 -03. 0. 60 +00 -03 0. 61 61 61 -01	271. .60E .10623 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	0.00 96.20 96.20 -09 -00 -00 -00 -00 -00 -00 -00 -00 -0	D .51 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	THRESH .02230 096E-01 0 0.00000 9.50000 THRESH .11000 0.00000 ENDF/B-1 .09670 012E-08 0 012E-08 0 0.00000 THRESH 0.00000 0.00000 THRESH	. 12 1 . 73 103E - 0	48 2 000 27 000 27 000 27 000 20 00 26 00 26 00 26 00 27 00 26 00 26 00 27 00 26 00 27 00 26 00 27 00 26 00 27 00 26 00 26 00 27 00 26 00 27 000 26 00 26 000 26 00 26 000 26 00 26 00	. 24219E-04	28585 28587 28603 28613	0 0 0
NI 0000 NI 0000 NI	0.000 58 0.000 58 63900 0.000 28.855 60 11021 86282 0.000 .001 61 91300	(N, NF (E+00 000 (N, T) 000 (N, T) 000 (N, T) 000 (N, T) 000 (N, P) 000 (N, P) 000 (24 (N, P) 000 000 000 (N, T) 000 000 000 000 000 000 000 0		00000 00000 00000 00000 00000 00000 00000 11200 00000 12692E 41114E 000000 88000 00 00000 91300E 24893F	57 57 57 +00 0 56 56 -03 0 60 +00 0 61 61 -01 -02	271. .60E .10623 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	0.00 96.20 96.20 -09 96.20 -09 96.05 -09 96.00 -05 -05 16.01	D .51 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	0.00000 THRESH .02230 096E-01 0 0 0.00000 9.50000 THRESH .11000 0 0 0 0 0 0 0 0 0 0 0 0	. 12 1 . 73 103E - 0	48 12 12 12 12 12 12 12 12 12 12	. 24219E-04	28585 28587 28603 28613	0 0 0

TABLE V. (cont)

