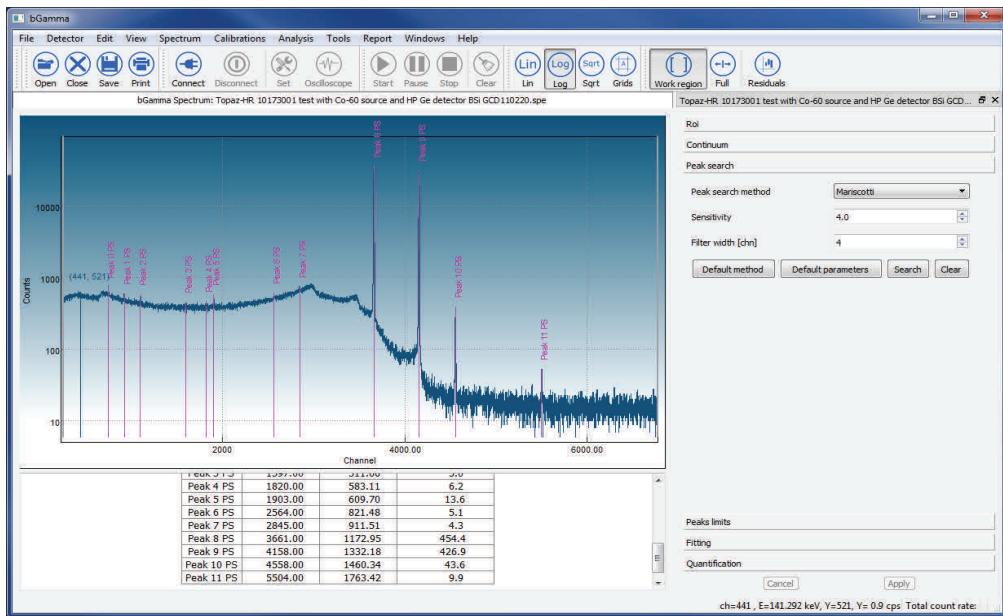




# TECHNICAL SPECIFICATIONS

## bGamma Software Package



### INTRODUCTION

The analysis of the energy spectra produced by a radioactive sample and recorded with a nuclear radiation detection system is a very critical step in gamma-ray spectrometry mostly due to its complexity. Large amount of interference between elemental emissions, the presence of spectrum artifacts (e.g. sum and escape peaks) and complex continuum among many others make difficult the correct radionuclide identification and quantification of its activity independently of the measurement geometry or sample characteristics.

bGamma software is a general purpose, comprehensive, and extensive software package designed for gamma-ray spectrum analysis, and radionuclide identification and quantification.

bGamma software can process any recorded gamma-ray spectrum independently from the detector, geometry and sample used. bGamma software package provides all the necessary tools and functionality for analyzing complex gamma-ray spectra in detail quantifying the radionuclides present in a given sample.

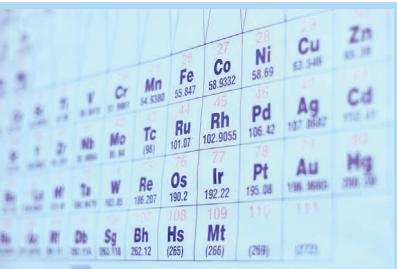
In particular, the software allows you to:

- Connect and control the hardware for correct data acquisition
- Control and visualize the data acquisition
- Import spectra from other file-formats
- Perform an energy, shape and efficiency calibration of the gamma-ray spectrum
- Search automatically for peaks and classify them by class (singlets, multiplets)
- Perform ROI analysis and calculations
- Fit the experimental data to mathematical models, performing also background subtraction, peak interference correction, etc.
- Identify nuclides with separation from possible spectrum artifacts and structures
- Perform radionuclide activity calculations

From the user's point of view, all of the above operations are achieved in a simple, yet powerful way. The modern Graphical User Interface (GUI) makes the spectrum visualization and analysis very intuitive and provides an important "visual" feedback of the analysis results.

