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AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

Jill R Mitchell

October 2020

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ENGINEERING CALCULATIONS AND ANALYSIS

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

1.	Does this ECAR involve a Safety SSC?	N/A	**Professional Engineer's Stamp** N/A See LWP-10010 for requirements
2.	Safety SSC Determination Document ID	N/A	
3.	Engineering Job (EJ) No.	2315	
4.	SSC ID	N/A	
5.	Building	TRA-670	
6.	Site Area	ATR Complex	

7. Objective/Purpose:

This engineering calculations and analysis report (ECAR) documents the results of the Advanced Test Reactor (ATR) detailed Monte Carlo N-Particle (MCNP) code full-core model as-run physics analysis performed to support the Colorado School of Mines (CSM) experiment in the B-5 position.

The purpose of this analysis is to calculate the following:

- The heat-generation rates of the test specimens and associated components as the result of irradiation for the currently planned cycles.
- The DPA for each capsule as a result of irradiation for the currently planned cycles.
- Decay heat (watts) at shutdown and after 30 minutes, 5 hours, 1 day, 7 days, 14 days, 30 days, 60 days, and 90 days of cooling for each capsule.
- Source terms (curies) at shutdown and after 30 minutes, 5 hours, 1 day, 7 days, 14 days, 30 days, 60 days, and 90 days of cooling for each capsule.

These calculations were performed using the computer codes MCNP and ORIGEN2. The neutronics model description, analysis details, and results are presented in the attached report. As part of the physics analysis, this ECAR was formalized as requested by the project manager; see Appendix A- 'Physics Analysis Request Form' for details.

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

8.	If revision, please state the reason and list sections or pages being affected: Rev. 1: Typo corrected in Table 3 for the Specimen Serial No.
9.	Conclusions/Recommendations: Results are shown for the heating rates (see Table 8 and Table 9), DPA (see Table 10), decay heat (see Table 11), and radionuclide concentrations (see Table 12 - Table 17) in this report. Heating rates were generated assuming nominal core power configurations, 22.5 MW and 22.6 MW south source power, for Cycle 164A and 164B, respectively, as documented in Reference [1]. The DPA was calculated for each capsule. The following, Table 1, displays the calculated DPA range for each capsule target. The calculated DPA ranges represent a south source power of 22.5 and 22.6 MW and a number of irradiation days amounting to 54.9 days for Cycle 164A and 64.1 days for Cycle 164B.

Table 1. Calculated DPA Range.

	Minimum DPA	Maximum DPA
Low	0.11	0.20
Medium	0.47	0.67
High	1.49	1.63

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

Contents

List of Tables

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

PROJECT ROLES AND RESPONSIBILITIES

Project Role	Name (Typed)	Organization	Pages Covered (if applicable)
Performer(s)	Jill Mitchell	C-130	All
Checker[a]	Jason Brookman	C-130	All
Independent Reviewer[b]	N/A	--	--
CUI Reviewer[c]	TBD	--	--
Manager[d]	Misti Lillo	C-130	All
Requestor[e]	Katie Anderson	C-630	All
Nuclear Safety[e]	N/A	--	--
Document Owner[e]	Donna Guillen	B-120	All

Responsibilities:

a. Confirmation of completeness, mathematical accuracy, and correctness of data and appropriateness of assumptions.
b. Concurrence of method or approach. See definition, LWP-10106.
c. Concurrence with the document's markings in accordance with LWP-11202.
d. Concurrence of procedure compliance. Concurrence with method/approach and conclusion.
e. Concurrence with the document's assumptions and input information. See definition of Acceptance, LWP-10200.

NOTE: *Delete or mark "N/A" for project roles not engaged. Include ALL personnel and their roles listed above in the eCR system. The list of the roles above is not all-inclusive. If needed, the list can be extended or reduced.*

1. SCOPE AND BRIEF DESCRIPTION

This engineering calculations and analysis report (ECAR) documents the results of the Advanced Test Reactor (ATR) physics analysis performed to support the irradiation of the Colorado School of Mines (CSM) Experiment in a small B position (B-5) located in the south region of the ATR. The purpose of this analysis is to calculate the following:

- The heat-generation rates of the test specimens and associated components as the result of irradiation for the currently planned cycles.
- The DPA for each capsule as a result of irradiation for the currently planned cycles.
- Decay heat (watts) at shutdown and after 30 minutes, 5 hours, 1 day, 7 days, 14 days, 30 days, 60 days, and 90 days of cooling for each capsule.
- Source terms (curies) at shutdown and after 30 minutes, 5 hours, 1 day, 7 days, 14 days, 30 days, 60 days, and 90 days of cooling for each capsule.

2. DESIGN AND TECHNICAL PARAMETER INPUT AND SOURCES

Three types of specimen geometries were manufactured using additive manufacturing techniques. The sample materials, 316 stainless steel and Inconel, were fabricated in the form of miniature tensile bars (16mm x 4mm x 1mm), PIE (TEM discs intended for PIE testing) disks (3mm diameter, 0.3mm thick), and TPP (discs intended for thermophysical property testing) disks (6mm diameter, 1mm thick). The specimens were irradiated in a total of five capsules in the B-5 position in the south region of the ATR at three different levels of intensity to evaluate DPA (displacement per atom), see Figure 1.

The CSM irradiation test used an aluminum basket and the experiment components were located in stainless steel capsules. The configuration for each capsule with materials and specimen information is illustrated in Table 2. Table 3 identifies the experiment specimen capsule location. Detailed material compositions for the specimens are listed in Table 4 from which the maximum value of any range listed was used in the MCNP model.

Table 2. CSM capsule information.

DPA Target	ATR Cycle	Capsule	Elevation (cm from core center line)	Specimen Holder	Specimen Material	Specimen Geometry
low	164A	E	-60.73	E2	Inconel	16 PIE and 16 TPP disk
			-57.23	E1	316sstl	16 PIE and 16 TPP disk
medium	164A & 164B	D	-53.73	D2	Inconel	16 PIE and 16 TPP disk
			-50.23	D1	316sstl	16 PIE and 16 TPP disk
high	164A & 164B	C	-3.80	C4	Inconel	16 PIE and 16 TPP disk
			-0.51	C3	Inconel	16 tensile
			2.54	C2	316sstl	16 tensile
			5.80	C1	316sstl	16 PIE and 16 TPP disk
medium	164A & 164B	B	52.23	B2	Inconel	16 tensile
			55.73	B1	316sstl	16 tensile
low	164A	A	59.23	A2	Inconel	16 tensile
			62.74	A1	316sstl	16 tensile

Table 3. CSM-10584 Specimen Identification.

Specimen Type	Specimen Serial No	Heating Identification
SS Tensile Batch 1	1	A-1 Tensile sample smear
SS Tensile Batch 1	2	
SS Tensile Batch 1	3	
SS Tensile Batch 1	4	
SS Tensile Batch 3	145	
SS Tensile Batch 3	146	
SS Tensile Batch 3	147	
SS Tensile Batch 3	148	
SS Tensile Batch 3	161	

Specimen Type	Specimen Serial No	Heating Identification
SS Tensile Batch 3	162	
SS Tensile Batch 3	163	
SS Tensile Batch 3	164	
SS Tensile Batch 4	217	
SS Tensile Batch 4	218	
SS Tensile Batch 4	219	
SS Tensile Batch 4	220	
Inconel Tensile Batch 1	13	A-2 Tensile sample smear
Inconel Tensile Batch 1	14	
Inconel Tensile Batch 1	15	
Inconel Tensile Batch 1	16	
Inconel Tensile Batch 2	73	
Inconel Tensile Batch 2	74	
Inconel Tensile Batch 2	75	
Inconel Tensile Batch 2	76	
Inconel Tensile Batch 2	89	
Inconel Tensile Batch 2	90	
Inconel Tensile Batch 2	91	
Inconel Tensile Batch 2	92	
Inconel Tensile Batch 4	229	
Inconel Tensile Batch 4	230	
Inconel Tensile Batch 4	231	
Inconel Tensile Batch 4	232	
SS Tensile Batch 1	5	B-1 Tensile sample smear
SS Tensile Batch 1	6	
SS Tensile Batch 1	7	
SS Tensile Batch 1	8	
SS Tensile Batch 3	153	
SS Tensile Batch 3	154	
SS Tensile Batch 3	155	
SS Tensile Batch 3	156	
SS Tensile Batch 3	157	
SS Tensile Batch 3	158	
SS Tensile Batch 3	159	
SS Tensile Batch 3	160	
SS Tensile Batch 4	221	

Specimen Type	Specimen Serial No	Heating Identification
SS Tensile Batch 4	222	
SS Tensile Batch 4	223	
SS Tensile Batch 4	224	
Inconel Tensile Batch 1	17	B-2 Tensile sample smear
Inconel Tensile Batch 1	18	
Inconel Tensile Batch 1	19	
Inconel Tensile Batch 1	20	
Inconel Tensile Batch 2	81	
Inconel Tensile Batch 2	82	
Inconel Tensile Batch 2	83	
Inconel Tensile Batch 2	84	
Inconel Tensile Batch 2	85	
Inconel Tensile Batch 2	86	
Inconel Tensile Batch 2	87	
Inconel Tensile Batch 2	88	
Inconel Tensile Batch 4	233	
Inconel Tensile Batch 4	234	
Inconel Tensile Batch 4	235	
Inconel Tensile Batch 4	236	
Small SS TEM Batch 1	49	C-1 PIE disk stack 1
Small SS TEM Batch 1	50	
Small SS TEM Batch 1	51	
Small SS TEM Batch 1	52	
Small SS TEM Batch 3	289	C-1 PIE disk stack 2
Small SS TEM Batch 3	290	
Small SS TEM Batch 3	206	
Small SS TEM Batch 3	208	
Small SS TEM Batch 3	201	C-1 PIE disk stack 3
Small SS TEM Batch 3	202	
Small SS TEM Batch 3	203	
Small SS TEM Batch 3	204	
Small SS TEM Batch 4	265	C-1 PIE disk stack 4
Small SS TEM Batch 4	266	
Small SS TEM Batch 4	267	
Small SS TEM Batch 4	268	
Large SS TEM Batch 1	25	C-1 TPP disk

Specimen Type	Specimen Serial No	Heating Identification
Large SS TEM Batch 1	26	
Large SS TEM Batch 1	27	
Large SS TEM Batch 1	28	
Large SS TEM Batch 3	181	
Large SS TEM Batch 3	182	
Large SS TEM Batch 3	183	
Large SS TEM Batch 3	184	
Large SS TEM Batch 3	177	
Large SS TEM Batch 3	178	
Large SS TEM Batch 3	179	
Large SS TEM Batch 3	180	
Large SS TEM Batch 4	241	
Large SS TEM Batch 4	242	
Large SS TEM Batch 4	243	
Large SS TEM Batch 4	244	
SS Tensile Batch 1	9	C-2 SS Tensile sample smear
SS Tensile Batch 1	10	
SS Tensile Batch 1	11	
SS Tensile Batch 1	12	
SS Tensile Batch 3	149	
SS Tensile Batch 3	150	
SS Tensile Batch 3	151	
SS Tensile Batch 3	152	
SS Tensile Batch 3	165	
SS Tensile Batch 3	166	
SS Tensile Batch 3	167	
SS Tensile Batch 3	168	
SS Tensile Batch 4	225	
SS Tensile Batch 4	226	
SS Tensile Batch 4	227	
SS Tensile Batch 4	228	
Inconel Tensile Batch 1	21	C-3 Inconel Tensile sample smear
Inconel Tensile Batch 1	22	
Inconel Tensile Batch 1	23	
Inconel Tensile Batch 1	24	
Inconel Tensile Batch 2	77	

Specimen Type	Specimen Serial No	Heating Identification
Inconel Tensile Batch 2	78	
Inconel Tensile Batch 2	79	
Inconel Tensile Batch 2	80	
Inconel Tensile Batch 2	93	
Inconel Tensile Batch 2	94	
Inconel Tensile Batch 2	95	
Inconel Tensile Batch 2	96	
Inconel Tensile Batch 4	237	
Inconel Tensile Batch 4	238	
Inconel Tensile Batch 4	239	
Inconel Tensile Batch 4	240	
Small IN TEM Batch 1	61	C4 - PIE disk stack 1
Small IN TEM Batch 1	62	
Small IN TEM Batch 1	63	
Small IN TEM Batch 1	64	
Small IN TEM Batch 2	121	C4 - PIE disk stack 2
Small IN TEM Batch 2	122	
Small IN TEM Batch 2	123	
Small IN TEM Batch 2	124	
Small IN TEM Batch 2	137	C4 - PIE disk stack 3
Small IN TEM Batch 2	138	
Small IN TEM Batch 2	139	
Small IN TEM Batch 2	140	
Small IN TEM Batch 4	281	C4 - PIE disk stack 4
Small IN TEM Batch 4	282	
Small IN TEM Batch 4	283	
Small IN TEM Batch 4	284	
Large IN TEM Batch 1	37	C-4 TPP disk
Large IN TEM Batch 1	38	
Large IN TEM Batch 1	39	
Large IN TEM Batch 1	40	
Large IN TEM Batch 2	97	
Large IN TEM Batch 2	98	
Large IN TEM Batch 2	99	
Large IN TEM Batch 2	100	
Large IN TEM Batch 2	113	

Specimen Type	Specimen Serial No	Heating Identification
Large IN TEM Batch 2	114	
Large IN TEM Batch 2	115	
Large IN TEM Batch 2	116	
Large IN TEM Batch 4	253	
Large IN TEM Batch 4	254	
Large IN TEM Batch 4	255	
Large IN TEM Batch 4	256	
Small SS TEM Batch 1	53	D1 - PIE disk stack 1
Small SS TEM Batch 1	54	
Small SS TEM Batch 1	55	
Small SS TEM Batch 1	56	
Small SS TEM Batch 3	193	D1 - PIE disk stack 2
Small SS TEM Batch 3	194	
Small SS TEM Batch 3	195	
Small SS TEM Batch 3	196	
Small SS TEM Batch 3	209	D1 - PIE disk stack 3
Small SS TEM Batch 3	210	
Small SS TEM Batch 3	211	
Small SS TEM Batch 3	212	
Small SS TEM Batch 4	269	D1 - PIE disk stack 4
Small SS TEM Batch 4	270	
Small SS TEM Batch 4	271	
Small SS TEM Batch 4	272	
Large SS TEM Batch 1	29	D1 - TPP disk
Large SS TEM Batch 1	30	
Large SS TEM Batch 1	31	
Large SS TEM Batch 1	32	
Large SS TEM Batch 3	169	
Large SS TEM Batch 3	170	
Large SS TEM Batch 3	171	
Large SS TEM Batch 3	172	
Large SS TEM Batch 3	185	
Large SS TEM Batch 3	186	
Large SS TEM Batch 3	187	
Large SS TEM Batch 3	188	
Large SS TEM Batch 4	245	

Specimen Type	Specimen Serial No	Heating Identification
Large SS TEM Batch 4	246	
Large SS TEM Batch 4	247	
Large SS TEM Batch 4	248	
Small IN TEM Batch 1	65	D2 - PIE disk stack 1
Small IN TEM Batch 1	66	
Small IN TEM Batch 1	67	
Small IN TEM Batch 1	68	
Small IN TEM Batch 2	125	D2 - PIE disk stack 2
Small IN TEM Batch 2	126	
Small IN TEM Batch 2	127	
Small IN TEM Batch 2	128	
Small IN TEM Batch 2	141	D2 - PIE disk stack 3
Small IN TEM Batch 2	142	
Small IN TEM Batch 2	143	
Small IN TEM Batch 2	144	
Small IN TEM Batch 4	277	D2 - PIE disk stack 4
Small IN TEM Batch 4	278	
Small IN TEM Batch 4	279	
Small IN TEM Batch 4	280	
Large IN TEM Batch 1	41	D2 - TPP disk
Large IN TEM Batch 1	42	
Large IN TEM Batch 1	43	
Large IN TEM Batch 1	44	
Large IN TEM Batch 2	101	
Large IN TEM Batch 2	102	
Large IN TEM Batch 2	103	
Large IN TEM Batch 2	104	
Large IN TEM Batch 2	117	
Large IN TEM Batch 2	118	
Large IN TEM Batch 2	119	
Large IN TEM Batch 2	120	
Large IN TEM Batch 4	257	
Large IN TEM Batch 4	258	
Large IN TEM Batch 4	259	
Large IN TEM Batch 4	260	
Small SS TEM Batch 1	57	E1 - PIE disk stack 1

Specimen Type	Specimen Serial No	Heating Identification
Small SS TEM Batch 1	58	
Small SS TEM Batch 1	59	
Small SS TEM Batch 1	60	
Small SS TEM Batch 3	197	
Small SS TEM Batch 3	198	E1 - PIE disk stack 2
Small SS TEM Batch 3	199	
Small SS TEM Batch 3	200	
Small SS TEM Batch 3	213	
Small SS TEM Batch 3	214	E1 - PIE disk stack 3
Small SS TEM Batch 3	215	
Small SS TEM Batch 3	216	
Small SS TEM Batch 4	273	
Small SS TEM Batch 4	274	E1 - PIE disk stack 4
Small SS TEM Batch 4	275	
Small SS TEM Batch 4	276	
Large SS TEM Batch 1	33	
Large SS TEM Batch 1	34	
Large SS TEM Batch 1	35	
Large SS TEM Batch 1	36	
Large SS TEM Batch 3	173	
Large SS TEM Batch 3	174	
Large SS TEM Batch 3	175	
Large SS TEM Batch 3	176	E1 - TPP disk
Large SS TEM Batch 3	189	
Large SS TEM Batch 3	190	
Large SS TEM Batch 3	191	
Large SS TEM Batch 3	192	
Large SS TEM Batch 4	249	
Large SS TEM Batch 4	250	
Large SS TEM Batch 4	251	
Large SS TEM Batch 4	252	
Small IN TEM Batch 1	69	
Small IN TEM Batch 1	70	E2 - PIE disk stack 1
Small IN TEM Batch 1	71	
Small IN TEM Batch 1	72	
Small IN TEM Batch 2	129	E2 - PIE disk stack 2

Specimen Type	Specimen Serial No	Heating Identification
Small IN TEM Batch 2	130	
Small IN TEM Batch 2	131	
Small IN TEM Batch 2	132	
Small IN TEM Batch 2	133	E2 - PIE disk stack 3
Small IN TEM Batch 2	134	
Small IN TEM Batch 2	135	
Small IN TEM Batch 2	136	
Small IN TEM Batch 4	285	E2 - PIE disk stack 4
Small IN TEM Batch 4	286	
Small IN TEM Batch 4	287	
Small IN TEM Batch 4	288	
Large IN TEM Batch 1	45	E2 - TPP disk
Large IN TEM Batch 1	46	
Large IN TEM Batch 1	47	
Large IN TEM Batch 1	48	
Large IN TEM Batch 2	105	
Large IN TEM Batch 2	106	
Large IN TEM Batch 2	107	
Large IN TEM Batch 2	108	
Large IN TEM Batch 2	109	
Large IN TEM Batch 2	110	
Large IN TEM Batch 2	111	
Large IN TEM Batch 2	112	
Large IN TEM Batch 4	261	
Large IN TEM Batch 4	262	
Large IN TEM Batch 4	263	
Large IN TEM Batch 4	264	

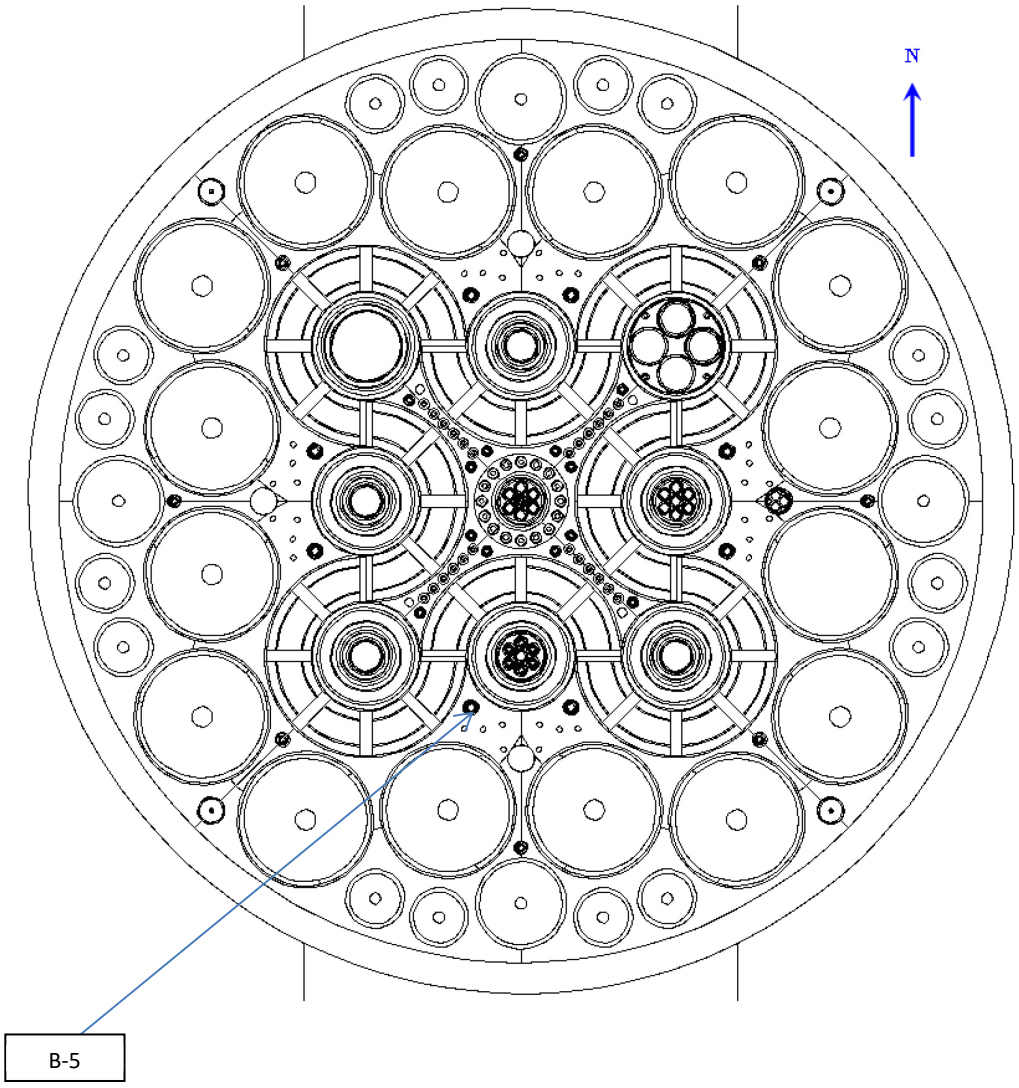

Figure 1. Radial cross section view of the ATR core, B-5 irradiation test position.

Table 4. Specimen material composition in wt% [3]**.**

Element	316 stainless steel	Inconel
Ni	12	50-55
Cr	17	17-21
Fe	balance	balance
Nb & Ta	n/a	4.75-5.50
Mo	2.5	2.8-3.3
Ti	n/a	0.65-1.15
Al	n/a	0.2-0.8
Co	n/a	1 max
C	0.08	0.08 max
Mn	2	0.35 max
Si	1	0.35 max
K	n/a	0.015 max
S	0.030	0.015 max
B	n/a	0.006 max
Cu	n/a	0.30 max
P	0.045	n/a

3. RESULTS OF LITERATURE SEARCHES AND OTHER BACKGROUND DATA

The general purpose Monte Carlo N-Particle transport code, MCNP [4][5], was used to model and evaluate the CSM experiment. ORIGEN2 [6] was used to calculate the source term for the experiment. The model for the CSM experiment is based on the drawings listed in Table 5. Nominal dimensions for the specimen, holders, and capsules are used in the model.

Table 5. List of drawings for CSM experiment.

INL Drawing	Drawing Title
605840 REV. 0	ATR NATIONAL SCIENTIFIC USER FACILITIES (NSUF) COLORADO SCHOOL OF MINES (CSM-10584) CYCLE 164A-1 STACKUP INSTALLATION
605842 REV. 0	ATR NATIONAL SCIENTIFIC USER FACILITIES (NSUF) COLORADO SCHOOL OF MINES (CSM-10584) B5 EXPERIMENT TRANSPORT CAPSULES ASSEMBLY AND DETAILS

INL Drawing	Drawing Title
605843 REV. 0	ATR NATIONAL SCIENTIFIC USER FACILITIES (NSUF) COLORADO SCHOOL OF MINES (CSM-10584) B5 EXPERIMENT SPECIMEN HOLDERS AND BASKETS ASSMEBLY AND DETAILS
605844 REV. 0	ATR NATIONAL SCIENTIFIC USER FACILITIES (NSUF) COLORADO SCHOOL OF MINES (CSM-10584) TENSILE, PIE AND TPP TEM SPECIMEN DETAILS
605845 REV. 0	ATR NATIONAL SCIENTIFIC USER FACILITIES (NSUF) COLORADO SCHOOL OF MINES (CSM-10584) CYCLE 164B-1 STACKUP INSTALLATION
035140	ATR REAC “O”& “Y”FLOW RESTRICTORS ASSEMBLY AND DETAILS

3.1. Data Libraries

The standard MCNP cross-section data libraries [4][5], provided with MCNP, were used to calculate the reactivity worth, heating rates, neutron flux, and DPA for the CSM experiment. The ATRXS library [6] was used in the ORIGEN2 calculations. The ENDF/B-VII library was used in the MCNP models.

4. ASSUMPTIONS

The following assumptions were used in this analysis:

1. The as-run analysis was performed based on nominal lobe powers provided in Appendix B for 164A and 164B.

2. An increase in lobe power for any lobe affecting the south region of the reactor will result in a change in test heating. Therefore, any power changes must be accounted for as a function of the ratio of the actual south lobe power to the analyzed south lobe source power.

3. The south lobe power is defined by the average of the SW, SE, and C lobe powers; S=(SW+SE+C)/3.

4. Heating rate values reported for CSM include energy deposition from prompt neutrons, prompt gammas, and delayed fission product gammas.

5. MCNP models describing the average core loading and control drum/neck shim positioning were used for this analysis.

5. COMPUTER CODE VALIDATION

The computer code, MCNP, is listed in the INL Enterprise Architecture (EA) Repository and is accepted as a qualified scientific and engineering analysis software. Table 6 lists the version and EA identification (ID) for the computer code used to perform the calculations and analyses documented by this ECAR.

Table 6. INL qualified analysis software, version, and EA ID.

Code Name	Version	V&V Tracking Number
MCNP	5 (Release 1.60)	234728 [7]
ORIGEN2	2.2	201298 [12]

MCNP has been verified and validated (V&V'd) for use at INL, as documented by the MCNP Version 5, Release 1.60 software management report [7]. The MCNP Version 5, Release 1.60 V&V process was performed and accepted on high-performance computing systems at INL. The computer configurations listed in Table 7 were used to perform the MCNP5 calculations reported in this ECAR.

Table 7. Computer configurations for INL-qualified MCNP5 and ORIGEN2 installations.

Computer	Processor	Operating System

34,992 core
 	
SGI ICE X distributed memory cluster
 	
(a.k.a. falcon computer system)
	2 Login Nodes
	falcon1, falcon2
	• 2 Intel Xeon E5-2695 v4 CPUs
	  ○ Broadwell chipset
	  ○ 18 cores per CPU
	  ○ 2.10 GHz
	• 128GB of RAM
	• FDR InfiniBand Interconnect
	972 Compute Nodes with:
	• 2 Intel Xeon E5-2695 v4 CPUs
	  ○ Broadwell chipset
	  ○ 18 cores per CPU
	  ○ 2.10 GHz
	• 128GB of RAM
	• FDR InfiniBand Interconnect
		SUSE Linux Enterprise Server 11 SP4

6. DISCUSSION / ANALYSIS

MCNP was used to calculate the heating rates, flux, and DPA for CSM. ORIGEN2 was used to calculate the decay heat, radionuclide inventory, and radionuclide source term versus cooling time for CSM.

6.1. Heating Normalization Factors

MCNP reports tally results normalized per source particle. The MCNP Type 6 energy deposition tally results or Type 7 fission energy deposition tally results are used to calculate HGRs. The MCNP Tally Type 6 has units of MeV/g per source particle (fission neutron for prompt neutron, gamma heating, and fission heating). The heating normalization factor (HNF) is defined by Equation (1).

$$HNF = \left(\frac{2.43\ fission\ neutrons}{fission}\right)\left(\frac{fission}{200\ MeV}\right)\left(\frac{1 \times 10^6\ W}{1\ MW}\right) \quad (1)$$

$$HNF = 1.215 \times 10^4 \frac{fission\ neutrons \cdot W}{MW \cdot MeV}$$

The HGR values are calculated using the MCNP Tally Type 6 results, the HNF, and the ATR core power. Prompt neutron and gamma heating rates (PHRs) are calculated using Equation (2).

$$PHR = \left(type\ 6\ tally \frac{MeV}{g \cdot fission\ neutron}\right)\left(1.215 \times 10^4 \frac{fission\ neutrons \cdot W}{MW \cdot MeV}\right)(Core\ Power\ MW)$$

$$PHR = (f6)(HNF)(Core\ Power)\frac{W}{g} \quad (2)$$

MCNP reports tally results normalized per source particle. The heating tallies have units of MeV/g per fission neutron. The MCNP Type 6 energy deposition tally results are used to calculate delayed gamma HGRs. The MCNP Tally Type 6 has units of MeV/g per source particle (per delayed fission product gamma for delayed fission product gamma heating). The delayed gamma heating normalization factor (DNF) is defined by Equation (3) using 8.9603 delayed fission photons per fission.

$$DFN = \left(\frac{8.9603\ delayed\ photons}{fission}\right)\left(\frac{fission}{200\ MeV}\right)\left(\frac{1 \times 10^6\ W}{MW}\right)$$

$$DFN = 4.480 \times 10^4 \frac{delayed\ photons \cdot W}{MW_{core\ power} \cdot MeV} \quad (3)$$

The HGR values are calculated using the MCNP Tally Type 6 or Type 7 results, the HNF, and the ATR core power. The delayed fission product heating rate (DHR) is calculated using Equation (4).

$$DHR = \left(type\ 6\ tally \frac{MeV}{g \cdot source\ photon}\right)\left(4.480 \times 10^4 \frac{delayed\ photons \cdot W}{MW \cdot MeV}\right)(Core\ Power\ MW)$$

$$DHR = (f6)(DNF)(Core\ Power)\frac{W}{g} \quad (4)$$

6.2. Neutron Flux Normalization Factor

MCNP reports tally results normalized per source particle. The MCNP Type 4 flux tally results are used to generate neutron flux input values for the ORIGEN2 activation calculations. The MCNP Tally Type 4 (for neutrons) has units of neutrons/cm^2 per source neutron. The neutron flux conversion factor (NFCF) is defined by Equation (5).

$$NFCF = \left(\frac{2.43\ fission\ neutrons}{fission}\right)\left(\frac{fission}{200\ MeV}\right)\left(\frac{6.24151 \times 10^{18}\ MeV}{MW_{Core\ Power} \cdot s}\right)$$

$$NFCF = 7.583 \times 10^{16}\frac{fission\ neutrons}{MW_{Core\ Power} \cdot s} \tag{5}$$

The neutron flux values are calculated using the MCNP tally type 4 results, the NFCF, and the ATR core power. The neutron flux is calculated using Equation (6).

$$\phi_{\text{neutron}} = \left(\text{type 4 tally}\frac{\text{neutrons}}{\text{cm}^2 - \text{fission neutron}}\right)\left(7.583 \times 10^{16}\frac{\text{fission neutrons}}{\text{MW}_{\text{core power}} - \text{s}}\right)(\text{Core Power MW})$$

$$\phi_{\text{neutron}} = (\text{f4})(7.583 \times 10^{16})(\text{Core Power})\frac{\text{neutrons}}{\text{cm}^2 - \text{s}} \tag{6}$$

6.3. MCNP DPA Calculations

The DPA rate in a material is estimated by using a tally multiplier card with a standard flux tally in MCNP. The tally multiplier card applied to a flux tally calculates the reaction rate, which is defined as the quantity:

$$C\int \Phi(E)R_m(E)dE \tag{7}$$

Where,

C = multiplicative constant

Φ(E) = energy dependent flux

$R_m(E)$ = energy dependent reaction rate of interest (ENDF/B-VII damage cross-section)

The quantity defined in Equation 12 is the total damage energy rate for the material. Assigning the quantity $\eta/2E_d$ to the constant C in Equation (7) results in:

$$\text{DPA rate} = C \int \Phi(E) R_m(E) dE \tag{8}$$

Where,

$C = \eta/2Ed$

$\int \Phi(E)\, Rm(E) dE$ = total damage energy.

The DPA cross section would be calculated by:

$$\sigma_{DPA} = \frac{\int \Phi(E) R_m(E) dE}{\int \Phi(E) dE} \tag{9}$$

The resulting cross section has units of MeV-barns per atom.

Therefore, using the MCNP tallies, the DPA rate is calculated by converting the flux multiplier result to units of MeV-cm^2 per atom, then multiplying by the efficiency (η) and dividing by 2 times the cutoff energy (E_d) then using the standard tally conversion factors:

$$DPA\ rate = FMn \times \frac{\eta}{2E_d} \times Flux\ Normalization\ Factor \times Core\ Power \tag{10}$$

7. RESULTS

7.1. Heating Results

Heating rates were generated assuming nominal core power configurations for cycle 164A and 164B [1]. The source power is assumed to be scaled to a nominal south power of 23.5 MW and 22.9 MW, for ATR cycles 164A and 164B, respectively. The heating results include prompt neutron and gamma heating, as well as delayed gamma heating. Delayed gamma heating was explicitly calculated using a separate MCNP model. The results for the heat generation rate calculations are presented in Table 8 - Table 9.

Table 8. Heating in CSM specimen and capsule components.

		Total Heating	164A W/g	164B W/g
Capsule E Low DPA Disk Specimen[1] (bottom of experiment)	E2	PIE disk stack 1	2.0	--
		PIE disk stack 2	2.0	--
		PIE disk stack 3	2.0	--
		PIE disk stack 4	2.0	--
		PIE holder	1.8	--
		TPP disk[2]	2.2	--
		TPP holder	1.7	--
		specimen holder	1.5	--
	E1	PIE disk stack 1	2.3	--
		PIE disk stack 2	2.3	--
		PIE disk stack 3	2.1	--
		PIE disk stack 4	2.1	--
		PIE holder	2.2	--
		TPP disk[2]	2.3	--
		TPP holder	2.1	--
		specimen holder	1.8	--
		spring	2.6	--
		capsule E 304 SSTL	2.3	--
Capsule D Medium DPA Disk Specimen	D2	PIE disk stack 1	3.1	3.1
		PIE disk stack 2	3.2	3.2
		PIE disk stack 3	2.9	2.9
		PIE disk stack 4	2.9	2.9
		PIE holder	2.8	2.8
		TPP disk[2]	3.2	3.2
		TPP holder	2.6	2.7
		specimen holder	2.3	2.3
	D1	PIE disk stack 1	3.1	3.2
		PIE disk stack 2	3.2	3.2
		PIE disk stack 3	3.1	3.1
		PIE disk stack 4	3.0	3.1
		PIE holder	3.2	3.2
		TPP disk[2]	3.3	3.3
		TPP holder	3.0	3.0

		Total Heating	164A W/g	164B W/g
		specimen holder	2.6	2.6
		spring	3.5	3.5
		capsule D 304 SSTL	3.3	3.3
		bottom sstl spacer	5.7	5.7
Capsule C High DPA Disk and Tensile Specimen	C4	PIE disk stack 1	8.4	8.5
		PIE disk stack 2	8.4	8.5
		PIE disk stack 3	7.9	8.0
		PIE disk stack 4	8.3	8.3
		PIE holder	7.6	7.6
		TPP disk[2]	8.2	8.3
		TPP holder	6.9	6.9
		specimen holder	6.0	6.0
	C3	Tensile sample smear[2]	8.0	8.0
		Tensile holder spacer	5.8	5.8
		Tensile specimen holder	6.0	6.0
	C2	Tensile sample smear[2]	7.3	7.3
		Tensile holder spacer	5.7	5.8
		Tensile specimen holder	5.9	6.0
	C1	PIE disk stack 1	7.6	7.6
		PIE disk stack 2	7.7	7.7
		PIE disk stack 3	7.2	7.3
		PIE disk stack 4	7.3	7.3
		PIE holder	7.6	7.6
		TPP disk[2]	7.4	7.4
		TPP holder	6.8	6.8
		specimen holder	5.9	5.9
		spring	7.4	7.4
		capsule C 304 SSTL	8.0	8.0
		top sstl spacer	5.4	5.4
Capsule B Medium DPA Tensile Specimen	B2	Tensile sample smear[2]	2.9	2.9
		Tensile holder spacer	2.0	2.0
		Tensile specimen holder	2.2	2.2
	B1	Tensile sample smear[2]	2.2	2.2
		Tensile holder spacer	1.7	1.7

		Total Heating	164A W/g	164B W/g
		Tensile specimen holder	1.8	1.9
		spring	2.0	2.0
		capsule B 304 SSTL	2.6	2.6
Capsule A Low DPA Tensile Specimen[1] (top of experiment)	A2	Tensile sample smear[2]	1.8	--
		Tensile holder spacer	1.3	--
		Tensile specimen holder	1.4	--
	A1	Tensile sample smear[2]	1.3	--
		Tensile holder spacer	0.9	--
		Tensile specimen holder	1.1	--
		spring	1.1	--
		capsule B 304 SSTL	1.6	--

1) Capsule Removed after 164A
2) Refers to the stack of tensile samples in each capsule, it is not the average

Table 9. Heating in B-5 assembly.

Elevation (cm from core center line)	Al Basket		H2O inside basket		H2O outside basket		1/4in Be Reflector	
	164A	164B	164A	164B	164A	164B	164A	164B
	W/g	W/g	W/g	W/g	W/g	W/g	W/g	W/g
-63.48	1.3	1.3	2.1	2.1	2.1	2.1	1.2	1.2
-60.73	1.5	1.5	2.7	2.7	2.7	2.7	1.5	1.5
-57.23	2.0	2.0	3.8	3.9	3.9	3.9	2.0	2.0
-53.73	2.4	2.4	4.7	4.7	4.7	4.8	2.5	2.5
-50.23	2.7	2.8	5.5	5.5	5.5	5.6	2.8	2.9
-27.03	4.9	4.9	10.1	10.1	10.1	10.2	5.2	5.2
-3.80	6.2	6.3	12.8	12.8	12.8	12.9	6.5	6.5
-0.51	6.3	6.3	12.8	12.9	12.9	12.9	6.5	6.6
2.54	6.2	6.3	12.8	12.8	12.9	12.9	6.5	6.6
5.80	6.2	6.2	12.7	12.8	12.8	12.8	6.5	6.5
29.00	4.7	4.7	9.6	9.6	9.7	9.7	4.9	4.9
52.23	2.3	2.3	4.6	4.6	4.6	4.6	2.4	2.4
55.73	1.9	1.9	3.8	3.8	3.8	3.9	2.0	2.0
59.23	1.5	1.5	3.0	3.0	3.0	3.0	1.6	1.6
62.74	1.1	1.1	2.1	2.1	2.1	2.1	1.1	1.1
65.74	0.8	0.8	1.4	1.4	1.4	1.4	0.8	0.8

7.2. DPA Results

The projected cumulative DPA was calculated for the CSM sample specimen. The efficiency was assumed to be 80%. The cutoff energy for 316 stainless steel and Inconel was calculated to be 4.03×10^{-5} MeV and 4.05×10^{-5} MeV, respectively. Table 10 reports the projected DPA for the CSM experiment after two ATR cycles of irradiation. The calculated DPA ranges represent a south source power of 22.5 MW (164A) and 22.6 MW (164B) and a number of irradiation days amounting to 54.9 days for Cycle 164A and 64.1 days for Cycle 164B.

Table 10. Projected total DPA after irradiation.

	316 Stainless Steel Specimen	Total DPA	Inconel Specimen	Total DPA	Max DPA	Min DPA
Capsule E[1]	PIE disk stack 1	0.19	PIE disk stack 1	0.12	0.20	0.11
	PIE disk stack 2	0.18	PIE disk stack 2	0.11		
	PIE disk stack 3	0.18	PIE disk stack 3	0.12		
	PIE disk stack 4	0.17	PIE disk stack 4	0.12		
	TPP disk[2]	0.20	TPP disk[2]	0.14		
Capsule D	PIE disk stack 1	0.65	PIE disk stack 1	0.56	0.67	0.51
	PIE disk stack 2	0.65	PIE disk stack 2	0.56		
	PIE disk stack 3	0.60	PIE disk stack 3	0.51		
	PIE disk stack 4	0.62	PIE disk stack 4	0.54		
	TPP disk[2]	0.67	TPP disk[2]	0.57		
Capsule C	Tensile sample smear[2]	1.58	PIE disk stack 1	1.58	1.63	1.49
	PIE disk stack 1	1.63	PIE disk stack 2	1.60		
	PIE disk stack 2	1.59	PIE disk stack 3	1.56		
	PIE disk stack 3	1.53	PIE disk stack 4	1.54		
	PIE disk stack 4	1.49	TPP disk[2]	1.56		
	TPP disk[2]	1.55	Tensile sample smear[2]	1.57		
Capsule B	Tensile sample smear[2]	0.55	Tensile sample smear[2]	0.47	0.55	0.47
Capsule A[1]	Tensile sample smear[2]	0.17	Tensile sample smear[2]	0.11	0.17	0.11

1) Capsule Removed after 164A
2) Refers to the stack of tensile samples in each capsule, it is not the average

7.3.Decay Heat

Table 11 provides the decay heat (in watts) for each of the CSM capsules immediately after the applicable cycle or combined cycles end, as well as additional time periods over the subsequent 90 days.

Table 11. Decay heat analysis for CSM.

