LAMPIRAN I

PERHITUNGAN AKTIVITAS RADIONUKLIDA YANG TERDAPAT DALAM MASING-MASING SAMPEL.

Untuk menghitung aktivitas radionuklida yang terdapat dalam suatu sampel biasanya digunakan rumus :

$$A_t = A_o \, e^{-\frac{0,693}{t_{1/2}} t}$$

dimana A_t = aktivitas pada saat diukur sekarang ini

A_o = aktivitas pada saat dilakukan pengukuran pertama kali (sesuai sertifikat)

$t_{1/2}$ = waktu paro

t = waktu peluruhan

Perlu diketahui bahwa aktivitas pada sertifikat yang dikeluarkan oleh IAEA mempunyai satuan Bq/Kg atau dps/Kg sedangkan pada pengukuran saat ini dicacah dalam satuan Bq/gr, sehingga perlu adanya koreksi terhadap satuan berat cuplikan. Adapun contoh perhitungan untuk aktivitas A_t adalah sebagai berikut :

Untuk cuplikan IAEA - 156 (Percob. I)

Diambil salah satu radionuklida yaitu Cs-137

A_o = 264 Bq/Kg

t = waktu peluruhan dari tanggal 1 Agustus 1986 sampai tanggal 11 Februari 1996

= 9 tahun 194 hari

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= 3481,16 hari (1 tahun = 365,24 hari)

$t_{1/2}$= 30,17 tahun = 11019,29 hari

sehingga :

$$A_t = 254\ e^{-\frac{0,693}{11019,29}\ 3481,16}$$

$$= 212,09\ Bq/kg$$

Koreksi beratnya sebagai adalah sebagai berikut : Pada pengukuran ini digunakan cuplikan IAEA-156 dengan berat 31,9878 gram,maka aktivitas pada Cs-137 adalah :

$$A_t = \frac{31,9878}{1000} \times 212,09$$

$$= 6,78\ Bq/gr$$

Simpangan relatif dari aktivitas diambil dari *Convidence interval* unsur Cs-137, yaitu :

$$S\ (A_t) = \frac{274 - 254}{274}$$

$$= 0,0729 \quad = 7,29\ \%$$

Dengan cara yang sama seperti di atas maka kita dapat menghitung radionuklida yang lain yang terdapat dalam sampel IAEA-156 dan IAEA-373.

Proses perhitungan selanjutnya adalah menghitung harga aktivitas dari radionuklida yang terdapat dalam masing-masing sampel yaitu dengan cara sampel yang pertama sebagai standart (sudah diketahui harga aktivitasnya) kemudian dipakai untuk menghitung sampel kedua yang terukur atau sebaliknya. Dalam perhitungan ini menggunakan cara

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relatif (membandingkan dengan aktivitas radionuklida yang sudah diketahui harganya) yaitu dengan rumus :

$$\frac{X_1}{A_1} = \frac{X_2}{A_2}$$

X_1 = cacah atau area radionuklida standart

X_2 = cacah atau area radionuklida yang dicari

A_1 = aktivitas radionuklida standart

A_2 = aktivitas radionuklida yang dicari

Perlu diketahui bahwa cacah atau area radionuklida adalah cacah bersihnya, sehingga berlaku rumus (2-16) yaitu :

$$C = G - B$$

Dimana C : Cacah bersih

G : Cacah kotor

B : Cacah *Background*

Sebagai contoh kita menghitung harga aktivitas Cs-137 dalam sampel 373S dengan sampel 156S sebagai standart.

X_1 = area dari Cs-137 dikurangi area blank (*Background*)

= 8324 - 0

X_2 = area dari Cs-137 dikurangi area blank (*Background*)

= 387232 - 0

A_1 = harga aktivitas dari Cs-137 dalam sampel 156, yaitu 212,09 Bq/kg. Sehingga :

$$A_2 = \frac{(387232 - 0) \times 212,09}{(8324 - 0)}$$

= 9871,15 Bq/kg.

Sedangkan untuk ralat relatif dari aktivitas (S A1

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dan S A_2) adalah :

S A_1 dicari dari *confidence interval* yang ada pada sertifikat. Sedangkan S A_2 dicari dengan cara sebagai berikut :

$$A_2 = \frac{X_2}{X_1} A_1$$

$$\partial A_2 = \sqrt{\left(\frac{\delta A_2}{\delta X_1} \partial X_1\right)^2 + \left(\frac{\delta A_2}{\delta X_2} \partial X_2\right)^2 + \left(\frac{\delta A_2}{\delta A_1} \partial A_1\right)^2}$$

$$= \sqrt{\frac{X_2^2 \, A_1^2 \, \partial X_1^2}{X_1^4} + \frac{A_1^2 \, \partial X_2^2}{X_1^2} + \frac{X_1^2 \, \partial A_1^2}{X_1^2}}$$

dimana ∂X_1 dan ∂X_2 adalah ralat atau simpangan baku dari cacah atau area (dapat dilihat pada data pengukuran). Sehingga ralat relatifnya adalah :

$$S\ A_2 = \frac{\partial A_2}{A_2}$$

$$= \sqrt{\frac{\partial X_1^2}{X_1^2} + \frac{\partial X_2^2}{X_2^2} + \frac{\partial A_1^2}{A_1^2}}$$

$$= \sqrt{S\ X_1^2 + S\ X_2^2 + S\ A_1^2}$$

dimana S X_2 = ralat relatif dari cacah cuplikan yang dibandingkan.

S X_1 = ralat relatif dari radionuklida

S A_1 = ralat relatif aktivitas radionuklida

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LAMPIRAN II

DATA PENCACAHAN SAMPEL IAEA-373

DAN IAEA-156

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CALIB DATE:  00-JAN-00 00:00:00     * ENERGY TOLERANCE:     1.250 KEV
KEV/CHNL:        .2154410           * HALF LIFE RATIO:      8.00
OFFSET:        40.2304600 KEV       * ABUNDANCE LIMIT:      80.00%
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ENERGY WINDOW 40.45 TO 1805.12

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FI
1	0	240.72	193.	1029.	.33	930.62	922	15	2.33E-03	31.8	
2	0	353.01	210.	464.	.83	1451.80	1447	12	2.54E-03	19.7	
3	0	511.32	1238.	795.	2.40	2186.63	2170	35	1.50E-02	6.9	
4	0	583.36	137.	310.	1.21	2521.01	2512	17	1.66E-03	27.1	
5	0	604.45	262.	369.	1.24	2618.92	2612	21	3.16E-03	17.0	
6	0	608.86	180.	455.	1.22	2639.36	2632	25	2.17E-03	28.3	
7	0	661.41	8374.	444.	1.29	2883.30	2867	31	1.01E-01	1.3	
8	0	794.42	252.	210.	1.85	3500.69	3485	28	3.04E-03	14.8	
9	0	1456.52	2301.	132.	1.81	6573.92	6557	34	2.78E-02	2.4	
10	0	1758.13	106.	63.	1.80	7973.85	7957	30	1.27E-03	16.0	

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ELAPSED LIVE TIME:     82800. SEC   * NBR ITERATIONS:     10.
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DETECTOR:            * LIBRARY:
CALIB DATE:   00-JAN-00 00:00:00    * ENERGY TOLERANCE:   1.250 KEV
KEV/CHNL:          .2154410         * HALF LIFE RATIO:    8.00
OFFSET:          40.2304600 KEV     * ABUNDANCE LIMIT:    80.00%
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ENERGY WINDOW 40.45 TO 1805.12

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	240.17	361.	840.	1.21	928.06	921	14	4.35E-03	16.0	
2	0	352.93	177.	605.	.50	1451.45	1444	14	2.14E-03	27.1	
3	3	510.67	731.	600.	1.72	2183.63	2169	33	8.82E-03	9.0	1.75E+
4	3	512.08	490.	558.	1.85	2190.14	2169	33	5.92E-03	13.3	
5	0	583.14	260.	453.	1.33	2519.97	2507	28	3.14E-03	19.9	
6	0	604.61	290.	368.	1.12	2619.66	2610	21	3.51E-03	15.7	
7	0	608.97	220.	278.	1.46	2639.91	2632	15	2.66E-03	16.3	
8	0	661.29	8120.	543.	1.33	2882.74	2867	32	9.81E-02	1.3	
9	0	794.35	259.	256.	1.95	3500.37	3487	28	3.13E-03	15.6	
10	0	909.63	162.	162.	.94	4035.44	4025	20	1.96E-03	17.3	
11	0	1456.27	2434.	140.	1.86	6572.76	6555	31	2.94E-02	2.3	
12	10	1757.52	69.	31.	1.37	7971.05	7959	28	8.31E-04	21.4	1.18E+
13	10	1758.67	78.	31.	1.37	7976.40	7959	28	9.36E-04	19.1	

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SAMPLE GEOMETRY:
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ELAPSED LIVE TIME:     82800. SEC       * NBR ITERATIONS:     10.
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DETECTOR:          * LIBRARY:           *
CALIB DATE:  00-JAN-00 00:00:00         * ENERGY TOLERANCE:   1.250 KEV
KEV/CHNL:        .2154410               * HALF LIFE RATIO:    8.00
OFFSET:        40.2304600 KEV           * ABUNDANCE LIMIT:    80.00%
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ENERGY WINDOW 40.45 TO 1805.12