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NI	62 (N.A)	FE 59 FE 59	44.6 D	THRESH . 11800	1. 19234	:	28624	0
	19200E-01 .1	19200E -01	. 15960E-01	.80493E-02 .	24705E-02	. 38833E-03		
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NI	62 (N.NP+D)) CO 61	1.650 H	THRESH	.06066	:	28625	0
		CO 61	. 30E - 05	. 46000				
	15540E-01 .1	155408-01	.80391E-02	.51463E-03 O.		0.		
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NI	64 (N,A)	FE 61	6.0 M	THRESH	1.26947	:	28644	0
	E0100E-01 E	FE 61	. 30E-05	1.05000	169755-03	756095-07		
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	32290E-02 .3	CO 63	. 30E - 05 . 49206E - 03	1.37000 .99096E-07 0.	. 12314	0.	20045	Ŭ
0.	32290E-02 .3 0.	CO 63 32290E-02	.30E-05 .49206E-03 0. 0	1.37000 .99096E-07 0. . 0.	. 123 14	0. 0.	20045	Ŭ
0.	32290E-02 .3 0. 0.	CO 63 32290E-02	.30E-05 .49206E-03 0. 0 0. 0	1.37000 .99096E-07 0. . 0.	. 12314	0. 0. 0.	20043	Ū
0.	32290E-02 .3 0. 0.	, CO 63 32290E-02	.30E-05 .49206E-03 0.00 0.00 0.00	1.37000 .99096E-07 0. . 0.	. 123 14	0. 0. 0.	20043	Ū
0.0.0	32290E-02 .3 0. 0. 0. 0.	, CO 63 32290E-02	.30E-05 .49206E-03 0. 0 0. 0 0. 0 0. 0 0. 0	1.37000 .99096E-07 0. . 0. . 0.	0.00000	0. 0. 0. 0. 0.	20045	Ū
0.0.0	32290E-02 .3 0. 0. 0.00000 0.0	, CO 63 CO 63 32290E-O2	.30E-05 .49206E-03 0.00 0.00 0.000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	1.37000 .99096E-07 0. . 0. . 0. . 0. . 0. . 0. 0. 0.00000	0.00000	0. 0. 0. 0. 0. 0.00000	20043	Ū
0. 0. 0. 0. 0.	32290E-02 .3 0. 0. 0. 0.00000 0.0 0.00000 0.0 63 (N.2N)	, C0 63 32290E-02 000000 0. 000000 6. CU 62	.30E-05 .49206E-03 0.00 0.00 0.00 0.0000 00000 0.0000 00000 4.600 9,74 M	1.37000 .99096E-07 0. . 0. . 0. . 0. . 0. . 0. . 0. . 0.	0.00000	0. 0. 0. 0. 0. 0.00000	29631	0
0. 0. 0. 0. 0.	32290E-02 .3 0. 0. 0. 0.00000 0.0 63 (N.2N)	CO 63 32290E-02 000000 0. 000000 6. CU 62 CU 62	.30E-05 .49206E-03 0.00 0.00 0.000 0.0000 00000 0.0000 00000 4.600 9.74 M .30E-05 DK	1.37000 .99096E-07 0. .0. .0. .0. .0. .0. .0. .0. .0. .0.	0.00000	0. 0. 0. 0. 0.00000	2963 1	0
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0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0	32290E-02 .3 0. 0. 0. 0.00000 0.0 63 (N.2N) 80832E+00 .4	CO 63 32290E-02 000000 0. 000000 6. CU 62 CU 62 49789E+00	.30E-05 .49206E-03 0.00 0.00 0.0000 00000 0.0000 00000 4.600 9.74 M .30E-05 DK .27633E+00 0.0000	1.37000 .99096E-07 0. 0. 0. 0. 0. 0. 0. 0.00000 0.000000 ENDF/B-3 1.25000 .27903E-01 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0	0.00000	0. 0. 0. 0. 0.00000 0.	29631	0
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0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0	32290E-02 .3 0. 0. 0.00000 0.0 63 (N.2N) 80832E+00 .4 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	, C0 63 32290E-02 000000 0. 000000 6. CU 62 CU 62 49789E+00	.30E-05 .49206E-03 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 9.74 .30E-05 DK .27633E+00 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000 0.000000	1.37000 .99096E-07 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0	0.00000	0. 0. 0. 0. 0. 0.00000 0. 0. 0. 0. 0.	29631	0
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V	51 (N.G) V	52 3.	76 M	ENDF/B-IV	1.44694	23512	0
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•	17030E-03 . 1703	DE-03 .18	463E-03 .2	1816E-03 .	27299E-03	. 347 18E -03	
•	50312E-03 .7415	4E-03 .94	284E-03 .1	1948E-02 .	13568E-02	. 15350E-02	
•	1/1246-02 .2954	JE-02 .45	APAE-02 .00	JU93E-02 .	95640E-02	.28296E-01	
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	56297E-0	.27014	E-04 .3155	5E-O8 O.	ο.	Ο.		
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V	51 (N.	.NA) SC	47 3.41	D	ENDF/B-IV	. 1 1 1 5 8	23516	0
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IV. GAMMA-RAY TRANSPORT OUT OF THE ARMOR SOURCE REGIONS AT DIFFERENT GAMMA DECAY TIMES T AFTER THE INITIAL BURST AT $t = 0^+$

From Eq. (3) we obtain the induced gamma activity rate for discrete values, T = 0, 1, 10...1000 h. These gamma-ray sources then become the ONETRAN source input to solve the transport of gamma rays and the gamma-ray fluxes at time T(h) after the initial prompt burst at $t = 0^+$ at the center of the armor.

V. INDUCED GAMMA DOSE RATE AT CENTER OF ARMOR

Finally, the gamma fluxes were converted to dose rates⁴ using the appropriate gamma-to-dose-rate conversion factors. A plot of the dose rate versus time after the prompt burst in the time domain of 1 to 1000 h is shown in Fig. 1 for both the 1-kt fission and 1-kt fusion sources. In Table VIII, the same data are listed for 0 to 10 000 h, and in Table 1X, the dose rate is integrated to obtain the dose from 0 to 10000 h and 1 to 1000 h, respectively.

