LVis Manual

Introduction

LVis is a graphical user interface for our GammaVision® Gamma-Ray Spectrum Analysis and MCA Emulator software (A66-BW), designed for use in counting laboratories.

Almost by definition, a counting laboratory deals with large numbers of samples, which may arrive in batches from a client, commercial or otherwise. Most commonly, the economics of operating the laboratory mean that the sample measurements are carried out by a technician with oversight from an expert-level spectroscopist. In order to maintain quality in this circumstance, the management of large numbers of samples in a simple manner with a minimal change of operator entry is highly desirable. LVis is designed to fill that need.

LVis is an “application manager” product. It uses the underlying software components of GammaVision to control acquisition hardware, and to manage the gamma spectroscopy samples in a counting laboratory. The analysis itself is performed using the tried-and-tested analysis capabilities of GammaVision itself. LVis provides a sophisticated sample automation environment to control acquisitions and analyses based upon pre-determined “parameter sets” which allow entry of sample-specific data by a technician as needed, while pre-loading automatically that information which can pre-specified by an expert or supervisor. Because LVis relies on core functions within GammaVision, the two applications must be used together.

GammaVision’s operation is “spectrum-oriented,” i.e., the user operations are generally related to the spectrum visible on the screen. This may be preferred by the expert user, but it is not the simplest approach for a counting lab technician.

The LVis approach is “detector- and sample-type-oriented.” The operator works from a left-hand “Configuration” sidebar, choosing an available detector (or multi-detector configuration) and the detector-specific “parameter set” configured for the detector geometry and type of analysis to be used. The process is as automated and straightforward for a technician to use as it can be.

Consistent with making sample automation as simple and streamlined as possible, LVis includes other features such as custom reporting and, most importantly, automatic generation of meaningful filenames through a system of “dollar ($) commands”. This latter feature means that LVis can generate filenames that automatically include within character strings that indicate the sample type, origin, operator ID, date, time, and other optional data. Alternatively, LVis can store all data for a measurement, including spectrum, analysis parameters, and analysis results, in a database file. This should enable the export to different databases (e.g., LIMS) or the generation of different export formats (such as .txt files, .b3h, etc.) without any great effort.

Program Description

LVis is aimed at users who wish to control several measuring chains (HPGe detectors and their associated electronic measuring equipment); or manage several different measurement geometries including required files such as libraries, calibrations, and correction tables. LVis development focused

on providing an easy-to-use, clear, and intuitive interface to minimize user errors.

For hardware actuation (start, stop, delete, read spectrum, hardware parameter adjustment), LVis uses the ORTEC Connections32 communication interface used for all ORTEC spectroscopy hardware. In addition, GammaVision .JOB files (macros) are used, however these are automatically comiled by LVis. The raw spectrum data (.CHN file), which is read via the Connections32 interface, is imported via a temporarily generated JOB file into the GammaVision buffer. The selected library and calibration are imported into the GammaVision buffer as well. Next, all analysis parameters are loaded via a temporarily generated .SDF file. Then, this information (data, library, calibration and analysis parameters) is saved into a temporary .SPC spectrum file. This .SPC file is then evaluated using the analysis algorithms contained in GammaVision. The generated analysis results, which are stored in a temporary .UFO file, are read, exported into a database and displayed in LVis. This database can be separately saved as Microsoft Access .MDB database.

In order to create a report, the database generated during a spectrum analysis is read and the data inserted into a report template. These report templates can be created using the SAP BusinessObjects® Crystal Reports® software v11 or later (which must be purchased separately) however existing reports can be modified with an integrated Crystal Reports Designer.

The most important analysis parameters can be adjusted in a user interface provided by LVis. As many of these settings are in general specific for a particular measuring geometry (and a detector), these default settings are stored in so-called parameter sets. These parameter sets are assigned to the detectors incorporated in LVis. All setup possibilities in such parameter sets can be defined by an administrator. The analysis parameters contained in the parameter sets are based upon the .SDF file (“Sample Type Settings”) provided by GammaVision. All analysis parameters of a GammaVision .SDF file that are not included in the LVis parameter sets, are taken from the Default.sdf file stored under the \Config folder in the LVis database directory. The temporary .SDF file required for analysis is then automatically generated based on a parameter set and the Default.sdf file.

In addition, it is possible to specify sample characteristics in a parameter set that can be pre-defined by an administrator and only selected by the user (e.g., sample location, measuring category, user).

LVis saves measurements in .LVM files. By default, the .LVM file is stored using a path containing the detector and used parameter set. This .LVM file contains spectrum raw data, analysis parameter, and, if already analyzed, analysis results of the last analysis as well as copies of the used library and calibration.

GammaVision cannot use two MDA methods at the same time. If methods are selected, which require calculation of two different MDA values (e.g., IMIS, KTA, etc.), then the MDA calculation is performed based upon analysis results from GammaVision (peak area, background region. etc), however the calculation itself is executed in LVis.

LVis contains its own quality control. Within the scope of this quality control, energy and full width half maximum calibration, efficiency calibration and the background can be verified. As the verifications are specific per detector, QA measurement parameters are assigned to a detector (similar to parameter sets). QA measurement development over a user-defined time period can be graphically presented in report form (based upon templates, which can be edited using Crystal Reports as well).

Installation & Configuration

In principle, six steps are necessary to install LVis and configure it for measurements. We recommend saving the configuration as a seventh step.

1. Installing and configuring GammaVision
2. Installing LVis
3. Configuring the global LVis settings
4. Setting administrator and start passwords
5. Adding detectors to LVis and configuring them
6. Creating parameter sets for each detector
7. Saving the configuration
8. Transferring an existing Configuration

Installing and Configuring GammaVision

Installing GammaVision and Connections-32

As noted in the introduction, LVis operates only in conjunction with our GammaVision software. In turn, GammaVision can only communicate with ORTEC spectroscopy hardware via our Connections32 communication software. Therefore, the first step is to install GammaVision and the included Connections32 Driver Update Kit (p/n 797230) according to the instructions in the GammaVision Software User's Manual (p/n 783620) and the driver update kit instructions (p/n 932721). Beginning with GammaVision v6.09, you must register your software within 60 days of installation.

Important

When you install GammaVision, several other programs are also installed that are used by LVis. These include the library editor, the spectrum plotting program GammaVisionPlot, and the entire driver interface to ORTEC hardware (Connections-32). They are installed in predefined directories under the folder `C:\Program Files\Shared Files\ORTEC Shared`. The respective functions will only work correctly in LVis if this folder structure remains unchanged. If you uninstall GammaVision, these files will be removed and LVis will not operate correctly.

Assigning Detector ID's and Descriptions in the MCB Configuration Program

The GammaVision installation instructions tell how to use the MCB Configuration program to establish communication between your PC and all the measuring chains (MCB-detector combinations) in your system. Each time you add a new measuring chain(s) to your system, you must rerun the MCB Configuration program to establish communication between your PC and the new MCB(s).

Important
Before running MCB Configuration, decide on the name you will use within LVis for each measuring chain. Then, when the results of the MCB Configuration hardware search are presented (which may be based on PC name, network node, and/or previous naming within MCB Configuration), change the ID Numbers and Descriptions of each instrument as needed. This name will be the one displayed in LVis when you add or remove detectors. Once you begin using a measuring chain in LVis, do not change its ID Number and Description within the MCB Configuration program; otherwise, some aspects of LVis may not function properly.

To prevent the MCB Configuration program from trying to renumber an already-defined measuring chain, add the **-I** and **-P** flags to the MCB Configuration command line so that it reads as follows (including the double quotation marks and a space separating each flag):

```
“C:\Program Files\Common Files\ORTEC Shared\UMCBI\mcbcon32.exe” -I -P
```

The flags function as follows:

- **-I** Ignore duplicate MCB ID numbers on the Master Instrument List and do not change other users’ MCB ID numbers. Allows you to close the updated Master Instrument List without renumbering.
- **-P** Append all newly discovered instruments to the existing list, i.e., don’t clear the existing list before starting instrument discovery. Renumber required unless you use this flag in conjunction with -I.
- **-L** Polls only the local PC for ORTEC MCBs.

Once you start the program, the following screen appears, describing the search procedure and the number of measuring chains found:

IMAGE MISSING

After searching is completed, all (powered-on and correctly connected) measuring chains found will be displayed:

IMAGE MISSING

You must assign a unique number and name to each measuring chain. You can change the name and number of the detector by double-clicking on the respective entry in the list and editing the parameters displayed in the Change Description or ID window.

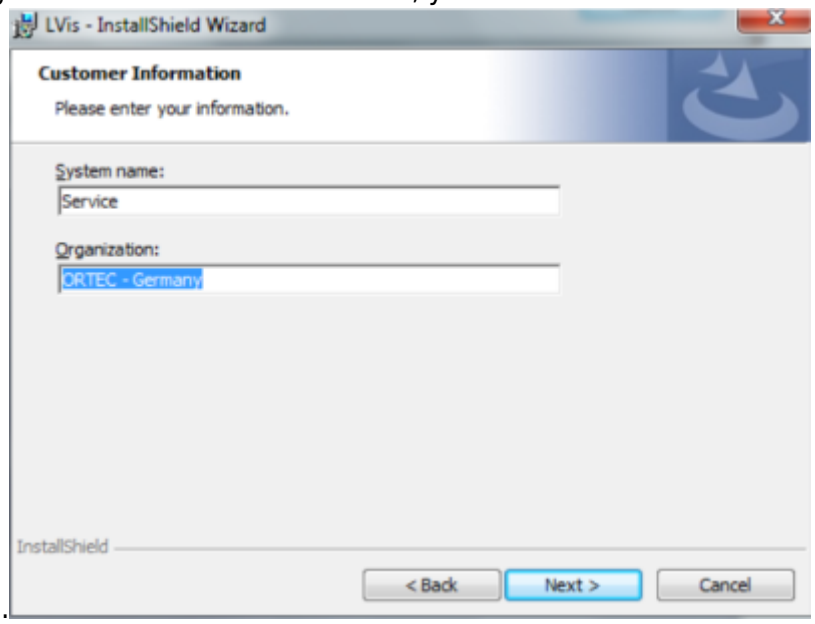
IMAGE MISSING

Important

The MCB Configuration command allows you to “see” all ORTEC instruments available on the entire network. Thus, the Renumber All option should only be applied with the greatest care, as it may change the numbers of measuring chains located in different laboratories! Using the **-I** and **-P** flags discussed above prevents most renumbering problems.

