

# GENIE 2000

*New happenings in gamma  
spectroscopy data analysis*

*Sylvie Ward – Sales Support Specialist*



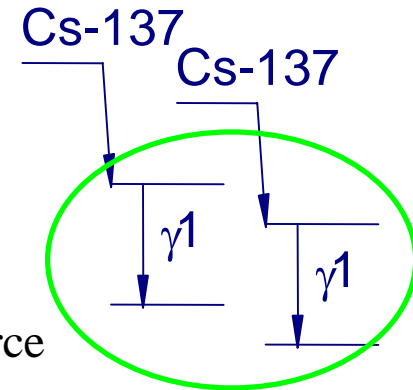
## *Genie-2000 Latest Features*

- Cascade Summing Correction
- LACE (Line Activity Consistency Evaluator)
- Interactive Nuclide Peak Labeling
- Automatic Gain Adjust
- Report Generator Improvement
- Enhanced Hardcopy Plotting
- Datasource Information / Summary Screen
- CAM File Preview

## Summing Errors

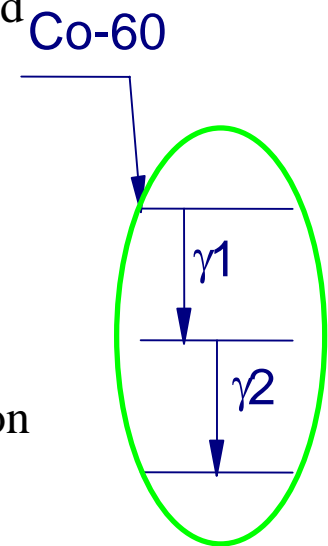
### Random Summing

- loss of peak area at very high count rate
- independent of energy, sample-to-detector distance, number of nuclides in the sample
- correctable with the use of a pulser or a stationary reference source