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	188.03	291.	1123.	1.16	686.04	678	16	3.51E-03	26.1	
2	0	240.24	296.	795.	1.38	928.37	921	13	3.57E-03	18.3	
3	0	352.83	212.	732.	.86	1450.96	1442	18	2.56E-03	26.7	
4	4	510.81	799.	581.	1.93	2184.24	2170	37	9.64E-03	8.8	1.93E+
5	4	512.05	412.	580.	1.97	2190.03	2170	37	4.98E-03	16.9	
6	0	583.30	199.	358.	.92	2520.73	2511	22	2.40E-03	22.8	
7	0	604.48	277.	258.	1.20	2619.05	2612	17	3.35E-03	13.3	
8	0	609.26	259.	292.	1.50	2641.23	2630	19	3.12E-03	15.4	
9	0	661.35	8421.	476.	1.32	2883.02	2869	29	1.02E-01	1.3	
10	0	794.62	228.	260.	2.01	3501.63	3489	26	2.75E-03	16.5	
11	0	909.44	183.	133.	1.46	4034.54	4024	21	2.20E-03	14.7	
12	0	1456.41	2448.	102.	1.83	6573.38	6554	39	2.96E-02	2.3	
13	0	1758.49	126.	37.	1.54	7975.54	7967	19	1.53E-03	12.3	

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ELAPSED LIVE TIME:     82800. SEC   * NBR ITERATIONS:     10.
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DETECTOR:          * LIBRARY:
CALIB DATE:   00-JAN-00 00:00:00    * ENERGY TOLERANCE:   1.250 KEV
KEV/CHNL:          .2154410         * HALF LIFE RATIO:    8.00
OFFSET:         40.2304600 KEV      * ABUNDANCE LIMIT:    80.00%
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ENERGY WINDOW 40.45 TO 1805.12

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	240.30	229.	959.	1.00	928.65	922	15	2.76E-03	26.7	
2	0	353.12	228.	616.	1.49	1452.33	1445	15	2.75E-03	21.6	
3	2	510.75	610.	573.	1.87	2183.99	2169	33	7.37E-03	11.1	1.98E+
4	2	512.04	693.	526.	1.87	2189.98	2169	33	8.36E-03	9.3	
5	0	583.27	203.	333.	1.11	2520.61	2512	22	2.45E-03	21.2	
6	0	604.71	241.	323.	1.62	2620.10	2612	19	2.91E-03	16.7	
7	0	609.25	260.	223.	.80	2641.17	2633	15	3.15E-03	12.7	
8	0	661.41	8431.	496.	1.27	2883.31	2870	28	1.02E-01	1.3	
9	0	794.75	242.	208.	1.16	3502.22	3492	23	2.92E-03	13.4	
10	0	910.01	126.	181.	1.06	4037.20	4028	22	1.52E-03	23.4	
11	0	1456.39	2579.	127.	1.89	6573.33	6555	38	3.11E-02	2.2	
12	2	1757.67	91.	26.	1.50	7971.73	7956	33	1.10E-03	16.7	6.28E-
13	2	1759.08	59.	24.	1.50	7978.27	7956	33	7.16E-04	25.7	

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DETECTOR:          * LIBRARY:
CALIB DATE:   00-JAN-00 00:00:00    * ENERGY TOLERANCE:     1.250 KEV
KEV/CHNL:        .2154410           * HALF LIFE RATIO:      8.00
OFFSET:        40.2304600 KEV       * ABUNDANCE LIMIT:      80.00%
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ENERGY WINDOW 40.45 TO 1805.12

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	187.92	233.	1137.	1.12	685.52	678	15	2.81E-03	33.0	
2	0	240.20	214.	870.	.92	928.18	921	13	2.59E-03	25.8	
3	0	353.06	250.	741.	1.03	1452.03	1442	19	3.02E-03	23.6	
4	2	509.52	216.	529.	1.64	2178.29	2169	30	2.61E-03	25.1	3.32E+(
5	2	511.07	949.	609.	1.65	2185.47	2169	30	1.15E-02	6.8	
6	0	583.08	190.	352.	1.44	2519.69	2509	22	2.29E-03	23.1	
7	0	604.30	273.	319.	1.18	2618.21	2609	20	3.30E-03	15.6	
8	0	608.84	290.	228.	1.61	2639.30	2630	18	3.51E-03	12.6	
9	0	661.06	8276.	488.	1.30	2881.65	2867	28	1.00E-01	1.3	
10	0	794.23	178.	138.	1.50	3499.78	3493	15	2.15E-03	14.0	
11	0	909.07	129.	221.	.82	4032.86	4026	26	1.56E-03	26.1	
12	0	1455.71	2339.	154.	1.70	6570.13	6550	34	2.82E-02	2.4	
13	0	1757.35	149.	70.	1.73	7970.27	7949	41	1.80E-03	15.3	

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ELAPSED LIVE TIME:     82800. SEC   * NBR ITERATIONS:       10.
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DETECTOR:            * LIBRARY:
CALIB DATE:   00-JAN-00 00:00:00    * ENERGY TOLERANCE:     1.250 KEV
KEV/CHNL:          .2154410         * HALF LIFE RATIO:      8.00
OFFSET:          40.2304600 KEV     * ABUNDANCE LIMIT:      80.00%
                                    *
*************************************************************
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ENERGY WINDOW 40.45 TO 1805.12

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	187.29	189.	423.	1.25	682.58	675	16	2.28E-03	27.1	
2	0	239.97	198.	429.	1.02	927.10	919	17	2.40E-03	21.9	
3	0	352.77	225.	160.	1.39	1450.69	1444	15	2.72E-03	13.2	
4	0	583.40	71.	127.	1.21	2521.19	2512	17	8.59E-04	33.7	
5	0	609.54	127.	113.	1.47	2642.54	2634	19	1.53E-03	20.8	
6	0	661.74	8320.	207.	1.33	2884.83	2869	29	1.00E-01	1.2	
7	0	910.40	118.	23.	1.44	4039.03	4026	22	1.43E-03	12.7	
8	4	1118.69	46.	18.	.69	5005.81	4997	21	5.58E-04	21.8	1.27E+0
9	4	1119.65	29.	19.	.69	5010.29	4997	21	3.46E-04	35.5	
10	0	1458.56	2370.	5.	1.85	6583.39	6562	39	2.86E-02	2.1	
11	4	1760.10	.41.	14.	1.36	7983.03	7970	29	4.89E-04	26.6	1.76E+0
12	4	1761.68	64.	23.	1.36	7990.35	7970	29	7.72E-04	16.9	

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*************************************************************
*****************      18-MAR-96 08:33:23      *****************
*************************************************************


SPECTRAL FILE NAME:  B:156S_2.DAT
SAMPLE DATE:  14-FEB-96 07:43:08
SAMPLE IDENTIFICATION:
TYPE OF SAMPLE:
SAMPLE QUANTITY:   1.000000          UNITS:
SAMPLE GEOMETRY:
EFFICIENCY FILE NAME:  NULL
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ACQUIRE DATE: 13-FEB-96 08:42:20    * FWHM(1332)            2.041
PRESET TIME(LIVE):     82800. SEC   * SENSITIVITY:          5.000
ELAPSED REAL TIME:     82808. SEC   * SHAPE PARAMETER :     5.0 %
ELAPSED LIVE TIME:     82800. SEC   * NBR ITERATIONS:       10.
                                    *
*************************************************************
                                    *
DETECTOR:            * LIBRARY:
CALIB DATE:   00-JAN-00 00:00:00    * ENERGY TOLERANCE:     1.250 KEV
KEV/CHNL:        .2154410           * HALF LIFE RATIO:      8.00
OFFSET:        40.2304600 KEV       * ABUNDANCE LIMIT:      80.00%
                                    *
*************************************************************
```

ENERGY WINDOW 40.45 TO 1805.12

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	187.13	124.	504.	1.07	681.87	674	16	1.50E-03	41.5	
2	0	239.70	281.	322.	.91	925.86	919	14	3.40E-03	13.2	
3	0	352.82	188.	273.	.98	1450.93	1440	20	2.27E-03	19.8	
4	0	582.83	147.	124.	1.54	2518.56	2507	20	1.78E-03	19.2	
5	0	609.19	166.	131.	1.50	2640.92	2633	17	2.00E-03	16.6	
6	0	661.60	8094.	248.	1.36	2884.17	2868	28	9.78E-02	1.2	
7	0	910.14	148.	68.	.56	4037.82	4021	30	1.78E-03	15.7	
8	4	1118.63	52.	17.	.82	5005.52	4993	31	6.24E-04	19.8	2.83E+
9	4	1120.08	39.	11.	.82	5012.27	4993	31	4.73E-04	23.7	
10	0	1458.29	2457.	68.	1.89	6582.13	6561	35	2.97E-02	2.1	
11	0	1761.02	121.	16.	1.11	7987.31	7966	35	1.46E-03	11.3	

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*************************************************************
*****************      18-MAR-96 08:28:13      *****************
*************************************************************


SPECTRAL FILE NAME:  B:156S_3.DAT
SAMPLE DATE:  16-FEB-96 08:31:45
SAMPLE IDENTIFICATION:
TYPE OF SAMPLE:
SAMPLE QUANTITY:    1.000000        UNITS:
SAMPLE GEOMETRY:
EFFICIENCY FILE NAME:  NULL
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                                   *
ACQUIRE DATE: 15-FEB-96 09:12:08   * FWHM(1332)          2.041
PRESET TIME(LIVE):     82800. SEC  * SENSITIVITY:        5.000
ELAPSED REAL TIME:     82808. SEC  * SHAPE PARAMETER :   5.0 %
ELAPSED LIVE TIME:     82800. SEC  * NBR ITERATIONS:     10.
                                   *
*************************************************************
                                   *
DETECTOR:          * LIBRARY:
CALIB DATE:   00-JAN-00 00:00:00   * ENERGY TOLERANCE:   1.250 KEV
KEV/CHNL:        .2154410          * HALF LIFE RATIO:    8.00
OFFSET:        40.2304600 KEV      * ABUNDANCE LIMIT:    80.00%
                                   *
*************************************************************
```

