Key features of bGamma

BrightSpec NV

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SUMMARY

Unique

- Unique features → feature not existing in any commercial software

Few

- Outstanding → remarkable implementation of this feature

Highlight

- Highlight → Feature that, as a result of its implementation, could position this product at the top of the selection list even when other similar products would have this feature realized as well.
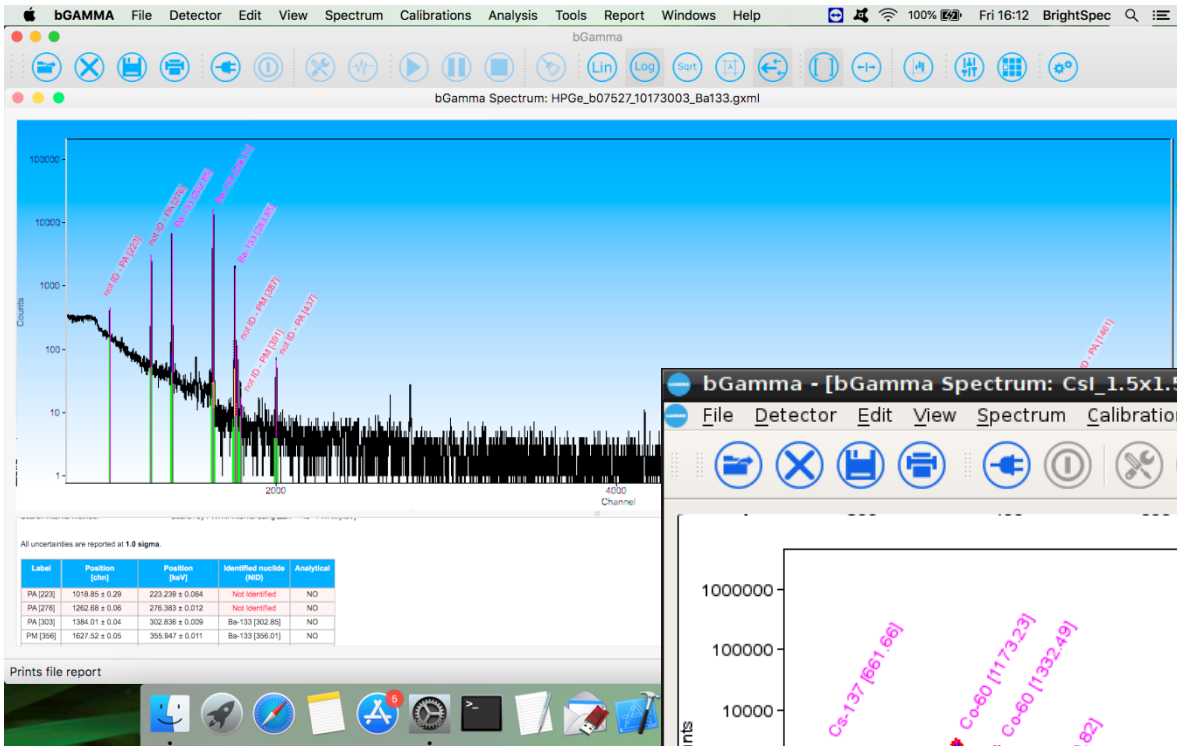
Platform independent

Unique

- Run seamlessly in any Operating system
    - MS Windows:
        - XP, 7, 8 and 10.
    - Linux
    - mac OS
- Wide hardware support
    - X86 (32-bit) μProcessor
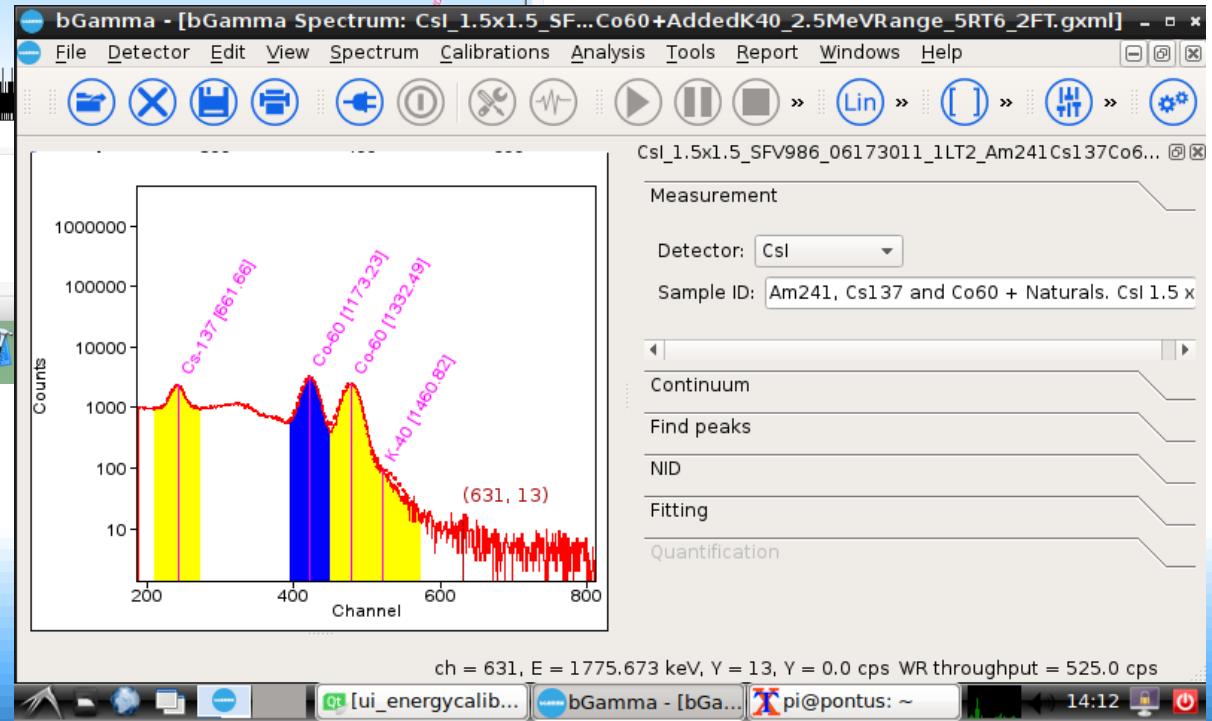   - 64-bit μProcessor
   - ARM μProcessor

