Public Service Company of Colorado

16805 WCR 19 1/2, Platteville, Colorado 80651

September 27, 1984
Fort St. Vrain
Unit No. 1
P-84387

50-267

RECEIVED
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Mr. John T. Collins
Regional Administrator, Region IV
U. S. Nuclear Regulatory Commission
611 Ryan Plaza Drive
Arlington, TX 76011

ATTN: Mr. E. H. Johnson

SUBJECT: I & E Inspection Report 84-20

REFERENCE: NRC Letter dated August 31, 1984

Dear Mr. Collins:

This letter is in response to the Notice of Violation received as a result of the special inspection conducted at Fort St. Vrain on July 31, 1984. The following response to the items contained in the Notice of Violation is hereby submitted:

A. Effluent Release to Unrestricted Areas

Technical Specification ELCO 8.1.2.a requires that the maximum instantaneous release rate of radioactive liquid effluent from the site shall be such that concentrations of radionuclides in the cooling tower blowdown do not exceed the values specified in Appendix B to 10 CFR Part 20.

Contrary to the above, between 0200 hours on July 19, 1984, and 1540 hours on July 20, 1984, total concentrations of radionuclides in liquid effluents released from the reactor building sump to unrestricted areas exceeded Technical Specification limits by a factor of 2.47.

This is a Severity Level IV Violation. (Supplement I) (267/8420-01)

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(1) The corrective steps which have been taken and the results achieved:

An aliquot of the July 20, 1984 sample was sent to EAL Corporation for analysis. A copy of the analysis results is attached. Based on EAL's analysis, the appropriate MPC to use, from note 3.c to Appendix B, 10CFR20, is 3.0E-6μCi/ml, not 3.0E-8μCi/ml as utilized previously for unidentified radionuclides. Based on the use of 3.0E-6μCi/ml as the MPC value, the release concentration of 6.72E-8μCi/ml is only 2.47 percent of the MPC value; therefore, no Technical Specification limits contained in ELCO 8.1.2a were exceeded.

(2) Corrective steps which will be taken to avoid further violations:

Not Applicable.

(3) The date when full compliance will be achieved:

Not Applicable.

B. Effluent Monitoring Instrumentation

Technical Specification ELCO 8.1.3.d states: "All liquid effluents released from the reactor building sump shall be continuously monitored by two activity monitors and their associated recorder. Equipment shall be operable to automatically terminate the release on high specific activity or low cooling water flow."

Contrary to the above, the liquid effluent monitors did not terminate the release on July 20, 1984, which exceeded Technical Specification limits.

This is a Severity Level IV Violation. (Supplement I) (267/8420-02)

(1) The corrective steps which have been taken and the results achieved:

The monitors referred to in ELCO 8.1.3d are two (2) sodium iodide gamma activity monitors, RT-6212 and RT-6213, located in the discharge line. It has never been represented to the NRC that PSC has on-line beta monitors; indeed our instrumentation and the words contained in ELCO 8.1.3d have not been amended since 1974. Up to this point in time, there has never been a problem with the understanding of the monitoring requirements of this section or its predecessor. Mr. Blaine Murray of your staff assisted PSC and EG&G in developing the new Radiological and Environmental Technical Specifications (RETS) in 1983, and at no time was a problem with the existing wording or a requirement for on-line beta activity monitors discussed. Nevertheless, as a result of this NRC inspection finding, PSC and Mr. Murray independently investigated the availability of on-line beta activity monitors, and both parties have come to the conclusion that there is no such instrumentation on the market.

(2) Corrective steps which will be taken to avoid further violations:

A Technical Specification change will be submitted to amend the wording in ELCO 8.1.3d to more clearly indicate that effluents will be monitored by gamma activity monitors and that equipment shall be operable to terminate the release on high specific gamma activity.

(3) The date when full compliance will be achieved:

A Technical Specification change will be submitted by November 30, 1984.

C. Notifications

10 CFR Part 50.72 requires that each nuclear power reactor licensee shall notify the NRC Operations Center within 4 hours of any event of liquid effluent releases that exceeds two times the combined maximum permissible concentrations for all radionuclides except tritium and dissolved noble gases, when averaged over a time period of 1 hour.

Contrary to the above, certain licensee personnel were aware that technical specification limits had been exceeded for liquid effluents the afternoon of July 24, 1984, regarding a release made on July 19 and 20, 1984; however, the NRC was not notified until 1615 hours on July 26, 1984, that concentrations of unknown beta activity had exceeded Technical Specification limits by a reported factor of 2.24.

