

**From:** [Price Kade](#)  
**To:** [Katanic, Janine](#); [Stermer Jeffrey](#)  
**Cc:** [Hoffenberg David](#); [Taylor Jacob](#)  
**Subject:** [External\_Sender] Re:NRC Inspection/EIRMC written response  
**Date:** Wednesday, June 30, 2021 5:12:15 PM  
**Attachments:** [image003.png](#)  
[image001.png](#)  
[AU1 dose assessment edit 6-30-21.pdf](#)

---

Hi Janine,

Please see the attached dose estimate for [REDACTED].

This is the final report put together by Adam Arndt.

Thanks,

Kade

**Kade Price, MHE, RT(R)(MR)**

Director of Diagnostic Imaging

(O) 208-227-2606

(M) 208-716-2508



---

**From:** Price Kade  
**Sent:** Tuesday, June 29, 2021 4:57 PM  
**To:** Katanic, Janine <Janine.Katanic@nrc.gov>; Stermer Jeffrey <Jeffrey.Stermer@hcahealthcare.com>  
**Cc:** Hoffenberg David <David.Hoffenberg@HCAhealthcare.com>; Taylor Jacob <Jacob.Taylor2@hcahealthcare.com>  
**Subject:** RE: NRC Inspection/EIRMC written response

Hi Janine,

Sorry for the delay in response but I do have answers for your questions listed below:

- What is the name and location of the other facility where AU1 received additional occupational dose? **Mountain View Hospital, Idaho Falls, ID**
- When did AU1 commence receiving occupational dose at this other facility (Month, Year)? **His first issued badge at Mountain View was for 1/1/2015.**
- Is AU1 still receiving occupational dose at this facility or did it cease? **Yes** If so, when (Month, Year)? **n/a**
- Was this the only other facility besides EIRMC that AU1 received occupational dose from during the time period of 2016-present? **Yes**
- It was noted that the other facility provided incomplete occupational dose data. If

occupational dose data was not complete, is there enough information for an estimate to be determined? Mountain View Hospital (the other facility) has provided a more complete exposure record. Please see the attached document.

- EIRMC has not provided enough information to support the statement that the combined dose (EIRMC + other facility) would not likely exceed NRC's occupational limits.
  - A quantitative estimate of the occupational dose from the other facility has not been provided. Please see the attached document for exposure records. This report has been forwarded to our Medical Physicist (Adam Arndt) and he will make any necessary amendments to the dose estimate. Once complete, we will get that revised estimate sent to you, via email.
  - Qualitative statements regarding the activities performed by AU1 at the other facility have not been provided (number and type of procedures, frequency of procedures, etc.). This is not information that EIRMC can request or have access to due to HIPAA regulations. This would require that EIRMC staff gain access to Mountain View patient information, which is prohibited by federal law. The methods we used to gather the data for [REDACTED] caseload required us to sift through the five years of patient reports, documents and exams stored on our PACS system. There is essentially no way to access [REDACTED] caseload at Mountain View Hospital without violating HIPAA.

Please let me know if we can provide any further clarification.

We will get the updated dose estimate to you as soon as Adam has it completed.

Thank you,

Kade

**Kade Price, MHE, RT(R)(MR)**

Director of Diagnostic Imaging

(O) 208-227-2606

(M) 208-716-2508



---

**From:** Katanic, Janine <[Janine.Katanic@nrc.gov](mailto:Janine.Katanic@nrc.gov)>

**Sent:** Tuesday, June 29, 2021 3:11 PM

**To:** Price Kade <[Kade.Price@hcahealthcare.com](mailto:Kade.Price@hcahealthcare.com)>; Stermer Jeffrey <[Jeffrey.Stermer@hcahealthcare.com](mailto:Jeffrey.Stermer@hcahealthcare.com)>

**Subject:** {EXTERNAL} NRC Inspection/EIRMC written response

**CAUTION!** This email originated from outside of our organization. **DO NOT CLICK** links or open attachments unless you recognize the sender and know the content is safe.

Hi Kade and Scott,

Was there an estimated timeline on EIRMC responding to the email below?

Thanks

Janine

Janine F. Katanic, PhD, CHP  
Senior Health Physicist  
Division of Nuclear Materials Safety  
Materials Inspection Branch  
US Nuclear Regulatory Commission  
Region IV  
office: 817-200-1151  
email: [Janine.Katanic@nrc.gov](mailto:Janine.Katanic@nrc.gov)

---

**From:** Katanic, Janine

**Sent:** Monday, June 21, 2021 10:39 AM

**To:** [David.Hoffenberg@HCAhealthcare.com](mailto:David.Hoffenberg@HCAhealthcare.com)

**Cc:** Price Kade <[Kade.Price@hcahealthcare.com](mailto:Kade.Price@hcahealthcare.com)>; Stermer Jeffrey  
<[Jeffrey.Stermer@hcahealthcare.com](mailto:Jeffrey.Stermer@hcahealthcare.com)>

**Subject:** NRC Inspection/EIRMC written response

Mr. Hoffenberg,

Thank you for your letter, which we received on June 8, 2021. It is currently under review. We have a few follow up questions regarding the occupational radiation dose that AU1 received at other facilities. Your written response states that AU1 is badged at one additional facility outside of EIRMC and that the occupational dosimetry information from that facility was incomplete. Your medical physics consultant noted in their analysis that the occupational dose received at other institutions, when added to the estimated occupational dose at EIRMC, would not likely result in a combined dose over the NRC's annual occupational dose limit.