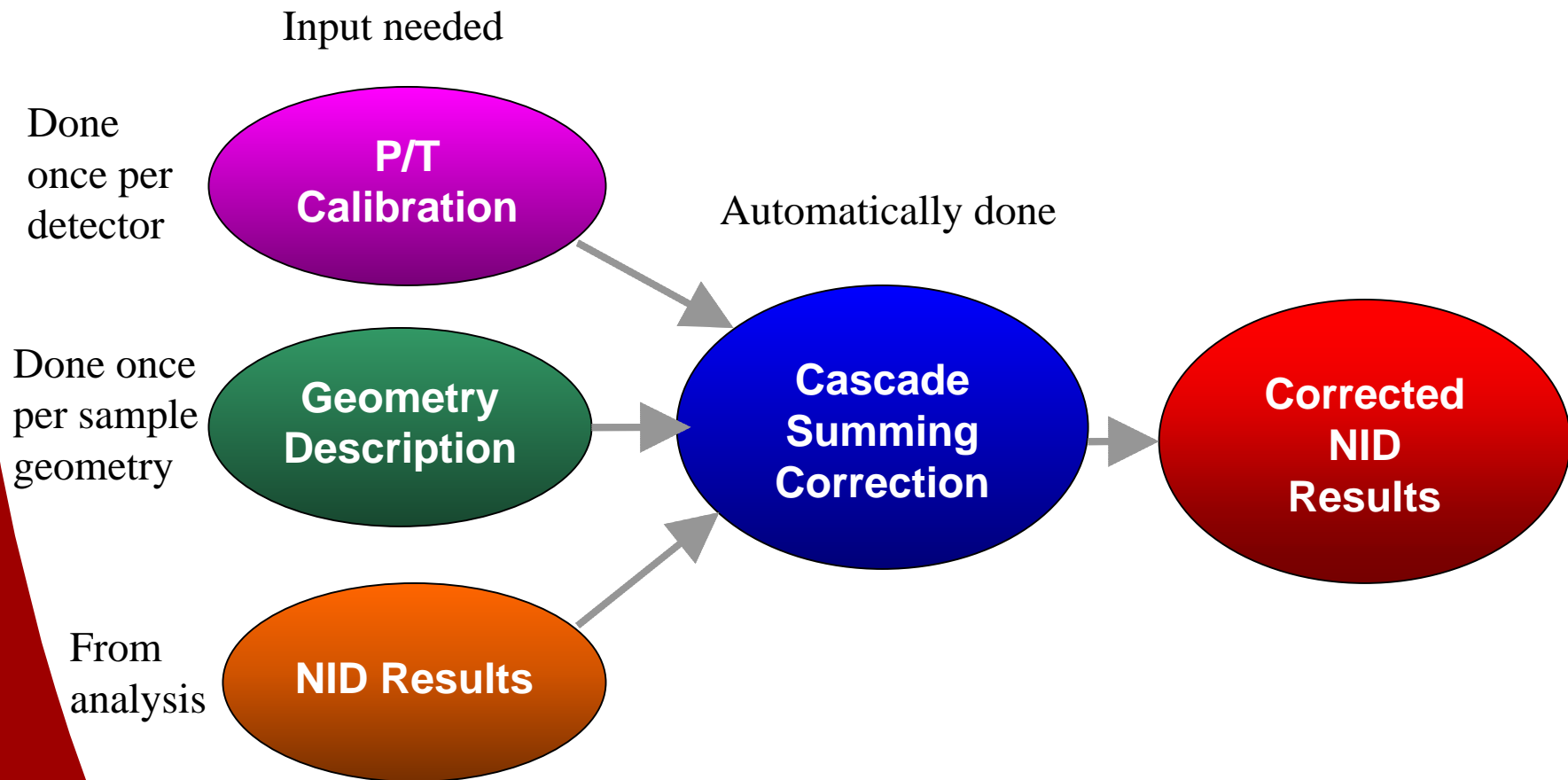


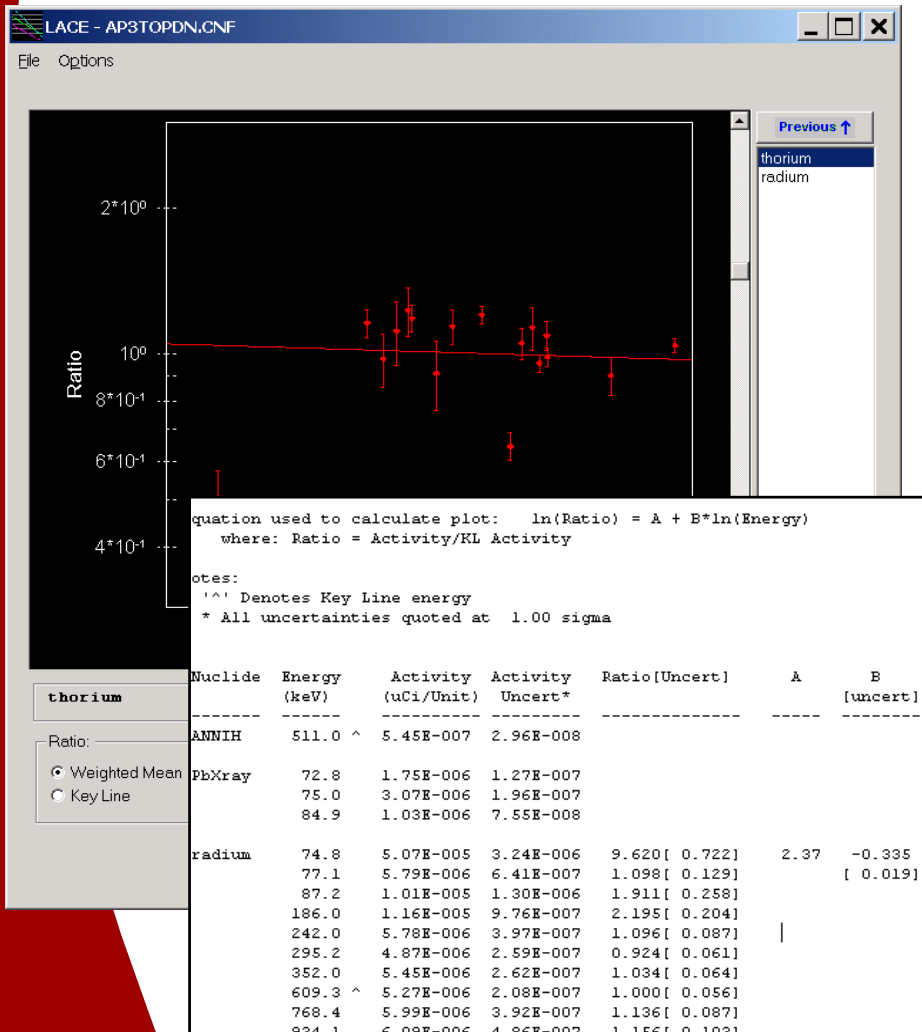
### True Coincidence Summing [Cascade Summing]

- loss or gain of peak area as a function of nuclide decay scheme and geometry
- independent of count rate - a problem for all samples
- different effect for different gamma energies of even the same nuclide
- correctable by increasing the sample-to-detector distance, if you want to pay the lower MDA penalty
- About 75 nuclides have this problem including common calibration nuclides
  - Co-60, Y-88, Ce-139, Eu-152, Cs-134, Ba-133
  - calibrations with these nuclides up close are wrong



2000  
**GENIE** *Cascade Summing Correction*



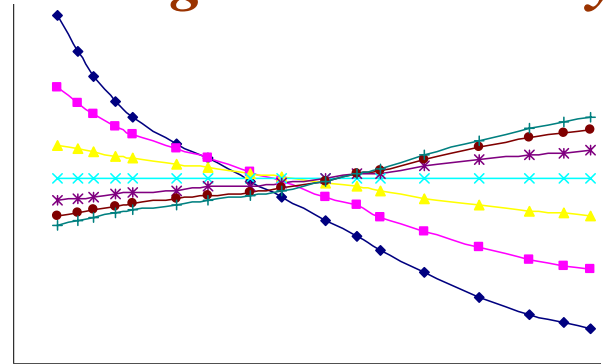
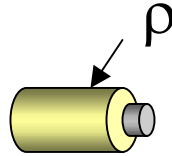
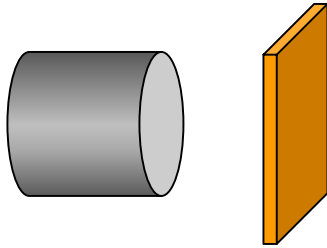


## Problems are easily seen new report, new graphic display

- Takes advantage of nuclides that emit multiple gamma energies
- Help to visualise imperfections in gamma spectra results
- Useful to improve quality of results

2000  
GENIE

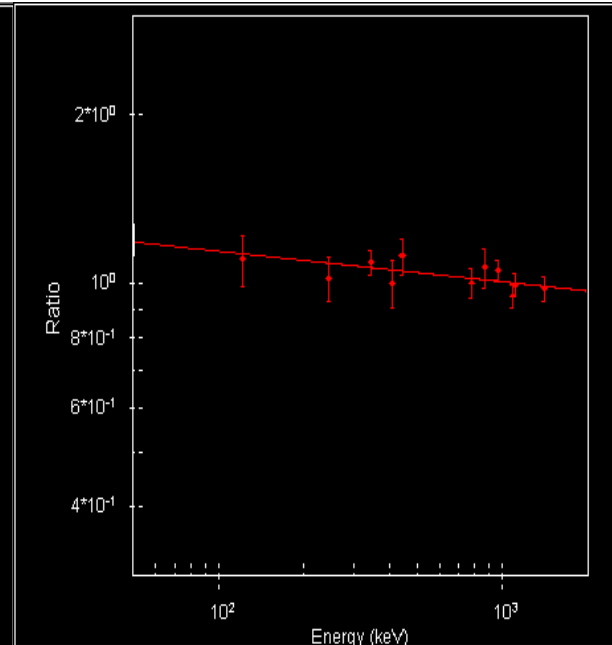
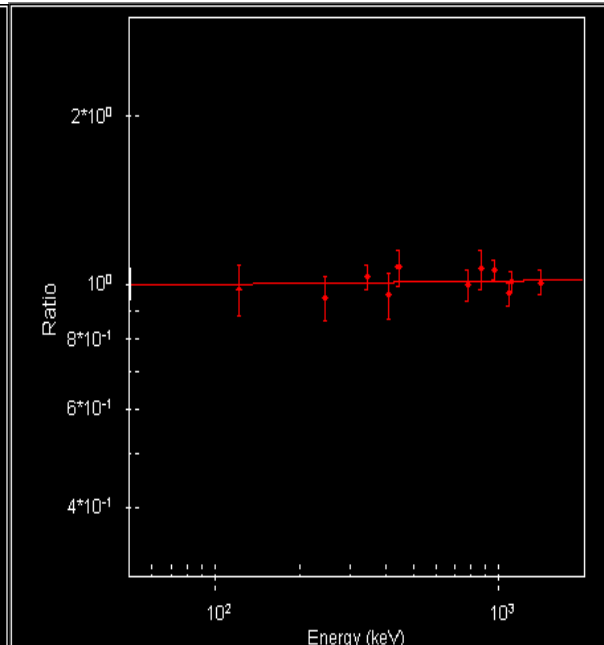
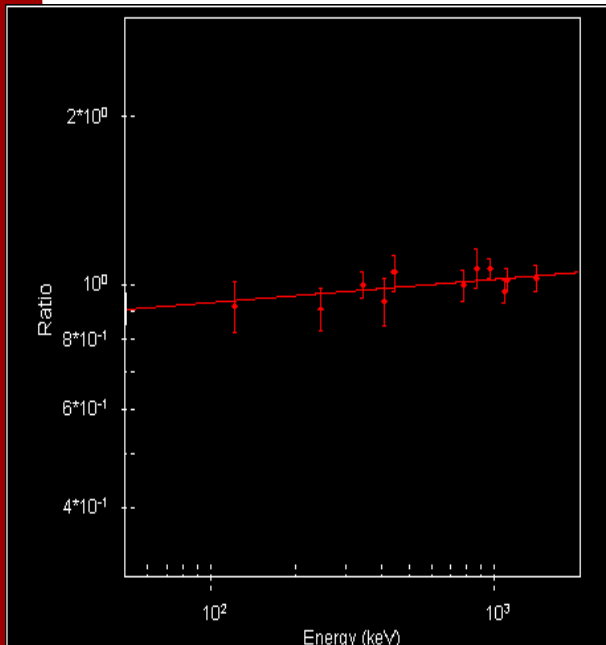
# LACE Example of Wrong Matrix Density



