General Mills, Inc.
James Ford Bell Technical Center
9000 Plymouth Avenue North
Minneapolis, Minnesota 55427

Mr. John Madera NRC

Frank J. Ebert JFBTC

09/20/89
FJE /02/89 X

Supportive Letter for Amendment of NRC License

Dear Mr. Madera:

This letter is to summarize our telephone discussion on Tuesday, September 19, 1989 regarding clarification of the close-out survey which lead to amend our NRC License No. 22-01642-06.

I had attended a Radiation Safety Training and Management course on Feb. 24,89 presented by Stan A. Huber Consultants Inc. In that course they had informed us that there was a process called a "Close-out Survey" that could be conducted if a laboratory needed to close down a laboratory without any further need or use for isoptopes. This close out survey would allow the use of this laboratory for non-radiation use without first going through an official license amendment.

I called your license section and was mailed a policy requiring the needed information for the close-out procedure.

I did conduct this close-out procedure and mailed it to your Department. This resulted in the telephone call from you suggesting to perform a license amendment and that the close-out data would be kept in the file and allow conversion of the laboratory to non-radioactive use.

Enclosed you will find a request for the License amendment along with the specified fee for $60.00

I thank you for calling and giving me the proper guidance on this issue. I hope I have given the needed information for the requested amendment.

Again, if you need to call me I am available at (612) -540 -2948.

Thank you for your support.

Sept 14
Frank Ebert
760
3594
30
Final
10/4/89

Frank J Ebert

Frank J. Ebert

cc:

General Mills, Inc.
James Ford Bell Technical Center
9000 Plymouth Avenue North
Minneapolis, Minnesota 55427

Nuclear Radiation Comm Glen Ellyn

FRANK J. Ebert JBBTC 09/20/89
FJE /01/89

Request for Amendment for NRC License No. 22-01642-06

The following is a request to Amend our NRC License No. 22-01642-06:

* Delete the use of Aqeuous Nucleotides - Iodine 125, Phosphorous 32, and Cobalt 57.

* Discontinue the use of room 10/115-1, at James Ford Bell Technical Center, General Mills Inc. as the specified radiation laboratory which was used formerly to conduct analysis using these aqueous isotopes (Iodine 125, Phosphorous 32, and Cobalt 57).

Supporting Information:

We have terminated the use of any isotopes in the facility since December 1988.

On April 26, 1989, the solid radioactive waste consisting of Cobalt 57 was transferred to our Radiation waste storage area with an activity of 4.4 microcuries as calculated from the natural disintegration of that isotope based on the half-life of Cobalt 57. Cobalt 57 was not used since December 1988.

Phosphorous 32 was used in aqeuous form and therefore consisted of low levels of waste that were disposed in a sanitary sewer. Its use was discontinued on August 1988.

Iodine 125 was discontinued in May 85 and the solid radioactive waste portion has decomposed from natural disintegration to levels equal to background levels. This solid waste has since been disposed of in a sanitary land fill.

We have conducted a detailed inspection and close-out survey in room 10/115-1 and have found it to be free of any measureable radioactive contamination.

CONTROL NO. 87980

Frank J Ebert

FRANK J. Ebert
RADIATION SAFETY OFFICER

RADIATION CLOSE OUT SURVEY

GENERAL MILLS, INC.

JAMES FORD BELL TECHNIAL CENTER - ROOM 10/115-1

FRANK J. EBERT, RADIATION SAFETY OFFICER
(612)540-2948

AUGUST 18, 1989

General Mills, Inc.
James Ford Bell Technical Center
9000 Plymouth Avenue North
Minneapolis, Minnesota 55427

Nuclear Radiation Comm Glen Ellyn

Frank J. Ebert GMI 8/309 09/06/89
FJE /01/89

Radiation Close-out survey. James Ford Bell Room 10/115-1

* The following information summarizes a close-out survey specifically for room 10-115-1 at General Mills Inc., James Ford Bell Technical Center, 9000 Plymouth Ave. N., Minneapolis, Mn. 55427.

The purpose of the Close-out request is two-fold:

1) We have discontinued the use of all radio-isotopes Phosporous-32, Iodine-125, and Cobalt-57 for "in vitro" diagnostic testing.

2) We want to use this laboratory for non-radioisotope uses.

1) NRC License No.: 22-01642-06

2) License: General Mills, Inc.
James Ford Bell technical Center
9000 Plymouth Avenue North
Minneapolis, Mn. 55427

3) History:

The use of this laboratory for radioisotope practices were for in vitro testing using Phosphorous 32, Iodine 125, and Cobalt 57.

Phosphorous 32:

Was used as an aqueous nucleotide for in vitro diagnostic procedure (Gene-trak) to detect Samonella and was discontinued in August, 1988.

The phosphorous-32 was in the form of an aqeous nucleotide with a maximum allowed possession of 1 millicurie.

Iodine 125:

Was used in prepackaged kits for in vitro diagnostic determination of the vitamin, Folic Acid.

The maximum allowable possession was 200 microcuries.

Iodine 125 has not been used in our facility since May, 1985 and we have discontinued its use.

CONTROL NO. 87980

Cobalt 57:

Was used in prepackaged kits for in vitro diagnostic determination for Vitamin B12.

Cobalt 57 has not been used in our facility since December, 1988 and we have discontinued its use.

On April 26, 1989, the solid radioactive waste consisting of Cobalt 57 was transferred to our Radiation waste storage area with an activity of 4.4 microcuries as calculated from the natural disintegration of that isotope based on the half-life of cobalt 57.

A copy of this information is included.

CLOSE-OUT SURVEY:
---

1) Survey Results:

Wipe Test Using the Beckman Model LS3801 Scintillation counter:

Procedure:

The survey wipe test was conducted on a Beckman Scintillation Counter Model LS3801.

Details on calibration of the Beckman LS3801 is included by the special attached memo "Beckman Conversation Summary"

The wipe test was determined by analyzing 10 cocktail blanks or controls containing scintillation fluid with wipe paper.

This was followed by conducting wipe tests on the specific stations as specified in the close-out survey report attached. The wipe test included the cocktail plus fluid plus the actual wipe.

This process was conducted at the windows specified for the three isotopes (I-125, Co-57, and P-32).

The difference of the cocktail survey wipe minus the blank cocktail represents the net counts per minute for each location surveyed. This net c/m value was then subtracted from the background c/m to give the final net c/m which is listed on the close-out survey for each isotope.

The Beckman Scintillation Counter is not sophisticated or applicable to measuring disintegrations per minute for this exercise.

If this presents a problem with your evaluation we will need a formal detailed procedure from your branch to assist us to satisfy the requirements of data in d/m rather than c/m.

Results of the wipe test close-out survey:

The following is a summary of the wipe test data:

Isotope: Iodine 125

100 cm2 wipes

LOCATION	ACTUAL SURVEY. COCKTAIL WITH WIPE	COCKTAIL CONTAINING WIPE PAPER ONLY	NET c/m Background Corrected
Control or blank	34.22	27.87	6.35
1. Sink	29.87	27.00	-3.48
2. Heating Bath	38.76	35.76	-3.35
3. Work Surface	38.27	32.13	-0.21
4. Centrifuge	33.04	31.09	-4.40
5. Scintillation Counter	33.93	33.27	-5.69
6. Refrigerator Shelf	33.67	29.53	-2.21
7. Disposal Storage	37.36	32.78	-1.77
8. Floor	41.36	32.09	+2.92
9. Charm II.	32.87	31.13	-4.61

Isotope: Cobalt 57

100 cm2 wipes

LOCATION	ACTUAL SURVEY. COCKTAIL WITH WIPE	COCKTAIL CONTAINING WIPE PAPER ONLY	NET c/m Background Corrected
Control or blank	39.20	32.93	6.27
1. Sink	34.64	31.84	-3.47
2. Heating Bath	43.44	40.31	-3.14
3. Work Surface	43.11	36.91	-0.07
4. Centrifuge	37.44	35.78	-4.61
5. Scintillation Counter	38.49	37.93	-5.71
6. Refrigerator Shelf	38.40	34.38	-2.25
7. Disposal Storage	41.91	37.33	-1.69
8. Floor	45.93	36.64	+2.33
9. Charm II.	37.76	35.98	-4.49

Isotope: Phosphorous 32

100 cm2 wipes

LOCATION	ACTUAL SURVEY. COCKTAIL WITH WIPE	COCKTAIL CONTAINING WIPE PAPER ONLY	NET c/m Background Corrected
Control or blank	45.02	38.38	6.64
1. Sink	40.64	37.64	-3.48
2. Heating Bath	49.18	45.31	-3.35
3. Work Surface	47.98	42.29	-0.21
4. Centrifuge	43.24	41.84	-4.40
5. Scintillation Counter	44.64	43.47	-5.69
6. Refrigerator Shelf	43.80	40.44	-2.21
7. Disposal Storage	47.58	43.73	-1.77
8. Floor	51.31	42.49	+2.92
9. Charm II.	42.69	41.62	-4.61

* All dose rates were less than 0.2 c/m as determined by the Ludlum Model 3 Survey meter with the 44-9 pancake detector.