Platform independent

Generic software

- Multipurpose and generic software for gamma-ray

  Few

  - Analysis of ANY type of Gamma-ray spectra independently of the detector used for its measurements
    - Low-medium-high energy resolution detectors
      - BGO, CsI, NaI(Tl), $CeBr_3$, SrI_2, $LaBr_3$
      - HPGe, Si(Li) and CdZnTl
  - All analysis parameters are at hand and saved as "model".
    - Models can be imported for quick spectrum analysis
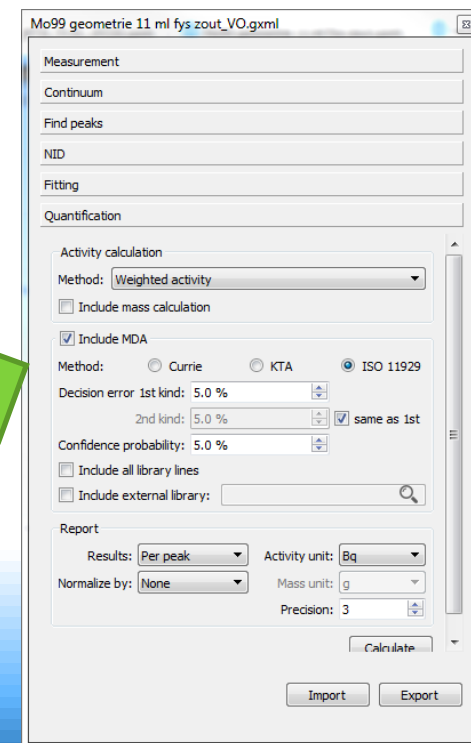
MultiDocument

- Allows working with many spectra at same time
  - Can mix spectra being acquired (hardware control) with spectra from saved files
  - Use of docking and floating windows

Outstanding GUI

Few

- Modern, comprehensive, powerful graphical user interface (GUI).
  - Nearly any analysis or calculation step is provided with visual feedback