ENERGY WINDOW 40.45 TO 1805.12

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	186.95	219.	523.	1.19	681.02	671	19	2.65E-03	27.0	
2	0	239.76	208.	325.	1.16	926.13	919	13	2.51E-03	17.4	
3	0	296.21	75.	178.	1.01	1188.16	1184	10	9.04E-04	32.5	
4	0	352.59	138.	219.	1.06	1449.88	1441	16	1.67E-03	22.2	
5	2	510.70	173.	143.	1.46	2183.75	2169	30	2.08E-03	18.0	2.85E+
6	2	512.38	87.	109.	1.33	2191.56	2169	30	1.05E-03	28.7	
7	0	583.39	113.	161.	1.26	2521.17	2511	22	1.36E-03	26.7	
8	0	609.67	167.	147.	1.54	2643.13	2634	20	2.02E-03	16.7	
9	0	661.69	8443.	207.	1.41	2884.59	2869	30	1.02E-01	1.2	
10	3	909.42	47.	19.	1.22	4034.48	4027	21	5.73E-04	29.7	5.78E+
11	3	910.36	130.	21.	1.48	4038.82	4027	21	1.57E-03	12.0	
12	0	968.48	63.	48.	1.27	4308.61	4300	18	7.59E-04	24.0	
13	0	1118.82	95.	55.	1.06	5006.45	4990	29	1.15E-03	20.3	
14	0	1458.45	2416.	64.	1.92	6582.86	6561	36	2.92E-02	2.1	
15	0	1760.95	101.	32.	1.45	7986.98	7970	28	1.22E-03	13.8	

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*************************************************************
*****************      18-MAR-9_ 08:19:28      *****************
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SPECTRAL FILE NAME:  B:156S_4.DAT
SAMPLE DATE:  29-FEB-96 14:16:57
SAMPLE IDENTIFICATION:
TYPE OF SAMPLE:
SAMPLE QUANTITY:   1.000000        UNITS:
SAMPLE GEOMETRY:
EFFICIENCY FILE NAME:  NULL
*************************************************************
                                   *
ACQUIRE DATE: 28-FEB-96 13:56:33   * FWHM(1332)          2.041
PRESET TIME(LIVE):     82800. SEC  * SENSITIVITY:        5.000
ELAPSED REAL TIME:     82808. SEC  * SHAPE PARAMETER :   5.0 %
ELAPSED LIVE TIME:     82800. SEC  * NBR ITERATIONS:     10.
                                   *
*************************************************************
                                   *
DETECTOR:          * LIBRARY:
CALIB DATE:   00-JAN-00 00:00:00   * ENERGY TOLERANCE:   1.250 KEV
KEV/CHNL:        .2154410          * HALF LIFE RATIO:    8.00
OFFSET:        40.2304600 KEV      * ABUNDANCE LIMIT:    80.00%
                                   *
*************************************************************
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ENERGY WINDOW 40.45 TO 1805.12

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	187.28	232.	425.	1.03	682.56	675	16	2.80E-03	22.5	
2	0	239.78	257.	237.	1.36	926.25	921	11	3.10E-03	12.4	
3	0	296.27	92.	275.	.60	1188.45	1182	14	1.12E-03	35.9	
4	0	352.89	178.	257.	1.23	1451.25	1442	19	2.15E-03	20.4	
5	5	509.94	124.	111.	1.35	2180.25	2169	28	1.50E-03	23.2	8.35E+0
6	5	511.70	220.	127.	1.35	2188.38	2169	28	2.66E-03	12.4	
7	0	583.49	114.	113.	.97	2521.61	2512	17	1.37E-03	22.1	
8	0	609.38	213.	94.	1.25	2641.80	2634	18	2.57E-03	12.0	
9	0	661.71	8461.	210.	1.40	2884.67	2869	27	1.02E-01	1.2	
10	0	910.44	103.	57.	1.99	4039.22	4029	20	1.24E-03	18.0	
11	0	968.01	71.	30.	1.48	4306.40	4298	16	8.58E-04	18.1	
12	0	1119.04	86.	40.	1.61	5007.43	5001	15	1.04E-03	17.1	
13	0	1458.43	2583.	46.	1.82	6582.77	6561	37	3.12E-02	2.0	
14	0	1760.89	98.	31.	1.39	7986.71	7972	25	1.19E-03	12.9	

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*************************************************************
*****************      18-MAR-96 08:00:37      *****************
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SPECTRAL FILE NAME:  B:156S_5.DAT
SAMPLE DATE:  17-MAR-96 08:20:45
SAMPLE IDENTIFICATION:
TYPE OF SAMPLE:
SAMPLE QUANTITY:   1.000000        UNITS:
SAMPLE GEOMETRY:
EFFICIENCY FILE NAME:  NULL
*************************************************************
                                   *
ACQUIRE DATE: 16-MAR-96 08:33:01   * FWHM(1332)          2.041
PRESET TIME(LIVE):     82800. SEC  * SENSITIVITY:        5.000
ELAPSED REAL TIME:     82809. SEC  * SHAPE PARAMETER :   5.0 %
ELAPSED LIVE TIME:     82800. SEC  * NBR ITERATIONS:     10.
                                   *
*************************************************************
                                   *
DETECTOR:          * LIBRARY:
CALIB DATE:  00-JAN-00 00:00:00    * ENERGY TOLERANCE:   1.250 KEV
KEV/CHNL:        .2156818          * HALF LIFE RATIO:    8.00
OFFSET:        39.0881800 KEV      * ABUNDANCE LIMIT:    80.00%
                                   *
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ENERGY WINDOW 39.30 TO 1805.95

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	92.64	60.	429.	.72	248.28	245	12	7.30E-04	68.9	
2	0	185.95	134.	532.	1.09	680.92	673	16	1.62E-03	41.7	
3	0	238.84	227.	380.	.98	926.16	919	16	2.74E-03	18.1	
4	0	351.78	212.	200.	1.10	1449.80	1441	16	2.56E-03	14.8	
5	0	583.03	152.	201.	2.02	2521.98	2511	31	1.83E-03	26.9	
6	0	608.77	216.	108.	1.35	2641.30	2630	25	2.60E-03	14.3	
7	0	660.92	8314.	235.	1.40	2883.10	2869	31	1.00E-01	1.2	
8	0	909.64	154.	47.	1.08	4036.26	4021	29	1.87E-03	13.1	
9	0	1458.21	2354.	75.	1.68	6579.70	6562	33	2.84E-02	2.2	
10	4	1760.45	75.	21.	1.34	7981.01	7969	27	9.10E-04	16.4	2.02E+
11	4	1761.78	52.	18.	1.34	7987.21	7969	27	6.30E-04	22.7	

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*************************************************************
*****************      18-MAR-96 08:12:36      *****************
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SPECTRAL FILE NAME:  B:373_N_1.DAT
SAMPLE DATE:  01-FEB-96 13:13:12
SAMPLE IDENTIFICATION:
TYPE OF SAMPLE:
SAMPLE QUANTITY:   1.000000        UNITS:
SAMPLE GEOMETRY:
EFFICIENCY FILE NAME:  NULL
*************************************************************
                                   *
ACQUIRE DATE: 31-JAN-96 14:05:05   * FWHM(1332)          2.041
PRESET TIME(LIVE):     82800. SEC  * SENSITIVITY:        5.000
ELAPSED REAL TIME:     82873. SEC  * SHAPE PARAMETER :   5.0 %
ELAPSED LIVE TIME:     82800. SEC  * NBR ITERATIONS:     10.
                                   *
*************************************************************
                                   *
DETECTOR:          * LIBRARY:
CALIB DATE:  00-JAN-00 00:00:00    * ENERGY TOLERANCE:   1.250 KEV
KEV/CHNL:        .2154410          * HALF LIFE RATIO:    8.00
OFFSET:        40.2304600 KEV      * ABUNDANCE LIMIT:    80.00%
                                   *
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ENERGY WINDOW 40.45 TO 1805.12

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	563.58	880.	3020.	1.27	2429.19	2420	20	1.06E-02	13.5	
2	0	569.74	1703.	2938.	1.29	2457.81	2449	20	2.06E-02	7.2	
3	0	604.97	11843.	3357.	1.31	2621.30	2608	28	1.43E-01	1.5	
4	0	661.80	387132.	4089.	1.37	2885.09	2868	34	4.68E+00	.2	
5	0	795.30	8358.	367.	1.51	3504.75	3490	29	1.01E-01	1.2	
6	0	801.38	783.	327.	1.22	3532.99	3520	27	9.46E-03	6.0	
7	0	910.07	136.	225.	1.54	4037.48	4025	25	1.64E-03	24.2	
8	0	1036.86	77.	164.	1.22	4626.02	4617	18	9.25E-04	33.1	
9	0	1118.90	82.	104.	1.11	5006.80	4999	17	9.89E-04	25.5	
10	0	1165.73	141.	140.	1.72	5224.16	5215	20	1.70E-03	18.6	
11	0	1362.34	275.	87.	1.35	6136.74	6122	28	3.32E-03	9.8	
12	0	1397.33	284.	94.	1.89	6299.15	6279	36	3.43E-03	10.4	
13	0	1457.44	1698.	125.	1.71	6578.18	6561	35	2.05E-02	2.9	
14	3	1758.83	103.	31.	1.68	7977.13	7965	31	1.25E-03	14.8	1.18E+
15	3	1760.21	63.	34.	1.68	7983.52	7965	31	7.63E-04	24.8	