Capsule	# Days of Irradiation	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	90 DAYS
		Watts	Watts	Watts	Watts	Watts	Watts	Watts	Watts	Watts
Capsule E*	54.9	3.94E+00	2.93E-01	1.47E-01	6.88E-02	4.71E-02	4.21E-02	3.31E-02	2.21E-02	1.56E-02
Capsule D	119	3.96E+00	3.11E-01	1.65E-01	8.64E-02	6.32E-02	5.69E-02	4.53E-02	3.11E-02	2.26E-02
Capsule C	119	7.32E+00	5.46E-01	2.92E-01	1.55E-01	1.12E-01	1.01E-01	8.06E-02	5.53E-02	4.04E-02
Capsule B	119	3.42E+00	2.88E-01	1.51E-01	7.82E-02	5.80E-02	5.22E-02	4.16E-02	2.86E-02	2.09E-02
Capsule A*	54.9	3.40E+00	2.71E-01	1.34E-01	6.21E-02	4.31E-02	3.86E-02	3.04E-02	2.03E-02	1.43E-02
*Capsule removed after cycle 164A										

7.4.Radionuclide Source Term

The source term for the CSM experiment was evaluated using the neutron flux for the experiment in the B-5 position. The peak MCNP calculated neutron flux, scaled to a south power of 22.6 MW, is $1.18 \times 10^{15} n/cm^2 \cdot s$. This flux value was used to calculate all radiological source terms and the decay heat generation rates for the CSM experiment.

Table 12 provides the summary of the radionuclide activity (in Curies) for each of the CSM capsules (which includes all material components: specimen, capsule, springs, and specimen holders) immediately after shutdown and for an additional 90 days. Table 13 - Table 17 display the isotopic data for each CSM capsule after their respective irradiation times.

Table 12. Source term summary for CSM.

Capsule	# Days of Irradiation	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	90 DAYS
		Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci
Capsule E*	54.9	3.34E+02	1.25E+02	1.14E+02	1.06E+02	9.16E+01	7.78E+01	5.41E+01	2.83E+01	1.59E+01
Capsule D	119	3.66E+02	1.56E+02	1.45E+02	1.38E+02	1.19E+02	1.02E+02	7.16E+01	3.91E+01	2.33E+01
Capsule C	119	6.65E+02	2.76E+02	2.57E+02	2.43E+02	2.10E+02	1.80E+02	1.27E+02	6.90E+01	4.12E+01
Capsule B	119	3.23E+02	1.43E+02	1.32E+02	1.25E+02	1.09E+02	9.27E+01	6.53E+01	3.56E+01	2.13E+01
Capsule A*	54.9	2.94E+02	1.14E+02	1.04E+02	9.69E+01	8.35E+01	7.09E+01	4.93E+01	2.58E+01	1.45E+01
*Capsule removed after cycle 164A										

Table 13. Radionuclide source term for CSM capsule A after 54.9 days of irradiation (Ci).

Capsule A - 54.9 days irradiation									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	90 DAYS
ISOTOPE	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci
H 3	7.32E-09	7.32E-09	7.32E-09	7.32E-09	7.31E-09	7.31E-09	7.29E-09	7.25E-09	7.22E-09
H 4	7.57E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

Capsule A - 54.9 days irradiation									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	90 DAYS
ISOTOPE	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci
HE 6	1.26E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LI 8	3.04E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BE 8	5.21E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BE 10	8.85E-11	8.85E-11	8.85E-11	8.85E-11	8.85E-11	8.85E-11	8.85E-11	8.85E-11	8.85E-11
BE 11	7.00E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B 12	2.29E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C 14	3.23E-09	3.23E-09	3.23E-09	3.23E-09	3.23E-09	3.23E-09	3.23E-09	3.23E-09	3.23E-09
C 15	3.36E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
O 19	2.40E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
F 20	9.06E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NE 23	9.41E-03	2.65E-17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NA 24	1.50E+00	1.46E+00	1.19E+00	4.93E-01	6.34E-04	2.69E-07	5.30E-15	1.88E-29	0.00E+00
NA 24M	2.01E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NA 25	5.68E-03	4.60E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MG 27	7.05E+00	7.83E-01	2.01E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MG 28	2.51E-08	2.46E-08	2.12E-08	1.13E-08	9.56E-11	3.65E-13	1.08E-18	4.67E-29	0.00E+00
AL 28	1.68E+02	1.56E-02	2.13E-08	1.13E-08	9.58E-11	3.65E-13	1.08E-18	0.00E+00	0.00E+00
AL 29	1.77E-03	7.31E-05	2.50E-17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AL 30	1.72E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SI 31	1.72E-02	1.51E-02	4.59E-03	3.02E-05	8.82E-22	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SI 32	1.95E-12	1.95E-12	1.95E-12	1.95E-12	1.95E-12	1.95E-12	1.95E-12	1.95E-12	1.95E-12
P 32	3.68E-03	3.68E-03	3.65E-03	3.51E-03	2.62E-03	1.87E-03	8.60E-04	2.01E-04	4.70E-05
P 33	1.15E-07	1.15E-07	1.14E-07	1.12E-07	9.44E-08	7.77E-08	4.99E-08	2.17E-08	9.45E-09
P 34	8.45E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
S 35	3.40E-05	3.40E-05	3.39E-05	3.37E-05	3.21E-05	3.04E-05	2.68E-05	2.12E-05	1.67E-05
S 37	2.54E-07	4.18E-09	3.61E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CL 36	1.86E-11	1.86E-11	1.86E-11	1.86E-11	1.86E-11	1.86E-11	1.86E-11	1.86E-11	1.86E-11
CL 38	1.42E-10	8.12E-11	5.32E-13	3.20E-22	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CL 38M	1.69E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AR 39	6.99E-08	6.99E-08	6.99E-08	6.99E-08	6.99E-08	6.99E-08	6.99E-08	6.99E-08	6.98E-08
AR 41	1.13E-08	9.33E-09	1.69E-09	1.25E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
K 40	1.56E-13	1.56E-13	1.56E-13	1.56E-13	1.56E-13	1.56E-13	1.56E-13	1.56E-13	1.56E-13
K 42	1.05E-04	1.02E-04	7.94E-05	2.74E-05	8.52E-09	6.90E-13	6.27E-18	6.26E-18	6.25E-18
K 43	5.08E-11	5.00E-11	4.36E-11	2.43E-11	2.94E-13	1.70E-15	1.31E-20	3.36E-30	0.00E+00
K 44	8.99E-12	3.49E-12	7.06E-16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CA 45	2.74E-07	2.74E-07	2.74E-07	2.73E-07	2.66E-07	2.58E-07	2.41E-07	2.12E-07	1.87E-07
CA 47	5.73E-09	5.72E-09	5.56E-09	4.92E-09	1.97E-09	6.75E-10	5.85E-11	5.98E-13	6.10E-15
SC 46	6.16E-05	6.16E-05	6.15E-05	6.11E-05	5.82E-05	5.49E-05	4.81E-05	3.75E-05	2.93E-05
SC 46M	6.93E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SC 47	2.63E-04	2.62E-04	2.52E-04	2.14E-04	6.18E-05	1.45E-05	5.30E-07	1.07E-09	2.17E-12
SC 48	2.50E-05	2.48E-05	2.31E-05	1.71E-05	1.75E-06	1.23E-07	2.82E-10	3.17E-15	3.58E-20
SC 49	2.11E-05	1.47E-05	5.67E-07	6.10E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SC 50	4.30E-07	2.22E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TI 51	1.15E-03	3.12E-05	2.42E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 52	8.92E-01	3.49E-03	7.38E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 53	5.53E-03	1.36E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 54	5.71E-05	8.03E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CR 51	9.07E+01	9.07E+01	9.02E+01	8.85E+01	7.61E+01	6.39E+01	4.28E+01	2.02E+01	9.55E+00
CR 55	1.56E+00	4.48E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 54	8.56E-01	8.55E-01	8.55E-01	8.54E-01	8.42E-01	8.29E-01	8.00E-01	7.49E-01	7.01E-01
MN 56	1.27E+01	1.11E+01	3.32E+00	2.01E-02	3.10E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 57	1.79E-02	4.40E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 58	5.71E-05	2.87E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE 55	3.10E+00	3.10E+00	3.10E+00	3.09E+00	3.08E+00	3.06E+00	3.03E+00	2.96E+00	2.90E+00
FE 59	1.30E+00	1.29E+00	1.29E+00	1.28E+00	1.16E+00	1.04E+00	8.16E-01	5.14E-01	3.24E-01

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

Capsule A - 54.9 days irradiation									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	90 DAYS
ISOTOPE	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci
CO 58	2.31E+00	2.31E+00	2.30E+00	2.29E+00	2.16E+00	2.01E+00	1.72E+00	1.28E+00	9.56E-01
CO 60	3.17E-02	3.17E-02	3.17E-02	3.17E-02	3.16E-02	3.15E-02	3.14E-02	3.10E-02	3.07E-02
CO 60M	8.52E-01	1.17E-01	2.02E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO 61	7.14E-03	5.79E-03	8.74E-04	2.99E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO 62	8.99E-04	8.57E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 59	3.25E-04	3.25E-04	3.25E-04	3.25E-04	3.25E-04	3.25E-04	3.25E-04	3.25E-04	3.25E-04
NI 63	4.12E-02	4.12E-02	4.12E-02	4.12E-02	4.12E-02	4.12E-02	4.12E-02	4.11E-02	4.11E-02
NI 65	1.04E+00	9.10E-01	2.64E-01	1.42E-03	8.91E-21	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 66	3.61E-05	3.59E-05	3.39E-05	2.66E-05	4.28E-06	5.07E-07	3.88E-09	4.17E-13	4.48E-17
CU 64	1.16E+00	1.13E+00	8.83E-01	3.13E-01	1.21E-04	1.26E-08	9.96E-18	0.00E+00	0.00E+00
CU 66	2.52E-01	4.30E-03	3.39E-05	2.66E-05	4.28E-06	5.08E-07	3.88E-09	4.17E-13	4.48E-17
CU 67	1.63E-06	1.62E-06	1.54E-06	1.24E-06	2.48E-07	3.77E-08	5.10E-10	1.60E-13	5.02E-17
ZN 65	1.73E-05	1.73E-05	1.72E-05	1.72E-05	1.69E-05	1.66E-05	1.58E-05	1.46E-05	1.34E-05
ZN 69	1.18E-10	8.43E-11	9.47E-12	2.54E-12	1.80E-15	3.80E-19	0.00E+00	0.00E+00	0.00E+00
ZN 69M	7.93E-12	7.73E-12	6.16E-12	2.37E-12	1.68E-15	3.54E-19	1.41E-27	0.00E+00	0.00E+00
SR 89	8.71E-12	8.71E-12	8.68E-12	8.59E-12	7.91E-12	7.19E-12	5.77E-12	3.82E-12	2.53E-12
SR 90	1.92E-14	1.92E-14	1.92E-14	1.92E-14	1.92E-14	1.92E-14	1.92E-14	1.92E-14	1.91E-14
SR 91	6.09E-13	5.87E-13	4.23E-13	1.06E-13	2.89E-18	1.37E-23	0.00E+00	0.00E+00	0.00E+00
Y 89M	9.17E-07	9.13E-07	8.78E-07	7.42E-07	2.08E-07	4.71E-08	1.58E-09	2.73E-12	4.72E-15
Y 90	1.23E-05	1.22E-05	1.16E-05	9.46E-06	1.99E-06	3.23E-07	5.04E-09	2.09E-12	2.00E-14
Y 90M	4.70E-13	4.21E-13	1.54E-13	2.13E-15	2.22E-29	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Y 91	9.48E-10	9.47E-10	9.45E-10	9.37E-10	8.72E-10	8.03E-10	6.64E-10	4.66E-10	3.26E-10
Y 92	7.03E-11	6.37E-11	2.64E-11	6.39E-13	3.60E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Y 94	4.34E-13	1.46E-13	8.12E-18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZR 89	9.19E-07	9.15E-07	8.79E-07	7.43E-07	2.08E-07	4.72E-08	1.59E-09	2.74E-12	4.72E-15
ZR 93	8.54E-12	8.54E-12	8.54E-12	8.54E-12	8.54E-12	8.54E-12	8.54E-12	8.54E-12	8.54E-12
ZR 95	1.42E-06	1.42E-06	1.42E-06	1.41E-06	1.32E-06	1.22E-06	1.03E-06	7.42E-07	5.36E-07
ZR 97	7.27E-08	7.12E-08	5.92E-08	2.72E-08	7.41E-11	7.50E-14	1.08E-20	0.00E+00	0.00E+00
NB 92	1.79E-04	1.78E-04	1.76E-04	1.67E-04	1.11E-04	6.87E-05	2.31E-05	2.98E-06	3.85E-07
NB 93M	3.10E-14	3.10E-14	3.13E-14	3.22E-14	3.89E-14	4.68E-14	6.48E-14	9.84E-14	1.32E-13
NB 94	1.38E-06	1.38E-06	1.38E-06	1.38E-06	1.38E-06	1.38E-06	1.38E-06	1.38E-06	1.38E-06
NB 95	2.51E-03	2.51E-03	2.50E-03	2.46E-03	2.19E-03	1.91E-03	1.39E-03	7.70E-04	4.27E-04
NB 95M	9.22E-09	9.22E-09	9.25E-09	9.34E-09	9.43E-09	8.97E-09	7.61E-09	5.51E-09	3.98E-09
NB 96	1.76E-05	1.73E-05	1.51E-05	8.62E-06	1.20E-07	8.19E-10	9.17E-15	4.79E-24	0.00E+00
NB 97	2.57E-06	1.94E-06	2.03E-07	2.73E-08	7.45E-11	7.58E-14	1.17E-20	0.00E+00	0.00E+00
NB 97M	6.88E-08	6.74E-08	5.61E-08	2.57E-08	7.02E-11	7.14E-14	1.03E-20	0.00E+00	0.00E+00
NB 98	3.84E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NB100	1.91E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MO 93M	5.31E-05	5.05E-05	3.20E-05	4.68E-06	2.20E-12	9.11E-20	0.00E+00	0.00E+00	0.00E+00
MO 93	4.87E-08	4.87E-08	4.87E-08	4.87E-08	4.87E-08	4.87E-08	4.87E-08	4.87E-08	4.87E-08
MO 99	3.72E-02	3.70E-02	3.53E-02	2.89E-02	6.36E-03	1.09E-03	1.93E-05	1.01E-08	5.23E-12
MO101	9.25E-03	2.23E-03	6.15E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TC 99	2.05E-09	2.05E-09	2.06E-09	2.09E-09	2.19E-09	2.21E-09	2.21E-09	2.21E-09	2.21E-09
TC100	2.14E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TC101	9.25E-03	5.34E-03	7.76E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RU103	2.86E-08	2.86E-08	2.85E-08	2.81E-08	2.53E-08	2.24E-08	1.69E-08	9.94E-09	5.85E-09
RU105	1.69E-13	1.57E-13	7.76E-14	4.01E-15	6.87E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RH104	1.58E-10	1.13E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RH104M	1.15E-11	9.25E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RH105	1.28E-13	1.28E-13	1.27E-13	9.45E-14	5.65E-15	2.14E-16	1.15E-19	8.54E-26	0.00E+00
SUMTOT	2.94E+02	1.14E+02	1.04E+02	9.69E+01	8.35E+01	7.09E+01	4.93E+01	2.58E+01	1.45E+01
0TOTAL	2.94E+02	1.14E+02	1.04E+02	9.69E+01	8.35E+01	7.09E+01	4.93E+01	2.58E+01	1.45E+01

Table 14. Radionuclide source term for CSM capsule B after 119 days of irradiation (Ci).

Capsule B - 119 days irradiation									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	90 DAYS
ISOTOPE	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci
H 3	6.60E-08	6.60E-08	6.60E-08	6.60E-08	6.59E-08	6.58E-08	6.57E-08	6.54E-08	6.51E-08
H 4	8.40E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HE 6	2.72E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LI 8	3.38E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BE 8	8.07E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BE 10	1.91E-10	1.91E-10	1.91E-10	1.91E-10	1.91E-10	1.91E-10	1.91E-10	1.91E-10	1.91E-10
BE 11	1.51E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B 12	2.29E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C 14	6.99E-09	6.99E-09	6.99E-09	6.99E-09	6.99E-09	6.99E-09	6.99E-09	6.99E-09	6.99E-09
C 15	1.58E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
O 19	1.13E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
F 20	1.96E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NE 23	9.41E-03	2.65E-17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NA 24	1.50E+00	1.46E+00	1.19E+00	4.93E-01	6.39E-04	2.72E-07	5.34E-15	1.90E-29	0.00E+00
NA 24M	4.35E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NA 25	5.68E-03	4.60E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MG 27	7.05E+00	7.83E-01	2.01E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MG 28	2.51E-08	2.46E-08	2.12E-08	1.13E-08	9.56E-11	3.65E-13	1.08E-18	4.67E-29	0.00E+00
AL 28	1.68E+02	1.56E-02	2.13E-08	1.13E-08	9.58E-11	3.66E-13	1.08E-18	0.00E+00	0.00E+00
AL 29	1.78E-03	7.32E-05	2.51E-17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AL 30	1.72E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SI 31	1.72E-02	1.51E-02	4.59E-03	3.02E-05	8.82E-22	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SI 32	4.24E-12	4.24E-12	4.24E-12	4.24E-12	4.24E-12	4.24E-12	4.24E-12	4.24E-12	4.24E-12
P 32	3.95E-03	3.95E-03	3.91E-03	3.76E-03	2.81E-03	2.00E-03	9.22E-04	2.16E-04	5.03E-05
P 33	1.46E-07	1.46E-07	1.45E-07	1.42E-07	1.20E-07	9.89E-08	6.35E-08	2.76E-08	1.20E-08
P 34	8.45E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
S 35	5.89E-05	5.88E-05	5.88E-05	5.84E-05	5.57E-05	5.27E-05	4.65E-05	3.67E-05	2.90E-05
S 37	2.87E-07	4.72E-09	4.08E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CL 36	4.04E-11	4.04E-11	4.04E-11	4.04E-11	4.04E-11	4.04E-11	4.04E-11	4.04E-11	4.04E-11
CL 38	4.98E-10	2.85E-10	1.86E-12	1.12E-21	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CL 38M	5.92E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AR 39	1.28E-07	1.28E-07	1.28E-07	1.28E-07	1.28E-07	1.28E-07	1.28E-07	1.28E-07	1.28E-07
AR 41	4.73E-08	3.92E-08	7.10E-09	5.26E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
K 40	3.15E-13	3.15E-13	3.15E-13	3.15E-13	3.15E-13	3.15E-13	3.15E-13	3.15E-13	3.15E-13
K 42	1.05E-04	1.02E-04	7.94E-05	2.73E-05	8.51E-09	6.90E-13	5.83E-17	5.82E-17	5.81E-17
K 43	1.10E-10	1.08E-10	9.45E-11	5.27E-11	6.37E-13	3.69E-15	2.84E-20	7.28E-30	0.00E+00
K 44	1.95E-11	7.58E-12	1.53E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CA 45	5.31E-07	5.31E-07	5.30E-07	5.28E-07	5.15E-07	5.00E-07	4.67E-07	4.11E-07	3.62E-07
CA 47	9.08E-09	9.05E-09	8.80E-09	7.80E-09	3.12E-09	1.07E-09	9.27E-11	9.47E-13	9.67E-15
SC 46	1.06E-04	1.06E-04	1.05E-04	1.05E-04	9.96E-05	9.40E-05	8.24E-05	6.43E-05	5.01E-05
SC 46M	3.00E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SC 47	2.64E-04	2.63E-04	2.53E-04	2.14E-04	6.20E-05	1.46E-05	5.32E-07	1.08E-09	2.20E-12
SC 48	2.56E-05	2.54E-05	2.37E-05	1.75E-05	1.79E-06	1.26E-07	2.88E-10	3.25E-15	3.67E-20
SC 49	2.25E-05	1.57E-05	6.06E-07	6.51E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SC 50	4.48E-07	2.31E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TI 51	1.22E-03	3.31E-05	2.56E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 52	1.21E+00	4.72E-03	1.00E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 53	5.57E-03	1.37E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 54	5.96E-05	8.38E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CR 51	1.14E+02	1.14E+02	1.14E+02	1.12E+02	9.60E+01	8.06E+01	5.40E+01	2.55E+01	1.20E+01
CR 55	1.63E+00	4.66E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 54	1.73E+00	1.73E+00	1.72E+00	1.72E+00	1.70E+00	1.67E+00	1.61E+00	1.51E+00	1.41E+00
MN 56	1.27E+01	1.11E+01	3.32E+00	2.01E-02	3.11E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

Capsule B - 119 days irradiation									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	90 DAYS
ISOTOPE	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci
MN 57	1.91E-02	4.70E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 58	5.78E-05	2.91E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE 55	6.55E+00	6.55E+00	6.55E+00	6.55E+00	6.52E+00	6.49E+00	6.41E+00	6.27E+00	6.14E+00
FE 59	1.92E+00	1.92E+00	1.92E+00	1.89E+00	1.73E+00	1.55E+00	1.21E+00	7.63E-01	4.80E-01
CO 58	2.53E+00	2.53E+00	2.53E+00	2.51E+00	2.36E+00	2.21E+00	1.89E+00	1.41E+00	1.05E+00
CO 60	7.25E-02	7.26E-02	7.25E-02	7.25E-02	7.24E-02	7.22E-02	7.18E-02	7.10E-02	7.02E-02
CO 60M	9.92E-01	1.36E-01	2.35E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO 61	1.04E-02	8.44E-03	1.27E-03	4.35E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO 62	8.92E-04	8.51E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 59	6.77E-04	6.77E-04	6.77E-04	6.77E-04	6.77E-04	6.77E-04	6.77E-04	6.77E-04	6.77E-04
NI 63	8.82E-02	8.82E-02	8.82E-02	8.82E-02	8.82E-02	8.82E-02	8.82E-02	8.81E-02	8.81E-02
NI 65	1.04E+00	9.10E-01	2.64E-01	1.42E-03	8.92E-21	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 66	3.58E-05	3.56E-05	3.36E-05	2.64E-05	4.24E-06	5.03E-07	3.84E-09	4.13E-13	4.44E-17
CU 64	1.16E+00	1.13E+00	8.80E-01	3.12E-01	1.21E-04	1.26E-08	9.93E-18	0.00E+00	0.00E+00
CU 66	2.53E-01	4.32E-03	3.36E-05	2.64E-05	4.25E-06	5.04E-07	3.85E-09	4.14E-13	4.45E-17
CU 67	1.64E-06	1.63E-06	1.55E-06	1.25E-06	2.49E-07	3.79E-08	5.13E-10	1.61E-13	5.04E-17
ZN 65	7.70E-05	7.69E-05	7.69E-05	7.67E-05	7.54E-05	7.39E-05	7.07E-05	6.49E-05	5.96E-05
ZN 69	1.18E-09	8.44E-10	9.48E-11	2.54E-11	1.80E-14	3.81E-18	0.00E+00	0.00E+00	0.00E+00
ZN 69M	7.94E-11	7.74E-11	6.17E-11	2.37E-11	1.68E-14	3.54E-18	1.41E-26	0.00E+00	0.00E+00
GA 70	1.87E-12	6.97E-13	9.80E-17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SR 89	3.69E-11	3.69E-11	3.68E-11	3.64E-11	3.35E-11	3.04E-11	2.44E-11	1.62E-11	1.07E-11
SR 90	9.00E-14	9.00E-14	9.00E-14	9.00E-14	9.00E-14	8.99E-14	8.98E-14	8.97E-14	8.95E-14
SR 91	1.35E-12	1.30E-12	9.38E-13	2.35E-13	6.41E-18	3.05E-23	0.00E+00	0.00E+00	0.00E+00
Y 89M	9.17E-07	9.13E-07	8.78E-07	7.42E-07	2.08E-07	4.71E-08	1.58E-09	2.74E-12	4.72E-15
Y 90	1.22E-05	1.22E-05	1.16E-05	9.43E-06	1.98E-06	3.22E-07	5.02E-09	2.15E-12	9.04E-14
Y 90M	1.07E-12	9.58E-13	3.50E-13	5.04E-15	5.24E-29	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Y 91	1.54E-09	1.54E-09	1.54E-09	1.52E-09	1.42E-09	1.31E-09	1.08E-09	7.57E-10	5.31E-10
Y 92	1.66E-10	1.50E-10	6.22E-11	1.51E-12	8.48E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Y 94	9.58E-13	3.23E-13	1.79E-17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZR 89	9.19E-07	9.15E-07	8.79E-07	7.43E-07	2.08E-07	4.72E-08	1.59E-09	2.74E-12	4.72E-15
ZR 93	1.84E-11	1.84E-11	1.84E-11	1.84E-11	1.84E-11	1.84E-11	1.84E-11	1.84E-11	1.84E-11
ZR 95	2.30E-06	2.30E-06	2.29E-06	2.27E-06	2.13E-06	1.97E-06	1.66E-06	1.20E-06	8.67E-07
ZR 97	7.26E-08	7.11E-08	5.91E-08	2.71E-08	7.40E-11	7.57E-14	1.09E-20	0.00E+00	0.00E+00
NB 92	1.83E-04	1.83E-04	1.80E-04	1.71E-04	1.13E-04	7.03E-05	2.36E-05	3.05E-06	3.94E-07
NB 93M	1.45E-13	1.45E-13	1.46E-13	1.47E-13	1.62E-13	1.79E-13	2.18E-13	2.90E-13	3.62E-13
NB 94	2.94E-06	2.94E-06	2.94E-06	2.94E-06	2.94E-06	2.94E-06	2.94E-06	2.94E-06	2.94E-06
NB 95	8.48E-03	8.48E-03	8.44E-03	8.31E-03	7.39E-03	6.43E-03	4.69E-03	2.60E-03	1.44E-03
NB 95M	1.57E-08	1.57E-08	1.57E-08	1.58E-08	1.55E-08	1.46E-08	1.23E-08	8.90E-09	6.43E-09
NB 96	4.44E-05	4.38E-05	3.83E-05	2.18E-05	3.03E-07	2.07E-09	2.32E-14	1.21E-23	0.00E+00
NB 97	2.58E-06	1.95E-06	2.03E-07	2.73E-08	7.43E-11	7.61E-14	1.18E-20	0.00E+00	0.00E+00
NB 97M	6.87E-08	6.74E-08	5.60E-08	2.57E-08	7.01E-11	7.17E-14	1.04E-20	0.00E+00	0.00E+00
NB 98	3.84E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NB100	1.91E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MO 93M	5.31E-05	5.05E-05	3.20E-05	4.68E-06	2.20E-12	9.10E-20	0.00E+00	0.00E+00	0.00E+00
MO 93	1.06E-07	1.06E-07	1.06E-07	1.06E-07	1.06E-07	1.06E-07	1.06E-07	1.06E-07	1.06E-07
MO 99	3.72E-02	3.70E-02	3.53E-02	2.89E-02	6.37E-03	1.09E-03	1.93E-05	1.01E-08	5.23E-12
MO101	9.24E-03	2.23E-03	6.15E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TC 99	4.49E-09	4.49E-09	4.50E-09	4.53E-09	4.63E-09	4.65E-09	4.65E-09	4.65E-09	4.65E-09
TC100	4.70E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TC101	9.24E-03	5.33E-03	7.75E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RU103	2.31E-07	2.31E-07	2.30E-07	2.27E-07	2.04E-07	1.80E-07	1.36E-07	8.00E-08	4.71E-08
RU105	3.09E-12	2.86E-12	1.41E-12	7.27E-14	1.25E-23	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RH104	2.73E-09	1.96E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RH104M	1.98E-10	1.64E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RH105	2.33E-12	2.34E-12	2.31E-12	1.72E-12	1.03E-13	3.83E-15	2.06E-18	1.53E-24	1.14E-30

Capsule B - 119 days irradiation									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	90 DAYS
ISOTOPE	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci
RH105M	8.65E-13	8.02E-13	3.97E-13	2.04E-14	3.50E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RH106	5.14E-13	1.01E-18	1.01E-18	1.01E-18	1.01E-18	1.01E-18	1.01E-18	9.52E-19	8.98E-19
RH106M	2.50E-13	2.13E-13	5.16E-14	7.24E-17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SUMTOT	3.23E+02	1.43E+02	1.32E+02	1.25E+02	1.09E+02	9.27E+01	6.53E+01	3.56E+01	2.13E+01
0TOTAL	3.23E+02	1.43E+02	1.32E+02	1.25E+02	1.09E+02	9.27E+01	6.53E+01	3.56E+01	2.13E+01

Table 15. Radionuclide source term for CSM capsule C after 119 days of irradiation (Ci).

Capsule C - 119 days irradiation									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	90 DAYS
ISOTOPE	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci
H 3	1.29E-07	1.29E-07	1.29E-07	1.29E-07	1.29E-07	1.29E-07	1.28E-07	1.28E-07	1.27E-07
H 4	1.46E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HE 6	5.31E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LI 8	5.86E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BE 8	1.50E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BE 10	3.73E-10	3.73E-10	3.73E-10	3.73E-10	3.73E-10	3.73E-10	3.73E-10	3.73E-10	3.73E-10
BE 11	2.95E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B 12	3.98E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C 14	1.37E-08	1.37E-08	1.37E-08	1.37E-08	1.37E-08	1.37E-08	1.37E-08	1.37E-08	1.37E-08
C 15	3.41E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
O 19	2.44E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
F 20	4.25E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NE 23	2.04E-02	5.74E-17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NA 24	3.24E+00	3.17E+00	2.57E+00	1.07E+00	1.38E-03	5.86E-07	1.15E-14	4.09E-29	0.00E+00
NA 24M	9.42E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NA 25	1.23E-02	9.96E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MG 27	1.53E+01	1.70E+00	4.36E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MG 28	5.43E-08	5.34E-08	4.60E-08	2.45E-08	2.07E-10	7.90E-13	2.34E-18	1.01E-28	0.00E+00
AL 28	3.64E+02	3.39E-02	4.61E-08	2.46E-08	2.08E-10	7.92E-13	2.35E-18	0.00E+00	0.00E+00
AL 29	3.72E-03	1.53E-04	5.23E-17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AL 30	3.59E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SI 31	3.50E-02	3.07E-02	9.33E-03	6.14E-05	1.79E-21	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SI 32	8.61E-12	8.61E-12	8.61E-12	8.61E-12	8.61E-12	8.61E-12	8.61E-12	8.60E-12	8.60E-12
P 32	5.10E-03	5.10E-03	5.05E-03	4.86E-03	3.64E-03	2.59E-03	1.19E-03	2.78E-04	6.50E-05
P 33	1.92E-07	1.92E-07	1.91E-07	1.87E-07	1.58E-07	1.30E-07	8.36E-08	3.64E-08	1.58E-08
P 34	1.11E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
S 35	7.75E-05	7.75E-05	7.74E-05	7.69E-05	7.33E-05	6.94E-05	6.12E-05	4.83E-05	3.81E-05
S 37	3.96E-07	6.51E-09	5.63E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CL 36	6.99E-11	6.99E-11	6.99E-11	6.99E-11	6.99E-11	6.99E-11	6.99E-11	6.99E-11	6.99E-11
CL 38	8.10E-10	4.64E-10	3.04E-12	1.83E-21	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CL 38M	9.65E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AR 39	2.22E-07	2.22E-07	2.22E-07	2.22E-07	2.22E-07	2.22E-07	2.22E-07	2.22E-07	2.22E-07
AR 41	8.21E-08	6.79E-08	1.23E-08	9.11E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
K 40	5.46E-13	5.46E-13	5.46E-13	5.46E-13	5.46E-13	5.46E-13	5.46E-13	5.46E-13	5.46E-13
K 42	1.82E-04	1.77E-04	1.38E-04	4.74E-05	1.48E-08	1.20E-12	1.01E-16	1.01E-16	1.01E-16
K 43	1.91E-10	1.88E-10	1.64E-10	9.16E-11	1.11E-12	6.39E-15	4.91E-20	1.26E-29	0.00E+00
K 44	3.39E-11	1.32E-11	2.66E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CA 45	9.21E-07	9.21E-07	9.20E-07	9.17E-07	8.94E-07	8.68E-07	8.11E-07	7.14E-07	6.28E-07
CA 47	1.58E-08	1.58E-08	1.53E-08	1.36E-08	5.43E-09	1.86E-09	1.62E-10	1.65E-12	1.68E-14
SC 46	1.83E-04	1.83E-04	1.83E-04	1.82E-04	1.73E-04	1.63E-04	1.43E-04	1.12E-04	8.70E-05
SC 46M	5.21E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SC 47	4.58E-04	4.56E-04	4.39E-04	3.73E-04	1.08E-04	2.53E-05	9.25E-07	1.87E-09	3.83E-12
SC 48	4.47E-05	4.43E-05	4.13E-05	3.06E-05	3.13E-06	2.19E-07	5.03E-10	5.67E-15	6.40E-20

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

Capsule C - 119 days irradiation									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	90 DAYS
ISOTOPE	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci
SC 49	3.92E-05	2.73E-05	1.05E-06	1.13E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SC 50	7.83E-07	4.05E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TI 51	2.28E-03	6.16E-05	4.77E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 52	2.34E+00	9.15E-03	1.94E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 53	1.08E-02	2.66E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 54	1.16E-04	1.62E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CR 51	2.22E+02	2.22E+02	2.21E+02	2.16E+02	1.86E+02	1.56E+02	1.05E+02	4.94E+01	2.33E+01
CR 55	3.16E+00	9.04E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 54	3.35E+00	3.35E+00	3.35E+00	3.34E+00	3.30E+00	3.25E+00	3.13E+00	2.93E+00	2.74E+00
MN 56	2.29E+01	2.00E+01	5.96E+00	3.61E-02	5.58E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 57	3.71E-02	9.12E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 58	1.12E-04	5.65E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE 55	1.27E+01	1.27E+01	1.27E+01	1.27E+01	1.27E+01	1.26E+01	1.24E+01	1.22E+01	1.19E+01
FE 59	3.73E+00	3.73E+00	3.72E+00	3.67E+00	3.35E+00	3.01E+00	2.35E+00	1.48E+00	9.32E-01
CO 58	4.90E+00	4.90E+00	4.89E+00	4.86E+00	4.58E+00	4.28E+00	3.66E+00	2.72E+00	2.03E+00
CO 60	1.29E-01	1.29E-01	1.29E-01	1.29E-01	1.28E-01	1.28E-01	1.27E-01	1.26E-01	1.25E-01
CO 60M	1.77E+00	2.43E-01	4.20E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO 61	1.93E-02	1.56E-02	2.36E-03	8.05E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO 62	1.74E-03	1.66E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 59	1.31E-03	1.31E-03	1.31E-03	1.31E-03	1.31E-03	1.31E-03	1.31E-03	1.31E-03	1.31E-03
NI 63	1.71E-01	1.71E-01	1.71E-01	1.71E-01	1.71E-01	1.71E-01	1.71E-01	1.71E-01	1.71E-01
NI 65	2.02E+00	1.76E+00	5.12E-01	2.75E-03	1.73E-20	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 66	6.93E-05	6.89E-05	6.51E-05	5.11E-05	8.22E-06	9.75E-07	7.45E-09	8.01E-13	8.60E-17
CU 64	2.50E+00	2.43E+00	1.90E+00	6.73E-01	2.60E-04	2.71E-08	2.14E-17	0.00E+00	0.00E+00
CU 66	5.45E-01	9.31E-03	6.52E-05	5.12E-05	8.23E-06	9.76E-07	7.46E-09	8.02E-13	8.61E-17
CU 67	3.52E-06	3.50E-06	3.33E-06	2.69E-06	5.36E-07	8.16E-08	1.11E-09	3.46E-13	1.09E-16
ZN 65	1.66E-04	1.66E-04	1.66E-04	1.66E-04	1.63E-04	1.60E-04	1.52E-04	1.40E-04	1.29E-04
ZN 69	2.55E-09	1.82E-09	2.04E-10	5.49E-11	3.88E-14	8.21E-18	0.00E+00	0.00E+00	0.00E+00
ZN 69M	1.71E-10	1.67E-10	1.33E-10	5.11E-11	3.62E-14	7.64E-18	3.04E-26	0.00E+00	0.00E+00
GA 70	4.03E-12	1.50E-12	2.11E-16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SR 89	6.39E-11	6.38E-11	6.37E-11	6.30E-11	5.80E-11	5.27E-11	4.23E-11	2.80E-11	1.86E-11
SR 90	1.56E-13	1.56E-13	1.56E-13	1.56E-13	1.56E-13	1.56E-13	1.56E-13	1.55E-13	1.55E-13
SR 91	2.34E-12	2.26E-12	1.63E-12	4.06E-13	1.11E-17	5.28E-23	0.00E+00	0.00E+00	0.00E+00
Y 89M	1.59E-06	1.58E-06	1.52E-06	1.29E-06	3.60E-07	8.16E-08	2.74E-09	4.73E-12	8.14E-15
Y 90	2.12E-05	2.11E-05	2.01E-05	1.64E-05	3.44E-06	5.57E-07	8.71E-09	3.73E-12	1.57E-13
Y 90M	1.86E-12	1.66E-12	6.06E-13	8.73E-15	9.07E-29	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Y 91	2.67E-09	2.67E-09	2.67E-09	2.64E-09	2.46E-09	2.26E-09	1.87E-09	1.31E-09	9.20E-10
Y 92	2.87E-10	2.60E-10	1.08E-10	2.61E-12	1.47E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Y 94	1.66E-12	5.59E-13	3.10E-17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZR 89	1.59E-06	1.58E-06	1.52E-06	1.29E-06	3.61E-07	8.17E-08	2.75E-09	4.73E-12	8.14E-15
ZR 93	3.20E-11	3.20E-11	3.20E-11	3.20E-11	3.20E-11	3.20E-11	3.20E-11	3.20E-11	3.20E-11
ZR 95	3.98E-06	3.98E-06	3.97E-06	3.94E-06	3.69E-06	3.42E-06	2.88E-06	2.08E-06	1.50E-06
ZR 97	1.26E-07	1.23E-07	1.02E-07	4.70E-08	1.28E-10	1.31E-13	1.89E-20	0.00E+00	0.00E+00
NB 92	3.17E-04	3.16E-04	3.12E-04	2.96E-04	1.96E-04	1.22E-04	4.09E-05	5.28E-06	6.82E-07
NB 93M	2.51E-13	2.51E-13	2.52E-13	2.56E-13	2.81E-13	3.10E-13	3.77E-13	5.02E-13	6.27E-13
NB 94	5.09E-06	5.09E-06	5.09E-06	5.09E-06	5.09E-06	5.09E-06	5.09E-06	5.09E-06	5.09E-06
NB 95	1.47E-02	1.47E-02	1.46E-02	1.44E-02	1.28E-02	1.12E-02	8.14E-03	4.50E-03	2.49E-03
NB 95M	2.72E-08	2.72E-08	2.73E-08	2.73E-08	2.68E-08	2.52E-08	2.13E-08	1.54E-08	1.11E-08
NB 96	7.70E-05	7.59E-05	6.64E-05	3.78E-05	5.26E-07	3.59E-09	4.02E-14	2.10E-23	0.00E+00
NB 97	4.47E-06	3.38E-06	3.52E-07	4.72E-08	1.29E-10	1.31E-13	2.03E-20	0.00E+00	0.00E+00
NB 97M	1.19E-07	1.17E-07	9.70E-08	4.45E-08	1.21E-10	1.24E-13	1.79E-20	0.00E+00	0.00E+00
NB 98	6.65E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NB100	3.30E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MO 93M	9.20E-05	8.74E-05	5.55E-05	8.11E-06	3.81E-12	1.58E-19	0.00E+00	0.00E+00	0.00E+00
MO 93	1.83E-07	1.83E-07	1.83E-07	1.83E-07	1.83E-07	1.83E-07	1.83E-07	1.83E-07	1.83E-07

Capsule C - 119 days irradiation									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	90 DAYS
ISOTOPE	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci
MO 99	6.44E-02	6.40E-02	6.11E-02	5.00E-02	1.10E-02	1.89E-03	3.35E-05	1.74E-08	9.05E-12
MO101	1.60E-02	3.86E-03	1.07E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TC 99	7.78E-09	7.78E-09	7.79E-09	7.84E-09	8.01E-09	8.05E-09	8.06E-09	8.06E-09	8.06E-09
TC100	8.13E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TC101	1.60E-02	9.24E-03	1.34E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RU103	4.00E-07	4.00E-07	3.98E-07	3.93E-07	3.53E-07	3.12E-07	2.35E-07	1.39E-07	8.17E-08
RU105	5.35E-12	4.95E-12	2.45E-12	1.26E-13	2.16E-23	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RH104	4.73E-09	3.39E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RH104M	3.42E-10	2.84E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RH105	4.04E-12	4.05E-12	4.01E-12	2.98E-12	1.79E-13	6.64E-15	3.57E-18	2.65E-24	1.97E-30
RH105M	1.50E-12	1.39E-12	6.88E-13	3.54E-14	6.07E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RH106	8.91E-13	1.91E-18	1.91E-18	1.91E-18	1.91E-18	1.91E-18	1.85E-18	1.75E-18	1.65E-18
RH106M	4.33E-13	3.70E-13	8.96E-14	1.25E-16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SUMTOT	6.65E+02	2.76E+02	2.57E+02	2.43E+02	2.10E+02	1.80E+02	1.27E+02	6.90E+01	4.12E+01
0TOTAL	6.65E+02	2.76E+02	2.57E+02	2.43E+02	2.10E+02	1.80E+02	1.27E+02	6.90E+01	4.12E+01

Table 16. Radionuclide source term for CSM capsule D after 119 days of irradiation (Ci).