Exposure Rate Measurements using the Ludlum Model 3 with 44-9 Pancake Detector:

* The sink drain as surveyed with the ludlum survey meter contained less than o.20 c/m when surveyed on 8/18/89

* The survey test conducted with the Ludlum survey meter indicated less than 0.2 c/m for ambient for the facility.

* The survey test conducted with the Ludlum survey meter indicated a less than 0.2 c/m for any of the specific locations as identified on the close out survey form.

2) Type of Survey Performed:

Close-out survey for room 10-115-1.:

1) Wipe test with Beckman scintillation counter of the facility with ambient survey and wipe test results keyed to specific locations.

2) Exposure measurement with a Ludlum Survey meter of the facility with the ambient and wipe test results keyed to specific locations.

3) Diagram of the facility with ambient survey and wipe test results keyed to specific locations.

Diagram of the facility with ambient survey and wipe test results are attached.

4) Name and Qualifications (if not previously listed on the license) of the person performing the survey:

Qualifications are listed on the license. But for convenience of the reader they are reinstated as follows:

Frank J. Ebert
Radiation Safety Officer

Corrine B. Hannon
Radiation Supervisor

5) Date the survey was performed:

August 18, 1989.

6) Description of the instrument used for exposure rate measurements and the date it was last calibrated.

Instrument: Ludlum Model 3 Survey Meter(serial number 18517)
with a model #44-9 "pancake" detector (serial # PR5631)

Date of Calibration: June 28, 1989

(Copy of calibration records are attached)

7. Description of the instrument used for the analysis of contamination wipe tests, and the date it was last calibrated.

Instrument: Beckman Liquid Scintillation Counter
Model LS-3801 Serial Number 7014664

Standards used are sealed Carbon-14 and Hydrogen-3 sources for Beta emissions (Beckman catolog #594-946) containing 0.4 microcurie/each, and a sealed Cesium-137 source for Gamma emissions (Beckman catalog #586-165) containing 0.1 microcurie.

Date of Calibration:

1) Calibrated by service representative May 9,1989.

2) Internal calibration conducted on August 18, 1989 by Corrine Hannon

(Copy of calibration records attached)

8) Background readings for the facility.

Ludlum Survey meter: less than 0.20 c/m

Beckman Liquid Scintillation counter using a control wipe:

Iodine 125	6.35 cpm
Cobalt 57	6.27 cpm
Phosphorous 32	6.64 cpm

Frank J. Ebert

cc: SJG
TRC (2)

8270 GM-1A 4-81

General Mills, Inc.

INTRA-COMPANY CORRESPONDENCE

Copy to R. Bowers At JFBTC
M. Harmann JFBTC
T. Smith JFBTC

To F. Ebert At JFBTC

From C. Hannon At JFBTC

Date 1/16/89
CBH/2/89X

Subject **DISCONTINUATION OF P-32 ITEMS ON RADIATION SURVEY REPORTS**

As per our conversation of Wednesday, 1/11/89, we will be discontinuing the inclusion of phosphorus-32 related items on the RIA Lab Radiation Survey reports.

This change is being made because Tom Smith completed the use of this isotope for Salmonella methods investigation late August of 1988. Tom feels he will not be using P-32 again in the foreseeable future.

CBH:on

CONTROL NO. 87980

CONTENTS OF DRUM

AS OF APRIL 26, 1989

4.4 MICROCURIES Co-57

SIGNED Frank J Ebert

RADIATION PROTECTION OFFICER

CONTROL NO. 87980

General Mills, Inc.

INTRA-COMPANY CORRESPONDENCE

Copy to R. Bowers At 3021
F. Hegele 2027
SJG
TRC2

To Frank Ebert At 8-309

From C. Hannon At 10-101

Date 3/26/89
CBH/15/89

Subject **SOLID WASTE STORAGE ACTIVITY PER WING 10, ROOM 10/113 SUMMARY**

Effective February 1989, it was agreed by management to discontinue the use of radioactive isotopes at trace levels for microvitamin analysis.

The waste barrel is currently just under half full.

The following information is obtained from the Receipt and Disposition Records for cobalt 57 per BioRad clinical kits for vitamin B12 analysis of vitamin concentrates and food products.

Iodine 125 information is not included as it had been on previous reports because no iodine 125 for folate analysis has been used since May, 1985.

The data below does not account for any decrease in activity that occurs from the natural disintegration of the isotope based on the half-life of the cobalt 57.

Date Received	Activity Received (in microcuries) Sanitary Sewer	Amount Directly Disposed of in (in microcuries)	Amount Used in Testing (in microcuries)
		Cobalt 57	
5-14-87	6	5.16	0.84
7-24-87	6	4.62	1.38
9-03-87	2	0.76	1.24
12-07-87	2	0.12	1.88
2-10-88	6	1.20	4.80
4-13-88	6	2.76	3.24
5-12-88	2	1.14	0.86
5-19-88	2	2.00	0.00
8-12-88	2	0.00	2.00
8-18-88	2	1.06	0.94
10-13-88	4	0.88	3.12
12-02-88	4	2.36	1.64
Total for cobalt 57	**44**	**22.06**	**21.94**

C. Hannon

CBH:on

CONTROL NO. 87980

OBS	MONTH	DAY	YEAR	TOTAL	DISCHG	TESTAMT
1	5	14	87	6	5.16	0.84
2	7	24	87	6	4.62	1.38
3	9	3	87	2	0.76	1.24
4	12	7	87	2	0.12	1.88
5	2	10	88	6	1.20	4.80
6	4	13	88	6	2.76	3.24
7	5	12	88	2	1.14	0.86
8	5	19	88	2	2.00	0.00
9	8	12	88	2	0.00	2.00
10	8	18	88	2	1.06	0.94
11	10	13	88	4	0.88	3.12
12	12	2	88	4	2.36	1.64

OBS	MONTH	DAY	YEAR	TOTAL	DISCHG	TESTAMT	TDAY	OLDAY	AGE	FACTOR	WASTEDRM
1	5	14	87	6	5.16	0.84	10708	9995	713	0.160408	0.067371
2	7	24	87	6	4.62	1.38	10708	10066	642	0.192473	0.132806
3	9	3	87	2	0.76	1.24	10708	10107	601	0.213832	0.132576
4	12	7	87	2	0.12	1.88	10708	10202	506	0.272877	0.256505
5	2	10	88	6	1.20	4.80	10708	10267	441	0.322420	0.773808
6	4	13	88	6	2.76	3.24	10708	10330	378	0.379007	0.613992
7	5	12	88	2	1.14	0.86	10708	10359	349	0.408294	0.175567
8	5	19	88	2	2.00	0.00	10708	10366	342	0.415696	0.000000
9	8	12	88	2	0.00	2.00	10708	10451	257	0.517041	0.517041
10	8	18	88	2	1.06	0.94	10708	10457	251	0.525065	0.246781
11	10	13	88	4	0.88	3.12	10708	10513	195	0.606227	0.945715
12	12	2	88	4	2.36	1.64	10708	10563	145	0.689239	0.565176

VARIABLE	SUM
TOTAL	44.00000000
DISCHG	22.06000000
TESTAMT	21.94000000
WASTEDRM	4.42733694

CALIBRATION SUCCESSFUL FRI 18 AUG 1989 08:02

BECKMAN MODEL LS-3801

INSTRUMENT CALIBRATION RECORDS

12-21-88 successful [illegible]

1-9-89	Successful	CSH
1-10-89	Successful	CSH
1-11-89	Successful	CSH
1-12-89	successful	CSH
1-17-89	Successful	CSH
1-20-89	Successful	CSH
2-27-89	Successful	CSH
3-7-89	Successful	CSH
3-10-89	Successful	CSH
3-23-89	Successful	CSH
4-10-89	Successful	CSH
1-24-89	Successful	CSH
5-29-89	Successful	CSH
6-16-89	Successful	CSH
6-23-89	Successful	CSH
7-25-89	Successful	CSH
7-26-89	Successful	CSH
8-9-89	Successful	CSH
8-10-89	Successful	CSH
8-14-89	Successful	CSH
8-15-89	Successful	CSH
8-16-89	Successful	CSH
8-17-89	Successful	CSH
8-18-89	Successful	CSH

GENERAL MILLS, INC. - JAMES FORD BELL TECHNICAL CENTER

RADIATION CLOSE-OUT SURVEY

This statement must be completed by an individual authorized to use radioactive materials and reviewed by the Corporate Radiation Officer. It is to be filed by date and retained until the Nuclear Regulatory Commission authorizes its disposition.

