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Department of Chemistry

1102 Natural Sciences II
University of California, Irvine
Irvine, CA 92697-2025

Wednesday, July 28, 2021

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555-0001

SUBJECT: University of California – Irvine, Docket Number 50-326, License Number R-116, Annual Report Submittal in Accordance with Technical Specification 6.7.1

Dear Sir or Madam:

By way of this transmission, the University of California, Irvine is submitting the annual operating report for the nuclear reactor as required by Technical Specification 6.7.1 of license number R-116, covering the period of July 1st, 2020 through June 30th, 2021.

If you have any questions regarding this matter, please contact George Miller at (949) 824-6649.

Sincerely,

George E. Miller

Dr. George E. Miller
Reactor Supervisor

Enclosure: UC Irvine Annual NRC Report 2020-2021.pdf

CC with Enclosure (by email):

- AJ Shaka, Reactor Director, Chemistry Department, UC Irvine
- Rachel Martin, former Reactor Director, Chemistry Department, UC Irvine
- James Bullock, Dean of School of Physical Sciences, UC Irvine
- Kevin Roche, Inspector, U. S. Nuclear Regulatory Commission
- Linh Tran, Senior Project Manager, U. S. Nuclear Regulatory Commission
- John Keffer, Reactor Facility Manager, Chemistry Department, UC Irvine
- Tro Babikian, Associate Reactor Supervisor, Chemistry Department, UC Irvine
- Reactor Operations Committee Members, UC Irvine
- American Nuclear Insurance, 95 Glastonbury Blvd., Glastonbury CT 06033, Policy NF-176

UNIVERSITY OF CALIFORNIA IRVINE
NUCLEAR REACTOR FACILITY
ANNUAL REPORT
2020-2021

FACILITY LICENSE R-116 – DOCKET NUMBER 50-326

GEORGE MILLER | Interim Reactor Supervisor

John Keffer | Reactor Facility Manager

Tro Babikian | Assistant Supervisor

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Section 1
Operations, Personnel and Reviews Summary

This academic year has continued as an unusual year for the facility with a general reduction in on-campus and off-campus research activities. However, the reactor has continued to be utilized in operator training and licensing and a minimal level of neutron activation use.

Personnel

Reactor Personnel this period have been stable as follows:

Reactor Director: Professor Rachel Martin

Reactor Supervisor: Dr. George Miller (SRO)

Reactor Manager: Mr. John Keffer (SRO as of 6/14/2021)

Associate Reactor Supervisor and Development Engineer: Dr. Tro Babikian (SRO)

One additional SRO remained licensed but was inactive in the requalification program.

In April 2021 operator license examinations were given for four students and former students as RO's, and John Keffer as an instant SRO. Licenses for all five candidates were issued on June 14th 2021.

The Campus Radiation Safety Officer during this period was represented on an interim basis by Mr. Rocky Dendo with back-ups identified from UCI Health and UCSF RSO's. As of June 1st 2021 a permanent campus RSO, Mr. Aldrich Rivera was appointed.

Operations

The facility applied for and was granted permission to re-open in Phase II of the UCI Campus restart in July, 2020. As of that date, full surveillance activities were resumed. No issues were identified as needing attention as a result of the prior shutdown. The facility remained in that status until July 6th 2021 when full opening was permitted for vaccinated individuals under a Phase IV University of California edict.

Operation of this facility supported UCI research and education programs in the Department of Chemistry (CHEM) and other UCI schools and departments. Research is being conducted in application of radioisotopes as tracers and radiochemical analytical and separation techniques including applications to nuclear waste separations. A new assistant professor appointed in chemistry last year plans to use the facility for nuclear fuel related research once her laboratory research program is able to commence. Her laboratory reconstruction has been delayed but occupancy is hopeful by the end of July 2021.