Capsule D - 119 days irradiation									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	90 DAYS
ISOTOPE	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci
H 3	7.25E-08	7.25E-08	7.25E-08	7.25E-08	7.24E-08	7.23E-08	7.21E-08	7.18E-08	7.15E-08
H 4	6.18E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HE 6	2.99E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LI 8	2.48E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BE 8	7.63E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BE 10	2.10E-10	2.10E-10	2.10E-10	2.10E-10	2.10E-10	2.10E-10	2.10E-10	2.10E-10	2.10E-10
BE 11	1.66E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B 12	1.69E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C 14	7.68E-09	7.68E-09	7.68E-09	7.68E-09	7.68E-09	7.68E-09	7.68E-09	7.68E-09	7.68E-09
C 15	1.84E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
O 19	1.31E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
F 20	2.29E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NE 23	1.10E-02	3.09E-17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NA 24	1.75E+00	1.71E+00	1.39E+00	5.76E-01	7.45E-04	3.17E-07	6.23E-15	2.21E-29	0.00E+00
NA 24M	5.07E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NA 25	6.62E-03	5.36E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MG 27	8.23E+00	9.14E-01	2.35E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MG 28	2.93E-08	2.88E-08	2.48E-08	1.32E-08	1.12E-10	4.26E-13	1.26E-18	5.45E-29	0.00E+00
AL 28	1.96E+02	1.83E-02	2.48E-08	1.32E-08	1.12E-10	4.27E-13	1.27E-18	0.00E+00	0.00E+00
AL 29	2.02E-03	8.34E-05	2.85E-17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AL 30	1.96E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SI 31	1.93E-02	1.69E-02	5.15E-03	3.39E-05	9.90E-22	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SI 32	4.75E-12	4.75E-12	4.75E-12	4.75E-12	4.75E-12	4.75E-12	4.75E-12	4.75E-12	4.75E-12
P 32	3.53E-03	3.53E-03	3.50E-03	3.37E-03	2.52E-03	1.79E-03	8.25E-04	1.93E-04	4.50E-05
P 33	1.29E-07	1.29E-07	1.28E-07	1.26E-07	1.06E-07	8.76E-08	5.62E-08	2.45E-08	1.06E-08
P 34	7.48E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
S 35	5.21E-05	5.21E-05	5.20E-05	5.17E-05	4.93E-05	4.67E-05	4.11E-05	3.25E-05	2.56E-05
S 37	2.48E-07	4.07E-09	3.52E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CL 36	2.97E-11	2.97E-11	2.97E-11	2.97E-11	2.97E-11	2.97E-11	2.97E-11	2.97E-11	2.97E-11
CL 38	3.84E-10	2.20E-10	1.44E-12	8.65E-22	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CL 38M	4.58E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AR 39	9.41E-08	9.41E-08	9.41E-08	9.41E-08	9.41E-08	9.41E-08	9.41E-08	9.41E-08	9.41E-08
AR 41	3.48E-08	2.88E-08	5.21E-09	3.86E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

Capsule D - 119 days irradiation									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	90 DAYS
ISOTOPE	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci
K 40	2.31E-13	2.31E-13	2.31E-13	2.31E-13	2.31E-13	2.31E-13	2.31E-13	2.31E-13	2.31E-13
K 42	7.71E-05	7.50E-05	5.83E-05	2.01E-05	6.25E-09	5.06E-13	4.28E-17	4.27E-17	4.27E-17
K 43	8.10E-11	7.98E-11	6.95E-11	3.88E-11	4.69E-13	2.72E-15	2.09E-20	5.36E-30	0.00E+00
K 44	1.44E-11	5.58E-12	1.13E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CA 45	3.91E-07	3.91E-07	3.90E-07	3.89E-07	3.79E-07	3.68E-07	3.44E-07	3.03E-07	2.66E-07
CA 47	6.79E-09	6.77E-09	6.57E-09	5.82E-09	2.33E-09	7.99E-10	6.93E-11	7.07E-13	7.22E-15
SC 46	7.77E-05	7.77E-05	7.76E-05	7.70E-05	7.33E-05	6.92E-05	6.06E-05	4.73E-05	3.69E-05
SC 46M	2.21E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SC 47	1.95E-04	1.94E-04	1.86E-04	1.58E-04	4.57E-05	1.08E-05	3.93E-07	7.93E-10	1.63E-12
SC 48	1.92E-05	1.91E-05	1.78E-05	1.32E-05	1.35E-06	9.45E-08	2.17E-10	2.45E-15	2.76E-20
SC 49	1.67E-05	1.16E-05	4.49E-07	4.83E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SC 50	3.41E-07	1.76E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TI 51	1.17E-03	3.17E-05	2.46E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 52	1.33E+00	5.19E-03	1.10E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 53	6.12E-03	1.50E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 54	6.54E-05	9.19E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CR 51	1.26E+02	1.26E+02	1.25E+02	1.22E+02	1.05E+02	8.84E+01	5.93E+01	2.80E+01	1.32E+01
CR 55	1.79E+00	5.12E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 54	1.90E+00	1.90E+00	1.90E+00	1.89E+00	1.87E+00	1.84E+00	1.77E+00	1.66E+00	1.55E+00
MN 56	1.34E+01	1.17E+01	3.49E+00	2.11E-02	3.27E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 57	2.10E-02	5.17E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 58	6.35E-05	3.20E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE 55	7.20E+00	7.20E+00	7.20E+00	7.19E+00	7.16E+00	7.13E+00	7.04E+00	6.89E+00	6.74E+00
FE 59	2.11E+00	2.11E+00	2.11E+00	2.08E+00	1.90E+00	1.70E+00	1.33E+00	8.38E-01	5.28E-01
CO 58	2.76E+00	2.76E+00	2.76E+00	2.74E+00	2.58E+00	2.41E+00	2.06E+00	1.53E+00	1.14E+00
CO 60	5.81E-02	5.81E-02	5.81E-02	5.81E-02	5.79E-02	5.78E-02	5.75E-02	5.69E-02	5.62E-02
CO 60M	8.19E-01	1.12E-01	1.94E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO 61	9.76E-03	7.91E-03	1.20E-03	4.08E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO 62	9.77E-04	9.32E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 59	7.38E-04	7.38E-04	7.38E-04	7.38E-04	7.38E-04	7.38E-04	7.38E-04	7.38E-04	7.38E-04
NI 63	9.63E-02	9.63E-02	9.63E-02	9.63E-02	9.63E-02	9.63E-02	9.62E-02	9.62E-02	9.61E-02
NI 65	1.14E+00	9.93E-01	2.88E-01	1.55E-03	9.73E-21	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 66	3.91E-05	3.88E-05	3.67E-05	2.88E-05	4.63E-06	5.49E-07	4.20E-09	4.51E-13	4.84E-17
CU 64	1.34E+00	1.30E+00	1.02E+00	3.61E-01	1.40E-04	1.45E-08	1.15E-17	0.00E+00	0.00E+00
CU 66	2.92E-01	5.00E-03	3.67E-05	2.88E-05	4.64E-06	5.50E-07	4.20E-09	4.52E-13	4.85E-17
CU 67	1.89E-06	1.88E-06	1.79E-06	1.45E-06	2.88E-07	4.38E-08	5.93E-10	1.86E-13	5.83E-17
ZN 65	8.91E-05	8.90E-05	8.90E-05	8.88E-05	8.73E-05	8.56E-05	8.18E-05	7.51E-05	6.90E-05
ZN 69	1.37E-09	9.76E-10	1.10E-10	2.94E-11	2.08E-14	4.40E-18	0.00E+00	0.00E+00	0.00E+00
ZN 69M	9.18E-11	8.95E-11	7.14E-11	2.74E-11	1.94E-14	4.10E-18	1.63E-26	0.00E+00	0.00E+00
GA 70	2.16E-12	8.07E-13	1.13E-16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SR 89	2.70E-11	2.70E-11	2.69E-11	2.66E-11	2.45E-11	2.23E-11	1.79E-11	1.18E-11	7.85E-12
SR 90	6.60E-14	6.60E-14	6.60E-14	6.60E-14	6.60E-14	6.60E-14	6.59E-14	6.58E-14	6.56E-14
SR 91	9.89E-13	9.54E-13	6.87E-13	1.72E-13	4.70E-18	2.23E-23	0.00E+00	0.00E+00	0.00E+00
Y 89M	6.72E-07	6.69E-07	6.43E-07	5.43E-07	1.52E-07	3.45E-08	1.16E-09	2.00E-12	3.45E-15
Y 90	8.98E-06	8.93E-06	8.50E-06	6.92E-06	1.46E-06	2.36E-07	3.69E-09	1.58E-12	6.63E-14
Y 90M	7.84E-13	7.01E-13	2.56E-13	3.69E-15	3.83E-29	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Y 91	1.13E-09	1.13E-09	1.13E-09	1.12E-09	1.04E-09	9.58E-10	7.93E-10	5.56E-10	3.89E-10
Y 92	1.21E-10	1.10E-10	4.56E-11	1.10E-12	6.21E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Y 94	7.01E-13	2.36E-13	1.31E-17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZR 89	6.73E-07	6.70E-07	6.44E-07	5.44E-07	1.52E-07	3.45E-08	1.16E-09	2.00E-12	3.44E-15
ZR 93	1.35E-11	1.35E-11	1.35E-11	1.35E-11	1.35E-11	1.35E-11	1.35E-11	1.35E-11	1.35E-11
ZR 95	1.68E-06	1.68E-06	1.68E-06	1.66E-06	1.56E-06	1.45E-06	1.22E-06	8.78E-07	6.35E-07
ZR 97	5.32E-08	5.21E-08	4.33E-08	1.99E-08	5.41E-11	5.50E-14	7.95E-21	0.00E+00	0.00E+00
NB 92	1.34E-04	1.34E-04	1.32E-04	1.25E-04	8.30E-05	5.15E-05	1.73E-05	2.23E-06	2.88E-07
NB 93M	1.06E-13	1.06E-13	1.07E-13	1.08E-13	1.19E-13	1.31E-13	1.60E-13	2.13E-13	2.65E-13

Capsule D - 119 days irradiation									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	90 DAYS
ISOTOPE	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci
NB 94	2.16E-06	2.16E-06	2.16E-06	2.16E-06	2.16E-06	2.16E-06	2.16E-06	2.16E-06	2.16E-06
NB 95	6.22E-03	6.22E-03	6.20E-03	6.10E-03	5.42E-03	4.72E-03	3.44E-03	1.91E-03	1.06E-03
NB 95M	1.15E-08	1.15E-08	1.15E-08	1.15E-08	1.13E-08	1.07E-08	9.01E-09	6.52E-09	4.71E-09
NB 96	3.26E-05	3.21E-05	2.81E-05	1.60E-05	2.23E-07	1.52E-09	1.70E-14	8.88E-24	0.00E+00
NB 97	1.89E-06	1.43E-06	1.49E-07	2.00E-08	5.44E-11	5.53E-14	8.57E-21	0.00E+00	0.00E+00
NB 97M	5.03E-08	4.93E-08	4.10E-08	1.88E-08	5.13E-11	5.22E-14	7.53E-21	0.00E+00	0.00E+00
NB 98	2.81E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NB100	1.40E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MO 93M	3.89E-05	3.70E-05	2.34E-05	3.43E-06	1.61E-12	6.67E-20	0.00E+00	0.00E+00	0.00E+00
MO 93	7.72E-08	7.72E-08	7.72E-08	7.72E-08	7.72E-08	7.72E-08	7.72E-08	7.72E-08	7.72E-08
MO 99	2.72E-02	2.71E-02	2.58E-02	2.11E-02	4.66E-03	7.98E-04	1.42E-05	7.36E-09	3.83E-12
MO101	6.77E-03	1.63E-03	4.50E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TC 99	3.29E-09	3.29E-09	3.29E-09	3.31E-09	3.39E-09	3.40E-09	3.41E-09	3.41E-09	3.41E-09
TC100	3.44E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TC101	6.77E-03	3.90E-03	5.68E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RU103	1.69E-07	1.69E-07	1.68E-07	1.66E-07	1.49E-07	1.32E-07	9.95E-08	5.86E-08	3.45E-08
RU105	2.26E-12	2.09E-12	1.04E-12	5.33E-14	9.14E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RH104	2.00E-09	1.43E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RH104M	1.45E-10	1.20E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RH105	1.71E-12	1.71E-12	1.69E-12	1.26E-12	7.54E-14	2.80E-15	1.51E-18	1.12E-24	0.00E+00
RH105M	6.33E-13	5.87E-13	2.91E-13	1.50E-14	2.57E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RH106	3.77E-13	7.37E-19	7.37E-19	7.37E-19	7.37E-19	7.37E-19	7.37E-19	6.97E-19	6.57E-19
SUMTOT	3.66E+02	1.56E+02	1.45E+02	1.38E+02	1.19E+02	1.02E+02	7.16E+01	3.91E+01	2.33E+01
0TOTAL	3.66E+02	1.56E+02	1.45E+02	1.38E+02	1.19E+02	1.02E+02	7.16E+01	3.91E+01	2.33E+01

Table 17. Radionuclide source term for CSM capsule E after 54.9 days of irradiation (Ci).

Capsule E - 54.9 days irradiation									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	90 DAYS
ISOTOPE	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci
H 3	8.04E-09	8.04E-09	8.04E-09	8.04E-09	8.03E-09	8.02E-09	8.01E-09	7.97E-09	7.93E-09
H 4	5.57E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HE 6	1.38E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LI 8	2.24E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BE 8	4.62E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BE 10	9.70E-11	9.70E-11	9.70E-11	9.70E-11	9.70E-11	9.70E-11	9.70E-11	9.70E-11	9.70E-11
BE 11	7.67E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B 12	1.69E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C 14	3.54E-09	3.54E-09	3.54E-09	3.54E-09	3.54E-09	3.54E-09	3.54E-09	3.54E-09	3.54E-09
C 15	3.92E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
O 19	2.79E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
F 20	1.06E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NE 23	1.10E-02	3.09E-17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NA 24	1.75E+00	1.71E+00	1.39E+00	5.76E-01	7.43E-04	3.16E-07	6.21E-15	2.21E-29	0.00E+00
NA 24M	2.34E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NA 25	6.62E-03	5.36E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MG 27	8.23E+00	9.14E-01	2.35E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MG 28	2.93E-08	2.88E-08	2.48E-08	1.32E-08	1.12E-10	4.26E-13	1.26E-18	5.45E-29	0.00E+00
AL 28	1.96E+02	1.83E-02	2.48E-08	1.32E-08	1.12E-10	4.27E-13	1.27E-18	0.00E+00	0.00E+00
AL 29	2.02E-03	8.32E-05	2.85E-17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AL 30	1.96E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SI 31	1.93E-02	1.69E-02	5.15E-03	3.39E-05	9.90E-22	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SI 32	2.19E-12	2.19E-12	2.19E-12	2.19E-12	2.19E-12	2.19E-12	2.19E-12	2.19E-12	2.19E-12
P 32	3.29E-03	3.29E-03	3.26E-03	3.14E-03	2.35E-03	1.67E-03	7.70E-04	1.80E-04	4.20E-05

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

Capsule E - 54.9 days irradiation									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	90 DAYS
ISOTOPE	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci
P 33	1.01E-07	1.01E-07	1.01E-07	9.87E-08	8.36E-08	6.88E-08	4.42E-08	1.92E-08	8.37E-09
P 34	7.48E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
S 35	3.01E-05	3.01E-05	3.00E-05	2.98E-05	2.85E-05	2.69E-05	2.37E-05	1.87E-05	1.48E-05
S 37	2.24E-07	3.67E-09	3.18E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CL 36	1.36E-11	1.36E-11	1.36E-11	1.36E-11	1.36E-11	1.36E-11	1.36E-11	1.36E-11	1.36E-11
CL 38	1.13E-10	6.46E-11	4.23E-13	2.54E-22	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CL 38M	1.35E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AR 39	5.13E-08	5.13E-08	5.13E-08	5.13E-08	5.13E-08	5.13E-08	5.13E-08	5.13E-08	5.13E-08
AR 41	8.28E-09	6.85E-09	1.24E-09	9.19E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
K 40	1.15E-13	1.15E-13	1.15E-13	1.15E-13	1.15E-13	1.15E-13	1.15E-13	1.15E-13	1.15E-13
K 42	7.71E-05	7.50E-05	5.83E-05	2.01E-05	6.25E-09	5.07E-13	4.60E-18	4.60E-18	4.59E-18
K 43	3.74E-11	3.68E-11	3.21E-11	1.79E-11	2.16E-13	1.25E-15	9.62E-21	2.47E-30	0.00E+00
K 44	6.62E-12	2.57E-12	5.20E-16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CA 45	2.02E-07	2.02E-07	2.02E-07	2.01E-07	1.96E-07	1.90E-07	1.78E-07	1.56E-07	1.38E-07
CA 47	4.26E-09	4.25E-09	4.13E-09	3.66E-09	1.46E-09	5.02E-10	4.35E-11	4.44E-13	4.54E-15
SC 46	4.54E-05	4.54E-05	4.53E-05	4.50E-05	4.28E-05	4.04E-05	3.54E-05	2.76E-05	2.16E-05
SC 46M	5.10E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SC 47	1.94E-04	1.93E-04	1.85E-04	1.57E-04	4.55E-05	1.07E-05	3.91E-07	7.89E-10	1.61E-12
SC 48	1.85E-05	1.84E-05	1.71E-05	1.27E-05	1.30E-06	9.08E-08	2.09E-10	2.35E-15	2.65E-20
SC 49	1.56E-05	1.09E-05	4.19E-07	4.51E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SC 50	3.22E-07	1.66E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TI 51	1.10E-03	2.97E-05	2.30E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 52	9.79E-01	3.83E-03	8.10E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 53	6.07E-03	1.49E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 54	6.27E-05	8.81E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CR 51	9.96E+01	9.95E+01	9.90E+01	9.71E+01	8.36E+01	7.01E+01	4.70E+01	2.22E+01	1.05E+01
CR 55	1.72E+00	4.90E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 54	9.40E-01	9.40E-01	9.40E-01	9.38E-01	9.26E-01	9.11E-01	8.80E-01	8.23E-01	7.70E-01
MN 56	1.34E+01	1.17E+01	3.48E+00	2.11E-02	3.26E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 57	1.97E-02	4.83E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 58	6.27E-05	3.16E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE 55	3.40E+00	3.40E+00	3.40E+00	3.40E+00	3.39E+00	3.37E+00	3.33E+00	3.26E+00	3.19E+00
FE 59	1.42E+00	1.42E+00	1.42E+00	1.40E+00	1.28E+00	1.15E+00	8.96E-01	5.65E-01	3.56E-01
CO 58	2.52E+00	2.52E+00	2.51E+00	2.49E+00	2.35E+00	2.20E+00	1.88E+00	1.40E+00	1.04E+00
CO 60	2.46E-02	2.46E-02	2.46E-02	2.46E-02	2.45E-02	2.45E-02	2.43E-02	2.41E-02	2.38E-02
CO 60M	6.57E-01	9.01E-02	1.56E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO 61	7.03E-03	5.70E-03	8.60E-04	2.94E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO 62	9.84E-04	9.38E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 59	3.55E-04	3.55E-04	3.55E-04	3.55E-04	3.55E-04	3.55E-04	3.55E-04	3.55E-04	3.55E-04
NI 63	4.49E-02	4.49E-02	4.49E-02	4.49E-02	4.49E-02	4.49E-02	4.49E-02	4.49E-02	4.49E-02
NI 65	1.14E+00	9.93E-01	2.88E-01	1.55E-03	9.73E-21	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 66	3.94E-05	3.91E-05	3.69E-05	2.90E-05	4.67E-06	5.53E-07	4.23E-09	4.55E-13	4.88E-17
CU 64	1.34E+00	1.31E+00	1.02E+00	3.62E-01	1.40E-04	1.46E-08	1.15E-17	0.00E+00	0.00E+00
CU 66	2.91E-01	4.97E-03	3.70E-05	2.91E-05	4.67E-06	5.54E-07	4.24E-09	4.55E-13	4.89E-17
CU 67	1.88E-06	1.87E-06	1.78E-06	1.44E-06	2.87E-07	4.36E-08	5.90E-10	1.85E-13	5.80E-17
ZN 65	2.00E-05	2.00E-05	2.00E-05	1.99E-05	1.96E-05	1.92E-05	1.83E-05	1.68E-05	1.55E-05
ZN 69	1.37E-10	9.76E-11	1.10E-11	2.94E-12	2.08E-15	4.40E-19	0.00E+00	0.00E+00	0.00E+00
ZN 69M	9.17E-12	8.95E-12	7.13E-12	2.74E-12	1.94E-15	4.10E-19	1.63E-27	0.00E+00	0.00E+00
SR 89	6.38E-12	6.37E-12	6.36E-12	6.29E-12	5.79E-12	5.26E-12	4.22E-12	2.80E-12	1.85E-12
SR 91	4.46E-13	4.30E-13	3.10E-13	7.74E-14	2.12E-18	1.01E-23	0.00E+00	0.00E+00	0.00E+00
Y 89M	6.72E-07	6.69E-07	6.43E-07	5.43E-07	1.52E-07	3.45E-08	1.16E-09	2.00E-12	3.45E-15
Y 90	9.01E-06	8.96E-06	8.53E-06	6.94E-06	1.46E-06	2.37E-07	3.70E-09	1.53E-12	1.47E-14
Y 90M	3.44E-13	3.08E-13	1.13E-13	1.56E-15	1.62E-29	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Y 91	6.95E-10	6.95E-10	6.94E-10	6.87E-10	6.40E-10	5.89E-10	4.87E-10	3.42E-10	2.39E-10
Y 92	5.15E-11	4.67E-11	1.93E-11	4.68E-13	2.64E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Capsule E - 54.9 days irradiation									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	90 DAYS
ISOTOPE	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci
ZR 89	6.73E-07	6.70E-07	6.44E-07	5.44E-07	1.52E-07	3.45E-08	1.16E-09	2.00E-12	3.44E-15
ZR 93	6.26E-12	6.26E-12	6.26E-12	6.26E-12	6.26E-12	6.26E-12	6.26E-12	6.26E-12	6.26E-12
ZR 95	1.04E-06	1.04E-06	1.04E-06	1.03E-06	9.65E-07	8.94E-07	7.52E-07	5.43E-07	3.93E-07
ZR 97	5.32E-08	5.21E-08	4.33E-08	1.99E-08	5.42E-11	5.54E-14	8.00E-21	0.00E+00	0.00E+00
NB 92	1.31E-04	1.31E-04	1.29E-04	1.22E-04	8.11E-05	5.03E-05	1.69E-05	2.18E-06	2.82E-07
NB 93M	2.28E-14	2.28E-14	2.29E-14	2.36E-14	2.85E-14	3.43E-14	4.75E-14	7.22E-14	9.67E-14
NB 94	1.01E-06	1.01E-06	1.01E-06	1.01E-06	1.01E-06	1.01E-06	1.01E-06	1.01E-06	1.01E-06
NB 95	1.84E-03	1.84E-03	1.84E-03	1.81E-03	1.61E-03	1.40E-03	1.02E-03	5.65E-04	3.13E-04
NB 95M	6.75E-09	6.75E-09	6.77E-09	6.84E-09	6.90E-09	6.57E-09	5.57E-09	4.03E-09	2.91E-09
NB 96	1.29E-05	1.27E-05	1.11E-05	6.32E-06	8.79E-08	6.00E-10	6.72E-15	3.51E-24	0.00E+00
NB 97	1.88E-06	1.42E-06	1.49E-07	2.00E-08	5.44E-11	5.56E-14	8.62E-21	0.00E+00	0.00E+00
NB 97M	5.04E-08	4.94E-08	4.11E-08	1.88E-08	5.13E-11	5.24E-14	7.58E-21	0.00E+00	0.00E+00
NB 98	2.81E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NB100	1.40E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MO 93M	3.89E-05	3.70E-05	2.34E-05	3.43E-06	1.61E-12	6.67E-20	0.00E+00	0.00E+00	0.00E+00
MO 93	3.56E-08	3.56E-08	3.56E-08	3.56E-08	3.56E-08	3.56E-08	3.56E-08	3.56E-08	3.56E-08
MO 99	2.72E-02	2.71E-02	2.58E-02	2.11E-02	4.66E-03	7.98E-04	1.41E-05	7.36E-09	3.83E-12
MO101	6.77E-03	1.63E-03	4.51E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TC 99	1.50E-09	1.50E-09	1.51E-09	1.53E-09	1.60E-09	1.62E-09	1.62E-09	1.62E-09	1.62E-09
TC100	1.57E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TC101	6.77E-03	3.91E-03	5.68E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RU103	2.10E-08	2.10E-08	2.09E-08	2.06E-08	1.85E-08	1.64E-08	1.24E-08	7.28E-09	4.29E-09
RH104	1.16E-10	8.29E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RH104M	8.38E-12	6.77E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SUMTOT	3.34E+02	1.25E+02	1.14E+02	1.06E+02	9.16E+01	7.78E+01	5.41E+01	2.83E+01	1.59E+01
0TOTAL	3.34E+02	1.25E+02	1.14E+02	1.06E+02	9.16E+01	7.78E+01	5.41E+01	2.83E+01	1.59E+01

8. REFERENCES

[1] N. H. Manwaring Letter to R. R. Little, Advanced Test Reactor Power History Through Cycle 164B-1, January 21, 2019, RE-03-19 (see Appendix B).

[2] W. C. Cook, A. C. Smith, "ATR CSAP Code Package on the Workstation Version 1," PG-T-96-002, May 1996.

[3] C.R. Tyler, "Functional and Operational Requirements Colorado School of Mines (CSM)-10584", FOR-308 Rev. 1.

[4] Tim Goorley, Jeffrey S. Bull, Forrest B. Brown, et. al., "Release of MCNP5_RSICC_1.30," Trans. Am. Nucl. Soc., Vol. 91, 693-694 (2004).

[5] X-5 Monte Carlo Team, "MCNP – A General Monte Carlo N-Particle Transport Code, Version 5," Volume I, LA-UR-03-1987, Los Alamos National Laboratory, April 24, 2003 (Revised /30/2004) and Volume II, LA-CP-0245, Los Alamos National Laboratory, April 24, 2003 (Revise 6/30/2004) (Vol. II is available with a licensed copy of MCNP).

[6] A. G. Croff, ORIGEN2: A Versatile Computer code for Calculating the Nuclide Compositions and Characteristics of Nuclear Materials, Nuclear Technology, Vol. 62, pp. 335-352, (1983).

[7] W. M. Cowherd, MCNP Verification and Validation For Use by the INL Neutronic Analysis Group, PLN-5021, Revision 0, January 6, 2016 (EA ID 234728).

[8] GDE-183, "Experiment Reactivities," Rev. 7, Nuclear Engineering, July 12, 2004.

[9] GDE-594, "Experiment Design and Analysis Guide – Neutronics & Physics," Rev. 1, June 26, 2015.

[10] S. S. Kim, B. G. Schnitzler, "Advanced Test Reactor: Serpentine Arrangement of Highly Enriched Water-Moderated Uranium-Aluminide Fuel Plates Reflected by Beryllium," INL/EXT-05-00780, September 2005; published in "International Handbook of Evaluated Criticality Safety Benchmark Experiments," NEA/NSC/DOC/(95)03/11, Volume II, HEU-MET-THERM-022, September 2005 Edition.

[11] B. G. Schnitzler, "Origen2 Cross Section Library Assessment for ATR Applications," BGS-6-91, Idaho National Laboratory, April 1991.

[12] J.R. Mitchell, J.W. Nielsen, "Software Management ORIGEN2 Version 2.2," PLN-3710, Revision 0, October 2011, INL Record Number 3818329, January 25, 2012 (EA ID 201298).

[13] T.A. Tomberlin, "Advanced Test Reactor Critical Facility Measurements in Support of Advanced Test Reactor Experiments," TRA-ATRC-1546, Rev. 0, March 2000.

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

APPENDIX A "PYHSICS ANALYSIS REQUEST FORM"

Rev. 3

Experiment Analysis Request Form

This form should be used to request analyses from the Experiment Design and Analysis (C660) department. Provide the completed form(s) to Keith Penny (Seldon.Penny@inl.gov).

Requester Information

Requester Name: Katie Anderson | Date: 7/19/2016 | Rev: 0

Office Phone: (208)526-0049 | Cell: (208)520-1197 | E-mail: katie.anderson@inl.gov

Type of Analysis Being Requested: Scoping

Comments:

Project Information

Project Name: CSM-10584 | Project Number: 0

Project/Experiment Manager: Katie Anderson

Office Phone: (208)526-0049 | Cell: (208)520-1197 | E-mail: katie.anderson@inl.gov

Experiment Information

Test Name: CMS-10584

Test Information: Irradiation performance testing of specimens produced by commerically available additive manufacturing techniques.

Test Location: B (Small) | Insertion Cycle: 164A | Final Discharge Cycle: | Duration: EFPD

Specific ATR Position(s): B5, possibly the Rabbit | ATR Cycle(s): 1 Cycle starting with 164A

Backup Test Information: unknown

Is an Experiment Safety Analysis (ESA) author needed? Yes ☒ No☐ Assigned ESA Author: TBD
Request ESA author from ATR Experiment Engineering (Dave Schoonen).

Is this a fueled experiment? Yes ☐ No☒ *If yes, complete "calculations for fueled test"s section.*

Experiment References Used to Support Calculation & Analysis

Engineering Inputs	
Experiment Plans	
Experiment Design	
T&FR	
Drawings	
ESA	
ECAR	
TEV	
Emails/Letters	
As-Built Data	
Quality Level	TBD — Quality Level Database Number: TBD
CUI Information	None
Other	

Provide the references listed above if they are not readily available through EDMS or other publicly available resources.

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

Rev. 3

Experiment Analysis Request Form

Neutronics/Physics Calculation & Analysis Request Form

Neutronics Analysis Request

Requesting a neutronics/physics analysis? Yes ☒ No ☐ *If yes, please fill out the information on this page.*

Deliverable ECAR Deliverable Title Physics Analysis of NSUF CSM-10584 Experiment

Draft Due Date 2/15/2017 Final/Approved Due Date 3/15/2017 Charge Number TBA

Comments

Purpose of Analysis Perform physics analysis to support CSM-10584 experiment

Persons assigned to support calculation & analysis tasks (as applicable).

Performer/Author	TBD
Checker	TBD
Independent Peer Reviewer	TBD
Approver (Line Manager)	Misti Lillo
Nuclear Safety Engineering	
Acceptance (Owner)	Katie Anderson
Other(s)	

Calculated Parameter	Scoping	Design	Projection	As-Run
Calculations for All Tests (typically required to support ESA)				
Neutron Heating Rates W/g ____	☒	☐	☐	☐
Gamma Heating Rates W/g ____	☒	☐	☐	☐
Test Reactivity Worth ($) relative to Water-Filled	☒	☐	☐	☐
Backup Test Reactivity Worth ($) relative to Water-Filled	☒	☐	☐	☐
Axial Flux Profile (FE(s) and coolant channel(s)?) ____	☒	☐	☐	☐
Other ____	☐	☐	☐	☐
Calculations for Tests in Flux Traps (typically required to support ESA)				
Temperature Coefficient of PCS (Flux Traps only) ($/°F)	☐	☐	☐	☐
Other ____	☐	☐	☐	☐
Additional Calculations for All Tests (not necessarily required to support ESA)				
Activation Ci/cc Irradiation Time TBD days	☒	☐	☐	☐
Decay Heat W/cc Cooling Time 30,60,90 days	☒	☐	☐	☐
DPA ____	☐	☐	☐	☐
Other ____	☐	☐	☐	☐
Calculations for Fueled Tests (not necessarily required to support ESA)				
Fuel Burnup ____	☐	☐	☐	☐
Fission Heating ____ Fission Density ____	☐	☐	☐	☐
Flux ____ (Fast/Thermal) ____	☐	☐	☐	☐
Fluence ____ (Fast/Thermal) ____	☐	☐	☐	☐
Fission Products ____	☐	☐	☐	☐
Local- or Point-to-Average Ratios ____	☐	☐	☐	☐
Other ____	☐	☐	☐	☐

APPENDIX B "POWER HISTORY LETTER"

INTEROFFICE MEMORANDUM

Idaho National Laboratory INL

Date: January 21, 2019

To: R. R. Little, Reactor and Nuclear Safety Engineering Manager, Advanced Test Reactor Programs

From: Reactor Engineering, Advanced Test Reactor Programs

Subject: Advanced Test Reactor Power History Through Cycle 164B-1

References:
(a) A. V. Briscoe letter to J. L. Durney, ATR Power History Through Cycle 34C-1, June 7, 1977, AVB-9-77
(b) C. C. Swanson letter to J. L. Durney, ATR Power History Through Cycle 72A-1, February 3, 1986, CAS-05-86
(c) L. S. Loret letter to E. C. Anderson, Sr., ATR Power History Through Cycle 102B-1, February 28, 1994, LSL-11-94
(d) D. E. Hale letter to J. C. Chapman, ATR Power History Through Cycle 133B-1, August 18, 2004, DEH-05-04

Table 1 lists the Advanced Test Reactor (ATR) N-16 constrained power history data since the Beryllium VI Core Internals Changeout (CIC) Cycle 134A-1 through Cycle 164B-1.

Table 2 lists the accumulated N-16 lobe and total core exposure, as obtained from the ATR Data Acquisition System (RDAS) for Cycles 134A-1 through 164B-1.

The ATR power history prior to Cycle 134A-1 is presented in the references.

Table 1. Summary of ATR Power History by Cycle

	Average Lobe Power (MW)					Cycle Exposure (MWd)						Length
	NW	NE	C	SW	SE	NW	NE	C	SW	SE	Total	(EFPD)
134A-1	-	-	-	-	-	-	-	-	-	-	-	-
134A-2	-	-	-	-	-	0.21	0.30	0.39	0.36	0.36	1.62	-
134B-1	18.0	18.0	24.5	23.0	25.0	452.82	452.24	615.47	578.48	628.58	2,727.59	25.10
134B-2	18.0	18.0	25.8	23.0	25.0	385.62	385.80	553.50	493.24	536.07	2,354.23	21.40
135A-1	18.0	18.0	29.8	28.1	35.4	236.16	235.99	391.07	368.63	463.98	1,695.83	13.10
135B-1	18.0	18.0	24.8	23.0	25.0	458.28	458.35	630.79	585.27	636.51	2,769.20	25.50
135B-2	18.0	18.0	25.2	23.0	25.0	405.02	405.70	567.38	517.82	562.99	2,458.91	22.50
135C-1	18.0	18.0	25.0	23.0	25.0	729.91	729.70	1,013.45	933.00	1,013.86	4,419.92	40.60
136A-1	18.0	18.0	24.0	23.0	23.0	916.18	916.39	1,218.91	1,169.47	1,170.17	5,391.12	50.90
136B-1	18.0	18.0	23.9	23.0	23.0	701.94	702.32	931.19	896.93	896.97	4,129.35	39.00
137A-1	18.0	18.0	24.7	20.0	25.0	975.35	974.76	1,336.16	1,083.20	1,353.31	5,722.78	54.10
137B-1	20.0	17.9	35.5	56.6	30.4	241.97	217.01	429.62	685.38	367.63	1,941.61	12.10
138A-1	18.0	18.0	23.6	23.0	25.0	1,046.87	1,047.69	1,370.69	1,336.39	1,453.47	6,255.11	58.10
138B-1	18.0	18.0	23.3	23.0	25.0	838.54	839.62	1,084.79	1,070.94	1,164.64	4,998.53	46.60
139A-1	18.0	18.0	23.9	23.0	25.0	928.73	929.09	1,231.07	1,186.27	1,289.47	5,564.63	51.60

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

R. R. Little
January 21, 2019
RE-03-19
Page 2 of 5

Table 1. Summary of ATR Power History by Cycle

	Average Lobe Power (MW)					Cycle Exposure (MWd)						Length
	NW	NE	C	SW	SE	NW	NE	C	SW	SE	Total	(EFPD)
139B-1	18.0	18.0	23.2	23.0	23.0	919.70	919.66	1,187.49	1,174.88	1,175.03	5,376.76	51.10
140A-1	18.0	18.0	21.8	23.0	23.0	836.99	837.18	1,012.89	1,069.69	1,069.39	4,826.14	46.50
140B-1	18.0	17.7	21.8	23.6	23.0	641.72	629.49	777.20	842.86	820.00	3,711.27	35.70
141A-1	18.0	18.0	23.4	23.0	23.0	583.25	583.08	756.83	745.05	745.45	3,413.66	32.40
142A-1	23.0	18.0	24.7	24.8	23.0	1,104.91	864.75	1,186.04	1,192.49	1,104.04	5,452.23	48.00
142B-1	23.0	18.0	25.4	25.4	25.0	1,196.93	936.68	1,323.41	1,322.45	1,298.70	6,078.17	52.00
143A-1/2	18.0	18.0	24.3	26.9	25.0	879.98	882.52	1,187.67	1,315.44	1,223.08	5,488.69	48.90
143B-1	18.0	18.0	24.9	27.0	25.1	1,032.06	1,032.58	1,423.53	1,543.74	1,435.01	6,466.92	57.30
144A-1	18.0	18.0	23.1	23.0	25.1	786.97	787.02	1,006.67	1,004.53	1,093.44	4,678.63	43.70
144B-1	18.0	18.1	22.4	23.0	23.0	932.25	933.43	1,155.74	1,190.72	1,190.89	5,403.03	51.70
145A-1	18.0	17.9	23.2	23.8	25.7	982.97	980.89	1,267.34	1,299.49	1,407.75	5,938.44	54.70
145B-1	17.8	17.8	23.0	24.6	25.8	1,020.46	1,019.96	1,321.43	1,407.79	1,478.25	6,247.89	57.30
146A-1	18.0	18.0	24.3	25.8	26.0	906.76	906.80	1,225.74	1,300.02	1,312.55	5,651.87	50.50
146B-1	23.0	18.0	26.0	23.0	26.0	903.68	707.11	1,021.59	903.85	1,020.96	4,557.19	39.20
147A-1	23.0	18.0	24.1	20.9	23.0	1,156.86	904.42	1,208.41	1,049.42	1,155.15	5,474.26	50.20
148A-1	18.0	18.0	23.6	22.0	23.0	855.97	855.75	1,121.43	1,043.79	1,093.64	4,970.58	47.50
148B-1	18.0	18.0	23.0	23.8	23.0	927.50	926.72	1,181.60	1,223.98	1,185.03	5,444.83	51.50
149A-1	18.0	18.0	24.2	24.0	23.0	662.45	662.65	891.28	883.28	846.80	3,946.46	36.80
149B-1	18.0	18.0	24.2	23.0	23.0	964.38	964.45	1,297.77	1,231.63	1,230.78	5,689.01	53.60
150A-1	18.9	18.0	30.5	37.5	35.1	233.41	221.60	375.93	462.71	432.58	1,726.23	12.32
150B-1	19.9	18.0	24.2	23.0	23.1	832.84	754.72	1,014.58	964.86	966.00	4,533.00	41.87
151A-1	18.9	14.2	22.0	23.6	23.0	1,058.63	799.95	1,237.01	1,324.39	1,289.04	5,709.02	56.14
151B-1/2	18.9	14.5	22.1	23.0	23.0	971.41	741.75	1,134.87	1,181.94	1,179.97	5,209.94	51.30
152A-1/6	-	-	-	-	-	0.30	0.30	0.50	0.40	0.50	2.00	-
152B-1	18.9	15.9	22.4	23.0	23.0	966.42	813.00	1,141.28	1,172.08	1,173.57	5,266.35	51.02
153B-1	19.7	19.7	30.8	35.4	44.0	265.20	265.35	414.47	476.12	591.42	2,012.56	13.45
154A-1	20.0	16.0	20.5	20.5	23.0	1,048.12	838.60	1,069.38	1,071.42	1,204.22	5,231.74	52.28
154B-1	20.0	17.9	21.6	22.8	23.9	1,066.60	958.47	1,156.40	1,220.49	1,275.27	5,677.23	53.44
155A-1	17.5	18.0	21.2	24.9	23.0	964.46	992.05	1,169.64	1,373.15	1,269.33	5,768.63	55.14
155B-1	18.0	18.7	22.0	22.9	23.0	896.41	933.78	1,097.45	1,145.28	1,146.21	5,219.13	49.92
156A-1	18.0	18.1	34.4	47.6	47.3	258.99	260.10	495.95	685.85	681.77	2,382.66	14.40
157A-1	18.0	16.9	20.1	19.9	24.0	674.80	636.93	755.89	749.37	900.30	3,717.29	37.58
157C-1	18.0	17.0	21.1	20.1	25.0	96.61	91.47	113.15	107.90	134.07	543.20	5.37
157D-1	18.0	17.0	21.6	20.9	25.0	1,072.06	1,012.51	1,288.16	1,247.14	1,490.31	6,110.18	59.71
158A-1	18.0	19.0	21.3	20.0	27.0	941.32	994.16	1,112.08	1,044.16	1,410.05	5,501.77	52.23
158B-1	18.0	19.0	19.0	22.7	23.0	924.85	977.00	974.33	1,165.25	1,183.34	5,224.77	51.36
159A-1	22.1	22.9	29.1	37.4	35.0	68.55	71.08	90.14	116.01	108.61	454.39	3.10
160A-1	17.5	21.1	19.8	20.0	26.1	924.07	1,115.94	1,050.71	1,057.87	1,380.71	5,529.30	52.94
160B-1	18.0	21.0	20.9	23.0	25.6	1,080.05	1,259.85	1,252.55	1,380.11	1,537.65	6,510.21	60.06
161A-1	18.0	20.9	30.6	42.7	41.5	230.21	268.17	392.91	547.87	532.53	1,971.69	12.82
162A-1	20.1	17.9	22.8	24.0	26.2	1,244.31	1,105.06	1,410.78	1,486.12	1,621.56	6,867.83	61.90
162B-1	20.0	14.5	19.2	23.9	23.0	769.04	560.05	738.98	918.84	884.90	3,871.81	38.51
163A-1	21.0	20.5	28.3	40.8	31.8	62.84	61.22	84.68	121.93	95.13	425.80	2.99
164A-1	20.0	16.0	19.4	22.4	25.7	1,099.06	879.28	1,067.84	1,230.00	1,410.51	5,686.69	54.91
164B-1	19.5	16.4	19.7	23.1	25.1	1,246.27	1,051.72	1,261.58	1,477.80	1,607.82	6,645.19	64.06

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

R. R. Little
January 21, 2019
RE-03-19
Page 3 of 5

Table 2. Cumulative Exposure

	Cumulative Exposure (MWd)					
	NW	NE	C	SW	SE	Total
134A-1	-	-	-	-	-	-
134A-2	0.21	0.30	0.39	0.36	0.36	1.62
134B-1	453.03	452.54	615.86	578.84	628.94	2,729.21
134B-2	838.65	838.34	1,169.36	1,072.08	1,165.01	5,083.44
135A-1	1,074.81	1,074.33	1,560.43	1,440.71	1,628.99	6,779.27
135B-1	1,533.09	1,532.68	2,191.22	2,025.98	2,265.50	9,548.47
135B-2	1,938.11	1,938.38	2,758.60	2,543.80	2,828.49	12,007.38
135C-1	2,668.02	2,668.08	3,772.05	3,476.80	3,842.35	16,427.30
136A-1	3,584.20	3,584.47	4,990.96	4,646.27	5,012.52	21,818.42
136B-1	4,286.14	4,286.79	5,922.15	5,543.20	5,909.49	25,947.77
137A-1	5,261.49	5,261.55	7,258.31	6,626.40	7,262.80	31,670.55
137B-1	5,503.46	5,478.56	7,687.93	7,311.78	7,630.43	33,612.16
138A-1	6,550.33	6,526.25	9,058.62	8,648.17	9,083.90	39,867.27
138B-1	7,388.87	7,365.87	10,143.41	9,719.11	10,248.54	44,865.80
139A-1	8,317.60	8,294.96	11,374.48	10,905.38	11,538.01	50,430.43
139B-1	9,237.30	9,214.62	12,561.97	12,080.26	12,713.04	55,807.19
140A-1	10,074.29	10,051.80	13,574.86	13,149.95	13,782.43	60,633.33
140B-1	10,716.01	10,681.29	14,352.06	13,992.81	14,602.43	64,344.60
141A-1	11,299.26	11,264.37	15,108.89	14,737.86	15,347.88	67,758.26
142A-1	12,404.17	12,129.12	16,294.93	15,930.35	16,451.92	73,210.49
142B-1	13,601.10	13,065.80	17,618.34	17,252.80	17,750.62	79,288.66
143A-1/2	14,481.08	13,948.32	18,806.01	18,568.24	18,973.70	84,777.35
143B-1	15,513.14	14,980.90	20,229.54	20,111.98	20,408.71	91,244.27
144A-1	16,300.11	15,767.92	21,236.21	21,116.51	21,502.15	95,922.90
144B-1	17,232.36	16,701.35	22,391.95	22,307.23	22,693.04	101,325.93
145A-1	18,215.33	17,682.24	23,659.29	23,606.72	24,100.79	107,264.37
145B-1	19,235.79	18,702.20	24,980.72	25,014.51	25,579.04	113,512.26
146A-1	20,142.55	19,609.00	26,206.46	26,314.53	26,891.59	119,164.13
146B-1	21,046.23	20,316.11	27,228.05	27,218.38	27,912.55	123,721.32
147A-1	22,203.09	21,220.53	28,436.46	28,267.80	29,067.70	129,195.58
148A-1	23,059.06	22,076.28	29,557.89	29,311.59	30,161.34	134,166.16
148B-1	23,986.56	23,003.00	30,739.49	30,535.57	31,346.37	139,610.99
149A-1	24,649.01	23,665.65	31,630.77	31,418.85	32,193.17	143,557.45
149B-1	25,613.39	24,630.10	32,928.54	32,650.48	33,423.95	149,246.46
150A-1	25,846.80	24,851.70	33,304.47	33,113.19	33,856.53	150,972.69
150B-1	26,679.64	25,606.42	34,319.05	34,078.05	34,822.53	155,505.69
151A-1	27,738.27	26,406.37	35,556.06	35,402.44	36,111.57	161,214.71
151B-1/2	28,709.68	27,148.12	36,690.93	36,584.38	37,291.54	166,424.65
152A-1/6	28,709.98	27,148.42	36,691.43	36,584.78	37,292.04	166,426.65
152B-1	29,676.40	27,961.42	37,832.71	37,756.86	38,465.61	171,693.00
153B-1	29,941.60	28,226.77	38,247.18	38,232.98	39,057.03	173,705.56
154A-1	30,989.72	29,065.37	39,316.56	39,304.40	40,261.25	178,937.30
154B-1	32,056.32	30,023.84	40,472.96	40,524.89	41,536.52	184,614.53
155A-1	33,020.78	31,015.89	41,642.60	41,898.04	42,805.85	190,383.16
155B-1	33,917.19	31,949.67	42,740.05	43,043.32	43,952.06	195,602.29
156A-1	34,176.18	32,209.77	43,236.00	43,729.17	44,633.83	197,984.95
157A-1	34,850.98	32,846.70	43,991.89	44,478.54	45,534.13	201,702.24
157C-1	34,947.59	32,938.17	44,105.04	44,586.44	45,668.20	202,245.44

R. R. Little
January 21, 2019
RE-03-19
Page 4 of 5

Table 2. Cumulative Exposure

	Cumulative Exposure (MWd)					
	NW	NE	C	SW	SE	Total
157D-1	36,019.65	33,950.68	45,393.20	45,833.58	47,158.51	208,355.62
158A-1	36,960.97	34,944.84	46,505.28	46,877.74	48,568.56	213,857.39
158B-1	37,885.82	35,921.84	47,479.61	48,042.99	49,751.90	219,082.16
159A-1	37,954.37	35,992.92	47,569.75	48,159.00	49,860.51	219,536.55
160A-1	38,878.44	37,108.86	48,620.46	49,216.87	51,241.22	225,065.85
160B-1	39,958.49	38,368.71	49,873.01	50,596.98	52,778.87	231,576.06
161A-1	40,188.70	38,636.88	50,265.92	51,144.85	53,311.40	233,547.75
162A-1	41,433.01	39,741.94	51,676.70	52,630.97	54,932.96	240,415.58
162B-1	42,202.05	40,301.99	52,415.68	53,549.81	55,817.86	244,287.39
163A-1	42,264.89	40,363.21	52,500.36	53,671.74	55,912.99	244,713.19
164A-1	43,363.95	41,242.49	53,568.20	54,901.74	57,323.5	250,399.88
164B-1	44,610.22	42,294.21	54,829.78	56,379.54	58,931.32	257,045.07

Prepared by
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ATR Reactor Engineering

Reviewed by
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ATR Reactor Engineering

NHM:LLS

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

R. R. Little
January 21, 2019
RE-03-19
Page 5 of 5

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APPENDIX C "ADDITIONAL SOURCE TERM"

The CSM-10584 experiment consisted of two sample materials. To support disassembly and future PIE of the CSM-10584 experiment the source term for 1 gram of each material scaled to the maximum experiment flux (1.18E+15) was calculated. This conservative source term can be scaled to the total mass for each sample geometry located in each capsule. The materials reported for the 54.9 EFPD irradiation should be applied to the specimen that were irradiated for only one cycle. The materials reported for the 119 EFPD irradiation should be applied to the remaining specimen.

