

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 030-04214/85002(DRSS)

Docket No. 030-04214

License No. 12-11184-01

Category E

Priority III

Licensee: Kay-Ray, Incorporated
516 West Campus Drive
Arlington Heights, IL 60004

Inspection At: 506 West Campus Drive
Arlington Heights, IL

Inspection Conducted: June 26, 1985

Enforcement Conference Conducted: July 29, 1985

Inspector: *J. L. Lynch*
J. L. Lynch
Radiation Specialist

7-31-85
Date

Reviewed By: *D. G. Wiedeman*
D. G. Wiedeman, Chief
Nuclear Materials Safety Section 1

7-31-85
Date

Approved By: *W. L. Axelson*
W. L. Axelson, Chief
Nuclear Materials Safety and
Safeguards Branch

7-31-85
Date

Inspection Summary

Inspection on June 26, 1985 (Report No. 030-04214/85002(DRSS))

Areas Inspected: Announced, special inspection initiated by an overexposure report dated June 18, 1985. The inspection included a review of operating procedures, facility tours, interviews with personnel and a review of information submitted by the licensee in a report dated June 28, 1985 and received by the NRC on July 1, 1985.

Results: The overexposure appears to be valid, one violation was identified. 10 CFR 20.101(a) [Section 5].

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DETAILS

1. Persons Contacted

#*John Crump, President
#*Leslie R. Axelrod, Vice President, Research and Engineering
 *Robert J. Baker, Vice President, Production
#*Alan J. Peterson, Radiation Safety Officer (RSO)
#*Maria Dalianis, Human Resources Manager
 Paul Colclough, Source Loading Supervisor
 Brad Hayden, Source Loader
#Stan Huber, Consultant

*Attended exit interview on June 26, 1985.

#Attended enforcement conference on July 29, 1985.

2. Purpose of Inspection

This announced special inspection was conducted at the licensee's Arlington Heights, Illinois facility on June 26, 1985. The inspection included an evaluation of a possible extremity overexposure of 19.61 rems to an individual performing source loading.

Kay-Ray installs sealed sources containing byproduct material in several types of gauging devices which are distributed to general and specific licensees. Kay-Ray also provides gauge maintenance, repair and removal services for customers.

An enforcement conference was held on July 29, 1985, to discuss the results of the June inspection.

3. Inspection History

- A. Routine Safety Inspection: March 19, 20, 22, 1985
Results: One violation
- B. Special Safety Inspection: October 18, 1983
Results: One violation
Comments: Missing sources
- C. Special Safety Inspection: June 8 and 10, August 1, 1983
Results: Three violations
Order Suspending License and to Show Cause
(Order in effect from August 15, 1983 to September 16, 1983)
\$1800 Civil Penalty
Comments: Whole body and extremity overexposures
- D. Routine Safety Inspection: April 12-13, 1983
Results: Four violations
Comments: Apparent whole body overexposure

- E. Routine Safety Inspection: February 24-25, 1982
Results: No violations
*Comments: Apparent extremity overexposure
 - F. Special Safety Inspection: February 9, 12, and March 20, 1981
Results: One violation
*Comments: Apparent whole body overexposure
 - G. Special Safety Inspection: May 19, 1980
Results: Two violations
Comments: Missing sources
 - H. Investigation: December 27-28, 1978 and January 5, 1979
Results: No violations
*Comments: Apparent overexposure
 - I. Routine Inspection: August 15-16, 1978
Results: One violation
 - J. Routine Inspection: September 2, 1977
Results: Three violations
 - K. Investigation: April 4-5, 1977
Results: Four violations
*Comments: Apparent overexposure
- * These apparent overexposures were attributed to exposures to the dosimetry devices only and not to the individual involved.

4. Report of Apparent Overexposure

Kay-Ray was notified on May 30, 1985, by R. S. Landauer that the TLD ring badge of a source loading employee had received a dose of 19.42 rems. The ring was worn by the source loading supervisor from May 13, 1985 to May 19, 1985 on his right ring finger. Upon notification, Kay-Ray immediately removed the individual from source handling duties.

The total quarterly extremity exposure was 19.61 rems. The individual continued to perform tasks in restricted areas including handling of loaded source heads for the final four weeks of the quarter. He was not wearing any extremity dosimetry during these activities, (ring badges are worn during source handling operations only). Presumably, the individual's extremities received additional exposure during this time which went unmeasured. An estimate of this additional dose, calculated from Kay-Ray exposure histories, amounts to less than five percent of the average quarterly total if handling procedures were followed correctly.

A written report of the overexposure dated June 18, 1985, was submitted to the NRC (Attachment A). The report stated that the exposure was presumed to be deliberate and to the dosimeter only. Since some employee dissension was evident around the same time and no definite source handling problem was identified by the individual, Kay-Ray felt that the most logical explanation for the overexposure was one of deliberate mishandling.