Please provide additional information regarding AU1's other occupational dose:

- What is the name and location of the other facility where AU1 received additional occupational dose?
- When did AU1 commence receiving occupational dose at this other facility (Month, Year)?
- Is AU1 still receiving occupational dose at this facility or did it cease? If so, when (Month, Year)?
- Was this the only other facility besides EIRMC that AU1 received occupational dose from during the time period of 2016-present?
- It was noted that the other facility provided incomplete occupational dose data. If occupational dose data was not complete, is there enough information for an estimate to be determined?
- EIRMC has not provided enough information to support the statement that the combined dose (EIRMC + other facility) would not likely exceed NRC's occupational limits.

- A quantitative estimate of the occupational dose from the other facility has not been provided.
- Qualitative statements regarding the activities performed by AU1 at the other facility have not been provided (number and type of procedures, frequency of procedures, etc.).

Please provide a response to the above.

Regards,  
Janine

Janine F. Katanic, PhD, CHP  
Senior Health Physicist  
Division of Nuclear Materials Safety  
Materials Inspection Branch  
US Nuclear Regulatory Commission  
Region IV  
office: 817-200-1151  
email: [Janine.Katanic@nrc.gov](mailto:Janine.Katanic@nrc.gov)

# HISTORY DETAIL REPORT

Accredited by the  
"National Institute of Standards and Technology  
through **NVLAP** for the specific scope of accreditation under  
lab code 100555-0"

ACCOUNT NO: XXXXXXXXXX LOCATION NO: 00003PRX (MOUNTAIN VIEW HOSPITAL, LLC)