Installing LVis

- Unordered List ItemIf updating from an earlier version of LVis, you must uninstall it before installing the new LVis version.



- Insert the LVis CD, use My Computer to navigate to the CD, run setup.exe, and follow the installation wizard prompts. Installation may take several minutes.
- On the Customer Information screen, we recommend choosing a descriptive system name and organization. For instance, if you choose the system name Chemistry 1 and the organization name NPP XYZ, this information will be transferred to the database so that a detector can be described in reports not simply by its name, but by the site or group as well (e.g.,, Detector 5 from Chemistry 1 @ NPP XYZ).
- On the Destination Folder screen, accept the default installation location, `C:\Program Files\LVis`, or select a different target directory.

IMAGE MISSING

- On the LVis Database Folder Screen, define the default folder for all LVis data.

IMAGE MISSING

- In this LVis Database Folder all relevant files used by LVis will be saved under different subfolders named:
  - **Config** – contains the LVis configuration file config.dat in which all settings are stored and several other files used during analysis and/or for communication with GammaVision.
  - **Help** – contains pdf version of this LVis manual
  - **Libraries** – default location for all nuclide libraries used within LVis. A set of example and master libraries are installed during setup.
  - **Measurements** – this is the default location for all LVis `.LVM` measurement files. For each detector configured in LVis a folder is created in this directory. Every `.LVM` file is automatically saved in this folder. If a measurement was analyzed or started using a predefined parameter sets the –LVM file is saved in a respective subfolder named after this parameter set.
  - **Reports10xx** – here all report templates are located. Depending on the language(s) used for LVis, this folder is named different. Reports1031 is used for German templates, Reports1033 for English and Reports1036 for French language reports. For more information on reports and the default report templates see the REPORTS chapter.
- On the Select Type screen, choose the desired language (**Standard** installs the German-language interface). There is no difference between these two installation modes apart from the language settings.

IMAGE MISSING

- When choosing “Other Languages” you can select in a following window what language you want to install:

IMAGE MISSING

Note

You can install more than one language. The basic language for LVis is always German, selecting another language simply installs a `Lang10xx.dll` file in the LVis program directory. If none of these `lang10xx.dll` files are present in the LVis program directory, LVis will come up with its default German. If only the English `Lang1033.dll` or the French `Lang1036.dll` is present, it will come up with the respective language. If the English as well as the French language dll is present, LVis will be started in English.

- Continue answering the prompts and, when installation is complete, click on Finish (no reboot is required).

When you start LVis for the first time after a new installation, the following screen is displayed. See the USER INTERFACE chapter for a detailed explanation of the screen features and commands.

IMAGE MISSING

Updating LVis

SECTION NEEDS UPDATE

To install a new version of LVis you must uninstall the previous version before. You can do this either by using the Windows Control Panel software-uninstall utility or by simply starting the new installation wizard, which will guide you through the uninstall process.

IMAGE MISSING

When LVis is uninstalled, the folders in the LVis database directory will not be deleted. This protects your customized configuration settings, report templates etc. from being deleted or overwritten when installing a new version of LVis.

If you would like to have a complete new installation after the update you should delete or rename the `\Config` folder or save a backup of the config.dat file elsewhere prior to the update (see Save and Restore the LVis Configuration). This way you can easily restore your old system by replacing the new `config.dat` file with the old one. The same is true for the report folder. It may well be that the update includes some new or modified templates. These will not be installed as long as there is already the respective report folder or standard report template existing. So either delete or rename this folder/template prior to the update/new installation.

Configuring the Global LVis Settings

To ensure proper functionality, several global settings must be adjusted in LVis. To do this, click on **Settings** on the LVis menu bar to open the following window. It lets you specify default values such as analysis engine, number of half-lives for decay correction, peak search presets, spectrum file format, and multi-detector configurations. It also allows you to populate the pull-down menus for measurement tags on the Parameter Sets window. Note that the Parameter Set window also lets you modify some of these settings, for instance, peak search presets.

We recommend using either the **ENV32** or **NPP32** analysis engine.

IMAGE MISSING

See Settings section for more detailed information on the options on this screen. In addition, see Pre-Defining Sample Size Units for Parameter Sets and Pre-Defining Users, Sample Descriptions, and Sample Locations for Parameter Sets for instructions on populating the pull-down lists on the Parameter Set window.

LVis User Management - Password-Protecting LVis Functionality

LVis offers two different types of access control to prevent unauthorized access, a detailed sophisticated user management called Uli where one can define users and assign individual rights to each of them or a simpler approach that offers two levels of password protection. The latter, simpler approach is the default after installation, the LVis User Management Uli can be activated in the LVis global settings dialog. If the basic two level password protection shall be used, it can be accessed via Admin on the menu bar. Once a password has been set, you must be an administrator to change passwords. Once you have logged in as an administrator, adding and removing password protection from LVis functions is as simple as clicking on the *padlock* icon beside a data entry field (the red padlock indicates a field that has been locked; a green padlock means the field is unlocked).

- The **administrator** password, which allows you to change and/or prevent non-administrators from changing the LVis global settings, passwords, detector/MCB settings, QA settings, parameter set contents, and reference source data. In addition, you can delete detectors from the list of available instruments. To set or change the administrator password, see Change password.
- The **start** password, which allows only authorized users (both administrators and non-administrators) to start up the LVis program. To define the start password, see Set start password.

For a detailed list of the functions that are password protected when using the simple two level passport approach, see Admin.

The LVis User Management Uli is described in detailed in the next section.

The LVis User Management Uli

In case a detailed, sophisticated user management within LVis is desired, one can make use of LVis user management *Uli*. *Uli* is a separate program that gets installed together with LVis which guides an administrator through the process of defining individual users and assigning different access levels to them. *Uli* creates a secure, protected database containing all the users and their individual rights. This database can be located anywhere, either locally on the pc itself or on a server or network location so that the same user management can be used on different systems running LVis in a network without having to define all the different users on every machine.

The use of the *Uli* user management can be activated by simply defining an IP address for its

database in the *LVis* global settings. When an IP address was defined LVis will try to get the access information from this location, however make sure that *Uli* was started on each machine before trying to get access to LVis, because otherwise you will get the error message No connection to user management any time when trying to log in to LVis.

IMAGE MISSING

If the user management information is supposed to be located on the local machine simply use `127.0.0.1` as the IP address. It simplifies things a lot if the *Uli* executable is placed in the Windows startup folder so that it gets loaded automatically at start (typically this can be found in: `C:\ProgramData\Microsoft\Windows\Start Menu\Programs\StartUp`)

Once *Uli* is started, its icon **IMAGE MISSING**is shown in the Windows system tray besides the date and time information! To change the *Uli* settings double click the icon or select *Uli* from the Windows start menu. A similar window like the one shown below should open.

IMAGE MISSING

Please note: Clicking the *close window* symbol in the top right corner will just close the *Uli* window, it will not close the user management. To really close *Uli* you need to press the left `Shift` key on your keyboard while clicking the *close window* icon.

To add a new user, click the button *New* and enter the user name and password as well as additional information like the email address (currently not used in LVis) and define the access rights in the window.

IMAGE MISSING

It is possible to assign the right for the following eight tasks:

1. Possibility to use *LVis* (this is for future purposes when *Uli* will be linked the user access control from *MS Windows* and not every potential user of the pc should be given allowance to use *LVis*)
2. Make changes to the LVis global settings
3. Add or Remove detectors
4. Create new of modify existing parameter sets
5. Change existing or create new calibrations, libraries and reference sources

6. Use the LabJournal to delete and archive LVM files as well as the creation of reports via the LabJournal
7. Use the peak editor to manually modify peak fits
8. Approve measurements

IMAGE MISSING

Adding and Configuring the Detectors

After installing the software and locating all *ORTEC* instruments with the MCB Configuration program, the next step is to integrate into *LVis* the detectors you will be using, then set up each one. To do this:

1. Add each detector to be used.
2. Configure the hardware according to measuring task and detector used. This will include adjusting the detector high voltage, amplifier gain, conversion gain, pulse shaping factors, etc.
3. Calibrate detectors/measurement chains.

Creation of Parameter Sets

In order to describe, measure, and analyze samples in *LVis*, you will need pre-defined measurement and analysis parameters for your detector. These settings are summarized in parameter sets, which are assigned to a specific detector. Each detector can have multiple parameter sets.

For a complete parameter set that you can use to analyze samples, you must at least calibrate the detector and have a suitable library available.

In order to create a new parameter set, unlock the program using the administrator password; then go to the configuration bar, right-click on the detector, and select *New parameter set* from the context menu.

Alternatively, you can also import LVis parameter set files (`.LVP`) (see Save Parameter Set - Load Parameter Set) or apply parameter sets from saved *LVis* measurements (`.LVM`) (see Import parameter set from existing ''.LVM'' file).

In order to adjust the parameter set to your respective measurement task, you must edit the parameter set.

Once this is completed, the detector (measuring chain) is ready for sample measurements.

Saving the Configuration

LVis allows you to save your complete configuration (all adjusted detectors, parameter sets, reference sources, and multi-detector configurations) as well as global settings (including all descriptions, names, and units). We strongly recommend that you do this. In the event of a new installation or a

hardware problem, your *LVis* configuration can be quickly and easily restored using this safety copy file.

In order to create a safety copy of your configuration, right-click on the configuration bar. Select *Backup config file* in the context menu. This `config.dat` file contains your entire configuration.

Quality assurance databases, calibration files or measurements are not saved within the scope of such a configuration backup. Saving these data must be done separately via backup of the respective data (easiest is to simply backup the complete *LVis* database folder), which we recommend be done at periodic intervals.

IMAGE MISSING

Transferring an existing Configuration

LVis allows you to easily transfer an existing configuration to another pc without having to copy eg every single parameter set individually. The easiest way to achieve this is to simply copy your complete *LVis* database folder from one machine to the other. Ensure that *LVis* is not started when doing this. All adjusted detectors, parameter sets, reference sources, multi-detector configurations as well as global settings (including all descriptions, names, and units) and QA databases should appear on the new pc when *LVis* is started after the files were copied. Though your detectors will be listed on the configuration tab in *LVis* they will very likely be labeled as “Not Connected”. This is because the respective ports (eg USB) to control the hardware are not necessary the same as they were on the previous system. However, as long as the detectors are named identically in *MCB Configuration* (see Assigning Detector ID Numbers and Descriptions in the *MCB Configuration* Program) you can *re-connect* the detectors from the detector context menu and thus maintain all the settings from the old system.