Shape Calibration →
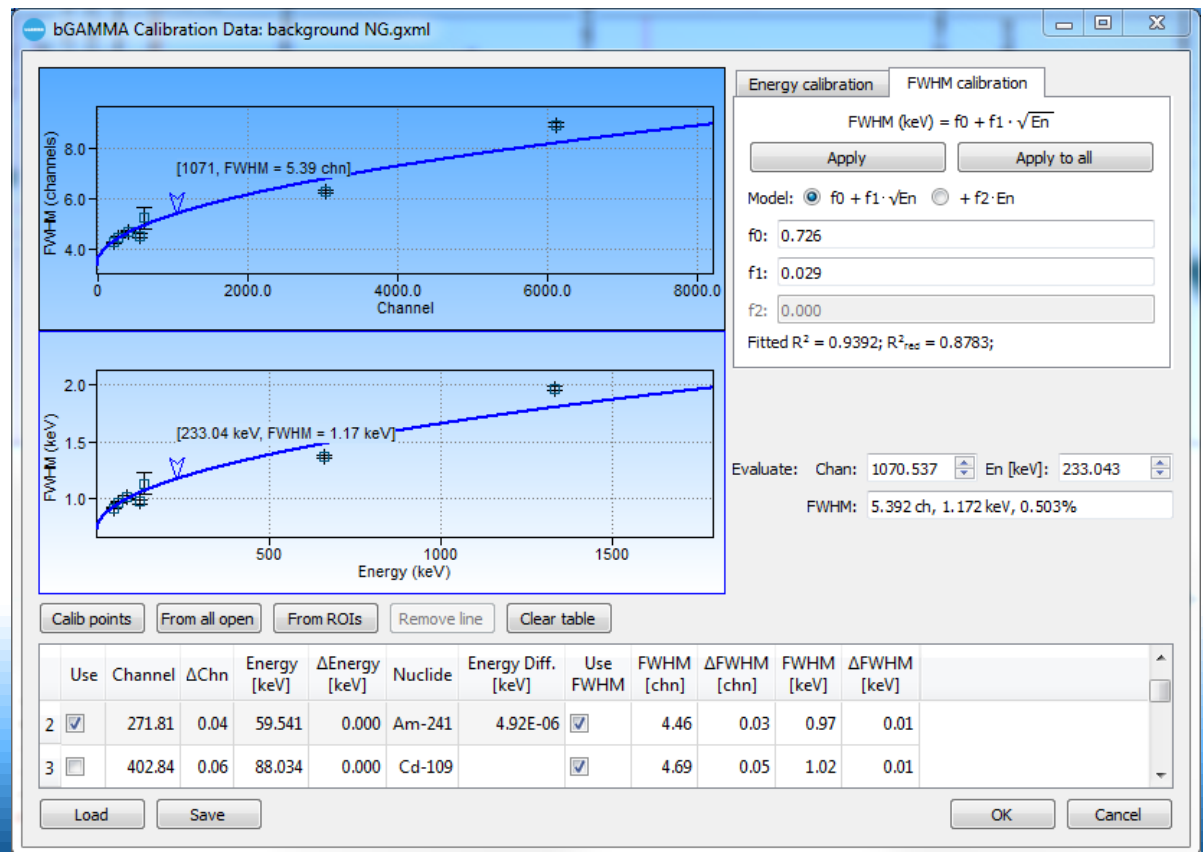
Outstanding GUI

- Peaks and ROI results data at hand.
- Each spectrum plot with residuals and its individual report panel
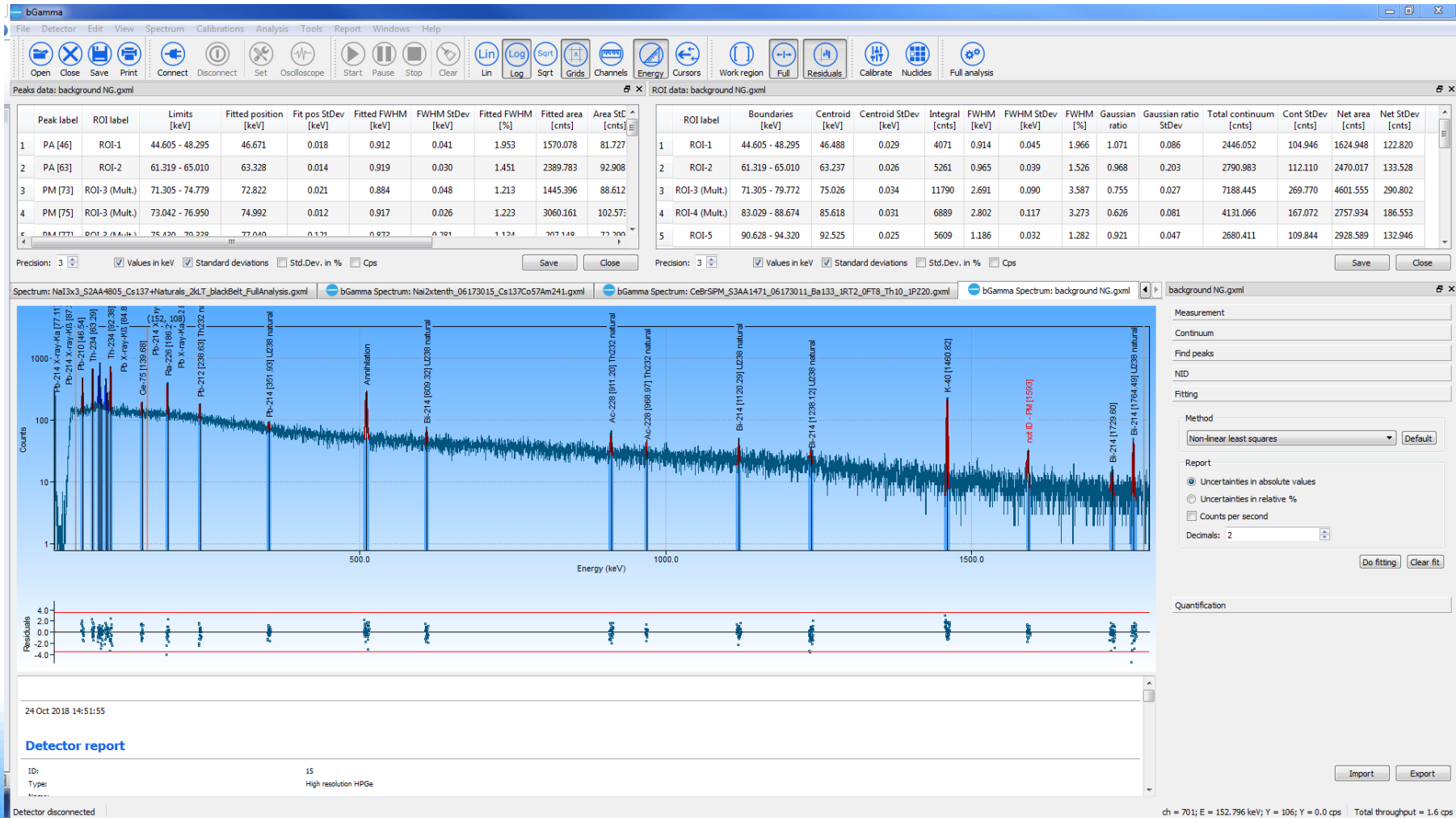
Accurate calculations