This is a Severity Level IV Violation. (Supplement I) (267/8420-03)

(1) The corrective steps which have been taken and the results achieved:

Contrary to the inspection report, no ". . . licensee personnel were aware that Technical Specification limits had been exceeded . . . the afternoon of July 24, 1984 . . .". PSC personnel were aware that the gross beta concentration exceeded the MPC for unidentified radionuclides. It has always been our position that until all analyses have been completed, no conclusions regarding Technical Specification compliance can be made. On the sample in question, all the analytical results and information regarding actual release and blowdown (dilution) rates were not available until July 26, 1984, at which time reporting was completed in accordance with 10CFR50.72(b)(2)(iv)(B). Nevertheless, all Radiochemistry personnel have been retrained regarding the importance of promptly reporting significant radiochemical results to department supervisory personnel for evaluation of reportability. Documentation of this retraining is available at the station for NRC review.

(2) Corrective steps which will be taken to avoid further violations:

In the future, when significant radiochemical results are obtained that indicate the possibility that Technical Specification limits may have been exceeded, the NRC will be promptly informed as a courtesy, pending completion of all required radiochemical analyses. Final determinations as to whether, in fact, Technical Specification limits have been exceeded will, of course, be promptly reported to the NRC in accordance with 10CFR50.72.

(3) The date when full compliance will be achieved:

September 24, 1984.

Should you have any further questions, please contact Mr. Frank J. Novachek, (303) 571-7436, ext. 201.

Sincerely,

J. W. Gahm
Manager, Nuclear Production
Fort St. Vrain Nuclear
Generating Station

JWG/djc

Attachment

EAL Corporation

Thermo Electron CORPORATION

2030 Wright Avenue
Richmond, California 94804
(415) 235-2633
(TWX) 910-382-8132

September 7, 1984

Ref: EAL W.O. No. 26-4300

Mr. Vern McGaffic
Supervisor of Radiochemistry
Public Service Company of Colorado
16805 Road 19 1/2
Platterville, Colorado 80651

Subject: Report on the Radiological Analysis of Water

Dear Mr. McGaffic:

The attached report summarizes the radiological analysis results on the two water samples received on July 30, 1984. One sample had no additives, and the other sample of the same water, had additives.

Phone conferences were held between yourself and EAL personnel at various times. The latter were either Rodney Melgard, Jim Floyd or myself. Jim Floyd and co-workers performed the analyses and much of the initial evaluations.

The final results are summarized in the attached data tables. Comments on the analysis and instrumentation are attached.

The information transmitted with the samples, that low energy beta emitters were present and that ^{35}S was identified, aided in directing our analyses. Sulfur-35 has a maximum beta energy of only 0.167 MeV. We performed analyses for ^{35}S and beta assays against ^{35}S isotopic standards, as well as the higher energy ^{137}Cs. The results in Table 1 show that 69. ± 16.% (2 σ) of the beta activity is accounted for. This leaves an apparent 31. ± 16.% of unaccounted activity. However, the gross assay of such low energy beta-emitters is influenced greatly by small changes of the assay parameters. It is known that the analysis errors quoted above should be increased for that reason, but it is difficult to determine how much. We could make further refinements in our low beta energy assay procedure for this particular sample and reduce analytical errors, etc. It is likely that future samples would be different, with different solids content and isotope mixtures. Therefore, more refinement of this methodology is not justified for this one sample. This is the reason gross beta assay results

on unknowns should be interpreted liberally. This problem is mentioned in a recent manuscript of a review of the Radiological Sampling and Analytical Methods for National Primary Drinking Regulations by Blanchard (EPA) and other authorities.

It is known that the accuracy of the assay of gross beta activity is very dependent on matching the beta energy of the unknown with a known isotopic standard. ASTM D1890 states that "the accuracy of any beta measurement is also dependent upon the number of nuclides present, combined with the various types of nuclides present, combined with the various types of energies of radiation, with the accuracy decreasing as the number of combinations increases."

We found that the beta assay of the sample by the techniques for "general measurements," as in ASTM D1890, using a ^{137}Cs standard, produces much lower results, see Table 2, than when using the ^{35}S standard. We have taken the later result as our best value.

Irregardless of the problems of beta assay, discussed above, analyses were performed to detect gamma emitters by Ge(Li) analysis, as well as by gross gamma assay using a NaI(Tl) gamma well spectrometer. X-ray spectrometry was performed to search for possible X-ray emitters, such as ^{55}Fe, etc. Gross alpha measurements were also performed. Specific analyses were performed for the low energy beta emitter ^{129}I, for ^{125}I and for combined ^{89}Sr - ^{90}Sr activity. All of the above analyses produced results at or below detection limits, except for a trace of ^{137}Cs, which comprised much less than one percent of the beta activity. The values are reported in Tables two and three.

