α β γ **ISuS** Institute for Spectrometry and Radiation Protection

Logistic, Consulting & Management for α·β·γ·n–Spectrometry and Radiation Protection.
Reference Systems and Software Products for *In Vivo*, *In Vitro* and *In Situ* Application.
Studies on Suitability and Construction of Complex Measurement Systems.
Service for α-, β-, γ-, & n-Spectrometry Systems

*VRF - γ-Spectrometry Software

- Non linear - Least-Squares Fitting Techniques for Gamma Spectrometry

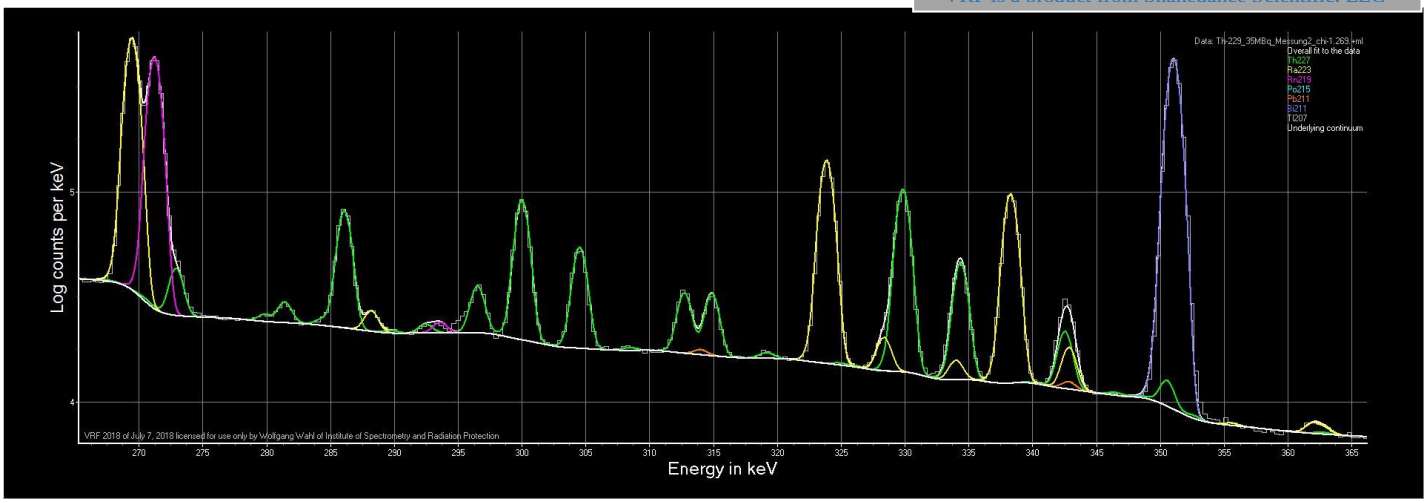
"After 40 years γ-spectrometry"

Finally a complete analysis of high resolution HPGe spectra

The latest generation in γ-spectra analysis

March 2021

*VRF is a product from Snakedance Scientific, LLC

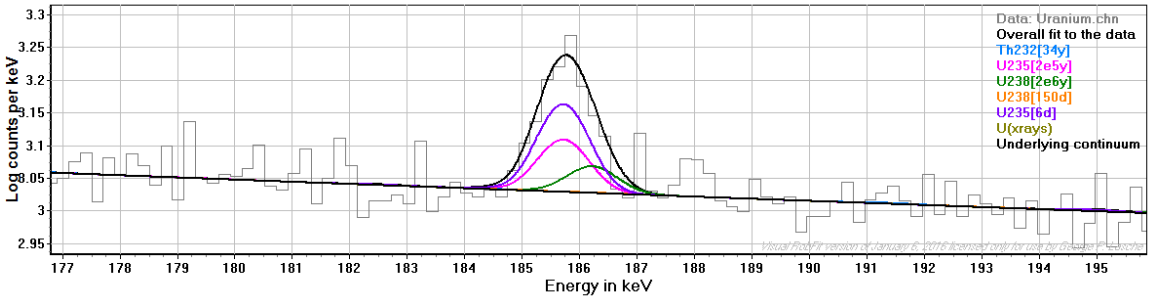


A new powerful method of high-resolution gamma-ray spectral analysis:

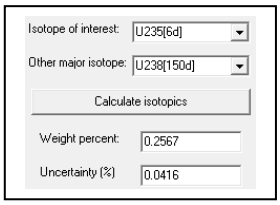
- A spectrum-wide shape is formed for each nuclide with activity adjusted at each iteration
- For all nuclides the full-spectrum shapes are summed and automatically repeated for best fit
- VRF is visually-driven for reporting, graphing and specialized analysis
- Detector energy, resolution and efficiency calibrations best fitting by up to 6-order Pàde
- High sensitive identification of minor peaks that are masked by larger overlapping peaks
- Automatic activity correction for decay during acquisition & collection and since collection
- Automatic random & true-coincidence summing and single, double and x-ray escape corrections
- Three different attenuation groups are selectable including low-energy peak-tail fitting
- Applicable to activation analysis for prompt and delayed neutrons
- Implemented calculation of isotopic ratios, e.g. for U-235/U238 or Pu-240/Pu-239
- Editable libraries (txt-files) for 1180 isotopes (3840 in preparation), selectable decay sequences (chains), all x-rays, 183 neutron activated nuclides and customizable groups of isotopes

1. Deconvolution: Example of a sensitive uranium analysis (isotopic-ratios)

Sample of U-235 (recently processed and fully aged) as well as U-238/Ra-226:

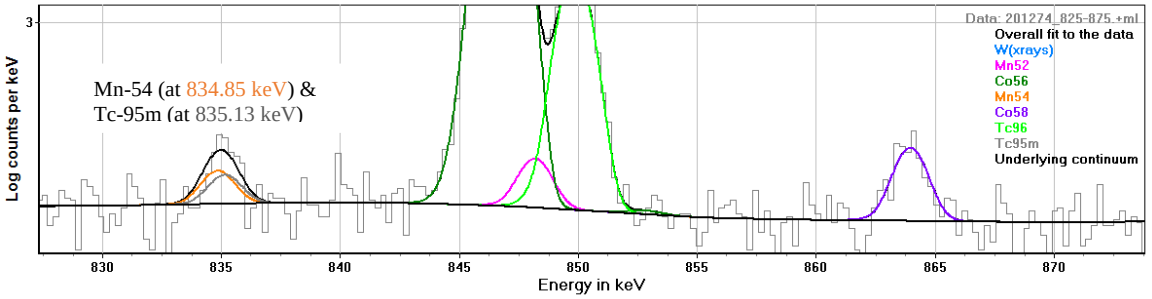


The deconvolution of Ra-226 (green) from the peaks of U-235 of the sample (purple) and U-235 from the surrounding environment (pink) can only be done with VRF. No background subtraction needed!



2. Interference: Example for a small peak masked between two large peaks

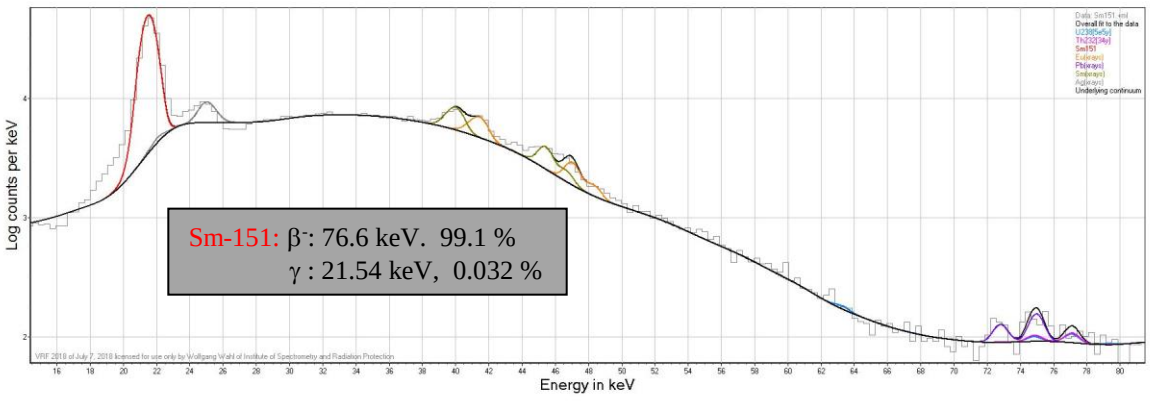
Small Mn-52 848.2 keV peak masked by two peaks of Co-56 846.8 keV & Tc-96 849.9 keV



The deconvolution of a very small from two large peaks is shown here as another example of what can only be done with VRF.

3. Background distribution: Low-energy peak over a bremsstrahlung distribution

Sm-151 source: The region from 8 keV to 84 keV of the analysed spectrum



Shown here is the low-energy bremsstrahlung distribution superimposed by the 21.5 keV low-energy single-photon transition (red fit) and the corresponding x-rays. This was only analysable with VRF.

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