Unique

- All… absolutely all and any calculated magnitude is reported with corresponding uncertainty value
- Co-variances are taking into account for uncertainty calculations

Unique

Manual or Visual operation

- Ability to insert/remove peaks and ROIs by several methods

  Few

  - Visually via GUI
  - By nuclide library
  - Automatic by mathematical algorithms
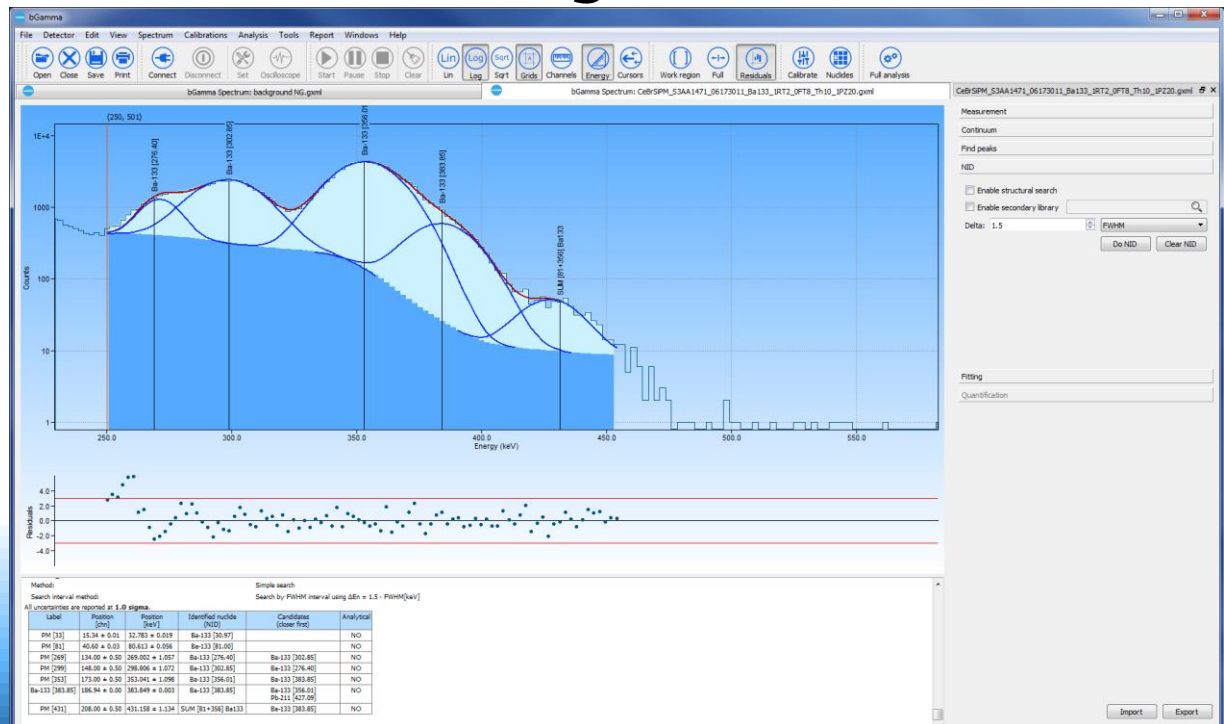
Manual or Visual operation

- Use of Multi-cursors
  - The use of "Spectroscopy-aware" cursors make easier the spectrum analysis and visual NID