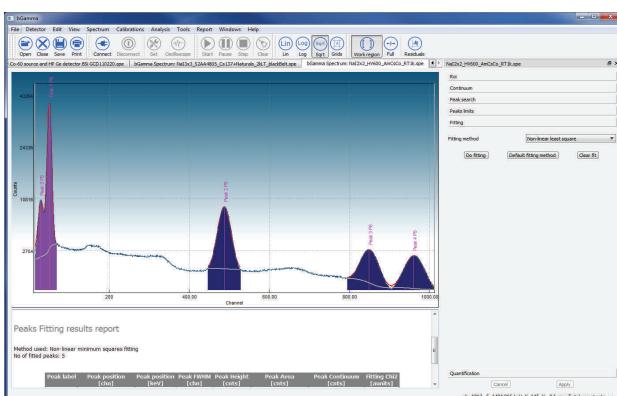
bGamma software is designed as a multi-document application, permitting simultaneous analysis of several spectra while at the same time acquiring data from multiple connected detectors.

The large quantity and variety of calculation algorithms implemented into bGamma makes possible the analysis of a broad range of gamma-ray spectra independently of the type of detector used: from high-resolution Ge to medium resolution scintillators like LaBr<sub>3</sub> or the widely-used NaI(Tl).



### FEATURES

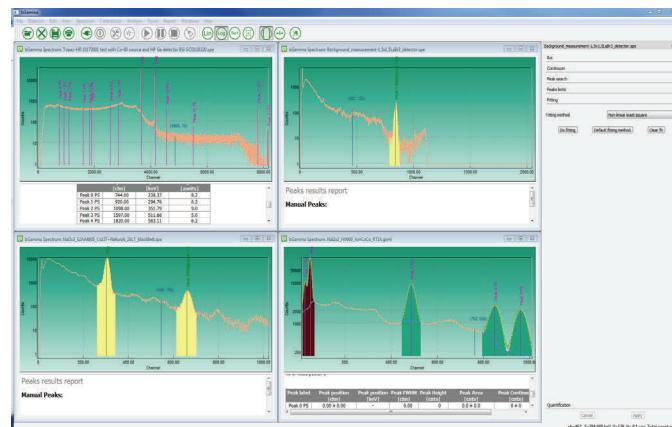
- Controls data acquisition via detector-MCA setups
- Implements different automatic peak search methods
- Provides different methods for peaks' continuum subtraction
- Region of interest (ROI) calculations and automatic and/or manual marking
- Energy and shape calibrations using comprehensive data input with visual interaction
- Easy to perform and yet powerful efficiency calibration
- Implements several spectrum analysis fitting methods, including **Bayesian fitting**. This wide choice of analysis methods warranties the success and/or suitability of spectrum analysis for any kind of gamma-ray spectrum and analysis needs
- Fitting and mathematical model parameters are at hand for quick changes and optimization
- Visual distinction and marking of ROIs and peaks in the spectrum. Multiple peak labelling implementation
- Advanced graphical user interface (GUI) that can be set to the user's preferences
- Advanced spectrum cursor showing satellite or spectrum artifacts
- Multi-document design with full data synchronization
- Great traceability, saving all information into XML-formatted files (\*.gxml)
- Import spectrum from other formats. E.g. Ortec (\*.chn) and Canberra (\*.cnf) files
- Customizable analysis reports, including fully colored and HTML-formatted tables
- Quantification via different methods
- Provision of full radionuclide library based on internationally well-known and maintained "NuDat" nuclear data files
- The software is multi-platform and runs seamlessly under MS Windows®, macOS® or Linux™



## SPECTRUM ANALYSIS

bGamma incorporates a powerful collection of computation engines that facilitate an accurate analysis of any kind of gamma-ray spectrum. They can be summarized as follows:

- ROI computations
- Continuum calculation methods
- Peak search engines
- Peak qualification methods and automatic ROI location
- Peak fitting algorithms
- Energy calibration methods
- FWHM calibration methods
- Efficiency calibration methods
- Nuclide identification techniques
- Activity calculation techniques
- Activity calculation algorithms



## CALIBRATIONS

Calibrations are an essential step in the correct analysis of a gamma-ray spectrum. bGamma offers all the necessary tools and functionality to carry out any type of calibration. The energy and shape (fwhm) calibrations are integrated into a single dialog. bGamma employs a significant amount of hidden *know-how* when suggesting the lines to be used for calibration according of the type of spectrum and detector. The powerful GUI provides detailed visual feedback during and after the process.