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						Half-Life (T _{1/2})	Gamma MeV per Disintegration	Activity A _o (Disintegration cm ^{3.} s)
1	Si	28	(N P)	Al	28	2.240E+00 m*	1.779E+00	9.152E+07
2	P	31	(\mathbf{N},\mathbf{P})	Si	31	2.620E+00 h	8.900E-04	2.776E+04
3	ст	50	(N,2N)	Cr	49	4 200E+01 m	1.092E+00	8.375E+03
۵. ۲	Cr	50	(\mathbf{N},\mathbf{G})	Cr	51	2 771E+01 d	3.137E-02	1.548E+02
5	Cr	50	(N P)	v.	50	4.000E+16 v	1.323E+00	9.495E-16
6.	Cr	50	(\mathbf{N},\mathbf{T})	v	48	1.598E+01 d	2.914E+00	3.602E-04
7.	Cr	52	(N.2N)	Cr	51	2.771E+01 d	3.137E-02	4.057E+03
8.	Cr	52	(N.P)	v	52	3.760E+00 m	1.447E+00	3.294E+07
9.	Cr	52	(N,T)	v	50	4.000E+16 v	1.323E+00	3.754E-22
10.	Cr	53	(N.P)	v	53	1.550E+00 m	1.040E+00	3.769E+06
11.	Cr	53	(N.NP+D)	v	52	3.760E+00 m	1.447E+00	5.022E+05
12.	Cr	54	(N.P)	v	54	4.300E+01 s	4.040E+00	8.209E+05
13.	Cr	54	(N,A)	Ti	51	5.750E+00 m	3.596E-01	4.997E+04
14.	Cr	54	(N,NP+D)	v	53	1.550E+00 m	1.040E+00	1.211E+05
15.	Cr	54	(N.T)	v	52	3.760E+00 m	1.447E+00	1.323E+01
16.	Mn	55	(N,2N)	Mn	54	3.125E+02 d	8.346E-01	7.908E+02
17.	Mn	55	(\mathbf{N},\mathbf{G})	Mn	56	2.580E+00 h	1.782E+00	7.374E+05
18.	Mn	55	(N.P)	Ст	55	3.550E+00 m	7.800E-04	7.499E+06
19	Mn	55	(\mathbf{N},\mathbf{A})	v.	52	3.760E+00 m	1.447E+00	4.462E+06
20.	Fe	54	(N.P)	Mn	54	3.125E+02 d	8.346E-01	5.193E+03
21.	Fe	54	(\mathbf{N},\mathbf{A})	Сг	51	2.771E+01 d	3.137E-02	8,737E+03
22.	Fe	56	(N.P)	Mn	56	2.580E+00 h	1.782E+00	4.308E+07
23.	Fe	56	(\mathbf{N},\mathbf{T})	Mn	54	3.125E+02 d	8.346E-01	1.026E+00
24.	Fe	57	(N.P)	Mn	57	1.590E+00 m	4.673E-02	6.628E+07
25.	Fe	57	(N,NP+D)	Mn	56	2.580E+00 h	1.782E+00	1.871E+05
26.	Fe	58	(N.G)	Fe	59	4.460E+01 d	1.192E+00	1.049E+02
27.	Fe	58	(N.P)	Mn	58	6.500E+01 s	2.537E+00	6.110E+06
28.	Fe	58	(N.A)	Cr	55	3.550E+00 m	7.800E-04	7.229E+05
29.	Fe	58	(N,NP+D)	Mn	57	1.590E+00 m	4.673E-02	1.173E+06
30.	Fe	58	(N,T)	Mn	56	2.580E+00 h	1.782E+00	4.210E+00
31.	Ni	58	(N.2N)	Ni	57	3.610E+01 h	2.106E+00	6.893E+03
32.	Ni	58	(N.P)	Со	58	7.080E+01 d	9.742E-01	5.701E+03
33.	Ni	58	(N,NP+D)	Co	57	2.710E+02 d	1.215E-01	2.680E+02
34.	Ni	58	(N.T)	Co	56	7.850E+01 d	3.642E+00	3.069E+00
35.	Ni	60	(N,P)	Co	60	5.270E+00 v	2.504E+00	1.663E+01
36.	Ni	61	(N.P)	Co	61	1.650E+00 h	6.066E-02	1.377E+04
37.	Ni	62	(N,A)	Fe	59	4.460E+01 d	1.192E+00	1.149E+01
38.	Ni	62	(N,NP+D)	Co	61	1.650E+00 h	6.066E-02	5.247E+03
39.	Ni	64	(N,A)	Fe	61	6.000E+00 m	1.269E+00	7.432E+03
40.	Ni	64	(N,NP+D)	Со	63	2.700E+01 s	1.251E-01	5.371E+04