Few
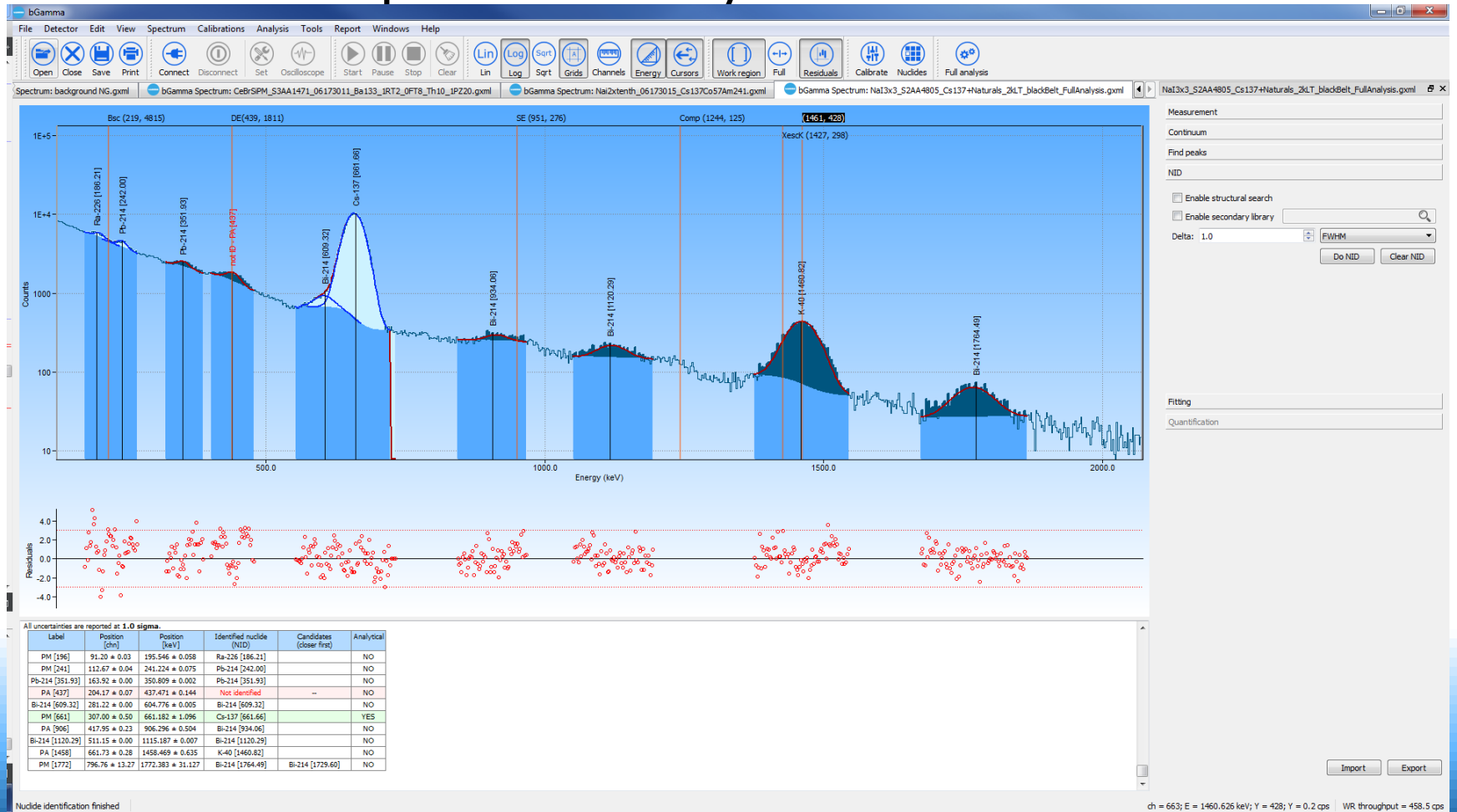
Computational algorithms

- Large selection of computational algorithms, included in the standard version of the software
  - Continuum models
    - By entire spectrum or per individual peaks
  - Extensive ROI calculations
  - Peak search and marking
    - 7 peak search methods
    - 4 peak marking and ROI identification algorithms
  - Three (3) peak fitting algorithms
    - Includes Bayesian peak fitting
- This wide range of choices warranties the success of the spectrum analysis from any type of detector, energy range and/or energy resolution