Cal Low (0.575 g/cc)

Nominal (1.15 g/cc)

Cal High (2.30 g/cc)

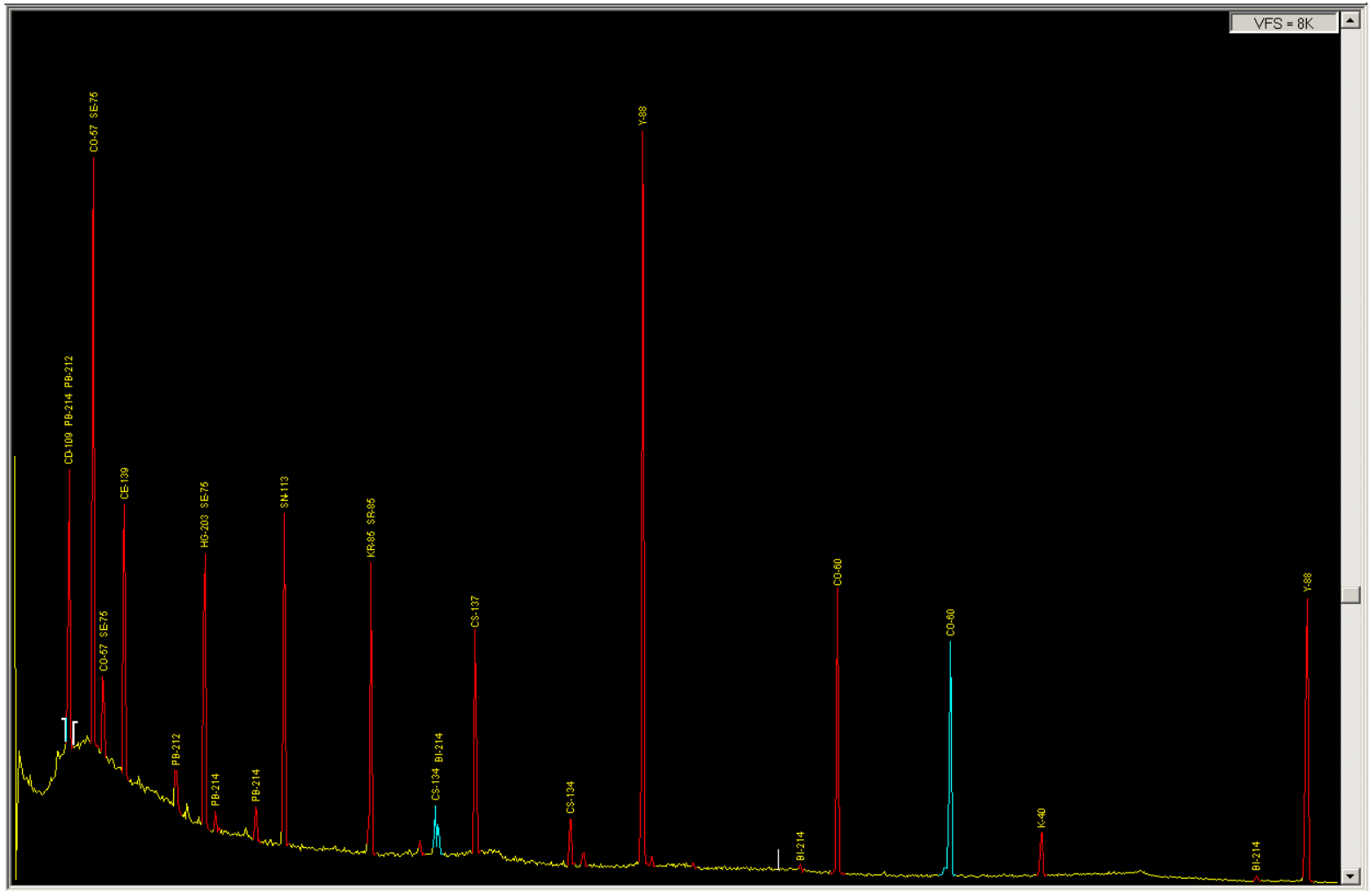


EU-152  $\ln(R) = -0.259 + 0.041(+0.030) * \ln(E)$

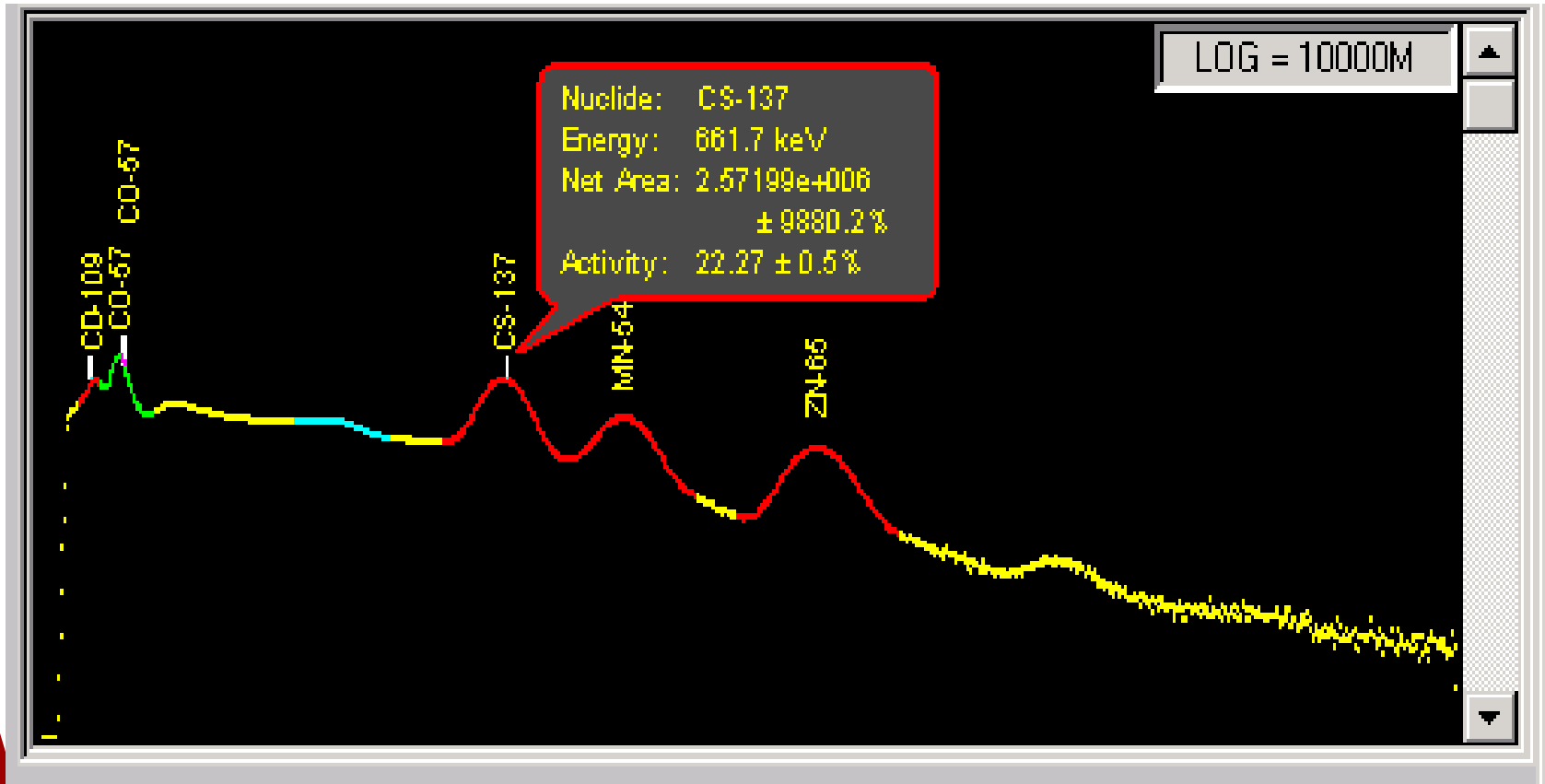
EU-152  $\ln(R) = -0.021 + 0.005(+0.030) * \ln(E)$