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*************************************************************
*****************     18-MAR-96 08:07:42     *****************
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SPECTRAL FILE NAME:  B:373N_2.DAT
SAMPLE DATE:  13-FEB-96 07:50:52
SAMPLE IDENTIFICATION:
TYPE OF SAMPLE:
SAMPLE QUANTITY:   1.000000        UNITS:
SAMPLE GEOMETRY:
EFFICIENCY FILE NAME:  NULL
*************************************************************
                                   *
ACQUIRE DATE: 12-FEB-96 08:38:15   * FWHM(1332)          2.041
PRESET TIME(LIVE):     82800. SEC  * SENSITIVITY:        5.000
ELAPSED REAL TIME:     82871. SEC  * SHAPE PARAMETER :   5.0 %
ELAPSED LIVE TIME:     82800. SEC  * NBR ITERATIONS:     10.
                                   *
*************************************************************
                                   *
DETECTOR:          * LIBRARY:
CALIB DATE:  00-JAN-00 00:00:00    * ENERGY TOLERANCE:   1.250 KEV
KEV/CHNL:        .2154410          * HALF LIFE RATIO:    8.00
OFFSET:        40.2304600 KEV      * ABUNDANCE LIMIT:    80.00%
                                   *
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ENERGY WINDOW 40.45 TO 1805.12

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	562.80	922.	2865.	1.38	2425.57	2416	20	1.11E-02	12.6	
2	0	568.84	1703.	3423.	1.48	2453.62	2442	24	2.06E-02	8.1	
3	0	604.14	11715.	2779.	1.46	2617.47	2606	24	1.41E-01	1.4	
4	0	608.75	300.	1485.	1.10	2638.89	2633	13	3.63E-03	23.9	
5	0	661.00	376360.	4110.	1.51	2881.38	2864	35	4.55E+00	.2	
6	0	794.25	8055.	557.	1.68	3499.89	3485	32	9.73E-02	1.3	
7	0	800.38	693.	327.	1.59	3528.36	3518	24	8.37E-03	6.6	
8	0	908.70	124.	215.	.87	4031.15	4021	21	1.50E-03	24.6	
9	0	1163.82	155.	169.	1.20	5215.28	5203	26	1.88E-03	19.5	
10	0	1360.33	195.	120.	2.39	6127.41	6118	26	2.35E-03	13.6	
11	0	1395.95	212.	106.	2.58	6292.77	6275	34	2.56E-03	13.5	
12	3	1454.91	1085.	58.	1.39	6566.42	6547	45	1.31E-02	3.7	3.43E+0
13	3	1456.69	667.	52.	1.48	6574.68	6547	45	8.06E-03	6.1	
14	3	1756.63	102.	36.	1.86	7966.90	7951	36	1.24E-03	16.5	2.21E+0
15	3	1758.22	69.	42.	1.86	7974.27	7951	36	8.28E-04	24.7	

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*************************************************************
*****************      18-MAR-96 08:03:10      *****************
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SPECTRAL FILE NAME:  B:373N_3.DAT
SAMPLE DATE:  15-FEB-96 09:08:30
SAMPLE IDENTIFICATION:
TYPE OF SAMPLE:
SAMPLE QUANTITY:   1.000000        UNITS:
SAMPLE GEOMETRY:
EFFICIENCY FILE NAME:  NULL
*************************************************************
                                   *
ACQUIRE DATE: 14-FEB-96 09:50:15   * FWHM(1332)          2.041
PRESET TIME(LIVE):     82800. SEC  * SENSITIVITY:        5.000
ELAPSED REAL TIME:     82874. SEC  * SHAPE PARAMETER :   5.0 %
ELAPSED LIVE TIME:     82800. SEC  * NBR ITERATIONS:     10.
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                                   *
DETECTOR:            * LIBRARY:
CALIB DATE:   00-JAN-00 00:00:00   * ENERGY TOLERANCE:   1.250 KEV
KEV/CHNL:          .2154410        * HALF LIFE RATIO:    8.00
OFFSET:          40.2304600 KEV    * ABUNDANCE LIMIT:    80.00%
                                   *
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ENERGY WINDOW 40.45 TO 1805.12

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	563.50	1049.	2689.	1.12	2428.82	2420	19	1.27E-02	10.8	
2	0	569.49	1842.	3137.	1.36	2456.65	2446	22	2.22E-02	7.0	
3	0	604.76	11950.	3312.	1.31	2620.33	2609	26	1.44E-01	1.5	
4	0	661.54	390489.	4338.	1.36	2883.89	2867	34	4.72E+00	.2	
5	0	795.01	8313.	545.	1.47	3503.42	3486	32	1.00E-01	1.3	
6	0	801.14	831.	255.	1.58	3531.89	3524	21	1.00E-02	5.2	
7	0	1361.66	319.	80.	1.86	6133.62	6123	28	3.86E-03	8.7	
8	0	1396.82	273.	85.	1.53	6296.79	6282	32	3.30E-03	10.1	
9	0	1456.74	1712.	129.	1.86	6574.92	6553	43	2.07E-02	3.1	
10	0	1758.93	151.	26.	1.88	7977.58	7968	28	1.82E-03	11.1	

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*****************      18-MAR-96 07:55:13      *****************
*************************************************************


SPECTRAL FILE NAME:  B:373N_4.DAT
SAMPLE DATE:  28-FEB-96 13:50:02
SAMPLE IDENTIFICATION:
TYPE OF SAMPLE:
SAMPLE QUANTITY:    1.000000          UNITS:
SAMPLE GEOMETRY:
EFFICIENCY FILE NAME:  NULL
*************************************************************
                                    *
ACQUIRE DATE: 27-FEB-96 14:40:32    * FWHM(1332)            2.041
PRESET TIME(LIVE):     82800. SEC   * SENSITIVITY:          5.000
ELAPSED REAL TIME:     82876. SEC   * SHAPE PARAMETER :     5.0 %
ELAPSED LIVE TIME:     82800. SEC   * NBR ITERATIONS:       10.
                                    *
*************************************************************
                                    *
DETECTOR:            * LIBRARY:
CALIB DATE:   00-JAN-00 00:00:00    * ENERGY TOLERANCE:     1.250 KEV
KEV/CHNL:          .2154410         * HALF LIFE RATIO:      8.00
OFFSET:         40.2304600 KEV      * ABUNDANCE LIMIT:      80.00%
                                    *
*************************************************************
```

ENERGY WINDOW 40.45 TO 1805.12

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	F
1	0	563.12	962.	2669.	1.16	2427.09	2420	17	1.16E-02	11.1	
2	0	569.34	1893.	3334.	1.26	2455.96	2445	23	2.29E-02	7.1	
3	0	604.50	12401.	3150.	1.26	2619.14	2606	26	1.50E-01	1.4	
4	0	661.25	406910.	4125.	1.32	2882.54	2867	32	4.91E+00	.2	
5	0	794.63	8714.	374.	1.28	3501.67	3487	30	1.05E-01	1.2	
6	0	800.59	811.	279.	1.55	3529.31	3519	22	9.79E-03	5.4	
7	0	909.61	86.	146.	1.11	4035.34	4028	14	1.04E-03	26.3	
8	0	1035.97	65.	173.	1.07	4621.87	4610	21	7.83E-04	41.2	
9	0	1165.22	215.	158.	1.11	5221.81	5211	25	2.59E-03	14.9	
10	0	1360.90	339.	78.	1.38	6130.08	6116	31	4.09E-03	8.3	
11	0	1395.80	256.	112.	2.01	6292.05	6279	32	3.09E-03	11.3	
12	0	1455.94	1700.	90.	1.77	6571.24	6552	38	2.05E-02	2.8	
13	2	1757.50	109.	36.	1.30	7970.96	7961	28	1.32E-03	14.6	1.04
14	2	1758.81	38.	30.	1.30	7977.04	7961	28	4.62E-04	40.7	

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*************************************************************
*****************      18-MAR-96 07:44:46      *****************
*************************************************************


SPECTRAL FILE NAME:  B:373N_5.DAT
SAMPLE DATE:  16-MAR-96 08:18:46
SAMPLE IDENTIFICATION:
TYPE OF SAMPLE:
SAMPLE QUANTITY:   1.000000        UNITS:
SAMPLE GEOMETRY:
EFFICIENCY FILE NAME:  NULL
*************************************************************
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ACQUIRE DATE: 15-MAR-96 08:26:07    * FWHM(1332)          2.041
PRESET TIME(LIVE):     82800. SEC   * SENSITIVITY:        5.000
ELAPSED REAL TIME:     82872. SEC   * SHAPE PARAMETER :   5.0 %
ELAPSED LIVE TIME:     82800. SEC   * NBR ITERATIONS:     10.
                                    *
*************************************************************
                                    *
DETECTOR:          * LIBRARY:
CALIB DATE:  00-JAN-00 00:00:00     * ENERGY TOLERANCE:   1.250 KEV
KEV/CHNL:        .2154410           * HALF LIFE RATIO:    8.00
OFFSET:        40.2304600 KEV       * ABUNDANCE LIMIT:    80.00%
                                    *
*************************************************************
```

ENERGY WINDOW 40.45 TO 1805.12

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	562.95	965.	2819.	1.21	2426.30	2417	20	1.17E-02	11.9	
2	0	568.96	1821.	3122.	1.24	2454.18	2443	23	2.20E-02	7.2	
3	0	604.14	11675.	2577.	1.31	2617.48	2609	22	1.41E-01	1.3	
4	0	660.92	384836.	4186.	1.36	2881.02	2864	33	4.65E+00	.2	
5	0	794.19	8323.	406.	1.42	3499.61	3485	31	1.01E-01	1.2	
6	0	800.21	754.	287.	1.38	3527.54	3516	24	9.10E-03	5.9	
7	0	908.73	147.	246.	2.58	4031.27	4020	29	1.78E-03	25.1	
8	0	1163.99	133.	189.	1.19	5216.09	5204	23	1.60E-03	22.6	
9	0	1360.25	225.	124.	1.28	6127.06	6114	29	2.72E-03	13.2	
10	0	1395.19	264.	78.	1.87	6289.26	6278	27	3.19E-03	9.5	
11	0	1455.36	1649.	106.	2.06	6568.54	6546	40	1.99E-02	2.9	
12	0	1757.24	111.	58.	1.59	7969.74	7957	32	1.35E-03	17.6	