Spectrum aquizition and analysis

You can acquire spectra either using the instructions specified in the parameter sets or manually independently from those. However, spectra analysis and saving of unevaluated spectra data is only possible in LVis using previously defined parameter sets. Spectrum, parameter set and possibly analysis results are saved together with the calibration and library used in a measurement, an `.LVM` file.

Start parameterized measurements

To start spectra acquisition using settings defined in a parameter set, `right-click` on the

parameter set and select *Start parameterized measurement*.

IMAGE MISSING

This will open the parameter set window, displaying the current preset sample, measurement, and analysis settings. If you wish, you can add sample-specific parameters to the unlocked fields (see Login and Logoff), e.g., sample name, additional information, sample weight, etc.

IMAGE MISSING

When all information has been entered, start data acquisition by clicking the *Start* button. If the memory content of the electronic measuring equipment has not been displayed yet on the desktop (See Detectors → Show), then it will now be automatically opened as an active window.

As soon as the measurement is running, the currently performed measurement by this detector and the parameter set used in this measurement are displayed in the configuration tree next to the respective detector as well as in the header of the spectra view.

If a measuring time is specified, then the already elapsed time is displayed in percentage in the configuration window next to the detector. If no fixed measuring time is specified (enter *0* [zero] in the measuring time field), then the measurement must be completed manually and the elapsed time will be displayed next to the detector.

IMAGE MISSING

Manual Spectrum Acquisition

LVis allows you to acquire spectra manually, without the need for defining a parameter set. To do this, `right-click` on the desired detector in the configuration bar, and select *Start spectra acquisition*. Alternatively, if the detector's spectrum window is already open on the desktop, you can start and stop acquisition with the respective tool bar buttons. You can also continue a previously stopped spectra acquisition.

Note that you can continue a previously stopped measurement regardless of whether the spectrum was acquired manually or with a parameter set, and whether or not it has already been analyzed. More counts are simply added to the spectrum already in detector memory.

Stop/Delete Measurement — Stop Data Acquisition

Once started, a parameterized measurement can only be stopped via the context menu of the detector by choosing *Clear active parameters*. In addition to aborting data collection, the reference between parameter set and data acquisition will be deleted.

IMAGE MISSING

The *Start* and *Stop* icons in the tool bar can only be used to start and stop a simple manual spectrum acquisition without reference to a parameter set. They cannot be used to stop a parameterized measurement.

You can stop a parameterized measurement by selecting *Evaluation* and then *Reject* in the subsequently displayed window. You must confirm whether the measurement should be canceled.

Analyze Measurements and Create Reports

A spectrum analysis in *LVis* contains of several automatically executed steps. On the one hand, the spectrum is transferred to GammaVision according to the settings defined in the parameter set (and global LVis settings), where it is respectively evaluated. The analysis results achieved are graphically presented in tabular form and can be used for the creation of a report or a .PBC file for the background correction.

In addition, a simple mathematical peak search takes place. This basically corresponds to a *GammaVision WAN32* analysis without library, hence to a pure *Mariscotti* peak search. The results of the peaks found in this peak search are entered into the analysis database as well and are later on compared to the analysis library specified in the parameter set.

Besides actual analysis and peak search, *LVis* also saves library and calibration files used in the analysis internally in the measurement (`.LVM` file) and shows the content on a separate Calibration/ Library tab. This allows repeating the analysis even years later using the previously valid parameters without creating a safety copy of each individual file.

Based on a measurement, an intermediate analysis can be performed during data acquisition (e.g., to check, whether the required limit of detection has been reached) or an analysis can be run after the specified measuring time is elapsed. An intermediate evaluation must always be started manually; a final evaluation can be started automatically.

In order to automatically analyze a measurement and to export a report after the measuring time is elapsed, the checkmark in the *Automatic analysis and report* in the Parameter Sets must be set and a report template must be marked on the selection box located underneath.

IMAGE MISSING

An intermediate analysis (or a manual final analysis) can be started by selecting *Analyze measurement* either from the configuration bar via the context menu of the respective detector or for a currently active detector, via the respective icon in the tool bar.

Analyze measurement combines the analysis settings specified in the parameter set with spectrum, calibration and library in one unit.

Thus, after selection of *Analyze current spectrum*, first a window is displayed, which, except for two additional tabs (Spectrum and Calibration/Library), is identical to the window for the selected parameter set. The associated Spectrum tab displays the spectrum that was available when *Analyze current spectrum* was selected.

IMAGE MISSING

The display options (zoom, linear-logarithmic y-axis, line, bar or point presentation, etc.) are identical to the options of Spectra windows on the desktop. In addition, the detector used for spectrum acquisition is shown in the upper left of the spectra window.

`Clicking` on *GammaVision* transfers the spectrum, including all analysis parameters, to GammaVision. This can be useful if you would like to use options not directly supported by LVis. Furthermore, it is possible to export into the simple *ORTEC* `.CHN` spectra format and to review the spectrum using the *GVPlot* spectra viewer in detail. The display of peak fits is not supported at this point, but only after an analysis.

If you have not defined a measuring time or a pre-set measuring time has not been reached yet, the data acquisition will continue in the background and will not be affected by the intermediate analysis.

In the first two tabs of the window, you can find all important information regarding the current measurement to be analyzed. Here you can verify all analysis parameters once more. If all parameters are OK, start the analysis by clicking the *Analyze* button.

Analysis Results

After the analysis is completed, the measurement window is displayed along with three additional tabs, Analysis results, Peak search, and Calibration/Library.

IMAGE MISSING

The Analysis results tab contains two tables. The upper table contains a list of all nuclides listed in the library, plus the identified (decay-corrected) activity, the corresponding errors and the respective detection limit. If you click on one of the listed nuclides, the analysis results of all corresponding

peaks are displaced in the lower table. All results of nuclides and peaks whose activity exceeds the detection limit are highlighted in red.

Tip
Compare the consistency of different peak activities of a nuclide. This will provide a good indication as to whether the analysis was meaningful or not.

By double-clicking on a peak entry in the lower table, you can reach the respective position in the spectrum and have the peak fit displayed.

After a spectrum analysis has been completed, it is possible to select different fit display options in the right menu of the spectrum tab.

All displays identified and unidentified peak fits; *Ident* only shows identified and *n. Id.* only the unidentified peaks.

IMAGE MISSING

Using the arrow keys **IMAGE MISSING**, you can move within the spectrum from peak to peak. Thereby the next peak of the respective, currently selected peak fit presentation is shown (e.g., moving from an unidentified peak to the next as well, if all unidentified peaks are currently displayed). It is as well possible to jump from peak to peak within the currently selected nuclide **IMAGE MISSING** . By using the up & down arrows one can switch from one nuclide to another and get all the respective peaks displayed.

Furthermore, you have the option to display basic fitting information of a peak in the spectrum by clicking on the *Info* button. As a result, information is automatically updated, if a different peak is selected manually or by using the arrow keys.

Important
Arrow keys as well as the *Info* function are only functional if a peak fit display has been selected.

Now the analysis results can be used to create a report (see Create Report). Furthermore you can create a .PBC file for background correction based on the analysis results.

IMAGE MISSING

If have done an analysis of your measurement before the specified live time preset was reached (intermediate analysis) and you would like to continue the measurement (e.g., because the required

limit of detection has not been reached), then select *Continue acquisition*.

Important
Only if you use *Continue measurement*, does *LVis* maintain the connection of used measurement parameters, assigned spectrum name, etc. with the current data acquisition of the detector. If you click on *Reject* or on the *Windows Close* icon (x) in the upper-right corner, the reference is lost and cannot be restored. Therefore always use *Continue measurement*.

Create Report

You can create an analysis results report for a measurement either by activating *Automatic analysis and report* in the parameter set or manually following a completed analysis by `clicking` on the *Print report* button in the Analysis results tab. In the latter case, you are first asked to select a report template in a selection menu. See also the Reports chapter.

IMAGE MISSING

As of this release, *LVis* has only one report template. All reports in LVis are based on *Crystal Reports* templates. You can either create these templates with *Crystal Reports* or we can work with you to create them. Contact your *ORTEC* representative or our Global Service Center. Existing report templates can be modified using the designer that comes with *LVis* (see Report Editor).

The reports are either displayed in a separate Crystal Reports viewer or if pdf reporting is activated in the Global Settings directly in your pdf viewer.

IMAGE MISSING

IMAGE MISSING

Tip
To save the report as a separate file or to process the measurement results in some form, use the Crystal Report Viewer export feature to export the data in a number of different file formats, including `.`PDF, *Microsoft Excel*, *Microsoft Word*, *HTML*, and comma-delimited text. To export a report, click on *Export file* in the upper left of the *Crystal Report* Viewer. This will display the following dialog, in which you can specify the export format:

IMAGE MISSING

Creation of a Background Correction Based on the Analysis Results

Analysis results can be used to create a background correction. This is performed in *GammaVision* and thus in *LVis* via `.PBC` files (see Background Correction and the *GammaVision* manual). A `.PBC` file stores the peak counting rate of a nuclide found in the background spectrum. For the correction, the respective counting rates are deducted from the measured values during the analysis. This correction is applied prior to any other correction or calculation based on peak counting rates.

`.PBC` files can be created from analysis results of any measurement via the *Create PBC* button. As `.PBC` files represent detector-specific parameters, its default location is in the PBC subdirectory under the respective detector folder.

Peak Search Results

Within the scope of spectrum analysis, as simple mathematic peak search is conducted. This basically corresponds to a *GammaVision WAN32* analysis without library (or a library without content); hence to a pure *Mariscotti* peak search.

Important
GammaVision requires a library for this peak search. The used library file `Null.lib` can be found in the `\Config` folder under the *LVis* program directory. Do not delete this file; otherwise peak search will not function anymore.

The results of the peaks found in this peak search are entered into the analysis database and compared to the analysis library specified in the parameter set. The comparison only considers the peak energy specified in the library and the centroids of peaks found in the peak search. The nuclide, whose peak energy is closest to this centroid and which is inside the specified match width, will be assigned to the found peak.

IMAGE MISSING

The peak search results are presented in tabular form in the Peak search tab. `Double-clicking` on an entry in the table takes you to the respective energy in the spectrum and displays the peak search fit. In order to distinguish between analysis results, the respective nuclide assignment is displayed using a question mark next to the nuclide name.

Internal Storage of Calibration and Library

Besides the actual analysis results and the peak search results, LVis also stores library and calibration files used for the analysis in the measurement (`.LVM` file) and displays the content in an individual tab.