EU-152  $\ln(R) = 0.388 + -0.055(+0.030) * \ln(E)$

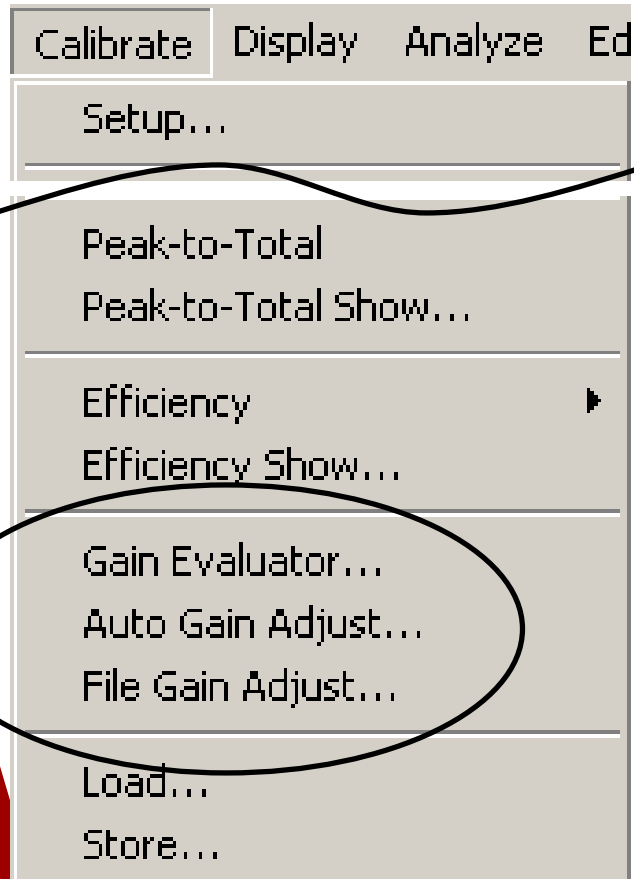
# Interactive Nuclide Peak Labeling



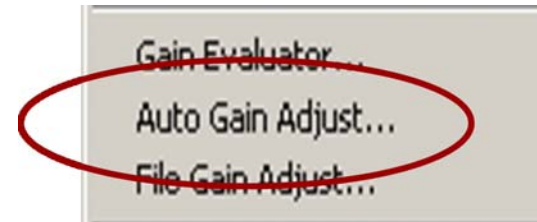
# Interactive Nuclide Peak Labeling



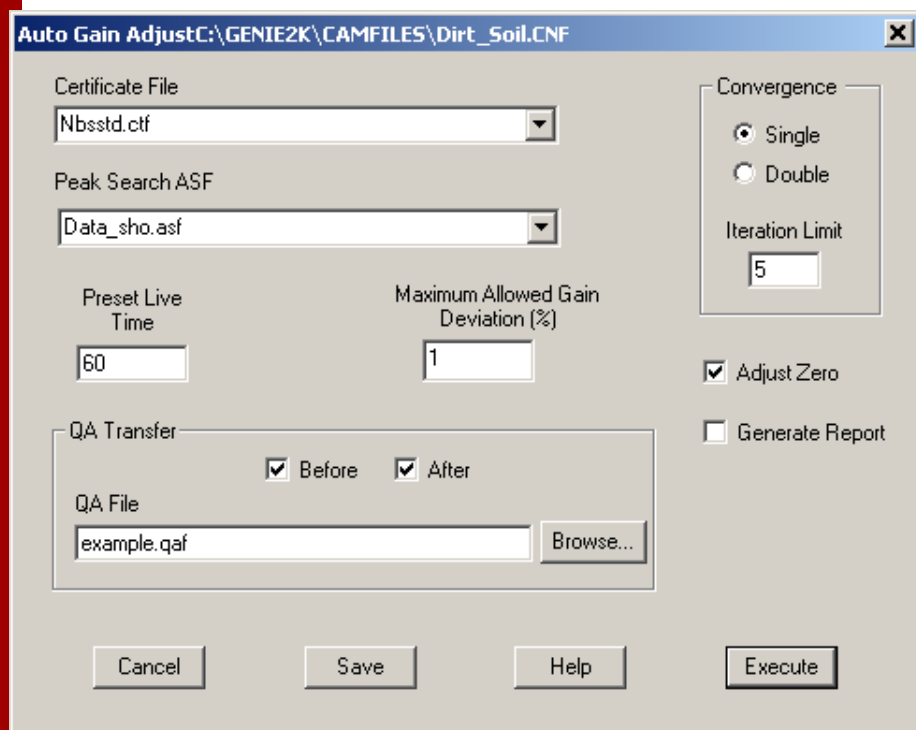
## *Automatic Gain Adjustment*



- Easy and automated way to set-up a  $\gamma$  spectroscopy system
- Facilitates comparisons, ease the monitoring of the consistency of analysis and also the following of trends
- Improve situations with less gain stability (In-situ measurements or NaI detectors)
- Can be used to check, adjust and track gain during extended campaigns : more QA!
- Requires full-computer controlled hardware



## Set-up conditions



- Place source on detector
- Enter Nuclide Energies, Analysis, Count times, and Stopping Limits
- Execute - have a cup of coffee while Genie does the work!
- System will perform a series of clear-acquire-analyse-adjust cycles until peak positions match current energy calibration
- Will even automatically update QA files before and/or after if desired
- Count samples with a perfectly calibrated instrument