During the June 26, 1985 inspection, the technical aspects of a possible overexposure were discussed with licensee representatives. After learning from the NRC that a large dose could be received in a very short time (on the order of seconds), Kay-Ray reevaluated their position as to the cause of the overexposure which they described in a letter dated June 28, 1985 (Attachments B and C). Kay-Ray now feels that an inadvertent error in the source loading supervisor's handling procedures may have caused the overexposure. A formal audit performed by the RSO on April 25, 1985 stated that the individual needed to sharpen his skills and increase his speed to minimize radiation exposure during source loading operations (Attachment D). The deficiencies noted during the audit added credence to the theory that the individual may have made a source handling error.

The licensee still contends, however, that a deliberate TLD exposure could be responsible for the overexposure. The supervisor and two source loaders apparently had a number of conflicts among themselves which may have prompted an attempt to cause trouble by deliberately exposing dosimetry badges to radiation sources. Although Kay-Ray maintains some degree of control over badges when they are not being used, opportunities were present for source loaders to sabotage the supervisor's ring badge. The source loader that Kay-Ray feels was most likely to cause this type of problem quit unexpectedly shortly after the overexposure incident. He stated to Kay-Ray personnel that he did not sabotage the badge. In an interview with the other source loader, the individual stated to the NRC representative that he did not deliberately expose any dosimetry devices to radiation sources, and did not know of any other person that performed such an act.

No violations were identified.

5. Apparent Overexposure Analysis

The exposed individual's eye level TLD badge received a dose of 40 millirem and his whole body film badge recorded a minimal dose (<10 millirem) between May 13, 1985 and May 19, 1985. These exposures are conceivable as source handling is performed behind a two inch thick lead shield equipped with a leaded glass viewing window. The shield attenuates radiation significantly prior to interaction with either the eye level or whole body badges. The arms and hands are not afforded this protection as the user must reach around the shield to handle sources. Radiation safety procedures state that handling is to be performed only with tongs and never directly with the individual's hands.

The supervisor's workload during the overexposure period consisted of loading twenty-four cesium-137 sources ranging in activity from 50 to 500 millicuries, and loading three 500 millicurie americium-241 sources. Since part of the loading process (after the source is in a holder) for the americium-241 sources does not take place behind the shield due to the large size of the source housings involved, the RSO initially thought that this process caused the overexposure. The RSO performed an evaluation and analysis on americium-241 source holders and housings and found that it was unlikely that the overexposure could be attributed to those

sources and that the cesium-137 source handling was more likely the cause of the overexposure. Long periods of exposure would be needed to achieve the same dose with the americium-241 sources according to the RSO's measurements.

In summary, the licensee cannot show whether the overexposure was intentional to the badge only or an actual overexposure. Their position was that an actual overexposure to the inexperienced loader is the most likely option.

As stated earlier in this report, the theory of intentional exposure to the dosimetry device was not adequately proven by the licensee. Therefore, the NRC concludes that the overexposure attributed to the source loading supervisor may have been received by the individual as reported. It is the NRC's policy to consider that personnel monitoring devices reflect an accurate assessment of the dose to an individual unless there is strong evidence to indicate otherwise. The NRC will proceed as if the individual received the dose indicated by the dosimetry device. The exposure of an individual's extremities to 19.61 rems in the second quarter of 1985 is in excess of the quarterly limit of 18.75 rems and therefore constitutes a violation of 10 CFR 20.101(a).

One violation was identified.

6. Exit Interview

An exit interview was held at the Kay-Ray facility on June 26, 1985. The licensee representatives in attendance are indicated in Section 1 of this report. The apparent violation was discussed along with the NRC policy regarding possible escalated enforcement.

7. Enforcement Conference

An enforcement conference was held at the licensee's facility in Arlington Heights, Illinois on July 29, 1985 as a result of a special safety inspection in response to a reported extremity overexposure. The purpose of the conference was to (1) discuss the apparent overexposure, its significance and causes, and the licensee's corrective actions, (2) determine whether there were any aggravating or mitigating circumstances, and (3) obtain other information which would help determine the appropriate enforcement action.

Mr. J. A. Hind, Director, Division of Radiological Safety and Safeguards, opened the meeting by describing the purpose and scope of the meeting as well as the NRC enforcement policy and concerns raised as a result of the June 26, 1985 inspection.

The licensee acknowledged the facts as well as the significance of the apparent violation. The licensee described their corrective action to prevent recurrence which included retraining of individuals with particular emphasis on the importance of maintaining low exposure times and distances. Another step to prevent further incidents involves increased controls over film badges. The NRC officials stated that these measures appeared appropriate and should reduce the possibility of future incidents in this area.