Date 8-18-89

Locations RIA Lab

Survey Instrument ~~Ludlum~~ Model 3 with 44-9 Pancake Detector
___ Technical Associates Cutie Pie Model CP44

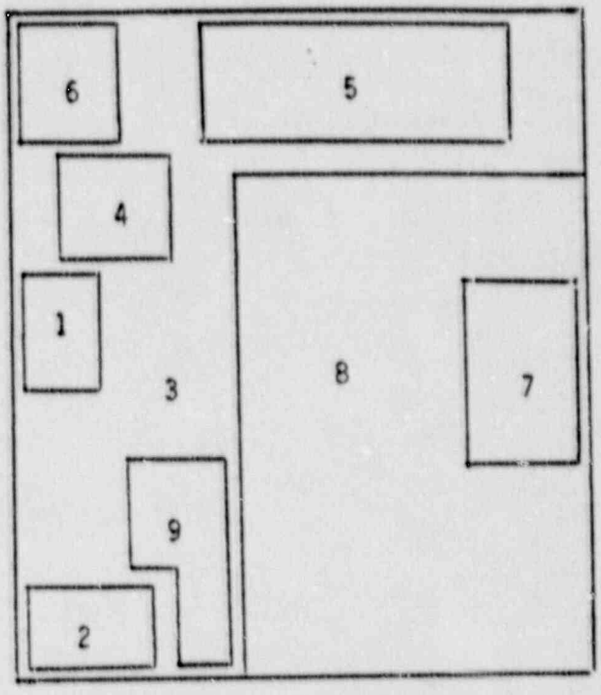
Prepared by [signature]

✓ All Dose Rates <0.2 mr/hr

___ Contamination detected

Remarks

channel 1 set for 0 to 550 window for I 125.



REMOVABLE CONTAMINATION

100 cm^2 wipes

	Location	Net c/m		Location	Net c/m
1.	Sink	-3.48	6.	Refrigerator Shelf	-2.21
2.	Heating bath	-3.35	7.	Disposal Storage	-1.77
3.	Work surface	-0.21	8.	Floor	+2.92
4.	Centrifuge	-4.40	9.	Charm II	-4.61
5.	Scintillation Counter	-5.69	10.		
			11.		
	BACKGROUND VALUE	6.35			

Counter - Beckman LS3801 137 Cs crystal

Calibration Source H3

Reviewed by Fred J. Ebert Date 8/18/89

MRADSUVY

CONTROL NO. 83980

GENERAL MILLS, INC. - JAMES FORD BELL TECHNICAL CENTER

RADIATION CLOSE-OUT SURVEY

This statement must be completed by an individual authorized to use radioactive materials and reviewed by the Corporate Radiation Officer. It is to be filed by date and retained until the Nuclear Regulatory Commission authorizes its disposition.

Date 8-18-89

Locations RIA Lab

Survey Instrument ✓ Tudlum Model 3 with 44-9 Pancake Detector
___ Technical Associates Cutie Pie Model CP44

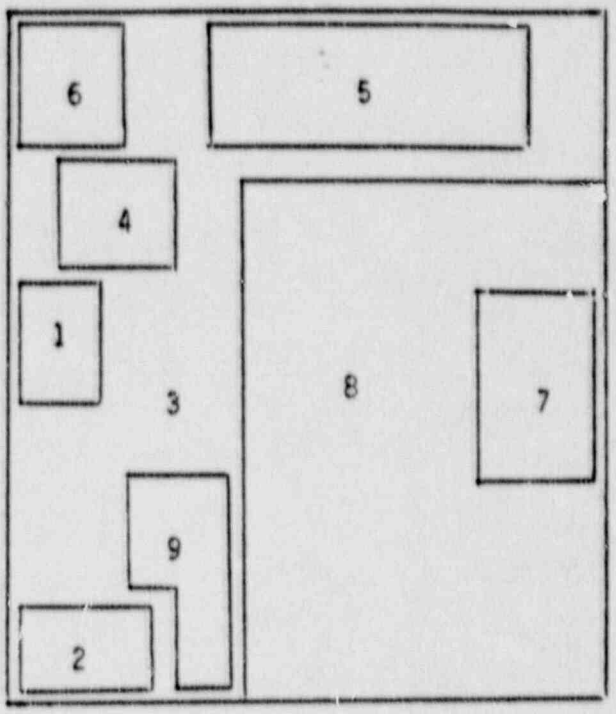
Prepared by CStharan

✓ All Dose Rates <0.2 mr/hr

___ Contamination detected

Remarks

Channel 2 set for 0 to 750
window for Co 57



REMOVABLE CONTAMINATION

100 cm^2 wipes

	Location	Net c/m		Location	Net c/m
1.	Sink	-3.47	6.	Refrigerator Shelf	-2.25
2.	Heating bath	-3.14	7.	Disposal Storage	-1.69
3.	Work surface	-0.07	8.	Floor	+2.33
4.	Centrifuge	-4.61	9.	Charm II	-4.49
5.	Scintillation Counter	-5.71	10.		
			11.		
	BACKGROUND VALUE	6.27			

Counter - Beckman LS3801 137 Cs crystal

Calibration Source H3

Reviewed by Fred J Ebert Date 8/18/89

MRADSUVY

CONTROL NO. 87980

GENERAL MILLS, INC. - JAMES FORD BELL TECHNICAL CENTER

RADIATION CLOSE-OUT SURVEY

This statement must be completed by an individual authorized to use radioactive materials and reviewed by the Corporate Radiation Officer. It is to be filed by date and retained until the Nuclear Regulatory Commission authorizes its disposition.

Date 8-18-89

Locations RIA Lab

Survey Instrument ✓ Ludlum Model 3 with 44-9 Pancake Detector
___ Technical Associates Cutie Pie Model CP44

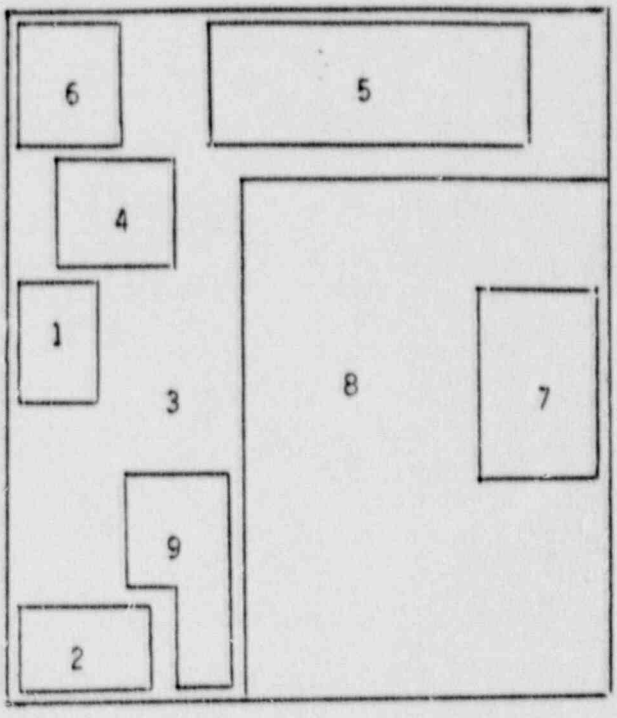
Prepared by C Harrison

✓ All Dose Rates <0.2 mr/hr

___ Contamination detected

Remarks

channel 3 set for 0 to 1000 window for P32.