## Display during Operation

**Auto Gain Adjust Status - C:\GENIE2K\CAMFILES\Naidemo.cnf**

Status: IN PROGRESS

Initiated: 11/26/2002 11:05:32

Acquisition: 32/60 seconds

Iteration: 2/5

% Gain Deviation: 6.6/0.5

Initial Gain: 17.266

Adjusted Gain: 19.323

Initial Zero: -1.221e-001 keV

Adjusted Zero: N/A

Iteration: 1

True(keV)	Found(keV)	Correction Factor	Shift/FWHM Fraction
59.5	AM-241	-	-
123.1	CO-57	135.6 ± 5.34 0.941 ± 0.041	0.75
-	-	189.4 ± 3.24 -	0.78
-	-	293.2 ± 3.87 -	0.78
661.6	CS-137	693.4 ± 7.24 0.952 ± 0.042	0.88
898.0	Y-88	934.5 ± 0.00 0.913 ± 0.023	0.91
1173.0	CO-60	1202.6 ± 0.00 0.934 ± 0.024	0.94
1332.3	CO-60	1378.5 ± 3.43 0.965 ± 0.035	0.96
1460.0	K-40	-	-
1836.0	Y-88	1890.8 ± 6.43 0.906 ± 0.046	1.05

Input is Sufficient (required energies: 4, supplied energies: 8)  
Output is Reliable (required matches: 4, output matches: 6)  
Tolerance Factor: 0.580  
Average Shift/FWHM Fraction: 0.87  
Weighted Average Gain Correction Factor: 0.934 ± 0.014  
Datasource Energy Calibration:  
 $E = 1.221e-001 + 2.432e+000*Ch + 3.428e-005*Ch^2$   
Calculated Energy Calibration:  
 $E = 2.826e-001 + 2.638e+000*Ch + 3.611e-005*Ch^2$

Buttons: Cancel/Abort, Help, Print Report Now, OK



Gain Evaluator - C:\GENIE2K\CAMFILES\Naidemo.cnf

Source of True Energies

Current NID Analysis Results

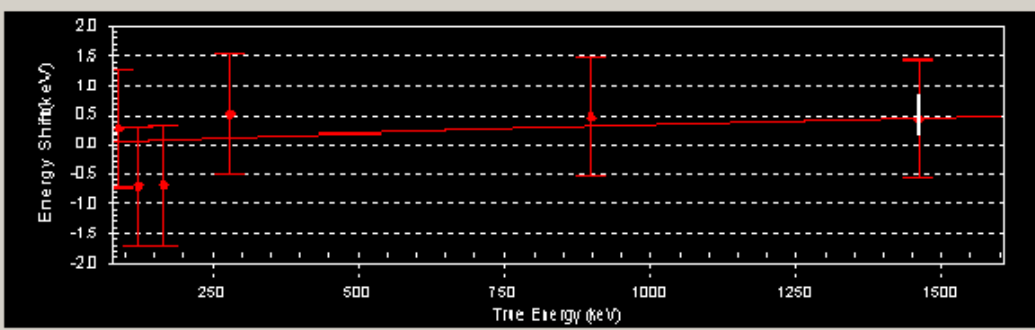
Certificate File: [ ]

Nuclide Library: [ ]

True Energies (Nuclide):

59.5	AM-241
123.1	CO-57
661.6	CS-137
898.0	Y-88
1173.0	CO-60
1332.3	CO-60
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1836.0	Y-88

Select All  
Clear



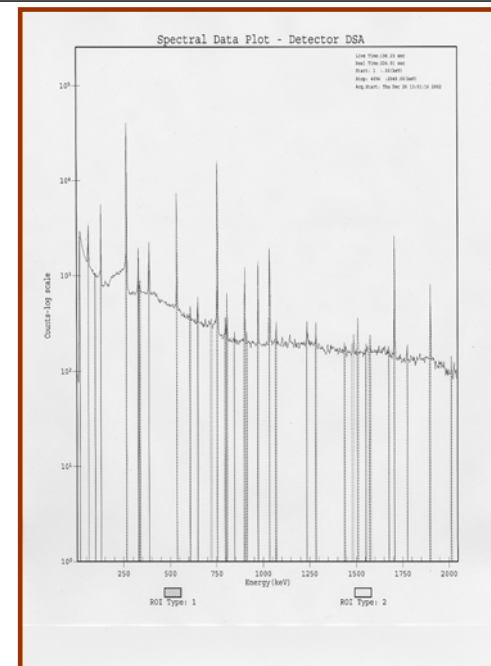
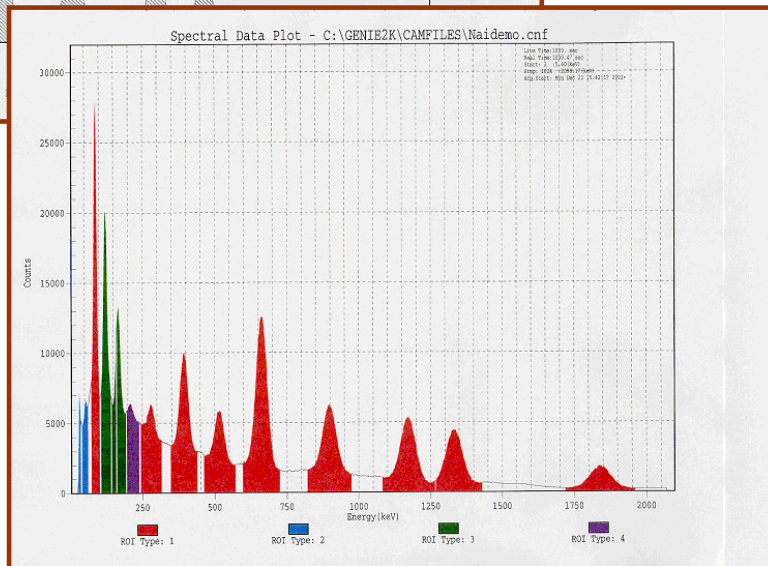
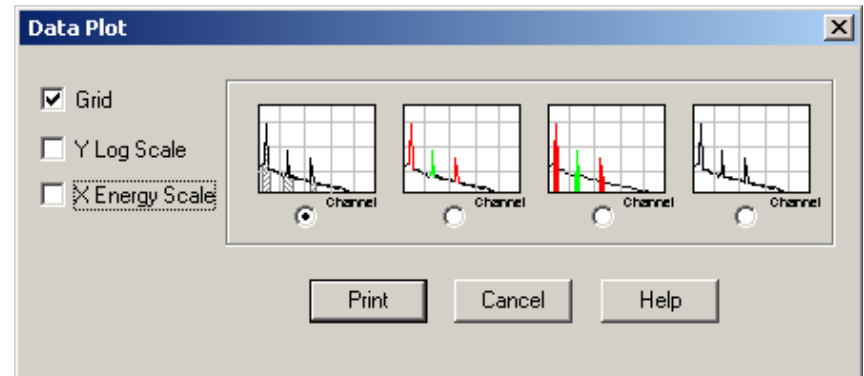
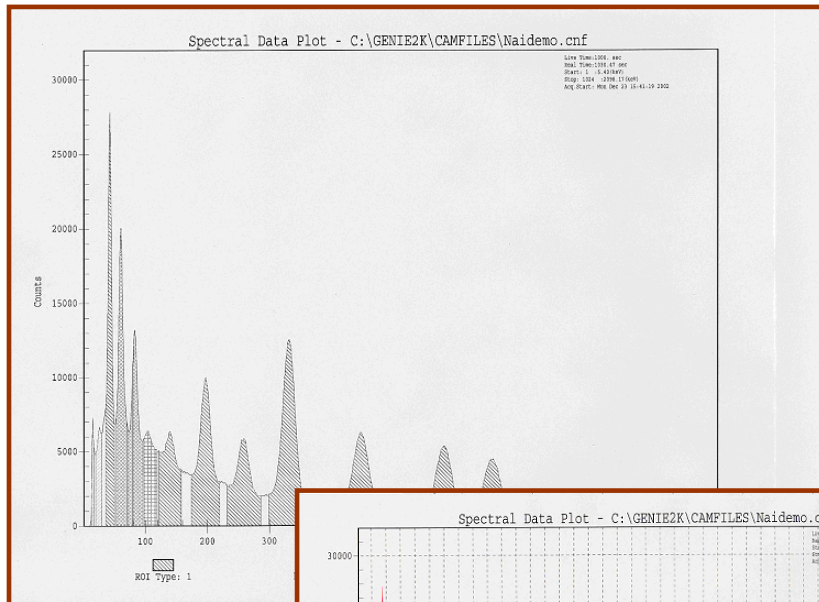
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Calculated Energy Calibration:  $E = 2.826e-001 + 2.638e+000*Ch + 3.611e-005*Ch^2$

