Application Note

SpectraWorks™ for Windows Spectrum Analysis Software

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Introduction

Many liquid scintillation counting (LSC) and gamma counting applications require review, comparison and mathematical manipulation of sample, background and reference spectra. These applications may include environmental analysis, waste management, radiation safety, health physics, biomedical research, and many others. Packards SpectraWorks for Windows™ can help you obtain the desired result faster and easier than ever before.

• Analyze for radionuclide contaminants.
• Compare unknowns to reference standards.
• Monitor changes in background.
• Review changes in the radionuclides found in environmental or waste samples.
• Optimize counting conditions for a specific energy region.
• Determine the minimum detection limit.
• Plus, a host of other tasks.

SpectraWorks is easy to use and it is a Windows-based program. Most operations require only the simple process of using the mouse to point and click to achieve the desired result. While some keyboard entries will be required to change numbers or define file names, the majority of tasks require only pointing and clicking with the mouse.

SpectraWorks has many time saving features to make your spectrum analysis tasks easier, so you get your results faster. Context-specific Help is at your fingertips to help you through all operations.

SpectraWorks Features

• Handy icon bar for frequently used functions.

• Context-specific, on-screen Help.

• Printer selection directly from SpectraWorks for color or black on white spectrum printout.

• Display one to four spectra at a time.
• Overlay or stack spectra.
• Display spectra in linear or log mode.
• Display spectra as counts or CPM.
• Display and print spectra filled with cross hatching or empty.
• Select displayed parameters: time, tSIE, end point, tSIS, original file name.
• Define up to six regions of interest (ROI).
• Fine tune ROIs with mouse and arrows.
• Customize spectrum and ROI colors.
• Identify spectra by original file name.
• Select automatic or manual scaling of both axes.
• Select CPM precision.
• Spectrum region cursors may be linked or independent.
• Zoom and unzoom spectra.
• Zoom and unzoom any portion of spectra.
• Smooth and unsmooth spectra.
• Add or subtract spectra.
• Multiply or divide spectra by a constant.
• Display negative numbers.
• Automatically calculate MDAs as DPM/L, pCi/L, Bq/L and T.U.
• Automatically calculate percent peak resolution.
• Rename and store manipulated spectra.
• Store spectra to and retrieve from ChroniCal database.
• Print spectra, run summaries and ROI summaries.
• Copy spectra to the Clipboard.
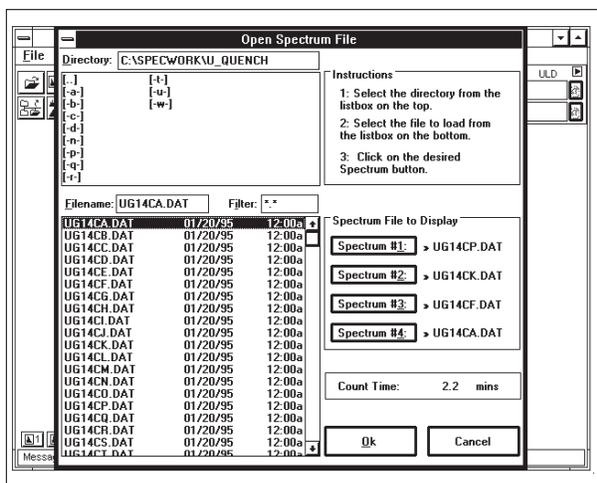• Notebook for recording comments about spectra.

Figure 1.
Spectrum files may be accessed from any available drive and path.

Random Access Spectrum Recall

With SpectraWorks you can recall and display up to four spectrum files from any available drive and path, either on your local disk drive or a network drive. Simply select each spectrum file you want to display and direct it into any of the four display locations. You can replace any of the selected spectrum files with another spectrum file at any time.