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*************************************************************
*****************      18-MAR-96 08:14:45      *****************
*************************************************************


SPECTRAL FILE NAME:  B:373_S_1.DAT
SAMPLE DATE:  01-FEB-96 13:12:45
SAMPLE IDENTIFICATION:
TYPE OF SAMPLE:
SAMPLE QUANTITY:   1.000000        UNITS:
SAMPLE GEOMETRY:
EFFICIENCY FILE NAME:  NULL
*************************************************************
                                    *
ACQUIRE DATE: 31-JAN-96 14:05:01    * FWHM(1332)          2.041
PRESET TIME(LIVE):     82800. SEC   * SENSITIVITY:        5.000
ELAPSED REAL TIME:     82863. SEC   * SHAPE PARAMETER :   5.0 %
ELAPSED LIVE TIME:     82800. SEC   * NBR ITERATIONS:     10.
                                    *
*************************************************************
                                    *
DETECTOR:          * LIBRARY:
CALIB DATE:  00-JAN-00 00:00:00     * ENERGY TOLERANCE:   1.250 KEV
KEV/CHNL:        .2154410           * HALF LIFE RATIO:    8.00
OFFSET:        40.2304600 KEV       * ABUNDANCE LIMIT:    80.00%
                                    *
*************************************************************
```

ENERGY WINDOW 40.45 TO 1805.12

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	605.17	1231.	2023.	1.26	2622.27	2611	21	1.49E-02	8.2	
2	0	662.03	387232.	3600.	1.43	2886.18	2868	36	4.68E+00	.2	
3	0	795.90	762.	98.	1.55	3507.57	3494	33	9.20E-03	4.8	
4	0	968.76	57.	66.	.63	4309.90	4302	21	6.83E-04	30.4	
5	0	1000.72	37.	36.	.87	4458.25	4451	19	4.52E-04	36.5	
6	0	1399.25	224.	31.	1.53	6308.09	6295	31	2.71E-03	9.2	
7	0	1459.29	1680.	65.	1.77	6586.79	6568	33	2.03E-02	2.6	
8	3	1761.46	58.	11.	.93	7989.33	7976	26	7.05E-04	18.8	2.67E+0
9	3	1762.98	57.	20.	.93	7996.37	7976	26	6.91E-04	17.3	

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*************************************************************
*****************      18-MAR-96 08:09:59      *****************
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SPECTRAL FILE NAME:  B:373S_2.DAT
SAMPLE DATE:  13-FEB-96 07:50:36
SAMPLE IDENTIFICATION:
TYPE OF SAMPLE:
SAMPLE QUANTITY:    1.000000          UNITS:
SAMPLE GEOMETRY:
EFFICIENCY FILE NAME:  NULL
*************************************************************
                                    *
ACQUIRE DATE: 12-FEB-96 08:38:14    * FWHM(1332)          2.041
PRESET TIME(LIVE):     82800. SEC   * SENSITIVITY:        5.000
ELAPSED REAL TIME:     82861. SEC   * SHAPE PARAMETER :   5.0 %
ELAPSED LIVE TIME:     82800. SEC   * NBR ITERATIONS:     10.
                                    *
*************************************************************
                                    *
DETECTOR:          * LIBRARY:
CALIB DATE:   00-JAN-00 00:00:00    * ENERGY TOLERANCE:   1.250 KEV
KEV/CHNL:         .2154410          * HALF LIFE RATIO:    8.00
OFFSET:         40.2304600 KEV      * ABUNDANCE LIMIT:    80.00%
                                    *
*************************************************************
```

ENERGY WINDOW 40.45 TO 1805.12

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	604.53	1525.	2362.	1.57	2619.29	2606	27	1.84E-02	8.0	
2	0	661.31	376231.	3873.	1.63	2882.85	2864	39	4.54E+00	.2	
3	0	795.10	719.	132.	1.54	3503.82	3485	35	8.68E-03	5.5	
4	0	909.89	107.	75.	.86	4036.67	4022	24	1.30E-03	19.2	
5	0	967.66	68.	33.	1.23	4304.78	4295	19	8.18E-04	20.7	
6	4	1397.16	135.	31.	1.96	6298.36	6277	40	1.63E-03	12.7	6.19E-(
7	4	1399.08	57.	21.	2.19	6307.31	6277	40	6.84E-04	25.6	
8	2	1456.67	855.	39.	1.39	6574.61	6560	41	1.03E-02	4.5	3.92E+(
9	2	1458.31	812.	30.	1.58	6582.20	6560	41	9.81E-03	5.1	

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*************************************************************
*****************      18-MAR-96 08:05:32      *****************
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SPECTRAL FILE NAME:  B:373S_3.DAT
SAMPLE DATE:  15-FEB-96 09:08:05
SAMPLE IDENTIFICATION:
TYPE OF SAMPLE:
SAMPLE QUANTITY:   1.000000        UNITS:
SAMPLE GEOMETRY:
EFFICIENCY FILE NAME:  NULL
*************************************************************
                                   *
ACQUIRE DATE: 14-FEB-96 09:50:14   * FWHM(1332)          2.041
PRESET TIME(LIVE):     82800. SEC  * SENSITIVITY:        5.000
ELAPSED REAL TIME:     82864. SEC  * SHAPE PARAMETER :   5.0 %
ELAPSED LIVE TIME:     82800. SEC  * NBR ITERATIONS:     10.
                                   *
*************************************************************
                                   *
DETECTOR:          * LIBRARY:      *
CALIB DATE:  00-JAN-00 00:00:00    * ENERGY TOLERANCE:   1.250 KEV
KEV/CHNL:        .2154410          * HALF LIFE RATIO:    8.00
OFFSET:        40.2304600 KEV      * ABUNDANCE LIMIT:    80.00%
                                   *
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ENERGY WINDOW 40.45 TO 1805.12

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	605.15	1355.	2099.	1.49	2622.14	2612	22	1.64E-02	7.9	
2	0	661.89	390502.	3821.	1.44	2885.50	2868	36	4.72E+00	.2	
3	0	795.81	722.	105.	1.64	3507.14	3493	28	8.72E-03	5.0	
4	2	910.62	43.	55.	1.18	4040.03	4032	19	5.22E-04	38.3	2.40E+
5	2	911.49	59.	38.	1.18	4044.07	4032	19	7.18E-04	25.8	
6	0	968.57	76.	46.	1.61	4309.00	4296	23	9.15E-04	21.1	
7	0	1119.46	109.	37.	1.24	5009.39	4997	27	1.32E-03	15.1	
8	0	1398.82	224.	34.	1.43	6306.10	6289	30	2.70E-03	9.4	
9	0	1458.80	1700.	53.	1.73	6584.51	6564	42	2.05E-02	2.6	
10	0	1761.39	106.	38.	1.79	7988.99	7972	29	1.28E-03	13.1	

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*************************************************************
*****************      18-MAR-96 07:58:05      *****************
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SPECTRAL FILE NAME:  B:373S_4.DAT
SAMPLE DATE:  28-FEB-96 13:49:12
SAMPLE IDENTIFICATION:
TYPE OF SAMPLE:
SAMPLE QUANTITY:    1.000000          UNITS:
SAMPLE GEOMETRY:
EFFICIENCY FILE NAME:  NULL
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ACQUIRE DATE: 27-FEB-96 14:40:37    * FWHM(1332)          2.041
PRESET TIME(LIVE):     82800. SEC   * SENSITIVITY:        5.000
ELAPSED REAL TIME:     82866. SEC   * SHAPE PARAMETER :   5.0 %
ELAPSED LIVE TIME:     82800. SEC   * NBR ITERATIONS:     10.
                                    *
*************************************************************
                                    *
DETECTOR:            * LIBRARY:
CALIB DATE:   00-JAN-00 00:00:00    * ENERGY TOLERANCE:   1.250 KEV
KEV/CHNL:          .2156818         * HALF LIFE RATIO:    8.00
OFFSET:          39.0881800 KEV     * ABUNDANCE LIMIT:    80.00%
                                    *
*************************************************************
```

ENERGY WINDOW 39.30 TO 1805.95

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	239.08	356.	2654.	1.22	927.25	923	11	4.30E-03	25.1	
2	0	604.17	1584.	2322.	1.39	2619.96	2606	25	1.91E-02	7.6	
3	0	661.08	406939.	3780.	1.40	2883.85	2867	34	4.91E+00	.2	
4	0	795.07	790.	93.	1.70	3505.07	3490	34	9.55E-03	4.7	
5	0	801.01	58.	45.	1.51	3532.61	3524	17	7.05E-04	24.9	
6	0	909.93	117.	53.	1.56	4037.63	4027	21	1.41E-03	16.5	
7	0	967.75	79.	79.	.74	4305.68	4297	31	9.60E-04	28.6	
8	2	1117.96	53.	15.	1.04	5002.17	4988	35	6.45E-04	22.0	1.90E+
9	2	1119.19	61.	19.	1.04	5007.83	4988	35	7.32E-04	20.3	
10	8	1396.97	45.	17.	.85	6295.75	6287	27	5.42E-04	26.7	2.40E+
11	8	1398.48	175.	39.	1.51	6302.75	6287	27	2.11E-03	10.4	
12	0	1458.41	1675.	39.	1.91	6580.65	6560	36	2.02E-02	2.6	
13	0	1760.95	130.	28.	1.83	7983.33	7962	36	1.57E-03	11.5	

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*************************************************************
*****************      18-MAR-96 07:47:30      *****************
*************************************************************

SPECTRAL FILE NAME:  B:373S_5.DAT
SAMPLE DATE:  16-MAR-96 08:19:21
SAMPLE IDENTIFICATION:
TYPE OF SAMPLE:
SAMPLE QUANTITY:    1.000000        UNITS:
SAMPLE GEOMETRY:
EFFICIENCY FILE NAME:  NULL
*************************************************************
                                   *
ACQUIRE DATE: 15-MAR-96 08:26:00   * FWHM(1332)          2.041
PRESET TIME(LIVE):     82800. SEC  * SENSITIVITY:        5.000
ELAPSED REAL TIME:     82862. SEC  * SHAPE PARAMETER :   5.0 %
ELAPSED LIVE TIME:     82800. SEC  * NBR ITERATIONS:     10.
                                   *
*************************************************************
                                   *
DETECTOR:          * LIBRARY:
CALIB DATE:  00-JAN-00 00:00:00    * ENERGY TOLERANCE:   1.250 KEV
KEV/CHNL:        .2154410          * HALF LIFE RATIO:    8.00
OFFSET:        40.2304600 KEV      * ABUNDANCE LIMIT:    80.00%
                                   *
*************************************************************
```