Reactor utilization, apart from operator training and maintenance, is for analytical sample irradiation, production of isotopic tracers, and neutron instrument testing. Analysis samples come from diverse origins related to forensic science, fossil fuels, geochemistry, art, and archaeological studies, chemical separations in nuclear fuel cycle experiments, chemical synthesis, industrial quality control, enzyme studies, trace element pollution studies, etc. During pandemic closures, no laboratory classes have

been held. The current plan is to restart in September 2021 the class work by undergraduates learning tracer and activation analysis techniques using small quantities of short-lived activated materials.

The operator training program continued by Zoom and with one-on one practice, As noted, four individuals were examined successfully in April 2021 for operator licenses and one “instant” senior operator license examination was given.

Use was made of the facility by other educational institutions, primarily using the gamma irradiator, but outreach continued to be suspended for 2020-2021, and no tours were conducted. A recording was made to provide virtual tours to potential graduate students.

Operations dropped again as the primary user on campus and associated group were effectively shut down even prior to the COVID-19 shut down and no user groups have yet been initiated. Criticality was achieved for 89.5 hours, down still further from the previous year, and the total energy generated was equivalent to 43.1 hours at full steady state power. Only 38 separate experiments were performed and 351 samples were irradiated, showing the decreased use of the facility, though a series used the pneumatic transfer system, increasing its use and the associated Ar-41 release. Seven pulses were performed this year, all without incident, all of them for operator training. A few unusual maintenance/surveillance results/activities were noted/conducted during this period and are described in Section 6.

Inspections and Reviews

A routine NRC inspection (encompassing (1) procedures;(2) experiments; (3) health physics; (4) design changes; (5) committees, audits and review; and (6) transportation activities) was conducted October 27-29, 2020. Two follow-up items from the prior inspection were cleared. The inspection report dated May 2021 indicated that no new issues were identified.

In March 2021, the required annual Reactor Operations Committee meeting was held remotely by using Zoom. No significant issues were discussed.

An Emergency/Security exercise was conducted on site in February 2021. On and off campus emergency response units were involved. In preparation for this event several Zoom planning meetings were held in late 2020. A full follow-up action report was prepared by UCI Emergency Service personnel.

Inspections/audits continue to be conducted quarterly by the Radiation Safety staff of EH&S at UCI. These have identified that surveillance frequency schedules have been properly maintained, and results continue to show absence of significant levels of contamination or personnel exposure.

Section 2

Data Tabulations for the Period July 1st, 2020 to June 30th, 2021

TABLE I – General Information

Experiment Approvals on file (active)	3
Experiments performed (including repeats)	38
Samples irradiated	351
Energy generated this period (Megawatt hours)	10.77
Total, 69 element core	127.00
>74 element core	1705.04*
Total energy generated since initial criticality (Megawatt hours)	1832.04*
Pulse operation this period	7
Total reactor pulses to 6/30/2021	1100
Hours critical this period	89.5
Total hours critical to date*	10859.75
Inadvertent scrams or unplanned shutdowns or events at power	9
Non-research personnel visits to reactor – logged and PRM issued as individuals	64
Maximum dosimeter recorded for visits - all less than (1 mrem)	0.1
Visiting researchers (Temporary PRM)	3
Maximum exposure recorded at one visit (mrem)	3.5
Staff and researchers badged with Thermoluminescent Dosimeters (TLD)	6
Students and assistant, or operators training – (TLD badged)	4
Exposures reported for radiochemistry class (**no** classes given 2020-21) average	0
Isotope Shipments off campus this period (1 activated samples to UCLA)	1

- Minor adjustments to summations made owing to transcription errors made in 2020

TABLE II – Reactor Core Status 2021-06-30 (Core Configuration last Changed 2018-01-18)		
Fuel elements in core (including 2 fuel followers)		84
Fuel elements in storage (reactor tank - used)		23
Fuel elements unused (4 instrumented elements + 1 element + 1 FFCR)		6
Graphite reflector elements in core		32
Graphite reflector elements in reactor tank storage		2
Water filled fuel element positions		4
Experimental facilities in core positions		5
Non-fueled control rods		2
Total core positions accounted for		127
Core excess, cold, no xenon (as of 6/22/2021)		$2.73
Control Rod Worths (Calibrated 02/04/2021)	REG	$2.86
	SHIM	$3.36
	ATR	$1.78
	FTR	$0.68
	Total	$8.68
Maximum possible pulse insertion (calculated)		$2.46
Maximum peak power recorded (4/082021) $1.50 insertion only		403MW
Maximum peak temperature recorded in pulse (B-ring,4/08/2021) ($1.50 in)		263 °C