**LOCATION ADDRESS:**

ATTN: DAVID THEEL  
1550 HOOPES AVENUE  
IDAHO FALLS, ID 834047407  
US

REPORTING PERIOD: 01/01/2015 - 06/25/2021

PAGE: 1 OF: 1

| WEARER<br>ID     | NAME | ID          | SERIAL<br># | BADGE<br>TYPE | BODY<br>REGION | MONITORING PERIOD       |                        | DOSE REPORTED IN UNITS OF MILLIREM |              |                     |         |       |
|------------------|------|-------------|-------------|---------------|----------------|-------------------------|------------------------|------------------------------------|--------------|---------------------|---------|-------|
|                  |      |             |             |               |                | FIRST READ<br>DATE/TIME | LAST READ<br>DATE/TIME | Hp(10)<br>DEEP                     | Hp(3)<br>EYE | Hp(0.07)<br>SHALLOW | NEUTRON | NOTES |
|                  |      | XXX-XX-XXXX |             | 36            | WB TR          | 01/01/2015 12:00:00 AM  | 03/31/2015 11:59:59 PM | 12                                 | 12           | 12                  |         |       |
|                  |      | XXX-XX-XXXX |             | 36            | WB TR          | 04/01/2015 12:00:00 AM  | 06/30/2015 11:59:59 PM | 0                                  | 0            | 0                   |         |       |
|                  |      | XXX-XX-XXXX |             | 36            | WB TR          | 07/01/2015 12:00:00 AM  | 09/30/2015 11:59:59 PM | 0                                  | 0            | 0                   |         |       |
|                  |      | XXX-XX-XXXX |             | 36            | WB TR          | 10/01/2015 12:00:00 AM  | 12/31/2015 11:59:59 PM | 0                                  | 0            | 0                   |         |       |
|                  |      | XXX-XX-XXXX |             | 36            | WB TR          | 01/01/2016 12:00:00 AM  | 03/31/2016 11:59:59 PM | 71                                 | 83           | 86                  |         |       |
|                  |      | XXX-XX-XXXX |             | 36            | WB TR          | 04/01/2016 12:00:00 AM  | 06/30/2016 11:59:59 PM | 22                                 | 24           | 24                  |         |       |
|                  |      | XXX-XX-XXXX |             | 36            | WB TR          | 04/01/2016 12:00:00 AM  | 06/30/2016 11:59:59 PM | 45                                 | 45           | 45                  |         |       |
|                  |      | XXX-XX-XXXX |             | 36            | WB TR          | 07/01/2016 12:00:00 AM  | 09/30/2016 11:59:59 PM | 72                                 | 79           | 79                  |         |       |
|                  |      | XXX-XX-XXXX |             | 36            | WB TR          | 10/01/2016 12:00:00 AM  | 12/31/2016 11:59:59 PM | 56                                 | 60           | 73                  |         |       |
|                  |      | XXX-XX-XXXX |             | 36            | WB TR          | 01/01/2017 12:00:00 AM  | 03/31/2017 11:59:59 PM | 21                                 | 21           | 21                  |         |       |
|                  |      | XXX-XX-XXXX |             | 36            | WB TR          | 04/01/2017 12:00:00 AM  | 06/30/2017 11:59:59 PM | 67                                 | 69           | 91                  |         |       |
|                  |      | XXX-XX-XXXX |             | 36            | WB TR          | 07/01/2017 12:00:00 AM  | 09/30/2017 11:59:59 PM | 63                                 | 63           | 63                  |         |       |
|                  |      | XXX-XX-XXXX |             | 36            | WB TR          | 10/01/2017 12:00:00 AM  | 12/31/2017 11:59:59 PM | 43                                 | 43           | 43                  |         |       |
|                  |      | XXX-XX-XXXX |             | 36            | WB TR          | 01/01/2018 12:00:00 AM  | 03/31/2018 11:59:59 PM | 35                                 | 38           | 39                  |         |       |
|                  |      | XXX-XX-XXXX |             | 36            | WB TR          | 04/01/2018 12:00:00 AM  | 06/30/2018 11:59:59 PM | 0                                  | 0            | 0                   |         |       |
|                  |      | XXX-XX-XXXX |             | 36            | WB TR          | 07/01/2018 12:00:00 AM  | 09/30/2018 11:59:59 PM | 0                                  | 0            | 0                   |         |       |
|                  |      | XXX-XX-XXXX |             | 36            | WB TR          | 10/01/2018 12:00:00 AM  | 12/31/2018 11:59:59 PM | 0                                  | 0            | 0                   |         |       |
|                  |      | XXX-XX-XXXX |             | 36            | WB TR          | 01/01/2019 12:00:00 AM  | 03/31/2019 11:59:59 PM | 0                                  | 0            | 0                   |         |       |
|                  |      | XXX-XX-XXXX |             | 36            | WB TR          | 04/01/2019 12:00:00 AM  | 06/30/2019 11:59:59 PM | 0                                  | 0            | 0                   |         |       |
|                  |      | XXX-XX-XXXX |             | 36            | WB TR          | 07/01/2019 12:00:00 AM  | 09/30/2019 11:59:59 PM | 14                                 | 14           | 14                  |         |       |
|                  |      | XXX-XX-XXXX |             | 36            | WB TR          | 10/01/2019 12:00:00 AM  | 12/31/2019 11:59:59 PM | 0                                  | 0            | 0                   |         |       |
|                  |      | XXX-XX-XXXX |             | 36            | WB TR          | 01/01/2020 12:00:00 AM  | 03/31/2020 11:59:59 PM | 0                                  | 0            | 0                   |         |       |
|                  |      | XXX-XX-XXXX |             | 36            | WB TR          | 04/01/2020 12:00:00 AM  | 06/30/2020 11:59:59 PM | 0                                  | 0            | 0                   |         |       |
|                  |      | XXX-XX-XXXX |             | 36            | WB TR          | 07/01/2020 12:00:00 AM  | 09/30/2020 11:59:59 PM | 14                                 | 14           | 14                  |         |       |
|                  |      | XXX-XX-XXXX |             | 36            | WB TR          | 10/01/2020 12:00:00 AM  | 12/31/2020 11:59:59 PM | 15                                 | 15           | 15                  |         |       |
| NUMBER OF READS: |      | 25          |             |               |                |                         | TOTAL:                 | 550                                | 580          | 619                 |         |       |
| 1                | 2    | 3           | 4           | 5             | 6              | 7                       | 8                      | 9                                  | 10           | 11                  | 12      | 13    |

SEE REVERSE SIDE FOR COMPLETE REPORT DETAILS BY COLUMN NUMBER

Report Approved By TPM

IT IS RECOMMENDED THAT YOU KEEP THIS REPORT FOR YOUR RECORDS



**MIRION**  
TECHNOLOGIES  
Dosimetry Services  
Division

MIRION TECHNOLOGIES (GDS), INC.  
P. O. Box 19755, Irvine, California 92619-9755  
Street Address: 2652 McCaw Avenue, Irvine, CA 92614  
U.S./Canada: 800-251-3331 | Worldwide: 949-419-1000  
www.mirion.com

REPORT RUN TIME: 06/25/2021 6:36:46PM

GENERAL INFORMATION

MINIMUM EXPOSURE REPORTED All dosimeters have a minimum threshold which an actual exposure cannot be measured with statistical accuracy.

DOSE EQUIVALENT The product of the absorbed dose in tissue, quality factor, and all other necessary modifying factors at the location of interest.

EXTERNAL DOSE That portion of the dose equivalent received from radition sources outside the body.

OCCUPATIONAL DOSE Dose received by an individual in a restricted area or in the course of employment in which the individual's assigned duties involve exposure to radiation and to radioactive material from licensed and unlicensed sources of radiation whether in the possession of the licensee or other person. Occupational dose does not include dose received from background radiation, such as a patient from medical practices, from voluntary participation in medical research programs, or as a member of the general public.

EXTREMITY Hand, elbow, arm below the elbow, foot, knee or leg below the knee.

WHOLE BODY Head, trunk, arms above the elbow, legs above the knee.