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TABLE VI. Chrome-Nickel Armor Steel Activation D-T Fusion Neutrons

TABLE VI. (cont)

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					v		,			
							Half-Life (T _{1/2})	Gamma MeV per Disintegration	Activity A _o (Disintegration/ cm ^{3.} s)	
	41.	Cu	63	(N,2N)	Cu	62	9.740E+00 m	1.009E+00	1.653E+06	
÷	42.	Cu	63	(N,G)	Cu	64	1.271E+01 h	1.966E-01	6.646E+03	
	43.	Cu	63	(N,A)	Co	60	5.270E+00 y	2.504E+00	5.966E-01	
	44.	Cu	65	(N,2N)	Cu	64	1.271E+01 h	1.966E-01	1.879E+04	
	45.	Cu	65	(N,P)	Ni	65	2.520E+00 h	5.888E-01	2.708E+03	
	46.	Cu	65	(N,A)	Co	62	1.390E+01 m	2.760E+00	5.043E+04	
	47.	Mo	100	(N,2N)	Мо	99	6.602E+01 h	1.538E-01	3.048E+03	
	48.	Мо	100	(N,G)	Мо	101	1.460E+01 m	8.616E-01	1.191E+05	
	49.	Мо	100	(N,A)	Zr	97	1.680E+01 h	8.877E-01	2.438E+01	
	50.	Мо	92	(N.NA)	Zr	88	8.340E+01 d	3.900E-01	6.279E-02	
	51.	Мо	96	(N,P)	Nb	96	2.340E+01 h	2.582E+00	1.493E+02	
	52.	Мо	97	(N.NP+D)	Nb	96	2.340E+01 h	2.582E+00	1.866E+01	
	53.	Мо	98	(N.G)	Мо	99	6.602E+01 h	1.538E-01	1.420E+03	
	54.	Мо	98	(N.A)	Zr	95	6.400E+01 d	7.246E-01	1.352E+00	
	55.	Мо	98	(N,T)	Nb	96	2.340E+01 h	2.582E+00	3.816E+00	
	56.	v	50	(N,A)	Sc	47	3.410E+00 d	1.116E-01	2.063E+00	
	57.	v	51	(N.G)	v	52	3.760E+00 m	1.447E+00	7.705E+05	
	58.	v	51	(N,P)	Ti	51	5.750E+00 m	3.596E-01	6.717E+05	
	59.	v	51	(N,A)	Sc	48	4.370E+01 h	3.352E+00	6.269E+02	
	60.	v	51	(N.NA)	Sc	47	3.410E+00 d	1.116E-01	3.196E+00	