Important
As soon as the Calibration/Library tab is available, the internal data presented in it will be used for reevaluation. If you manually changed the files originally presented in the Analysis tab, then you must explicitly select them (although they might have the same file name) in order to consider them in the next analysis (See the chapter Reevaluation of Existing Measurements in this manual).

IMAGE MISSING

All three calibrations (channel energy, energy full width at half maximum and energy efficiency relation) as well as the corresponding nodes (sampling points) are presented in a graph on the left side of this tab. You can move the cursor over the functions and display the respective pair of values at the current cursor position.

You can find the file name of the originally used calibration as well as the date the calibration was created, in the graph title.

The fit functions are displayed in explicit mathematical form underneath the graph as well. To save this internally stored calibration as a `.CLB` file, `click` on the *Export* button below the calibration graph. The internal calibration can be manually modified by editing the calibration table (see Modifying the internal nuclide library of an *LVis* measurement file in this manual)

On the right side of the tab, you can find basic data of the library as well as the nuclides contained, including the respective (radioactive) half-life and corresponding peaks and energies with emission probabilities, In the header you can find the originally used library, as well its date of creation and last modification. To save this internally stored library as a `.LIB` file, `click` on the *Export library* button. The library can be modified from within the LVM file for testing (see Modifying the internal nuclide library of an LVis measurement file in this manual).

Modifying the internal nuclide library of an LVis measurement file

The analysis library can be modified directly from the *Calibration/Library* tab of an LVM file. The library information is displayed on the right side of the tab. You can edit nuclide or peak energy information by simply right clicking the respective information.

IMAGE MISSING

Choosing from these menus will lead you directly to the same library editor described in detail in the Analysis Library section of this manual. The rank of a peak or the position of a nuclide in the library can be modified with the up and down arrows right side of the library information.

Info
When the library information was changed, the library name will switch to `internal.lib` indicating that its information is only available in this LVM file. If the library shall be available for use in routine analysis procedures (see: Parameter Sets) or other *LVis* measurements, it will have to be exported and saved as a *GammaVision* library file `*.lib`.

Important
When modifying the internal library of an *LVis* measurement, only the library information stored inside the particular LVM file is changed. The *GammaVision* library file `*.lib` that was originally specified on the *Analysis* tab of the *LVis* measurement will remain unchanged. When re-analyzing the measurement after a library was internally modified, the new internal library will be used even though another library may be mentioned on the *Analysis* tab. On the analysis report and on the *Calibration/Library* tab it will however clearly be indicated that an internal library is used.

Modifying the internal calibration of an LVis measurement file

The internal calibration can be modified directly from the *Calibration/Library* tab of an LVM file. The currently valid energy, FWHM and efficiency calibrations are displayed in the graph. Note the different scaling for the three curves. Information about the origin of the energy/FWHM and efficiency calibrations is displayed above the graph (see red marking in picture below).

IMAGE MISSING

The calibration data can be reviewed in detail and edited by opening and editing the information in the Calibration table. For more information see Calibration and Changing a Calibration in an .LVM file. To open the Calibration table editor `click` the button *Calibration table*.

IMAGE MISSING

By `clicking` the *Energy* or *Efficiency* button in the lower left corner (green arrows in picture above) of the Calibration table editor it is possible to select which set of data is displayed in the main table.

Double clicking an entry in the table allows for modification which is applied immediately to the calibration. Note that any analysis results displayed on the *Analysis results* tab of your LVM file are set to *0* when changing data in the calibration file. All fits on the *Calibration/Library* tab are re-calculated. And the reference of the calibration data on top of the graph changes to *internal* (see red marking in picture below).

IMAGE MISSING

Re-evaluate Existing Measurements

A measurement saved as an .LVM file can be reevaluated at any time. For this purpose, the measurement must be open (see Open file). All parameters related to this measurement, including spectrum, internal library and calibration as well as the last received analysis results are then displayed in the typical .LVM window on the desktop.

IMAGE MISSING

Furthermore, in the Analysis results tab, you can display the data obtained after the last spectrum analysis run, and you can directly generate a report (See Create Reports).

If you would like to analyze the spectrum with different analysis parameters, then you can change those in the first two tabs (Unlocking might be required for possibly locked fields) and reevaluate the spectrum by clicking on the *Analyze* field. The current analysis results will be overwritten and a new report can be created.

Info
If you do not change any calibration and library fields in the Analysis tab, the internally stored data will be used. This means that in this circumstance, the original, separately available files are not read again!

Therefore, if you have changed these external files in the meantime (by preparing a new energy calibration or adding a nuclide to the analysis library), then you must explicitly select them one more time (although they may have the same file name) in order to consider the changes in the reevaluation and import the files into the .LVM file.

If you specify a new calibration file for reevaluation in the Analysis tab, then *LVis* offers the option of either selecting the energy (and full width at half maximum) calibration or efficiency calibration or both. Correspondingly, you can either replace the entire internally stored calibration file or only selected parts.

IMAGE MISSING

Info
If you save the measurement after a changed analysis, the previous settings will be overridden. You can only reproduce the former results by resetting analysis and correction parameters to the previous settings and running the analysis again. Thus, for better orientation, you can always find the analysis date and time on the report. If possible save or archive your analysis reports (for instance, by printing them as `.PDF` files).

Approval of Measurements and Analysis Results

If desired, one can define an additional *approval* process to *LVis* measurements. This feature can be activated in the global settings and it adds an additional tag/status to LVM files. Anyone with the appropriate right to approve measurements (see LVis User Management - Password-Protecting LVis Functionality) can change this tag by approving or disapproving analysis results. If the user management *Uli* is not used, then anyone with admin rights has the right for approval. The status of approval is indicated by a red or a green symbol besides the header of the *Analysis results* tab.

IMAGE MISSING

To change the approval status of an LVM file right click the status information at the header of *Analysis results* tab.

IMAGE MISSING

Info
Only a saved LVM file can be approved. When approving analysis results you don’t need to save the file again. The respective change of the status will automatically be applied to the LVM file. However when removing an approval, you will have to save the file afterwards to apply the change.

The information about the approval status will be listed in the lab journal and can hence be used for filtering and file retrieval. In addition, there are specific additional things that may happen to an LVis

file when being approved (depending on the type of measurement):

1. If the LVM file is a QA measurement, the QA results will be transferred to the QA detector database.
2. If the LVM file is a calibration file, you will be asked if the energy calibration shall be applied to the detector and if the efficiency calibration shall be updated in a parameter set.
3. If the LVM file is a *normal* measurement (no calibration, no QA) and in case the automatic file exchange with a *LIMS* is used (see Global Settings), the creation of analysis result output files for the *LIMS* is depending on approval of the LVM.

Using EFFTRAN with LVis

LVis extremely simplifies the use of the free software codes EFFTRAN and/or MEFFTRAN together with *GammaVision*. These codes, developed and openly published by Tim Vidmar (tim.vidmar@sckcen.be), can be used to calculate correction factors for TCS (True Coincidence Summing) and efficiency transfer to account for differences between calibration and sample geometries. From *LVis* it is possible to automatically trigger EFFTRAN calculations and use its results during an analysis process. The efficiency transfer correction is then implemented into the *GammaVision* analysis by creating a geometry correction file (`*.GEO`) whereas the nuclide/peak specific correction factors to account for the TCS are implemented by creation of a correction library (`*.LVF`). Both of these corrections, LVF and GEO are saved in every *LVis* measurement file (`*.LVM`) as internal data. To make use of the auto-calculation the following is required:

- A copy of EFFTRAN and MEFFTRAN on your pc. The file location of these programs must be defined in the *LVis* Global Settings.

IMAGE MISSING

- Valid detector data must be defined for the detector. This is dimensional and materials data for description of the geometrical details of the detector element. (Usually given on the detector data sheet). For a detector that is configured in *LVis*, this can be done from the detector configuration menu. Any new measurement that is acquired will then automatically have this information available. For existing measurements (LVM files) this information can be entered on the *Detector system* tab.
- Valid information about the counting geometry (sample container, position on endcap, matrix etc.) during calibration. This information is only available when the calibration is taken from an LVM file, it is not possible to do EFFTRAN calculations when using GammaVision CLB files for the calibrations. When creating LVM calibrations in LVis the container and matrix information is automatically taken from the reference source information. In case a *normal* LVM file is used for the calibration make sure that the respective data is specified on the Counting Geometry tab.
- Valid information about the counting geometry (sample container, position on endcap, matrix etc.) during sample acquisition. This can be specified on the *Counting Geometry* tab (see blue marking on the screenshot below).

Info
Note that *LVis* always calculates an average density for the specified sample material

based on what was entered in the sample mass and volume fields (see red marking on the screenshot below). The density that is specified in the materials editor for the respective sample material will not be used! Instead of the sample volume one can specify the sample filling height in the lower of these two *sample size input fields* as well.

IMAGE MISSING

- It is important, that the upper of the two *sample size input fields* (red marking above) always represents the sample size used for scaling the reported activity on the report! The lower *sample size input field* is only used for calculation of the filling height and/or density!
- Ticking the boxes on Calibration tab without selecting a specific file.

IMAGE MISSING

When clicking *Analyze Spectrum*, LVis will combine all this information and will send it to EFFTRAN. The status of the EFFTRAN calculation is displayed in a separate window:

IMAGE MISSING

The resulting correction factors will automatically be used to correct the *GammaVision* analysis and can be reviewed on the *Corrections* tab by `clicking` the button on the right side of the respective correction type field.

Important
Pay attention to your analysis library setup when using EFFTRAN for the calculation of true coincidence summing (TCS) factors. In order to calculate the correction factors, EFFTRAN matches the nuclide names and peak energies from the analysis library with its internal database of decay data (KORDAT) and only if the nuclide name is identical and the energy within a very small energy window, the respective peak will be corrected. So, for example if Iodine-131 is listed in the analysis library as J-131 it will not be corrected, because the correct elemental symbol for Iodine is “I” and not “J” and hence J-131 is not existing in the EFFTRAN decay database. The same applies for the peak energies: The correct Co-60 peak energies are 1332.49 and 1173,23 keV. An analysis library using 1332,51 keV and 1173,24 will leave the first peak uncorrected and the second corrected, simply because the 1332.51 keV peak is too far away from the EFFTRAN database entry. Therefore: Always check the correction factors in the LVF file and double check if a correction factor is 1 (so no correction is applied).

Calibration

Calibrations contain information regarding energy, full width at half maximum (FWHM) and efficiency calibrations. They must be selected and loaded for analyses (see Analysis Parameters). In *LVis*, *GammaVision* calibrations (`.CLB` files) or any calibrated *LVis* measurement file (`.LVM` files) can be used as a source of calibration.