1 gram of 316SS irradiated for 54.9 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g
H 3	6.15E-11	6.15E-11	6.15E-11	6.15E-11	6.15E-11	6.14E-11	6.12E-11	6.10E-11	5.82E-11
HE 6	1.05E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BE 8	1.82E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BE 10	7.37E-13	7.37E-13	7.37E-13	7.37E-13	7.37E-13	7.37E-13	7.37E-13	7.37E-13	7.37E-13
BE 11	5.83E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C 14	2.71E-11	2.71E-11	2.71E-11	2.71E-11	2.71E-11	2.71E-11	2.71E-11	2.71E-11	2.71E-11
NE 23	3.23E-09	9.08E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NA 24	8.05E-12	7.87E-12	6.39E-12	2.66E-12	3.42E-15	1.45E-18	2.85E-26	0.00E+00	0.00E+00
NA 24M	3.44E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NA 25	4.89E-09	3.96E-18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MG 27	6.51E-06	7.23E-07	1.86E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MG 28	2.31E-14	2.28E-14	1.96E-14	1.05E-14	9.64E-17	8.73E-18	2.59E-23	0.00E+00	0.00E+00
AL 28	7.84E-03	7.29E-07	1.97E-14	1.05E-14	9.65E-17	8.73E-18	2.59E-23	0.00E+00	0.00E+00
AL 29	2.65E-04	1.09E-05	3.73E-18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AL 30	2.57E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SI 31	5.04E-03	4.42E-03	1.35E-03	8.85E-06	2.58E-22	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SI 32	5.72E-13	5.72E-13	5.72E-13	5.72E-13	5.72E-13	5.72E-13	5.72E-13	5.72E-13	5.71E-13
P 32	7.21E-03	7.20E-03	7.13E-03	6.87E-03	5.13E-03	3.66E-03	1.68E-03	3.93E-04	1.48E-10
P 33	1.98E-07	1.98E-07	1.97E-07	1.92E-07	1.63E-07	1.34E-07	8.61E-08	3.75E-08	7.91E-12
P 34	1.46E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
S 35	5.86E-05	5.86E-05	5.85E-05	5.82E-05	5.55E-05	5.25E-05	4.63E-05	3.66E-05	3.30E-06
S 37	4.21E-07	6.92E-09	5.98E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CL 36	8.13E-14	8.13E-14	8.13E-14	8.13E-14	8.13E-14	8.13E-14	8.13E-14	8.13E-14	8.13E-14
CL 38	9.97E-11	5.70E-11	3.73E-13	2.24E-22	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CL 38M	1.19E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CA 45	1.00E-13	1.00E-13	1.00E-13	9.96E-14	9.71E-14	9.43E-14	8.81E-14	7.75E-14	2.12E-14
CA 47	3.63E-12	3.62E-12	3.52E-12	3.12E-12	1.25E-12	4.27E-13	3.71E-14	3.79E-16	0.00E+00
SC 47	1.86E-08	1.86E-08	1.79E-08	1.52E-08	4.38E-09	1.03E-09	3.77E-11	7.73E-14	0.00E+00
SC 48	1.11E-08	1.10E-08	1.03E-08	7.61E-09	7.79E-10	5.46E-11	1.26E-13	1.42E-18	0.00E+00
SC 49	5.56E-09	3.87E-09	1.50E-10	1.61E-16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SC 50	4.72E-10	2.44E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TI 51	2.25E-05	6.09E-07	4.72E-21	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 52	2.97E-02	1.16E-04	2.45E-26	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 53	1.83E-04	4.49E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 54	1.89E-06	2.65E-16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CR 51	3.00E+00	2.99E+00	2.98E+00	2.92E+00	2.51E+00	2.11E+00	1.41E+00	6.68E-01	3.22E-04
CR 55	5.41E-02	1.55E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 54	3.02E-02	3.02E-02	3.02E-02	3.01E-02	2.97E-02	2.93E-02	2.82E-02	2.64E-02	1.34E-02
MN 56	1.09E+01	9.53E+00	2.84E+00	1.72E-02	2.66E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

1 gram of 316SS irradiated for 54.9 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g
MN 57	6.31E-04	1.55E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 58	2.02E-06	1.01E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE 55	1.10E-01	1.10E-01	1.10E-01	1.10E-01	1.09E-01	1.09E-01	1.07E-01	1.05E-01	8.40E-02
FE 59	4.57E-02	4.57E-02	4.56E-02	4.50E-02	4.10E-02	3.68E-02	2.88E-02	1.81E-02	1.65E-04
CO 58	1.17E-01	1.17E-01	1.16E-01	1.15E-01	1.09E-01	1.02E-01	8.69E-02	6.47E-02	3.26E-03
CO 60	1.82E-04	1.82E-04	1.82E-04	1.82E-04	1.81E-04	1.81E-04	1.80E-04	1.78E-04	1.60E-04
CO 60M	4.23E-03	5.80E-04	1.00E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO 61	2.53E-04	2.05E-04	3.09E-05	1.06E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO 62	4.29E-05	4.09E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 59	1.64E-05	1.64E-05	1.64E-05	1.64E-05	1.64E-05	1.64E-05	1.64E-05	1.64E-05	1.64E-05
NI 63	2.08E-03	2.08E-03	2.08E-03	2.08E-03	2.08E-03	2.08E-03	2.08E-03	2.08E-03	2.06E-03
NI 65	5.27E-02	4.59E-02	1.33E-02	7.16E-05	4.50E-22	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 66	1.82E-06	1.81E-06	1.71E-06	1.34E-06	2.16E-07	2.56E-08	1.96E-10	2.10E-14	0.00E+00
CU 64	2.89E-06	2.81E-06	2.20E-06	7.80E-07	3.01E-10	3.14E-14	2.48E-23	0.00E+00	0.00E+00
CU 66	7.08E-05	2.98E-06	1.71E-06	1.34E-06	2.16E-07	2.56E-08	1.96E-10	2.11E-14	0.00E+00
CU 67	4.16E-10	4.14E-10	3.93E-10	3.18E-10	6.33E-11	9.64E-12	1.30E-13	4.09E-17	0.00E+00
ZN 65	7.53E-12	7.53E-12	7.52E-12	7.51E-12	7.38E-12	7.23E-12	6.91E-12	6.35E-12	2.67E-12
SR 89	6.70E-11	6.70E-11	6.68E-11	6.61E-11	6.09E-11	5.53E-11	4.44E-11	2.94E-11	4.45E-13
SR 90	1.19E-14	1.19E-14	1.19E-14	1.19E-14	1.19E-14	1.19E-14	1.18E-14	1.18E-14	1.16E-14
SR 91	4.61E-12	4.44E-12	3.20E-12	7.99E-13	2.19E-17	1.04E-22	0.00E+00	0.00E+00	0.00E+00
Y 89M	7.06E-06	7.03E-06	6.75E-06	5.71E-06	1.60E-06	3.62E-07	1.22E-08	2.10E-11	0.00E+00
Y 90	4.45E-09	4.42E-09	4.21E-09	3.43E-09	7.21E-10	1.17E-10	1.84E-12	1.26E-14	1.16E-14
Y 90M	3.62E-12	3.24E-12	1.18E-12	1.69E-14	1.75E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Y 91	1.26E-11	1.26E-11	1.26E-11	1.25E-11	1.16E-11	1.07E-11	8.86E-12	6.21E-12	1.67E-13
Y 92	5.30E-10	4.81E-10	1.99E-10	4.82E-12	2.72E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Y 94	3.29E-12	1.11E-12	6.16E-17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZR 89	7.07E-06	7.04E-06	6.76E-06	5.72E-06	1.60E-06	3.63E-07	1.22E-08	2.11E-11	0.00E+00
ZR 93	5.28E-12	5.28E-12	5.28E-12	5.28E-12	5.28E-12	5.28E-12	5.28E-12	5.28E-12	5.28E-12
ZR 95	1.09E-05	1.09E-05	1.09E-05	1.08E-05	1.01E-05	9.40E-06	7.90E-06	5.71E-06	2.09E-07
ZR 97	5.59E-07	5.48E-07	4.55E-07	2.09E-07	5.69E-10	5.71E-13	8.25E-20	0.00E+00	0.00E+00
NB 92	1.37E-03	1.37E-03	1.35E-03	1.28E-03	8.52E-04	5.28E-04	1.77E-04	2.29E-05	2.07E-14
NB 93M	1.91E-14	1.91E-14	1.93E-14	1.98E-14	2.40E-14	2.89E-14	4.00E-14	6.08E-14	2.67E-13
NB 94	6.00E-10	6.00E-10	6.00E-10	6.00E-10	6.00E-10	6.00E-10	6.00E-10	6.00E-10	6.00E-10
NB 95	2.64E-05	2.63E-05	2.63E-05	2.60E-05	2.43E-05	2.24E-05	1.87E-05	1.33E-05	4.66E-07
NB 95M	7.09E-08	7.09E-08	7.11E-08	7.18E-08	7.25E-08	6.90E-08	5.86E-08	4.23E-08	1.55E-09
NB 96	4.97E-05	4.90E-05	4.28E-05	2.44E-05	3.39E-07	2.32E-09	2.60E-14	1.36E-23	0.00E+00
NB 97	1.98E-05	1.50E-05	1.56E-06	2.10E-07	5.72E-10	5.82E-13	8.89E-20	0.00E+00	0.00E+00
NB 97M	5.29E-07	5.19E-07	4.31E-07	1.98E-07	5.39E-10	5.48E-13	7.81E-20	0.00E+00	0.00E+00
NB 98	2.95E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NB100	1.47E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MO 93M	4.09E-04	3.88E-04	2.46E-04	3.60E-05	1.69E-11	7.00E-19	0.00E+00	0.00E+00	0.00E+00
MO 93	3.74E-07	3.74E-07	3.74E-07	3.74E-07	3.74E-07	3.74E-07	3.74E-07	3.74E-07	3.74E-07
MO 99	2.86E-01	2.84E-01	2.71E-01	2.22E-01	4.90E-02	8.39E-03	1.49E-04	7.73E-08	0.00E+00
MO101	7.12E-02	1.72E-02	4.73E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TC 99	1.58E-08	1.58E-08	1.58E-08	1.60E-08	1.68E-08	1.70E-08	1.70E-08	1.70E-08	1.70E-08
TC100	1.65E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TC101	7.12E-02	4.11E-02	5.97E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RU103	2.20E-07	2.20E-07	2.20E-07	2.17E-07	1.95E-07	1.72E-07	1.30E-07	7.64E-08	3.50E-10
RU105	1.30E-12	1.21E-12	5.97E-13	3.07E-14	5.27E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RH104	1.22E-09	8.72E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RH104M	8.80E-11	7.30E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RH105	9.84E-13	9.86E-13	9.76E-13	7.27E-13	4.35E-14	1.61E-15	8.65E-19	6.42E-25	0.00E+00
RH105M	3.65E-13	3.38E-13	1.68E-13	8.62E-15	1.48E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RH106	2.17E-13	1.79E-19	1.79E-19	1.79E-19	1.79E-19	1.79E-19	1.79E-19	1.79E-19	1.01E-19
RH106M	1.05E-13	9.01E-14	2.18E-14	1.35E-16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

1 gram of 316SS irradiated for 54.9 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g
SUMTOT	1.48E+01	1.32E+01	6.42E+00	3.47E+00	2.86E+00	2.40E+00	1.67E+00	8.85E-01	1.03E-01
0TOTAL	1.48E+01	1.32E+01	6.42E+00	3.47E+00	2.86E+00	2.40E+00	1.67E+00	8.85E-01	1.03E-01

1 gram of 316SS irradiated for 119 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 Year
	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g
H 3	5.54E-10	5.54E-10	5.54E-10	5.54E-10	5.54E-10	5.53E-10	5.52E-10	5.49E-10	5.24E-10
HE 6	2.28E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BE 8	3.94E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BE 10	1.60E-12	1.60E-12	1.60E-12	1.60E-12	1.60E-12	1.60E-12	1.60E-12	1.60E-12	1.60E-12
BE 11	1.26E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C 14	5.87E-11	5.87E-11	5.87E-11	5.87E-11	5.87E-11	5.87E-11	5.87E-11	5.87E-11	5.87E-11
NE 23	7.00E-09	1.97E-23	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NA 24	1.96E-11	1.91E-11	1.55E-11	6.45E-12	8.31E-15	3.53E-18	6.95E-26	0.00E+00	0.00E+00
NA 24M	1.62E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NA 25	1.06E-08	8.58E-18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MG 27	6.53E-06	7.25E-07	1.86E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MG 28	2.32E-14	2.28E-14	1.97E-14	1.05E-14	9.66E-17	8.75E-18	2.59E-23	0.00E+00	0.00E+00
AL 28	7.84E-03	7.29E-07	1.97E-14	1.05E-14	9.68E-17	8.75E-18	2.60E-23	0.00E+00	0.00E+00
AL 29	2.65E-04	1.09E-05	3.74E-18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AL 30	2.57E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SI 31	5.04E-03	4.42E-03	1.35E-03	8.85E-06	2.58E-22	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SI 32	1.24E-12	1.24E-12	1.24E-12	1.24E-12	1.24E-12	1.24E-12	1.24E-12	1.24E-12	1.24E-12
P 32	7.72E-03	7.72E-03	7.65E-03	7.36E-03	5.50E-03	3.92E-03	1.80E-03	4.21E-04	1.59E-10
P 33	2.52E-07	2.52E-07	2.50E-07	2.45E-07	2.07E-07	1.71E-07	1.10E-07	4.77E-08	1.01E-11
P 34	1.46E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
S 35	1.02E-04	1.02E-04	1.01E-04	1.01E-04	9.61E-05	9.10E-05	8.02E-05	6.33E-05	5.72E-06
S 37	4.21E-07	6.92E-09	5.98E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CL 36	7.32E-13	7.32E-13	7.32E-13	7.32E-13	7.32E-13	7.32E-13	7.32E-13	7.32E-13	7.32E-13
CL 38	2.17E-10	1.24E-10	8.14E-13	4.89E-22	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CL 38M	2.59E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CA 45	9.53E-13	9.53E-13	9.52E-13	9.49E-13	9.25E-13	8.98E-13	8.39E-13	7.38E-13	2.02E-13
CA 47	9.31E-12	9.28E-12	9.02E-12	7.99E-12	3.20E-12	1.10E-12	9.51E-14	9.73E-16	0.00E+00
SC 47	4.23E-08	4.21E-08	4.05E-08	3.44E-08	9.94E-09	2.34E-09	8.56E-11	1.76E-13	0.00E+00
SC 48	3.58E-08	3.55E-08	3.31E-08	2.45E-08	2.51E-09	1.76E-10	4.03E-13	4.55E-18	0.00E+00
SC 49	1.20E-08	8.38E-09	3.24E-10	3.48E-16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SC 50	1.03E-09	5.31E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TI 51	2.48E-05	6.71E-07	5.20E-21	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 52	4.01E-02	1.57E-04	3.32E-26	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 53	1.84E-04	4.52E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 54	1.97E-06	2.77E-16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CR 51	3.78E+00	3.78E+00	3.76E+00	3.68E+00	3.17E+00	2.66E+00	1.78E+00	8.42E-01	4.06E-04
CR 55	5.64E-02	1.61E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 54	6.09E-02	6.09E-02	6.08E-02	6.07E-02	5.99E-02	5.90E-02	5.70E-02	5.33E-02	2.71E-02
MN 56	1.08E+01	9.44E+00	2.82E+00	1.70E-02	2.63E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 57	6.75E-04	1.66E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 58	2.04E-06	1.03E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE 55	2.32E-01	2.32E-01	2.32E-01	2.32E-01	2.31E-01	2.30E-01	2.27E-01	2.22E-01	1.78E-01
FE 59	6.78E-02	6.78E-02	6.76E-02	6.68E-02	6.09E-02	5.47E-02	4.27E-02	2.69E-02	2.44E-04
CO 58	1.28E-01	1.28E-01	1.28E-01	1.27E-01	1.19E-01	1.11E-01	9.52E-02	7.10E-02	3.57E-03
CO 60	6.63E-04	6.63E-04	6.63E-04	6.62E-04	6.61E-04	6.59E-04	6.56E-04	6.49E-04	5.81E-04
CO 60M	1.21E-02	1.66E-03	2.87E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO 61	2.98E-04	2.41E-04	3.65E-05	1.25E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

1 gram of 316SS irradiated for 119 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 Year
	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g
CO 62	4.26E-05	4.06E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 59	3.42E-05	3.42E-05	3.42E-05	3.42E-05	3.42E-05	3.42E-05	3.42E-05	3.42E-05	3.42E-05
NI 63	4.45E-03	4.45E-03	4.45E-03	4.45E-03	4.45E-03	4.45E-03	4.45E-03	4.45E-03	4.42E-03
NI 65	5.27E-02	4.59E-02	1.33E-02	7.16E-05	4.50E-22	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 66	1.80E-06	1.79E-06	1.69E-06	1.33E-06	2.14E-07	2.54E-08	1.94E-10	2.08E-14	0.00E+00
CU 64	1.33E-05	1.29E-05	1.01E-05	3.59E-06	1.39E-09	1.44E-13	1.14E-22	0.00E+00	0.00E+00
CU 66	1.51E-04	4.33E-06	1.70E-06	1.33E-06	2.14E-07	2.54E-08	1.94E-10	2.09E-14	0.00E+00
CU 67	9.49E-10	9.44E-10	8.97E-10	7.25E-10	1.44E-10	2.20E-11	2.98E-13	9.33E-17	0.00E+00
ZN 65	1.57E-10	1.57E-10	1.57E-10	1.56E-10	1.54E-10	1.51E-10	1.44E-10	1.32E-10	5.55E-11
ZN 69	1.85E-13	1.32E-13	1.49E-14	3.98E-15	2.81E-18	5.94E-22	0.00E+00	0.00E+00	0.00E+00
ZN 69M	1.24E-14	1.21E-14	9.66E-15	3.70E-15	2.62E-18	5.54E-22	0.00E+00	0.00E+00	0.00E+00
SR 89	2.84E-10	2.84E-10	2.83E-10	2.80E-10	2.58E-10	2.34E-10	1.88E-10	1.24E-10	1.89E-12
SR 90	5.63E-14	5.63E-14	5.63E-14	5.63E-14	5.63E-14	5.62E-14	5.62E-14	5.61E-14	5.50E-14
SR 91	1.00E-11	9.66E-12	6.95E-12	1.74E-12	4.76E-17	2.26E-22	0.00E+00	0.00E+00	0.00E+00
Y 89M	7.06E-06	7.03E-06	6.75E-06	5.71E-06	1.60E-06	3.62E-07	1.22E-08	2.11E-11	0.00E+00
Y 90	1.06E-08	1.05E-08	1.00E-08	8.17E-09	1.72E-09	2.78E-10	4.40E-12	5.79E-14	5.50E-14
Y 90M	8.24E-12	7.37E-12	2.69E-12	3.84E-14	3.99E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Y 91	4.80E-11	4.80E-11	4.79E-11	4.75E-11	4.42E-11	4.07E-11	3.37E-11	2.36E-11	6.35E-13
Y 92	1.26E-09	1.14E-09	4.72E-10	1.14E-11	6.44E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Y 94	7.16E-12	2.41E-12	1.34E-16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZR 89	7.07E-06	7.04E-06	6.76E-06	5.72E-06	1.60E-06	3.63E-07	1.22E-08	2.11E-11	0.00E+00
ZR 93	1.16E-11	1.16E-11	1.16E-11	1.16E-11	1.16E-11	1.16E-11	1.16E-11	1.16E-11	1.16E-11
ZR 95	1.77E-05	1.77E-05	1.76E-05	1.75E-05	1.64E-05	1.52E-05	1.28E-05	9.23E-06	3.38E-07
ZR 97	5.59E-07	5.47E-07	4.55E-07	2.09E-07	5.68E-10	5.79E-13	8.36E-20	0.00E+00	0.00E+00
NB 92	1.41E-03	1.40E-03	1.39E-03	1.31E-03	8.72E-04	5.41E-04	1.82E-04	2.35E-05	2.12E-14
NB 93M	9.02E-14	9.02E-14	9.05E-14	9.17E-14	1.01E-13	1.12E-13	1.36E-13	1.81E-13	6.33E-13
NB 94	1.28E-09	1.28E-09	1.28E-09	1.28E-09	1.28E-09	1.28E-09	1.28E-09	1.28E-09	1.28E-09
NB 95	4.36E-05	4.36E-05	4.35E-05	4.31E-05	4.02E-05	3.71E-05	3.08E-05	2.18E-05	7.53E-07
NB 95M	1.21E-07	1.21E-07	1.21E-07	1.21E-07	1.19E-07	1.12E-07	9.47E-08	6.85E-08	2.51E-09
NB 96	5.08E-05	5.00E-05	4.38E-05	2.49E-05	3.47E-07	2.37E-09	2.65E-14	1.38E-23	0.00E+00
NB 97	1.98E-05	1.50E-05	1.56E-06	2.10E-07	5.71E-10	5.82E-13	9.01E-20	0.00E+00	0.00E+00
NB 97M	5.29E-07	5.18E-07	4.31E-07	1.98E-07	5.38E-10	5.48E-13	7.92E-20	0.00E+00	0.00E+00
NB 98	2.96E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NB100	1.47E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MO 93M	4.08E-04	3.88E-04	2.46E-04	3.60E-05	1.69E-11	7.00E-19	0.00E+00	0.00E+00	0.00E+00
MO 93	8.11E-07	8.11E-07	8.11E-07	8.12E-07	8.12E-07	8.12E-07	8.12E-07	8.11E-07	8.11E-07
MO 99	2.86E-01	2.84E-01	2.71E-01	2.22E-01	4.90E-02	8.39E-03	1.49E-04	7.73E-08	0.00E+00
MO101	7.11E-02	1.71E-02	4.73E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TC 99	3.45E-08	3.46E-08	3.46E-08	3.48E-08	3.56E-08	3.58E-08	3.58E-08	3.58E-08	3.58E-08
TC100	3.61E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TC101	7.11E-02	4.10E-02	5.96E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RU103	1.78E-06	1.77E-06	1.77E-06	1.74E-06	1.57E-06	1.39E-06	1.05E-06	6.16E-07	2.82E-09
RU105	2.38E-11	2.20E-11	1.09E-11	5.60E-13	9.61E-23	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RH104	2.10E-08	1.50E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RH104M	1.52E-09	1.26E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RH105	1.79E-11	1.80E-11	1.78E-11	1.33E-11	7.93E-13	2.94E-14	1.58E-17	1.18E-23	0.00E+00
RH105M	6.65E-12	6.17E-12	3.06E-12	1.57E-13	2.70E-23	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RH106	3.96E-12	8.51E-18	8.51E-18	8.51E-18	8.41E-18	8.30E-18	8.06E-18	7.61E-18	4.28E-18
RH106M	1.92E-12	1.64E-12	3.98E-13	9.63E-16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SUMTOT	1.57E+01	1.41E+01	7.36E+00	4.42E+00	3.70E+00	3.13E+00	2.21E+00	1.22E+00	2.14E-01
0TOTAL	1.57E+01	1.41E+01	7.36E+00	4.42E+00	3.70E+00	3.13E+00	2.21E+00	1.22E+00	2.14E-01

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

1 gram of inconel irradiated for 54.9 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g
H 3	6.16E-11	6.16E-11	6.16E-11	6.16E-11	6.16E-11	6.15E-11	6.14E-11	6.11E-11	5.83E-11
H 4	1.51E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HE 6	1.05E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LI 8	6.07E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BE 8	6.08E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BE 10	2.11E-12	2.11E-12	2.11E-12	2.11E-12	2.11E-12	2.11E-12	2.11E-12	2.11E-12	2.11E-12
BE 11	1.67E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B 12	4.57E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C 14	2.71E-11	2.71E-11	2.71E-11	2.71E-11	2.71E-11	2.71E-11	2.71E-11	2.71E-11	2.71E-11
NE 23	1.13E-09	3.18E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NA 24	1.13E-03	1.11E-03	8.98E-04	3.73E-04	4.81E-07	2.04E-10	4.02E-18	0.00E+00	0.00E+00
NA 24M	1.20E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NA 25	1.71E-09	1.39E-18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MG 27	5.41E-03	6.01E-04	1.54E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MG 28	1.93E-11	1.89E-11	1.63E-11	8.69E-12	7.34E-14	2.85E-16	8.46E-22	0.00E+00	0.00E+00
AL 28	1.32E-01	1.23E-05	1.63E-11	8.70E-12	7.36E-14	2.86E-16	8.48E-22	0.00E+00	0.00E+00
AL 29	9.27E-05	3.82E-06	1.31E-18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AL 30	8.98E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SI 31	8.38E-04	7.34E-04	2.24E-04	1.47E-06	4.29E-23	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SI 32	9.50E-14	9.50E-14	9.50E-14	9.50E-14	9.50E-14	9.50E-14	9.50E-14	9.50E-14	9.49E-14
P 32	1.46E-03	1.46E-03	1.45E-03	1.39E-03	1.04E-03	7.40E-04	3.41E-04	7.96E-05	3.00E-11
P 33	9.89E-08	9.89E-08	9.83E-08	9.62E-08	8.15E-08	6.71E-08	4.31E-08	1.87E-08	3.96E-12
P 34	7.29E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
S 35	2.93E-05	2.93E-05	2.93E-05	2.91E-05	2.77E-05	2.63E-05	2.31E-05	1.83E-05	1.65E-06
S 37	2.85E-07	4.68E-09	4.05E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CL 36	1.34E-10	1.34E-10	1.34E-10	1.34E-10	1.34E-10	1.34E-10	1.34E-10	1.34E-10	1.34E-10
CL 38	6.58E-10	3.76E-10	2.46E-12	1.48E-21	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CL 38M	7.83E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AR 37	4.82E-14	4.82E-14	4.80E-14	4.73E-14	4.20E-14	3.65E-14	2.66E-14	1.47E-14	3.48E-17
AR 39	5.04E-07	5.04E-07	5.04E-07	5.04E-07	5.04E-07	5.04E-07	5.04E-07	5.04E-07	5.03E-07
AR 41	8.13E-08	6.73E-08	1.22E-08	9.03E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
K 40	1.13E-12	1.13E-12	1.13E-12	1.13E-12	1.13E-12	1.13E-12	1.13E-12	1.13E-12	1.13E-12
K 42	7.58E-04	7.37E-04	5.73E-04	1.97E-04	6.14E-08	4.98E-12	4.52E-17	4.51E-17	4.44E-17
K 43	4.49E-10	4.42E-10	3.85E-10	2.15E-10	2.60E-12	1.50E-14	1.15E-19	2.96E-29	0.00E+00
K 44	7.94E-11	3.09E-11	6.24E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CA 45	2.43E-06	2.43E-06	2.42E-06	2.42E-06	2.35E-06	2.29E-06	2.14E-06	1.88E-06	5.13E-07
CA 47	4.98E-08	4.96E-08	4.82E-08	4.27E-08	1.71E-08	5.86E-09	5.08E-10	5.19E-12	0.00E+00
SC 46	5.45E-04	5.45E-04	5.44E-04	5.41E-04	5.15E-04	4.86E-04	4.25E-04	3.32E-04	2.66E-05
SC 46M	6.13E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SC 47	2.32E-03	2.31E-03	2.22E-03	1.89E-03	5.45E-04	1.28E-04	4.68E-06	9.44E-09	0.00E+00
SC 48	2.18E-04	2.16E-04	2.01E-04	1.49E-04	1.53E-05	1.07E-06	2.46E-09	2.78E-14	0.00E+00
SC 49	1.85E-04	1.29E-04	4.98E-06	5.35E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SC 50	3.68E-06	1.90E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TI 51	4.20E-03	1.14E-04	8.80E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 52	3.64E-02	1.42E-04	3.01E-26	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 53	2.25E-04	5.54E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 54	2.33E-06	3.27E-16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CR 51	3.69E+00	3.69E+00	3.67E+00	3.60E+00	3.10E+00	2.60E+00	1.74E+00	8.23E-01	3.97E-04
CR 55	6.42E-02	1.83E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 54	5.13E-03	5.13E-03	5.13E-03	5.12E-03	5.05E-03	4.98E-03	4.80E-03	4.49E-03	2.28E-03
MN 56	2.14E+00	1.87E+00	5.58E-01	3.38E-03	5.22E-20	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 57	1.07E-04	2.64E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 58	3.49E-07	1.76E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE 55	2.50E-02	2.50E-02	2.50E-02	2.50E-02	2.49E-02	2.48E-02	2.45E-02	2.39E-02	1.92E-02
FE 59	8.07E-03	8.07E-03	8.05E-03	7.95E-03	7.25E-03	6.51E-03	5.08E-03	3.20E-03	2.91E-05

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

1 gram of inconel irradiated for 54.9 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g
CO 58	5.34E-01	5.34E-01	5.33E-01	5.29E-01	4.99E-01	4.66E-01	3.98E-01	2.97E-01	1.49E-02
CO 60	3.05E-01	3.05E-01	3.05E-01	3.05E-01	3.04E-01	3.04E-01	3.02E-01	2.99E-01	2.68E-01
CO 60M	8.32E+00	1.14E+00	1.97E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO 61	2.43E-02	1.97E-02	2.98E-03	1.02E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO 62	2.09E-04	2.00E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 59	7.52E-05	7.52E-05	7.52E-05	7.52E-05	7.52E-05	7.52E-05	7.52E-05	7.52E-05	7.52E-05
NI 63	9.53E-03	9.53E-03	9.53E-03	9.53E-03	9.53E-03	9.53E-03	9.52E-03	9.52E-03	9.46E-03
NI 65	2.42E-01	2.11E-01	6.11E-02	3.28E-04	2.06E-21	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 66	8.35E-06	8.30E-06	7.83E-06	6.16E-06	9.90E-07	1.17E-07	8.97E-10	9.64E-14	0.00E+00
CU 64	3.03E-01	2.95E-01	2.31E-01	8.18E-02	3.16E-05	3.29E-09	2.60E-18	0.00E+00	0.00E+00
CU 66	6.57E-02	1.12E-03	7.85E-06	6.17E-06	9.91E-07	1.18E-07	8.98E-10	9.65E-14	0.00E+00
CU 67	4.25E-07	4.23E-07	4.02E-07	3.25E-07	6.47E-08	9.85E-09	1.33E-10	4.18E-14	0.00E+00
ZN 65	4.51E-06	4.51E-06	4.51E-06	4.49E-06	4.42E-06	4.33E-06	4.14E-06	3.80E-06	1.60E-06
ZN 69	3.08E-11	2.20E-11	2.47E-12	6.64E-13	4.70E-16	9.93E-20	0.00E+00	0.00E+00	0.00E+00
ZN 69M	2.07E-12	2.02E-12	1.61E-12	6.18E-13	4.38E-16	9.25E-20	3.68E-28	0.00E+00	0.00E+00
GA 70	2.25E-14	7.67E-15	1.08E-18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SR 89	8.84E-11	8.84E-11	8.82E-11	8.72E-11	8.03E-11	7.30E-11	5.86E-11	3.88E-11	5.88E-13
SR 90	3.19E-13	3.19E-13	3.19E-13	3.19E-13	3.19E-13	3.18E-13	3.18E-13	3.18E-13	3.11E-13
SR 91	6.26E-12	6.03E-12	4.34E-12	1.09E-12	2.97E-17	1.41E-22	0.00E+00	0.00E+00	0.00E+00
Y 89M	9.31E-06	9.27E-06	8.91E-06	7.54E-06	2.11E-06	4.78E-07	1.61E-08	2.78E-11	0.00E+00
Y 90	2.10E-04	2.09E-04	1.99E-04	1.62E-04	3.41E-05	5.53E-06	8.63E-08	3.58E-11	3.11E-13
Y 90M	4.78E-12	4.27E-12	1.56E-12	2.23E-14	2.31E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Y 91	1.62E-08	1.62E-08	1.62E-08	1.60E-08	1.49E-08	1.38E-08	1.14E-08	7.97E-09	2.14E-10
Y 92	7.23E-10	6.56E-10	2.72E-10	6.57E-12	3.70E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Y 94	4.45E-12	1.50E-12	8.31E-17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZR 89	9.33E-06	9.29E-06	8.93E-06	7.55E-06	2.11E-06	4.79E-07	1.61E-08	2.78E-11	0.00E+00
ZR 93	1.42E-10	1.42E-10	1.42E-10	1.42E-10	1.42E-10	1.42E-10	1.42E-10	1.42E-10	1.42E-10
ZR 95	1.44E-05	1.44E-05	1.44E-05	1.43E-05	1.34E-05	1.24E-05	1.04E-05	7.53E-06	2.76E-07
ZR 97	7.38E-07	7.23E-07	6.01E-07	2.76E-07	7.51E-10	7.57E-13	1.10E-19	0.00E+00	0.00E+00
NB 92	1.81E-03	1.81E-03	1.79E-03	1.69E-03	1.12E-03	6.98E-04	2.34E-04	3.02E-05	2.73E-14
NB 93M	5.14E-13	5.15E-13	5.18E-13	5.33E-13	6.45E-13	7.76E-13	1.07E-12	1.63E-12	7.17E-12
NB 94	2.36E-05	2.36E-05	2.36E-05	2.36E-05	2.36E-05	2.36E-05	2.36E-05	2.36E-05	2.36E-05
NB 95	4.30E-02	4.30E-02	4.29E-02	4.22E-02	3.75E-02	3.27E-02	2.38E-02	1.32E-02	3.26E-05
NB 95M	9.36E-08	9.36E-08	9.39E-08	9.48E-08	9.57E-08	9.11E-08	7.73E-08	5.59E-08	2.05E-09
NB 96	2.56E-04	2.52E-04	2.21E-04	1.26E-04	1.75E-06	1.19E-08	1.34E-13	6.97E-23	0.00E+00
NB 97	2.61E-05	1.97E-05	2.06E-06	2.77E-07	7.55E-10	7.68E-13	1.18E-19	0.00E+00	0.00E+00
NB 97M	6.98E-07	6.85E-07	5.69E-07	2.61E-07	7.11E-10	7.24E-13	1.04E-19	0.00E+00	0.00E+00
NB 98	3.90E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NB100	1.94E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MO 93M	5.39E-04	5.13E-04	3.25E-04	4.75E-05	2.23E-11	9.25E-19	0.00E+00	0.00E+00	0.00E+00
MO 93	4.94E-07	4.94E-07	4.94E-07	4.94E-07	4.94E-07	4.94E-07	4.94E-07	4.94E-07	4.94E-07
MO 99	3.77E-01	3.75E-01	3.58E-01	2.93E-01	6.46E-02	1.11E-02	1.96E-04	1.02E-07	0.00E+00
MO101	9.39E-02	2.27E-02	6.25E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TC 99	2.08E-08	2.08E-08	2.09E-08	2.12E-08	2.22E-08	2.24E-08	2.25E-08	2.25E-08	2.25E-08
TC100	2.18E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TC101	9.39E-02	5.42E-02	7.88E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RU103	2.91E-07	2.91E-07	2.90E-07	2.86E-07	2.57E-07	2.27E-07	1.71E-07	1.01E-07	4.62E-10
RU105	1.72E-12	1.59E-12	7.88E-13	4.05E-14	6.95E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RH104	1.61E-09	1.15E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RH104M	1.16E-10	9.63E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RH105	1.30E-12	1.30E-12	1.29E-12	9.60E-13	5.74E-14	2.13E-15	1.15E-18	8.53E-25	0.00E+00
RH105M	4.82E-13	4.47E-13	2.21E-13	1.14E-14	1.95E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RH106	2.87E-13	2.36E-19	2.36E-19	2.36E-19	2.36E-19	2.36E-19	2.36E-19	2.36E-19	1.39E-19
RH106M	1.39E-13	1.19E-13	2.88E-14	1.78E-16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SUMTOT	1.65E+01	8.62E+00	5.82E+00	4.91E+00	4.05E+00	3.46E+00	2.51E+00	1.47E+00	3.14E-01

1 gram of inconel irradiated for 54.9 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g
0TOTAL	1.65E+01	8.62E+00	5.82E+00	4.91E+00	4.05E+00	3.46E+00	2.51E+00	1.47E+00	3.14E-01