 $(t = 0^+ \text{ explosion time})$

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						Half-Life (T _{1/2})	Gamma MeV per Disintegration	Activity A _o (Disintegration/ cm ³ ·s)
1	5	28	(NP)	Δ1	28	2 240E±00 m*	1 779F+00	4 076F+05
2	Þ	31	(\mathbf{N},\mathbf{P})	Si	31	2.620E+00 h	8.900E-04	1.103E+03
3	Cr	50	(N 2N)	Cr	49	4.200E+01 m	1.092E+00	1.747E-01
4	Cr	50	(\mathbf{N}, \mathbf{G})	Cr	51	2.771E+01 d	3.137E-02	1.293E+02
5	Cr	50	(N.P)	v.	50	4.000E+16 v	1.323E+00	1.078E-17
6	Cr	52	(\mathbf{N},\mathbf{T})	v	48	1.598E+01 d	2.914E+00	7.227E-09
7	Cr	52	(N, 2N)	Ст	51	2.771E+01 d	3.137E-02	1.178E-01
8	Cr	52	(\mathbf{N}, \mathbf{P})	v	52	3 760E+00 m	1.447E+00	2.806E+05
Q.	Cr	52	(\mathbf{N},\mathbf{T})	v	50	4.000E+16 v	1.323E+00	7.534E-27
10	Cr	53	(\mathbf{N},\mathbf{P})	v	53	1.550E+00 m	1.040F+00	9.655E+03
11	Cr	53	(N NP+D)	v	52	3 760E+00 m	1.040E+00	2.648E+01
12	Cr	54	(\mathbf{N},\mathbf{P})	v	51	4 300E+01 s	1.447E+00	2.040E+01
12.		54	(\mathbf{N},\mathbf{r})	v T;	51	4.300E+01 s	4.040E+00	1.241F±01
13.		54	(\mathbf{N},\mathbf{M})	V	53	1.550E+00 m	1.040E+00	3 398F±00
14.		54	(NT)	v V	53	3 760E+00 m	1.040E+00 1.447E±00	2.654E_04
15.	Mn	55	(\mathbf{N},\mathbf{I})	V Mn	51	3.125E+02 d	9.346F_01	6.414F_07
17	Mn	55	(\mathbf{N},\mathbf{C})	Mn	56	2 580E 100 h	1.782E+00	6 402F±05
19	Mn	55	(\mathbf{N},\mathbf{O})		55	2.580E+00 m	7 800F_04	3 396F+04
10.	Mn	55	(\mathbf{N},\mathbf{r})	V	53	3.350E+00 m	1.800E-04	3.183F+03
20	Ee	54	(\mathbf{N},\mathbf{A})	Mn	54	3.125E102 d	8 346F_01	1.275E+02
20.	гс Ба	54	(\mathbf{N},\mathbf{r})	C-	54	3.123E+02 d	3 137E 02	5 525E+02
21.	FC Fo	54	(\mathbf{N}, \mathbf{A})	Cr Mn	56	2.771E+01 u	1.7920	9.021E+01
22.	ге Б-	50	(\mathbf{N},\mathbf{F})	M	50	2.360E+00 II	0.762E+00	2.021E+04
23.	re E-	50	(\mathbf{N},\mathbf{I})	Mn	54	1.500E+02 u	0.340E-01	2.0382-05
24.	Fe E-	51	(\mathbf{N},\mathbf{P})	Mn	51	1.590E+00 m	4.0/3E-02	2.4346+03
25.	ге Г-	51	(N,NP+D)	Mn	50	2.380E+00 h	1.782E+00	6.241E-01
26.	Fe	58	(N,G)	Fe	59	4.460E+01 d	1.192E+00	0.341E+01
21.	ге	58	(\mathbf{N},\mathbf{P})	Mn	58	6.500E+01 s	2.53/E+00	2.318E+03
28.	Fe	58	(N,A)	Cr	22	3.550E+00 m	7.800E-04	1.004E+02
29.	ге	58	(N,NP+D)	Mn	57	1.590E+00 m	4.0/3E-02	4.10/E+U1
30.	re	58	(\mathbf{N},\mathbf{I})	Mn	50	2.580E+00 h	1./82E+00	8.448E-UJ
31.	NI NI	58	(N,2N)	Ni	57	3.610E+01 h	2.106E+00	2.189E-01
32.	NI NI	58	(\mathbf{N},\mathbf{P})	Co	58	7.080E+01 d	9.742E-01	1.7026+02
33.	NI NI	58	(N,NP+D)	Co	57	2.710E+02 d	1.215E-01	4.31/E-02
34.	Ni	58	(N,T)	Co	56	7.850E+01 d	3.642E+00	6.2/6E-05
55. 24	Ni	60	(N,P)	Co	60	5.270E+00 y	2.504E+00	5.301E-U2
36.	Ni	61	(N,P)	Co	61	1.650E+00 h	6.066E-02	8.104E+01
37.	Ni	62	(N,A)	Fe	59	4.460E+01 d	1.192E+00	3.708E-03
38.	Ni	62	(N,NP+D)	Co	61	1.650E+00 h	6.066E-02	2.3/9E-01
39.	Ni	64	(N,A)	Fe	61	6.000E+00 m	1.269E+00	9.232E-01
40 .	Ni	64	(N,NP+D)	Co	63	2.700E+01 s	1.251E-01	1.402E+00