It is concluded that the prime radioactive contaminants are low energy beta emitters and that all of the activity is accounted for as ^{35}S, within analytical limits of error and methodology limitations.

Please call me if there are any questions or further information is needed.

Sincerely yours,

Robert A. Wessman

Robert A. Wessman, Manager
Nuclear Projects
Nuclear Science Department

RAW/sc
Enclosures: Tables 1, 2, 3 and 4, and notes
Figure 1

TABLE 1 ACTIVITY BALANCE AS ^{35}S

All analyses are on the water sample with no additive, unless stated.

Item	Analysis	EAL Sample No. (Series 3044)	Results µCi/mL (± % error, 2 σ) or as stated	Comment (a)
A.	Gross beta as ^{35}S	103	1.44 E-04	
B.	Gross beta as ^{35}S	104	1.49 E-04	
C.	Average	Average	1.47 E-04 (5.)(a)	See Table 2-C for report as ^{137}Cs
D.	^{35}S	11 A-2	1.08 E-04	
E.	^{35}S	12 A-2	0.94 E-04	
F.	Average	Average	1.01 E-04 (20.)(b)	
G.	^{35}S as % beta		69. ± 16.%	Item $\frac{F}{C} \times 100$
H.	Apparent unaccounted beta	---	0.46 E-04 (47.)	Item C-F
I.	% unaccounted beta	---	31. ± 16% (c)	Item $\frac{H}{C} \times 100$
J.	Absorption counting of evaporated sample	103 and 104	half thickness 3.35 mg/cm² Al	See Figure 1
K.	Absorption counting of ^{35}S standard	903 and 904	half thickness 3.35 mg/cm² Al	See Figure 1
L.	Review of Absorption and beta counting	---	---- (d)	The sample activity closely matches ^{35}S

TABLE 2 ACTIVITY BALANCE AS ^{137}Cs

All analyses are on the water sample with no additive, unless stated.

Item	Analysis	EAL Sample No. (Series 3044)	Results µCi/mL (±% error, 2 σ)	Comment
A.	Gross beta as ^{137}Cs	103	3.80 E-05 (5.)	Ash Weight 40.9 mg
B.	Gross beta as ^{137}Cs	104	3.68 E-05 (5.)	Ash weight 45.3 mg
C.	Average beta, low weight	Average	3.74 E-05 (5.)(c)	See Table 1-C for report as ^{35}S
D.	Gross beta as ^{137}Cs (General Method)	1	1.79 E-05 (5.)	Ash weight 216. mg
E.	Gross beta as ^{137}Cs (General Method)	2	2.02 E-05 (5.)	Ash weight 191. gm water with additive
F.	Average beta, standard weight	Average	1.91 E-05 (17.)(e)	
G.	^{137}Cs by gamma analysis	110	3.41 E-08 (70.)(f)	See Table 4
H.	^{137}Cs as % Item F beta	---	0.2 ± 0.1%	The activity has very little ^{137}Cs present
I.	Apparent unaccounted beta	---	1.907 E-05 (17.)	Item F-C
J.	% unaccounted beta	---	99.8 ± 24.%	Item $\frac{I}{F}$ x 100 ^{137}Cs is not the proper reference standard
K.	Ratio of beta assays at different weights	---	1.96 ± 0.35	Item $\frac{C}{F}$ The use of ^{137}Cs is not valid since the result varies with sample ash weight in a different manner than ^{137}Cs betas

TABLE 3 ANALYSIS FOR OTHER POSSIBLE ISOTOPES
All analyses are on the water sample with no additive, unless stated.

Item	Analysis	EAL Sample No. (Series 3044)	Results µci/mL ± % error, 2 σ	Comments
A	Gamma Emitters	110	^{137}Cs 3.41 E-08 (70.)(f) No other emitters detected	2380 minutes on Ge(Li), see Table 3 for detection limits
B	Gross gamma	111	(g)	No peaks observed
C	Gross x-ray	120,121	<2. E-06 (h)	No peaks observed
D	^{90}Sr	21	<1.7 E-09	Immediate count minimum ^{90}Y growth Det. Lim. <1.7 E-09
E	^{90}Sr	21	<5. E-10	Counted after growth period, none observed Det. Lim. <7. E-10
F	^{89}Sr	21	<1.9 E-09	At 7/20/84, 0244 Det. Lim. <1.9 E-09
G	^{129}I	22	<4. E-08	Det. Lim. <4. E-08
H	^{125}I	22	<6. E-08 (i)	Det. Lim. <6. E-08
I	Gross alpha	103	<1. E-07	Det. Lim. <7. E-08
J	Gross alpha	104	<2. E-07	Det. Lim. <7. E-08 Preserved water
K	Gross alpha	1	<5. E-08	Det. Lim. <1.3 E-07
L	Gross alpha	2	<5. E-08	Det. Lim. <7. E-08