ENERGY WINDOW 40.45 TO 1805.12

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	52.94	199.	1939.	.49	58.97	55	7	2.41E-03	37.5	
2	0	604.37	1218.	1822.	1.15	2618.53	2610	19	1.47E-02	7.8	
3	0	661.23	384975.	3712.	1.44	2882.43	2864	35	4.65E+00	.2	
4	0	794.99	761.	100.	1.70	3503.31	3486	31	9.19E-03	4.7	
5	4	909.26	99.	35.	1.50	4033.73	4022	31	1.19E-03	17.8	1.30E+0
6	4	910.49	58.	40.	1.50	4039.44	4022	31	7.01E-04	30.0	
7	0	1397.26	184.	55.	1.19	6298.86	6282	28	2.22E-03	11.0	
8	0	1457.41	1642.	24.	2.12	6578.04	6556	40	1.98E-02	2.6	
9	2	1759.15	61.	10.	.91	7978.62	7967	28	7.40E-04	16.5	1.82E+0
10	2	1760.48	49.	10.	1.00	7984.80	7967	28	5.91E-04	22.5	

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*************************************************************
*****************      18-MAR-96 08:44:54      *****************
*************************************************************


SPECTRAL FILE NAME:  B:BLANK_1S.DAT
SAMPLE DATE:  15-MAR-96 08:20:34
SAMPLE IDENTIFICATION:
TYPE OF SAMPLE:
SAMPLE QUANTITY:    1.000000          UNITS:
SAMPLE GEOMETRY:
EFFICIENCY FILE NAME:  NULL
*************************************************************
                                    *
ACQUIRE DATE: 14-MAR-96 08:12:14    * FWHM(1332)            2.041
PRESET TIME(LIVE):     82800. SEC   * SENSITIVITY:          5.000
ELAPSED REAL TIME:     82806. SEC   * SHAPE PARAMETER :     5.0 %
ELAPSED LIVE TIME:     82800. SEC   * NBR ITERATIONS:       10.
                                    *
*************************************************************
                                    *
DETECTOR:            * LIBRARY:
CALIB DATE:  00-JAN-00 00:00:00     * ENERGY TOLERANCE:     1.250 KEV
KEV/CHNL:        .2154410           * HALF LIFE RATIO:      8.00
OFFSET:        40.2304600 KEV       * ABUNDANCE LIMIT:      80.00%
                                    *
*************************************************************
```

ENERGY WINDOW 40.45 TO 1805.12

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	186.73	159.	308.	.85	679.98	673	14	1.92E-03	25.6	
2	0	239.82	205.	291.	.86	926.42	919	16	2.48E-03	17.8	
3	0	296.05	137.	169.	1.00	1187.41	1180	17	1.66E-03	21.0	
4	0	352.36	233.	172.	1.50	1448.77	1439	21	2.81E-03	14.3	
5	0	583.26	123.	96.	1.71	2520.56	2511	23	1.48E-03	20.9	
6	0	609.25	205.	139.	.85	2641.19	2628	26	2.48E-03	15.0	
7	3	908.86	50.	43.	1.55	4031.85	4020	33	6.07E-04	33.2	1.12E-
8	3	910.20	88.	41.	1.55	4038.07	4020	33	1.07E-03	19.1	
9	5	966.89	28.	21.	1.27	4301.24	4293	24	3.43E-04	45.7	4.64E-
10	5	967.96	58.	25.	1.27	4306.19	4293	24	6.99E-04	24.4	
11	0	999.75	33.	22.	.29	4453.76	4450	14	3.99E-04	30.4	
12	0	1118.26	82.	41.	1.03	5003.83	4988	28	9.94E-04	20.4	
13	0	1457.48	723.	32.	1.88	6578.37	6560	32	8.73E-03	4.1	
14	5	1759.52	67.	12.	1.63	7980.32	7967	28	8.14E-04	17.2	1.46E
15	5	1761.13	44.	9.	1.63	7987.80	7967	28	5.30E-04	21.6	

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*****************      18-MAR-96 07:35:55      *****************