Cancel Help Print Report **Fix File Gain** Save New CAL File ReEvaluate

- Displays graph showing agreement between true peak energy and found energy
- Can show improper NID/library, gain, zero
- All deviations should be small
- Should be part of data review process
- Can be part of ASF step [like IPF, LACE]

## Enhanced Hardcopy Plotting

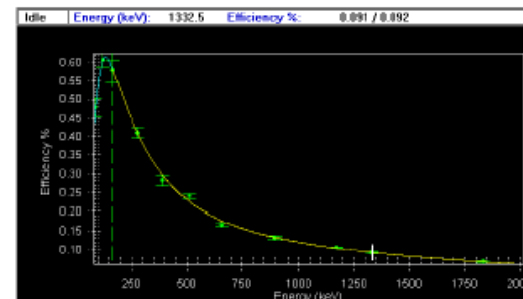


- Inclusion of graphics within the body of the report.
- Inclusion of special calculation
- Dynamic setting of the text
- Create "standard" graphics files
- Backward compatible with existing templates

## CANBERRA

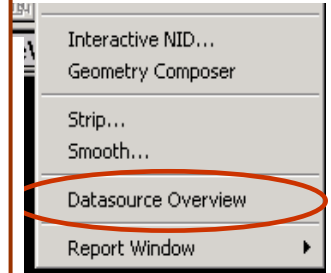
**Filename** : C:\GENIE2K\CAMFILES\Nbsstd.cnf  
**Report Generated On** : 10/14/2002 8:06:38 AM  
**Sample Title** : test2  
**Spectrum Description** : *NID Analysis w/Report*  
**Sample Identification** : NBS Std.  
**Sample Type** : Point Source  
**Sample Geometry** : @25 cm  
**Peak Locate Threshold** : 5.00  
**Peak Locate Range (in channels)** : 1 - 4096  
**Peak Area Range (in channels)** : 1 - 4096  
**Identification Energy Tolerance** : 1.000 keV  
**Sample Size** : 1.000E+000 unit  
**Sample Taken On** : 9/1/1978 6:00:00 AM  
**Acquisition Started** : 11/13/1978 12:00:00 PM  
**Live Time** : 4000.0 seconds  
**Real Time** : 4020.0 seconds  
**Dead Time** : 0.50 %

**Efficiency Calibration Used Done On** : 12/1/1994  
**Efficiency ID** : Temp



# Datasource Information

- MCA parameters used
- Analysis steps already performed on the datasource (with the algorithm name)
- Overview of Calibration Information



**Datasource Overview**

Acquisition | Analysis | Calibration

Datasource: C:\GENIE2K\CAMFILES\Naidemo.cnf

Input Information

Channels: 1024  
 Acq. Mode: PHA+  
 MCA Type: AcSp/+  
 AMP Type: NaI+  
 ADC Type: AccuSpec  
 HVPS Type: NaI+  
 Sample Title: Mixed Standard

**Datasource Overview**

Acquisition | Analysis | Calibration

Analysis Sequence Description: NID Analysis w/Report

Analysis Files

Peak Locate C:\GENIE2K\CAMFILES\STDLIB.NLB  
 Nuclide Identification C:\GENIE2K\CAMFILES\STDLIB.NLB

Analysis Steps

Acquisition	7/26/1993 12:56:39 PM
Peak Locate	Unidentified 2nd Diff.
Peak Area	Sum / Non-Linear LSQ Fit
Efficiency Correction	Standard
Nuclide Identification	NID w/ Interf. Corr.

**Datasource Overview**

Acquisition | Analysis | Calibration

Energy

Energy:  $3.442e+000 \text{ keV} + 1.960e+000 \cdot \text{Ch} + 8.350e-005 \cdot \text{Ch}^2$   
 FWHM:  $-7.181e+000 \text{ keV} + 1.909e+000 \cdot E^{1/2}$   
 Low Tail:

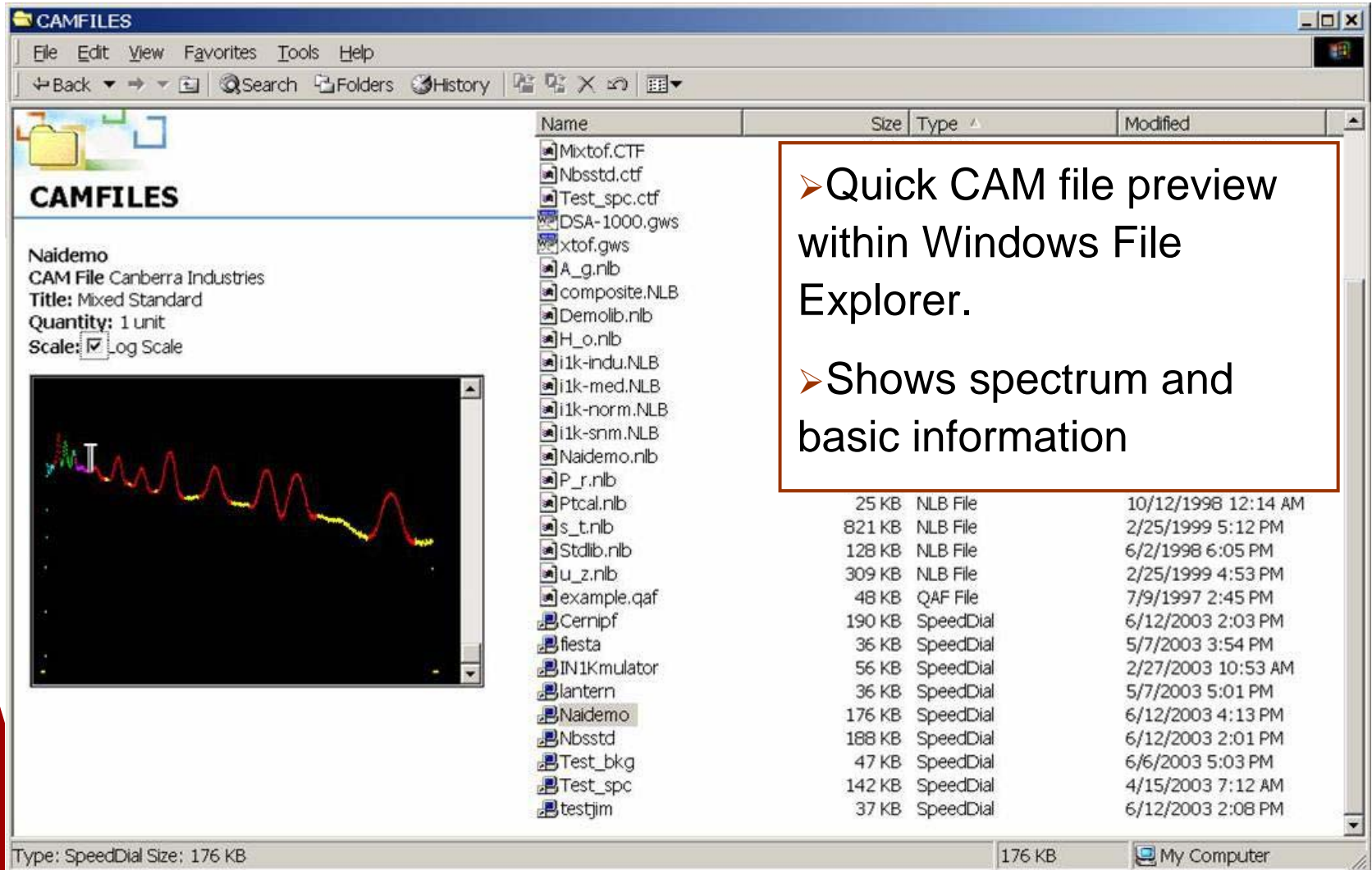
Efficiency

Type: Dual      Order of Low Energy Poly: 0      Order of the Polynomial: 5

$\ln(\text{Eff}) = -6.215e+002 + 5.303e+002 \cdot \ln(E) - 1.803e+002 \cdot \ln(E)^2 + 3.049e+001 \cdot \ln(E)^3 - 2.566e+000 \cdot \ln(E)^4 + 8.584e-002 \cdot \ln(E)^5$

Peak to Total

OK Cancel Print Help



**CAMFILES**

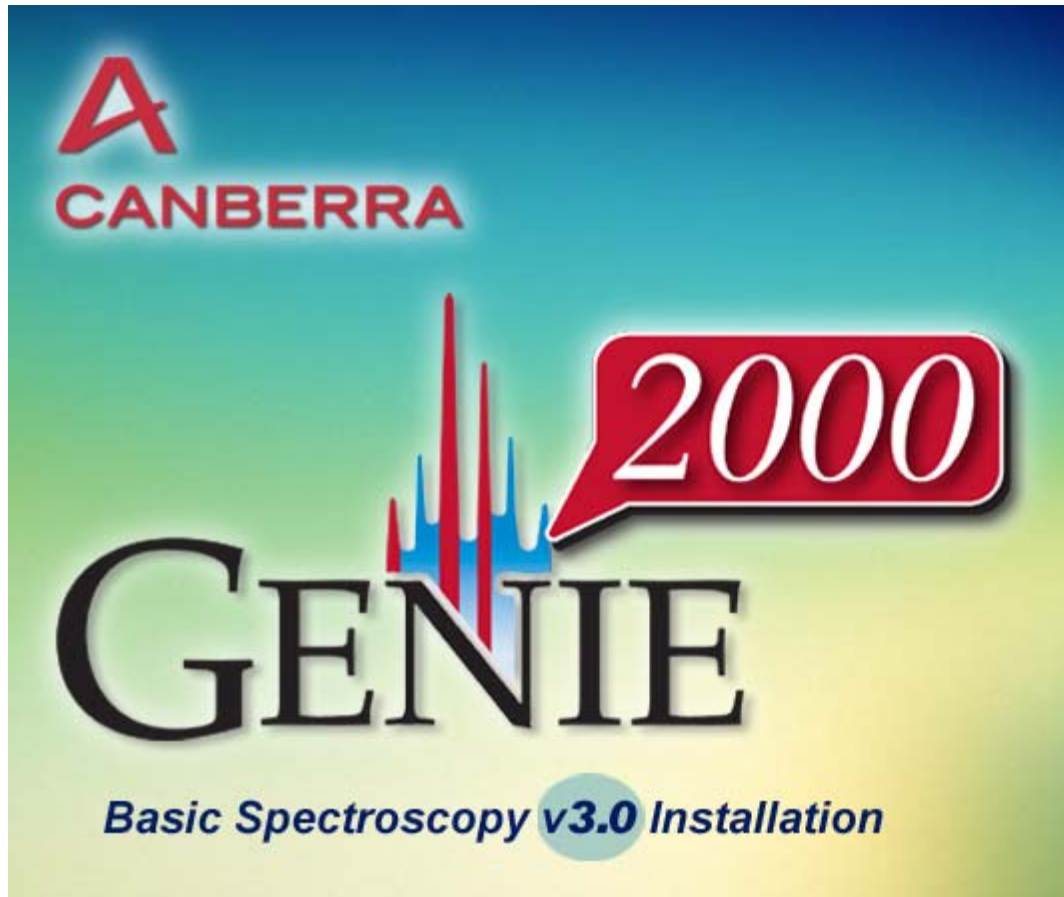
Naidemo  
CAM File Canberra Industries  
Title: Mixed Standard  
Quantity: 1 unit  
Scale:  Log Scale

Name	Size	Type	Modified
Mixtof.ctf			
Nbsstd.ctf			
Test_spc.ctf			
DSA-1000.gws			
xtof.gws			
A_g.nlb			
composite.NLB			
Demolib.nlb			
H_o.nlb			
i1k-indu.NLB			
i1k-med.NLB			
i1k-norm.NLB			
i1k-snm.NLB			
Naidemo.nlb	176 KB	SpeedDial	6/12/2003 4:13 PM
P_r.nlb			
Ptcal.nlb	25 KB	NLB File	10/12/1998 12:14 AM
s_t.nlb	821 KB	NLB File	2/25/1999 5:12 PM
Stdlib.nlb	128 KB	NLB File	6/2/1998 6:05 PM
u_z.nlb	309 KB	NLB File	2/25/1999 4:53 PM
example.qaf	48 KB	QAF File	7/9/1997 2:45 PM
Cernipf	190 KB	SpeedDial	6/12/2003 2:03 PM
fiesta	36 KB	SpeedDial	5/7/2003 3:54 PM
IN1Kmulator	56 KB	SpeedDial	2/27/2003 10:53 AM
lantern	36 KB	SpeedDial	5/7/2003 5:01 PM
Naidemo	176 KB	SpeedDial	6/12/2003 4:13 PM
Nbsstd	188 KB	SpeedDial	6/12/2003 2:01 PM
Test_bkg	47 KB	SpeedDial	6/6/2003 5:03 PM
Test_spc	142 KB	SpeedDial	4/15/2003 7:12 AM
testjim	37 KB	SpeedDial	6/12/2003 2:08 PM

Type: SpeedDial Size: 176 KB

176 KB My Computer

- Quick CAM file preview within Windows File Explorer.
- Shows spectrum and basic information