1 gram of inconel irradiated for 119 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g
H 3	5.56E-10	5.56E-10	5.56E-10	5.56E-10	5.55E-10	5.54E-10	5.53E-10	5.51E-10	5.25E-10
H 4	1.68E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
HE 6	2.28E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LI 8	6.73E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BE 8	6.77E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BE 10	3.12E-12	3.12E-12	3.12E-12	3.12E-12	3.12E-12	3.12E-12	3.12E-12	3.12E-12	3.12E-12
BE 11	2.47E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
B 12	4.57E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C 14	5.87E-11	5.87E-11	5.87E-11	5.87E-11	5.87E-11	5.87E-11	5.87E-11	5.87E-11	5.87E-11
NE 23	2.45E-09	6.90E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NA 24	1.13E-03	1.11E-03	8.98E-04	3.73E-04	4.83E-07	2.06E-10	4.04E-18	0.00E+00	0.00E+00
NA 24M	5.66E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NA 25	3.71E-09	3.01E-18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MG 27	5.41E-03	6.01E-04	1.54E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MG 28	1.92E-11	1.89E-11	1.63E-11	8.69E-12	7.34E-14	2.85E-16	8.46E-22	0.00E+00	0.00E+00
AL 28	1.32E-01	1.23E-05	1.63E-11	8.70E-12	7.36E-14	2.86E-16	8.48E-22	0.00E+00	0.00E+00
AL 29	9.29E-05	3.83E-06	1.31E-18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AL 30	8.99E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SI 31	8.38E-04	7.35E-04	2.24E-04	1.47E-06	4.30E-23	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SI 32	2.06E-13	2.06E-13	2.06E-13	2.06E-13	2.06E-13	2.06E-13	2.06E-13	2.06E-13	2.06E-13
P 32	1.56E-03	1.56E-03	1.55E-03	1.49E-03	1.11E-03	7.93E-04	3.65E-04	8.53E-05	3.22E-11
P 33	1.26E-07	1.26E-07	1.25E-07	1.22E-07	1.04E-07	8.54E-08	5.48E-08	2.38E-08	5.03E-12
P 34	7.29E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
S 35	5.08E-05	5.08E-05	5.07E-05	5.04E-05	4.81E-05	4.55E-05	4.01E-05	3.17E-05	2.86E-06
S 37	5.22E-07	8.57E-09	7.42E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CL 36	2.89E-10	2.89E-10	2.89E-10	2.89E-10	2.89E-10	2.89E-10	2.89E-10	2.89E-10	2.89E-10
CL 38	2.79E-09	1.60E-09	1.05E-11	6.28E-21	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CL 38M	3.32E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AR 37	3.82E-13	3.82E-13	3.81E-13	3.75E-13	3.33E-13	2.90E-13	2.11E-13	1.17E-13	2.77E-16
AR 39	9.25E-07	9.25E-07	9.25E-07	9.25E-07	9.25E-07	9.25E-07	9.25E-07	9.24E-07	9.22E-07
AR 41	3.41E-07	2.82E-07	5.12E-08	3.79E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
K 40	2.27E-12	2.27E-12	2.27E-12	2.27E-12	2.27E-12	2.27E-12	2.27E-12	2.27E-12	2.27E-12
K 42	7.57E-04	7.36E-04	5.72E-04	1.97E-04	6.14E-08	4.98E-12	4.21E-16	4.20E-16	4.13E-16
K 43	9.73E-10	9.59E-10	8.35E-10	4.66E-10	5.63E-12	3.26E-14	2.50E-19	6.42E-29	0.00E+00
K 44	1.72E-10	6.69E-11	1.35E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CA 45	4.69E-06	4.69E-06	4.69E-06	4.67E-06	4.56E-06	4.42E-06	4.13E-06	3.64E-06	9.93E-07
CA 47	7.79E-08	7.76E-08	7.54E-08	6.68E-08	2.67E-08	9.17E-09	7.95E-10	8.12E-12	0.00E+00
SC 46	9.34E-04	9.34E-04	9.32E-04	9.26E-04	8.81E-04	8.32E-04	7.29E-04	5.68E-04	4.55E-05
SC 46M	2.66E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SC 47	2.32E-03	2.31E-03	2.22E-03	1.89E-03	5.46E-04	1.28E-04	4.69E-06	9.48E-09	0.00E+00
SC 48	2.17E-04	2.15E-04	2.01E-04	1.48E-04	1.52E-05	1.07E-06	2.45E-09	2.76E-14	0.00E+00
SC 49	1.96E-04	1.37E-04	5.27E-06	5.67E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SC 50	3.68E-06	1.91E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TI 51	4.21E-03	1.14E-04	8.82E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 52	4.93E-02	1.93E-04	4.08E-26	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 53	2.27E-04	5.59E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 54	2.43E-06	3.42E-16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CR 51	4.66E+00	4.65E+00	4.63E+00	4.54E+00	3.91E+00	3.28E+00	2.20E+00	1.04E+00	5.01E-04

1 gram of inconel irradiated for 119 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g
CR 55	6.69E-02	1.91E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 54	1.04E-02	1.04E-02	1.03E-02	1.03E-02	1.02E-02	1.00E-02	9.68E-03	9.06E-03	4.60E-03
MN 56	2.12E+00	1.85E+00	5.52E-01	3.34E-03	5.16E-20	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 57	1.15E-04	2.82E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 58	3.64E-07	1.83E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE 55	5.29E-02	5.29E-02	5.29E-02	5.29E-02	5.26E-02	5.24E-02	5.18E-02	5.06E-02	4.05E-02
FE 59	1.22E-02	1.22E-02	1.22E-02	1.20E-02	1.10E-02	9.85E-03	7.70E-03	4.85E-03	4.40E-05
CO 58	5.86E-01	5.86E-01	5.84E-01	5.80E-01	5.47E-01	5.11E-01	4.37E-01	3.25E-01	1.64E-02
CO 60	6.44E-01	6.44E-01	6.44E-01	6.44E-01	6.43E-01	6.41E-01	6.37E-01	6.30E-01	5.65E-01
CO 60M	8.09E+00	1.11E+00	1.92E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO 61	5.00E-02	4.05E-02	6.12E-03	2.09E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO 62	2.08E-04	1.98E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 59	1.57E-04	1.57E-04	1.57E-04	1.57E-04	1.57E-04	1.57E-04	1.57E-04	1.57E-04	1.57E-04
NI 63	2.04E-02	2.04E-02	2.04E-02	2.04E-02	2.04E-02	2.04E-02	2.04E-02	2.04E-02	2.03E-02
NI 65	2.42E-01	2.11E-01	6.11E-02	3.28E-04	2.06E-21	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 66	8.28E-06	8.23E-06	7.77E-06	6.11E-06	9.82E-07	1.16E-07	8.90E-10	9.56E-14	0.00E+00
CU 64	3.02E-01	2.94E-01	2.30E-01	8.16E-02	3.15E-05	3.28E-09	2.59E-18	0.00E+00	0.00E+00
CU 66	6.60E-02	1.13E-03	7.78E-06	6.12E-06	9.83E-07	1.17E-07	8.91E-10	9.57E-14	0.00E+00
CU 67	4.27E-07	4.24E-07	4.03E-07	3.26E-07	6.50E-08	9.89E-09	1.34E-10	4.20E-14	0.00E+00
ZN 65	2.01E-05	2.01E-05	2.01E-05	2.01E-05	1.97E-05	1.93E-05	1.85E-05	1.70E-05	7.12E-06
ZN 69	3.08E-10	2.20E-10	2.48E-11	6.64E-12	4.70E-15	9.94E-19	0.00E+00	0.00E+00	0.00E+00
ZN 69M	2.07E-11	2.02E-11	1.61E-11	6.19E-12	4.38E-15	9.25E-19	3.68E-27	0.00E+00	0.00E+00
GA 70	4.88E-13	1.82E-13	2.55E-17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SR 89	3.74E-10	3.74E-10	3.73E-10	3.69E-10	3.40E-10	3.09E-10	2.48E-10	1.64E-10	2.49E-12
SR 90	1.49E-12	1.49E-12	1.49E-12	1.49E-12	1.49E-12	1.49E-12	1.49E-12	1.49E-12	1.46E-12
SR 91	1.41E-11	1.36E-11	9.76E-12	2.44E-12	6.67E-17	3.17E-22	0.00E+00	0.00E+00	0.00E+00
Y 89M	9.31E-06	9.27E-06	8.91E-06	7.53E-06	2.11E-06	4.78E-07	1.61E-08	2.78E-11	0.00E+00
Y 90	2.10E-04	2.09E-04	1.99E-04	1.62E-04	3.40E-05	5.51E-06	8.61E-08	3.68E-11	1.46E-12
Y 90M	1.09E-11	9.72E-12	3.56E-12	5.08E-14	5.28E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Y 91	2.64E-08	2.64E-08	2.63E-08	2.61E-08	2.43E-08	2.23E-08	1.85E-08	1.30E-08	3.48E-10
Y 92	1.70E-09	1.54E-09	6.38E-10	1.54E-11	8.69E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Y 94	9.91E-12	3.34E-12	1.85E-16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZR 89	9.33E-06	9.29E-06	8.93E-06	7.55E-06	2.11E-06	4.79E-07	1.61E-08	2.78E-11	0.00E+00
ZR 93	3.05E-10	3.05E-10	3.05E-10	3.05E-10	3.05E-10	3.05E-10	3.05E-10	3.05E-10	3.05E-10
ZR 95	2.33E-05	2.33E-05	2.33E-05	2.31E-05	2.16E-05	2.01E-05	1.69E-05	1.22E-05	4.46E-07
ZR 97	7.37E-07	7.22E-07	6.01E-07	2.76E-07	7.49E-10	7.59E-13	1.10E-19	0.00E+00	0.00E+00
NB 92	1.86E-03	1.85E-03	1.83E-03	1.73E-03	1.15E-03	7.14E-04	2.40E-04	3.10E-05	2.80E-14
NB 93M	2.40E-12	2.40E-12	2.41E-12	2.44E-12	2.68E-12	2.96E-12	3.60E-12	4.80E-12	1.67E-11
NB 94	5.03E-05	5.03E-05	5.03E-05	5.03E-05	5.03E-05	5.03E-05	5.03E-05	5.03E-05	5.03E-05
NB 95	1.45E-01	1.45E-01	1.45E-01	1.42E-01	1.27E-01	1.10E-01	8.04E-02	4.45E-02	1.09E-04
NB 95M	1.60E-07	1.60E-07	1.60E-07	1.60E-07	1.57E-07	1.48E-07	1.25E-07	9.04E-08	3.31E-09
NB 96	7.15E-04	7.05E-04	6.17E-04	3.51E-04	4.88E-06	3.33E-08	3.74E-13	1.95E-22	0.00E+00
NB 97	2.62E-05	1.98E-05	2.06E-06	2.77E-07	7.54E-10	7.66E-13	1.18E-19	0.00E+00	0.00E+00
NB 97M	6.98E-07	6.84E-07	5.69E-07	2.61E-07	7.11E-10	7.22E-13	1.04E-19	0.00E+00	0.00E+00
NB 98	3.90E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NB100	1.94E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MO 93M	5.39E-04	5.13E-04	3.25E-04	4.75E-05	2.23E-11	9.24E-19	0.00E+00	0.00E+00	0.00E+00
MO 93	1.07E-06	1.07E-06	1.07E-06	1.07E-06	1.07E-06	1.07E-06	1.07E-06	1.07E-06	1.07E-06
MO 99	3.77E-01	3.75E-01	3.58E-01	2.93E-01	6.46E-02	1.11E-02	1.96E-04	1.02E-07	0.00E+00
MO101	9.38E-02	2.26E-02	6.24E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TC 99	4.56E-08	4.56E-08	4.57E-08	4.60E-08	4.70E-08	4.72E-08	4.73E-08	4.73E-08	4.73E-08
TC100	4.77E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TC101	9.38E-02	5.42E-02	7.87E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RU103	2.34E-06	2.34E-06	2.33E-06	2.30E-06	2.07E-06	1.83E-06	1.38E-06	8.13E-07	3.72E-09
RU105	3.14E-11	2.90E-11	1.44E-11	7.39E-13	1.27E-22	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

1 gram of inconel irradiated for 119 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g
RH104	2.77E-08	1.99E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RH104M	2.01E-09	1.66E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RH105	2.37E-11	2.37E-11	2.35E-11	1.75E-11	1.05E-12	3.89E-14	2.09E-17	1.55E-23	0.00E+00
RH105M	8.78E-12	8.14E-12	4.03E-12	2.08E-13	3.56E-23	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RH106	5.22E-12	1.12E-17	1.12E-17	1.12E-17	1.11E-17	1.10E-17	1.06E-17	1.00E-17	5.65E-18
RH106M	2.54E-12	2.17E-12	5.25E-13	1.27E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SUMTOT	1.78E+01	1.01E+01	7.32E+00	6.39E+00	5.39E+00	4.65E+00	3.44E+00	2.12E+00	6.47E-01
0TOTAL	1.78E+01	1.01E+01	7.32E+00	6.39E+00	5.39E+00	4.65E+00	3.44E+00	2.12E+00	6.47E-01

1 gram of inconel irradiated for 54.9 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel
H 1	8.11E-07	8.11E-07	8.11E-07	8.11E-07	8.11E-07	8.11E-07	8.11E-07	8.11E-07	8.11E-07
H 2	1.58E-10	1.58E-10	1.58E-10	1.58E-10	1.58E-10	1.58E-10	1.58E-10	1.58E-10	1.58E-10
H 3	6.38E-15	6.38E-15	6.38E-15	6.38E-15	6.38E-15	6.37E-15	6.36E-15	6.33E-15	6.04E-15
HE 4	4.71E-06	4.71E-06	4.71E-06	4.71E-06	4.71E-06	4.71E-06	4.71E-06	4.71E-06	4.71E-06
LI 6	7.94E-14	7.94E-14	7.94E-14	7.94E-14	7.94E-14	7.94E-14	7.94E-14	7.94E-14	7.94E-14
LI 7	6.96E-06	6.96E-06	6.96E-06	6.96E-06	6.96E-06	6.96E-06	6.96E-06	6.96E-06	6.96E-06
BE 9	1.29E-09	1.29E-09	1.29E-09	1.29E-09	1.29E-09	1.29E-09	1.29E-09	1.29E-09	1.29E-09
BE 10	9.44E-11	9.44E-11	9.44E-11	9.44E-11	9.44E-11	9.44E-11	9.44E-11	9.44E-11	9.44E-11
B 10	1.17E-06	1.17E-06	1.17E-06	1.17E-06	1.17E-06	1.17E-06	1.17E-06	1.17E-06	1.17E-06
B 11	4.89E-05	4.89E-05	4.89E-05	4.89E-05	4.89E-05	4.89E-05	4.89E-05	4.89E-05	4.89E-05
C 12	7.90E-04	7.90E-04	7.90E-04	7.90E-04	7.90E-04	7.90E-04	7.90E-04	7.90E-04	7.90E-04
C 13	9.61E-06	9.61E-06	9.61E-06	9.61E-06	9.61E-06	9.61E-06	9.61E-06	9.61E-06	9.61E-06
C 14	6.07E-12	6.07E-12	6.07E-12	6.07E-12	6.07E-12	6.07E-12	6.07E-12	6.07E-12	6.07E-12
NE 21	8.76E-15	8.76E-15	8.76E-15	8.76E-15	8.76E-15	8.76E-15	8.76E-15	8.76E-15	8.76E-15
NE 22	4.67E-14	4.67E-14	4.67E-14	4.67E-14	4.67E-14	4.67E-14	4.67E-14	4.67E-14	4.67E-14
NA 23	3.78E-15	3.78E-15	3.78E-15	3.78E-15	3.78E-15	3.78E-15	3.78E-15	3.78E-15	3.78E-15
NA 24	1.30E-10	1.27E-10	1.03E-10	4.29E-11	5.52E-14	2.35E-17	4.62E-25	0.00E+00	0.00E+00
MG 24	7.78E-09	7.79E-09	7.81E-09	7.87E-09	7.91E-09	7.91E-09	7.91E-09	7.91E-09	7.91E-09
MG 25	3.64E-09	3.64E-09	3.64E-09	3.64E-09	3.64E-09	3.64E-09	3.64E-09	3.64E-09	3.64E-09
MG 26	1.66E-09	1.66E-09	1.66E-09	1.66E-09	1.66E-09	1.66E-09	1.66E-09	1.66E-09	1.66E-09
MG 27	7.35E-12	8.16E-13	2.10E-21	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AL 27	8.00E-03	8.00E-03	8.00E-03	8.00E-03	8.00E-03	8.00E-03	8.00E-03	8.00E-03	8.00E-03
AL 28	4.42E-11	4.11E-15	5.45E-21	2.90E-21	2.45E-23	9.53E-26	2.83E-31	0.00E+00	0.00E+00
AL 29	9.32E-14	3.84E-15	1.31E-27	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SI 28	3.22E-03	3.22E-03	3.22E-03	3.22E-03	3.22E-03	3.22E-03	3.22E-03	3.22E-03	3.22E-03
SI 29	1.69E-04	1.69E-04	1.69E-04	1.69E-04	1.69E-04	1.69E-04	1.69E-04	1.69E-04	1.69E-04
SI 30	1.16E-04	1.16E-04	1.16E-04	1.16E-04	1.16E-04	1.16E-04	1.16E-04	1.16E-04	1.16E-04
SI 31	2.17E-11	1.90E-11	5.79E-12	3.81E-14	1.11E-30	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SI 32	5.53E-15	5.53E-15	5.53E-15	5.53E-15	5.53E-15	5.53E-15	5.53E-15	5.53E-15	5.52E-15
P 31	7.55E-09	7.55E-09	7.56E-09	7.57E-09	7.57E-09	7.57E-09	7.57E-09	7.57E-09	7.57E-09
P 32	5.11E-09	5.11E-09	5.06E-09	4.87E-09	3.64E-09	2.59E-09	1.19E-09	2.79E-10	1.05E-16
P 33	6.25E-13	6.24E-13	6.21E-13	6.08E-13	5.15E-13	4.24E-13	2.72E-13	1.18E-13	2.50E-17
S 32	1.42E-04	1.42E-04	1.42E-04	1.42E-04	1.42E-04	1.42E-04	1.42E-04	1.42E-04	1.42E-04
S 33	1.20E-06	1.20E-06	1.20E-06	1.20E-06	1.20E-06	1.20E-06	1.20E-06	1.20E-06	1.20E-06
S 34	6.69E-06	6.69E-06	6.69E-06	6.69E-06	6.69E-06	6.69E-06	6.69E-06	6.69E-06	6.69E-06
S 35	6.91E-10	6.91E-10	6.90E-10	6.86E-10	6.54E-10	6.19E-10	5.46E-10	4.31E-10	3.89E-11
S 36	2.86E-08	2.86E-08	2.86E-08	2.86E-08	2.86E-08	2.86E-08	2.86E-08	2.86E-08	2.86E-08
CL 35	1.59E-10	1.59E-10	1.60E-10	1.64E-10	1.96E-10	2.31E-10	3.04E-10	4.19E-10	8.11E-10
CL 36	4.05E-09	4.05E-09	4.05E-09	4.05E-09	4.05E-09	4.05E-09	4.05E-09	4.05E-09	4.05E-09
CL 37	3.00E-11	3.00E-11	3.00E-11	3.00E-11	3.00E-11	3.00E-11	3.00E-11	3.00E-11	3.00E-11

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

1 gram of inconel irradiated for 54.9 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel
AR 36	6.87E-16	6.88E-16	6.92E-16	7.12E-16	8.62E-16	1.04E-15	1.44E-15	2.19E-15	9.83E-15
AR 38	2.65E-15	2.65E-15	2.66E-15	2.66E-15	2.66E-15	2.66E-15	2.66E-15	2.66E-15	2.66E-15
AR 39	1.48E-08	1.48E-08	1.48E-08	1.48E-08	1.48E-08	1.48E-08	1.48E-08	1.48E-08	1.48E-08
AR 40	2.67E-09	2.67E-09	2.67E-09	2.67E-09	2.67E-09	2.67E-09	2.67E-09	2.67E-09	2.67E-09
AR 41	1.94E-15	1.61E-15	2.92E-16	2.16E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
K 39	1.39E-04	1.39E-04	1.39E-04	1.39E-04	1.39E-04	1.39E-04	1.39E-04	1.39E-04	1.39E-04
K 40	1.61E-07	1.61E-07	1.61E-07	1.61E-07	1.61E-07	1.61E-07	1.61E-07	1.61E-07	1.61E-07
K 41	1.06E-05	1.06E-05	1.06E-05	1.06E-05	1.06E-05	1.06E-05	1.06E-05	1.06E-05	1.06E-05
K 42	1.26E-10	1.22E-10	9.48E-11	3.27E-11	1.02E-14	8.24E-19	7.49E-24	7.48E-24	7.35E-24
CA 42	9.15E-09	9.15E-09	9.18E-09	9.24E-09	9.27E-09	9.27E-09	9.27E-09	9.27E-09	9.27E-09
CA 43	9.66E-10	9.66E-10	9.66E-10	9.66E-10	9.66E-10	9.66E-10	9.66E-10	9.66E-10	9.66E-10
CA 44	7.42E-09	7.42E-09	7.42E-09	7.42E-09	7.42E-09	7.42E-09	7.42E-09	7.42E-09	7.42E-09
CA 45	1.36E-10	1.36E-10	1.36E-10	1.36E-10	1.32E-10	1.28E-10	1.20E-10	1.06E-10	2.88E-11
CA 46	8.49E-10	8.49E-10	8.49E-10	8.49E-10	8.49E-10	8.49E-10	8.49E-10	8.49E-10	8.49E-10
CA 47	8.12E-14	8.09E-14	7.87E-14	6.97E-14	2.79E-14	9.56E-15	8.29E-16	8.46E-18	0.00E+00
SC 45	1.64E-11	1.64E-11	1.65E-11	1.70E-11	2.04E-11	2.42E-11	3.27E-11	4.70E-11	1.24E-10
SC 46	1.61E-08	1.61E-08	1.61E-08	1.60E-08	1.52E-08	1.43E-08	1.26E-08	9.80E-09	7.84E-10
SC 47	2.80E-09	2.78E-09	2.68E-09	2.27E-09	6.57E-10	1.55E-10	5.64E-12	1.14E-14	0.00E+00
SC 48	1.46E-10	1.45E-10	1.35E-10	9.99E-11	1.02E-11	7.17E-13	1.65E-15	1.86E-20	0.00E+00
SC 49	2.77E-12	1.93E-12	7.45E-14	8.02E-20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SC 50	1.67E-15	8.64E-21	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TI 46	9.11E-04	9.11E-04	9.11E-04	9.11E-04	9.11E-04	9.11E-04	9.11E-04	9.11E-04	9.11E-04
TI 47	8.40E-04	8.40E-04	8.40E-04	8.40E-04	8.40E-04	8.40E-04	8.40E-04	8.40E-04	8.40E-04
TI 48	8.46E-03	8.46E-03	8.46E-03	8.46E-03	8.46E-03	8.46E-03	8.46E-03	8.46E-03	8.46E-03
TI 49	6.69E-04	6.69E-04	6.69E-04	6.69E-04	6.69E-04	6.69E-04	6.69E-04	6.69E-04	6.69E-04
TI 50	6.25E-04	6.25E-04	6.25E-04	6.25E-04	6.25E-04	6.25E-04	6.25E-04	6.25E-04	6.25E-04
TI 51	6.56E-12	1.77E-13	1.38E-27	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 50	3.72E-07	3.72E-07	3.72E-07	3.72E-07	3.72E-07	3.72E-07	3.72E-07	3.72E-07	3.72E-07
V 51	3.36E-05	3.36E-05	3.38E-05	3.46E-05	4.00E-05	4.54E-05	5.47E-05	6.47E-05	7.36E-05
V 52	3.78E-11	1.48E-13	3.12E-35	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 53	1.02E-13	2.51E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CR 50	8.70E-03	8.70E-03	8.70E-03	8.70E-03	8.70E-03	8.70E-03	8.70E-03	8.70E-03	8.70E-03
CR 51	3.99E-05	3.99E-05	3.97E-05	3.90E-05	3.35E-05	2.81E-05	1.89E-05	8.90E-06	4.30E-09
CR 52	1.75E-01	1.75E-01	1.75E-01	1.75E-01	1.75E-01	1.75E-01	1.75E-01	1.75E-01	1.75E-01
CR 53	2.05E-02	2.05E-02	2.05E-02	2.05E-02	2.05E-02	2.05E-02	2.05E-02	2.05E-02	2.05E-02
CR 54	5.34E-03	5.34E-03	5.34E-03	5.34E-03	5.34E-03	5.34E-03	5.34E-03	5.34E-03	5.34E-03
CR 55	6.66E-11	1.90E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 54	6.63E-07	6.63E-07	6.63E-07	6.61E-07	6.53E-07	6.43E-07	6.20E-07	5.80E-07	2.95E-07
MN 55	3.47E-03	3.47E-03	3.47E-03	3.47E-03	3.47E-03	3.47E-03	3.47E-03	3.47E-03	3.47E-03
MN 56	9.86E-08	8.62E-08	2.57E-08	1.56E-10	2.41E-27	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 57	5.23E-14	1.29E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE 54	6.22E-03	6.22E-03	6.22E-03	6.22E-03	6.22E-03	6.22E-03	6.22E-03	6.22E-03	6.22E-03
FE 55	1.00E-05	1.00E-05	1.00E-05	9.99E-06	9.95E-06	9.90E-06	9.78E-06	9.57E-06	7.66E-06
FE 56	1.02E-01	1.02E-01	1.02E-01	1.02E-01	1.02E-01	1.02E-01	1.02E-01	1.02E-01	1.02E-01
FE 57	2.59E-03	2.59E-03	2.59E-03	2.59E-03	2.59E-03	2.59E-03	2.59E-03	2.59E-03	2.59E-03
FE 58	3.43E-04	3.43E-04	3.43E-04	3.44E-04	3.45E-04	3.46E-04	3.48E-04	3.51E-04	3.60E-04
FE 59	1.64E-07	1.64E-07	1.64E-07	1.62E-07	1.47E-07	1.32E-07	1.03E-07	6.51E-08	5.91E-10
CO 58	1.68E-05	1.68E-05	1.68E-05	1.66E-05	1.57E-05	1.46E-05	1.25E-05	9.32E-06	4.69E-07
CO 59	9.75E-03	9.75E-03	9.75E-03	9.75E-03	9.75E-03	9.75E-03	9.75E-03	9.75E-03	9.75E-03
CO 60	2.70E-04	2.70E-04	2.70E-04	2.70E-04	2.69E-04	2.69E-04	2.67E-04	2.64E-04	2.37E-04
CO 60M	2.78E-08	3.82E-09	6.59E-17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO 61	7.80E-10	6.33E-10	9.55E-11	3.26E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO 62	1.04E-13	9.87E-20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 58	3.70E-01	3.70E-01	3.70E-01	3.70E-01	3.70E-01	3.70E-01	3.70E-01	3.70E-01	3.70E-01

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

1 gram of inconel irradiated for 54.9 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel
NI 59	9.92E-04	9.92E-04	9.92E-04	9.92E-04	9.92E-04	9.92E-04	9.92E-04	9.92E-04	9.92E-04
NI 60	1.46E-01	1.46E-01	1.46E-01	1.46E-01	1.46E-01	1.46E-01	1.46E-01	1.46E-01	1.46E-01
NI 61	6.66E-03	6.66E-03	6.66E-03	6.66E-03	6.66E-03	6.66E-03	6.66E-03	6.66E-03	6.66E-03
NI 62	2.07E-02	2.07E-02	2.07E-02	2.07E-02	2.07E-02	2.07E-02	2.07E-02	2.07E-02	2.07E-02
NI 63	1.54E-04	1.54E-04	1.54E-04	1.54E-04	1.54E-04	1.54E-04	1.54E-04	1.54E-04	1.53E-04
NI 64	5.45E-03	5.45E-03	5.45E-03	5.45E-03	5.45E-03	5.45E-03	5.45E-03	5.45E-03	5.45E-03
NI 65	1.26E-08	1.10E-08	3.19E-09	1.72E-11	1.08E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 66	9.60E-12	9.54E-12	9.01E-12	7.08E-12	1.14E-12	1.35E-13	1.03E-15	1.11E-19	0.00E+00
CU 63	2.05E-03	2.05E-03	2.05E-03	2.05E-03	2.05E-03	2.05E-03	2.05E-03	2.05E-03	2.05E-03
CU 64	7.86E-08	7.65E-08	5.98E-08	2.12E-08	8.19E-12	8.53E-16	6.75E-25	0.00E+00	0.00E+00
CU 65	9.47E-04	9.47E-04	9.47E-04	9.47E-04	9.47E-04	9.47E-04	9.47E-04	9.47E-04	9.47E-04
CU 66	1.18E-10	2.01E-12	1.40E-14	1.10E-14	1.77E-15	2.10E-16	1.61E-18	1.73E-22	0.00E+00
CU 67	5.62E-13	5.59E-13	5.31E-13	4.29E-13	8.55E-14	1.30E-14	1.76E-16	5.52E-20	0.00E+00
ZN 64	2.08E-06	2.08E-06	2.08E-06	2.10E-06	2.10E-06	2.10E-06	2.10E-06	2.10E-06	2.10E-06
ZN 65	5.47E-10	5.47E-10	5.47E-10	5.45E-10	5.36E-10	5.26E-10	5.02E-10	4.61E-10	1.94E-10
ZN 66	1.26E-06	1.26E-06	1.26E-06	1.26E-06	1.26E-06	1.26E-06	1.26E-06	1.26E-06	1.26E-06
ZN 67	3.24E-10	3.24E-10	3.24E-10	3.24E-10	3.24E-10	3.24E-10	3.24E-10	3.24E-10	3.24E-10
ZN 68	6.50E-13	6.50E-13	6.50E-13	6.50E-13	6.50E-13	6.50E-13	6.50E-13	6.50E-13	6.50E-13
SR 88	4.10E-15	4.10E-15	4.10E-15	4.10E-15	4.10E-15	4.10E-15	4.10E-15	4.10E-15	4.10E-15
SR 89	3.04E-15	3.04E-15	3.03E-15	3.00E-15	2.76E-15	2.51E-15	2.02E-15	1.34E-15	2.02E-17
SR 90	2.34E-15	2.34E-15	2.34E-15	2.34E-15	2.33E-15	2.33E-15	2.33E-15	2.33E-15	2.28E-15
Y 89	2.21E-10	2.21E-10	2.22E-10	2.25E-10	2.37E-10	2.41E-10	2.42E-10	2.42E-10	2.42E-10
Y 89M	1.18E-15	1.17E-15	1.13E-15	9.54E-16	2.67E-16	6.06E-17	2.04E-18	3.52E-21	0.00E+00
Y 90	3.86E-10	3.84E-10	3.66E-10	2.98E-10	6.26E-11	1.02E-11	1.59E-13	6.57E-17	5.72E-19
Y 91	6.61E-13	6.61E-13	6.60E-13	6.54E-13	6.09E-13	5.60E-13	4.64E-13	3.25E-13	8.73E-15
ZR 89	2.08E-11	2.07E-11	1.99E-11	1.68E-11	4.71E-12	1.07E-12	3.59E-14	6.19E-17	0.00E+00
ZR 90	5.13E-09	5.14E-09	5.15E-09	5.22E-09	5.46E-09	5.51E-09	5.52E-09	5.52E-09	5.52E-09
ZR 91	3.29E-09	3.29E-09	3.29E-09	3.29E-09	3.29E-09	3.29E-09	3.29E-09	3.29E-09	3.29E-09
ZR 92	6.83E-08	6.83E-08	6.85E-08	6.92E-08	7.32E-08	7.63E-08	7.96E-08	8.11E-08	8.13E-08
ZR 93	5.63E-08	5.63E-08	5.63E-08	5.63E-08	5.63E-08	5.63E-08	5.63E-08	5.63E-08	5.63E-08
ZR 94	7.09E-09	7.09E-09	7.09E-09	7.09E-09	7.09E-09	7.09E-09	7.09E-09	7.09E-09	7.09E-09
ZR 95	6.72E-10	6.71E-10	6.70E-10	6.64E-10	6.23E-10	5.77E-10	4.85E-10	3.51E-10	1.28E-11
ZR 96	4.85E-13	4.85E-13	4.85E-13	4.85E-13	4.85E-13	4.85E-13	4.85E-13	4.85E-13	4.85E-13
ZR 97	3.86E-13	3.78E-13	3.14E-13	1.44E-13	3.93E-16	3.96E-19	5.72E-26	0.00E+00	0.00E+00
NB 92	1.30E-08	1.30E-08	1.28E-08	1.21E-08	8.05E-09	4.99E-09	1.68E-09	2.16E-10	1.95E-19
NB 93	5.48E-02	5.48E-02	5.48E-02	5.48E-02	5.48E-02	5.48E-02	5.48E-02	5.48E-02	5.48E-02
NB 93M	1.82E-15	1.82E-15	1.83E-15	1.88E-15	2.28E-15	2.74E-15	3.80E-15	5.77E-15	2.54E-14
NB 94	1.26E-04	1.26E-04	1.26E-04	1.26E-04	1.26E-04	1.26E-04	1.26E-04	1.26E-04	1.26E-04
NB 95	1.10E-06	1.10E-06	1.10E-06	1.08E-06	9.58E-07	8.35E-07	6.09E-07	3.37E-07	8.34E-10
NB 95M	2.46E-13	2.46E-13	2.46E-13	2.49E-13	2.51E-13	2.39E-13	2.03E-13	1.47E-13	5.37E-15
NB 96	1.83E-10	1.80E-10	1.58E-10	8.97E-11	1.25E-12	8.52E-15	9.55E-20	4.99E-29	0.00E+00
NB 97	9.70E-13	7.34E-13	7.66E-14	1.03E-14	2.81E-17	2.86E-20	4.39E-27	0.00E+00	0.00E+00
MO 92	4.68E-03	4.68E-03	4.68E-03	4.68E-03	4.68E-03	4.68E-03	4.68E-03	4.68E-03	4.68E-03
MO 93M	1.10E-10	1.04E-10	6.61E-11	9.66E-12	4.54E-18	1.88E-25	0.00E+00	0.00E+00	0.00E+00
MO 93	4.50E-07	4.50E-07	4.50E-07	4.50E-07	4.50E-07	4.50E-07	4.50E-07	4.50E-07	4.50E-07
MO 94	3.00E-03	3.00E-03	3.00E-03	3.00E-03	3.00E-03	3.00E-03	3.00E-03	3.00E-03	3.00E-03
MO 95	5.07E-03	5.07E-03	5.07E-03	5.07E-03	5.07E-03	5.07E-03	5.07E-03	5.07E-03	5.07E-03
MO 96	5.61E-03	5.61E-03	5.61E-03	5.61E-03	5.61E-03	5.61E-03	5.61E-03	5.61E-03	5.61E-03
MO 97	3.21E-03	3.21E-03	3.21E-03	3.21E-03	3.21E-03	3.21E-03	3.21E-03	3.21E-03	3.21E-03
MO 98	8.12E-03	8.12E-03	8.12E-03	8.12E-03	8.12E-03	8.12E-03	8.12E-03	8.12E-03	8.12E-03
MO 99	7.86E-07	7.82E-07	7.46E-07	6.11E-07	1.35E-07	2.31E-08	4.09E-10	2.13E-13	0.00E+00
MO100	3.30E-03	3.30E-03	3.30E-03	3.30E-03	3.30E-03	3.30E-03	3.30E-03	3.30E-03	3.30E-03
MO101	7.37E-10	1.78E-10	4.90E-16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

1 gram of inconel irradiated for 54.9 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel
TC 99	1.23E-06	1.23E-06	1.23E-06	1.25E-06	1.31E-06	1.32E-06	1.33E-06	1.33E-06	1.33E-06
TC100	3.05E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TC101	7.16E-10	4.13E-10	6.01E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RU 99	2.80E-13	2.80E-13	2.82E-13	2.91E-13	3.60E-13	4.42E-13	6.31E-13	9.85E-13	4.59E-12
RU100	2.98E-08	2.98E-08	2.98E-08	2.98E-08	2.98E-08	2.98E-08	2.98E-08	2.98E-08	2.98E-08
RU101	2.74E-06	2.74E-06	2.74E-06	2.74E-06	2.74E-06	2.74E-06	2.74E-06	2.74E-06	2.74E-06
RU102	2.29E-08	2.29E-08	2.29E-08	2.29E-08	2.29E-08	2.29E-08	2.29E-08	2.29E-08	2.29E-08
RU103	9.01E-12	9.01E-12	8.98E-12	8.85E-12	7.96E-12	7.04E-12	5.31E-12	3.13E-12	1.43E-14
RU104	3.55E-14	3.55E-14	3.55E-14	3.55E-14	3.55E-14	3.55E-14	3.55E-14	3.55E-14	3.55E-14
RH103	2.17E-13	2.17E-13	2.20E-13	2.33E-13	3.21E-13	4.13E-13	5.85E-13	8.02E-13	1.11E-12
PD104	1.01E-14	1.01E-14	1.01E-14	1.01E-14	1.01E-14	1.01E-14	1.01E-14	1.01E-14	1.01E-14
SUMTOT	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
0TOTAL	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00

1 gram of inconel irradiated for 119 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel
H 1	1.76E-06	1.76E-06	1.76E-06	1.76E-06	1.76E-06	1.76E-06	1.76E-06	1.76E-06	1.76E-06
H 2	7.40E-10	7.40E-10	7.40E-10	7.40E-10	7.40E-10	7.40E-10	7.40E-10	7.40E-10	7.40E-10
H 3	5.76E-14	5.76E-14	5.76E-14	5.75E-14	5.75E-14	5.74E-14	5.73E-14	5.70E-14	5.44E-14
HE 3	1.07E-16	1.08E-16	1.09E-16	1.16E-16	1.69E-16	2.31E-16	3.72E-16	6.35E-16	3.25E-15
HE 4	6.50E-06	6.50E-06	6.50E-06	6.50E-06	6.50E-06	6.50E-06	6.50E-06	6.50E-06	6.50E-06
LI 6	3.18E-13	3.18E-13	3.18E-13	3.18E-13	3.18E-13	3.18E-13	3.18E-13	3.18E-13	3.18E-13
LI 7	7.72E-06	7.72E-06	7.72E-06	7.72E-06	7.72E-06	7.72E-06	7.72E-06	7.72E-06	7.72E-06
BE 9	2.80E-09	2.80E-09	2.80E-09	2.80E-09	2.80E-09	2.80E-09	2.80E-09	2.80E-09	2.80E-09
BE 10	1.40E-10	1.40E-10	1.40E-10	1.40E-10	1.40E-10	1.40E-10	1.40E-10	1.40E-10	1.40E-10
B 10	8.51E-08	8.51E-08	8.51E-08	8.51E-08	8.51E-08	8.51E-08	8.51E-08	8.51E-08	8.51E-08
B 11	4.89E-05	4.89E-05	4.89E-05	4.89E-05	4.89E-05	4.89E-05	4.89E-05	4.89E-05	4.89E-05
C 12	7.90E-04	7.90E-04	7.90E-04	7.90E-04	7.90E-04	7.90E-04	7.90E-04	7.90E-04	7.90E-04
C 13	9.61E-06	9.61E-06	9.61E-06	9.61E-06	9.61E-06	9.61E-06	9.61E-06	9.61E-06	9.61E-06
C 14	1.32E-11	1.32E-11	1.32E-11	1.32E-11	1.32E-11	1.32E-11	1.32E-11	1.32E-11	1.32E-11
N 14	2.59E-16	2.59E-16	2.60E-16	2.64E-16	2.90E-16	3.20E-16	3.90E-16	5.21E-16	1.85E-15
NE 21	4.15E-14	4.15E-14	4.15E-14	4.15E-14	4.15E-14	4.15E-14	4.15E-14	4.15E-14	4.15E-14
NE 22	2.20E-13	2.20E-13	2.20E-13	2.20E-13	2.20E-13	2.20E-13	2.20E-13	2.20E-13	2.20E-13
NA 23	1.78E-14	1.78E-14	1.78E-14	1.78E-14	1.78E-14	1.78E-14	1.78E-14	1.78E-14	1.78E-14
NA 24	1.30E-10	1.27E-10	1.03E-10	4.29E-11	5.55E-14	2.36E-17	4.64E-25	0.00E+00	0.00E+00
MG 24	1.70E-08	1.70E-08	1.71E-08	1.71E-08	1.72E-08	1.72E-08	1.72E-08	1.72E-08	1.72E-08
MG 25	7.90E-09	7.90E-09	7.90E-09	7.90E-09	7.90E-09	7.90E-09	7.90E-09	7.90E-09	7.90E-09
MG 26	3.60E-09	3.60E-09	3.60E-09	3.60E-09	3.60E-09	3.60E-09	3.60E-09	3.60E-09	3.60E-09
MG 27	7.35E-12	8.16E-13	2.10E-21	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AL 27	8.00E-03	8.00E-03	8.00E-03	8.00E-03	8.00E-03	8.00E-03	8.00E-03	8.00E-03	8.00E-03
AL 28	4.42E-11	4.11E-15	5.45E-21	2.90E-21	2.45E-23	9.53E-26	2.83E-31	0.00E+00	0.00E+00
AL 29	9.34E-14	3.85E-15	1.32E-27	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SI 28	3.22E-03	3.22E-03	3.22E-03	3.22E-03	3.22E-03	3.22E-03	3.22E-03	3.22E-03	3.22E-03
SI 29	1.69E-04	1.69E-04	1.69E-04	1.69E-04	1.69E-04	1.69E-04	1.69E-04	1.69E-04	1.69E-04
SI 30	1.16E-04	1.16E-04	1.16E-04	1.16E-04	1.16E-04	1.16E-04	1.16E-04	1.16E-04	1.16E-04
SI 31	2.17E-11	1.90E-11	5.79E-12	3.81E-14	1.11E-30	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SI 32	1.20E-14	1.20E-14	1.20E-14	1.20E-14	1.20E-14	1.20E-14	1.20E-14	1.20E-14	1.20E-14
P 31	1.64E-08	1.64E-08	1.64E-08	1.64E-08	1.64E-08	1.64E-08	1.64E-08	1.64E-08	1.64E-08
P 32	5.48E-09	5.47E-09	5.42E-09	5.22E-09	3.90E-09	2.78E-09	1.28E-09	2.99E-10	1.13E-16