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SPECTRAL FILE NAME:  B:BLANK_2S.DAT
SAMPLE DATE:  18-MAR-96 07:31:49
SAMPLE IDENTIFICATION:
TYPE OF SAMPLE:
SAMPLE QUANTITY:   1.000000        UNITS:
SAMPLE GEOMETRY:
EFFICIENCY FILE NAME:  NULL
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ACQUIRE DATE: 17-MAR-96 08:22:11   * FWHM(1332)          2.041
PRESET TIME(LIVE):     82800. SEC  * SENSITIVITY:        5.000
ELAPSED REAL TIME:     82806. SEC  * SHAPE PARAMETER :   5.0 %
ELAPSED LIVE TIME:     82800. SEC  * NBR ITERATIONS:     10.
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DETECTOR:          * LIBRARY:
CALIB DATE:   00-JAN-00 00:00:00   * ENERGY TOLERANCE:   1.250 KEV
KEV/CHNL:        .2156818          * HALF LIFE RATIO:    8.00
OFFSET:        39.0881800 KEV      * ABUNDANCE LIMIT:    80.00%
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ENERGY WINDOW 39.30 TO 1805.95

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	93.01	144.	333.	1.23	250.00	242	19	1.73E-03	31.2	
2	0	185.87	201.	341.	1.15	680.53	672	18	2.43E-03	23.2	
3	0	238.48	234.	235.	1.09	924.48	917	15	2.82E-03	14.4	
4	0	294.97	95.	238.	.76	1186.37	1178	18	1.15E-03	34.5	
5	0	351.59	149.	198.	.84	1448.90	1441	20	1.80E-03	23.2	
6	0	582.16	143.	62.	1.08	2517.95	2511	16	1.73E-03	14.3	
7	4	608.08	148.	33.	1.25	2638.10	2631	20	1.79E-03	12.2	1.88E+00
8	4	609.14	62.	36.	1.25	2643.03	2631	20	7.50E-04	33.3	
9	0	909.20	143.	42.	1.03	4034.24	4022	28	1.73E-03	14.1	
10	0	998.79	45.	34.	2.58	4449.62	4435	24	5.48E-04	30.2	
11	0	1118.13	73.	31.	1.25	5002.95	4993	21	8.80E-04	19.4	
12	0	1457.68	651.	53.	1.48	6577.23	6561	29	7.86E-03	4.5	
13	4	1759.96	66.	9.	1.27	7978.77	7965	26	7.92E-04	16.7	8.22E-0
14	4	1761.08	41.	6.	1.27	7983.93	7965	26	5.00E-04	25.0	

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*****************     18-MAR-96 08:42:46     *****************
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SPECTRAL FILE NAME:  B:BLANK_1N.DAT
SAMPLE DATE:  15-MAR-96 08:19:43
SAMPLE IDENTIFICATION:
TYPE OF SAMPLE:
SAMPLE QUANTITY:   1.000000        UNITS:
SAMPLE GEOMETRY:
EFFICIENCY FILE NAME:  NULL
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ACQUIRE DATE: 14-MAR-96 08:11:49   * FWHM(1332)          2.041
PRESET TIME(LIVE):     82800. SEC  * SENSITIVITY:        5.000
ELAPSED REAL TIME:     82807. SEC  * SHAPE PARAMETER :   5.0 %
ELAPSED LIVE TIME:     82800. SEC  * NBR ITERATIONS:     10.
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                                   *
DETECTOR:          * LIBRARY:
CALIB DATE:  00-JAN-00 00:00:00    * ENERGY TOLERANCE:   1.250 KEV
KEV/CHNL:        .2154410          * HALF LIFE RATIO:    8.00
OFFSET:        40.2304600 KEV      * ABUNDANCE LIMIT:    80.00%
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*************************************************************
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ENERGY WINDOW 40.45 TO 1805.12

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	240.45	251.	693.	1.11	929.34	922	15	3.03E-03	21.0	