Section 3
Inadvertent Scrams, Unplanned Shutdowns, Events at Power

TABLE III – Scrams, Unplanned Shutdowns, Events at Power			
2020-10-07	11:19	250 kw	A NOP/High Voltage scram was received during a 250 kw irradiation operation. The cause was established to be a notebook on the console moved to accidently hit a button on the WRM channel. Restart was immediately initiated.
2021-01-28	17:19	200 kw	Linear scram from Wide Range Linear Module (WRLM) was triggered as the energy potentiometer was being adjusted to match the calculated power level for the reactor. Restart was authorized by the Reactor Supervisor. Power levels were re-attained at 200 kw and calibration values re-checked. As prior year!
2021-02-02	16:30	<250kw	Linear scram from WRLM during power ramp from 1.5 w to 250 kw as too fast a period (6 secs) for range adjustment. Trainee Op.
2021-02-04	09:34	Ca 750 w	Linear scram from WRLM during power ramp from 1.5 w to 250 kw as too fast a period (7 secs) for range adjustment. SRO.
2021-03-17	09:39	<1.5 w	Period scram tripped by firing TR rods during S/Up. No recurrence.
2021-03-25	15:33	After scram	SHIM rod drive position found erratic. Operations suspended. See Section 4 for issue and resolution.
2021-04-07	14:23 and 15:28	$1.50 pulse insertion	Incredible peak power reading reported. Pulse monitoring unit not properly resetting to zero following other operations. Peak Fuel temperature and integrated energy reported were as expected from low power pulse. Estimated actual peak power between 200 – 250 megawatts. Peak temperature of 260-266 ^{o}C and total energy 9-10 Mw-sec were reported in accord with prior operations.
2021-04-08	2 pulses	$1.50	Same as 04-07
2021-04-14	09:42	$1.50	Same as 04-07

Section 4
Non-Routine Maintenance and Surveillance and Other Incidents

The following non-routine maintenance/surveillance activities were carried out during this period. As noted earlier, routine surveillance and operations were established as of the start of this review period.

TABLE IV – Maintenance, Surveillance, and Other Incidents

2020-07-01	-	On June 16th 2020, as part of shut-down surveillance, it was noted that air supply gauges on the supplies to the transient rods were reading zero. On further investigation it was revealed that contractors working to supply building air to new laboratories had inadvertently severed the supply line feeding the reactor. This was finally repaired on July 1st and system returned to former status.
2020-07-01	-	All surveillance items for normal routine operations were conducted and the reactor restarted following shutdown since March 10 2020. All core status and instrument responses were found to agree with those prior to last operations. Routine operations resumed on 7/14/2020 with operator training.
2020-08-03	-	SHIM rod drive was observed not to drive down smoothly after a scram (rod was down). An older motor was substituted for the current motor and normal behavior observed. The position indicator was adjusted to read as normal.
2020-10-28	App 23:15-	A CAM (continuous air monitor) alarm was reported by UCIPD dispatch desk. Upon entry the air flow rate was found to be below specs. A new filter was installed and flow was normal. The old filter was unusually black. Cause was smoke from wild-fires in the up wind region a couple of days before the event. The campus had been given unhealthful air warnings.
2020-11-24		SHIM rod drive motor replaced with new one with capacitor to fix occasional erratic drive down or drift down observations. All drive and drop times verified to be normal.
2021-01-21		A small water leak noted at top of one resin tank in purification system. A replacement 1 inch NPT close nipple was installed and the system restarted. Conductivity and flow rates were all as formerly. This was similar to opposite nipple failure (on other resin tank) last year.
2021-02-11		ATR not energizing to fire. Found switch failed. Replaced with identical spare, tested OK.
2021-02-22	14:40	Small filter holder retrieved from pool. (dropped 02-18-2021.) no radioactivity found on checks,
2021-03-25	15:33	SHIM drive stopped at 30 units during drive down after scram. Also calculated core excess in prior run noticed to be different than expected. Check showed SHIM drive position potentiometer to be improperly secured enabling it to provide false readings to console.
2021-03-29		All SHIM drive motor and position potentiometer bolts re-secured. Rod drop and drive tests performed. Checks normal with all drive operations and reported readings now as expected.