TABLE 4 EAL CORP. GE(LI) ANALYSIS REPORT

NUCLIDE	DPM/ML WET	UCI /ML WET	ERROR PERCENT
3044 110	TZERO = 202.333 1984		3044 110
	100.000 MLS		
K 40	<4.843E-01	<2.181E-07	DET LIM
CR 51	<5.912E-01	<2.663E-07	DET LIM
MN 54	<4.705E-02	<2.119E-08	DET LIM
CO 57	<2.581E-02	<1.162E-08	DET LIM
CO 58	<5.158E-02	<2.323E-08	DET LIM
FE 59	<1.656E-01	<7.459E-08	DET LIM
CO 60	<3.371E-02	<1.518E-08	DET LIM
ZN 65	<9.049E-02	<4.076E-08	DET LIM
SE 75	<4.591E-02	<2.068E-08	DET LIM
NB 94	<3.717E-02	<1.674E-08	DET LIM
ZR 95	<1.239E-01	<5.582E-08	DET LIM
NB 95	<5.344E-02	<2.407E-08	DET LIM
RU 106	<2.999E-01	<1.351E-07	DET LIM
AG 110M	<4.434E-02	<1.997E-08	DET LIM
SB 124	<1.313E-01	<5.914E-08	DET LIM
SB 125	<9.965E-02	<4.489E-08	DET LIM
I 131	<4.088E-01	<1.842E-07	DET LIM
CS 134	<4.300E-02	<1.937E-08	DET LIM
CS 137	7.571E-02	3.410E-08	35.3
BA 140	<6.759E-01	<3.045E-07	DET LIM
CE 141	<8.301E-02	<3.739E-08	DET LIM
CE 144	<2.028E-01	<9.135E-08	DET LIM
IR 192	<3.919E-02	<1.765E-08	DET LIM
NP 239	<1.829E-01	<8.239E-08	DET LIM

NOTES TO TABLES 1, 2 AND 3

a. This value assumes all activity is from ^{35}S and uses that efficiency. The error noted does not include any deviation due to that assumption. The efficiency was obtained by running duplicate ^{35}S spikes (Samples 903 and 904). The precision of the value is 3% (1 σ). In the case of the low energy ^{35}S beta, the results are affected by the reproducibility of the sample thickness, the distribution of the residue, etc. Such variations contribute to the analysis error, which is difficult to estimate, but greater than stated.

b. This was done by radiochemistry analysis using LSC.

c. The "apparently unaccounted for beta activity" may be ^{35}S, within the limits of error plus uncertainties in the methodology. Further work was not justified, as discussed in the letter report.

d. The absorption counting was done on the second shelf of a Methane End Window Counter (MEW) which has a nominal background of 15 cpm. Calibrated Al absorbers were used.

e. The gross beta counting results are calculated using a counting efficiency versus ash weight curve prepared from ^{137}Cs standards. This is the general method of gross beta analyses. The difference between line item C (low ash weight samples) and item F (high ash weight samples) is interpreted as due to the use of a ^{137}Cs standard, whereas a low energy standard should be used, as in Table 1. The use of the usual ^{137}Cs standard produces much lower beta activity concentration result.

f. Gamma analysis by Ge(Li) - A 100-mL aliquot of sample was counted 2380 minutes. Additional results are reported in Table 4.

g. Gross gamma - An aliquot was counted 2500 minutes in a gamma well vial on a NaI (Tl) gamma well detector with a multichannel analyzer. The activity above the combined background of the detector plus the vial was observed in any of the regions between 13 and 1200 keV.

h. Gross X-ray - Two evaporated aliquots were counted for 2600 minutes on different thin NaI (Tl) X-ray spectrometers. No peaks above background were observed in any range between 2 to 22 keV on either sample. The

Notes to Tables 1, 2 and 3 (cont'd)

^{55}Fe (Mn) X-ray region was integrated and a less than value calculated. It was felt that the ^{35}S content of the sample perturbed the table in the spectrum, in this case, since the table was slightly elevated above normal instrument background.

i. A chemically purified iodine fraction was counted on a gamma well NaI(Tl) spectrometer. No peaks were detected for ^{125}I nor ^{131}I or ^{133}I. The detection limits are about the same for these isotopes.