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

1 gram of inconel irradiated for 119 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel
P 33	7.95E-13	7.94E-13	7.90E-13	7.73E-13	6.55E-13	5.39E-13	3.46E-13	1.51E-13	3.18E-17
S 32	1.42E-04	1.42E-04	1.42E-04	1.42E-04	1.42E-04	1.42E-04	1.42E-04	1.42E-04	1.42E-04
S 33	1.24E-06	1.24E-06	1.24E-06	1.24E-06	1.24E-06	1.24E-06	1.24E-06	1.24E-06	1.24E-06
S 34	6.69E-06	6.69E-06	6.69E-06	6.69E-06	6.69E-06	6.69E-06	6.69E-06	6.69E-06	6.69E-06
S 35	1.20E-09	1.20E-09	1.20E-09	1.19E-09	1.13E-09	1.07E-09	9.46E-10	7.47E-10	6.74E-11
S 36	2.86E-08	2.86E-08	2.86E-08	2.86E-08	2.86E-08	2.86E-08	2.86E-08	2.86E-08	2.86E-08
CL 35	6.37E-10	6.37E-10	6.39E-10	6.46E-10	7.01E-10	7.62E-10	8.89E-10	1.09E-09	1.77E-09
CL 36	8.75E-09	8.75E-09	8.75E-09	8.75E-09	8.75E-09	8.75E-09	8.75E-09	8.75E-09	8.75E-09
CL 37	1.27E-10	1.27E-10	1.27E-10	1.27E-10	1.27E-10	1.27E-10	1.27E-10	1.27E-10	1.27E-10
AR 36	3.22E-15	3.22E-15	3.23E-15	3.27E-15	3.60E-15	3.98E-15	4.84E-15	6.47E-15	2.30E-14
AR 38	2.33E-14	2.33E-14	2.33E-14	2.33E-14	2.33E-14	2.33E-14	2.33E-14	2.33E-14	2.33E-14
AR 39	2.71E-08	2.71E-08	2.71E-08	2.71E-08	2.71E-08	2.71E-08	2.71E-08	2.71E-08	2.71E-08
AR 40	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08	1.12E-08
AR 41	8.16E-15	6.75E-15	1.22E-15	9.06E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
K 39	1.39E-04	1.39E-04	1.39E-04	1.39E-04	1.39E-04	1.39E-04	1.39E-04	1.39E-04	1.39E-04
K 40	3.25E-07	3.25E-07	3.25E-07	3.25E-07	3.25E-07	3.25E-07	3.25E-07	3.25E-07	3.25E-07
K 41	1.06E-05	1.06E-05	1.06E-05	1.06E-05	1.06E-05	1.06E-05	1.06E-05	1.06E-05	1.06E-05
K 42	1.25E-10	1.22E-10	9.48E-11	3.27E-11	1.02E-14	8.24E-19	6.96E-23	6.95E-23	6.83E-23
CA 42	2.00E-08	2.00E-08	2.00E-08	2.01E-08	2.01E-08	2.01E-08	2.01E-08	2.01E-08	2.01E-08
CA 43	2.09E-09	2.09E-09	2.09E-09	2.09E-09	2.09E-09	2.09E-09	2.09E-09	2.09E-09	2.09E-09
CA 44	1.61E-08	1.61E-08	1.61E-08	1.61E-08	1.61E-08	1.61E-08	1.61E-08	1.61E-08	1.61E-08
CA 45	2.64E-10	2.64E-10	2.63E-10	2.62E-10	2.56E-10	2.48E-10	2.32E-10	2.04E-10	5.57E-11
CA 46	1.90E-09	1.90E-09	1.90E-09	1.90E-09	1.90E-09	1.90E-09	1.90E-09	1.90E-09	1.90E-09
CA 47	1.27E-13	1.27E-13	1.23E-13	1.09E-13	4.36E-14	1.50E-14	1.30E-15	1.32E-17	0.00E+00
SC 45	7.09E-11	7.09E-11	7.11E-11	7.20E-11	7.86E-11	8.61E-11	1.03E-10	1.30E-10	2.79E-10
SC 46	2.76E-08	2.76E-08	2.75E-08	2.73E-08	2.60E-08	2.45E-08	2.15E-08	1.68E-08	1.34E-09
SC 47	2.80E-09	2.79E-09	2.68E-09	2.28E-09	6.58E-10	1.55E-10	5.65E-12	1.14E-14	0.00E+00
SC 48	1.46E-10	1.44E-10	1.35E-10	9.96E-11	1.02E-11	7.15E-13	1.64E-15	1.85E-20	0.00E+00
SC 49	2.94E-12	2.05E-12	7.89E-14	8.49E-20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SC 50	1.67E-15	8.65E-21	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TI 46	9.10E-04	9.10E-04	9.10E-04	9.10E-04	9.10E-04	9.10E-04	9.10E-04	9.10E-04	9.10E-04
TI 47	8.39E-04	8.39E-04	8.39E-04	8.39E-04	8.39E-04	8.39E-04	8.39E-04	8.39E-04	8.39E-04
TI 48	8.42E-03	8.42E-03	8.42E-03	8.42E-03	8.42E-03	8.42E-03	8.42E-03	8.42E-03	8.42E-03
TI 49	7.09E-04	7.09E-04	7.09E-04	7.09E-04	7.09E-04	7.09E-04	7.09E-04	7.09E-04	7.09E-04
TI 50	6.26E-04	6.26E-04	6.26E-04	6.26E-04	6.26E-04	6.26E-04	6.26E-04	6.26E-04	6.26E-04
TI 51	6.57E-12	1.78E-13	1.38E-27	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 50	7.84E-07	7.84E-07	7.84E-07	7.84E-07	7.84E-07	7.84E-07	7.84E-07	7.84E-07	7.84E-07
V 51	1.08E-04	1.08E-04	1.08E-04	1.09E-04	1.16E-04	1.23E-04	1.35E-04	1.47E-04	1.59E-04
V 52	5.11E-11	2.00E-13	4.23E-35	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 53	1.03E-13	2.54E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CR 50	8.62E-03	8.62E-03	8.62E-03	8.62E-03	8.62E-03	8.62E-03	8.62E-03	8.62E-03	8.62E-03
CR 51	5.04E-05	5.03E-05	5.01E-05	4.91E-05	4.23E-05	3.55E-05	2.38E-05	1.12E-05	5.42E-09
CR 52	1.75E-01	1.75E-01	1.75E-01	1.75E-01	1.75E-01	1.75E-01	1.75E-01	1.75E-01	1.75E-01
CR 53	2.06E-02	2.06E-02	2.06E-02	2.06E-02	2.06E-02	2.06E-02	2.06E-02	2.06E-02	2.06E-02
CR 54	5.57E-03	5.57E-03	5.57E-03	5.57E-03	5.57E-03	5.57E-03	5.57E-03	5.57E-03	5.57E-03
CR 55	6.94E-11	1.99E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 54	1.34E-06	1.34E-06	1.34E-06	1.33E-06	1.32E-06	1.30E-06	1.25E-06	1.17E-06	5.95E-07
MN 55	3.44E-03	3.44E-03	3.44E-03	3.44E-03	3.44E-03	3.44E-03	3.44E-03	3.44E-03	3.44E-03
MN 56	9.75E-08	8.52E-08	2.54E-08	1.54E-10	2.38E-27	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 57	5.60E-14	1.38E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE 54	6.21E-03	6.21E-03	6.21E-03	6.21E-03	6.21E-03	6.21E-03	6.21E-03	6.21E-03	6.21E-03
FE 55	2.12E-05	2.12E-05	2.12E-05	2.11E-05	2.10E-05	2.09E-05	2.07E-05	2.03E-05	1.62E-05
FE 56	1.02E-01	1.02E-01	1.02E-01	1.02E-01	1.02E-01	1.02E-01	1.02E-01	1.02E-01	1.02E-01
FE 57	2.76E-03	2.76E-03	2.76E-03	2.76E-03	2.76E-03	2.76E-03	2.76E-03	2.76E-03	2.76E-03

1 gram of inconel irradiated for 119 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel
FE 58	3.59E-04	3.59E-04	3.59E-04	3.59E-04	3.60E-04	3.61E-04	3.63E-04	3.67E-04	3.77E-04
FE 59	2.48E-07	2.48E-07	2.48E-07	2.45E-07	2.23E-07	2.00E-07	1.56E-07	9.86E-08	8.95E-10
CO 58	1.84E-05	1.84E-05	1.84E-05	1.82E-05	1.72E-05	1.60E-05	1.37E-05	1.02E-05	5.14E-07
CO 59	9.48E-03	9.48E-03	9.48E-03	9.48E-03	9.48E-03	9.48E-03	9.48E-03	9.48E-03	9.48E-03
CO 60	5.69E-04	5.69E-04	5.69E-04	5.69E-04	5.68E-04	5.67E-04	5.63E-04	5.57E-04	4.99E-04
CO 60M	2.70E-08	3.71E-09	6.40E-17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO 61	1.61E-09	1.30E-09	1.97E-10	6.72E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO 62	1.03E-13	9.80E-20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 58	3.68E-01	3.68E-01	3.68E-01	3.68E-01	3.68E-01	3.68E-01	3.68E-01	3.68E-01	3.68E-01
NI 59	2.07E-03	2.07E-03	2.07E-03	2.07E-03	2.07E-03	2.07E-03	2.07E-03	2.07E-03	2.07E-03
NI 60	1.46E-01	1.46E-01	1.46E-01	1.46E-01	1.46E-01	1.46E-01	1.46E-01	1.46E-01	1.46E-01
NI 61	6.91E-03	6.91E-03	6.91E-03	6.91E-03	6.91E-03	6.91E-03	6.91E-03	6.91E-03	6.91E-03
NI 62	2.05E-02	2.05E-02	2.05E-02	2.05E-02	2.05E-02	2.05E-02	2.05E-02	2.05E-02	2.05E-02
NI 63	3.31E-04	3.31E-04	3.31E-04	3.31E-04	3.31E-04	3.31E-04	3.31E-04	3.31E-04	3.28E-04
NI 64	5.45E-03	5.45E-03	5.45E-03	5.45E-03	5.45E-03	5.45E-03	5.45E-03	5.45E-03	5.45E-03
NI 65	1.26E-08	1.10E-08	3.19E-09	1.72E-11	1.08E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 66	9.52E-12	9.46E-12	8.94E-12	7.02E-12	1.13E-12	1.34E-13	1.02E-15	1.10E-19	0.00E+00
CU 63	2.04E-03	2.04E-03	2.04E-03	2.04E-03	2.04E-03	2.04E-03	2.04E-03	2.05E-03	2.05E-03
CU 64	7.83E-08	7.62E-08	5.96E-08	2.11E-08	8.16E-12	8.51E-16	6.73E-25	0.00E+00	0.00E+00
CU 65	9.51E-04	9.51E-04	9.51E-04	9.51E-04	9.51E-04	9.51E-04	9.51E-04	9.51E-04	9.51E-04
CU 66	1.18E-10	2.02E-12	1.39E-14	1.09E-14	1.76E-15	2.09E-16	1.60E-18	1.71E-22	0.00E+00
CU 67	5.64E-13	5.61E-13	5.33E-13	4.31E-13	8.59E-14	1.31E-14	1.77E-16	5.55E-20	0.00E+00
ZN 64	4.52E-06	4.53E-06	4.53E-06	4.55E-06	4.55E-06	4.55E-06	4.55E-06	4.55E-06	4.55E-06
ZN 65	2.44E-09	2.44E-09	2.44E-09	2.43E-09	2.39E-09	2.34E-09	2.24E-09	2.06E-09	8.64E-10
ZN 66	2.74E-06	2.74E-06	2.74E-06	2.74E-06	2.74E-06	2.74E-06	2.74E-06	2.74E-06	2.74E-06
ZN 67	1.50E-09	1.50E-09	1.50E-09	1.50E-09	1.50E-09	1.50E-09	1.50E-09	1.50E-09	1.50E-09
ZN 68	6.50E-12	6.50E-12	6.50E-12	6.50E-12	6.50E-12	6.50E-12	6.50E-12	6.50E-12	6.50E-12
GA 69	3.37E-15	3.37E-15	3.38E-15	3.38E-15	3.38E-15	3.38E-15	3.38E-15	3.38E-15	3.38E-15
SR 88	1.93E-14	1.93E-14	1.93E-14	1.93E-14	1.93E-14	1.93E-14	1.93E-14	1.93E-14	1.93E-14
SR 89	1.29E-14	1.29E-14	1.28E-14	1.27E-14	1.17E-14	1.06E-14	8.53E-15	5.65E-15	8.56E-17
SR 90	1.09E-14	1.09E-14	1.09E-14	1.09E-14	1.09E-14	1.09E-14	1.09E-14	1.09E-14	1.07E-14
Y 89	5.03E-10	5.03E-10	5.04E-10	5.07E-10	5.19E-10	5.23E-10	5.24E-10	5.24E-10	5.24E-10
Y 89M	1.18E-15	1.17E-15	1.13E-15	9.54E-16	2.67E-16	6.06E-17	2.04E-18	3.52E-21	0.00E+00
Y 90	3.85E-10	3.83E-10	3.65E-10	2.97E-10	6.24E-11	1.01E-11	1.58E-13	6.77E-17	2.68E-18
Y 91	1.08E-12	1.07E-12	1.07E-12	1.06E-12	9.89E-13	9.10E-13	7.53E-13	5.28E-13	1.42E-14
ZR 89	2.08E-11	2.07E-11	1.99E-11	1.68E-11	4.71E-12	1.07E-12	3.59E-14	6.19E-17	0.00E+00
ZR 90	1.16E-08	1.16E-08	1.16E-08	1.17E-08	1.19E-08	1.19E-08	1.19E-08	1.19E-08	1.19E-08
ZR 91	7.13E-09	7.13E-09	7.13E-09	7.13E-09	7.13E-09	7.13E-09	7.13E-09	7.13E-09	7.13E-09
ZR 92	1.62E-07	1.62E-07	1.62E-07	1.63E-07	1.67E-07	1.70E-07	1.74E-07	1.75E-07	1.75E-07
ZR 93	1.22E-07	1.22E-07	1.22E-07	1.22E-07	1.22E-07	1.22E-07	1.22E-07	1.22E-07	1.22E-07
ZR 94	1.58E-08	1.58E-08	1.58E-08	1.58E-08	1.58E-08	1.58E-08	1.58E-08	1.58E-08	1.58E-08
ZR 95	1.09E-09	1.09E-09	1.08E-09	1.07E-09	1.01E-09	9.33E-10	7.84E-10	5.67E-10	2.08E-11
ZR 96	1.87E-12	1.87E-12	1.87E-12	1.87E-12	1.87E-12	1.87E-12	1.87E-12	1.87E-12	1.87E-12
ZR 97	3.86E-13	3.78E-13	3.14E-13	1.44E-13	3.92E-16	3.97E-19	5.73E-26	0.00E+00	0.00E+00
NB 92	1.33E-08	1.33E-08	1.31E-08	1.24E-08	8.24E-09	5.11E-09	1.72E-09	2.22E-10	2.00E-19
NB 93	5.47E-02	5.47E-02	5.47E-02	5.47E-02	5.47E-02	5.47E-02	5.47E-02	5.47E-02	5.47E-02
NB 93M	8.49E-15	8.50E-15	8.52E-15	8.64E-15	9.49E-15	1.05E-14	1.28E-14	1.70E-14	5.91E-14
NB 94	2.69E-04	2.69E-04	2.69E-04	2.69E-04	2.69E-04	2.69E-04	2.69E-04	2.69E-04	2.69E-04
NB 95	3.71E-06	3.71E-06	3.70E-06	3.64E-06	3.23E-06	2.82E-06	2.06E-06	1.14E-06	2.79E-09
NB 95M	4.19E-13	4.19E-13	4.19E-13	4.20E-13	4.12E-13	3.88E-13	3.28E-13	2.37E-13	8.69E-15
NB 96	5.12E-10	5.04E-10	4.41E-10	2.51E-10	3.49E-12	2.38E-14	2.67E-19	1.39E-28	0.00E+00
NB 97	9.73E-13	7.36E-13	7.67E-14	1.03E-14	2.80E-17	2.85E-20	4.39E-27	0.00E+00	0.00E+00
MO 92	4.68E-03	4.68E-03	4.68E-03	4.68E-03	4.68E-03	4.68E-03	4.68E-03	4.68E-03	4.68E-03

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

1 gram of inconel irradiated for 119 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel	g/1g of inconel
MO 93M	1.10E-10	1.04E-10	6.61E-11	9.66E-12	4.54E-18	1.88E-25	0.00E+00	0.00E+00	0.00E+00
MO 93	9.74E-07	9.74E-07	9.74E-07	9.74E-07	9.74E-07	9.74E-07	9.74E-07	9.74E-07	9.74E-07
MO 94	3.00E-03	3.00E-03	3.00E-03	3.00E-03	3.00E-03	3.00E-03	3.00E-03	3.00E-03	3.00E-03
MO 95	4.94E-03	4.94E-03	4.94E-03	4.94E-03	4.94E-03	4.94E-03	4.94E-03	4.94E-03	4.94E-03
MO 96	5.73E-03	5.73E-03	5.73E-03	5.73E-03	5.73E-03	5.73E-03	5.73E-03	5.73E-03	5.73E-03
MO 97	3.22E-03	3.22E-03	3.22E-03	3.22E-03	3.22E-03	3.22E-03	3.22E-03	3.22E-03	3.22E-03
MO 98	8.12E-03	8.12E-03	8.12E-03	8.12E-03	8.12E-03	8.12E-03	8.12E-03	8.12E-03	8.12E-03
MO 99	7.86E-07	7.82E-07	7.46E-07	6.11E-07	1.35E-07	2.31E-08	4.09E-10	2.13E-13	0.00E+00
MO100	3.29E-03	3.29E-03	3.29E-03	3.29E-03	3.29E-03	3.29E-03	3.29E-03	3.29E-03	3.29E-03
MO101	7.37E-10	1.78E-10	4.90E-16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TC 99	2.69E-06	2.69E-06	2.69E-06	2.71E-06	2.77E-06	2.78E-06	2.79E-06	2.79E-06	2.79E-06
TC100	6.67E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TC101	7.16E-10	4.13E-10	6.00E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RU 99	1.41E-12	1.41E-12	1.42E-12	1.43E-12	1.58E-12	1.75E-12	2.15E-12	2.90E-12	1.05E-11
RU100	1.51E-07	1.51E-07	1.51E-07	1.51E-07	1.51E-07	1.51E-07	1.51E-07	1.51E-07	1.51E-07
RU101	5.88E-06	5.88E-06	5.88E-06	5.88E-06	5.88E-06	5.88E-06	5.88E-06	5.88E-06	5.88E-06
RU102	1.07E-07	1.07E-07	1.07E-07	1.07E-07	1.07E-07	1.07E-07	1.07E-07	1.07E-07	1.07E-07
RU103	7.26E-11	7.25E-11	7.23E-11	7.13E-11	6.41E-11	5.67E-11	4.27E-11	2.52E-11	1.15E-13
RU104	6.48E-13	6.48E-13	6.48E-13	6.48E-13	6.48E-13	6.48E-13	6.48E-13	6.48E-13	6.48E-13
RH103	3.74E-12	3.75E-12	3.77E-12	3.87E-12	4.58E-12	5.32E-12	6.71E-12	8.45E-12	1.09E-11
PD104	3.91E-13	3.91E-13	3.91E-13	3.91E-13	3.91E-13	3.91E-13	3.91E-13	3.91E-13	3.91E-13
SUMTOT	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
0TOTAL	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00

1 gram of 316SS irradiated for 54.9 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS
H 1	3.61E-07	3.61E-07	3.61E-07	3.61E-07	3.61E-07	3.61E-07	3.61E-07	3.61E-07	3.61E-07
H 2	7.03E-11	7.03E-11	7.03E-11	7.03E-11	7.03E-11	7.03E-11	7.03E-11	7.03E-11	7.03E-11
H 3	6.37E-15	6.37E-15	6.37E-15	6.37E-15	6.37E-15	6.36E-15	6.34E-15	6.31E-15	6.03E-15
HE 4	1.48E-07	1.48E-07	1.48E-07	1.48E-07	1.48E-07	1.48E-07	1.48E-07	1.48E-07	1.48E-07
LI 6	7.94E-14	7.94E-14	7.94E-14	7.94E-14	7.94E-14	7.94E-14	7.94E-14	7.94E-14	7.94E-14
BE 9	1.29E-09	1.29E-09	1.29E-09	1.29E-09	1.29E-09	1.29E-09	1.29E-09	1.29E-09	1.29E-09
BE 10	3.30E-11	3.30E-11	3.30E-11	3.30E-11	3.30E-11	3.30E-11	3.30E-11	3.30E-11	3.30E-11
C 12	7.90E-04	7.90E-04	7.90E-04	7.90E-04	7.90E-04	7.90E-04	7.90E-04	7.90E-04	7.90E-04
C 13	9.61E-06	9.61E-06	9.61E-06	9.61E-06	9.61E-06	9.61E-06	9.61E-06	9.61E-06	9.61E-06
C 14	6.07E-12	6.07E-12	6.07E-12	6.07E-12	6.07E-12	6.07E-12	6.07E-12	6.07E-12	6.07E-12
NE 22	1.34E-13	1.34E-13	1.34E-13	1.34E-13	1.34E-13	1.34E-13	1.34E-13	1.34E-13	1.34E-13
NA 23	1.08E-14	1.08E-14	1.08E-14	1.08E-14	1.08E-14	1.08E-14	1.08E-14	1.08E-14	1.08E-14
MG 25	1.04E-08	1.04E-08	1.04E-08	1.04E-08	1.04E-08	1.04E-08	1.04E-08	1.04E-08	1.04E-08
MG 26	4.75E-09	4.75E-09	4.75E-09	4.75E-09	4.75E-09	4.75E-09	4.75E-09	4.75E-09	4.75E-09
MG 27	8.84E-15	9.82E-16	2.52E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AL 27	5.11E-11	5.11E-11	5.11E-11	5.11E-11	5.11E-11	5.11E-11	5.11E-11	5.11E-11	5.11E-11
AL 28	2.61E-12	2.43E-16	6.55E-24	3.49E-24	3.22E-26	2.91E-27	8.65E-33	0.00E+00	0.00E+00
AL 29	2.66E-13	1.10E-14	3.75E-27	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SI 28	9.19E-03	9.19E-03	9.19E-03	9.19E-03	9.19E-03	9.19E-03	9.19E-03	9.19E-03	9.19E-03
SI 29	4.83E-04	4.83E-04	4.83E-04	4.83E-04	4.83E-04	4.83E-04	4.83E-04	4.83E-04	4.83E-04
SI 30	3.31E-04	3.31E-04	3.31E-04	3.31E-04	3.31E-04	3.31E-04	3.31E-04	3.31E-04	3.31E-04
SI 31	1.31E-10	1.15E-10	3.49E-11	2.29E-13	6.70E-30	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

1 gram of 316SS irradiated for 54.9 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS
SI 32	3.33E-14	3.33E-14	3.33E-14	3.33E-14	3.33E-14	3.33E-14	3.33E-14	3.32E-14	3.32E-14
P 31	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04
P 32	2.53E-08	2.52E-08	2.50E-08	2.41E-08	1.80E-08	1.28E-08	5.90E-09	1.38E-09	5.19E-16
P 33	1.25E-12	1.25E-12	1.24E-12	1.22E-12	1.03E-12	8.47E-13	5.44E-13	2.37E-13	5.00E-17
S 32	2.84E-04	2.84E-04	2.84E-04	2.84E-04	2.84E-04	2.84E-04	2.84E-04	2.84E-04	2.84E-04
S 33	2.39E-06	2.39E-06	2.39E-06	2.39E-06	2.39E-06	2.39E-06	2.39E-06	2.39E-06	2.39E-06
S 34	1.34E-05	1.34E-05	1.34E-05	1.34E-05	1.34E-05	1.34E-05	1.34E-05	1.34E-05	1.34E-05
S 35	1.38E-09	1.38E-09	1.38E-09	1.37E-09	1.31E-09	1.24E-09	1.09E-09	8.62E-10	7.78E-11
S 36	5.72E-08	5.72E-08	5.72E-08	5.72E-08	5.72E-08	5.72E-08	5.72E-08	5.72E-08	5.72E-08
CL 35	3.18E-10	3.18E-10	3.20E-10	3.29E-10	3.92E-10	4.62E-10	6.09E-10	8.39E-10	1.62E-09
CL 36	2.46E-12	2.46E-12	2.46E-12	2.46E-12	2.46E-12	2.46E-12	2.46E-12	2.46E-12	2.46E-12
CL 37	4.54E-12	4.54E-12	4.54E-12	4.54E-12	4.54E-12	4.54E-12	4.54E-12	4.54E-12	4.54E-12
CA 44	3.28E-14	3.28E-14	3.28E-14	3.28E-14	3.28E-14	3.28E-14	3.28E-14	3.28E-14	3.28E-14
CA 46	1.31E-14	1.31E-14	1.31E-14	1.31E-14	1.31E-14	1.31E-14	1.31E-14	1.31E-14	1.31E-14
SC 47	2.25E-14	2.24E-14	2.15E-14	1.83E-14	5.28E-15	1.24E-15	4.55E-17	9.32E-20	0.00E+00
SC 48	7.46E-15	7.40E-15	6.89E-15	5.10E-15	5.23E-16	3.66E-17	8.42E-20	9.49E-25	0.00E+00
TI 47	7.41E-09	7.41E-09	7.41E-09	7.41E-09	7.41E-09	7.41E-09	7.41E-09	7.41E-09	7.41E-09
TI 48	3.90E-12	3.90E-12	3.90E-12	3.91E-12	3.91E-12	3.91E-12	3.91E-12	3.91E-12	3.91E-12
TI 49	2.01E-08	2.01E-08	2.01E-08	2.01E-08	2.01E-08	2.01E-08	2.01E-08	2.01E-08	2.01E-08
TI 50	8.02E-08	8.02E-08	8.02E-08	8.02E-08	8.02E-08	8.02E-08	8.02E-08	8.02E-08	8.02E-08
TI 51	3.52E-14	9.52E-16	7.37E-30	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 50	3.01E-07	3.01E-07	3.01E-07	3.01E-07	3.01E-07	3.01E-07	3.01E-07	3.01E-07	3.01E-07
V 51	2.72E-05	2.72E-05	2.74E-05	2.80E-05	3.24E-05	3.68E-05	4.43E-05	5.24E-05	5.96E-05
V 52	3.08E-11	1.20E-13	2.54E-35	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 53	8.28E-14	2.04E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CR 50	7.04E-03	7.04E-03	7.04E-03	7.04E-03	7.04E-03	7.04E-03	7.04E-03	7.04E-03	7.04E-03
CR 51	3.24E-05	3.24E-05	3.22E-05	3.16E-05	2.72E-05	2.28E-05	1.53E-05	7.22E-06	3.49E-09
CR 52	1.42E-01	1.42E-01	1.42E-01	1.42E-01	1.42E-01	1.42E-01	1.42E-01	1.42E-01	1.42E-01
CR 53	1.66E-02	1.66E-02	1.66E-02	1.66E-02	1.66E-02	1.66E-02	1.66E-02	1.66E-02	1.66E-02
CR 54	4.32E-03	4.32E-03	4.32E-03	4.32E-03	4.32E-03	4.32E-03	4.32E-03	4.32E-03	4.32E-03
CR 55	5.62E-11	1.61E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 54	3.90E-06	3.90E-06	3.90E-06	3.89E-06	3.84E-06	3.78E-06	3.65E-06	3.41E-06	1.74E-06
MN 55	1.98E-02	1.98E-02	1.98E-02	1.98E-02	1.98E-02	1.98E-02	1.98E-02	1.98E-02	1.98E-02
MN 56	5.02E-07	4.39E-07	1.31E-07	7.92E-10	1.23E-26	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 57	3.08E-13	7.57E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE 54	3.66E-02	3.66E-02	3.66E-02	3.66E-02	3.66E-02	3.66E-02	3.66E-02	3.66E-02	3.66E-02
FE 55	4.39E-05	4.39E-05	4.39E-05	4.38E-05	4.36E-05	4.34E-05	4.29E-05	4.20E-05	3.36E-05
FE 56	5.99E-01	5.99E-01	5.99E-01	5.99E-01	5.99E-01	5.99E-01	5.99E-01	5.99E-01	5.99E-01
FE 57	1.52E-02	1.52E-02	1.52E-02	1.52E-02	1.52E-02	1.52E-02	1.52E-02	1.52E-02	1.52E-02
FE 58	1.98E-03	1.98E-03	1.98E-03	1.98E-03	1.98E-03	1.99E-03	1.99E-03	1.99E-03	1.99E-03
FE 59	9.29E-07	9.28E-07	9.26E-07	9.15E-07	8.34E-07	7.49E-07	5.85E-07	3.69E-07	3.35E-09
CO 58	3.66E-06	3.66E-06	3.65E-06	3.63E-06	3.42E-06	3.19E-06	2.73E-06	2.03E-06	1.02E-07
CO 59	4.95E-06	4.95E-06	4.95E-06	4.97E-06	5.05E-06	5.13E-06	5.29E-06	5.51E-06	5.88E-06
CO 60	1.61E-07	1.61E-07	1.61E-07	1.61E-07	1.60E-07	1.60E-07	1.59E-07	1.57E-07	1.41E-07
CO 60M	1.41E-11	1.94E-12	3.34E-20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO 61	8.11E-12	6.57E-12	9.93E-13	3.39E-16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO 62	2.12E-14	2.02E-20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 58	8.06E-02	8.06E-02	8.06E-02	8.06E-02	8.06E-02	8.06E-02	8.06E-02	8.06E-02	8.06E-02
NI 59	2.16E-04	2.16E-04	2.16E-04	2.16E-04	2.16E-04	2.16E-04	2.16E-04	2.16E-04	2.16E-04
NI 60	3.19E-02	3.19E-02	3.19E-02	3.19E-02	3.19E-02	3.19E-02	3.19E-02	3.19E-02	3.19E-02
NI 61	1.45E-03	1.45E-03	1.45E-03	1.45E-03	1.45E-03	1.45E-03	1.45E-03	1.45E-03	1.45E-03
NI 62	4.52E-03	4.52E-03	4.52E-03	4.52E-03	4.52E-03	4.52E-03	4.52E-03	4.52E-03	4.52E-03
NI 63	3.37E-05	3.37E-05	3.37E-05	3.37E-05	3.37E-05	3.37E-05	3.37E-05	3.37E-05	3.34E-05
NI 64	1.19E-03	1.19E-03	1.19E-03	1.19E-03	1.19E-03	1.19E-03	1.19E-03	1.19E-03	1.19E-03

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

1 gram of 316SS irradiated for 54.9 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS
NI 65	2.75E-09	2.40E-09	6.96E-10	3.74E-12	2.35E-29	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 66	2.09E-12	2.08E-12	1.96E-12	1.54E-12	2.48E-13	2.94E-14	2.25E-16	2.42E-20	0.00E+00
CU 63	1.91E-08	1.91E-08	1.93E-08	1.98E-08	2.40E-08	2.89E-08	4.00E-08	6.08E-08	2.72E-07
CU 64	7.49E-13	7.29E-13	5.70E-13	2.02E-13	7.81E-17	8.14E-21	6.43E-30	0.00E+00	0.00E+00
CU 65	9.94E-07	9.95E-07	9.96E-07	9.97E-07	9.97E-07	9.97E-07	9.97E-07	9.97E-07	9.97E-07
CU 66	1.27E-13	5.33E-15	3.06E-15	2.41E-15	3.87E-16	4.59E-17	3.51E-19	3.77E-23	0.00E+00
ZN 64	6.64E-12	6.65E-12	6.71E-12	6.84E-12	6.92E-12	6.92E-12	6.92E-12	6.92E-12	6.92E-12
ZN 66	6.96E-10	6.96E-10	6.96E-10	6.96E-10	6.98E-10	6.98E-10	6.98E-10	6.98E-10	6.98E-10
ZN 67	1.23E-13	1.23E-13	1.23E-13	1.23E-13	1.23E-13	1.23E-13	1.23E-13	1.23E-13	1.23E-13
SR 88	3.11E-15	3.11E-15	3.11E-15	3.11E-15	3.11E-15	3.11E-15	3.11E-15	3.11E-15	3.11E-15
SR 89	2.31E-15	2.30E-15	2.30E-15	2.27E-15	2.09E-15	1.90E-15	1.53E-15	1.01E-15	1.53E-17
Y 89	1.67E-10	1.68E-10	1.68E-10	1.71E-10	1.80E-10	1.82E-10	1.83E-10	1.83E-10	1.83E-10
Y 90	8.17E-15	8.12E-15	7.74E-15	6.30E-15	1.32E-15	2.15E-16	3.38E-18	2.31E-20	2.13E-20
ZR 89	1.57E-11	1.57E-11	1.51E-11	1.27E-11	3.57E-12	8.08E-13	2.72E-14	4.69E-17	0.00E+00
ZR 90	5.00E-14	5.01E-14	5.05E-14	5.19E-14	5.69E-14	5.80E-14	5.82E-14	5.82E-14	5.82E-14
ZR 91	2.49E-09	2.49E-09	2.49E-09	2.49E-09	2.49E-09	2.49E-09	2.49E-09	2.49E-09	2.49E-09
ZR 92	5.18E-08	5.18E-08	5.19E-08	5.24E-08	5.55E-08	5.78E-08	6.03E-08	6.14E-08	6.16E-08
ZR 93	2.10E-09	2.10E-09	2.10E-09	2.10E-09	2.10E-09	2.10E-09	2.10E-09	2.10E-09	2.10E-09
ZR 94	5.25E-09	5.25E-09	5.25E-09	5.25E-09	5.25E-09	5.25E-09	5.25E-09	5.25E-09	5.25E-09
ZR 95	5.09E-10	5.09E-10	5.08E-10	5.03E-10	4.72E-10	4.37E-10	3.68E-10	2.66E-10	9.73E-12
ZR 96	3.67E-13	3.67E-13	3.67E-13	3.67E-13	3.67E-13	3.67E-13	3.67E-13	3.67E-13	3.67E-13
ZR 97	2.92E-13	2.86E-13	2.38E-13	1.09E-13	2.97E-16	2.98E-19	4.31E-26	0.00E+00	0.00E+00
NB 92	9.83E-09	9.81E-09	9.69E-09	9.18E-09	6.10E-09	3.78E-09	1.27E-09	1.64E-10	1.48E-19
NB 93	5.07E-12	5.07E-12	5.10E-12	5.25E-12	6.36E-12	7.65E-12	1.06E-11	1.62E-11	7.25E-11
NB 94	3.20E-09	3.20E-09	3.20E-09	3.20E-09	3.20E-09	3.20E-09	3.20E-09	3.20E-09	3.20E-09
NB 95	6.74E-10	6.73E-10	6.72E-10	6.66E-10	6.21E-10	5.73E-10	4.78E-10	3.40E-10	1.19E-11
NB 95M	1.86E-13	1.86E-13	1.87E-13	1.89E-13	1.90E-13	1.81E-13	1.54E-13	1.11E-13	4.07E-15
NB 96	3.55E-11	3.50E-11	3.06E-11	1.74E-11	2.43E-13	1.66E-15	1.86E-20	9.69E-30	0.00E+00
NB 97	7.35E-13	5.56E-13	5.80E-14	7.81E-15	2.13E-17	2.16E-20	3.31E-27	0.00E+00	0.00E+00
MO 92	3.55E-03	3.55E-03	3.55E-03	3.55E-03	3.55E-03	3.55E-03	3.55E-03	3.55E-03	3.55E-03
MO 93M	8.30E-11	7.89E-11	5.00E-11	7.32E-12	3.44E-18	1.42E-25	0.00E+00	0.00E+00	0.00E+00
MO 93	3.41E-07	3.41E-07	3.41E-07	3.41E-07	3.41E-07	3.41E-07	3.41E-07	3.41E-07	3.41E-07
MO 94	2.28E-03	2.28E-03	2.28E-03	2.28E-03	2.28E-03	2.28E-03	2.28E-03	2.28E-03	2.28E-03
MO 95	3.84E-03	3.84E-03	3.84E-03	3.84E-03	3.84E-03	3.84E-03	3.84E-03	3.84E-03	3.84E-03
MO 96	4.25E-03	4.25E-03	4.25E-03	4.25E-03	4.25E-03	4.25E-03	4.25E-03	4.25E-03	4.25E-03
MO 97	2.43E-03	2.43E-03	2.43E-03	2.43E-03	2.43E-03	2.43E-03	2.43E-03	2.43E-03	2.43E-03
MO 98	6.15E-03	6.15E-03	6.15E-03	6.15E-03	6.15E-03	6.15E-03	6.15E-03	6.15E-03	6.15E-03
MO 99	5.96E-07	5.93E-07	5.65E-07	4.63E-07	1.02E-07	1.75E-08	3.10E-10	1.61E-13	0.00E+00
MO100	2.50E-03	2.50E-03	2.50E-03	2.50E-03	2.50E-03	2.50E-03	2.50E-03	2.50E-03	2.50E-03
MO101	5.59E-10	1.35E-10	3.72E-16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TC 99	9.30E-07	9.30E-07	9.33E-07	9.46E-07	9.91E-07	1.00E-06	1.00E-06	1.00E-06	1.00E-06
TC100	2.31E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TC101	5.43E-10	3.13E-10	4.55E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RU 99	2.12E-13	2.12E-13	2.14E-13	2.21E-13	2.73E-13	3.35E-13	4.78E-13	7.46E-13	3.48E-12
RU100	2.26E-08	2.26E-08	2.26E-08	2.26E-08	2.26E-08	2.26E-08	2.26E-08	2.26E-08	2.26E-08
RU101	2.08E-06	2.08E-06	2.08E-06	2.08E-06	2.08E-06	2.08E-06	2.08E-06	2.08E-06	2.08E-06
RU102	1.74E-08	1.74E-08	1.74E-08	1.74E-08	1.74E-08	1.74E-08	1.74E-08	1.74E-08	1.74E-08
RU103	6.83E-12	6.82E-12	6.80E-12	6.71E-12	6.03E-12	5.33E-12	4.02E-12	2.37E-12	1.08E-14
RU104	2.69E-14	2.69E-14	2.69E-14	2.69E-14	2.69E-14	2.69E-14	2.69E-14	2.69E-14	2.69E-14
RH103	1.64E-13	1.65E-13	1.67E-13	1.76E-13	2.43E-13	3.13E-13	4.43E-13	6.07E-13	8.42E-13
PD104	7.61E-15	7.61E-15	7.61E-15	7.61E-15	7.61E-15	7.61E-15	7.61E-15	7.61E-15	7.61E-15
SUMTOT	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

1 gram of 316SS irradiated for 54.9 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS
0TOTAL	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00

1 gram of 316SS irradiated for 119 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 Year
	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS
H 1	7.82E-07	7.82E-07	7.82E-07	7.82E-07	7.82E-07	7.82E-07	7.82E-07	7.82E-07	7.82E-07
H 2	3.30E-10	3.30E-10	3.30E-10	3.30E-10	3.30E-10	3.30E-10	3.30E-10	3.30E-10	3.30E-10
H 3	5.74E-14	5.74E-14	5.74E-14	5.74E-14	5.74E-14	5.73E-14	5.72E-14	5.69E-14	5.43E-14
HE 3	1.07E-16	1.07E-16	1.09E-16	1.16E-16	1.69E-16	2.31E-16	3.71E-16	6.34E-16	3.24E-15
HE 4	4.31E-07	4.31E-07	4.31E-07	4.31E-07	4.31E-07	4.31E-07	4.31E-07	4.31E-07	4.31E-07
LI 6	3.18E-13	3.18E-13	3.18E-13	3.18E-13	3.18E-13	3.18E-13	3.18E-13	3.18E-13	3.18E-13
BE 9	2.80E-09	2.80E-09	2.80E-09	2.80E-09	2.80E-09	2.80E-09	2.80E-09	2.80E-09	2.80E-09
BE 10	7.15E-11	7.15E-11	7.15E-11	7.15E-11	7.15E-11	7.15E-11	7.15E-11	7.15E-11	7.15E-11
C 12	7.90E-04	7.90E-04	7.90E-04	7.90E-04	7.90E-04	7.90E-04	7.90E-04	7.90E-04	7.90E-04
C 13	9.61E-06	9.61E-06	9.61E-06	9.61E-06	9.61E-06	9.61E-06	9.61E-06	9.61E-06	9.61E-06
C 14	1.32E-11	1.32E-11	1.32E-11	1.32E-11	1.32E-11	1.32E-11	1.32E-11	1.32E-11	1.32E-11
N 14	2.59E-16	2.59E-16	2.60E-16	2.64E-16	2.90E-16	3.20E-16	3.90E-16	5.21E-16	1.85E-15
NE 22	6.27E-13	6.27E-13	6.27E-13	6.27E-13	6.27E-13	6.27E-13	6.27E-13	6.27E-13	6.27E-13
NA 23	5.08E-14	5.08E-14	5.08E-14	5.08E-14	5.08E-14	5.08E-14	5.08E-14	5.08E-14	5.08E-14
MG 25	2.26E-08	2.26E-08	2.26E-08	2.26E-08	2.26E-08	2.26E-08	2.26E-08	2.26E-08	2.26E-08
MG 26	1.03E-08	1.03E-08	1.03E-08	1.03E-08	1.03E-08	1.03E-08	1.03E-08	1.03E-08	1.03E-08
MG 27	8.86E-15	9.84E-16	2.53E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AL 27	1.11E-10	1.11E-10	1.11E-10	1.11E-10	1.11E-10	1.11E-10	1.11E-10	1.11E-10	1.11E-10
AL 28	2.61E-12	2.43E-16	6.57E-24	3.50E-24	3.23E-26	2.92E-27	8.67E-33	0.00E+00	0.00E+00
AL 29	2.67E-13	1.10E-14	3.76E-27	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SI 28	9.19E-03	9.19E-03	9.19E-03	9.19E-03	9.19E-03	9.19E-03	9.19E-03	9.19E-03	9.19E-03
SI 29	4.84E-04	4.84E-04	4.84E-04	4.84E-04	4.84E-04	4.84E-04	4.84E-04	4.84E-04	4.84E-04
SI 30	3.31E-04	3.31E-04	3.31E-04	3.31E-04	3.31E-04	3.31E-04	3.31E-04	3.31E-04	3.31E-04
SI 31	1.31E-10	1.15E-10	3.49E-11	2.29E-13	6.70E-30	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SI 32	7.22E-14	7.22E-14	7.22E-14	7.22E-14	7.22E-14	7.22E-14	7.22E-14	7.22E-14	7.21E-14
P 31	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04	4.50E-04
P 32	2.71E-08	2.70E-08	2.68E-08	2.58E-08	1.93E-08	1.37E-08	6.32E-09	1.48E-09	5.58E-16
P 33	1.59E-12	1.59E-12	1.58E-12	1.55E-12	1.31E-12	1.08E-12	6.92E-13	3.01E-13	6.36E-17
S 32	2.84E-04	2.84E-04	2.84E-04	2.84E-04	2.84E-04	2.84E-04	2.84E-04	2.84E-04	2.84E-04
S 33	2.49E-06	2.49E-06	2.49E-06	2.49E-06	2.49E-06	2.49E-06	2.49E-06	2.49E-06	2.49E-06
S 34	1.34E-05	1.34E-05	1.34E-05	1.34E-05	1.34E-05	1.34E-05	1.34E-05	1.34E-05	1.34E-05
S 35	2.40E-09	2.40E-09	2.39E-09	2.38E-09	2.27E-09	2.15E-09	1.89E-09	1.49E-09	1.35E-10
S 36	5.72E-08	5.72E-08	5.72E-08	5.72E-08	5.72E-08	5.72E-08	5.72E-08	5.72E-08	5.72E-08
CL 35	1.27E-09	1.27E-09	1.28E-09	1.29E-09	1.40E-09	1.52E-09	1.78E-09	2.18E-09	3.53E-09
CL 36	2.22E-11	2.22E-11	2.22E-11	2.22E-11	2.22E-11	2.22E-11	2.22E-11	2.22E-11	2.22E-11
CL 37	9.91E-12	9.91E-12	9.91E-12	9.91E-12	9.91E-12	9.91E-12	9.91E-12	9.91E-12	9.91E-12
AR 38	2.60E-15	2.60E-15	2.60E-15	2.60E-15	2.60E-15	2.60E-15	2.60E-15	2.60E-15	2.60E-15
CA 44	1.53E-13	1.53E-13	1.53E-13	1.53E-13	1.53E-13	1.53E-13	1.53E-13	1.53E-13	1.53E-13
CA 46	6.15E-14	6.15E-14	6.15E-14	6.15E-14	6.15E-14	6.15E-14	6.15E-14	6.15E-14	6.15E-14
SC 47	5.10E-14	5.07E-14	4.88E-14	4.14E-14	1.20E-14	2.82E-15	1.03E-16	2.12E-19	0.00E+00
SC 48	2.40E-14	2.38E-14	2.22E-14	1.64E-14	1.68E-15	1.18E-16	2.71E-19	3.05E-24	0.00E+00
TI 47	1.60E-08	1.60E-08	1.60E-08	1.60E-08	1.60E-08	1.60E-08	1.60E-08	1.60E-08	1.60E-08
TI 48	1.84E-11	1.84E-11	1.84E-11	1.84E-11	1.84E-11	1.84E-11	1.84E-11	1.84E-11	1.84E-11
TI 49	4.35E-08	4.35E-08	4.35E-08	4.35E-08	4.35E-08	4.35E-08	4.35E-08	4.35E-08	4.35E-08
TI 50	1.75E-07	1.75E-07	1.75E-07	1.75E-07	1.75E-07	1.75E-07	1.75E-07	1.75E-07	1.75E-07
TI 51	3.87E-14	1.05E-15	8.12E-30	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