In each *LVis* measurement, the calibration is presented in its own tab (see as well Changing a Calibration in an .LVM file).

IMAGE MISSING

The accurate measurement values of individual calibrations can be shown and edited in a calibration table. There you can find (if known) the reference source (on the left side), as well as optionally the respective nodes and fit information of the energy and FHWM calibration or the efficiency calibration.

IMAGE MISSING

To change peak fit parameters, click on the Spectrum tab to access the peak editor.

IMAGE MISSING

Several ways exist to create and edit calibrations. For example it is possible, to manually calibrate each already existing measurement (`.LVM` file) using the peak editor (See Detector Calibration). It is also possible to change an already existing calibration by changing the data in the calibration table.

However, *LVis* usually automatically takes care of all calibrations using its own detector-specific calibration parameter sets (see Detector Calibration). The calibration data obtained is automatically assigned to the detector or measurement parameter sets to ensure that the most up-to-date calibrations are used at all times. In principle, energy and FWHM calibration (channel-energy relation and channel-resolution relation) as well as efficiency calibration (energy - efficiency relation) are performed in two separate steps. The energy calibration as detector-specific calibration is saved under the detector (or better, the electronic measurement equipment); efficient calibrations can be assigned to individual parameter sets. If such calibrated parameter set is used, LVis automatically combines the current internal energy calibration of the detector with the efficiency calibration stored in the parameter set for analysis.

Automatic calibrations are based on reference sources, which contain all necessary nuclide information (library) and activity data (certificate file). In order to use the automatic LVis calibration function, you must create your calibration sources as reference sources in *LVis*. Without reference sources it is not possible to create calibration measurements in LVis. Therefore, in the event that no

reference source is available in the calibration parameter set, you will be requested to enter one prior to analysis.

IMAGE MISSING

Detector Calibration

Calibration parameter sets (one each for energy/FWHM calibration and efficiency calibration) can be created, changed and started from the context menu of a detector (Energy/Efficiency calibration parameters). Parameter sets for energy/FWHM calibration and efficiency calibration only differ in one field for the reference data and contain, in addition, the measuring time, peak analysis parameters and the reference source to be used (nuclides, peaks and possibly activity and reference date).

IMAGE MISSING

Selecting *New Energy/Efficiency calibration* in the detector menu starts a new parameterized calibration measurement. *Calibration using current spectrum* lets you use an already existing (manually started) spectrum for calibration.

IMAGE MISSING

Creation of an Energy Calibration for a Detector

In order to create an energy calibration for a detector, a spectrum with respective calibration parameter set must be evaluated. This can either be done by selecting *Execute energy calibration* (starts a new parameterized calibration measurement) or by selecting *Energy calibration based on current measurement*, if a spectrum has already been recorded using the calibration source.

IMAGE MISSING

In this case, the corresponding calibration table does not contain any information except the entries from the reference source on the left side.

IMAGE MISSING

When *Auto calibration* is `clicked`, *LVis* will try to find the peaks specified in the reference source, and then accordingly calibrate the spectrum.

Important
The nuclide library used for creating the reference source should be absolutely unique. It should only contain nuclides specified in the corresponding certificate. If energies are present in the reference source, which, for example, cannot be found in the spectra (e.g., due to the short half-life of the corresponding nuclide), problems may occur during automatic calibration.

Next the calibration will be displayed in the respective tab. Clicking on the *Calibration table* button takes you to detailed calibration information.

IMAGE MISSING

Corresponding nodes and fit results of the automatic calibration can now be found and, if necessary, edited in the calibration table (simply by clicking on the respective entry in the calibration table). All identified peaks used for calibration from the reference source are marked with an asterisk (*) in the calibration table (in the reference source data are displayed in the left table).

Double-clicking on peak energy in the left column of the calibration table takes you automatically to the respective peak in the spectrum. There you can display the fit in detail by clicking on *Peak editor*. You can also change the fit and apply the changes to the calibration.

IMAGE MISSING

Important
The fit displayed in the peak editor always depends on the fit display modus selected on the spectra view. If no fits were shown in the spectrum, *LVis* will fit the peak for the display in peak editor. This result may differ from the *GammaVision* analysis or peak search.

If the calibration is saved, *LVis* will then ask whether to assign this energy calibration to the detector.

IMAGE MISSING

This ensures that each spectrum newly recorded using this detector will automatically be furnished

with the current energy calibration. For this purpose, this energy calibration is stored in the electronic measurement equipment and will not be lost, once *LVis* is exited or the electronic measurement equipment is switched off.

You can always review the measurement corresponding to the currently active energy calibration of a detector by selecting *Open last energy calibration* in the context menu of the detector.

IMAGE MISSING

If you would like to delete the internally stored energy calibration, then select *Delete energy calibration* in the context menu.

Efficiency Calibration Creation for a Detector

Efficiency calibrations are not created for detectors as such, but for parameter sets, as they depend on the sample geometry.

To create an efficiency calibration, select *Execute efficiency calibration* from the detector's context menu. This analyzes the spectrum using the respective calibration parameter set.

IMAGE MISSING

Thus, both *GammaVision* and *LVis* offer different fit functions for the creation of an optimum efficiency calibration (e.g., polynomial, square-square, linear, etc.; you can find a detailed description in the *GammaVision* manual). Fit functions are usually detector-specific (e.g., n-type detector — square/square, p-type detector — polynomial). Thus, it is possible to specify the fit function by selecting *Efficiency fit parameters* in the context menu of the detector.

IMAGE MISSING

Then, the fit functions specified here, are automatically used for efficiency calibrations executed per calibration parameter set (furthermore, it is possible to change the function afterwards in the calibration table at any time).

If the detector is already energy-calibrated, then respective nodes and fit information are displayed in the calibration table.

IMAGE MISSING

If no energy calibration exists, clicking on *Auto calibration* first creates an energy calibration. Then by clicking *Auto calibration* a second time, the actual efficiency calibration is performed.

After the calibration is completed, the calibration results are displayed in the respective tab.

IMAGE MISSING

Now the calibration table contains energy/FWHM calibration entries as well as efficiency calibration entries. When the calibration table is open, only the graphs of the calibration selected in the calibration table are displayed in the calibration tab.

IMAGE MISSING

Corresponding nodes and fit results of the efficiency and energy calibration can be found below the calibration fit display and, if necessary, edited in the calibration table (simply by clicking on the respective entry in the calibration table). All identified peaks used for calibration from the reference source are marked with an asterisk (*) in the calibration table (in the reference source data are displayed in the left table).

`Double-clicking` on peak energy in the left column of the calibration table (the reference source information) takes you automatically to the respective peak in the spectrum. There you can display the fit in detail by `clicking` on *Peak editor*. You can also change the fit and apply the changes to the calibration. Furthermore, it is possible to change the fit and apply the changes to the calibration.

IMAGE MISSING

Important
The fit displayed in the peak editor always depends on the fit display modus selected on the spectra view. If no fits were shown in the spectrum, *LVis* will fit the peak for the display in peak editor. This result may differ from the *GammaVision* analysis or peak search.

If the calibration is saved, LVis will then ask first, whether to assign this energy calibration to the detector.

IMAGE MISSING

This is necessary, as within the scope of a parameterized (automatic) efficiency calibration, an energy calibration may be created as well.

Next, the efficiency calibration can be assigned to one or more parameter sets.

IMAGE MISSING

Tip
If you have assigned the wrong energy calibration to a detector by mistake, you can simply change it. Delete the *wrong* calibration by `clicking` on *Delete energy calibration*.

IMAGE MISSING

Open the valid calibration measurement of the detector and reevaluate the measurement (even of you have not changed any analysis parameters! It is important that the *Save* button is activated again). If you subsequently click on *Save*, you will be asked again whether you would like to use this calibration for the detector. The same applies to efficiency calibrations and linking of parameter sets.

Changing a Calibration in an .LVM File

In an already existing measurement (`.LVM` file), two ways exist to change a calibration. Either you open the calibration table and directly change the internal calibration by adding or deleting entries; or you load a complete energy or efficiency calibration from a `GammaVision .CLB` or *LVis* `.LVM` file.

This can be done by clicking on *Calibration file* in the Analysis tab. After a file is selected, it is possible to decide in the following dialog with which parts of this file the internal calibration should be overridden.

IMAGE MISSING

If you would like to directly edit the internal calibration, you must always open the internal calibration table in an `.LVM` measurement via the lower left button. The calibration table shows all nodes of both calibrations. You can switch in between them via the *Energy* and *Efficiency* buttons in the bottom left of the calibration table window.

IMAGE MISSING

It is possible to delete individual table entries as well as all data. You can undo the last change via the *Back* button. All changes will be immediately displayed in the Calibration/Library tab and new data will be considered in the fit. If the calibration table is open, the Calibration/Library tab will only show the graph valid for the respective calibration.

IMAGE MISSING

It is possible to add existing calibration data from GammaVision `.ENT`, `.EFT`, `.CLB` or *LVis*'s `.LVM` files to the one currently being edited. Simply click the *Import* button in the right top corner of the calibration table, and select the file from which the calibration data shall be added.

In order to add a new entry to the calibration table manually based on the spectrum data, the respective peak parameters must be adjusted in the peak editor first. The peak editor can be started from the Spectrum tab. You can either directly click on a peak in the spectrum; or `double-click` on the library information in the calibration table to go to the respective position in the spectrum. This will open the peak editor.

IMAGE MISSING

In order to change individual peak characteristics, you must first select the respective parameter on the right side. Click and drag the vertical marker line to change the value.

This screen also allows you to assign the peak to a (different) nuclide. If you click on the icon next to the nuclide name, a list of all peaks in the library is displayed from which you can select the desired entry.

IMAGE MISSING

After all parameters have been adjusted, the peak can be applied to the calibration table by clicking on *Apply to calibration*. Note that any analysis results displayed on the “Analysis results” tab of your LVM file are set to “0” when changing data in the calibration file. All fits on the *Calibration/Library* tab are re-calculated. And the reference of the calibration data on top of the graph changes to `internal` (see red marking in picture below).

IMAGE MISSING

THE USER INTERFACE

The LVis user interface has four major parts:

1. Tool bar
2. Menu bar
3. Configuration bar
4. Desktop

IMAGE MISSING

Tool Bar

The tool bar provides quick access per mouse click to different actions within the application. The actions are represented using icons. These actions are not always possible in the current program status. In such cases, the icon is highlighted in gray (no colors).