Section 5
Facility Changes and Special Experiments Approved

Technical Specification Amendment 7 was received dated January 14th, 2021. This updated the organization chart to remove a redundant position in the administrative supervision of the campus radiation safety officer (RSO).

Five (5) 10 CFR 50.59 changes were initiated and completed during the course of the year:

2020-01	completed 7/1/2020	Repaired the facility compressed air link to the building supply following external contractor severance and re-routing. No work done within facility.
2020-02	Completed 8/11/2020	Swapped in older SHIM rod drive motor for current one to affect observed erratic drive down behavior (drive occasionally stopping drive down following rod scram). No scram implications.
2020-03	Completed 9/1/2020	Revisions of Standard Operating Procedures to align with current Tech Specs as to references and other improvements to assist operational clarity. Passed by RIOC for final approval.
2020-04	Completed 9/13/2020	Checklist revisions made to align with current Tech Specs and improve operator information collection. Special focus on assuring ventilation system operation during all facility modes.
2020-05	Completed 11/17/2020	Replaced SHIM rod drive motor with new motor and capacitor from manufacturer as earlier replacement (see 2020-02 above) still had occasional issues in auto drive-down of SHIM drive. Required slight mod of associated bushing to obtain fit. All performance verified to meet original specs.

No new experiments involving the reactor were approved or performed during the year.

Section 6
Radioactive Effluent Release
(a) Gases

The major direct release to the environs is Argon-41 produced during normal operations. Very small amounts of other gases may be released from irradiated materials in experiments.

Releases are computed based on original measurements at point of origin within the facility and taking only dilution into account. Since much of the release is from operation of the pneumatic transfer system for samples, this is a conservative estimate in that assumption is made that all use of the PT is at full steady state power level (250 kW) when, in fact, considerable use is with the reactor at a lower power level. In view of the small numbers involved, and the fact that an integrated dose check is provided by an environmental dosimeter hanging on the side of the exhausts at the point of entry to the fan creating the stack discharge, it is considered unnecessary to provide further checks of these estimates. The dosimeter data confirm that an individual standing directly in the exhaust flow for one year would receive an additional submersion dose from the exhaust less than the reliability limit of the dosimeters, or less than 20 mrem per year. The dosimeter data are presented separately in section 7. Over the years that data have been collected, the accumulated exposure at the exhaust locations have been lower than for "control" points because of lower masses of concrete structures in the vicinity. In fact, the data have been consistent at about 20 mrem per year below control level, and >30 mrem below a distant check level (5th floor library) so confidence of exposure less than 5 mrem over background seems plausible.

Release estimates based on operational parameters are as follows:

TABLE V – Radioactive Effluent Release Estimates	
Operation of pneumatic transfer system - 07/01/2020 - 06/30/2021:	
A. Minutes of Operation (minutes):	259
B. Release Rate Assumed (µCi/mL):	6.0 E-08
C. Flow Rate of Exhaust Air (mL/min):	1.2 E+08
D. Dilution Factor (unitless):	0.01
E. PT System Release Computed (µCi): A*B*C*D = E:	18.65
Release from pool surface – 07/01/2020 – 06/30/2021:	
F. Total Hours of Operation at Full Power (EFPH):	43.1
G. Release Rate Assumed (µCi/mL):	1.0 E-08
H. Flow Rate of Exhaust Air (mL/min):	1.2 E+08
I. Dilution Factor (unitless):	0.01
J. Pool Surface Release Computed (µCi): F*G*H*I*60 = J:	31.03
Total Emissions from PT and Pool (µCi): E + J:	49.7
Total Effluent Released in One Year (mL): 525960 min / year*H*I	6.31 E+11
Average Concentration Released (µCi/mL): Total Emissions / Total Effluent	7.9 E-11