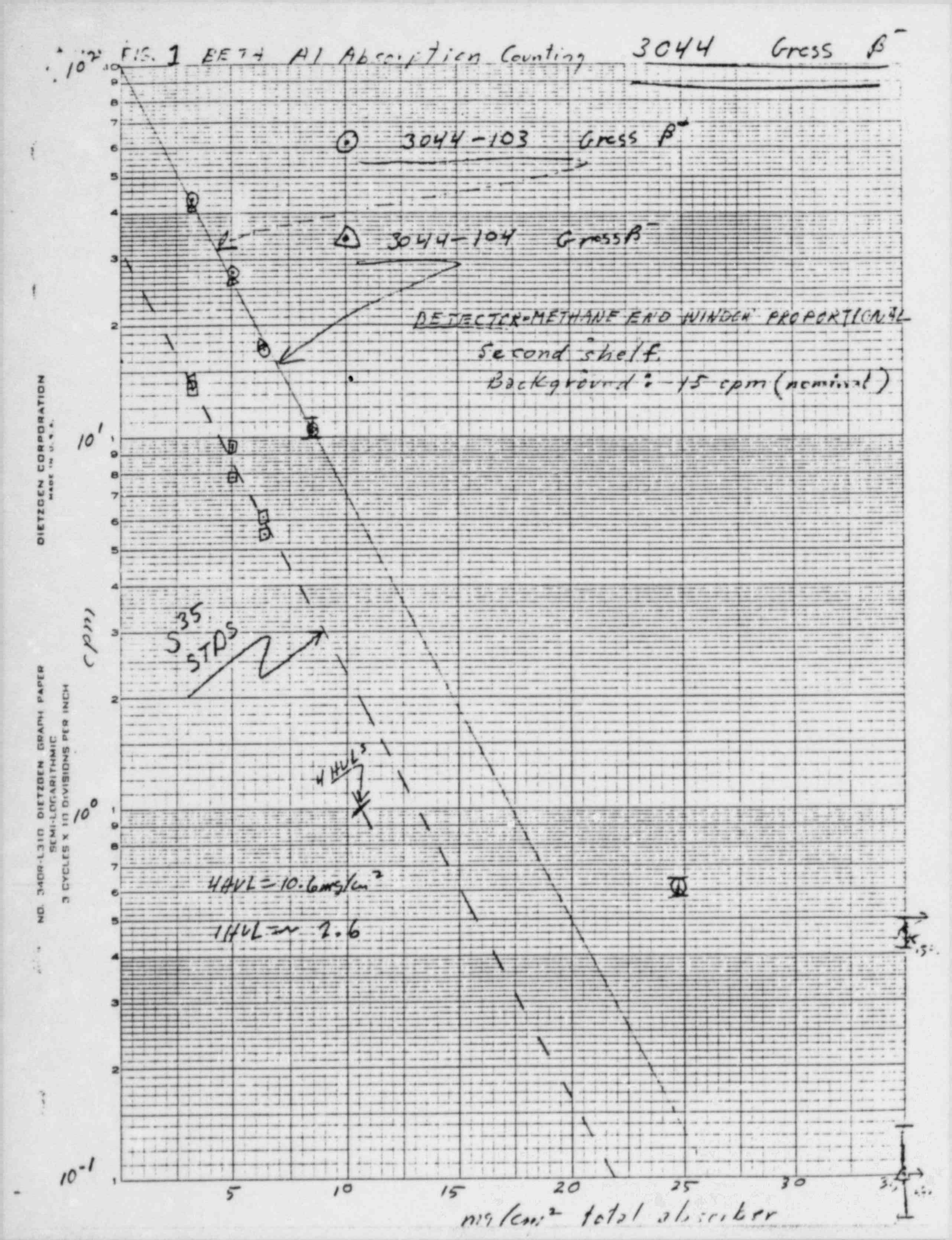
FIG. 1 BETA Al Absorption Counting 3044 Gross β⁻
3044-103 Gross β⁻
3044-104 Gross β⁻
DETECTOR-METHANE END WINDOW PROPORTIONAL
Second shelf.
Background: ~15 cpm (nominal)
S35 STDS
HVL
HVL = 10.6 mg/cm²
1HVL = 2.6
counts per minute (cpm)
mg/cm² total absorber
DIETZGEN CORPORATION
NO. 340R-L310 DIETZGEN GRAPH PAPER
SEMI-LOGARITHMIC
3 CYCLES X 10 DIVISIONS PER INCH