Important
If the actions refer to measurements (e.g., Start, Stop, Analyze, etc.), then the icons are only active if measurements are open on the desktop. If measurements run in the background, meaning that they are not shown on the desktop, then the respective actions can only be activated in the configuration bar by directly selecting the detector. If several measurements are open, the actions (icons) in the tool bar refer to the currently active measurement!

The following actions can be initiated via the tool bar.

IMAGE MISSING

Open File

Clicking the folder icon in the tool bar automatically opens the basic directory of all measurements, which is defined under Settings. Then you can open a .LVM file stored there.

IMAGE MISSING

This action is identical to the “Open file” menu item in the menu bar under “File”. As LVis can in general manage several instances at the same time (several detectors can measure at the same time, several spectra can be opened at the same time), this action is always possible, independent of the actual program status.

Save File

Via the floppy disc icon, you can save an open project (spectrum, spectrum with adjusted analysis parameters or spectrum with analysis parameters, etc.) can be saved as an .LVM file

Important
If a name is assigned for this file in the parameter set, then the file will be saved without confirmation prompt into the basic directory, in a folder with the detector name, and there in a folder with the name of the parameter set.

If no name is entered, you must define via a dialog where and under which name the project should be saved (corresponds to the Windows action “Save as”). The possibility to save a project is of course only available, if a spectrum or a measurement is open.

Analyze Active Spectrum

Using this icon, an active spectrum (hence a spectrum, which is shown on the desktop and is active and was started parameterized, can be evaluated using the parameters defined at the beginning of the measurement.

If for an active spectrum on the desktop the analysis parameters are not available (since it was started manually) you will have to define all parameters manually as well.

Normally this icon can be used to check a running measurement by a preliminary analysis (e.g., if the limit of detection is reached) or to analyze a finished measurement.

Start Spectrum Acquisition

In order to start spectra acquisition without parameters, click on “Start spectra acquisition”. This is possible if the detector (or the memory content of the corresponding electronic measurement equipment) is active and shown on the desktop. In addition, it is possible to continue a stopped spectra acquisition.

If the memory content is not shown on the desktop, then you can only start spectra acquisition from the context menu of a detector in the configuration bar.

Important
For this action it is not important whether the spectrum was started in the memory of

electronic measurement equipment with measurement parameters and has already been evaluated or if the memory is empty. The spectrum currently stored in the memory of electronic measurement equipment is simply continued.

Stop Spectrum Acquisition

Using this action, you can stop a spectrum acquisition started without parameters (not parameterized). Parameterized started measurements can only be stopped via the context menu of a detector in the configuration bar (Choose “Analyze” — after saving the measurement you will be asked if the acquisitions shall be stopped). This action is only available for spectra, which are currently shown on the desktop and are active.

Delete Spectrum (manually acquired spectra only)

This command clears the detector memory (hence, the spectrum) corresponding to the currently active spectrum window on the desktop. This only applies to spectra acquisition started without parameters. It does not matter whether data acquisition is currently underway place or not.

Login (green “padlock” icon)

Click on the green “Open lock icon” to unlock protected functions of the application. This requires the administrator password. If the administrator is logged in, this icon is highlighted in gray.

Logoff (red “padlock” icon)

If the “Closed lock icon” is active (red) this indicates that the application is currently unlocked. Clicking this icon locks the program.

Peak Search

Using this icon, you can start a peak search in the currently active spectrum window. The results of a peak search started via the tool bar are subsequently shown in the spectrum. However, they will not be saved and cannot be used for a report. They are only used for a quick verification of the energy calibration. In order to distinguish between analysis results, the peak description always displays a question mark next to the nuclide name. The illustration of the peak search results can be hidden by repeated clicking on the icon in the tool bar.

IMAGE MISSING

The peak search basically corresponds to a GammaVision WAN32 analysis without library (or a library

without content), hence to a pure Mariscotti peak search.

Important
GammaVision requires a library without entries for this peak search. The used library file Null.lib can be found in the \Config folder under the LVis program directory. Do not delete or change this file, otherwise peak search will not function anymore.

All other peak search parameters required for peak search are different, depending if it is a manually or a parameterized started data acquisition.

If the measurement was started using a parameter set, then the parameters defined in the Spectrum section of the Analysis tab apply:

IMAGE MISSING

The results of the peak search are subsequently compared with the entries in the Analysis library defined in the parameter set. The nuclide, whose peak energy is closest to a found centroid and which is inside the specified match width, will be assigned to the peak.

If data acquisition was started manually, the parameters adjusted in the Default.sdf file apply and the comparison is performed using the suspect library defined in the global settings.

Info
In case of parameterized spectra, this peak search corresponds to the automatic peak search within the scope of spectrum analysis (see Peak search results).

Change Sample

This button is only active, when a sample changer controlled by the ORTEC hardware I/O is defined for the currently selected detector. Clicking this button changes the output level on the “CHANGE SAMPLE” output of your ORTEC MCB.

SampleSetEditor

This button is only active when a sample changer is defined for the currently selected detector. Clicking this button opens the editor for the definition of a set of samples (sample batches), the LVis SampleSetEditor.

LabJournal

Clicking this button opens the LVis LabJournal.

Menu bar

The menu bar consists of the following menu items:

IMAGE MISSING

Similar to all Windows applications, existing program files (.LVM files) can be opened here. Furthermore, a list of recently used files is provided and you can exit the program. In addition the Crystal Reports Designer Report Editor can be started from here. However this is just possible when no other measurement is active on the LVis desktop (see left screenshot). If an acquisition is currently being acquired or an existing .LVM file is displayed on the LVis desktop the menu is somewhat different because it is now possible to save the active document or save it as a different file (see right screenshot).

IMAGE MISSING

Report Editor

LVis has a built in Report Editor based on the Crystal Reports Designer. The Report Editor can be used to modify existing report templates. Typically all your report templates are located in your LVis database subfolder \Reports10xx (xx = 31 German; xx=33 English; xx= 36 French). Select the *.rpt file that you would like to modify and click open.

IMAGE MISSING

Important
The names used for the report templates located in your respective LVis database\Reports10xx folder are critical! Do not delete these files. Before you modify one of these reports, don’t forget to make a backup of the original ones. It is possible to add templates for the analysis reports which can then be selected in the respective menu on the parameter sets. All report templates that have a name starting with “Standard” will be listed as available analysis report templates on your parameter sets.

The selected file will be opened in the LVis Report Editor.

IMAGE MISSING

Here you can modify your reports. Since the Report Editor is part of the Business Objects Crystal Reports 2011 Developer software that we use for designing the reporting we included the designer in LVis. It works the same way as Crystal Reports itself but offers some limited functionality. Because of the complexity of this software package it is not possible to describe all its features in this manual. The Report Editor is more intended to be used to do minor changes like new headings or activation/suppression of individual subreports.

You can preview your modifications and save your new report templates by using the buttons on the bottom bar of the editor.

If you want a completely new, customized report, contact your local ORTEC representative.

View

In the “View” menu you can select, whether you would like to display the tool bar and the “status bar”. By default both are active. The status bars is used to display error messages and can be deactivated.

Windows

Here you can define how windows should be arranged on the desktop. You can select between “overlapping” (Cascade) and “side-by-side” (Tiled).

IMAGE MISSING

If more than one window is opened on the desktop, all windows are displayed in a list. They can be directly selected and displayed in the foreground as the active window. See Spectra windows for more information on arranging the windows on the desktop. In addition you have the possibility to show all detectors that are configured in LVis “side-by-side” on the desktop with a single click

Tip
Note that all windows on the desktop are listed in the configuration bar under the “Currently open“ section, and can be moved into the foreground by double-clicking their respective entry on this list.

Settings

The Settings window allows you to define global parameters for the entire LVis system.

Global Settings

The fields on the Settings dialog are defined as follows:

1. Path to the base directory of all measurement data. Unless differently defined by additional program functions, all measurement data is filed in this directory.
2. Here the path to the GammaVision application is defined. This information is crucial for LVis operation.
3. If your LVis is supposed to import sample data from a LIMS you can specify here the path to the respective directory where the sample information files are located. Importing sample data via automated file exchange requires some customization. If you would like to use this feature contact your local ORTEC sales representative.
4. If your LVis is supposed to export analysis results to a LIMS you can specify here the path to the directory where LVis will save the analysis results files that are to be imported by the LIMS. Exporting sample data via automated file exchange requires some customization. If you would like to use this feature contact your local ORTEC sales representative.
5. Default value of max. half-life correction. If a decay correction is activated in a parameter set, this value defines from which time no correction should be applied. The value defined here is a default value only. You can adjust the value to be used for measurement analysis in the respective parameter set.
6. Besides saving spectra in LVis' .LVM files, it is also possible to save them in the GammaVision .SPC spectrum file format. If this is a general request, this setting can be enabled by activating "Automatic SPC file creation after analysis". SPC files receive the same names as .LVM files and are stored in the same directory (See Item 1).
7. LVis can export the entire measurement data and analysis results into a MS Access database. For this purpose activate "Automatic database file creation after analysis". The database created receives the same name and is stored in the same directory as the .LVM file (See Item 1). This is useful, if you would like to perform further calculations based on the results of an analysis (dose rate calculation, etc.), or if you would like to transfer selected data to a different database (LIMS systems). The structure of this database is explained under "Analysis database structure" in this manual.
8. Analysis algorithm selection Here you can select which GammaVision analysis algorithm you would like to use for the analysis of your spectra. The algorithms differ in general, if it has been specified earlier to receive false positive or false negative results and if the focus is on library-based or mathematical (Mariscotti) peak search. More detailed information regarding the individual analysis algorithms can be found in the GammaVision manual. We recommend either using ENV32 or NPP32 for LVis operation.

IMAGE MISSING

1. Activation of library-based peak stripping. More detailed information can be found in the GammaVision manual. We generally recommend activating this function.

2. Definition of the suspected nuclide library Here the path to a library is defined, which is used to retroactively compare unidentified peaks of an analysis in order to propose in the report a nuclide for these peaks. This library is not used for the actual analysis and thus can contain significantly more nuclides.
3. Simultaneous measurement support activation with several detectors using parameters sets of the same names (multi-detector configuration). Here you can define the storage location of these multi-detector measurement data as well as the automatic file name generation. For further information, please refer to Multi-Detector Configuration.
4. It is also possible to adjust several input field labels in order to better correspond to the actual laboratory setup. The labels proposed here are default values only. You can adjust the names to be used for measurement analysis in the respective parameter set.
5. Automatically open geometry list of a detector in the configuration bar (in case of many geometries or detectors, it is expedient to suppress this functionality!)
6. Parameters for automatic file name indexing. Here you can define number of digits, start value and validity period of indexes. Automatic indexing in file names can be used in the parameter set by adding i in the name field (seeEdit parameter set).
7. Activating PDF Support can be done by ticking this box. If ticked, the analysis reports will automatically be saved as pdf files and displayed in the default pdf viewer.