Computational algorithms

- Outstanding peak fitting and multiplet deconvolution
  - With visual feedback (residuals plot)
  - And Statistical qualifiers in the report (e.g. colored χ^2)
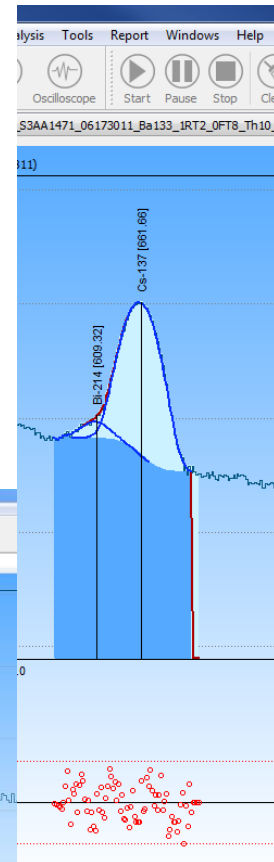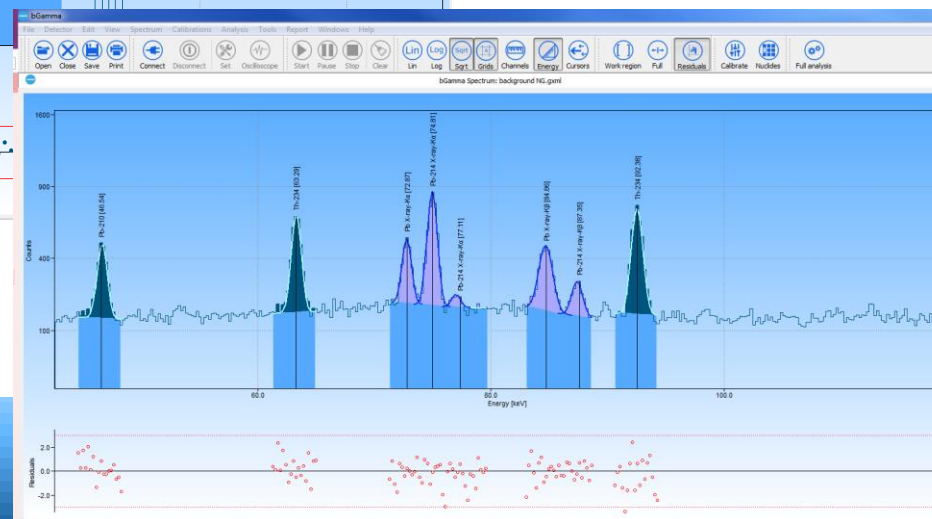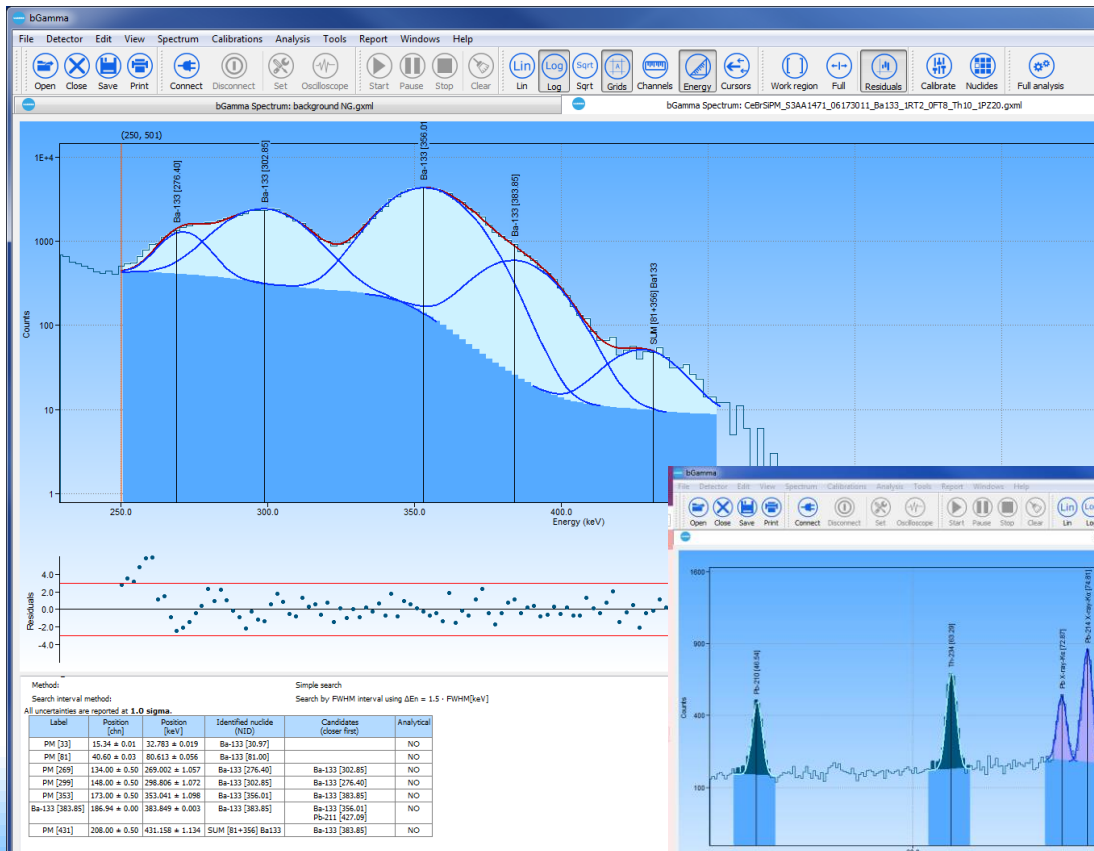
Computational algorithms

- Implements Bayesian peak fitting
  - Minimum input parameters
  - Does NOT rely on shape (FWHM) calibration

Unique

Import files

- Can open files from:
  - IAEA (*.spe)
  - Canberra, binary (*.chn)

    Unique

    - NO need of Canberra VDM or run time libraries installation
  - Ortec (*chn)
  - ANSI N42.42
    - Including latest edition N42.42.2012
  - Generic text file

Reports

- bGamma produces colored, rich-formatted and aligned reports
- HTML-based reports

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Peak fitting results report

Method used: Non-linear least squares

All uncertainties are reported at **1.0 sigma**.