REMOVABLE CONTAMINATION

100 cm^2 wipes

	Location	Net c/m		Location	Net c/m
1.	Sink	-3.64	6.	Refrigerator Shelf	-3.28
2.	Heating bath	-2.77	7.	Disposal Storage	-2.79
3.	Work surface	-0.95	8.	Floor	+2.18
4.	Centrifuge	-5.24	9.	Charm II	-5.57
5.	Scintillation Counter	-5.47	10.		
			11.		
BACKGROUND VALUE		6.64			

Counter - Beckman LS3801 137 Cs crystal

Calibration Source H3

Reviewed by Frank J Elest Date 8/18/89

MRADSUVY

ACTUAL SURVEY - COCKTAIL WITH WIPE

USER: 2 ID:WIPE TEST PRESET TIME: 45.00 FRI 18 AUG 1989 08:36
SAMPLE REPEAT: 1 CYCLE REPEAT: 1 SCR:N RS232:N
H#: 0 AQC:N QCF:N RCM:Y
RCM-TIME: 0.50 INT: 1.00
CHANNEL 1-LL: 0 UL: 550 2SIGMA: 2.00 BKG SUB:7125 0.00 BKG 2SIG: 0.00 LSR: 0
CHANNEL 2-LL: 0 UL: 750 2SIGMA: 2.00 BKG SUB:6657 0.00 BKG 2SIG: 0.00 LSR: 0
CHANNEL 3-LL: 0 UL:1000 2SIGMA: 2.00 BKG SUB:7332 0.00 BKG 2SIG: 0.00 LSR: 0
DATA CALC: CPM, UNKNOWN REPLICATES: 1 NORM FACTOR:Q 1.00000
HALF LIFE(DAYS):N

SAM	POS	CH	CPM	2SIG%	TIME	EL TIME	RCM%	ERR
1	22- 1	1	34.22	5.10	45.00	46.85	33.61	
		2	39.[illegible]	4.76				
		3	45.02	4.44				
	RCM:	35.08,25.80,22.96,31.15,21.77,25.79,32.16,34.28,24.69,33.61						
2	22- 2	1	29.87	5.46	45.00	93.76	14.51	
		2	34.64	5.07				
		3	40.64	4.68				
	RCM:	35.83,17.09,19.73,19.80,23.20,12.08,14.66,19.85,22.21,14.51						
3	22- 3	1	38.76	4.79	45.00	140.89	22.53	
		2	43.44	4.52				
		3	49.18	4.25				
	RCM:	33.89,67.52,27.95,36.53,31.18,42.61,32.37,34.03,33.98,22.53						
4	22- 4	1	38.27	4.82	45.00	187.98	22.96	
		2	43.11	4.54				
		3	47.98	4.30				
	RCM:	45.52,38.08,29.05,49.97,32.78,41.69,33.04,44.17,28.94,22.96						
5	22- 5	1	33.04	5.19	45.00	235.01	28.73	
		2	37.44	4.87				
		3	43.24	4.53				
	RCM:	31.97,33.00,78.95,20.10,28.46,52.67,29.81,44.92,22.54,28.73						
6	22- 6	1	33.93	5.12	45.00	282.06	17.83	
		2	38.49	4.81				
		3	44.64	4.46				
	RCM:	31.03,25.32,20.45,21.74,19.83,28.30,29.67,36.36,29.60,17.83						
7	22- 7	1	33.67	5.14	45.00	329.07	35.74	
		2	38.40	4.81				
		3	43.80	4.50				
	RCM:	24.39,42.81,26.80,23.84,40.01,32.02,29.10,29.37,24.80,35.74						
8	22- 8	1	37.36	4.88	45.00	376.11	33.72	
		2	41.91	4.61				
		3	47.58	4.32				
	RCM:	40.45,29.91,40.58,33.63,34.91,27.51,38.83,31.16,34.99,33.72						
9	22- 9	1	41.36	4.64	45.00	423.25	34.79	
		2	45.93	4.40				
		3	51.31	4.16				
	RCM:	48.74,71.42,43.99,51.49,55.20,32.22,38.90,23.94,46.81,34.79						
10	22-10	1	32.87	5.20	45.00	470.22	22.19	
		2	37.76	4.85				
		3	42.69	4.56				
	RCM:	30.73,22.35,24.58,25.85,31.75,25.81,29.86,22.03,27.43,22.19						

CONTROL NO. 87980

[signature] 8/18/89

LOCKTAIL CONTAINING WIPE PAPER ONLY

SAM	POS	CH		CPM	2SIG%	TIME	EL TIME	RCM%	ERR
19	28- 1	1	IR5	27.87	5.65	45.00	515.13	14.56	
		2	Co57	32.93	5.20				
		3	P32	38.38	4.81				
	RCM: 30.37, 14.73, 12.80, 25.85, 20.62, 14.61, 14.86, 14.32, 15.17, 14.56								
20	28- 2	1		27.00	5.74	45.00	562.06	18.01	
		2		31.84	5.28				
		3		37.64	4.86				
	RCM: 23.32, 22.37, 13.59, 16.49, 10.67, 18.84, 16.90, 17.02, 15.45, 18.01								
21	28- 3	1		35.76	4.99	45.00	609.14	37.44	
		2		40.31	4.70				
		3		45.31	4.43				
	RCM: 31.51, 32.94, 29.64, 26.28, 28.28, 39.06, 26.28, 30.31, 28.71, 37.44								
22	28- 4	1		32.13	5.26	45.00	656.14	26.21	
		2		36.91	4.91				
		3		42.29	4.58				
	RCM: 35.66, 32.09, 26.13, 42.00, 33.82, 22.77, 26.37, 23.69, 21.14, 26.21								
23	28- 5	1		31.09	5.35	45.00	703.11	21.35	
		2		35.78	4.98				
		3		41.84	4.61				
	RCM: 35.97, 24.16, 18.66, 20.39, 24.40, 23.09, 28.86, 23.51, 27.24, 21.35								
24	28- 6	1		33.27	5.17	45.00	750.10	26.36	
		2		37.93	4.84				
		3		43.47	4.52				
	RCM: 33.85, 32.50, 24.82, 34.76, 24.94, 23.77, 29.35, 37.00, 29.99, 26.36								
25	28- 7	1		29.53	5.49	45.00	797.06	16.57	
		2		34.38	5.08				
		3		40.44	4.69				
	RCM: 42.69, 24.06, 27.10, 18.39, 34.02, 20.02, 21.08, 19.35, 44.35, 16.57								
26	28- 8	1		32.78	5.21	45.00	844.09	27.18	
		2		37.33	4.88				
		3		43.73	4.51				
	RCM: 27.69, 19.19, 22.26, 37.22, 31.14, 33.23, 35.43, 19.82, 37.91, 27.18								
27	28- 9	1		32.09	5.26	45.00	891.08	24.51	
		2		36.64	4.93				
		3		42.49	4.57				
	RCM: 23.08, 28.58, 30.60, 18.13, 16.00, 21.75, 21.93, 13.27, 23.14, 24.51								
28	28-10	1		31.13	5.34	45.00	938.06	16.76	
		2		35.98	4.97				
		3		41.62	4.62				
	RCM: 26.53, 19.59, 24.36, 22.94, 21.09, 24.61, 16.00, 21.33, 19.66, 16.76								

EXHIBIT NO. 87980

Frank J Bent

8/18/89

General Mills, Inc.

INTRA-COMPANY CORRESPONDENCE

Copy to At

To F. Ebert At 8-309

From C. Hannon At 10-101 Date 08/29/89
CBH /38/89

Subject **Beckman Conversation Summary**

This is a summary of the conversation I had with Pete Hansen, of Beckman Instruments, regarding the closeout procedure.

1. The LS3801 is not capable of doing DPMs on backgrounds because:

   * there is/was greater than one (1) isotope used in the RIA lab and one can not do DPMs without specifying an isotope and a level.

   * the background counts are so low the counting efficiency is not as good as is normally encountered during experiments;

   * background is the whole of all backgrounds, inclusive of everything including cosmic radiation as well as the isotopes with which we have worked.

   This was verified by Lance Artel (Beckman Application, Fullerton, CA).

2. He suggested we copy the DPM section of the book and submit it with our statement about our scintillation counter not being capable of doing backgrounds in DPMs.

3. Our set of calibration tubes includes three (3) vials; C14, H3 and background. Each of these vials contains a standard medium (toluene) which has been argon-purged-perfect. Even air can affect the machine's efficiency.