Tip
Note that when PDF Support is activated, reports will not be sent automatically to your default printer. They will be displayed on screen and saved in the same location as the measurement .LVM file.

1. When the use of the LVis user management “Uli” is desired, it can be activated here by entering a valid IP address. In cases when the user management configuration is supposed to be on the local pc, enter 127.0.0.1.
2. If LVis shall automatically log out a user after a certain idle time, simply enter a time in seconds here.
3. If measurements shall be approved before being published (eg. results exported to a LIMS or QA measurements being transferred to the LVis detector QA database), tick this box. (see Approval of Measurements and Analysis Results for more details)
4. In case you are using the free software EFFTRAN by Tim Vidmar (www.efftran.com) for the calculation of true coincidence summing factors or efficiency transfer, it is possible to automatically have LVis combine all necessary information about the geometrical setup and trigger the calculation. To do this simply enter here the EFFTRAN and MEFFTRAN file locations. More information can be found in chapter Using EFFTRAN with LVis
5. Clicking on the “Units” and “Labels” buttons takes you to the respective menus, where you can define default values for the pull down menus available in the parameter set. (for further information refer to the following chapters)
6. Under “Peak search” you can define peak search parameters that will be applied if no other respective parameters were defined (if e.g., spectrum acquisition was not started parameterized). The adjustment options correspond to the options in parameter sets.

IMAGE MISSING

Important
Your changes will only be applied if you are logged in as the administrator, i.e., if you have unlocked the application

Pre-Defining Sample Size Units for Parameter Sets

Pre-Defining Users, Sample Descriptions, and Sample Locations for Parameter Sets

LVis lets you choose sample size units offers the option the select the different units in a parameter set (activity unit, sample weight, reference quantity) via the pull-down menu.

IMAGE MISSING

For this purpose, several commonly used units are predefined. However, you can add any number of units, which can then be selected in a parameter set.

Important
Newly added units are only available after their setup in the parameter sets has been completed. Measurements and parameter sets that are open, when the new unit is created, will only offer the new unit, once they are closed and opened again.

You reach the respective menu by clicking on the “Units” button in the global Settings window.

IMAGE MISSING

A factor is displayed next to each unit. This factor defines the ratio between this unit and already existing or basis units (which has a factor 1).

Info
Liter corresponds to a factor of 1, m^3 corresponds to a factor of 0.001, and 1000 liters correspond to 1 m3.

In order to add a new unit, simply click on “New”. The following window opens:

IMAGE MISSING

Enter the respective unit description as well as the corresponding factor, then click on “OK”

Tip
You can also add further explanation to your units. For example, you can differentiate between dried (dry mass) and untreated samples (moist mass). This can easily be indicated in the sample reference unit by using kg (DM) and kg (MM).

Pre-Defining Users, Sample Descriptions, and Sample Locations for Parameter Sets

In LVis you can provide a number of descriptions per measurement. Some of these descriptions can be predefined, so that you do not have to enter them over and over again, but can simply select them from a pull-down menu. To do this, click on the “Names” button in the global Settings window to open the following dialog.

IMAGE MISSING

LVis lets you pre-define, or add to pre-defined, lists of user names, sample categories, and sampling locations from pull-down menus used in the parameter set window. “Category” helps to summarize different measurements into individual groups. “User” indicates the person who measured the sample. This input field can however be named differently by clicking in the field above the table. The same is true for the last category whose default label is sample Location (or sample origin). In the above picture, this was changed to “Sample Type”. Note that for parameter sets that are linked to an external database, the Location field will be used for the selection of a dataset and will hence not display the entries listed here!

In addition, you can specify, for each type of entry, whether it is a mandatory, “Required” field that must be entered into the parameter set by the user prior to any measurement analysis. You can also assign each name or description with an alias (Shortcut), which can be used in the parameter set for automatic file name generation using the dollar commands U for user, C for sample category, and L for the sample location. For further information, refer to Edit parameter set and the table of dollar commands. In order to add a new name or description, click on “New” beneath the respective table. The following window opens:

IMAGE MISSING

Enter the name or description with its corresponding abbreviation, then click on “OK”.

Important
Newly added units, names, and descriptions become available for use once data entry on the Settings dialog is complete and the dialog is closed. Measurements and parameter sets that are open when a new description is created will only offer it in the respective pulldown menus after they are closed and opened again.

Editors

Besides the spectrum itself, the calibration and the analysis settings several additional information is needed for a gamma spectroscopic analysis. Mainly this is the nuclide or analysis library which is essential for spectrum analysis but there is other additional information that may eventually be needed for a thorough analysis like eg a correction library that allows to apply peak and/or nuclide specific correction factors to the analysis, a geometry correction that applies energy specific changes to the efficiency curve or a background correction which subtracts counts from identified peaks to compensate for nuclides present in the system and not the sample. In LVis these additional information is saved by use of additional files that can be created and edited via special “Editors” that can be accessed and started from this menu.

IMAGE MISSING

Analysis Library Editor

In general, LVis uses the GammaVision nuclide library format .LIB and you can certainly make use of the external GammaVision editor program, LibEdit.exe, to create and edit ORTEC .LIB-format library files. (The library editor is installed by default in C:\Program Files\Common Files\ORTEC Shared\LibEdit.).

Important
It is currently not possible to use Nuclide Navigator database libraries in LVis!

Besides the GammaVision editor it is possible to create and modify library information within LVis. This can either be done from “Editors” in the Menu Bar or from within a specific LVis measurement LVM file (the herein created library can be exported in the .LIB format so that it is available for use in parameter sets. This is explained in detail in the chapter Modifying the internal nuclide library of an LVis measurement file of this manual).

All library files are saved by default to the library folder in your LVis database directory.

Important
Besides calibration, the nuclide library is the most important information you provide to the program for spectrum analysis. Thus, diligence is required in creating it. A library must be tailored for the measurement task. It does not make sense to add each isotope from the map of nuclides. In most cases it also does not make sense to specify every line up to a transition probability of a few per thousand or include low-energy peaks or x-ray lines.

Tip
If you are not sure about the “needs” of your application, start with a “coarse” library and refine the data in the library later using the possibility to adjust working libraries in an LVM file for testing (see Modifying the internal nuclide library of an LVis measurement file).

Selecting “Analysis library” under Editors in the LVis Menu Bar opens a dialogue to open an existing library file for modification. It will always come up with the default library folder in your LVis database directory.

IMAGE MISSING

If a library shall be created from scratch, simply don’t select a file here and click “Cancel”. The library editor itself looks like this:

IMAGE MISSING

You can “Load” or “Add” the data from an existing library, you can “Save” and “Print” the library.

Important
Adding data from a library will add all data for all nuclides that are not existing in the currently open one. The information about nuclides that are already existing will be maintained.

To add a single nuclide to the library simply right click into the white main area of the editor and choose “Add Nuclide”.

IMAGE MISSING

This will bring up the following dialogue:

IMAGE MISSING

Here one can either enter a nuclide name, halflife and uncertainty manually and define then in a subsequent window all the different peak energies with their respective emission probabilities or one simply enters a name and imports the nuclide with all of its data from an existing ORTEC library or from the LARA database (http://www.nucleide.org/Laraweb).

Info
The nuclide uncertainty does not refer to a single peak, but the entire nuclide. The 1-sigma uncertainty entered here is calculated in square in the total uncertainty of the nuclide activity. This is the 1-sigma uncertainty, which you can also find in the report and in the Analysis results tab (1-sigma total uncertainty of nuclide activity = square root (counting uncertainty2 + nuclide uncertainty2 + calibration uncertainty2). If you want to be very accurate, enter the total uncertainty of the emission probabilities of all peaks, which are listed in the library, plus the half-life uncertainty. However, in most cases, calculating the total uncertainty based on the transition probability uncertainty of all key lines and the half-life is sufficient. The default value of 5 % is relatively high. Depending on the nuclide and the listed lines, values between 0.1 and 10% are realistic. If you cannot find any uncertainties in the reference books you are using, then you can enter 0.001 (0 is not a permitted input). This means that these uncertainties will not have any real impact on the calculation of the nuclide activity uncertainties.

The LARA database is published by the French “Laboratoire National Henri Becquerel” which is – at least to our knowledge – using all the reviewed nuclear data from the DDEP, the Decay Data Evaluation Project. An international collaboration that was formed in 1995 which includes members of the BNM-CEA/LNHB (France), PTB (Germany), INEEL (USA), KRI (Russia), LBNL (USA), NPL (United Kingdom) and CIEMAT (Spain), with the objective of providing carefully produced recommended data (http://www.nucleide.org/DDEP_WG/DDEPdata.htm). In order to be able to import data from the LARA database a valid internet connection is required.

Tip
In rare occasions you might experience problems when importing nuclide data from LARA so that you receive error messages like “Unreasonable answer from LARA” or similar. In these rare occasions it usually helps when you browse to the LARA page and select the respective nuclide for display, then try to import again.

When importing data from either an ORTEC GammaVision library or LARA, one can limit the number of

peaks that are imported by applying filters for the energy and the emission probability so that just peaks with energies being within the selected energy range and above the specified emission probability will be imported.

Every nuclide in the library will be listed in the editor. One can modify the nuclide information by right clicking on the respective entry and selecting “Edit”. From this menu it is as well possible to “Delete” the nuclide or “Add Peaks” to this nuclide.

IMAGE MISSING

Using the “Photon Properties”, you can define the energy assignment, e.g., if it is a gamma or x-ray quant, or an escape peak. In addition, you can specify a “Peak Flag” that specifies whether the activity (peak activity) determined from this energy should be included in the average determination for the total nuclide activity.

Important
You can define so-called “key lines.” Key lines must be found in a spectrum to identify a nuclide. The peak on level 1 will be automatically set as the key line.

For more detailed instructions on using the library editor, see the GammaVision user manual.