DEEP DOSE EQUIVALENT DDE Incremental measurement in rem for dose equivalent at a tissue depth of 1 cm (1000 mg/cm2); applies to whole body exposure.

EYE DOSE EQUIVALENT LDE Incremental measurement in rem for dose equivalent at a tissue depth of 0.3 cm (300 mg/cm2); applies to external exposure of the lens of the eye.

SHALLOW DOSE EQUIVALENT SDE - WB Incremental measurement in rem for dose equivalent at a tissue depth of 0.007 cm (7 mg/cm2); applies to shallow dose of whole body.

SHALLOW DOSE EQUIVALENT SDE - E Incremental measurement in rem for dose equivalent at a tissue depth of 0.007 cm (7mg/cm2); applies to shallow dose of extremity.

EFFECTIVE DOSE EQUIVALENT (EDE) The sum over the tissues of the product of the dose equivalent HT in a tissue (T) and the weighting factor wT representing its proportion of the total stochastic (cancer and genetic) risk resulting from irradiation of tissue (T) to the risk when the whole body is irradiated uniformly.

TECHNICAL DATA Mirion Technologies (GDS) Inc. performs calibrations of its dosimetry systems that are traceable to NIST and is accredited by the National Institute of Standards and Technology through NVLAP.

RADIATION TEST SOURCES  
Mirion Technologies (GDS) Inc. has demonstrated satisfactory performance in accordance with the most recent version of ANSI N13.11 "Criteria for Testing Personnel Dosimetry Performance." DOE/EH-0027 "DOE" standard for the Performance Testing of Performed Dosimetry System.

|             |                      |                                 |
|-------------|----------------------|---------------------------------|
|             | 10 CFR 20 LIMITS     | STATE LIMITS                    |
| Whole Body  | TEDE 5,000 mrem/year | (if applicable) 1,250 mrem/qtr. |
| Lens of Eye | 15,000 mrem/year     | 1,250 mrem/qtr.                 |
| Skin        | SDE 50,000 mrem/year | 7,500 mrem/qtr.                 |
| Extremity   | 50,000 mrem/year     | 18,750 mrem/qtr.                |

DOSE CONVERSION

1 mrem 0.01 mSv

REPORT IDENTIFICATION SECTION

ACCOUNT - Unique identifying number permanently assigned to a facility.

LOCATION - Location specified by customer.

REPORTING PERIOD  
- For Instadose dosimeters Dates indicate last successful reads of the report query selected by customer.  
- For other dosimeter types Dates indicate start and end dates of the report query selected by customer.

PAGE \_\_\_\_ OF \_\_\_\_ Indicates number of report pages in this reporting sequence.

WEARER IDENTIFICATION SECTION

COLUMN 1 Wearer's assigned identification number.

COLUMN 2 Individual's last and first name.

COLUMN 3 Unique individual wearer identification assigned within an account. All exposure records are kept by the User ID.

COLUMN 4 Instadose Only Serial number registered to the Instadose device.

COLUMN 5 Physical type of radiation detection media uti ized in assigned dosimeter.

| Badge Type                          |  |
|-------------------------------------|--|
| 09 - CR39 Fast Neutron Dosimeter    | 21 - REMtrack® Card (1 chip)           |
| 11 - High Dose Dosimeter            | 22 - REMtrack® Card (2 chip)           |
| 13 - High Dose Chipstrate Dosimeter | 23 - REMtrack® Card (1 chip + In-115m) |
| 14 - TLD 100 Badge                  | 24 - REMtrack® Card (2 chip + In-115m) |
| 15 - TLD 760 Badge + CR39           | 25 - CR39 in TLD 760 + In-155m         |
| 16 - TLD 760 Badge                  | 26 - TLD 760 + In-115m                 |
| 17 - TLD 110 Environmental          | 27 - Eye Dosimeter                     |
| 18 - Hard Ring                      | 30 - APEX                              |
| 19 - MeasurRing®                    | 31 - ID1                               |
| 20 - TLD 814 Environmental          | 35 - TLD 760 MCP + CR39                |
|                                     | 36 - TLD 760 MCP                       |
|                                     | 37 - ID+                               |

COLUMN 6a Two unique fields, first 2 digits reflect the general region of the body to be monitored or reflects non-personal use based on table

| Monitored Region |                       |     |                   |
|------------------|-----------------------|-----|-------------------|
| WB & EW          | Whole Body            | NPU | Non-Personnel Use |
| EYE              | Lens of Eye           | EQ  | Equipment         |
| URE              | Upper Right Extremity | ARE | Area              |
| ULE              | Upper Left Extrem ty  | UNK | Unknown           |
| LRE              | Lower Right Extremity | NSE | Non-Specific      |
| LLE              | Lower Left Extrem ty  |     |                   |

COLUMN 6b Specific body part to be monitored if applicable.This field is optional and is provided to help differentiate between multiple badges worn on the same body region based on table

| Monitored Part of Body |                |               |                |
|------------------------|----------------|---------------|----------------|
| Whole Body             | Extremities    | Non-Personnel |                |
| Blank                  | Not Identified | Blank         | Not Identified |
| HD                     | Head           | FA            | Forearm        |
| CL                     | Collar         | EL            | Elbow          |
| CH                     | Chest          | WR            | Wrist          |
| TR                     | Torso          | HN            | Hand           |
| GR                     | Groin          | FN            | Finger         |
| FS                     | Fetus          | FP            | Fingertip      |
| UA                     | Upper Arm      | KN            | Knee           |
| TH                     | Thigh          | FL            | Foreleg        |
| BA                     | Back           | AN            | Ankle          |
|                        |                | FT            | Foot           |

DOSIMETER AND EXPOSURE HISTORY SECTION

Monitoring Period

COLUMN 7 - For Instadose dosimeters the date/time of the last successful read.  
- For other dosimeter types the first day of the monitoring period.