   The calibration is a check of the ability of the machine to excite and count this "perfect" vial. The counting efficiency should 100% (or an "H number" of zero) or the calibration would not be successful. The calibration does not and can not differentiate between the vials spiked with C14, H3 or nothing.

   The calibration counting is done on a zero (0) to 560 window. This window encompasses the Compton edge (see attached, section 5.2.1).

4. Pete still suggested counting the one (1) vial ten (10) times for the statistics before performing the wipe test. He still recommended we conduct this work with the three (3) windows where we were working, i.e. 0-550 for I125, 0-750 for Co57, and 0-1000 for P32.

C. Hannon

cc:

CONTROL NO. 87950

Section 10

Disintegrations Per Minute (DPM)

10.1 INTRODUCTION

While the Counts per Minute (CPM) program provides a measure of the rate of activity as observed by the instrument, the Disintegrations per Minute (DPM) program provides a measure of the rate of absolute activity taking place within the sample. DPM is a standard routine on the LS 3801 and 5801, and an option on the LS 1801.

When investigators use cpm data, they are assuming that the counting efficiency of all samples is the same. In practice, however, counting efficiency is affected by a wide range of factors — choice of liquid scintillation cocktail, amount of cocktail, sample type, amount of sample, trace impurities or quenching agents, size and type of vial, among others. The use of DPM makes the experiment independent of these factors.

On the Beckman Liquid Scintillation systems (LS 1801 and 3801), one program is available for converting results to DPM in single-label experiments, and another for dual-label experiments.

On disk-drive systems (LS 5801), the DPM programs are more elaborate. Where appropriate, they are treated separately in the following discussions. In addition, the disk programs include a triple-label DPM routine.

The discussion of theory in this chapter presumes an understanding of quench, quench monitoring, quench correction, counting efficiency, AQC, and related topics. If you are not already familiar with these topics, you will find them discussed in Section 1.7 and Section 5.

10.2 ESTABLISHING QUENCH CURVES

Prior to performing DPM calculations (single, dual, or triple label), the instrument must be provided with quench curves relating counting efficiency to H# for the isotope(s) being used. The accuracy of a standard quench curve is essential for accurate DPM results. Since the Beckman LS counter will store quench curves indefinitely, it is important to take the time to prepare an accurate one. Standard sets are available from Beckman for ^{3}H and ^{14}C (see Appendix 7). If you wish to prepare your own quench set, review the following guidelines:

1. A set of standards consists of at least five and no more than 20 standards.
2. Each standard should have ideally the same type of cocktail and the same volume of cocktail as the unknowns. H# is independent of cocktail volume effects.
3. Add the same known dpm of the isotope being used in the experiment to each standard. There are calibrated sources such as ^{3}H water and ^{14}C toluene commercially available. These are accurate to ± 3% or 4% of the stated dpm.
4. Check the cpm of each vial to insure reproducible pipetting. The cpm in each vial should be the same within counting statistics and allowable pipetting error.
5. Add quenching agent to each standard in increasing amounts. Make sure the quench range of the standards covers the full quench range expected in the experimental samples. There is some question over what should be used for the quenching agent. Ideally, it should be the same material that will be the quenching agent in the unknowns. However, nitroethane or nitromethane are commonly used, and produce quench curves identical to most quenching agents found in experiments.

The standards are counted by the instrument and used to store a quench curve. This is done by using the H# and CPM of each standard. The counting efficiency of each standard is calculated from the known dpm added to the standard and the cpm recorded by the instrument.

$$\% \text{ Efficiency} = \frac{\text{CPM}}{\text{DPM}} \times 100$$

A plot of Efficiency vs. H# gives a graphic quench curve as shown in Figure 10-1. The LS counter stores a mathematical representation of this curve and automatically calculates dpm. DPM can be calculated for the unknowns manually from the quench curve as follows:

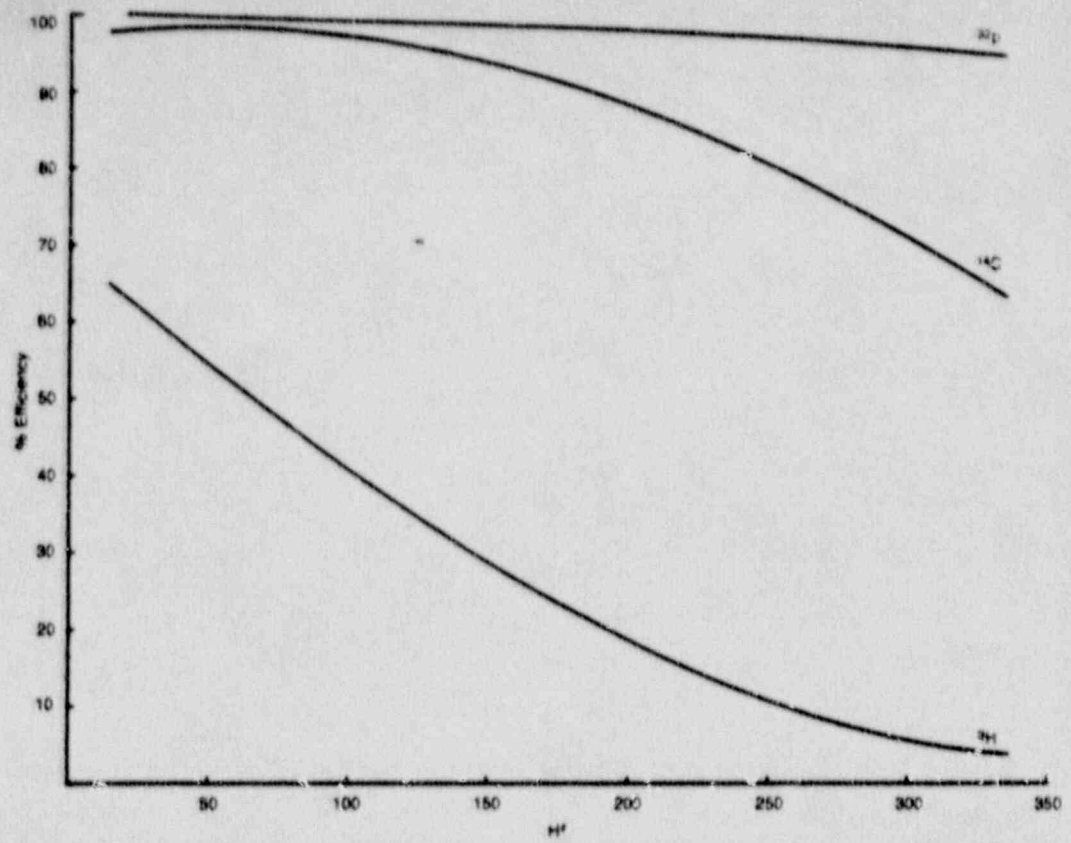


Figure 10-1. Quench Curves for Three Common Radioisotopes

1. Count the unknowns. The counter prints out the cpm and H#.
2. Find the H# of the unknown on the X-axis of the quench curve.
3. Draw a vertical line from the H# to the curve and then horizontally from the curve to the Y-Axis.
4. Read off the efficiency from the Y-Axis.
5. Calculate the DPM for each unknown from the cpm and counting efficiency:

$$DPM = \frac{CPM}{Efficiency}$$

From this point on the DPM programs in the LS 1801/3801 and LS 5801 will be discussed separately because of the differences in capabilities, setup, printout and calculations.

10.3 SINGLE LABEL DPM (LS 1801/3801)

10.3.1 Setting Up The DPM Program

The single label DPM program is set up under DATA CALC 5 in the user file. The DPM program on the 1801 and 3801 are identical except for the following:

1801—The questions for setting up the DPM program are printed on the printer one at a time.

3801—The questions are displayed on the CRT and the are selected and edited by using the cursor.

Figure 10-2 shows the question order as presented on the printer of the 1801. On the left side of Figure 10-2 are the questions asked, and on the right side is an explanation of each of the questions. Note that on the 1801, when a question is answered through the keyboard, the response is also printed out so that you can verify the entry. The explanation of the questions is the same for both the 1801 and 3801. Figure 10-3 is the CRT display for the 3801 Single Label DPM program. There are two items displayed on this screen that are not shown in Figure 10-2. These are QUENCH COEFFICIENTS AND QUENCH LIMITS. If no DPM program is stored, the coefficients are all 0 and the quench limits are 0 and 1000 (default values). After quench standards are counted, the quench coefficients and quench limits will automatically be calculated and displayed on the CRT or printed out on the 1801 printer.

