

Computer Code Abstracts

CORGAM

1. Name of Code: CORGAM.
2. Computer for Which Code is Designed: IBM 360/50. Programming Language: FORTRAN IV Level G. Disk storage required.
3. Nature of Physical Problem Solved: A correlation algorithm¹ is coded to allow the unfolding of complex gamma-ray spectra typically collected in a neutron activation analysis procedure. The code 1) will compensate for electronic shifts in the data, 2) will correct for background, 3) will normalize the data to a fixed neutron flux level, 4) allows a choice of weighting factors, and 5) allows a choice of methods for calculation of standard deviations. The code requires a matrix of reference gamma-ray spectra. These spectra can be in a raw-data form. All of the modifications available to the complex gamma-ray spectra are available to the reference gamma-ray spectra. In addition, a decay correction is available for the reference gamma-ray spectra. Only the reference gamma-ray spectra that have intensity coefficients which are significant at a prescribed level of significance are retained in the final solution. The intermediate solutions, i.e., those solutions that contain reference gamma-ray spectra which have nonsignificant intensity coefficients at the prescribed level, are printed out. Therefore, several solutions are imbedded in the final solution.
4. Method of Solution: A backward elimination least-squares method² is employed. The elimination criterion is one in which the Student's t value of each intensity coefficient is compared to a t value at a prescribed level of significance. The calculation of the standard deviation for each intensity coefficient accounts for randomness in both the complex and reference gamma-ray spectra.
5. Restrictions of the Complexity of the Problem: Number of reference gamma-ray spectra: variable. Number of channels of data: variable. Currently the program is restricted to a problem of 400 channels and 15 reference spectra. There would be no difficulty in expanding this to as many as 4096 channels; however, the number of reference spectra is limited by the accuracy desired in the inversion procedure. The inversion program currently being used would suffer (from the accuracy standpoint) if the number of reference spectra were $> \sim 25$.
6. Typical Running Time: Running time depends entirely on which and how many of the program options are selected. A typical analysis, involving 256 channels and 14 reference spectra and using reference spectra which were suitably aligned, will require < 1 min of execution time.

7. Unusual Features of the Program: CORGAM is a novel method of unfolding complex gamma-ray spectra because the variance calculations include contributions from both the complex and reference spectra. Also, only reference spectra that have intensity coefficients which are significant at a preselected level are retained in the final solution. The intermediate results can be printed out, and the level of significance of each of the intensity coefficients can be observed.
8. Related Programs: Programs by Young,³ Trombka,⁴ Parr and Lucas,⁵ and others⁶ are described in the literature. Similar analysis methods are employed in these programs and CORGAM.
9. Status: The theory is being prepared for publication and a computer manual for the program will soon be finished. The code is being used routinely.
10. References:
 - ¹N. D. ECKHOFF, "Optimal Neutron Activation Analysis," PhD Dissertation, Kansas State University (June 1968).
 - ²N. R. DRAPER and H. SMITH, *Applied Regression Analysis*, John Wiley and Sons, Inc. (1966).
 - ³M. H. YOUNG and N. S. SINGHAL, *Nucl. Instr. and Methods*, **45**, 287 (1966).
 - ⁴J. I. TROMBKA, *Trans. Am. Nucl. Soc.*, **10**, 33 (1967).
 - ⁵R. M. PARR and H. F. LUCAS, Jr., *IEEE Trans. Nucl. Sci.*, **NS-11** (3), 349 (1964).
 - ⁶G. D. O'KELLEY, Ed., "Applications of Computers to Nuclear and Radiochemistry," *Proc. Symp., Gatlinburg, Tenn.* (1962).

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GAMBLE-5

1. Name of Program: GAMBLE-5, A Program for the Solution of the Multigroup Neutron Diffusion Equations in Two Dimensions with Arbitrary Group Scattering.
2. Computer for Which Program is Designed: UNIVAC 1108. Programming Languages Used: FORTRAN IV, but for scratch data handling use is made of UNIVAC 1108 assembly language.