**Will be released in the next few months.**

# *Introducing the InSpector 1000*



*New Release*

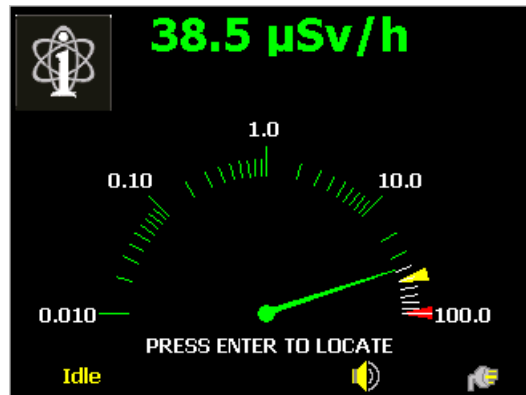
# *Find and Identify Radiation – Easily, Accurately and Reliably...*

- ✓ Dose and count rate measurements
- ✓ Nuclide identification and activity measurements
- ✓ Spectrum acquisition and analysis



- ✓ Digital Signal Processing Technology
- ✓ NaI detector characterisation

# Real-time High-performance Hand held radiation Identifier





**Tracks, monitors** and **alerts** the user of any radiation hazard from background ...

◀ Previous/Next Page 1 of 2 Not all peaks ident.

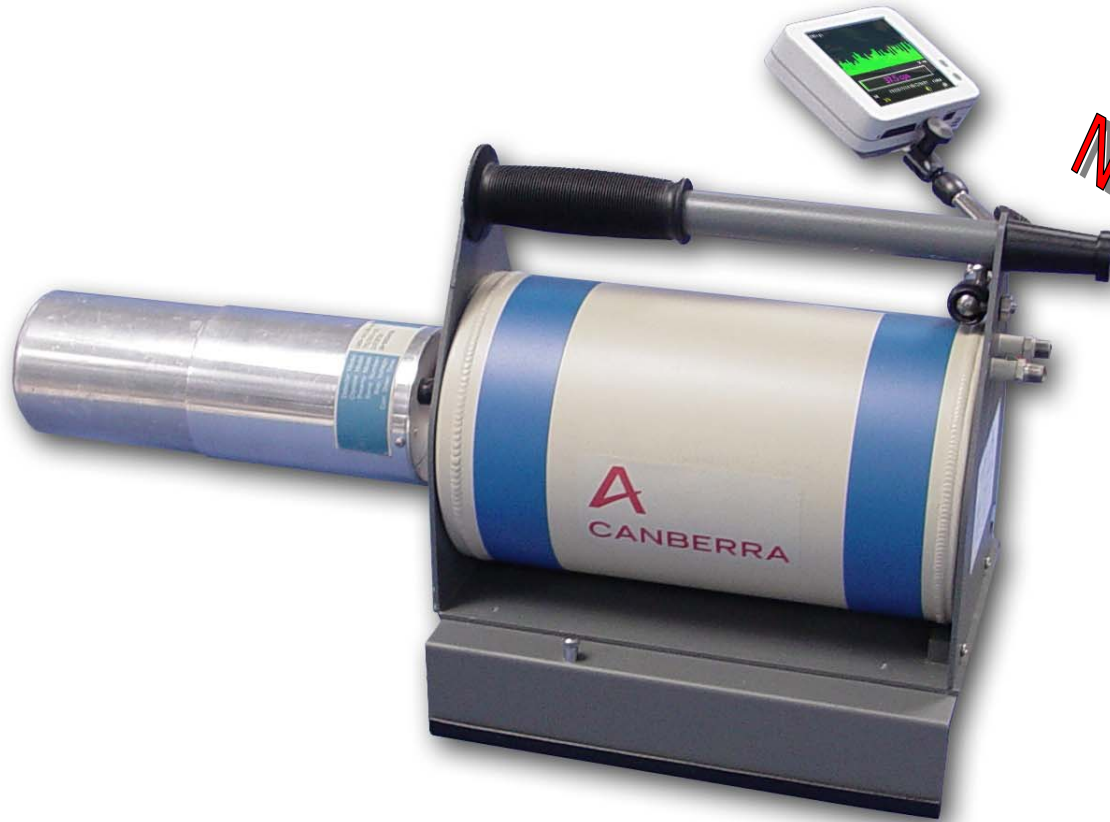
Nuclide	Type	µSv/h
CD-109	fission	0.174
Y-88	fission	8.742
SR-85	fission	5.267
SN-113	fission	0.866

**Press Enter to Save Spectrum**

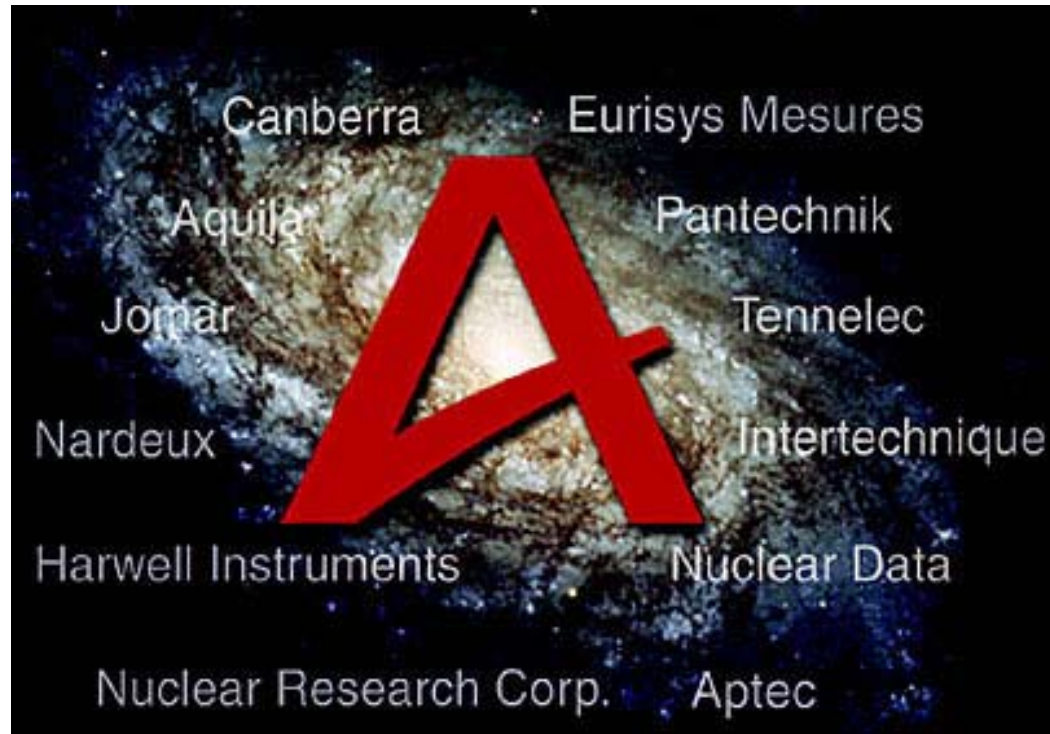
Acquiring Analyzing ▶ ▶  

**Identifies** and **reports** the radiation hazard!

# *Portable Gamma Spectrometer 2000*



*New Release*



Canberra Harwell Ltd

Your Partner for World Class Performance