Since 2.0 E-09 µCi/mL provides an annual exposure for constant immersion of 10 mrem, this corresponds to < 0.4 mrem potential additional radiation exposure to an individual standing in and breathing in the effluent stack for the entire year, a zero likelihood event.

Additional note: the mixed and diluted exhaust plume is discharged to approximately 100 feet above the roof level (200 feet above surrounding ground), granting even greater dilution.

(b) Liquids and Solids

Liquid and solid wastes from utilization of by-product materials are disposed through a university contract. Waste is transferred to the custody of UCI Environmental Health and Safety (EH&S). Disposals to this custody are given below. It is important to note that activity values are estimated at the time of transfer to EH&S control. Since few shipments are being made from campus, decay to negligible levels occurs for all medium-lived radionuclides. Teaching course items (used for training in liquid scintillation counting techniques) may be a mixture of reactor generated byproducts including ^{3}H from ^{6}Li irradiation and purchased materials (exclusively ^{14}C). During this period, advantage continued to be taken of a campus program to dispose of additional legacy radioisotope materials including decayed sealed sources and measurement samples, mostly not UCI reactor related.

Production of radioactive waste materials has been minimal during this period.

Solid, Dry Waste:

Three separate solid dry waste transfers were made this period.

1. One 50 gall drum of legacy materials from a former experimental apparatus (delayed neutron and fast transfer counting system) including a contaminated lead cylinder and estimates of residual radionuclides from sample leakages : ^{65}Zn: 0.08 μCi; ^{137}Cs: 0.1 μCi; ^{238}U: 0.9 μCi; ^{26}Al: 0.03 μCi; ^{60}Co: 0.7 μCi; ^{113}Cd: 0.05 μCi.
2. One container of ^{232}Th dry solid chemicals 0.1 μCi.
3. One container of dry solids of ^{238}U and ^{99}Mo each 1 μCi at time of transfer.

Liquid Waste:

A total of 3 gallons of liquid wastes were transferred during this period.

1. 2 one gallon containers of waste from sample disposal following activation analysis containing mainly ^{124}Sb activities estimated 2.3 microcuries.
2. 1 one gallon container of waste from former LSC student experiments estimated at 1 microcurie of tritium (^{3}H).

Section 7
Environmental Surveillance

Environmental dosimeters are in place at 12 locations around the UCI Campus for environmental monitoring purposes. These are provided by Mirion Technologies, Irvine, California (formerly Global Dosimetry Systems). The environmental packs have three chips in each pack which are averaged for exposure recording. Mirion runs multiple control samples in addition to the locations listed below. All dosimeters are housed in small metal locked boxes (except for locations 10 and 12). The table below lists the locations. As work in Engineering Tower 521 had ceased, the dosimeter there was redeployed to the storage closet across the hall from the east side of the reactor facility. Other locations have been renamed to agree with the locations in the revised ventilation system provided for Rowland Hall, and a new laboratory constructed on the former loading dock adjacent to the north side of the facility.

Routine contamination surveys consisting of wipe tests and G-M surveys have shown mostly a "clean" facility with significant, removable contamination only in areas coming into direct contact with samples removed from the reactor, and on sample handling tools. Trash is surveyed before disposal and not disposed of unless found to be free of removable and fixed contamination.

