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WORCESTER POLYTECHNIC INSTITUTE
HEALTH PHYSICS PROCEDURE HP-21
CALIBRATION OF THE GeLi DETECTOR

1. PURPOSE:

To calibrate the GeLi Detector using the Multi-Channel Analyzer (MCA) and a calibrated mixed radiation source.

2. FREQUENCY:

This procedure shall be performed semi-annually.

3. MATERIALS, TOOLS, AND EQUIPMENT:

3.1. Form(s):

3.1.1. Mixed Source Calibration Data

3.2. Calibrated mixed radiation source (i.e.: relatively new QCD.1 source)

3.3. Multi-Channel Analyzer

4. PRECAUTIONS:

4.1. Ensure that all health physics practices are followed throughout the survey.

4.2. Utilize the concepts of time, distance, and shielding to maintain exposure as low as reasonably achievable.

5. INSTRUCTIONS:

5.1. In x-tree, cursor to MCA EFF CAL, type x.

5.2. At the command prompt, type RSO (for the RSO directory of the MCA).

5.3. Place the mixed radiation source in the lead shield.

5.4. Record the time and the date of collection and the source's position in the detector (ie., red cap geometry).

5.5. Count the source for a minimum of 2 hours (Presets menu, Live Time (in seconds); Acquire menu, Start). Ensure that the dead time is no greater than 10%.

NOTE: Items from the pull-down menus located across the top portion of the screen (Files, Calculate, Services, ROI, Presets, Acquire, Display) may be accessed by depressing the ALT button in conjunction with the underlined letter of the desired selection.

5.6. Place the information into the Buffer (Acquire menu, MCB>Buffer).

5.7. Enter the Buffer (Display menu, MCB/Buffer).

5.8. Expand the display (Display menu, Full/Expand).

5.9 Mark the Regions of Interest (ROI) (the energies of the regions of interest are listed on the form)

5.9.1 Move the cursor to the top of the peak (the highest counts in the channel).

5.9.1.1. Use the right arrow key or the left arrow key to move the cursor to the right or to the left in small increments.

5.9.1.2. Use the Pg Up key or the Pg Dn key to move the cursor to the right or to the left in large increments.

5.9.1.3. Use the CTRL button in conjunction with the right arrow key or the CTRL button in conjunction with the left arrow key to move the cursor from peak to peak.

5.9.2. Depress the insert button (the ROI should now be highlighted in red).

NOTE: Manually mark unusually shaped peaks (the computer may only mark part of the peak) (ROI menu, Mark - to begin marking the ROI; ROI menu, Off - to conclude marking the ROI).

5.10. Record the peak counts on the form.

5.11. Print the report (Files menu, Report--**NOT PRINT**, type "prn" at the prompt).

5.12. Save the spectrum (Files menu, Save).

5.13. Record on the form the net area counts along with its degree of certainty for each ROI (the information is contained in the report).

5.14. Exit the MCA program (Services menu, Quit).

5.15. Return to x-tree (depress ESC).

5.16. Cursor to the MCA\EFF\CAL directory, press return.

5.17. Copy a previous MCA efficiency calibration data file (cursor to the file (denoted by the suffix .dat), type c for copy, rename the file).

5.18. Edit the file (depress e), enter the new collection date, the new count time (live time), and the new sample counts (net area counts).

5.19. Exit the file (depress escape, select save file & quit).

5.20. Quit x-tree (type q). At the command prompt, type cd\MCA\EFF\CAL. At the c:\MCA\EFF\CAL prompt, type e, space once, type the filename (without the .dat suffix), and press return.

5.21. Upon completion of the program's run (approximately three minutes later), hit any key to return to the command prompt. Type x to return to x-tree. Cursor to MCA\EFF\CAL and press return. Tag each of the following files (cursor to the file and type t): (filename).COF, (filename).DAT, and (filename).OUT. Print the files (depress the CTRL button in conjunction with the p key).

5.22. Plot efficiency (%) vs. energy (keV). A relatively smooth curve should be apparent.

5.23. Attach the following forms and file: the graph, the .COF file, the .DAT file, the .OUT file, and the Mixed Source Calibration Data form.

6. RESTORATION:

None

7. REFERENCES:

None

Ge DETECTOR EFFICIENCY VERSUS ENERGY PROGRAM

SUPPLEMENTAL PROCEDURE

NOTE: This is NOT a Health Physics Procedure. It is a supplemental procedure to HP-21 "Calibration of the Ge-Li Detector" for assisting researchers performing neutron activation analysis (NAA) or any quantification of sample radioactivity.

1. PURPOSE

This procedure is a user's guide for the "CAL_EFF" program that will provide users of the coaxial germanium detector the efficiency of the detector at any given energy. It uses the latest calibration data to perform an interpolation of efficiency versus energy data.

2. INSTRUCTIONS

1. Using DOS or XTREE, verify the latest Ge detector calibration files (----.DAT, ----.COF, ----.PLT, ----.RUN, and ----.OUT) are under directory C:\EFF. The latest calibration files may be copied from directory C:\ MCA\ EFF\ CAL.

2. Under the EFF directory, type: CAL_EFF <return>.

3. At the program prompt, enter the energy in keV to obtain the efficiency.

4. To exit the program, type: -1 <return>.