Efficiency calibration uses a versatile fitting engine to derive the complex calibration coefficients in a polynomial of the logarithmic of energy. This calibration dialog provides a simple, yet comprehensive GUI for immediate and visual feedback of the obtained efficiency calibration results.

## NUCLIDE LIBRARY

bGamma incorporates the entire radionuclide decay emissions database. All nuclide data is available to any instance of the spectrum analysis and/or data visualization. The nuclide decay data is taken from the internationally well-known data file NuDat, which is produced, certified and maintained by the International Nuclear Data Committee.

## REQUIREMENTS

bGamma is a multiplatform software and runs on the following OS:

- Microsoft Windows XP™ up to Windows 10™ for 32- and 64-bit processors
- macOS®
- Linux™

## ORDERING INFORMATION

1. bGamma Application Software: Single License and Single Input
  - Right to run the software on a single PC. Connection to only one detector (hardware)
2. bGamma Application Software: Single License and Multiple Inputs
  - Right to run the software on a single PC. Connection to multiple detectors (hardware)
3. bGamma Application Software: Network License.
  - Right to run the software on a PC connected to a network. The number of instances of the software will depend on the number of “licenses” purchased or activated.
4. **bGamma package:** Includes full bGamma application software (Single License) + Topaz-HR MCA

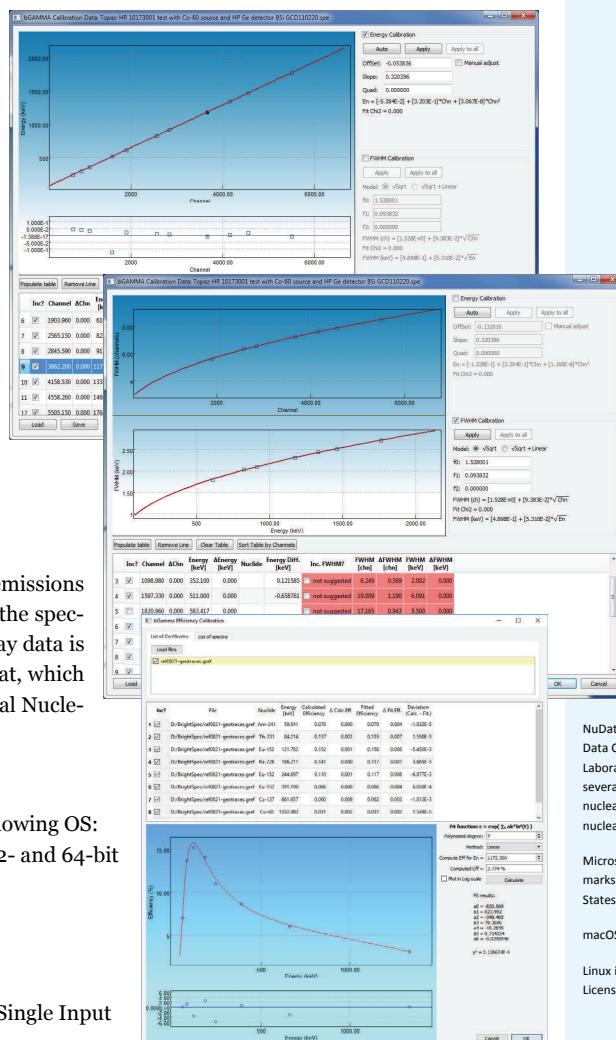
## ADDITIONAL INFORMATION

The bGamma product line includes the “bGamma Programming Libraries”, which are offered as a separate product. Please contact us for more details on using “bGamma Programming Libraries” and its license op-

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NuDat was developed by the National Nuclear Data Center (NNDC) in Brookhaven National Laboratory, USA. It provides data extracted from several databases containing nuclear structure, nuclear decay, and some neutron-induced nuclear reaction information.

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