COLUMN 8 - For Instadose dosimeters the date/time of a successful read.  
- For other dosimeter types the last day of the monitoring period.

COLUMN 9 - Deep Cumulative total reported during the read period.

COLUMN 10 - Eye Cumulative total reported during the read period.

COLUMN 11 - Shallow Cumulative total for all dosimeters reported during the read period.

COLUMN 12 - Neutron Dose stated in part of the reported Deep, Eye, and Shallow in date range exposure and is included in Column 9, 10, and 11. Non-personnel Neutron Badges are calibrated for response of dosimeter on a phantom.

COLUMN 13 - Notes (please reference below).

EXPLANATION OF CODE KEY FOR NOTES

A. FOR INSTADOSE DOSIMETERS Manual dose adjustment.

FOR OTHER DOSIMETER TYPES CONTROL BADGE NOT USED IN EVALUATION therefore limiting an accurate assessment of either a storage or transit dose. Some or all of the exposure reported may be due to exposure during storage or transit. A Mirion Technologies (GDS) inc. designated control was used for an estimate of the storage and transit dose. The reason for the control not being used may be one of the following

- Control badge was not created or was not returned for the mon toring period.
- Control badge returned was not for the same monitoring period as dosimeter.
- Control badge was received damaged.
- Control badge was received contaminated.
- Control badge exhib ted an exposure.
- Control badge exhib ted an unusual response.
- Customer's request. Mirion Technologies (GDS) Inc. designated control was not used.
- Components Missing
- Component Missing or Damaged.

B. CONTROL BADGE EXHIBITED EXPOSURE AND THE DOSEMETER EXHIBITED A SIMILAR EXPOSURE. The control badge was used in the evaluation.

C. DOSEMETER DAMAGED. No evaluation possible. Type of damage may be one of the following

- Light
- Chemical
- Water/Moisture
- Heat
- Radioactive Contamination found
- Components physically damaged
- Components missing
- Component Missing or Damaged

D. DOSEMETER RESULT NOT VALID. No evaluation possible. Type of problem may be one of the following

- Exposure Through Back of Holder
- Side Exposure
- Unusual Exposure Pattern. May be due to an uneven or partially shielded exposure
- Internal Fil ters Missing. Check holder for possible damage. Request new holder if necessary.
- Unusual Element Response. Response indicated suspect result
- Dosimeter Saturated. Delivered dose exceeds maximum reportable
- CR39 Dosimeter Damaged. Neutron component only
- CR39 Missing. Neutron component only
- Abnormal Glow Curve. Response indicated suspect result

EXPLANATION OF CODE KEY FOR PROCESS NOTES

E. DOSEMETER EXHIBITED UNUSUAL EXPOSURE PATTERN. Reported dose is estimate only.

F. UNUSED BADGE. Per customer notice. No evaluation made.

G. OUTDATED BADGE. Badge received after the expiration date. No evaluation made.

H. OUTDATED BADGE. Badge received after the expiration date. Reported dose is estimate only.

I. CUSTOMER ESTIMATED DOSE. Customer provided dose in writing.

J. ESTIMATED DOSE. Automatically generated estimate provided at customer's request. Based on dose history.

K. TLD NEUTRON RESPONSE SUBSTITUTED FOR CR39 RESPONSE. Responses may be one of the following

- CR39 Missing
- CR39 Damaged
- CR39 Exhibited Unusual Response

L. FOR INSTADOSE BADGES Manual dose adjustment.

FOR OTHER DOSIMETER NO BADGE RETURNED for the monitoring period indicated. The following action was taken

- No Evaluation Possible. Exposure history current through last monitoring period reported.
- Customer Estimated Dose. Customer provided dose in writing.
- Estimated Dose. Automatic ly generated estimate provided at customer's request. Based on dose history.

M. FOR WEARERS CALCULATING AN EDE EDE Calculation could not be performed due to missing data.

REFERENCES

1. For rules and regulations applying to Radiation Safety in your state contact your State Health Department.

2. Standards for Protection against Radiation are published in the Code of Federal Regulations and may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. Ask for 10 CFR 20.

3. Regulatory Guide 8.7 Instructions for Recording and Reporting Occupational Exposure Data provides guidance on

\* Determining the doses in the current monitoring year for all persons who must be monitored and recording them on an NRC Form 5.

\* Submitting an annual report to the NRC of the results of individual monitoring (NRC Form 5).