Single Spectrum Display

Displaying a single spectrum allows you evaluate it either as it is, or after smoothing or mathematical manipulations. You can even use the zoom function to select a specific segment of the spectrum to examine for small peaks, contamination, etc.
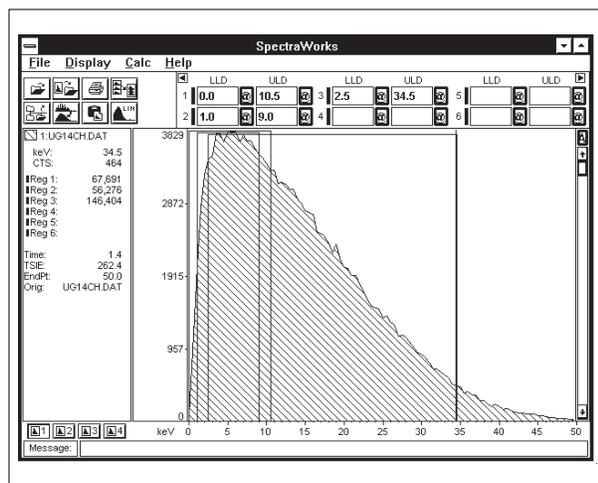

Figure 2.
Quenched ^{14}C spectrum in the linear display mode.

Simultaneous Display of Up to Four Spectra

By displaying two, three, or even four spectra, you can compare spectra to determine whether or not they are similar. Examples include: determining whether your background spectrum has changed from the last time it was measured; tracking the ingrowth of a daughter radionuclide over time; determining the differences among unknown sample spectra; and even teaching students about the effects of quench or other phenomena. In either stack or overlay mode, the active file is highlighted as a darkened area to the left of the spectra.

Stack Spectra

The stack spectra mode enables you to view up to four spectra one above the other. The mouse cursor may be linked to apply to all spectra, or it may be independently set for each of the four spectra. This enables you to set the cursor to a point of interest on one spectrum, and compare it to where the same point occurs on other spectra.
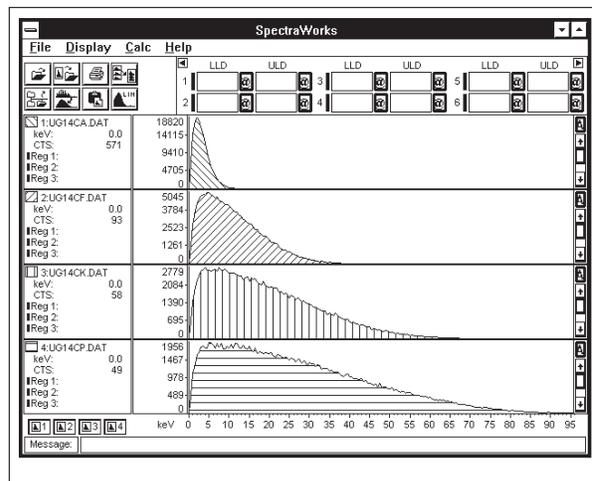

Figure 3.
The stacked spectra mode helps you view and identify spectral characteristics independently.

Overlay Spectra

With the overlay mode you can more closely compare the shape characteristics of two, three or four spectra. You can also toggle between the stack mode and the overlay mode for identifying spectral characteristics.