10.3.2 Setting Up The User File

The quench curve you store will determine the accuracy of all the DPM answers you get from this program. It is therefore recommended that you set up rigerous counting conditions for the standards. These can be relaxed for the unknowns as you see fit. Count the samples long enough to reach a 0.5% to 1% 2sigma statistical limit (160,000 to 40,000 total counts). Turn AQC on and take multiple H#'s (3). Channel one must be used for counting the isotope in this program. RCM, if available, should be used.

Section 5

H Number and Automatic Quench Compensation (AQC)

5.1 INTRODUCTION

The problems arising from counting errors due to quench have traditionally been one of the greatest drawbacks to users of liquid scintillation instruments. This hurdle was finally overcome with a new approach to the measurement of quench, developed in the laboratories of Beckman Instruments in the 1970's, principally by Dr. Donald Horrocks, after whom the technique is named. That technique is the "H Number."

In addition to providing an accurate and consistent method of measuring quench that is independent of the sample, type of vial, or volume of cocktail, using the H# approach gives rise to another significant advantage. It permits highly accurate compensation for the effects of quench.

5.2 H NUMBER

5.2.1 The Compton Spectrum

Several different methods of measuring quench are used in modern LS counters. All of the so-called "external" quench monitoring methods rely on the analysis of a specific region (or regions) of a "Compton spectrum."

To obtain the Compton spectrum, a gamma-emitting isotope (in this instrument, ^{137}Cs) is positioned near the sample vial while it is in the counting chamber of the instrument. Interaction of the gamma rays from the ^{137}Cs with the solvent of the cocktail (Figure 5-1) results in the production of Compton electrons. These interact with the cocktail in the same way as beta particles from a sample.

The pulse-height spectrum obtained by counting the sample in the presence of ^{137}Cs is the Compton spectrum (Figure 5-2). Note from the figure that quench affects the Compton spectrum in a fashion analogous to the beta spectrum of the sample alone. The amount of quench in a sample can be determined by analyzing the position of the Compton edge (CE in Figure 5-2). Before this is done, any counts from the sample are subtracted to give just the Compton spectrum. In the Beckman LS instruments, quench is monitored by the "H Number" method.

5.2.2 Calculation of H#

The ^{137}Cs Compton spectrum is used to calculate the H#. The H# is the difference between a point on the

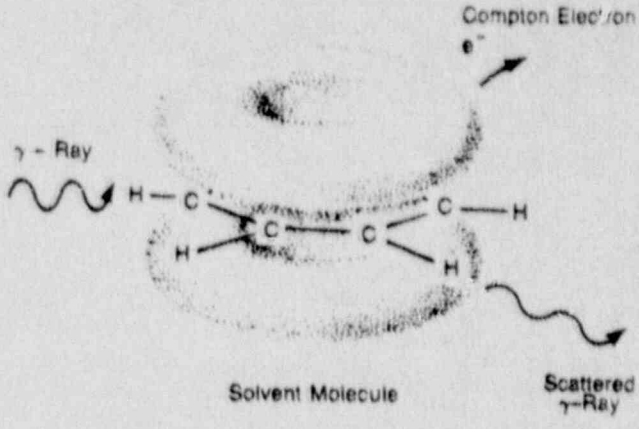


Figure 5-1. Gamma Rays Interaction with Solvent Molecules

Compton spectrum of an unquenched standard (calibration point) compared to a point on the Compton spectrum for the unknown sample being analyzed. The particular point on the spectrum used for this calculation is called the inflection point of the Compton edge (See Figure 5-2). The inflection point is approximately midway on the high energy portion on the spectrum called the Compton edge (where the first derivitive goes through zero). When the LS counter is calibrated (Section 2.7) an unquenched standard is used to establish the position (in channel number) of the inflection point of the Compton spectrum. This number (about 830) is stored in the instrument memory. This point is shown in Figure 5-2 (CEuq, Compton edge--unquenched). The following events occur when the H# for an unknown is to be calculated:

1. The sample is moved into the counting chamber.
2. The ^{137}Cs source (called a "pea") is moved out of the protective lead container to a position near the sample in the counting chamber. There is no direct contact with the ^{137}Cs pea. The gamma rays penetrate through the counting chamber and into the vial to produce the Compton spectrum.

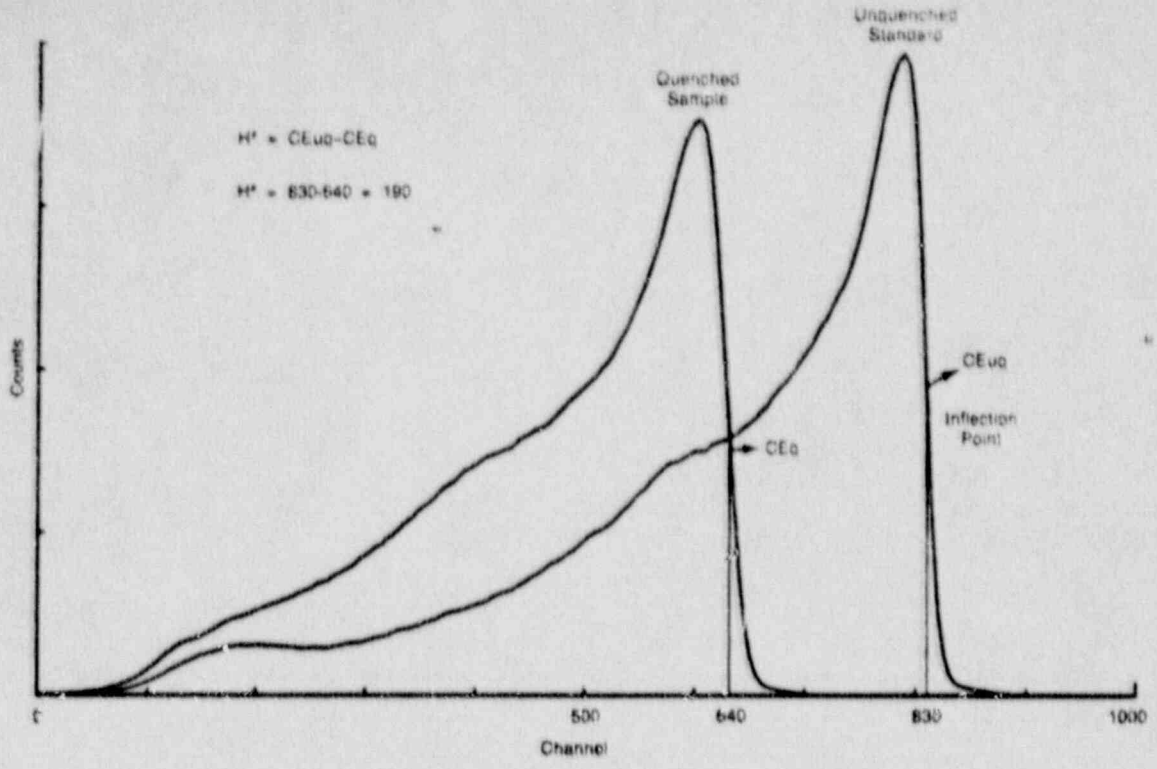


Figure 5-2. The ^{137}Cs Compton Spectra for H# Determination

3. The counts in the unknown plus the counts in the Compton spectrum are recorded for a short period of time (6 seconds for 10 mL of cocktails).
4. The ^{137}Cs pea is moved back into the lead container.
5. The unknown sample is counted alone without the ^{137}Cs.
6. The unknown sample spectrum is subtracted from the spectrum of the unknown plus ^{137}Cs to obtain a pure ^{137}Cs spectrum.
7. The position of the inflection point (in channel number) of the unknown is calculated (Figure 5-2, CEq, Compton edge-quenched).
8. The H# is the difference between the unquenched (stored in memory) and quenched inflection points: H# = CEuq – CEq.

5.3 AUTOMATIC QUENCH COMPENSATION (AQC)

5.3.1 AQC In Single-Label Counting

As pointed out in the earlier discussion (Section 1.7.2), the effect of quench is to shift the pulse height spectrum to lower channel numbers.