\* Acquiring records of prior exposure (NRC Form 5).

This report is furnished to you under the provisions of the Nuclear Regulatory Commission regulation 10 CFR part 19. You should preserve this report for further reference.

This report shall not be reproduced except in full without the written approval of the processing facility.

This report must not be used to claim product endorsement by NVLAP or any agency of the U.S. Government.



June 30, 2021

EASTERN IDAHO REGIONAL MEDICAL CENTER  
Department of Radiology  
3100 Channing Way  
Idaho Falls, ID 83404

RE: Edit to include dose from other intuitions, Table 9 and conclusion.

Background:

Upon inspection by a representative of the NRC, the assigned dosimetry results for an Interventional Radiologist identified as AU1 in NRC Inspection Report 030-32290/2020-001; EA-21-019 were called into question due to inconsistency of dosimeter return/wear.

AU1 was assigned two dosimeters, collar and chest, since 1/2016. Since December 2018, measured doses on the collar dosimeter are routinely in the 300-500 mrem range. Prior to December 2018, collar dosimetry results were primarily below the level of detection, 1 mrem. This indicates that AU1 either did not routinely wear his dosimeter or wore it under lead apparel in 2016, 2017 and 2018. Starting in 12/2018, the collar dosimetry results indicate that AU1 was wearing his collar dosimeter and wearing it outside of the lead apparel (a few instances of inconsistency remain i.e. not returned). The 2019/2020 results of the collar dosimeter are consistent with interventional radiology physicians.

Eastern Idaho Regional Medical Center has not utilized a leaded protective apparel correction, such as the Webster calculation, to dosimetry results. Due to this, the highest measured dose from the two dosimeters assigned was used as the assigned dose. All assigned doses for AU1, except December 2018, were from the collar dosimeter as expected.

Justification:

It is common practice to assign a dose amount to missing data of a monitored individual by utilizing an average of at least three dosimeter readings. Given that the validity of AU1's dosimetry is in question, it can be shown that much AU1's 2019 collar dosimeter values represent a valid monitored amount and can be used to form an average collar dosimetry result.

---

Corporate: 214 E. Huron Street, Ann Arbor, MI 48104 (734) 662-3197 Fax: (734) 662-9224

Regional: 50 E. 91st Street, Suite 211, Indianapolis, IN 46240 (317) 581-1911 Fax: (317) 581-1931

Salt Lake City, UT  Sussex, WI  Springfield, IL

[www.mpcphysics.com](http://www.mpcphysics.com)  [mpc@mpcphysics.com](mailto:mpc@mpcphysics.com)

## Validation Method 1: Comparison to other personnel performing similar duties

**Table 1: Collar DDE dosimetry comparison values for IR1 and AU1**

|                 |               | IR1              | AU1              |
|-----------------|---------------|------------------|------------------|
| Begin Wear Date | End Wear Date | Total DDE (mrem) | Total DDE (mrem) |
| 2019/12/01      | 2019/12/31    | 23               | 146              |
| 2019/11/01      | 2019/11/30    | 344              | 521              |
| 2019/10/01      | 2019/10/31    | 430              | -                |
| 2019/09/01      | 2019/09/30    | 118              | 1008*            |
| 2019/08/01      | 2019/08/31    | 215              | 379              |
| 2019/07/01      | 2019/07/31    | 353              | M                |
| 2019/06/01      | 2019/06/30    | 533              | 382              |
| 2019/05/01      | 2019/05/31    | 270              | 385              |
| 2019/04/01      | 2019/04/30    | 143              | 547              |
| 2019/03/01      | 2019/03/31    | 100              | 209              |
| 2019/02/01      | 2019/02/28    | 362              | 559              |
| 2019/01/01      | 2019/01/31    | 632              | 652              |

\* Known instance of wear from 9/1-10/31

As shown in Table 1, much of AU1's collar dosimeter values are consistent with another Interventional Radiologist, IR1, from the same facility. These values are also in range with Interventional Radiologists from other facilities (personal observation, not reported).

## Validation Method 2: Comparison to phantom scatter ratios

**Table 2: Entrance Exposure/Scatter Rate Ratio**

| SID (cm) | kV | mA  | Entrance Exposure "EE" (R/min) | Scatter Rate "SR" (mR/hr) | EE/SR ratio |
|----------|----|-----|--------------------------------|---------------------------|-------------|
| 100      | 64 | 283 | 8.68                           | 338                       | 0.00065     |

Direct measurement of scatter radiation performed utilizing 8 inches Lucite in CINE mode of operation of a similar type fluoroscopy system were made at the collar level of a typical operator location (~0.5 m) without the hanging shield.