1 gram of 316SS irradiated for 119 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 Year
	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS
V 50	6.35E-07	6.35E-07	6.35E-07	6.35E-07	6.35E-07	6.35E-07	6.35E-07	6.35E-07	6.35E-07
V 51	8.76E-05	8.77E-05	8.79E-05	8.86E-05	9.42E-05	9.97E-05	1.09E-04	1.19E-04	1.29E-04
V 52	4.16E-11	1.63E-13	3.44E-35	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 53	8.35E-14	2.05E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CR 50	6.98E-03	6.98E-03	6.98E-03	6.98E-03	6.98E-03	6.98E-03	6.98E-03	6.98E-03	6.98E-03
CR 51	4.09E-05	4.08E-05	4.06E-05	3.98E-05	3.43E-05	2.88E-05	1.93E-05	9.11E-06	4.40E-09
CR 52	1.42E-01	1.42E-01	1.42E-01	1.42E-01	1.42E-01	1.42E-01	1.42E-01	1.42E-01	1.42E-01
CR 53	1.67E-02	1.67E-02	1.67E-02	1.67E-02	1.67E-02	1.67E-02	1.67E-02	1.67E-02	1.67E-02
CR 54	4.51E-03	4.51E-03	4.51E-03	4.51E-03	4.51E-03	4.51E-03	4.51E-03	4.51E-03	4.51E-03
CR 55	5.85E-11	1.67E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 54	7.86E-06	7.86E-06	7.86E-06	7.85E-06	7.74E-06	7.62E-06	7.36E-06	6.88E-06	3.50E-06
MN 55	1.96E-02	1.96E-02	1.96E-02	1.96E-02	1.96E-02	1.96E-02	1.96E-02	1.96E-02	1.97E-02
MN 56	4.97E-07	4.35E-07	1.30E-07	7.85E-10	1.21E-26	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 57	3.29E-13	8.09E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE 54	3.65E-02	3.65E-02	3.65E-02	3.65E-02	3.65E-02	3.65E-02	3.65E-02	3.65E-02	3.65E-02
FE 55	9.28E-05	9.28E-05	9.28E-05	9.27E-05	9.23E-05	9.19E-05	9.08E-05	8.88E-05	7.11E-05
FE 56	5.99E-01	5.99E-01	5.99E-01	5.99E-01	5.99E-01	5.99E-01	5.99E-01	5.99E-01	5.99E-01
FE 57	1.63E-02	1.63E-02	1.63E-02	1.63E-02	1.63E-02	1.63E-02	1.63E-02	1.63E-02	1.63E-02
FE 58	2.01E-03	2.01E-03	2.01E-03	2.01E-03	2.01E-03	2.01E-03	2.01E-03	2.01E-03	2.01E-03
FE 59	1.38E-06	1.38E-06	1.37E-06	1.36E-06	1.24E-06	1.11E-06	8.69E-07	5.47E-07	4.97E-09
CO 58	4.02E-06	4.01E-06	4.01E-06	3.98E-06	3.75E-06	3.50E-06	2.99E-06	2.23E-06	1.12E-07
CO 59	1.42E-05	1.42E-05	1.42E-05	1.42E-05	1.43E-05	1.45E-05	1.47E-05	1.50E-05	1.56E-05
CO 60	5.86E-07	5.86E-07	5.86E-07	5.86E-07	5.84E-07	5.83E-07	5.80E-07	5.73E-07	5.14E-07
CO 60M	4.05E-11	5.55E-12	9.58E-20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO 61	9.56E-12	7.75E-12	1.17E-12	4.00E-16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO 62	2.10E-14	2.01E-20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 58	8.04E-02	8.04E-02	8.04E-02	8.04E-02	8.04E-02	8.04E-02	8.04E-02	8.04E-02	8.04E-02
NI 59	4.51E-04	4.51E-04	4.51E-04	4.51E-04	4.51E-04	4.51E-04	4.51E-04	4.51E-04	4.51E-04
NI 60	3.19E-02	3.19E-02	3.19E-02	3.19E-02	3.19E-02	3.19E-02	3.19E-02	3.19E-02	3.19E-02
NI 61	1.51E-03	1.51E-03	1.51E-03	1.51E-03	1.51E-03	1.51E-03	1.51E-03	1.51E-03	1.51E-03
NI 62	4.48E-03	4.48E-03	4.48E-03	4.48E-03	4.48E-03	4.48E-03	4.48E-03	4.48E-03	4.48E-03
NI 63	7.22E-05	7.22E-05	7.22E-05	7.22E-05	7.22E-05	7.22E-05	7.21E-05	7.21E-05	7.16E-05
NI 64	1.19E-03	1.19E-03	1.19E-03	1.19E-03	1.19E-03	1.19E-03	1.19E-03	1.19E-03	1.19E-03
NI 65	2.75E-09	2.40E-09	6.95E-10	3.74E-12	2.35E-29	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 66	2.07E-12	2.06E-12	1.95E-12	1.53E-12	2.46E-13	2.92E-14	2.23E-16	2.39E-20	0.00E+00
CU 63	8.91E-08	8.91E-08	8.94E-08	9.05E-08	9.95E-08	1.10E-07	1.34E-07	1.78E-07	6.31E-07
CU 64	3.45E-12	3.36E-12	2.63E-12	9.31E-13	3.59E-16	3.74E-20	2.96E-29	0.00E+00	0.00E+00
CU 65	2.16E-06	2.16E-06	2.16E-06	2.16E-06	2.16E-06	2.16E-06	2.16E-06	2.16E-06	2.16E-06
CU 66	2.71E-13	7.75E-15	3.03E-15	2.38E-15	3.83E-16	4.55E-17	3.47E-19	3.73E-23	0.00E+00
CU 67	1.25E-15	1.25E-15	1.19E-15	9.59E-16	1.91E-16	2.91E-17	3.93E-19	1.23E-22	0.00E+00
ZN 64	6.67E-11	6.67E-11	6.70E-11	6.76E-11	6.80E-11	6.80E-11	6.80E-11	6.80E-11	6.80E-11
ZN 65	1.90E-14	1.90E-14	1.90E-14	1.90E-14	1.87E-14	1.83E-14	1.75E-14	1.60E-14	6.74E-15
ZN 66	3.19E-09	3.19E-09	3.19E-09	3.19E-09	3.19E-09	3.19E-09	3.19E-09	3.19E-09	3.19E-09
ZN 67	1.19E-12	1.19E-12	1.19E-12	1.19E-12	1.19E-12	1.19E-12	1.19E-12	1.19E-12	1.19E-12
ZN 68	3.90E-15	3.90E-15	3.90E-15	3.90E-15	3.90E-15	3.90E-15	3.90E-15	3.90E-15	3.90E-15
SR 88	1.46E-14	1.46E-14	1.46E-14	1.46E-14	1.46E-14	1.46E-14	1.46E-14	1.46E-14	1.46E-14
SR 89	9.76E-15	9.75E-15	9.73E-15	9.62E-15	8.86E-15	8.05E-15	6.46E-15	4.28E-15	6.49E-17
Y 89	3.81E-10	3.81E-10	3.82E-10	3.84E-10	3.93E-10	3.96E-10	3.97E-10	3.97E-10	3.97E-10
Y 90	1.95E-14	1.94E-14	1.84E-14	1.50E-14	3.15E-15	5.11E-16	8.09E-18	1.06E-19	1.01E-19
Y 91	1.96E-15	1.96E-15	1.95E-15	1.94E-15	1.80E-15	1.66E-15	1.37E-15	9.62E-16	2.59E-17
ZR 89	1.57E-11	1.57E-11	1.51E-11	1.27E-11	3.57E-12	8.08E-13	2.72E-14	4.70E-17	0.00E+00
ZR 90	2.94E-13	2.94E-13	2.95E-13	2.98E-13	3.10E-13	3.13E-13	3.13E-13	3.13E-13	3.14E-13
ZR 91	5.40E-09	5.40E-09	5.40E-09	5.40E-09	5.40E-09	5.40E-09	5.40E-09	5.40E-09	5.40E-09
ZR 92	1.23E-07	1.23E-07	1.23E-07	1.23E-07	1.27E-07	1.29E-07	1.32E-07	1.33E-07	1.33E-07

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

1 gram of 316SS irradiated for 119 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 Year
	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS	g/1g of 316SS
ZR 93	4.61E-09	4.61E-09	4.61E-09	4.61E-09	4.61E-09	4.61E-09	4.61E-09	4.61E-09	4.61E-09
ZR 94	1.14E-08	1.14E-08	1.14E-08	1.14E-08	1.14E-08	1.14E-08	1.14E-08	1.14E-08	1.14E-08
ZR 95	8.22E-10	8.22E-10	8.21E-10	8.14E-10	7.62E-10	7.07E-10	5.94E-10	4.29E-10	1.57E-11
ZR 96	1.42E-12	1.42E-12	1.42E-12	1.42E-12	1.42E-12	1.42E-12	1.42E-12	1.42E-12	1.42E-12
ZR 97	2.92E-13	2.86E-13	2.38E-13	1.09E-13	2.97E-16	3.03E-19	4.37E-26	0.00E+00	0.00E+00
NB 92	1.01E-08	1.01E-08	9.92E-09	9.40E-09	6.24E-09	3.87E-09	1.30E-09	1.68E-10	1.52E-19
NB 93	2.38E-11	2.38E-11	2.39E-11	2.42E-11	2.66E-11	2.94E-11	3.58E-11	4.78E-11	1.70E-10
NB 93M	3.19E-16	3.19E-16	3.20E-16	3.24E-16	3.57E-16	3.94E-16	4.80E-16	6.41E-16	2.24E-15
NB 94	6.84E-09	6.84E-09	6.84E-09	6.84E-09	6.84E-09	6.84E-09	6.84E-09	6.84E-09	6.84E-09
NB 95	1.12E-09	1.12E-09	1.11E-09	1.10E-09	1.03E-09	9.47E-10	7.87E-10	5.58E-10	1.93E-11
NB 95M	3.17E-13	3.17E-13	3.18E-13	3.18E-13	3.12E-13	2.94E-13	2.49E-13	1.80E-13	6.58E-15
NB 96	3.63E-11	3.58E-11	3.13E-11	1.78E-11	2.48E-13	1.69E-15	1.90E-20	9.90E-30	0.00E+00
NB 97	7.37E-13	5.58E-13	5.81E-14	7.80E-15	2.12E-17	2.16E-20	3.35E-27	0.00E+00	0.00E+00
MO 92	3.54E-03	3.54E-03	3.54E-03	3.54E-03	3.54E-03	3.54E-03	3.54E-03	3.54E-03	3.54E-03
MO 93M	8.30E-11	7.89E-11	5.00E-11	7.32E-12	3.44E-18	1.42E-25	0.00E+00	0.00E+00	0.00E+00
MO 93	7.38E-07	7.38E-07	7.38E-07	7.38E-07	7.38E-07	7.38E-07	7.38E-07	7.38E-07	7.38E-07
MO 94	2.28E-03	2.28E-03	2.28E-03	2.28E-03	2.28E-03	2.28E-03	2.28E-03	2.28E-03	2.28E-03
MO 95	3.74E-03	3.74E-03	3.74E-03	3.74E-03	3.74E-03	3.74E-03	3.74E-03	3.74E-03	3.74E-03
MO 96	4.34E-03	4.34E-03	4.34E-03	4.34E-03	4.34E-03	4.34E-03	4.34E-03	4.34E-03	4.34E-03
MO 97	2.44E-03	2.44E-03	2.44E-03	2.44E-03	2.44E-03	2.44E-03	2.44E-03	2.44E-03	2.44E-03
MO 98	6.15E-03	6.15E-03	6.15E-03	6.15E-03	6.15E-03	6.15E-03	6.15E-03	6.15E-03	6.15E-03
MO 99	5.96E-07	5.93E-07	5.65E-07	4.63E-07	1.02E-07	1.75E-08	3.10E-10	1.61E-13	0.00E+00
MO100	2.50E-03	2.50E-03	2.50E-03	2.50E-03	2.50E-03	2.50E-03	2.50E-03	2.50E-03	2.50E-03
MO101	5.58E-10	1.35E-10	3.71E-16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TC 99	2.04E-06	2.04E-06	2.04E-06	2.05E-06	2.10E-06	2.11E-06	2.11E-06	2.11E-06	2.11E-06
TC100	5.06E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TC101	5.42E-10	3.13E-10	4.55E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RU 99	1.07E-12	1.07E-12	1.07E-12	1.09E-12	1.20E-12	1.33E-12	1.63E-12	2.19E-12	7.94E-12
RU100	1.14E-07	1.14E-07	1.14E-07	1.14E-07	1.14E-07	1.14E-07	1.14E-07	1.14E-07	1.14E-07
RU101	4.46E-06	4.46E-06	4.46E-06	4.46E-06	4.46E-06	4.46E-06	4.46E-06	4.46E-06	4.46E-06
RU102	8.10E-08	8.10E-08	8.10E-08	8.10E-08	8.10E-08	8.10E-08	8.10E-08	8.10E-08	8.10E-08
RU103	5.50E-11	5.50E-11	5.48E-11	5.40E-11	4.86E-11	4.29E-11	3.24E-11	1.91E-11	8.73E-14
RU104	4.91E-13	4.91E-13	4.91E-13	4.91E-13	4.91E-13	4.91E-13	4.91E-13	4.91E-13	4.91E-13
RH103	2.84E-12	2.84E-12	2.86E-12	2.93E-12	3.47E-12	4.03E-12	5.08E-12	6.40E-12	8.29E-12
PD104	2.96E-13	2.96E-13	2.96E-13	2.96E-13	2.96E-13	2.96E-13	2.96E-13	2.96E-13	2.96E-13
SUMTOT	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
0TOTAL	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00

The tables below can be used for determining the source term for the flux wires used in the CSM-10584 experiment.

1 gram of Fe (CSM flux wire) irradiated for 54.9 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g
H 3	6.94E-14	6.94E-14	6.94E-14	6.94E-14	6.93E-14	6.93E-14	6.91E-14	6.88E-14	6.56E-14
SC 48	4.06E-11	4.02E-11	3.75E-11	2.77E-11	2.84E-12	1.99E-13	4.56E-16	5.14E-21	0.00E+00
SC 50	6.12E-15	3.17E-20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TI 51	3.68E-09	9.95E-11	7.71E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 52	1.73E-05	6.75E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

V 53	4.71E-09	1.16E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 54	2.19E-10	3.08E-20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CR 51	1.09E-02	1.09E-02	1.09E-02	1.07E-02	9.19E-03	7.71E-03	5.17E-03	2.44E-03	1.18E-06
CR 55	9.25E-06	2.65E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 54	4.62E-02	4.62E-02	4.62E-02	4.61E-02	4.55E-02	4.48E-02	4.33E-02	4.05E-02	2.06E-02
MN 56	5.27E-01	4.60E-01	1.37E-01	8.31E-04	1.29E-20	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 57	9.67E-04	2.38E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 58	3.08E-06	1.55E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE 55	1.66E-01	1.66E-01	1.66E-01	1.66E-01	1.65E-01	1.64E-01	1.62E-01	1.59E-01	1.27E-01
FE 59	6.99E-02	6.99E-02	6.97E-02	6.89E-02	6.28E-02	5.64E-02	4.41E-02	2.78E-02	2.52E-04
CO 60	7.47E-06	7.47E-06	7.47E-06	7.47E-06	7.46E-06	7.44E-06	7.39E-06	7.31E-06	6.55E-06
CO 60M	5.78E-04	7.93E-05	1.37E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO 61	5.72E-07	4.64E-07	7.01E-08	2.39E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SUMTOT	8.21E-01	7.53E-01	4.30E-01	2.92E-01	2.82E-01	2.73E-01	2.55E-01	2.29E-01	1.48E-01
0TOTAL	8.21E-01	7.53E-01	4.30E-01	2.92E-01	2.82E-01	2.73E-01	2.55E-01	2.29E-01	1.48E-01

1 gram of Fe (CSM flux wire) irradiated for 54.9 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	g/1g of Fe	g/1g of Fe	g/1g of Fe	g/1g of Fe	g/1g of Fe	g/1g of Fe	g/1g of Fe	g/1g of Fe	g/1g of Fe
H 1	2.71E-07	2.71E-07	2.71E-07	2.71E-07	2.71E-07	2.71E-07	2.71E-07	2.71E-07	2.71E-07
H 2	5.28E-11	5.28E-11	5.28E-11	5.28E-11	5.28E-11	5.28E-11	5.28E-11	5.28E-11	5.28E-11
HE 4	5.90E-08	5.90E-08	5.90E-08	5.90E-08	5.90E-08	5.90E-08	5.90E-08	5.90E-08	5.90E-08
TI 50	1.04E-12	1.04E-12	1.04E-12	1.04E-12	1.04E-12	1.04E-12	1.04E-12	1.04E-12	1.04E-12
V 51	9.93E-08	9.94E-08	9.99E-08	1.02E-07	1.18E-07	1.34E-07	1.62E-07	1.91E-07	2.18E-07
V 52	1.79E-14	6.99E-17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CR 51	1.18E-07	1.18E-07	1.18E-07	1.16E-07	9.94E-08	8.34E-08	5.59E-08	2.64E-08	1.27E-11
CR 52	1.27E-10	1.27E-10	1.27E-10	1.27E-10	1.27E-10	1.27E-10	1.27E-10	1.27E-10	1.27E-10
CR 53	4.28E-07	4.28E-07	4.28E-07	4.28E-07	4.28E-07	4.28E-07	4.28E-07	4.28E-07	4.28E-07
CR 54	5.02E-07	5.02E-07	5.05E-07	5.15E-07	5.94E-07	6.85E-07	8.86E-07	1.25E-06	3.82E-06
CR 55	9.60E-15	2.75E-17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 54	5.97E-06	5.97E-06	5.97E-06	5.96E-06	5.88E-06	5.79E-06	5.59E-06	5.23E-06	2.66E-06
MN 55	1.35E-06	1.35E-06	1.36E-06	1.40E-06	1.69E-06	2.02E-06	2.79E-06	4.19E-06	1.69E-05
MN 56	2.43E-08	2.12E-08	6.32E-09	3.83E-11	5.92E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 57	4.72E-13	1.16E-18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 58	1.04E-15	5.21E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE 54	5.60E-02	5.60E-02	5.60E-02	5.60E-02	5.60E-02	5.60E-02	5.60E-02	5.60E-02	5.60E-02
FE 55	6.63E-05	6.63E-05	6.63E-05	6.62E-05	6.59E-05	6.56E-05	6.48E-05	6.34E-05	5.08E-05
FE 56	9.18E-01	9.18E-01	9.18E-01	9.18E-01	9.18E-01	9.18E-01	9.18E-01	9.18E-01	9.18E-01
FE 57	2.33E-02	2.33E-02	2.33E-02	2.33E-02	2.33E-02	2.33E-02	2.33E-02	2.33E-02	2.33E-02
FE 58	3.04E-03	3.04E-03	3.04E-03	3.04E-03	3.04E-03	3.04E-03	3.04E-03	3.04E-03	3.04E-03
FE 59	1.42E-06	1.42E-06	1.42E-06	1.40E-06	1.28E-06	1.15E-06	8.95E-07	5.64E-07	5.12E-09
CO 59	6.77E-07	6.77E-07	6.81E-07	6.98E-07	8.22E-07	9.52E-07	1.20E-06	1.53E-06	2.09E-06
CO 60	6.61E-09	6.61E-09	6.61E-09	6.61E-09	6.59E-09	6.57E-09	6.54E-09	6.47E-09	5.79E-09
CO 60M	1.93E-12	2.65E-13	4.57E-21	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO 61	1.84E-14	1.49E-14	2.25E-15	7.69E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 60	4.30E-11	4.30E-11	4.35E-11	4.54E-11	5.96E-11	7.62E-11	1.14E-10	1.84E-10	8.57E-10
NI 61	2.67E-12	2.67E-12	2.68E-12	2.68E-12	2.68E-12	2.68E-12	2.68E-12	2.68E-12	2.68E-12
SUMTOT	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
0TOTAL	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00

1 gram of Fe (CSM flux wire) irradiated for 119 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g
H 3	7.06E-13	7.06E-13	7.06E-13	7.06E-13	7.05E-13	7.04E-13	7.03E-13	6.99E-13	6.67E-13

SC 48	1.31E-10	1.30E-10	1.21E-10	8.96E-11	9.18E-12	6.43E-13	1.47E-15	1.66E-20	0.00E+00
SC 50	2.87E-14	1.48E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TI 51	1.36E-08	3.68E-10	2.85E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 52	5.58E-05	2.18E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 53	1.02E-08	2.50E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 54	8.55E-10	1.20E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CR 51	1.39E-02	1.39E-02	1.38E-02	1.36E-02	1.17E-02	9.79E-03	6.56E-03	3.10E-03	1.50E-06
CR 55	2.73E-05	7.82E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 54	9.32E-02	9.32E-02	9.32E-02	9.30E-02	9.18E-02	9.04E-02	8.72E-02	8.16E-02	4.15E-02
MN 56	5.28E-01	4.62E-01	1.38E-01	8.34E-04	1.29E-20	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 57	1.03E-03	2.54E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 58	3.12E-06	1.57E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE 55	3.51E-01	3.51E-01	3.51E-01	3.51E-01	3.49E-01	3.47E-01	3.43E-01	3.36E-01	2.69E-01
FE 59	1.04E-01	1.04E-01	1.03E-01	1.02E-01	9.31E-02	8.36E-02	6.54E-02	4.12E-02	3.74E-04
CO 60	6.13E-05	6.13E-05	6.13E-05	6.13E-05	6.12E-05	6.10E-05	6.07E-05	6.00E-05	5.38E-05
CO 60M	2.07E-03	2.84E-04	4.90E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO 61	4.67E-06	3.79E-06	5.72E-07	1.95E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 63	5.35E-15	5.35E-15	5.35E-15	5.35E-15	5.35E-15	5.35E-15	5.35E-15	5.34E-15	5.31E-15
SUMTOT	1.09E+00	1.02E+00	6.99E-01	5.60E-01	5.46E-01	5.31E-01	5.02E-01	4.62E-01	3.11E-01
0TOTAL	1.09E+00	1.02E+00	6.99E-01	5.60E-01	5.46E-01	5.31E-01	5.02E-01	4.62E-01	3.11E-01

1 gram of Fe (CSM flux wire) irradiated for 119 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	g/1g of Fe	g/1g of Fe	g/1g of Fe	g/1g of Fe	g/1g of Fe	g/1g of Fe	g/1g of Fe	g/1g of Fe	g/1g of Fe
H 1	5.88E-07	5.88E-07	5.88E-07	5.88E-07	5.88E-07	5.88E-07	5.88E-07	5.88E-07	5.88E-07
H 2	2.48E-10	2.48E-10	2.48E-10	2.48E-10	2.48E-10	2.48E-10	2.48E-10	2.48E-10	2.48E-10
HE 4	1.29E-07	1.29E-07	1.29E-07	1.29E-07	1.29E-07	1.29E-07	1.29E-07	1.29E-07	1.29E-07
TI 48	1.54E-15	1.54E-15	1.54E-15	1.57E-15	1.62E-15	1.63E-15	1.63E-15	1.63E-15	1.63E-15
TI 50	4.87E-12	4.87E-12	4.87E-12	4.87E-12	4.87E-12	4.87E-12	4.87E-12	4.87E-12	4.87E-12
V 51	3.21E-07	3.21E-07	3.21E-07	3.24E-07	3.45E-07	3.65E-07	4.00E-07	4.37E-07	4.71E-07
V 52	5.78E-14	2.26E-16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CR 51	1.50E-07	1.50E-07	1.50E-07	1.47E-07	1.26E-07	1.06E-07	7.09E-08	3.35E-08	1.62E-11
CR 52	8.27E-10	8.27E-10	8.27E-10	8.27E-10	8.27E-10	8.27E-10	8.27E-10	8.27E-10	8.27E-10
CR 53	9.21E-07	9.21E-07	9.21E-07	9.21E-07	9.21E-07	9.21E-07	9.21E-07	9.21E-07	9.21E-07
CR 54	1.96E-06	1.96E-06	1.97E-06	1.99E-06	2.15E-06	2.33E-06	2.74E-06	3.46E-06	8.65E-06
CR 55	2.84E-14	8.12E-17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 54	1.20E-05	1.20E-05	1.20E-05	1.20E-05	1.19E-05	1.17E-05	1.13E-05	1.05E-05	5.36E-06
MN 55	6.22E-06	6.22E-06	6.24E-06	6.32E-06	6.93E-06	7.64E-06	9.25E-06	1.22E-05	3.90E-05
MN 56	2.43E-08	2.13E-08	6.35E-09	3.84E-11	5.94E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 57	5.04E-13	1.24E-18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 58	1.05E-15	5.27E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE 54	5.60E-02	5.60E-02	5.60E-02	5.60E-02	5.60E-02	5.60E-02	5.60E-02	5.60E-02	5.60E-02
FE 55	1.40E-04	1.40E-04	1.40E-04	1.40E-04	1.40E-04	1.39E-04	1.37E-04	1.34E-04	1.07E-04
FE 56	9.16E-01	9.16E-01	9.16E-01	9.16E-01	9.16E-01	9.16E-01	9.16E-01	9.16E-01	9.16E-01
FE 57	2.49E-02	2.49E-02	2.49E-02	2.49E-02	2.49E-02	2.49E-02	2.49E-02	2.49E-02	2.49E-02
FE 58	3.07E-03	3.07E-03	3.07E-03	3.07E-03	3.07E-03	3.07E-03	3.07E-03	3.07E-03	3.07E-03
FE 59	2.11E-06	2.11E-06	2.10E-06	2.08E-06	1.89E-06	1.70E-06	1.33E-06	8.37E-07	7.60E-09
CO 59	2.42E-06	2.42E-06	2.43E-06	2.46E-06	2.64E-06	2.83E-06	3.20E-06	3.70E-06	4.52E-06
CO 60	5.42E-08	5.42E-08	5.42E-08	5.42E-08	5.41E-08	5.40E-08	5.37E-08	5.31E-08	4.76E-08
CO 60M	6.91E-12	9.48E-13	1.64E-20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO 61	1.50E-13	1.22E-13	1.84E-14	6.27E-18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 60	7.03E-10	7.04E-10	7.07E-10	7.23E-10	8.40E-10	9.76E-10	1.29E-09	1.86E-09	7.39E-09
NI 61	4.92E-11	4.93E-11	4.94E-11	4.94E-11	4.94E-11	4.94E-11	4.94E-11	4.94E-11	4.94E-11
NI 62	3.09E-14	3.09E-14	3.09E-14	3.09E-14	3.09E-14	3.09E-14	3.09E-14	3.09E-14	3.09E-14
SUMTOT	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
0TOTAL	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

1 gram of Ti (CSM flux wire) irradiated for 54.9 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g
H 3	2.73E-14	2.73E-14	2.73E-14	2.73E-14	2.73E-14	2.72E-14	2.72E-14	2.70E-14	2.58E-14
S 37	1.57E-11	2.58E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CL 38	1.23E-15	5.44E-16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AR 41	3.04E-09	2.51E-09	4.56E-10	3.37E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AR 42	2.46E-18	2.46E-18	2.46E-18	2.46E-18	2.46E-18	2.46E-18	2.45E-18	2.45E-18	2.41E-18
K 42	8.23E-12	8.00E-12	6.22E-12	2.14E-12	6.69E-16	2.51E-18	2.45E-18	2.45E-18	2.41E-18
K 43	3.90E-08	3.84E-08	3.35E-08	1.87E-08	2.26E-10	1.31E-12	1.00E-17	2.57E-27	0.00E+00
K 44	6.90E-09	2.68E-09	5.42E-13	1.37E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CA 45	2.11E-04	2.11E-04	2.11E-04	2.10E-04	2.05E-04	1.99E-04	1.86E-04	1.63E-04	4.46E-05
CA 47	4.33E-06	4.31E-06	4.19E-06	3.71E-06	1.48E-06	5.09E-07	4.42E-08	4.51E-10	2.49E-30
SC 46	4.74E-02	4.74E-02	4.73E-02	4.70E-02	4.48E-02	4.22E-02	3.70E-02	2.89E-02	2.31E-03
SC 46M	5.33E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SC 47	2.02E-01	2.01E-01	1.93E-01	1.64E-01	4.74E-02	1.11E-02	4.07E-04	8.20E-07	0.00E+00
SC 48	1.89E-02	1.88E-02	1.75E-02	1.30E-02	1.33E-03	9.30E-05	2.14E-07	2.41E-12	0.00E+00
SC 49	1.61E-02	1.12E-02	4.33E-04	4.65E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SC 50	3.20E-04	1.65E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TI 51	3.63E-01	9.81E-03	7.60E-17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 52	9.35E-04	3.65E-06	7.73E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 53	4.96E-14	1.22E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CR 51	2.63E-11	2.63E-11	2.61E-11	2.56E-11	2.21E-11	1.85E-11	1.24E-11	5.86E-12	2.83E-15
CR 55	1.29E-13	3.45E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SUMTOT	6.48E-01	2.88E-01	2.59E-01	2.24E-01	9.37E-02	5.37E-02	3.76E-02	2.90E-02	2.36E-03
0TOTAL	6.48E-01	2.88E-01	2.59E-01	2.24E-01	9.37E-02	5.37E-02	3.76E-02	2.90E-02	2.36E-03

1 gram of Ti (CSM flux wire) irradiated for 54.9 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	g/1g of Ti	g/1g of Ti	g/1g of Ti	g/1g of Ti	g/1g of Ti	g/1g of Ti	g/1g of Ti	g/1g of Ti	g/1g of Ti
H 1	1.07E-07	1.07E-07	1.07E-07	1.07E-07	1.07E-07	1.07E-07	1.07E-07	1.07E-07	1.07E-07
H 2	2.08E-11	2.08E-11	2.08E-11	2.08E-11	2.08E-11	2.08E-11	2.08E-11	2.08E-11	2.08E-11
HE 4	7.41E-08	7.41E-08	7.41E-08	7.41E-08	7.41E-08	7.41E-08	7.41E-08	7.41E-08	7.41E-08
AR 40	5.62E-13	5.62E-13	5.62E-13	5.62E-13	5.62E-13	5.62E-13	5.62E-13	5.62E-13	5.62E-13
K 41	1.81E-14	1.81E-14	1.81E-14	1.81E-14	1.81E-14	1.81E-14	1.81E-14	1.81E-14	1.81E-14
K 43	1.21E-14	1.19E-14	1.04E-14	5.79E-15	6.99E-17	4.04E-19	3.10E-24	7.97E-34	0.00E+00
CA 43	8.38E-08	8.38E-08	8.38E-08	8.38E-08	8.38E-08	8.38E-08	8.38E-08	8.38E-08	8.38E-08
CA 44	6.45E-07	6.45E-07	6.45E-07	6.45E-07	6.45E-07	6.45E-07	6.45E-07	6.45E-07	6.45E-07
CA 45	1.18E-08	1.18E-08	1.18E-08	1.18E-08	1.15E-08	1.12E-08	1.04E-08	9.17E-09	2.50E-09
CA 46	7.38E-08	7.38E-08	7.38E-08	7.38E-08	7.38E-08	7.38E-08	7.38E-08	7.38E-08	7.38E-08
CA 47	7.06E-12	7.04E-12	6.84E-12	6.06E-12	2.42E-12	8.31E-13	7.21E-14	7.36E-16	4.06E-36
SC 45	1.42E-09	1.43E-09	1.43E-09	1.47E-09	1.77E-09	2.11E-09	2.84E-09	4.09E-09	1.08E-08
SC 46	1.40E-06	1.40E-06	1.40E-06	1.39E-06	1.32E-06	1.25E-06	1.09E-06	8.52E-07	6.82E-08
SC 47	2.43E-07	2.42E-07	2.33E-07	1.98E-07	5.72E-08	1.34E-08	4.91E-10	9.88E-13	0.00E+00
SC 48	1.27E-08	1.26E-08	1.17E-08	8.69E-09	8.90E-10	6.24E-11	1.43E-13	1.61E-18	0.00E+00
SC 49	2.41E-10	1.68E-10	6.48E-12	6.97E-18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SC 50	1.45E-13	7.51E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TI 46	7.92E-02	7.92E-02	7.92E-02	7.92E-02	7.92E-02	7.92E-02	7.92E-02	7.92E-02	7.92E-02
TI 47	7.30E-02	7.30E-02	7.30E-02	7.30E-02	7.30E-02	7.30E-02	7.30E-02	7.30E-02	7.30E-02
TI 48	7.35E-01	7.35E-01	7.35E-01	7.35E-01	7.35E-01	7.35E-01	7.35E-01	7.35E-01	7.35E-01
TI 49	5.82E-02	5.82E-02	5.82E-02	5.82E-02	5.82E-02	5.82E-02	5.82E-02	5.82E-02	5.82E-02
TI 50	5.43E-02	5.43E-02	5.43E-02	5.43E-02	5.43E-02	5.43E-02	5.43E-02	5.43E-02	5.43E-02
TI 51	5.67E-10	1.53E-11	1.19E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

V 51	5.38E-06	5.38E-06	5.38E-06	5.38E-06	5.38E-06	5.38E-06	5.38E-06	5.38E-06	5.38E-06
V 52	9.69E-13	3.78E-15	8.01E-37	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CR 52	7.08E-09	7.08E-09	7.08E-09	7.08E-09	7.08E-09	7.08E-09	7.08E-09	7.08E-09	7.08E-09
CR 53	4.50E-12	4.50E-12	4.50E-12	4.50E-12	4.50E-12	4.50E-12	4.50E-12	4.50E-12	4.50E-12
CR 54	1.08E-14	1.08E-14	1.08E-14	1.08E-14	1.08E-14	1.08E-14	1.08E-14	1.08E-14	1.08E-14
SUMTOT	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
0TOTAL	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00

1 gram of Ti (CSM flux wire) irradiated for 119 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g	Ci/g
H 3	2.78E-13	2.78E-13	2.78E-13	2.78E-13	2.78E-13	2.77E-13	2.77E-13	2.75E-13	2.63E-13
S 37	7.34E-11	1.20E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CL 38	1.26E-14	7.50E-15	1.94E-16	1.16E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AR 41	6.63E-09	5.48E-09	9.94E-10	7.36E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AR 42	1.16E-17	1.16E-17	1.16E-17	1.16E-17	1.16E-17	1.16E-17	1.16E-17	1.16E-17	1.14E-17
K 42	3.61E-11	3.51E-11	2.73E-11	9.41E-12	2.94E-15	1.18E-17	1.16E-17	1.16E-17	1.14E-17
K 43	8.43E-08	8.31E-08	7.23E-08	4.04E-08	4.88E-10	2.82E-12	2.17E-17	5.56E-27	0.00E+00
K 44	1.50E-08	5.81E-09	1.18E-12	2.96E-28	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CA 45	4.08E-04	4.08E-04	4.08E-04	4.06E-04	3.96E-04	3.85E-04	3.59E-04	3.16E-04	8.63E-05
CA 47	6.77E-06	6.75E-06	6.56E-06	5.81E-06	2.32E-06	7.97E-07	6.91E-08	7.06E-10	3.89E-30
SC 46	8.12E-02	8.12E-02	8.11E-02	8.05E-02	7.66E-02	7.23E-02	6.34E-02	4.94E-02	3.96E-03
SC 46M	2.31E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SC 47	2.02E-01	2.01E-01	1.93E-01	1.64E-01	4.75E-02	1.12E-02	4.08E-04	8.25E-07	0.00E+00
SC 48	1.89E-02	1.87E-02	1.74E-02	1.29E-02	1.32E-03	9.26E-05	2.13E-07	2.40E-12	0.00E+00
SC 49	1.71E-02	1.19E-02	4.58E-04	4.93E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SC 50	3.20E-04	1.66E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TI 51	3.63E-01	9.83E-03	7.62E-17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 52	2.03E-03	7.91E-06	1.68E-27	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 53	5.03E-13	1.24E-18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CR 51	1.99E-10	1.99E-10	1.98E-10	1.94E-10	1.67E-10	1.40E-10	9.41E-11	4.44E-11	2.14E-14
CR 55	2.85E-12	6.08E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN 56	1.05E-14	9.09E-15	2.68E-15	8.11E-17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SUMTOT	6.85E-01	3.23E-01	2.93E-01	2.58E-01	1.26E-01	8.39E-02	6.41E-02	4.97E-02	4.04E-03
0TOTAL	6.85E-01	3.23E-01	2.93E-01	2.58E-01	1.26E-01	8.39E-02	6.41E-02	4.97E-02	4.04E-03

1 gram of Ti (CSM flux wire) irradiated for 119 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	g/1g of Ti	g/1g of Ti	g/1g of Ti	g/1g of Ti	g/1g of Ti	g/1g of Ti	g/1g of Ti	g/1g of Ti	g/1g of Ti
H 1	2.32E-07	2.32E-07	2.32E-07	2.32E-07	2.32E-07	2.32E-07	2.32E-07	2.32E-07	2.32E-07
H 2	9.76E-11	9.76E-11	9.76E-11	9.76E-11	9.76E-11	9.76E-11	9.76E-11	9.76E-11	9.76E-11
HE 4	1.61E-07	1.61E-07	1.61E-07	1.61E-07	1.61E-07	1.61E-07	1.61E-07	1.61E-07	1.61E-07
AR 40	2.64E-12	2.64E-12	2.64E-12	2.64E-12	2.64E-12	2.64E-12	2.64E-12	2.64E-12	2.64E-12
K 41	8.53E-14	8.53E-14	8.54E-14	8.55E-14	8.55E-14	8.55E-14	8.55E-14	8.55E-14	8.55E-14
K 43	2.61E-14	2.57E-14	2.24E-14	1.25E-14	1.51E-16	8.75E-19	6.71E-24	1.72E-33	0.00E+00
CA 43	1.81E-07	1.81E-07	1.81E-07	1.81E-07	1.81E-07	1.81E-07	1.81E-07	1.81E-07	1.81E-07
CA 44	1.40E-06	1.40E-06	1.40E-06	1.40E-06	1.40E-06	1.40E-06	1.40E-06	1.40E-06	1.40E-06
CA 45	2.29E-08	2.29E-08	2.29E-08	2.28E-08	2.22E-08	2.16E-08	2.02E-08	1.78E-08	4.85E-09
CA 46	1.65E-07	1.65E-07	1.65E-07	1.65E-07	1.65E-07	1.65E-07	1.65E-07	1.65E-07	1.65E-07
CA 47	1.11E-11	1.10E-11	1.07E-11	9.48E-12	3.79E-12	1.30E-12	1.13E-13	1.15E-15	6.35E-36
SC 45	6.16E-09	6.17E-09	6.19E-09	6.26E-09	6.84E-09	7.49E-09	8.91E-09	1.13E-08	2.42E-08
SC 46	2.40E-06	2.40E-06	2.39E-06	2.38E-06	2.26E-06	2.13E-06	1.87E-06	1.46E-06	1.17E-07
SC 47	2.43E-07	2.42E-07	2.33E-07	1.98E-07	5.72E-08	1.34E-08	4.91E-10	9.94E-13	0.00E+00
SC 48	1.27E-08	1.26E-08	1.17E-08	8.66E-09	8.87E-10	6.21E-11	1.43E-13	1.61E-18	0.00E+00

SC 49	2.55E-10	1.78E-10	6.86E-12	7.38E-18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SC 50	1.45E-13	7.52E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TI 46	7.91E-02	7.91E-02	7.91E-02	7.91E-02	7.91E-02	7.91E-02	7.91E-02	7.91E-02	7.91E-02
TI 47	7.30E-02	7.30E-02	7.30E-02	7.30E-02	7.30E-02	7.30E-02	7.30E-02	7.30E-02	7.30E-02
TI 48	7.32E-01	7.32E-01	7.32E-01	7.32E-01	7.32E-01	7.32E-01	7.32E-01	7.32E-01	7.32E-01
TI 49	6.16E-02	6.16E-02	6.16E-02	6.16E-02	6.16E-02	6.16E-02	6.16E-02	6.16E-02	6.16E-02
TI 50	5.44E-02	5.44E-02	5.44E-02	5.44E-02	5.44E-02	5.44E-02	5.44E-02	5.44E-02	5.44E-02
TI 51	5.67E-10	1.54E-11	1.19E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
V 51	1.17E-05	1.17E-05	1.17E-05	1.17E-05	1.17E-05	1.17E-05	1.17E-05	1.17E-05	1.17E-05
V 52	2.10E-12	8.20E-15	1.74E-36	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CR 51	2.16E-15	2.16E-15	2.15E-15	2.10E-15	1.81E-15	1.52E-15	1.02E-15	4.81E-16	2.32E-19
CR 52	3.32E-08	3.32E-08	3.32E-08	3.32E-08	3.32E-08	3.32E-08	3.32E-08	3.32E-08	3.32E-08
CR 53	4.56E-11	4.56E-11	4.56E-11	4.56E-11	4.56E-11	4.56E-11	4.56E-11	4.56E-11	4.56E-11
CR 54	2.39E-13	2.39E-13	2.39E-13	2.39E-13	2.39E-13	2.39E-13	2.39E-13	2.39E-13	2.39E-13
SUMTOT	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
0TOTAL	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00