This shifting of the spectrum creates a difficulty with regard to the setting of the Channel Parameters. Consider a ^{14}C channel set from 400 to 670 (^{14}C above ^{3}H channel). The counts that will be observed by the instrument vary considerably, depending on the quench of a particular sample: the greater the quench, the smaller the portion of the curve that lies within the channel.

Automatic Quench Compensation is provided as a way of overcoming this difficulty. When AQC is in use, the channel upper and lower limits are automatically adjusted by an amount determined by the H#. Figure 5-3 depicts a situation in which the channel limits are set at 400 and 670. With little quench, this gives a counting efficiency of 77% (5-3A). With an H# of 200, the spectrum is shifted to lower channels. Now the efficiency is down to 16% (5-3B). The AQC feature automatically adjusts the channel limits by a like amount, making them 200 and 470. Thus, the sample is counted with window settings that allow maximum counting efficiency (68%, Figure 5-3C). AQC cannot recover events that are quenched below detectability. AQC adjusts the counting windows to optimum settings.

AQC is also useful in low activity counting. Adjusting the window based on quench reduces the background counts without reducing sample counts.

5.3.2 AQC In Dual-Label Counting

In dual- and triple-label counting, there is always some "spill" of the higher-energy isotopes into the counting windows of the lower-energy isotopes and vice versa. Since ^{3}H and ^{14}C are common isotopes, these will be used as examples.

When analyzing dual-label samples, the instrument must be able to correct the ^{14}C spill in order to obtain accurate ^{3}H dpm results. The Beckman 5801 Series LS counters will perform this correction automatically and print out the ^{3}H and ^{14}C dpm. A statistical problem when correcting for the ^{14}C spill is that with even moderately

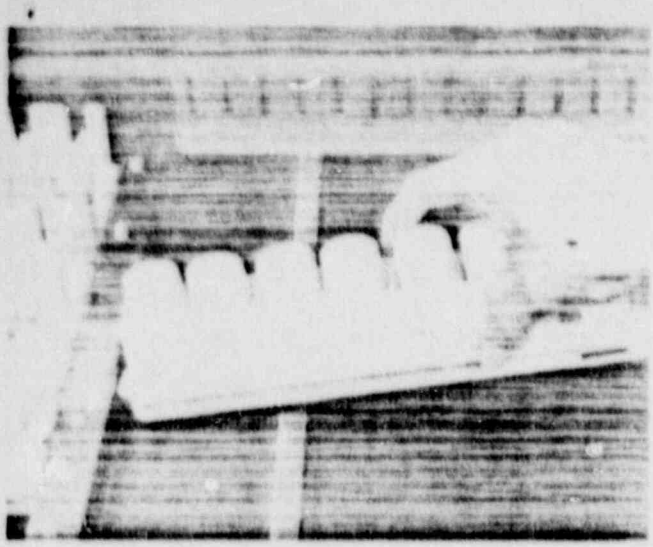


Figure 2-7. Placing a Rack in Sample Changer

2.7 CALIBRATING

Calibration is done to assure that a given window setting for an isotope really covers the energy spectrum for that isotope. The inflection point of the Compton edge of ^{137}Cs has a known, fixed energy in an unquenched solution of 478 keV. In the calibration routine the instrument adjusts itself so that the 478 keV beta falls in the correct channel (835).

The system incorporates a self-calibration feature, based on using the unquenched calibration standard of ^{3}H provided by Beckman. Section 5.2 explains the Compton spectrum. To set up the system for calibration, place the sealed, unquenched ^{3}H standard in the #1 position of the rack on which you have mounted the CALIBRATION card. It is convenient to use this same rack for storing the other two sealed samples provided. Place the ^{14}C calibration standard in position #2, and the sealed background vial in position #3.

As previously mentioned, Beckman recommends that you leave this calibration rack in the instrument. Even though the system will seldom require calibration, leaving the rack in place provides you the assurance that regular calibrations are being performed.

2.7.1 Auto Calibration

If you install the AUTO CALIBRATE card on the rack, the system will perform a calibration using the first sample on that rack. No other samples in the rack will be processed. After calibration, the system searches for the next rack with a User Number card or Halt card.

2.7.2 Manual Calibration

With the rack in position to be read, press the SPECIAL PROG key. A display of special programs appears, one line of which reads:

5 CALIBRATION

Press numeral "5," and RETURN.
The system now displays:

SYSTEM CALIBRATION
USE UNQUENCHED STD, PRESS MANUAL COUNT

When you press the manual count key, the instrument will load the first vial, count it, and then make internal gain corrections as needed. (Note that the system accepts the first vial as containing the standard; be certain the standard is not preceded by any other vials.)

2.7.3 Calibration Results

After calibrating, the system will display CALIBRATION SUCCESSFUL, followed by the day, date, and time of calibration.

Should the display report that calibration was unsuccessful, check to be sure the first vial contains the ^{3}H standard, and that the vial is not damaged. Press MANUAL COUNT to recalibrate. If the instrument should be unable to calibrate successfully after three attempts, call your Beckman Service Representative.

2.7.4 When Calibration Should be Done

The instrument should be calibrated daily for the first week or two until the phototubes settle in. To check this you could do the following:

1. Calibrate the instrument with the unquenched ^{3}H standard.
2. Set up a User Number to do an H#.
3. Determine and Record the H# of the ^{3}H standard.
4. At some later time, check the H# of the ^{3}H standard. If it has changed by more than plus or minus 4, recalibrate.

After the initial warmup, a monthly calibration is more than sufficient. Calibration should also be performed prior to setting up any program with standard curves or stored standards such as DPM, digital integration or RIA. Also calibrate before determining window settings through Spectrum Search and Spectrum Analysis.

GENERAL MILLS, INC. - JAMES FORD BELL TECHNICAL CENTER
MONTHLY RADIATION SURVEY REPORT

This statement must be completed by an individual authorized to use radioactive materials and reviewed by the Corporate Radiation Officer. It is to be filed by date and retained until the Nuclear Regulatory Commission authorizes its disposition.

Date_____

Locations_____

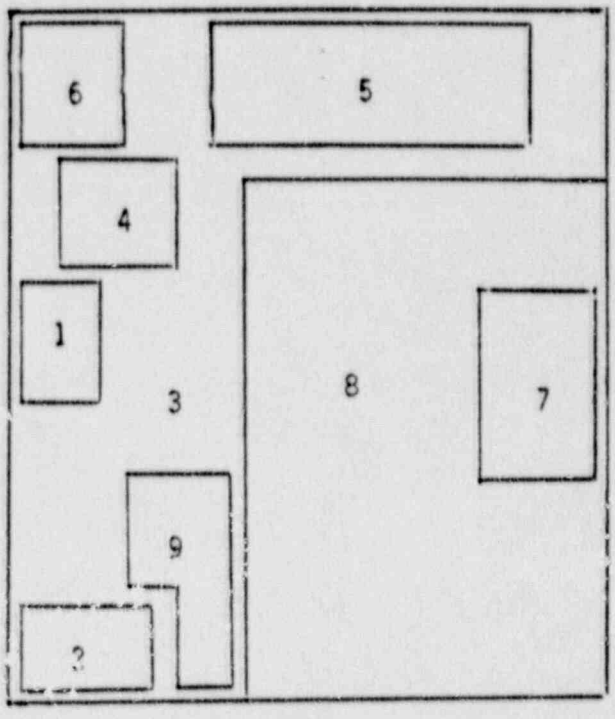
Survey Instrument___Ludlum Model 3 with 44-9 Pancake Detector
___Technical Associates Cutie Pie Model CP44

Prepared by _____

___ All Dose Rates <0.2 mr/hr _____

___ Contamination detected_____

Remarks _____



REMOVABLE CONTAMINATION

100 cm^2 wipes

	Location	Net c/m		Location	Net c/m
1.	Sink		6.	Refrigerator Shelf	
2.	Heating bath		7.	Disposal Storage	
3.	Work surface		8.	Floor	
4.	Centrifuge		9.	Charm II	
5.	Scintillation Counter		10.		
			11.		

BACKGROUND VALUE _____

Counter - Beckman LS3801 137 Cs crystal

Calibration Source H3

Reviewed by _____ Date _____

MRADSUVY

General Mills, Inc.
James Ford Bell Technical Center

9000 Plymouth Avenue North
Minneapolis, Minnesota 55427

CBH /30/89

June 19, 1989

Mr. Bill Norred
Ludlum Measurements, Inc.
501 Oak Street
Sweetwater, Tx
79556

Dear Mr. Norred:

Enclosed please find one Ludlum survey meter, (serial number 18517), with a model 44-9 "pancake" detector, (serial number PR5631). It is being submitted to you for required semi-annual calibration.