2	0	352.85	246.	370.	1.47	1451.06	1444	13	2.97E-03	15.7	
3	2	510.73	695.	378.	1.29	2183.91	2172	34	8.39E-03	7.3	4.00E
4	2	512.29	337.	357.	1.26	2191.14	2172	34	4.07E-03	14.2	
5	0	582.92	171.	202.	1.10	2518.99	2511	15	2.06E-03	17.9	
6	0	608.91	280.	249.	.97	2639.61	2630	18	3.38E-03	13.5	
7	0	1116.76	108.	114.	1.28	4996.87	4985	24	1.30E-03	23.0	
8	0	1455.46	693.	108.	2.03	6568.99	6555	30	8.37E-03	5.1	
9	0	1757.22	130.	40.	1.62	7969.64	7954	28	1.58E-03	13.4	

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*****************      18-MAR-96 07:41:14      *****************
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SPECTRAL FILE NAME:  B:BLANK_2N.DAT
SAMPLE DATE:  18-MAR-96 07:32:25
SAMPLE IDENTIFICATION:
TYPE OF SAMPLE:
SAMPLE QUANTITY:   1.000000        UNITS:
SAMPLE GEOMETRY:
EFFICIENCY FILE NAME:  NULL
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ACQUIRE DATE: 17-MAR-96 08:22:05    * FWHM(1332)          2.041
PRESET TIME(LIVE):    82800. SEC    * SENSITIVITY:        5.000
ELAPSED REAL TIME:    82807. SEC    * SHAPE PARAMETER :   5.0 %
ELAPSED LIVE TIME:    82800. SEC    * NBR ITERATIONS:     10.
                                    *
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                                    *
DETECTOR:          * LIBRARY:
CALIB DATE:  00-JAN-00 00:00:00     * ENERGY TOLERANCE:   1.250 KEV
KEV/CHNL:        .2154410           * HALF LIFE RATIO:    8.00
OFFSET:        40.2304600 KEV       * ABUNDANCE LIMIT:    80.00%
                                    *
*************************************************************
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ENERGY WINDOW 40.45 TO 1805.12

PK	IT	ENERGY	AREA	BKGND	FWHM	CHANNEL	LEFT	PW	CTS/SEC	%ERR	FIT
1	0	95.84	135.	1255.	2.02	258.11	242	24	1.63E-03	73.9	
2	0	239.87	281.	610.	.78	926.66	919	14	3.39E-03	17.5	
3	0	352.74	177.	462.	.57	1450.56	1443	16	2.13E-03	25.5	
4	3	509.54	284.	346.	1.19	2178.38	2166	33	3.43E-03	16.6	2.12E-
5	3	511.10	804.	422.	1.52	2185.62	2166	33	9.71E-03	7.0	
6	0	582.65	182.	226.	1.27	2517.73	2509	17	2.20E-03	19.3	
7	0	608.61	252.	220.	.82	2638.20	2630	19	3.05E-03	14.1	
8	0	1116.33	135.	89.	1.45	4994.87	4982	24	1.63E-03	17.8	
9	0	1455.15	667.	93.	1.77	6567.54	6552	31	8.06E-03	5.1	
10	7	1755.99	49.	34.	1.57	7963.95	7953	30	5.95E-04	29.3	1.06E-
11	7	1757.41	74.	28.	1.57	7970.53	7953	30	8.89E-04	19.6	

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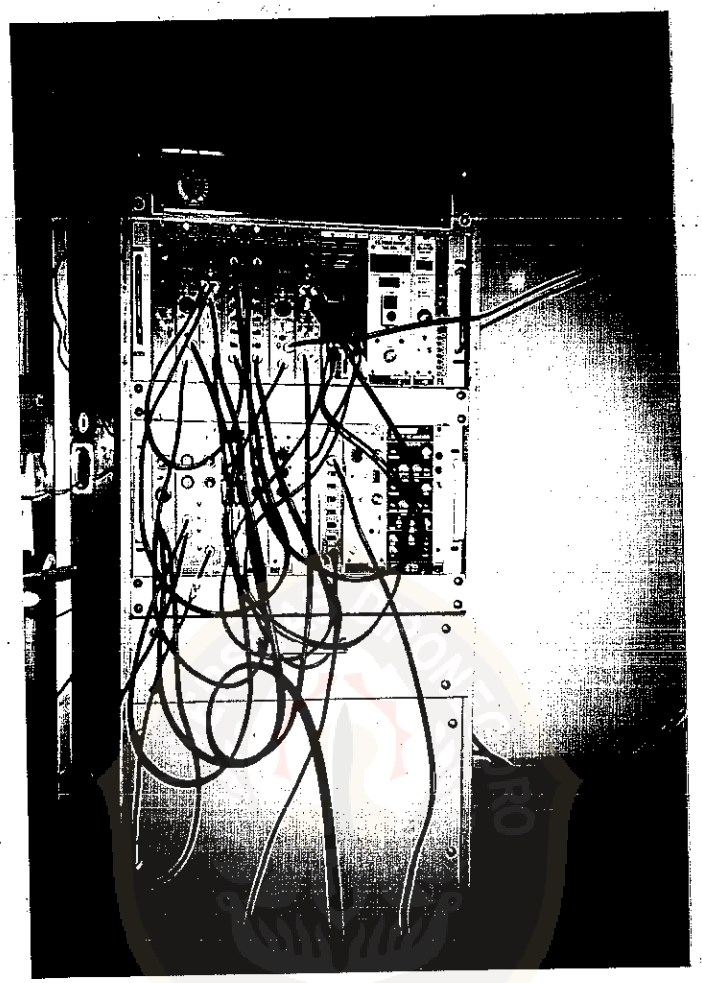
LAMPIRAN III

FOTO ALAT SCS



Keterangan : foto modul elektronik dari SCS

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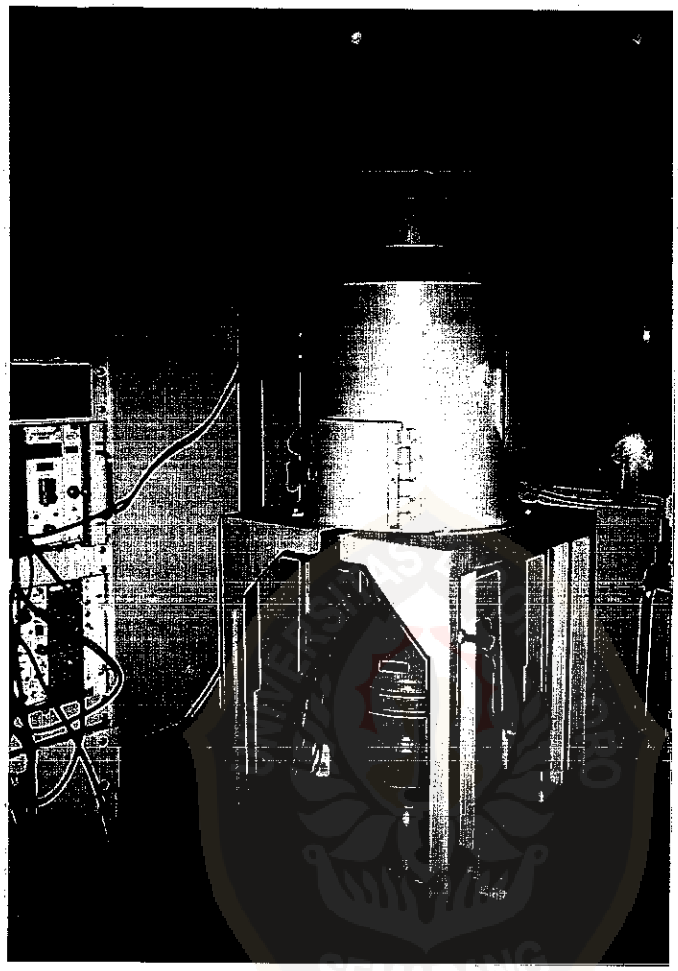

Keterangan : foto detektor HPGe, NaI(Tl) serta Perusai pasif

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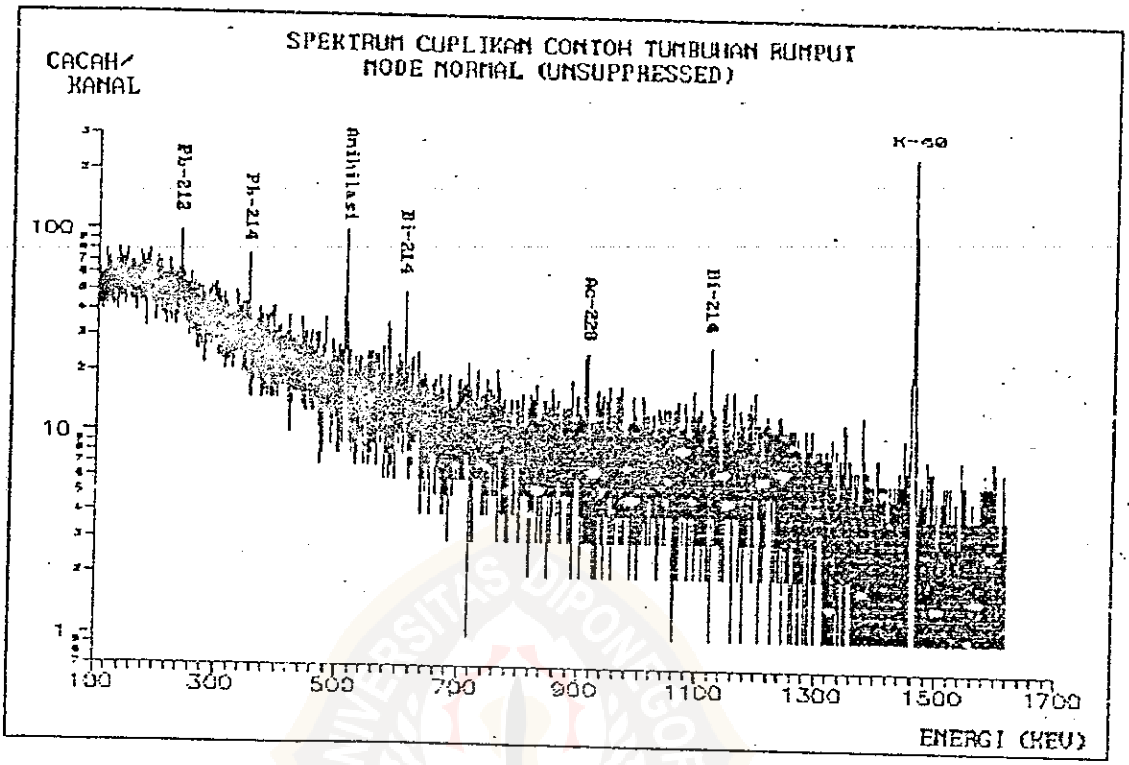
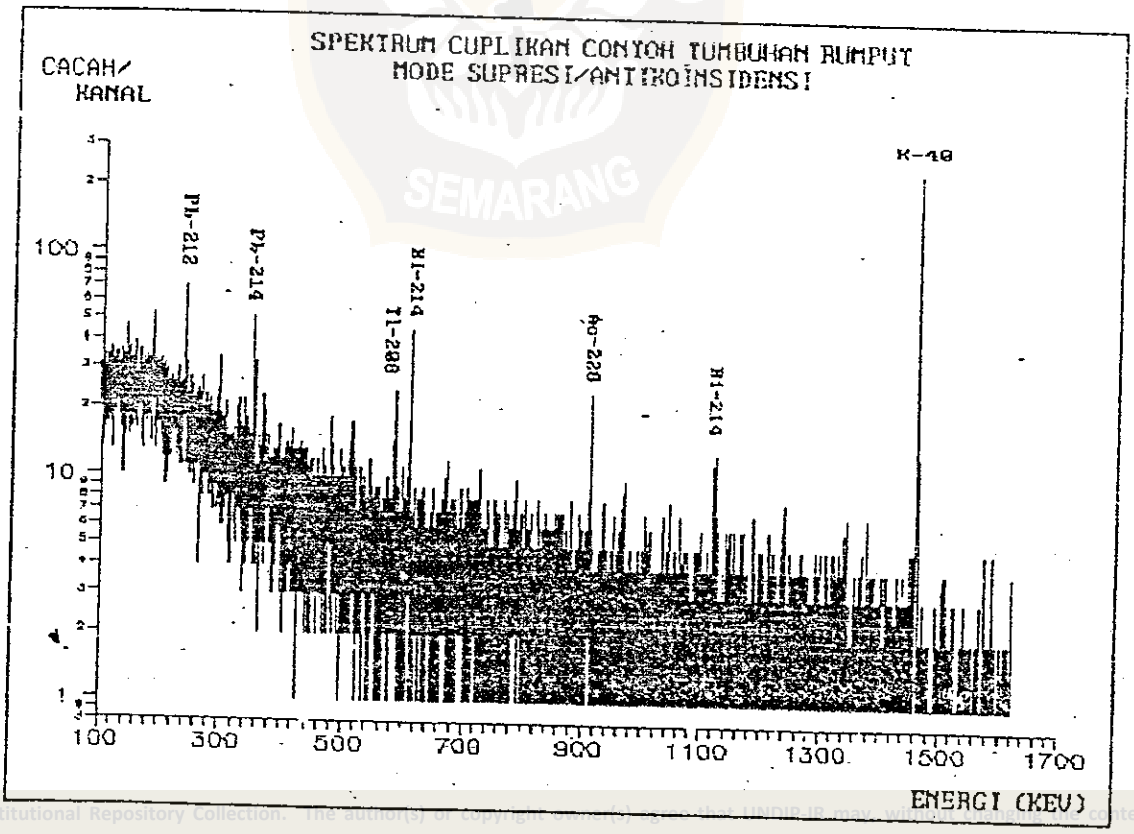
LAMPIRAN IV





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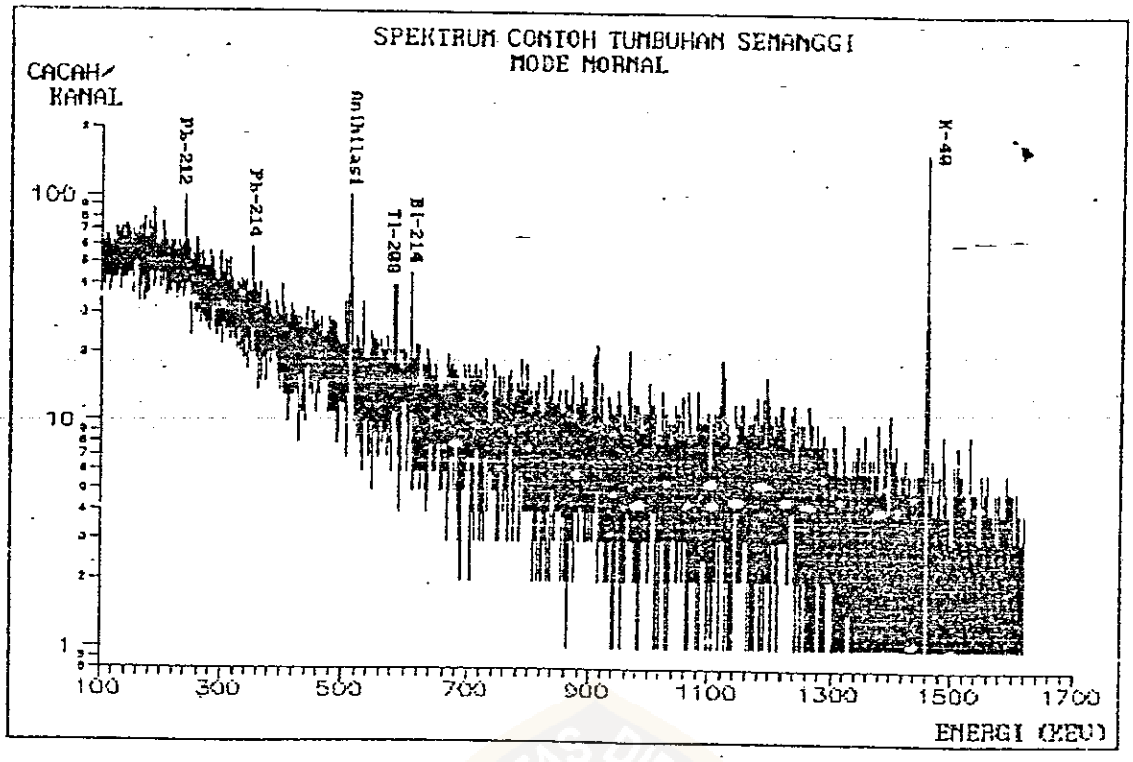

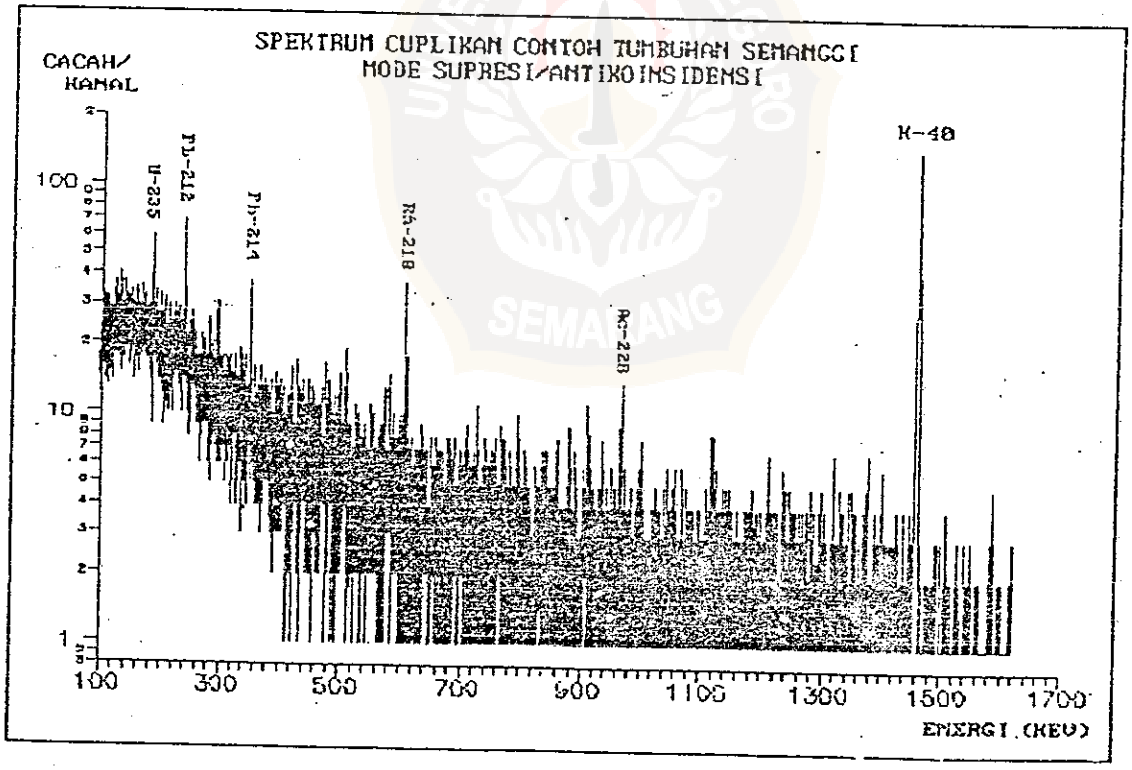

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