

# FMTTD Demo Neutron Coincidence Counting Software

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The PPIA neutron coincidence counting software was derived from INCC version 4.04. The singles, doubles and triples rates are corrected for dead time and background. The sample standard deviation is used to calculate errors. Quality Control (QC) consists of the accidentals/singles and three sigma outlier tests and a test for the high voltage within one percent of the target.

There were only minor additions made to the code that were not already in INCC. One was to read the digital I/O board to determine when to start a measurement and what kind of measurement to make. The other was to write PPIA specific results to the serial port whenever a measurement completed.

The results consist of reporting a shift register failure or one of the following:

## Background

Singles Rate  $\pm$  error

Doubles Rate  $\pm$  error

Triples Rate  $\pm$  error

Error Condition: Pass/Fail (singles and doubles greater than zero = Pass)

## Measurement Control ( $^{252}\text{Cf}$ source)

Singles  $\pm$  error

Doubles  $\pm$  error

Triples  $\pm$  error

Test: Pass/Fail (Comparison of Doubles/Singles Ratio, must be within  $\pm 0.3\%$  = Pass)

Report: Result of Measurement control

## Assay

Singles  $\pm$  error

Doubles  $\pm$  error

Triples  $\pm$  error

Calculates:

$^{240}\text{Pu}$  effective  $\pm$  error

Alpha  $\pm$  error

Multiplication  $\pm$  error

Reports:

$^{240}\text{Pu}$  effective  $\pm$  error  
Alpha  $\pm$  error

The code was modified to run under DOS instead of Windows and report measurement data, status and results to the console. The code uses Raima Data Manager to maintain its database, the Los Alamos National Laboratory Safeguards Science & Technology Group (NIS-5) shift register library for operating the PSR and the NIS-5 com library for serial communications.

Parameters for operating the shift register, setting QC test limits, measurement count times, etc. were intentionally hard coded so that they could only be changed by editing and rebuilding the code.