

SEQUENTIAL ANALYSIS OF GAMMA SPECTRA

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This work shows how easy one can deal with a huge number of gamma spectra. The method can be used for radiation monitoring. It is based on the macro feature of the windows XP connected to QBASIC software. The routine was used usefully in generating accurate results free from human errors. One hundred measured gamma spectra were fully analyzed in 10 minutes using our fast and automated method controlling the Genie 2000 gamma acquisition analysis software.

INTRODUCTION

Usually one can find gamma-spectrum software which can deal with one spectrum. The problem started to be complicated if one needs to analyze a group of successive results. One has to construct his own routine and plan for dealing with a big number of gamma-spectra in the order of 10^2 or bigger. In this work we introduce a fast method based on using the macro feature of the Windows XP followed by QBASIC software. The aim was concentrated to how the output data can directly join to the EXCEL 2007 data sheet program.

ANALYSIS PROCEDURES

1- Win XP Macro Editing

For macro editing we used the Easy Macro Recorder V3.68 copyright 2004-2008 Gold Solution Software. The editing needs three files:

- i. Input file for the name of the gamma-spectra must have a format free from any space and without extension. Data has to be in a column form.
- ii. Output file for collecting the Genie 2000 results.
- iii. Run the Genie 2000 and adjust it for the probate input data spectra place. Delay switch, after loading the spectra, can be adjusted to meet the user requirement. The period can be assigned to enough time for examine the spectrum by screen.

Playback speed was adjusted to normal speed. This is because the fast and very fast speed gives bad and corrupted results. Looping times can be adjusted up to 200 times.

Part for the macro scheme for the loading spectrum in the Genie 2000 is shown in Fig. 1

Start	Continue
Wait 3047	KeyUp 1
LButtonDown 365,64	Wait 985
Wait 93	KeyDown 4
LButtonUp 365,64	Wait 281
Wait 1063	KeyUp 4
LButtonDown 381,76	Wait 1375
Wait 140	KeyDown Enter
LButtonUp 381,76	Wait 94
Wait 2750	KeyUp Enter
KeyDown Del	Wait 2375
Wait 141	KeyDown Ctrl
KeyUp Del	Wait 328
Wait 672	KeyDown Alt
KeyDown 1	KeyUp Ctrl
Wait 141	Wait 100
KeyDown 0	KeyUp Alt
Wait 78	Wait 100
KeyUp 0	
Wait 15	

Figure 1: Part of used macro for loading sequential spectra to Genie 2000.

2- Compressing the Genie 2000 Output Results

The out put of the Genie 2000 was compressed to a form as shown in scheme (1). It is reduced to half of its size to generate the results faster and small storage size. Only output data about the analyzed file name, measuring time, dead time and Gamma energy and its intensity are summarized.

Filename: 104.CN	
Report Generated On : 2008.06.21 19:12:50	
Live Time	: 7200.0 seconds
Dead Time	: 0.09 %
Energy	Net Peak
(keV)	Area
238.90	1.03E+003
295.48	5.53E+002
351.98	1.27E+003
510.40	8.97E+002
582.66	4.55E+002
608.79	1.62E+003
910.18	5.21E+002
967.76	3.88E+002

1119.09	6.20E+002
1375.83	1.26E+002
1459.33	3.69E+003
1728.24	1.52E+002
1762.84	6.96E+002
1202.88	1.92E+002
1612.56	8.45E+002

Scheme 1: Represents the compressed Genie 2000 results form to be used for the QBASIC software Prog. (1) input.

The final results are summarized in two output files as shown in Fig.2.

- The first one lists the input information needed form measuring spectrum like: spectrum name, measuring time, dead time, ...
- The second file lists the required result from the total analysis done. It can give the selected gamma energy and its intensity as well as its existence probability.
- The two files format was selected for easy importing the Excel 2007.

```

CLS
g1min = 349 g1max = 355 g2min = 607 g2max = 611 g3min = 236 g3max = 240
ON ERROR GOTO 199
OPEN "aaa.TXT" FOR INPUT AS #1 OPEN "out.txt" FOR OUTPUT AS #2 OPEN
"out1.txt" FOR OUTPUT AS #3
5 LINE INPUT #1, line1$ '1
IF line1$ =
"*****"
THEN 10
IF line1$ = "1000" THEN 1000 'end of the file
GOTO 5
10
FOR i = 1 TO 5
LINE INPUT #1, line1$
NEXT i
PRINT #2, line1$;
FOR i = 1 TO 18
LINE INPUT #1, line1$
NEXT i
PRINT #2, line1$;
FOR i = 1 TO 2
LINE INPUT #1, line1$
NEXT i
PRINT #2, line1$;
FOR i = 1 TO 3
LINE INPUT #1, line1$
NEXT i
PRINT #2, line1$;

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FOR i = 1 TO 24
LINE INPUT #1, line1$
NEXT i
PRINT #2,
198 INPUT #1, a, b, c, d, e, f, g, h, i
IF a = 0 THEN 199
IF e > g1min AND e < g1max THEN
a(1) = e
b(1) = g
END IF
IF e > g2min AND e < g2max THEN
a(2) = e
b(2) = g
END IF
IF e > g3min AND e < g3max THEN
a(3) = e
b(3) = g
END IF
GOTO 198
199 FOR i = 1 TO 3
PRINT #3, USING "#####"; a(i); b(i);
NEXT i
PRINT #3,
FOR i = 1 TO 3
a(i) = 0
b(i) = 0
NEXT i
GOTO 5
1000 CLOSE 1
CLOSE 2
CLOSE 3
END

```

Prog. 1: Proposed QBasic software used as interface between Genie 2000 and Excel 2007.

Output										
File	Acquisition time		measuring time	Dead time	G1	I1	G2	I2	G3	I3
100.CN	2008.05.21	21:11:53	10800.0sec	0.04 %	352	576	609	876	0	0
102.CN	2008.05.22	9:37:27	10800.0sec	0.04 %	352	585	609	888	0	0
103.CN	2008.05.31	13:22:54	7200.0sec	0.10 %	351	1610	608	1960	239	1280
104.CN	2008.05.30	14:37:13	7200.0sec	0.09 %	352	1270	609	1620	239	1030
105.CN	2008.05.20	6:49:54	10800.0sec	0.04 %	352	639	609	762	0	0

Figure 2: Sample output file selected for 352, 609 and 239 exit Gamma channels (keV).

CONCLUSION

We introduced a fast method for gamma spectra monitoring. The user by this automated method can handle 100 spectra and analysis it in a very short time accurately and free of human errors. The golden goals for this work were achieved. And now the method is applied successfully in the Experimental Nuclear Physics Department, Cairo, Egypt.

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