Table VI - Locations for Environmental Dosimeters
1. South Reactor Facility Perimeter
2. West Reactor Facility Perimeter
3. North Reactor Facility Perimeter in adjacent lab of Atmospheric Chemistry group.
4. Rowland Hall Roof Air Exhaust Duct to Fan 1.
5. Rowland Hall, First Floor Hallway Over Reactor Facility.
6. McGaugh Hall Top (5^{th}) Floor
7. Langson Library Top Floor
8. Reines Hall Top (5^{th}) Floor
9. Rowland Hall Roof Air exhaust Duct to Fan 2.
10. On-campus Faculty Housing
11. Rowland Hall Roof Air Exhaust Duct to Fan 3.
12. Reactor Storage Closet Rowland Hall East side of facility.

Table VII – Environmental Dosimetry Data
Average Total Exposures in mrem (Including Control Background)

Location	***Quarter***				***Annual***	***Prior Year***	***Above Control***
	[1]**2020 Q2**	**2020 Q3**	**2020 Q4**	**2021 Q1**			
1. S. Facility Perimeter	16	21	22	31	90	114	+2
2. W. Facility Perimeter	17	23	25	33	98	115	+10
3. N. Facility Perimeter	15	32	22	32	101	123	+14
4. Facility Air Exhaust Fan 1.	11	16	17	26	76	86	-12
5. Hallway Over Facility	12	17	19	27	75	94	-13
6. McGaugh Hall Top Floor	13	19	21	28	81	95	-9
7. Langson Library Top Floor	18	24	27	34	103	122	+15
8. Reines Hall Top Floor	14	20	21	30	85	101	-3
9. Facility Air Exhaust Fan 2.	11	16	18	26	71	86	-17
10. On-Campus Housing	12	18	18	26	74	92	-14
11 Facility Air Exhaust Fan 3.	11	16	17	25	69	87	-19
12 E. Facility Closet	13	18	20	27	78	67	-10
Background Control	15	20	22	31	88	106	0

Notes:

1. Delayed exchange as a result of pandemic schedule upsets. 2 months instead of 3. Q1 was 4 mo.

Discussion

Raw data is presented here, along with controls and prior year comparisons. Within this range, the data sets vary relatively little. Locations on walls bordering the facility, such as 1, 2, 3, are usually the highest, remote locations, such as 10, 11, and 12, are the lowest. Data for this year reflects several issues:

- Location 7 is on the top floor of a large building and may experience greater cosmic flux, as well as concrete releases. This has been a result continuing for many years.
- Location 1 near the facility's gamma irradiator, as well as a lead cave which continues to store a higher activity load.
- Location 2 is on the other side of a location in the reactor facility temporarily used for source storage.
- Location 3 is on the other side of a concrete wall from the ion exchange resin tanks which have moderate levels of activity. This location is also in a radiation use laboratory, which may be contributing to the higher dose readings but more likely due to TNORM in the concrete wall and floor.

Conclusion

Exposure estimated to a single individual in any uncontrolled area at this facility is minimal. With the exception of three locations nearest the facility, all dosimetry associated with exposures from the facility indicates lower than control levels. Locations 1 and 2 are in hallways with extremely minimal occupancy or travel, especially since security policy is to maintain permanently locked doors to the hallways on this floor level (access only with building keys), and location 3 is in an adjacent radiation use laboratory. The hallway overhead (location 5) is only casually occupied and not close to a main building entrance. The air released from the facility/building (measured by locations 4, 9, and 11) continues to give no detectable exposure above background. Over many years, the data at each specific location has shown remarkable consistency. The net conclusion is that, within precision of measurement, and compared to distant control areas (numbers 7 and 10), we are operating within statistical error of zero of potential (full 24/7 occupancy) public exposure over normal background levels.