**Table 3: AU1 collar DDE ratio to monthly entrance air KERMA**

| Date   | Entrance Air KERMA (mGy) | Total DDE (mrem) | Ratio  |
|--------|--------------------------|------------------|--------|
| Nov-19 | 8817                     | 521              | 0.0006 |
| Oct-19 | 18924                    | -                | -      |
| Sep-19 | 8930                     | 1008*            | 0.0004 |
| Aug-19 | 22249                    | 379              | 0.0002 |
| Jul-19 | 5962                     | M                | -      |
| Jun-19 | 9110                     | 382              | 0.0004 |
| May-19 | 18004                    | 385              | 0.0002 |
| Apr-19 | 12183                    | 547              | 0.0004 |
| Mar-19 | 3275                     | 209              | 0.0006 |
| Feb-19 | 8059                     | 559              | 0.0007 |
| Jan-19 | 15018                    | 652              | 0.0004 |

\* September ratio= total entrance KERMA for Sep and Oct due to known wear of dosimeter for two months

As can be seen in Table 2 and Table 3, AU1's collar dosimetry results as a ratio to the air KERMA value reported by the fluoroscopy system for the procedures performed is in range with the ratio from the phantom measurements. The values for AU1 are generally lower as the phantom measurements were made without any hanging shield.

Based on validation method 1 and 2, it can be argued that AU1's measured dosimetry for much of 2019 appear to be an accurate representation of the collar dose and can be used to form a reasonable estimate for the missing/suspect dosimetry results.

Dose estimation results:

**Table 4: Workload and DDE for average value**

| Date    | Entrance Air KERMA (mGy) | Total DDE (mrem) |
|---------|--------------------------|------------------|
| Nov-19  | 8817                     | 521              |
| Aug-19  | 22249                    | 379              |
| Jun-19  | 9110                     | 382              |
| May-19  | 18004                    | 385              |
| Apr-19  | 12183                    | 547              |
| Mar-19  | 3275                     | 209              |
| Average | 12273                    | 404              |

A workload weighted average 0.033 mrem/mGy Air KERMA will be used for assigned doses for AU1 for any missing, usually low or known inappropriate wear (i.e. chest at collar). Measured collar values that appear to be valid values are used in place of an estimated value. The noted exception is Sep 2019 which accounts for two months of wear. The Sep measured value is an appropriate value for the two months of wear.

As noted in the background information, no leaded apparel protection correction such as a Webster Calculation was performed on the dosimetry results for AU1. Since the

majority (if not all) measured dose is due to AU1's use of fluoroscopy, it is appropriate to use a correction. An industry standard correction using collar dosimetry is Assigned DDE= 0.3 \* Collar DDE, known as EDE 2 calculation by the dosimetry provider. This EDE2 correction should be used for AU1's measured and estimated dosimetry results.

**Table 5: AU1 2017 dose (measured used in total if values are appropriate for workload)**

| Begin Wear Date | End Wear Date | Dosimeter Location | Measured DDE (mrem) | Estimate (mrem) | EDE2 (mrem) | Workload- Reference Point Air KERMA (mGy) |
|-----------------|---------------|--------------------|---------------------|-----------------|-------------|---|
| 2017/12/01      | 2017/12/31    | Collar             | 13                  | -               | 4           | 6   |
| 2017/11/01      | 2017/11/30    | Collar             | 15                  | 69              | 21          | 2101                                      |
| 2017/10/01      | 2017/10/31    | Collar             | 957                 | -               | 287         | 13065                                     |
| 2017/09/01      | 2017/09/30    | Collar             | M                   | 550             | 165         | 16704                                     |
| 2017/08/01      | 2017/08/31    | Collar             | M                   | 220             | 66          | 6686                                      |
| 2017/07/01      | 2017/07/31    | Collar             | M                   | 145             | 44          | 4409                                      |
| 2017/06/01      | 2017/06/30    | Collar             | M                   | 172             | 52          | 5235                                      |
| 2017/05/01      | 2017/05/31    | Collar             | M                   | 264             | 79          | 8017                                      |
| 2017/04/01      | 2017/04/30    | Collar             |                     | 202             | 61          | 6128                                      |
| 2017/03/01      | 2017/03/31    | Collar             |                     | 302             | 91          | 9176.3                                    |
| 2017/02/01      | 2017/02/28    | Collar             |                     | 275             | 83          | 8368                                      |
| 2017/01/01      | 2017/01/31    | Collar             |                     | 430             | 129         | 13050.8                                   |
|                 |               |                    |                     |                 |             |   |
| 2017            |               |                    |                     |                 | 1080        |   |

**Table 6: AU1 2018 dose (measured used in total if values are appropriate for workload)**

| Begin Wear Date | End Wear Date | Dosimeter Location | Measured DDE (mrem) | Estimate (mrem) | EDE2 (mrem) | Workload- Reference Point Air KERMA (mGy) |
|-----------------|---------------|--------------------|---------------------|-----------------|-------------|---|
| 2018/12/01      | 2018/12/31    | Chest              | 217                 | 836             | 251         | 25390                                     |
| 2018/11/01      | 2018/11/30    | Collar             | M                   | 388             | 116         | 11790                                     |
| 2018/10/01      | 2018/10/31    | Collar             | M                   | 594             | 178         | 18036                                     |
| 2018/09/01      | 2018/09/30    | Collar             | M                   | 153             | 46          | 4640                                      |
| 2018/08/01      | 2018/08/31    | Collar             | M                   | 866             | 260         | 26306                                     |
| 2018/07/01      | 2018/07/31    | Collar             | M                   | 279             | 84          | 8464                                      |
| 2018/06/01      | 2018/06/30    | Collar             | M                   | 438             | 132         | 13319                                     |
| 2018/05/01      | 2018/05/31    | Collar             | M                   | 333             | 100         | 10122                                     |
| 2018/04/01      | 2018/04/30    | Collar             | M                   | 390             | 117         | 11851                                     |
| 2018/03/01      | 2018/03/31    | Collar             | M                   | 230             | 69          | 6993.6                                    |
| 2018/02/01      | 2018/02/28    | Collar             | 7                   | 930             | 279         | 28262                                     |
| 2018/01/01      | 2018/01/31    | Collar             | 8                   | 251             | 75          | 7621                                      |
|                 |               |                    |                     |                 |             |   |
| 2018            |               |                    |                     |                 | 1706        |   |