Linear and Log Display

With SpectraWorks you can toggle between linear and log displays with a single click of the lin/log icon. Sometimes the log mode enhances the presence of additional spectral shapes which may be missed by viewing a spectrum displayed in the linear mode.
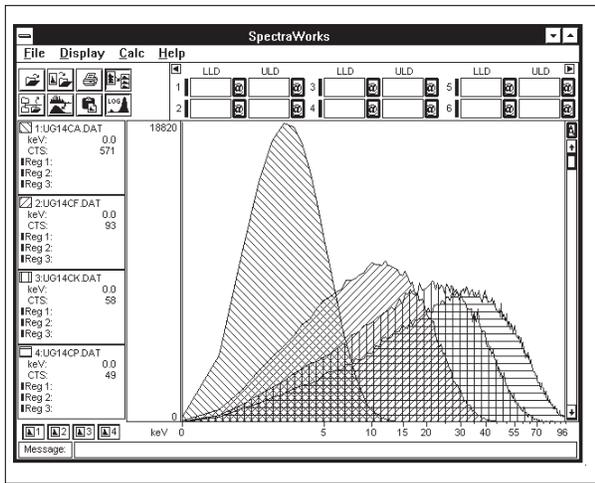
Figure 4.
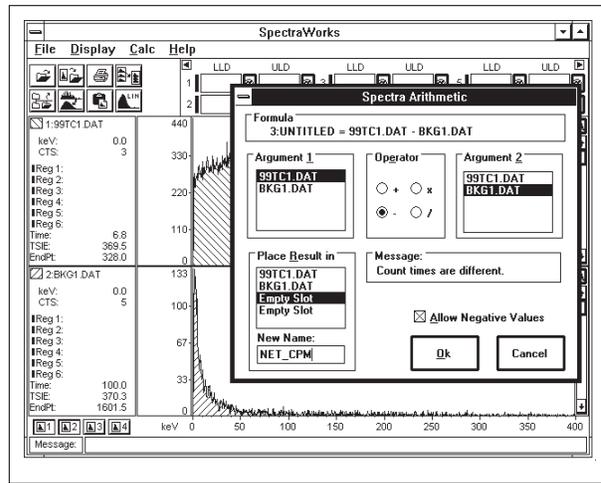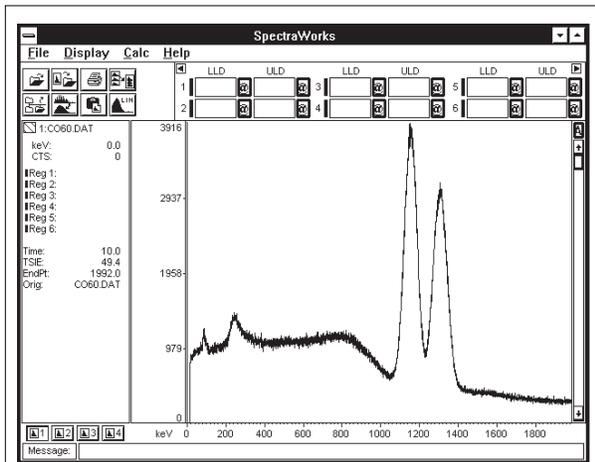The SpectraWorks overlay mode lets you identify small differences in up to four spectra at once.

A

B

Figures 5A and 5B.
(A) Linear spectrum of ^{60}Co. (B) Log spectrum of ^{60}Co (from a gamma counter).

Figure 6.
Simply select the operation you want, and the spectra to be manipulated.
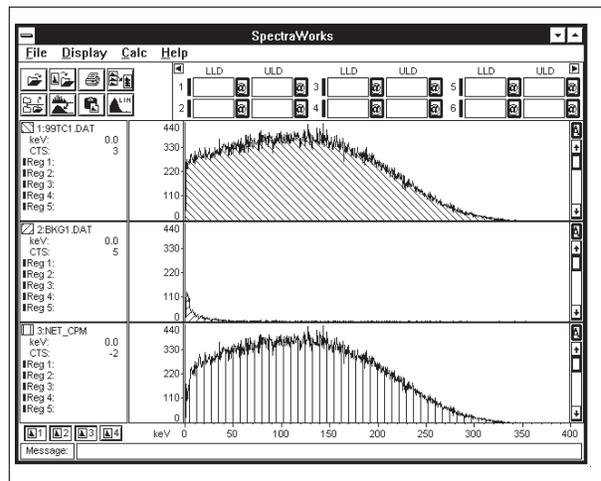

Figure 7.
Note the change in the low keV end of the bottom spectrum after subtracting background from the top spectrum.

Add, Subtract, Multiply and Divide

SpectraWorks allows you to add or subtract spectra to produce a variety of desired results. For example, you may wish to add spectra to simulate certain mixtures of radionuclides that would be found in unknown samples. Or, a very common application would be to remove the effects of background on a low level sample spectrum by subtracting the background spectrum from the sample in order to view the net sample spectrum.