Section 8
Radiation Exposure to Personnel

UCI issues TLD badges to students or researchers regularly utilizing radiation within the facility. Finger dosimetry (TLD) rings were also issued to all those personnel, as there is a strong likelihood of regularly handling radioactive sources. TLDs were read quarterly by Mirion Technologies, and results are presented in Table VIII. Data are for 4 quarters of operations since April 1, 2019. Reporting categories are deep, eye, shallow, and ring shallow. Neutron dosimetry badging was discontinued owing to absence of any recorded exposure greater than zero after many years. Other individuals visiting or casually working in the facility were issued Personal Radiation Monitors (PRM) Dosimans or Dosicards for which results are shown in Table IX. 10 persons were issued TLD badges and finger TLDs on a continual basis. On a decision by the campus RSO based on past performance data, most operator trainees were not issued TLD dosimeters, although 4 were retained. None were involved in handling reactor fuel, components, irradiated samples or other active materials.

Table IX also lists all visiting individuals that were issued with Dosimans or Dosicards (PRM) that record in units of 0.1 mrem. In the course of a few hours, a worker could accumulate 0.2 mrem background. A tour visitor usually accumulates 0.0 or 0.1 mrem during a 45 minute visit to the facility.

TABLE VIII
Aggregate Personnel Exposure from TLD (mrem) 2020-04-01 to 2021-03-30

Group	Individuals	Whole Body			Ring
		Deep	Eye	Shallow	Shallow
A	2	4	4	81	40
B	2	21	26	38	-
C	6	10	9	11	0
D	0	0	0	0	-
Total	**10**	**35**	**39**	**130**	**40**

TABLE IX
Data from EPDs for Workers and Visitors*

Group	Persons Admitted*	Max Dose (mrem)	Total Dose (mrem)
A	3	3.5	6.3
C	64	0.0	0.0
E	0	0.0	0.0
Total	**67**	**3.5**	**6.3**

* Multiple admissions of the same individual are separately counted. 35 separate individuals were logged in.

Group A: Activation Analysis Personnel: individuals doing extensive or casual activation analysis and radiochemical work at the facility. Most of the exposure is a result of Cl-38 or Al-28 radioactivity production.

Group B: Workers: individuals receiving exposure as a result of handling isotopes for shipment, and/or sources used for calibration activities in the facility.

Group C: Inactive / Other: individuals who did enter but not directly carry out radiation related activities during this period, therefore any exposure reported is an indication of range of general background (for PRM) or background and precision where the TLDs are stored when not in use. This group includes visiting researchers admitted to review facilities for potential experiments, those bringing and taking away samples exposed in the cesium gamma irradiator in the facility and maintenance workers NOT doing work on radiation related systems all of whom are always issued EPD. [Note: Operation of the gamma irradiator is restricted to badged staff personnel].

Group D: Class Students: none in this period.

Group E: Tourists: no tour groups were permitted this period.

Personnel exposures continue to be very low at this facility in keeping with ALARA efforts and the low degree of operations experienced. One calibration source needed special close handling as its normal handling tool failed and needed repair leading to some exposure dose to a class B individual. Two different activation analysts were employed in this period. Handling activities of ^{38}Cl and ^{24}Na containing samples leads to some exposure.

Section 9
Closing Remarks

Overall, the facility has seen a significant decline in usage and related income, but measures are being taken to ensure continued function. Waste generation and disposal has remained at its traditionally low values, given the low power of the reactor and the capacity for short term storage of materials. Radiation exposure to personnel also remains low, attributing most dose absorbed to the primary activation analyst of the facility or to handling of calibration sources.

As noted, this is a second exceptional year, so future planning is very unclear. The chemistry department has made a commitment to continue to employ two individuals: a Reactor Facility Manager, who will assume the role of Reactor Supervisor, and a full time Assistant Engineer as Associate Supervisor, operator trainer, chemical analyst, and reactor operator.

A recently hired Assistant Professor of Chemistry is commencing a radiochemistry and nuclear fuel-oriented research program and is assuming teaching roles with the radiochemistry program, assuring its continuation beyond the eventual retirement of the current Interim Supervisor.

Re-establishment of full operations including laboratory classes and research awaits the outcomes of COVOD-19 effects on the UCI Campus. At this time, it is anticipated that undergraduates will be fully returning to campus starting in late September 2021 and graduate students will fully return during the summer of 2021. All staff and students will be required to be fully vaccinated unless exceptions are granted.