**Table 7: AU1 2019 dose (measured used in total if values are appropriate for workload)**

| Begin Wear Date | End Wear Date | Dosimeter Location | Measured DDE (mrem) | Estimate (mrem) | EDE2 (mrem) | Workload- Reference Point Air KERMA (mGy) |
|-----------------|---------------|--------------------|---------------------|-----------------|-------------|---|
| 2019/12/01      | 2019/12/31    | Collar             | 146                 |                 | 44          |   |
| 2019/11/01      | 2019/11/30    | Collar             | 521                 |                 | 156         | 8817                                      |
| 2019/10/01      | 2019/10/31    | Collar             |                     |                 | -           | 18924                                     |
| 2019/09/01      | 2019/09/30    | Collar             | 1008                |                 | 302         | 8930                                      |
| 2019/08/01      | 2019/08/31    | Collar             | 379                 |                 | 114         | 22249                                     |
| 2019/07/01      | 2019/07/31    | Collar             | M                   | 197             | 59          | 5962                                      |
| 2019/06/01      | 2019/06/30    | Collar             | 382                 |                 | 115         | 9110                                      |
| 2019/05/01      | 2019/05/31    | Collar             | 385                 |                 | 116         | 18004                                     |
| 2019/04/01      | 2019/04/30    | Collar             | 547                 |                 | 164         | 12183                                     |
| 2019/03/01      | 2019/03/31    | Collar             | 209                 |                 | 63          | 3275                                      |
| 2019/02/01      | 2019/02/28    | Collar             | 559                 |                 | 168         | 8059                                      |
| 2019/01/01      | 2019/01/31    | Collar             | 652                 |                 | 196         | 15018                                     |
|                 |               |                    |                     |                 |             |   |
| 2019            |               |                    |                     |                 | 1495        |   |

**Table 8: AU1 2020 dose measured values used except for Aug/Oct**

| Begin Wear Date | End Wear Date | Dosimeter Location | Measured DDE (mrem) | Estimate (mrem) | EDE2 | Workload- Reference Point Air KERMA (mGy) |
|-----------------|---------------|--------------------|---------------------|-----------------|------|---|
| 2020/12/01      | 2020/12/31    | Collar             | 131                 |                 | 39   |   |
| 2020/11/01      | 2020/11/30    | Collar             | 264                 |                 | 79   |   |
| 2020/10/01      | 2020/10/31    | Collar             | M                   | 303             | 91   | 9170                                      |
| 2020/09/01      | 2020/09/30    | Collar             | 721                 |                 | 216  |   |
| 2020/08/01      | 2020/08/31    | Collar             |                     | 453             | 136  | 13733                                     |
| 2020/07/01      | 2020/07/31    | Collar             | 391                 |                 | 117  |   |
| 2020/06/01      | 2020/06/30    | Collar             | 757                 |                 | 227  |   |
| 2020/05/01      | 2020/05/31    | Collar             | 223                 |                 | 67   |   |
| 2020/04/01      | 2020/04/30    | Collar             | 152                 |                 | 46   |   |
| 2020/03/01      | 2020/03/31    | Collar             | 323                 |                 | 97   |   |
| 2020/02/01      | 2020/02/29    | Collar             | 248                 |                 | 74   |   |
| 2020/01/01      | 2020/01/31    | Collar             | 598                 |                 | 179  |   |
|                 |               |                    |                     |                 |      |   |
| 2020            |               |                    |                     |                 | 1369 |   |

**Table 9: Annual DDE from other institutions**

| Date | Other Institutions DDE (mrem) | Total DDE (mrem) |
|------|-------------------------------|------------------|
| 2017 | 194                           | 1274             |
| 2018 | 35                            | 1741             |
| 2019 | 14                            | 1509             |
| 2020 | 29                            | 1398             |

**Conclusion:**

Tables 5-8 represent, with reasonable accuracy, dose estimates and measured dosimetry results that are indicative of reasonable wear, accepting this methodology, AU1's annual dose for 2017-2020 does not exceed the annual occupational dose limit of 5000 mrem. Furthermore, the values are low enough that dose received at other institutions do not result in a combined dose value over the annual limit for AU1, Table 9.

Respectfully submitted,



Adam Arndt, M.S., CHP, DABR  
Medical Physicist