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TABLE VII. Chrome-Nickel Armor Steel Activation Fission Neutrons

TABLE VII. (cont)

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	$(t = 0^+ explosion time)$							
						Half-Life (T _{1/2})	Gamma MeV per Disintegration	Activity A _o (Disintegration/ cm ³ .s)
41.	Cu	63	(N,2N)	Cu	62	9.740E+00 m	1.009E+00	8.881E+01
42.	Cu	63	(N,G)	Cu	64	1.271E+01 h	1.966E-01	3.577E+03
43.	Cu	63	(N,A)	Co	60	5.270E+00 v	2.504E+00	1.016E-03
44.	Cu	65	(N,2N)	Cu	64	1.271E+01 h	1.966E-01	1.628E+00
45.	Cu	65	(N,P)	Ni	65	2.520E+00 h	5.888E-01	1.151E+01
46.	Cu	64	(N,A)	Co	62	1.390E+01 m	2.760E+00	7.901E+01
47.	Mo	100	(N,2N)	Mo	99	6.602E+01 h	1.538E-01	1.136E+00
48.	Mo	100	(N,G)	Mo	101	1.460E+01 m	8.616E-01	7.794E+04
49.	Mo	100	(N,A)	Zr	97	1.680E+01 h	8.877E-01	7.198E-03
50.	Mo	92	(N,NA)	Zr	88	8.340E+01 d	3.900E-01	2.313E-05
51.	Мо	96	(N,P)	Nb	96	2.340E+01 h	2.582E+00	5.608E-02
52.	Mo	97	(N,NP+D)	Nb	96	2.340E+01 h	2.582E+00	1.356E-03
53.	Мо	98	(N,G)	Мо	99	6.602E+01 h	1.538E-01	6.885E+02
54.	Mo	98	(N,A)	Zr	95	6.400E+01 d	7.246E-01	5.857E-04
55.	Мо	98	(N,T)	Nb	96	2.340E+01 h	2.582E+00	8.134E-05
56.	v	50	(N,A)	Sc	47	3.410E+00 d	1.116E-01	2.440E-03
57.	v	51	(N,G)	v	52	3.760E+00 m	1.447E+00	5.528E+05
58.	v	51	(N,P)	Ti	51	5.750E+00 m	3.596E-01	3.046E+03
59.	v	51	(N,A)	Sc	48	4.370E+01 h	3.352E+00	1.479E-01
60.	v	51	(N,NA)	Sc	47	3.410E+00 d	1.116E-01	2.213E-04



Fig. 1. Prompt neutron induced gamma-ray dose rate/kt at center of armor (D-T fusion and fission).

(1-kt D-T Fusion and 1-kt Fission)								
Time after Burst	Rad/h	Rad/h						
(h)	1-kt D-T Fusion	I-kt Fission						
0	587.00	24.00						
1	121.00	9.41						
10	10.80	0.842						
20	0.80	0.064						
25	0.300	0.0207						
30	0.106	0.00889						
40	0.0514	0						
50	0.042	0						
100	0.0294	0						
1000	0.0166	0						
10 000	0.00339	0						

TABLE VIII. Chrome-Nickel Armor Steel Ac-

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tivation Gamma Dose Rate at Center of Armor: ONETRAN Calculation

TABLE IX.	Chrome-Nickel Armor Steel Time-Inte-
	grated Dose Rate at Center of Armor:
	ONETRAN Calculation (1-kt D-T
	Fusion and 1-kt Fission)

Time-Integ	rated Dose	Rad 1-kt D-T Fusion	Rad 1-kt Fission
0 →	1 h	296	16
$1 \rightarrow$	30 h	450	35
30 →	1000 h	49	
$0 \rightarrow$	1000 h	795	51
<u> </u>	1000 h	499	35

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