Please use the following purchase order number for billing purposes:

RD-103629-D-2

When returning the instrument please send it to me directly at the address listed below. We will need a copy of the calibration certificate and the conversion chart for our records to be included with the instrument.

Corky Hannon
General Mills, Inc.
James Ford Bell Technical Center
9000 Plymouth Avenue
Minneapolis, Mn.
55427

Room 10-101

I appreciate your help on this matter.

Sincerely,

C. Hannon
Research Microbiologist

cc: [redacted]
R. Bowers 3021

CONTROL NO. 87980

DESIGNER AND MANUFACTURER OF
Scientific and Industrial Instruments

LUDLUM MEASUREMENTS, INC.
915 • 235-5494 - 235-4947 TELEX No. 006852 UD
POST OFFICE BOX 810
501 OAK STREET
SWEETWATER, TEXAS, U. S. A. 79556

CONVERSION CHART

CUSTOMER: General Mills, Inc. Date 6-28-89

Order No. 147444 Model No. 3 S/N 18517

Source Cs 137 Detector Model 44-9 S/N PR 5631

Size 150 mci H. V.: 900v

Reference Point	Dial	Range/Scale
200 mR/hr	1.9 K	X 100
150 "	1.65 K	"
100 "	1.35 K	"
50 "	.9 K	"
25 "	.55 K	"
15 "	3 K	X 10
5 "	1.2 K	"
2 "	4.2 K	X 1
1 "	2.2 K	"

Form 27

LUDLUM MEASUREMENTS, INC.

WORK ORDER No. 147444

Customer Name Bemis Mills, Inc Condition Received good

Address 9000 Plymouth Ave North Minneapolis, Mn 55427

Special Instructions ☐ YES ☐ Call customer with Est. ☑ Other 6 mo cal

1. Mod. No. 3 S/N 18517 4. Mod. No. ____ S/N ____ 7. Mod. No. ____ S/N ____

2. Mod. No. 44-9 S/N 5631 5. Mod. No. ____ S/N ____ 8. Mod. No. ____ S/N ____

3. Mod. No. ____ S/N ____ 6. Mod. No. ____ S/N ____ 9. Mod. No. ____ S/N ____

ITEM	PART NO.	DESCRIPTION	AMOUNT	PRICE/EA.	COST

Total Parts Cost ____

REMARKS:

Number Calibrated 1 No. of Probes 1 30.00

Labor ____ hr (s) at $ ____ per hour ____

Sub Total 30.00

Shipping Charges ____

TOTAL CHARGES ____

Signed Debby Kilmore Date 6-28-89

Q/C Released [signature] Date 6-25-89

Date 7/05 Contacted ____ Phone No. ____

P O No. ____ By ____

Form 15

CONTROL NO. 879

CERTIFICATE OF CALIBRATION

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 FAX NO. (915) 235-4672
501 OAK STREET TELEX No. 466832 UD
SWEETWATER, TEXAS, U.S.A. PH. 915-235-5494

CUSTOMER General Mills Inc. ORDER NO. 142444

Mfg. Ludlum Model 3 Serial No. 18517

Mfg. Ludlum Det. Model 44-9 Serial No. PR 3631

Cal. Date 6-28-87 Cal. Due Date 12-28-87 Cal. Interval 6 mo METERFACE

Check mark (✓) applies to applicable instr. and/or detector IAW mfg. spec, s. ☐ New Instrument

☐ Det. (Alpha) Bkgnd. cpm ☑ Det. Oper. V 900 V at .25 MV

T 80 °F RH 53 % Alt. 22.26 Cm Hg ☑ F/S Resp. ck ☑ Zero Reset ck. ☑ Audio ck. ☑ Meter Zeroed

☑ Bat. ck. (Min. Volt) 2.2 VDC ☐ Bat. Volt VDC Instrument Volt Set 900 V

☐ Threshold Dial Input Sens. .25 mV. ☐ Input Sens Linearity

☐ HV Readout (2 points) Ref./Inst. / V Ref./Inst. / V

☐ Alarm Setting ck. ☐ Window Operation ☐ Background subtract ☑ Mechanical ck.

Repair Instrument Received: ☑ Within Toler. + -10% ☐ 10-20% ☐ Out Toler. ☐ Requiring Repair

COMMENTS:

Gamma Calibration: GM detectors positioned perpendicular to source except for M. 44-9 in which the back of probe faces source.

RANGE MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT METER READING	INSTRUMENT REC'D "AS FOUND READING"
X 100	400 K cpm	4 K	4 K
X "	100 "	1 K	1 K
X 10	40 "	4 K	4 K
X "	10 "	1 K	1 K
X 1	4 "	4 K	4 K
X "	1 "	1 K	1 K
X 0.1	400 cpm	4 K	4 K
X "	100	1.2	1 K
X			
X			
X			

all Range(s) Calibrated Electronically

	Reference Cal. Point	Instrument Meter Reading	"As Found Reading"
Digital Readout	/ / / / /	/ / / / /	/ / / / /
Log Scale	/ / / / /	/ / / / /	/ / / / /

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Bureau of Standards, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants, or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of MIL-STD-45662A and ANSI N323-1978.

☑ Cs137 Gamma s/n 1162 ☐ Neutron Am-241 Be s/n T-304 State of Texas Calibration License No. LO-1965

☐ Alpha s/n ☐ Beta s/n ☐ Other

☑ M-500 s/n 13672 ☐ Oscilloscope s/n ☐ Multimeter s/n

Calibrated By: Debbie Gibson Date 6-28-87

Reviewed By: Date 2-5-88

Form 22 — 5/85

CALIBRATION NO. 87020

CUSTOMER

Sheet 1 Of 1

BECKMAN

BECKMAN INSTRUMENTS, INC

FIELD SERVICE REPORT

FSR No. 1761-3173 | District 1173 | Engineer Name TERRY G. HANSON | Bio Haz | Div/Op | Call No. | Instrument Model—Serial No. (5-3801 — 7019464) | Call Date/Hour 5/9/89 11:00 | Dispatch | Date Rec'd

Institution Name Control Data | City GOLDEN VALLEY | State MN | Alert | C.R. | Accessory Model — Serial No. — | Instrument Up Date/Hr 5/9/89 13:30

User | Department | Old Drive Sits | Cur. Counter | Prior Counter | Revolutions | Rate Direction | Charge Code 05 | Responsible Part

Debit Account — — | Mgr. Approval | Call Complete: ☐ Yes ☐ No ☐ Parts Only ☐ Phone Repair | Call Back Reason: ☐ Chemistry/Applications ☐ Parts ☐ Recurring Problems ☐ Ship Damage ☐ Short Ship ☐ Error

DESCRIPTION	✓	Part Number	Trans Code	Labor Hrs	Travel Hrs	Tax Code	Part Qty	Hrly Rate/ Unit Price	AMOUNT
LABOR			07	2.5	1.0			130.00	N/C
ELEV. TIP		594715	01				1		
PM CH 2 ROUTINE SERVICE									
3H = 65%									
I.C. = 97%									
UNDERWIND = 18 = 0-400									
22 0-670									
30 0-1000									
Systems Check OK.									

Purchase Order | Tax Amt. | 81 | — | — | Total From Addendum | Total Net | Tax Rate % | Sales Tax | INVOICE AMOUNT

Does Inst. Qualify for Agreement? ☐ Yes ☐ No | Customer Signature | Telephone and Extension

FORM #03373-15 PRINTED IN U.S.A.

5.9.89	Beckman personnel in for preventive maintenance work (Pete Hansen was the Beckman rep.)

BECKMAN MODEL LS-3801

INSTRUMENT CALIBRATION RECORDS

12-21-88	successful	
1-9-89	successful	
1-2-89	successful	
1-11-89	successful	
1-12-89	successful	
1-27-89	successful	
1-20-89	successful	
2-27-89	successful	
3-7-89	successful	
3-10-89	successful	
3-23-89	successful	
4-10-89	successful	
1-24-89	successful	
5-29-89	successful	
6-16-89	successful	
6-23-89	successful	
7-25-89	successful	
7-26-89	successful	

CONTROL NO. 879 0