1 gram of 95Zn-5Al (CSM melt wire) irradiated for 119 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	Ci/1g of 95Zn-5Al	Ci/1g of 95Zn-5Al	Ci/1g of 95Zn-5Al	Ci/1g of 95Zn-5Al	Ci/1g of 95Zn-5Al	Ci/1g of 95Zn-5Al	Ci/1g of 95Zn-5Al	Ci/1g of 95Zn-5Al	Ci/1g of 95Zn-5Al
H 3	2.56E-14	2.56E-14	2.56E-14	2.56E-14	2.56E-14	2.56E-14	2.55E-14	2.54E-14	2.42E-14
NA 24	7.07E-03	6.91E-03	5.61E-03	2.33E-03	3.00E-06	1.28E-09	2.51E-17	0.00E+00	0.00E+00
NA 25	9.83E-12	7.96E-21	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MG 27	3.38E-02	3.76E-03	9.65E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MG 28	1.20E-10	1.18E-10	1.02E-10	5.43E-11	4.59E-13	1.74E-15	5.17E-21	0.00E+00	0.00E+00
AL 28	8.11E-01	7.54E-05	1.02E-10	5.44E-11	4.60E-13	1.75E-15	5.18E-21	0.00E+00	0.00E+00
AL 29	7.75E-10	3.19E-11	1.09E-23	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SI 31	1.10E-12	9.61E-13	2.92E-13	1.96E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE 59	3.77E-12	3.77E-12	3.76E-12	3.71E-12	3.38E-12	3.04E-12	2.37E-12	1.50E-12	1.36E-14
CO 60	7.23E-15	7.23E-15	7.23E-15	7.23E-15	7.22E-15	7.20E-15	7.16E-15	7.08E-15	6.34E-15
CO 60M	3.19E-14	4.99E-15	8.61E-23	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO 61	1.17E-09	9.45E-10	1.43E-10	4.88E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO 62	1.12E-06	1.07E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 63	3.53E-07	3.53E-07	3.53E-07	3.53E-07	3.53E-07	3.53E-07	3.53E-07	3.53E-07	3.50E-07
NI 65	1.01E-04	8.79E-05	2.55E-05	1.37E-07	8.61E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 66	3.45E-09	3.43E-09	3.24E-09	2.54E-09	4.09E-10	4.85E-11	3.71E-13	3.98E-17	0.00E+00
CU 64	5.27E-06	5.13E-06	4.01E-06	1.42E-06	5.49E-10	5.73E-14	4.53E-23	0.00E+00	0.00E+00
CU 66	5.69E-03	9.65E-05	3.24E-09	2.55E-09	4.10E-10	4.86E-11	3.71E-13	3.99E-17	0.00E+00
CU 67	3.47E-08	3.45E-08	3.28E-08	2.65E-08	5.28E-09	8.04E-10	1.09E-11	3.41E-15	0.00E+00
ZN 65	3.79E+00	3.79E+00	3.79E+00	3.78E+00	3.72E+00	3.64E+00	3.48E+00	3.20E+00	1.34E+00
ZN 69	8.80E+00	6.29E+00	7.06E-01	1.90E-01	1.34E-04	2.83E-08	1.13E-16	0.00E+00	0.00E+00
ZN 69M	5.91E-01	5.76E-01	4.60E-01	1.77E-01	1.25E-04	2.64E-08	1.05E-16	0.00E+00	0.00E+00
ZN 71	1.32E-02	2.92E-06	2.89E-07	1.00E-08	8.77E-20	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZN 71M	1.38E-03	1.27E-03	5.71E-04	1.99E-05	1.74E-16	2.18E-29	0.00E+00	0.00E+00	0.00E+00
GA 70	5.52E-02	2.06E-02	2.90E-06	1.58E-22	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

GA 72	2.04E-04	1.99E-04	1.60E-04	6.28E-05	5.29E-08	1.37E-11	8.68E-20	0.00E+00	0.00E+00
GA 72M	6.31E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GE 71	8.51E-05	8.50E-05	8.40E-05	8.02E-05	5.64E-05	3.74E-05	1.46E-05	2.51E-06	4.09E-14
GE 71M	9.19E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GE 75	4.28E-13	3.34E-13	3.49E-14	2.50E-18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GE 75M	9.42E-14	7.82E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SUMT OT	1.41E+01	1.07E+01	4.96E+00	4.15E+00	3.72E+00	3.64E+00	3.48E+00	3.20E+00	1.34E+00
0TOTA L	1.41E+01	1.07E+01	4.96E+00	4.15E+00	3.72E+00	3.64E+00	3.48E+00	3.20E+00	1.34E+00

1 gram of 95Zn-5Al (CSM melt wire) irradiated for 54.9 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	Ci/1g of 95Zn-5Al	Ci/1g of 95Zn-5Al	Ci/1g of 95Zn-5Al	Ci/1g of 95Zn-5Al	Ci/1g of 95Zn-5Al	Ci/1g of 95Zn-5Al	Ci/1g of 95Zn-5Al	Ci/1g of 95Zn-5Al	Ci/1g of 95Zn-5Al
H 3	2.52E-15	2.52E-15	2.52E-15	2.52E-15	2.52E-15	2.51E-15	2.51E-15	2.50E-15	2.38E-15
NA 24	7.07E-03	6.91E-03	5.61E-03	2.33E-03	3.00E-06	1.28E-09	2.51E-17	0.00E+00	0.00E+00
NA 25	2.09E-12	1.69E-21	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MG 27	3.38E-02	3.76E-03	9.65E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MG 28	1.20E-10	1.18E-10	1.02E-10	5.43E-11	4.59E-13	1.74E-15	5.16E-21	0.00E+00	0.00E+00
AL 28	8.11E-01	7.54E-05	1.02E-10	5.44E-11	4.60E-13	1.75E-15	5.17E-21	0.00E+00	0.00E+00
AL 29	1.65E-10	6.79E-12	2.32E-24	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SI 31	1.08E-13	9.44E-14	2.88E-14	2.42E-16	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE 59	4.52E-13	4.52E-13	4.50E-13	4.45E-13	4.06E-13	3.64E-13	2.85E-13	1.79E-13	1.63E-15
CO 61	5.39E-10	4.36E-10	6.59E-11	2.25E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO 62	2.52E-07	2.41E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 63	1.64E-07	1.64E-07	1.64E-07	1.64E-07	1.64E-07	1.64E-07	1.64E-07	1.64E-07	1.63E-07
NI 65	9.87E-05	8.60E-05	2.50E-05	1.34E-07	8.43E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 66	3.41E-09	3.39E-09	3.20E-09	2.52E-09	4.04E-10	4.79E-11	3.66E-13	3.94E-17	0.00E+00
CU 64	1.19E-06	1.16E-06	9.06E-07	3.21E-07	1.24E-10	1.29E-14	1.02E-23	0.00E+00	0.00E+00
CU 66	1.29E-03	2.18E-05	3.21E-09	2.52E-09	4.05E-10	4.80E-11	3.67E-13	3.94E-17	0.00E+00
CU 67	7.29E-09	7.25E-09	6.89E-09	5.57E-09	1.11E-09	1.69E-10	2.29E-12	7.17E-16	0.00E+00
ZN 65	1.91E+00	1.91E+00	1.91E+00	1.90E+00	1.87E+00	1.84E+00	1.75E+00	1.61E+00	6.76E-01
ZN 69	8.79E+00	6.28E+00	7.06E-01	1.89E-01	1.34E-04	2.83E-08	1.13E-16	0.00E+00	0.00E+00
ZN 69M	5.91E-01	5.76E-01	4.59E-01	1.76E-01	1.25E-04	2.64E-08	1.05E-16	0.00E+00	0.00E+00
ZN 71	1.32E-02	2.92E-06	2.89E-07	1.00E-08	8.77E-20	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZN 71M	1.38E-03	1.27E-03	5.71E-04	1.99E-05	1.74E-16	2.18E-29	0.00E+00	0.00E+00	0.00E+00
GA 70	2.55E-02	9.51E-03	1.34E-06	7.28E-23	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GA 72	9.44E-05	9.21E-05	7.38E-05	2.90E-05	2.45E-08	6.33E-12	4.01E-20	0.00E+00	0.00E+00
GA 72M	2.92E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GE 71	1.35E-05	1.35E-05	1.34E-05	1.28E-05	8.98E-06	5.95E-06	2.33E-06	3.99E-07	6.51E-15
GE 71M	1.96E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GE 75	1.95E-14	1.53E-14	1.65E-15	1.18E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SUMT OT	1.22E+01	8.79E+00	3.08E+00	2.27E+00	1.87E+00	1.84E+00	1.75E+00	1.61E+00	6.76E-01

1 gram of 95Zn-5Al (CSM melt wire) irradiated for 54.9 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	Ci/1g of 95Zn-5Al	Ci/1g of 95Zn-5Al	Ci/1g of 95Zn-5Al	Ci/1g of 95Zn-5Al	Ci/1g of 95Zn-5Al	Ci/1g of 95Zn-5Al	Ci/1g of 95Zn-5Al	Ci/1g of 95Zn-5Al	Ci/1g of 95Zn-5Al
0TOTAL	1.22E+01	8.79E+00	3.08E+00	2.27E+00	1.87E+00	1.84E+00	1.75E+00	1.61E+00	6.76E-01

1 gram of 95Zn-5Al (CSM melt wire) irradiated for 119 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	g/1g of 95Zn-5Al	g/1g of 95Zn-5Al	g/1g of 95Zn-5Al	g/1g of 95Zn-5Al	g/1g of 95Zn-5Al	g/1g of 95Zn-5Al	g/1g of 95Zn-5Al	g/1g of 95Zn-5Al	g/1g of 95Zn-5Al
H 1	2.14E-08	2.14E-08	2.14E-08	2.14E-08	2.14E-08	2.14E-08	2.14E-08	2.14E-08	2.14E-08
H 2	9.00E-12	9.00E-12	9.00E-12	9.00E-12	9.00E-12	9.00E-12	9.00E-12	9.00E-12	9.00E-12
HE 4	1.90E-08	1.90E-08	1.90E-08	1.90E-08	1.90E-08	1.90E-08	1.90E-08	1.90E-08	1.90E-08
NE 21	2.60E-13	2.60E-13	2.60E-13	2.60E-13	2.60E-13	2.60E-13	2.60E-13	2.60E-13	2.60E-13
NA 24	8.12E-10	7.94E-10	6.45E-10	2.68E-10	3.45E-13	1.47E-16	2.88E-24	0.00E+00	0.00E+00
MG 24	1.06E-07	1.06E-07	1.07E-07	1.07E-07	1.07E-07	1.07E-07	1.07E-07	1.07E-07	1.07E-07
MG 25	2.09E-11	2.09E-11	2.09E-11	2.09E-11	2.09E-11	2.09E-11	2.09E-11	2.09E-11	2.09E-11
MG 26	1.16E-14	1.16E-14	1.16E-14	1.16E-14	1.16E-14	1.16E-14	1.16E-14	1.16E-14	1.16E-14
MG 27	4.59E-11	5.10E-12	1.31E-20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AL 27	5.00E-02	5.00E-02	5.00E-02	5.00E-02	5.00E-02	5.00E-02	5.00E-02	5.00E-02	5.00E-02
AL 28	2.70E-10	2.51E-14	3.40E-20	1.81E-20	1.53E-22	5.85E-25	1.73E-30	0.00E+00	0.00E+00
SI 28	1.43E-05	1.43E-05	1.43E-05	1.43E-05	1.43E-05	1.43E-05	1.43E-05	1.43E-05	1.43E-05
SI 29	1.41E-09	1.41E-09	1.41E-09	1.41E-09	1.41E-09	1.41E-09	1.41E-09	1.41E-09	1.41E-09
SI 30	1.52E-13	1.52E-13	1.52E-13	1.52E-13	1.52E-13	1.52E-13	1.52E-13	1.52E-13	1.52E-13
FE 58	2.24E-13	2.24E-13	2.24E-13	2.24E-13	2.24E-13	2.24E-13	2.24E-13	2.24E-13	2.24E-13
NI 61	7.10E-09	7.10E-09	7.10E-09	7.10E-09	7.10E-09	7.10E-09	7.10E-09	7.10E-09	7.10E-09
NI 62	2.54E-11	2.54E-11	2.54E-11	2.54E-11	2.54E-11	2.54E-11	2.54E-11	2.54E-11	2.54E-11
NI 63	5.72E-09	5.72E-09	5.72E-09	5.72E-09	5.72E-09	5.72E-09	5.72E-09	5.71E-09	5.68E-09
NI 64	3.74E-10	3.75E-10	3.75E-10	3.75E-10	3.75E-10	3.75E-10	3.75E-10	3.75E-10	3.75E-10
NI 65	5.27E-12	4.59E-12	1.33E-12	7.16E-15	4.50E-32	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 66	3.97E-15	3.94E-15	3.72E-15	2.93E-15	4.70E-16	5.58E-17	4.26E-19	4.58E-23	0.00E+00
CU 63	7.04E-12	7.05E-12	7.07E-12	7.16E-12	7.87E-12	8.69E-12	1.06E-11	1.41E-11	5.00E-11
CU 64	1.37E-12	1.33E-12	1.04E-12	3.69E-13	1.42E-16	1.48E-20	1.17E-29	0.00E+00	0.00E+00
CU 65	8.21E-05	8.21E-05	8.24E-05	8.34E-05	9.12E-05	1.00E-04	1.20E-04	1.54E-04	3.79E-04
CU 66	1.02E-11	1.73E-13	5.80E-18	4.56E-18	7.33E-19	8.69E-20	6.64E-22	7.14E-26	0.00E+00
CU 67	4.59E-14	4.56E-14	4.34E-14	3.51E-14	6.99E-15	1.06E-15	1.44E-17	4.51E-21	0.00E+00
ZN 64	4.51E-01	4.51E-01	4.51E-01	4.51E-01	4.51E-01	4.51E-01	4.51E-01	4.51E-01	4.51E-01
ZN 65	4.60E-04	4.60E-04	4.60E-04	4.59E-04	4.51E-04	4.42E-04	4.22E-04	3.88E-04	1.63E-04
ZN 66	2.67E-01	2.67E-01	2.67E-01	2.67E-01	2.67E-01	2.67E-01	2.67E-01	2.67E-01	2.67E-01
ZN 67	3.97E-02	3.97E-02	3.97E-02	3.97E-02	3.97E-02	3.97E-02	3.97E-02	3.97E-02	3.97E-02
ZN 68	1.85E-01	1.85E-01	1.85E-01	1.85E-01	1.85E-01	1.85E-01	1.85E-01	1.85E-01	1.85E-01
ZN 69	1.84E-07	1.31E-07	1.48E-08	3.96E-09	2.80E-12	5.93E-16	2.36E-24	0.00E+00	0.00E+00
ZN 69M	1.79E-07	1.75E-07	1.39E-07	5.34E-08	3.78E-11	7.99E-15	3.18E-23	0.00E+00	0.00E+00
ZN 70	6.30E-03	6.30E-03	6.30E-03	6.30E-03	6.30E-03	6.30E-03	6.30E-03	6.30E-03	6.30E-03
ZN 71	1.20E-11	2.64E-15	2.62E-16	9.09E-18	7.95E-29	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZN 71M	1.23E-10	1.12E-10	5.07E-11	1.76E-12	1.54E-23	1.94E-36	0.00E+00	0.00E+00	0.00E+00
GA 69	3.82E-04	3.82E-04	3.82E-04	3.82E-04	3.82E-04	3.82E-04	3.82E-04	3.82E-04	3.82E-04
GA 70	4.34E-10	1.62E-10	2.28E-14	1.24E-30	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GA 71	6.50E-07	6.50E-07	6.50E-07	6.50E-07	6.50E-07	6.50E-07	6.51E-07	6.51E-07	6.51E-07

1 gram of 95Zn-5Al (CSM melt wire) irradiated for 119 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	g/1g of 95Zn-5Al	g/1g of 95Zn-5Al	g/1g of 95Zn-5Al	g/1g of 95Zn-5Al	g/1g of 95Zn-5Al	g/1g of 95Zn-5Al	g/1g of 95Zn-5Al	g/1g of 95Zn-5Al	g/1g of 95Zn-5Al
GA 72	6.61E-11	6.45E-11	5.17E-11	2.03E-11	1.71E-14	4.44E-18	2.81E-26	0.00E+00	0.00E+00
GE 70	1.22E-06	1.22E-06	1.22E-06	1.22E-06	1.22E-06	1.22E-06	1.22E-06	1.22E-06	1.22E-06
GE 71	5.46E-10	5.45E-10	5.39E-10	5.15E-10	3.62E-10	2.40E-10	9.37E-11	1.61E-11	2.62E-19
GE 72	4.61E-09	4.61E-09	4.63E-09	4.66E-09	4.68E-09	4.68E-09	4.68E-09	4.68E-09	4.68E-09
GE 73	2.32E-12	2.32E-12	2.32E-12	2.32E-12	2.32E-12	2.32E-12	2.32E-12	2.32E-12	2.32E-12
GE 74	2.34E-14	2.34E-14	2.34E-14	2.34E-14	2.34E-14	2.34E-14	2.34E-14	2.34E-14	2.34E-14
SUMTOT	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
0TOTAL	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00

1 gram of 95Zn-5Al (CSM melt wire) irradiated for 54.9 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	g/1g of 95Zn-5Al	g/1g of 95Zn-5Al	g/1g of 95Zn-5Al	g/1g of 95Zn-5Al	g/1g of 95Zn-5Al	g/1g of 95Zn-5Al	g/1g of 95Zn-5Al	g/1g of 95Zn-5Al	g/1g of 95Zn-5Al
H 1	9.85E-09	9.85E-09	9.85E-09	9.85E-09	9.85E-09	9.85E-09	9.85E-09	9.85E-09	9.85E-09
H 2	1.92E-12	1.92E-12	1.92E-12	1.92E-12	1.92E-12	1.92E-12	1.92E-12	1.92E-12	1.92E-12
HE 4	8.75E-09	8.75E-09	8.75E-09	8.75E-09	8.75E-09	8.75E-09	8.75E-09	8.75E-09	8.75E-09
NE 21	5.48E-14	5.48E-14	5.48E-14	5.48E-14	5.48E-14	5.48E-14	5.48E-14	5.48E-14	5.48E-14
NA 24	8.12E-10	7.94E-10	6.45E-10	2.68E-10	3.45E-13	1.47E-16	2.88E-24	0.00E+00	0.00E+00
MG 24	4.86E-08	4.87E-08	4.88E-08	4.92E-08	4.95E-08	4.95E-08	4.95E-08	4.95E-08	4.95E-08
MG 25	4.45E-12	4.45E-12	4.45E-12	4.45E-12	4.45E-12	4.45E-12	4.45E-12	4.45E-12	4.45E-12
MG 26	1.13E-15	1.13E-15	1.13E-15	1.13E-15	1.13E-15	1.13E-15	1.13E-15	1.13E-15	1.13E-15
MG 27	4.59E-11	5.10E-12	1.31E-20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AL 27	5.00E-02	5.00E-02	5.00E-02	5.00E-02	5.00E-02	5.00E-02	5.00E-02	5.00E-02	5.00E-02
AL 28	2.70E-10	2.51E-14	3.40E-20	1.81E-20	1.53E-22	5.85E-25	1.72E-30	0.00E+00	0.00E+00
SI 28	6.61E-06	6.61E-06	6.61E-06	6.61E-06	6.61E-06	6.61E-06	6.61E-06	6.61E-06	6.61E-06
SI 29	3.00E-10	3.00E-10	3.00E-10	3.00E-10	3.00E-10	3.00E-10	3.00E-10	3.00E-10	3.00E-10
SI 30	1.49E-14	1.49E-14	1.49E-14	1.49E-14	1.49E-14	1.49E-14	1.49E-14	1.49E-14	1.49E-14
FE 58	4.77E-14	4.77E-14	4.77E-14	4.77E-14	4.77E-14	4.77E-14	4.77E-14	4.77E-14	4.77E-14
NI 61	3.28E-09	3.28E-09	3.28E-09	3.28E-09	3.28E-09	3.28E-09	3.28E-09	3.28E-09	3.28E-09
NI 62	3.78E-12	3.78E-12	3.78E-12	3.78E-12	3.78E-12	3.78E-12	3.78E-12	3.78E-12	3.78E-12
NI 63	2.66E-09	2.66E-09	2.66E-09	2.66E-09	2.66E-09	2.66E-09	2.66E-09	2.66E-09	2.64E-09
NI 64	1.38E-10	1.38E-10	1.38E-10	1.38E-10	1.38E-10	1.38E-10	1.38E-10	1.38E-10	1.38E-10
NI 65	5.16E-12	4.50E-12	1.30E-12	7.01E-15	4.40E-32	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI 66	3.92E-15	3.90E-15	3.68E-15	2.89E-15	4.65E-16	5.51E-17	4.21E-19	4.53E-23	0.00E+00
CU 63	1.51E-12	1.51E-12	1.52E-12	1.56E-12	1.89E-12	2.28E-12	3.15E-12	4.80E-12	2.15E-11
CU 64	3.09E-13	3.00E-13	2.35E-13	8.33E-14	3.22E-17	3.35E-21	2.65E-30	0.00E+00	0.00E+00
CU 65	1.85E-05	1.86E-05	1.87E-05	1.92E-05	2.31E-05	2.76E-05	3.75E-05	5.49E-05	1.68E-04
CU 66	2.30E-12	3.90E-14	5.74E-18	4.51E-18	7.25E-19	8.59E-20	6.57E-22	7.06E-26	0.00E+00
CU 67	9.63E-15	9.58E-15	9.11E-15	7.36E-15	1.47E-15	2.23E-16	3.02E-18	9.47E-22	0.00E+00
ZN 64	4.51E-01	4.51E-01	4.51E-01	4.51E-01	4.51E-01	4.51E-01	4.51E-01	4.51E-01	4.51E-01
ZN 65	2.32E-04	2.32E-04	2.32E-04	2.31E-04	2.27E-04	2.23E-04	2.13E-04	1.95E-04	8.20E-05
ZN 66	2.67E-01	2.67E-01	2.67E-01	2.67E-01	2.67E-01	2.67E-01	2.67E-01	2.67E-01	2.67E-01
ZN 67	3.98E-02	3.98E-02	3.98E-02	3.98E-02	3.98E-02	3.98E-02	3.98E-02	3.98E-02	3.98E-02
ZN 68	1.85E-01	1.85E-01	1.85E-01	1.85E-01	1.85E-01	1.85E-01	1.85E-01	1.85E-01	1.85E-01
ZN 69	1.84E-07	1.31E-07	1.48E-08	3.96E-09	2.80E-12	5.92E-16	2.36E-24	0.00E+00	0.00E+00

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

1 gram of 95Zn-5Al (CSM melt wire) irradiated for 54.9 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	g/1g of 95Zn-5Al	g/1g of 95Zn-5Al	g/1g of 95Zn-5Al	g/1g of 95Zn-5Al	g/1g of 95Zn-5Al	g/1g of 95Zn-5Al	g/1g of 95Zn-5Al	g/1g of 95Zn-5Al	g/1g of 95Zn-5Al
ZN 69M	1.79E-07	1.75E-07	1.39E-07	5.34E-08	3.78E-11	7.99E-15	3.18E-23	0.00E+00	0.00E+00
ZN 70	6.30E-03	6.30E-03	6.30E-03	6.30E-03	6.30E-03	6.30E-03	6.30E-03	6.30E-03	6.30E-03
ZN 71	1.20E-11	2.64E-15	2.62E-16	9.09E-18	7.95E-29	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZN 71M	1.23E-10	1.12E-10	5.07E-11	1.76E-12	1.54E-23	1.94E-36	0.00E+00	0.00E+00	0.00E+00
GA 69	1.76E-04	1.76E-04	1.76E-04	1.76E-04	1.77E-04	1.77E-04	1.77E-04	1.77E-04	1.77E-04
GA 70	2.00E-10	7.47E-11	1.05E-14	5.72E-31	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GA 71	3.01E-07	3.01E-07	3.01E-07	3.01E-07	3.01E-07	3.01E-07	3.01E-07	3.01E-07	3.01E-07
GA 72	3.06E-11	2.98E-11	2.39E-11	9.39E-12	7.92E-15	2.05E-18	1.30E-26	0.00E+00	0.00E+00
GE 70	2.60E-07	2.60E-07	2.60E-07	2.60E-07	2.60E-07	2.60E-07	2.60E-07	2.60E-07	2.60E-07
GE 71	8.69E-11	8.68E-11	8.58E-11	8.19E-11	5.76E-11	3.82E-11	1.49E-11	2.56E-12	4.18E-20
GE 72	9.75E-10	9.76E-10	9.82E-10	9.97E-10	1.01E-09	1.01E-09	1.01E-09	1.01E-09	1.01E-09
GE 73	2.28E-13	2.28E-13	2.28E-13	2.28E-13	2.28E-13	2.28E-13	2.28E-13	2.28E-13	2.28E-13
GE 74	1.07E-15	1.07E-15	1.07E-15	1.07E-15	1.07E-15	1.07E-15	1.07E-15	1.07E-15	1.07E-15
SUMTOT	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
0TOTAL	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

1 gram of Pb (CSM melt wire) irradiated for 119 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	Ci/1g of Pb	Ci/1g of Pb	Ci/1g of Pb	Ci/1g of Pb	Ci/1g of Pb	Ci/1g of Pb	Ci/1g of Pb	Ci/1g of Pb	Ci/1g of Pb
TL206	1.46E-13	6.36E-15	3.10E-15	3.10E-15	3.10E-15	3.10E-15	3.10E-15	3.10E-15	3.10E-15
PB204	1.72E-16	1.72E-16	1.72E-16	1.72E-16	1.72E-16	1.72E-16	1.72E-16	1.72E-16	1.72E-16
PB205	9.31E-10	9.31E-10	9.31E-10	9.31E-10	9.31E-10	9.31E-10	9.31E-10	9.31E-10	9.31E-10
PB209	2.18E-03	1.96E-03	7.62E-04	1.41E-05	1.03E-18	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BI208	4.72E-15	4.72E-15	4.72E-15	4.72E-15	4.72E-15	4.72E-15	4.72E-15	4.72E-15	4.72E-15
BI210	1.05E-07	1.05E-07	1.02E-07	9.18E-08	4.00E-08	1.52E-08	1.66E-09	2.62E-11	1.21E-29
BI210M	3.11E-15	3.11E-15	3.11E-15	3.11E-15	3.11E-15	3.11E-15	3.11E-15	3.11E-15	3.11E-15
BI211	3.86E-13	2.22E-17	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PO210	2.47E-08	2.47E-08	2.48E-08	2.51E-08	2.62E-08	2.62E-08	2.46E-08	2.12E-08	4.61E-09
PO211	1.39E-12	6.25E-20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PO211M	2.32E-14	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SUMTOT	2.18E-03	1.96E-03	7.62E-04	1.42E-05	6.71E-08	4.23E-08	2.72E-08	2.22E-08	5.54E-09
0TOTAL	2.18E-03	1.96E-03	7.62E-04	1.42E-05	6.71E-08	4.23E-08	2.72E-08	2.22E-08	5.54E-09
1 gram of Pb (CSM melt wire) irradiated for 119 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	Ci/1g of Pb	Ci/1g of Pb	Ci/1g of Pb	Ci/1g of Pb	Ci/1g of Pb	Ci/1g of Pb	Ci/1g of Pb	Ci/1g of Pb	Ci/1g of Pb
TL206	3.11E-14	0.00E+00	6.65E-16	6.65E-16	6.65E-16	6.65E-16	6.65E-16	6.65E-16	6.65E-16
PB204	1.73E-16	1.73E-16	1.73E-16	1.73E-16	1.73E-16	1.73E-16	1.73E-16	1.73E-16	1.73E-16
PB205	4.29E-10	4.29E-10	4.29E-10	4.29E-10	4.29E-10	4.29E-10	4.29E-10	4.29E-10	4.29E-10
PB209	2.18E-03	1.96E-03	7.61E-04	1.41E-05	1.03E-18	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BI208	1.02E-15	1.02E-15	1.02E-15	1.02E-15	1.02E-15	1.02E-15	1.02E-15	1.02E-15	1.02E-15
BI210	4.53E-08	4.51E-08	4.40E-08	3.94E-08	1.72E-08	6.53E-09	7.14E-10	1.13E-11	5.20E-30
BI210M	6.68E-16	6.68E-16	6.68E-16	6.68E-16	6.68E-16	6.68E-16	6.68E-16	6.68E-16	6.68E-16
BI211	1.66E-13	9.54E-18	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PO210	5.11E-09	5.11E-09	5.15E-09	5.29E-09	5.93E-09	6.10E-09	5.83E-09	5.04E-09	1.09E-09
PO211	2.87E-13	2.68E-20	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PO211M	4.78E-15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SUMTOT	2.18E-03	1.96E-03	7.62E-04	1.41E-05	2.36E-08	1.31E-08	6.98E-09	5.48E-09	1.52E-09
0TOTAL	2.18E-03	1.96E-03	7.62E-04	1.41E-05	2.36E-08	1.31E-08	6.98E-09	5.48E-09	1.52E-09

1 gram of Pb (CSM melt wire) irradiated for 119 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	g/1g of Pb	g/1g of Pb	g/1g of Pb	g/1g of Pb	g/1g of Pb	g/1g of Pb	g/1g of Pb	g/1g of Pb	g/1g of Pb
HE 4	2.06E-14	2.06E-14	2.07E-14	2.11E-14	2.44E-14	2.83E-14	3.69E-14	5.15E-14	1.22E-13
TL205	6.02E-14	6.03E-14	6.04E-14	6.12E-14	6.73E-14	7.44E-14	9.06E-14	1.21E-13	4.30E-13
PB204	1.38E-02	1.38E-02	1.38E-02	1.38E-02	1.38E-02	1.38E-02	1.38E-02	1.38E-02	1.38E-02
PB205	1.60E-05	1.60E-05	1.60E-05	1.60E-05	1.60E-05	1.60E-05	1.60E-05	1.60E-05	1.60E-05
PB206	2.33E-01	2.33E-01	2.33E-01	2.33E-01	2.33E-01	2.33E-01	2.33E-01	2.33E-01	2.33E-01
PB207	2.28E-01	2.28E-01	2.28E-01	2.28E-01	2.28E-01	2.28E-01	2.28E-01	2.28E-01	2.28E-01
PB208	5.26E-01	5.26E-01	5.26E-01	5.26E-01	5.26E-01	5.26E-01	5.26E-01	5.26E-01	5.26E-01
PB209	4.79E-10	4.31E-10	1.68E-10	3.10E-12	2.27E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BI208	1.01E-12	1.01E-12	1.01E-12	1.01E-12	1.01E-12	1.01E-12	1.01E-12	1.01E-12	1.01E-12
BI209	2.89E-07	2.89E-07	2.89E-07	2.89E-07	2.89E-07	2.89E-07	2.89E-07	2.89E-07	2.89E-07
BI210	8.49E-13	8.47E-13	8.25E-13	7.39E-13	3.23E-13	1.23E-13	1.34E-14	2.11E-16	9.76E-35
BI210M	5.47E-12	5.47E-12	5.47E-12	5.47E-12	5.47E-12	5.47E-12	5.47E-12	5.47E-12	5.47E-12
PO210	5.50E-12	5.50E-12	5.52E-12	5.58E-12	5.83E-12	5.82E-12	5.48E-12	4.73E-12	1.03E-12
SUMTOT	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
0TOTAL	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
1 gram of Pb (CSM melt wire) irradiated for 54.9 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	g/1g of Pb	g/1g of Pb	g/1g of Pb	g/1g of Pb	g/1g of Pb	g/1g of Pb	g/1g of Pb	g/1g of Pb	g/1g of Pb
HE 4	1.82E-15	1.83E-15	1.85E-15	1.93E-15	2.65E-15	3.55E-15	5.59E-15	9.05E-15	2.58E-14
TL205	1.28E-14	1.28E-14	1.29E-14	1.33E-14	1.61E-14	1.94E-14	2.68E-14	4.09E-14	1.83E-13
PB204	1.38E-02	1.38E-02	1.38E-02	1.38E-02	1.38E-02	1.38E-02	1.38E-02	1.38E-02	1.38E-02
PB205	7.38E-06	7.38E-06	7.38E-06	7.38E-06	7.38E-06	7.38E-06	7.38E-06	7.38E-06	7.38E-06
PB206	2.36E-01	2.36E-01	2.36E-01	2.36E-01	2.36E-01	2.36E-01	2.36E-01	2.36E-01	2.36E-01
PB207	2.24E-01	2.24E-01	2.24E-01	2.24E-01	2.24E-01	2.24E-01	2.24E-01	2.24E-01	2.24E-01
PB208	5.26E-01	5.26E-01	5.26E-01	5.26E-01	5.26E-01	5.26E-01	5.26E-01	5.26E-01	5.26E-01
PB209	4.79E-10	4.31E-10	1.68E-10	3.10E-12	2.26E-25	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BI208	2.17E-13	2.17E-13	2.17E-13	2.17E-13	2.17E-13	2.17E-13	2.17E-13	2.17E-13	2.17E-13
BI209	1.34E-07	1.34E-07	1.34E-07	1.34E-07	1.34E-07	1.34E-07	1.34E-07	1.34E-07	1.34E-07
BI210	3.65E-13	3.64E-13	3.54E-13	3.18E-13	1.39E-13	5.26E-14	5.75E-15	9.08E-17	4.19E-35
BI210M	1.18E-12	1.18E-12	1.18E-12	1.18E-12	1.18E-12	1.18E-12	1.18E-12	1.18E-12	1.18E-12
PO210	1.14E-12	1.14E-12	1.15E-12	1.18E-12	1.32E-12	1.36E-12	1.30E-12	1.12E-12	2.43E-13
SUMTOT	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
0TOTAL	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

1 gram of Bi (CSM melt wire) irradiated for 119 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	Ci/1g of Bi	Ci/1g of Bi	Ci/1g of Bi	Ci/1g of Bi	Ci/1g of Bi	Ci/1g of Bi	Ci/1g of Bi	Ci/1g of Bi	Ci/1g of Bi
H 3	1.22E-16	1.22E-16	1.22E-16	1.22E-16	1.22E-16	1.22E-16	1.21E-16	1.21E-16	1.15E-16
TL206	2.15E-08	2.15E-08	2.15E-08	2.15E-08	2.15E-08	2.15E-08	2.15E-08	2.15E-08	2.15E-08
PB209	1.61E-04	1.45E-04	5.62E-05	1.04E-06	7.60E-20	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BI208	3.28E-08	3.28E-08	3.28E-08	3.28E-08	3.28E-08	3.28E-08	3.28E-08	3.28E-08	3.28E-08
BI210	3.89E-01	3.88E-01	3.78E-01	3.39E-01	1.48E-01	5.61E-02	6.13E-03	9.67E-05	4.47E-23
BI210M	2.16E-08	2.16E-08	2.16E-08	2.16E-08	2.16E-08	2.16E-08	2.16E-08	2.16E-08	2.16E-08
BI211	1.42E-06	8.19E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PO210	1.66E-01	1.67E-01	1.67E-01	1.67E-01	1.69E-01	1.67E-01	1.56E-01	1.34E-01	2.91E-02
PO211	9.35E-06	2.30E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PO211M	1.56E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SUMTOT	5.55E-01	5.54E-01	5.44E-01	5.06E-01	3.17E-01	2.23E-01	1.62E-01	1.34E-01	2.91E-02
0TOTAL	5.55E-01	5.54E-01	5.44E-01	5.06E-01	3.17E-01	2.23E-01	1.62E-01	1.34E-01	2.91E-02
1 gram of Bi (CSM melt wire) irradiated for 54.9 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	Ci/1g of Bi	Ci/1g of Bi	Ci/1g of Bi	Ci/1g of Bi	Ci/1g of Bi	Ci/1g of Bi	Ci/1g of Bi	Ci/1g of Bi	Ci/1g of Bi
TL206	9.91E-09	9.91E-09	9.91E-09	9.91E-09	9.91E-09	9.91E-09	9.91E-09	9.91E-09	9.91E-09
PB209	1.61E-04	1.45E-04	5.62E-05	1.04E-06	7.60E-20	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BI208	1.51E-08	1.51E-08	1.51E-08	1.51E-08	1.51E-08	1.51E-08	1.51E-08	1.51E-08	1.51E-08
BI210	3.89E-01	3.87E-01	3.77E-01	3.38E-01	1.48E-01	5.60E-02	6.13E-03	9.67E-05	4.47E-23
BI210M	9.95E-09	9.95E-09	9.95E-09	9.95E-09	9.95E-09	9.95E-09	9.95E-09	9.95E-09	9.95E-09
BI211	1.42E-06	8.19E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PO210	8.23E-02	8.24E-02	8.27E-02	8.37E-02	8.81E-02	8.83E-02	8.32E-02	7.18E-02	1.56E-02
PO211	4.63E-06	2.30E-13	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PO211M	7.71E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SUMTOT	4.71E-01	4.70E-01	4.60E-01	4.22E-01	2.36E-01	1.44E-01	8.93E-02	7.19E-02	1.56E-02
0TOTAL	4.71E-01	4.70E-01	4.60E-01	4.22E-01	2.36E-01	1.44E-01	8.93E-02	7.19E-02	1.56E-02

Title: AS-RUN NEUTRONICS EVALUATION FOR THE CSM-10584 EXPERIMENT IN THE ATR

ECAR NO.: 4496 REV. NO.: 1 PROJECT NO.: 32501 Date: 10/19/2020

1 gram of Bi (CSM melt wire) irradiated for 119 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	g/1g of Bi	g/1g of Bi	g/1g of Bi	g/1g of Bi	g/1g of Bi	g/1g of Bi	g/1g of Bi	g/1g of Bi	g/1g of Bi
H 1	1.01E-10	1.01E-10	1.01E-10	1.01E-10	1.01E-10	1.01E-10	1.01E-10	1.01E-10	1.01E-10
H 2	4.27E-14	4.27E-14	4.27E-14	4.27E-14	4.27E-14	4.27E-14	4.27E-14	4.27E-14	4.27E-14
HE 4	2.17E-07	2.17E-07	2.17E-07	2.20E-07	2.42E-07	2.67E-07	3.21E-07	4.14E-07	8.59E-07
PB206	1.10E-05	1.11E-05	1.11E-05	1.12E-05	1.23E-05	1.36E-05	1.64E-05	2.12E-05	4.41E-05
PB207	1.11E-07	1.11E-07	1.11E-07	1.11E-07	1.11E-07	1.11E-07	1.11E-07	1.11E-07	1.11E-07
PB208	2.43E-11	2.43E-11	2.43E-11	2.44E-11	2.46E-11	2.48E-11	2.54E-11	2.65E-11	3.75E-11
PB209	3.53E-11	3.18E-11	1.24E-11	2.29E-13	1.67E-26	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BI208	7.01E-06	7.01E-06	7.01E-06	7.01E-06	7.01E-06	7.01E-06	7.01E-06	7.01E-06	7.01E-06
BI209	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
BI210	3.13E-06	3.12E-06	3.04E-06	2.73E-06	1.19E-06	4.52E-07	4.94E-08	7.79E-10	3.60E-28
BI210M	3.80E-05	3.80E-05	3.80E-05	3.80E-05	3.80E-05	3.80E-05	3.80E-05	3.80E-05	3.80E-05
BI211	3.40E-15	1.96E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PO210	3.70E-05	3.70E-05	3.71E-05	3.73E-05	3.77E-05	3.71E-05	3.46E-05	2.98E-05	6.47E-06
SUMTOT	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
0TOTAL	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
1 gram of Bi (CSM melt wire) irradiated for 54.9 EFPDs									
	EOC	30 MINs	5 HRS	1 DAY	7 DAYS	14 DAYS	30 DAYS	60 DAYS	1 YEAR
	g/1g of Bi	g/1g of Bi	g/1g of Bi	g/1g of Bi	g/1g of Bi	g/1g of Bi	g/1g of Bi	g/1g of Bi	g/1g of Bi
H 1	4.68E-11	4.68E-11	4.68E-11	4.68E-11	4.68E-11	4.68E-11	4.68E-11	4.68E-11	4.68E-11
H 2	9.10E-15	9.10E-15	9.10E-15	9.10E-15	9.10E-15	9.10E-15	9.10E-15	9.10E-15	9.10E-15
HE 4	4.43E-08	4.43E-08	4.47E-08	4.61E-08	5.71E-08	7.02E-08	9.94E-08	1.49E-07	3.87E-07
PB206	2.27E-06	2.27E-06	2.29E-06	2.36E-06	2.93E-06	3.61E-06	5.11E-06	7.65E-06	1.99E-05
PB207	9.81E-09	9.81E-09	9.81E-09	9.81E-09	9.81E-09	9.81E-09	9.81E-09	9.81E-09	9.81E-09
PB208	1.32E-12	1.32E-12	1.32E-12	1.33E-12	1.43E-12	1.55E-12	1.82E-12	2.32E-12	7.41E-12
PB209	3.53E-11	3.18E-11	1.24E-11	2.29E-13	1.67E-26	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BI208	3.23E-06	3.23E-06	3.23E-06	3.23E-06	3.23E-06	3.23E-06	3.23E-06	3.23E-06	3.23E-06
BI209	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
BI210	3.13E-06	3.12E-06	3.04E-06	2.73E-06	1.19E-06	4.51E-07	4.94E-08	7.79E-10	3.60E-28
BI210M	1.75E-05	1.75E-05	1.75E-05	1.75E-05	1.75E-05	1.75E-05	1.75E-05	1.75E-05	1.75E-05
BI211	3.40E-15	1.96E-19	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PO210	1.83E-05	1.83E-05	1.84E-05	1.86E-05	1.96E-05	1.96E-05	1.85E-05	1.60E-05	3.46E-06
SUMTOT	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
0TOTAL	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00