Peak label	Related ROI	Position | Std.Dev. [chn]		Position | Std.Dev. [keV]		FWHM | Std.Dev. [chn]		FWHM | Std.Dev. [keV]		FWHM | Std.Dev. [%]		Area | Std.Dev. [cnts]		Continuum | Std.Dev. [cnts]		Fit χ^2 [aunits]	Identified nuclide (NID)
PA [46]	ROI-1	212.52	0.08	46.67	0.02	4.20	0.19	0.91	0.04	1.95	0.09	1570.08	81.73	2446.05	104.95	0.57	Pb-210 [46.54]
PA [63]	ROI-2	289.25	0.06	63.33	0.01	4.23	0.14	0.92	0.03	1.45	0.05	2389.78	92.91	2790.98	112.11	0.65	Th-234 [63.29]
PM [73]	ROI-3 (Multiplet)	332.99	0.10	72.82	0.02	4.07	0.22	0.88	0.05	1.21	0.07	1445.40	88.61	7188.45	269.77	0.36	Pb X-ray-Ka [72.87]
PM [75]		342.98	0.06	74.99	0.01	4.23	0.12	0.92	0.03	1.22	0.03	3060.16	102.57	7188.45	269.77	0.36	Pb-214 X-ray-Ka [74.81]
PM [77]		352.46	0.56	77.05	0.12	4.02	1.30	0.87	0.28	1.13	0.37	207.15	72.30	7188.45	269.77	0.36	Pb-214 X-ray-Ka [77.11]
PM [85]	ROI-4 (Multiplet)	387.91	0.12	84.75	0.03	6.01	0.25	1.30	0.05	1.54	0.06	2026.04	97.82	4131.07	167.07	0.46	Pb X-ray-Kß [84.86]
PM [88]		400.25	0.21	87.43	0.04	4.89	0.40	1.06	0.09	1.21	0.10	718.39	71.45	4131.07	167.07	0.46	Pb-214 X-ray-Kß [87.35]
PA [93]	ROI-5	423.99	0.06	92.58	0.01	4.88	0.14	1.06	0.03	1.15	0.03	3017.33	100.59	2680.41	109.84	1.14	Th-234 [92.38]
PA [144]	ROI-6	658.61	0.38	143.53	0.08	4.48	0.89	0.97	0.19	0.68	0.13	311.92	67.62	2330.19	102.59	0.40	Ge-75 [139.68]
PA [185]	ROI-7	852.25	0.11	185.60	0.02	4.35	0.25	0.94	0.06	0.51	0.03	1168.76	77.24	2604.89	114.10	0.36	Ra-226 [186.21]
PA [238]	ROI-8	1095.49	0.35	238.47	0.08	4.70	0.81	1.02	0.18	0.43	0.07	336.93	63.97	2140.51	103.60	0.32	Pb-212 [238.63] Th232 natural
PA [351]	ROI-9	1615.83	1.26	351.63	0.27	8.27	2.24	1.80	0.49	0.51	0.14	168.16	57.36	1586.99	93.45	0.21	Pb-214 [351.93] U238 natural
PM [511]	ROI-10	2348.03	0.15	511.02	0.03	11.96	0.32	2.60	0.07	0.51	0.01	3015.46	96.05	1990.47	141.12	0.74	Annihilation
PA [609]	ROI-11	2798.66	0.62	609.22	0.14	6.31	1.44	1.37	0.31	0.23	0.05	188.83	47.25	1045.90	79.35	0.25	Bi-214 [609.32] U238 natural
PA [911]	ROI-12	4181.72	0.64	911.07	0.14	8.14	1.47	1.78	0.32	0.20	0.04	225.13	44.94	861.17	80.35	0.54	Ac-228 [911.20] Th232 natural
PM [969]	ROI-13	4446.17	0.79	968.86	0.17	5.73	1.74	1.25	0.38	0.13	0.04	99.72	34.22	407.92	32.00	0.27	Ac-228 [968.97] Th232 natural
PA [1120]	ROI-14	5137.35	0.67	1120.03	0.15	8.56	1.53	1.87	0.33	0.17	0.03	201.86	40.03	672.28	73.39	0.35	Bi-214 [1120.29] U238 natural
PA [1238]	ROI-15	5676.49	1.55	1238.07	0.34	7.87	3.58	1.72	0.78	0.14	0.06	73.72	36.67	780.67	81.46	0.26	Bi-214 [1238.12] U238 natural
PA [1461]	ROI-16	6693.02	0.10	1460.91	0.02	8.94	0.20	1.96	0.04	0.13	0.00	1904.11	58.98	243.16	46.80	1.27	K-40 [1460.82]
PM [1593]	ROI-17	7294.77	0.50	1593.01	0.11	8.98	1.03	1.97	0.23	0.12	0.01	216.10	29.93	229.94	37.20	0.33	Not identified
PA [1731]	ROI-18	7920.95	1.25	1730.60	0.27	11.55	2.87	2.54	0.63	0.15	0.04	93.75	26.03	258.99	50.87	0.36	Bi-214 [1729.60]
PA [1766]	ROI-19	8079.82	0.31	1765.53	0.07	9.46	0.64	2.08	0.14	0.12	0.01	385.51	32.06	239.78	48.95	0.50	Bi-214 [1764.49] U238 natural