Compute MDA's

Region optimization and MDA calculations are performed easily by selecting the reference and background samples of interest, entering the DPM value
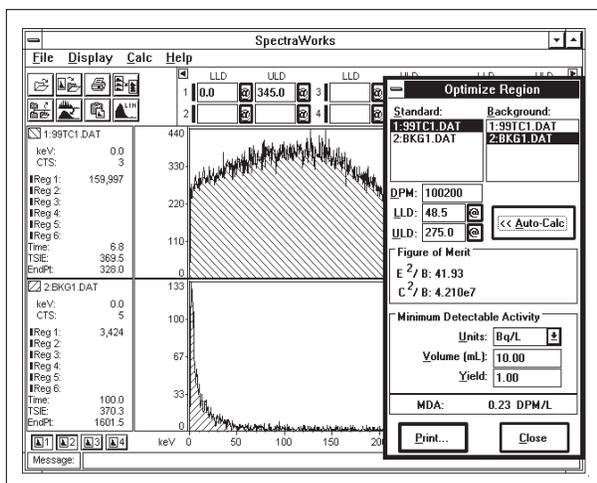
Figure 8.
Sensitivity limits are easily and quickly calculated with SpectraWorks.

of the reference, and then clicking the Auto-Calc button. The optimized region is shown as the E^2/B (C^2/B if you don't know the DPM of the reference sample). The MDA is automatically computed in the units of your choice, such as Bq/L, DPM/L, pCi/L or Tritium Units (T.U.).

Compute Peak Resolution

It is easy to calculate peak resolution with SpectraWorks for either alpha and gamma spectra. You simply select the lower and upper limits of the peak of interest in region 1, and then click on the Peak Resolution selection in the Calc menu. The peak resolution is immediately shown on the screen. Changes in the resolution of alpha spectra could indicate the presence of additional radionuclides, or a change in quench. Peak resolution for gamma
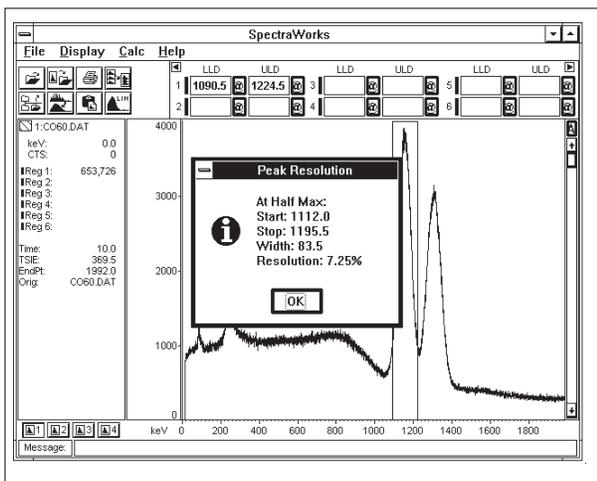

Figure 9.
SpectraWorks simplifies the calculation of peak resolution for a variety of applications.

spectra can be used to monitor the performance of your detector over time as an additional GLP performance check.

SpectraWorks Handles Spectra from Many Packard LSC and Gamma Counters

SpectraWorks allows you to analyze the spectra from a wide variety of Packard counters. Spectra from the following systems may be analyzed with SpectraWorks:

- Tri-Carb® liquid scintillation analyzer models 1600TR, 1900TR, 2100TR, 2300TR, 2500TR series, 2700TR series.
- Packard Cobra® Auto Gamma® analyzer models 5002 and 5003.

Computer and Software Requirements

SpectraWorks requires the following minimum computer configuration:

- IBM® compatible 386 (or higher) computer with 4 MB RAM.
- At least 1 MB of hard disk space available.
- Microsoft® Windows 3.1 or OS/2® v2.0 with Windows or higher.

SpectraWorks may also be installed directly for true multi-tasking use on Packard LSC and gamma models equipped with the OS/2 option. With SpectraWorks installed on these systems, you can count samples and store spectra while simultaneously analyzing previously counted spectra, without interfering with sample counting.

With the ChroniCal BuildDB program installed, spectra are automatically transferred to your network file server and stored in GLP compliant ODBC database format for easy retrieval from any Windows compatible computer attached to the network.

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