Reports

- Reports contain colored and well formatted tables
  - Colors are used to flag statistically doubtful calculation results
- Dedicated reports for specific sections
- Reports can includes plots images (e.g. spectrum plot with fitting results)
- Report templates can be created , using HTML commands, for more specific or user-defined spectrum analysis reports
  - HTML markup is widely supported and easy translatable to other applications (e.g. MS Explorer)
  - No need to learn dedicated or specific scripting languages and/or commands
- Reports can be exported into PDF

Nuclide library

Unique

- Broader meaning of nuclide library
- bGamma includes the whole decay radiation data from 3386 nuclides
  - NuDat decay data files
  - Recommended and maintained by INDC and BNL (USA)
- Any radiation is always at hand
  - No need for getting out of the analysis to "search" for the correct nuclear radiation or edit the nuclear library file.
  - Spectrum analysis steps are fully reproducible, since it does not contain links to external nuclear data files
  - Provision of "fast radiation search", tagged isotopes or isotope radiations, etc.

Hardware control

- Within bGamma you can connect, set and control any BrightSpec hardware for data acquisition
- Provision of an auto-updated applet, according to connected hardware capabilities
  - Extensive counting preset modes
- Provision of a dockable digital oscilloscope for hardware troubleshooting
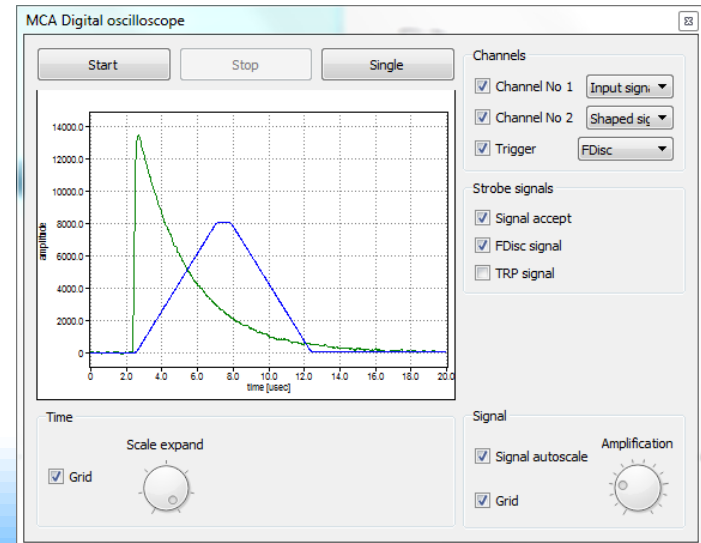
SUMMARY OF FEATURES

Brief summary of most important application features

# Unique features

Unique

- OS–independent
  - **The only software in the market that runs on MS Windows (XP, 7, 8 and 10), Linux and mac OS**
  - With wide support of μProcessors:
    - X86, 64–bit and ARM
- Inclusion of Bayesian peak fitting algorithms
  - Allows the possibility to fit spectra with minimum input data (e.g. calibrations)
  - Mark/insert a peak and fit straight–away

Unique features

Unique
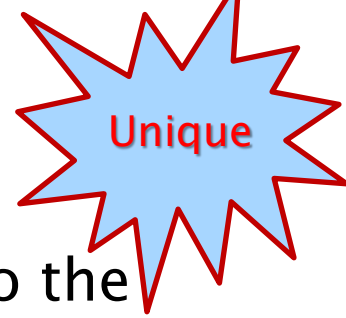
- Entire nuclear decay radiation data embedded into the application.
  - Fast access to any decay radiation
  - ALL decay radiations are quickly at hand
    - No need for external nuclear library files
    - Spectrum analysis goes smoother. No need for endless cycles of exiting application or spectrum analysis process to edit/search nuclide library for specific radiations.
    - No links to external files (e.g. nuclide library file) which can be missing and therefore impossible to recreate the spectrum analysis
- Every calculated magnitude is reported with its uncertainties
- Covariance inclusion on the uncertainties treatment
- Outstanding Graphical User Interface
  - Many features (see previous slides)
  - Possibility to view all calculated parameters and magnitudes in tables and most of them updated on "real time" even while data acquisition is performed

Outstanding feature

- Can analyze any gamma-ray spectrum. Independently of the detector used, energy resolution or energy range

- Easy but comprehensive methods for energy and shape calibrations, with provision of visual feedback

- Calculation of MDAs following ISO11929 standard (up-to latest revision), with clear results and recommendations

Highlighted features

Highlight

- HTML-formatted reports
  - Including tables with colored cells for data results warnings
- Import of foreigner file formats, like Canberra CNF does not need any extra files or libraries to be installed
  - Imports N42.42 (up to latest edition)
- Simple and "automatically updated" window for hardware control
- Spectrum analysis parameters can be exported\imported as Model.
- Fats and intuitive operations within an outstanding GUI.
  - Peaks insert\delete, multi-cursor, nuclide search, etc.
  - Residuals plots, model parameters at hand, etc.