Correction Library Editor

Correction libraries (*.lvf files) can be used to apply corrections to either the peak emission probabilities (peak specific corrections) or the reported total nuclide activity (nuclide specific corrections). The basic idea behind correction libraries is that eventually needed sample type or detector specific corrections like those for true coincidences for example that usually would be taken into account by manually modifying (correcting!!) analysis libraries are automatically applied while still being able to report the uncorrected values as well as the correction factors (for more seeCorrection Libraries(LVF Files)).

The structure of a correction library is very similar to the one of an analysis library. However instead of halflives and emission probabilities, simple factors are defined for either a nuclide or a peak. Peak Corrections are applied by multiplying the emission probability in the analysis library with the correction factor of the correction library so if e.g. the 1332 keV peak of Co-60 has to be corrected by 10 % due to true coincidence summing out, a factor of 1.1 would have to be defined in the correction library for this peak. If however eg the nuclide activity of Cs-137 should be doubled simply define a nuclide correction factor of 2.

A correction library can be created manually or edited by selecting “Correction library” under Editors in the LVis Menu Bar. This opens a dialogue to select an existing correction library file (*.LVF) for modification.

IMAGE MISSING

Note that instead of solely *.LVF file formats, it is as well possible to open a standard GammaVision library *.lib or a (M)EffTran correction file (gv.txt) as a correction library. Usually correction libraries are linked to a detector which is why they are best stored in a subdirectory named “Corr” in the LVis database directory of the respective detector. These folders are created automatically in each detector folder by LVis, however only when a correction library is created from within an LVM file so that the detector is known, the editor points to the respective directory, otherwise it will be the default library folder.

The correction library editor looks very much like the nuclide library editor. It is possible to load or add data from an existing correction library as well as from an existing GammaVision nuclide library file *.lib or a (M)EffTran Correction file (gv.txt).

IMAGE MISSING

When loading a GammaVision library (*.lib) as a correction library one can set all nuclide and peak correction factors to 1 by clicking “Neutral”.

Right clicking on a peak energy or a nuclide name will bring up a context menu from where an entry can either be deleted, manually added or and existing entry can be modified. The respective editor for the nuclide and peak specific correction factors are shown below.

IMAGE MISSING

IMAGE MISSING

An additional uncertainty can be defined for the library correction. It is applied to the nuclide uncertainty from the analysis library (see Nuclide Uncertainty Estimate).

Peak Background Correction Editor

Peak background correction (PBC) is used if an isotope in the sample is also contained in the background. The correction subtracts counts in a peak resulting from the background, from the measured spectrum (for more see Background Correction (PBC Files). A PBC file can be created manually or edited by selecting “Background correction” under Editors in the LVis Menu Bar. This opens a dialogue to select an existing background correction file (*.PBC) for modification.

Note that PBC files are linked to a detector which is why they are best stored in a subdirectory named “PBC” in the LVis database directory of the respective detector. These folders are created

automatically in each detector folder by LVis and when creating a PBC file from the “Analysis results” tab of an LVis LVM file this will be your default PBC file location where the file will be stored. However when using the editor from the menu bar, you will be directed to the default library folder.

The Peak Background Correction editor itself looks like this:

IMAGE MISSING

The PBC editor looks very much like the nuclide library editor. It is possible to load an existing PBC file or add data from one. When loading or adding background data from an existing PBC file (*.pbc) one can reset all peak background count rates to 0 by clicking “Neutral”.

Right clicking on a peak energy or a nuclide name will bring up a context menu from where a PBC entry can either be deleted, manually added or and existing entry can be modified. The respective editor for the nuclide and peak specific correction factors are shown below

IMAGE MISSING

IMAGE MISSING

For each peak background count rate an individual uncertainty can be defined, which will be applied to the uncertainty of the respective peak activity (see Peaked Background Correction and Uncertainty Calculations).

Geometry Correction Editor

The geometry correction is used to compensate for differences between two counting geometries. As shown in the equation in chapter Geometry Corrections (GEO Files), the respective correction factors (at energy E) are multiplied with the peak activities for each identified peak from the library (at the same energy E). The factors are stored in a table as energy correction factor pairs. The determination of the correction factors can be performed experimentally by counting the two samples and calculating the ratio of the peak activities. Hence the geometry correction editor consists of a 4 column table, where one can enter the peak energy, the reference and the actual value as well as their ratio (which is calculated automatically when entering the reference and the current value). The ratio itself represents the correction factor. The factor is linearly interpolated between the energies in the table and linearly extrapolated outside the energy range of the table points. In LVis this is shown in a graph.

IMAGE MISSING

Geometry tables can be built automatically in GammaVision using analysis results (.UFO) files. The correction can be greater or less than 1.0 to allow for corrections between any two geometries. In LVis GEO file can be created manually or edited by selecting “Geometry correction” under Editors in the LVis Menu Bar. This opens a dialogue to select an existing geometry correction file (*.GEO) for modification. So, one way to create a geometry correction file is to manually enter the energy, reference and actual value by double clicking into the table.

Note that GEO files are linked to a detector which is why they are best stored in a subdirectory named “GEO” in the LVis database directory of the respective detector. These folders are created automatically in each detector folder by LVis and when using GEO files in an LVM file. However when using the editor from the menu bar, you will be directed to the default library folder.

Since the geometry correction basically applies an energy dependent correction to every (identified) peak, the geometry correction can as well be used to apply correction factors determined by 3rd party programs like e.g. ANGLE, GeSpeCorr or (M)EFFTRAN for the efficiency transfer between different geometries. Some of these programs provide an ORTEC geometry correction file as a direct output for others the calculated correction factors have to be entered manually into the editor. Note that it is not necessary to provide values for the reference and the actual value. Only energy and correction factor are mandatory entries.

It is as well possible to enter an uncertainty value for the geometry correction (see Geometry Uncertainty Estimate). Note that if the uncertainty is 0 or no value is entered, or if using a .GEO file from an earlier version of GammaVision, a fixed value of 1.5 % is used.

Materials Editor

Some functions in LVis, eg the efficiency transfer calculation by EFFTRAN, require the declaration of materials like eg the sample material or the compounds that the detector element is consisting of. In LVis it is possible to create new materials with the Materials Editor that can be accessed from the Main menu “Editors”.

IMAGE MISSING

Every material in LVis is composed of (multiple) chemical elements and/or molecules. Every material is characterized by its name and density. To create a new element, open the materials editor and click “New”, then specify a name. To modify an existing material, select one from the list and click “Edit”. This will bring you to the following dialogue:

IMAGE MISSING

To add a molecule or element from the library on the left side to the material composition on the right side, simply drag and drop the molecule/element from the left to the right. When all ingredients of your material are listed specify the mass fraction (mass percentage) for each. In case you want to create a new molecule (all elements are already available) simply click on “New” below the library

listing the existing molecule/elements. This will bring up the following window:

IMAGE MISSING

To create a new molecule simply drag and drop the elemental constituents from the left library to the right, then define the atomic fraction and the name.

External Database Editor

With the “External Database” feature of LVis it is possible to link a complete set of data to a measurement and show this data on a separate tab in an LVM file. The selection of the data set is achieved by listing a key value in the “Location field” of a parameter set. Such a dataset is usually implemented by importing it from a LIMS or any other database by csv file import/export. However, prior to any import or linking it is necessary to configure the database fields that should be displayed on the LVis LVM file. This configuration can be defined with the “External Database Editor”, so the very first time, when the external database editor is started the following configuration window will pop up.

IMAGE MISSING

The first thing to do, is to define the name of the data set (give it a label). Note that this label will later be displayed as the name of the tab in the LVM file. In addition, it is possible to define the separator in the CSV file that will be used to import data into the database.

Clicking on “Add” will allow the definition of a new data field in the database. It is possible to select from six different types of data (see screenshot above). For each data field, one has to specify a name (label), a preset (default value), the position of the value in the csv file, the position of the respective field on the tab in LVis as well as the limits for the size of a value and if the entry is unique.

IMAGE MISSING

The “Position in LVis” is referring to the location of the respective data entry on the database tab in an LVM file. The following dataset of patient information (see screenshot below):

IMAGE MISSING

will show the database entries on the tab like this:

IMAGE MISSING

Note that the pulldown menu for the Location field of the parameter set will be different depending on which of the database fields were ticked for “Selection” in this configuration. The three entries selection shown above will bring up a selection menu like this:

IMAGE MISSING

Once the database fields are defined and configured, the “External Database Editor” will come up with the default editor that allows to add new entries to the database

IMAGE MISSING

Clicking on “Add” will bring up the following window, that allows manual entry of a new data set.

IMAGE MISSING

Note that “Import of datasets via a csv file” (see blue marking below) as well as editing the “Database Settings” (see red marking) can be achieved by clicking on the icon in the top left corner of the database editor

IMAGE MISSING

Admin

The Admin menu allows you to password-protect several LVis settings against unauthorized access. This includes the following functions:

Change global settings • Change of LVis global settings

Change MCB settings • Detector configuration (changes the hardware settings of the measuring chain)

Change QA settings • QA settings (tolerances and intervals, etc. specification for QA measurements)

Delete a detector • Delete detector (removes a detector from the list of available detectors)

Parameter sets: create, edit, delete, copy, import, load, save • New parameter set (creates a new measurement parameters set for a detector) • Delete parameter set (removes a parameter set from the list of available parameter sets of the detector) • Edit parameter set (changes predefined measurement and analysis parameters, unlocks input fields for the user) • Copy parameter set (copies a complete measurement parameter set) • Import parameter set from existing .LVM file (applies settings of a .LVM measurement as new parameter set) • Load parameter set (imports a parameter set, saved as a .LVP file, into a detector) • Save parameter set (saves a parameter set as .LVP file)

Reference sources: create, edit load, save • New reference source (manual creation of a new calibration source) • Load reference source (imports a reference source, saved as .LVS file) • Save reference source (saves a reference source as .LVS file) • Edit reference source (edits an already existing reference source)

Change passwords • Change password (changes the current administrator password) • Set start password (changes the password to be entered when starting LVis)

These changes can only be made by an administrator (or by any user doing so before the administrator password is set). Adding and removing password protection from LVis functions is as simple as clicking on the “padlock” icon beside a data entry field (the red padlock indicates a field that has been locked; a green padlock means the field is unlocked).

Login and Logoff

There are two options to unlock the application. Either you click on “ Admin“ in the menu bar and then click on “Login”, or you can click on the green “open padlock” icon (“Login”) on thetool bar In both cases, you reach the login window, where password entry will be requested.

IMAGE MISSING

IMAGE MISSING

After you enter the password and confirm it with “OK”, the application will be unlocked. After the administrator has performed the requested settings, it is expedient to lock the program again to protect it against unauthorized changes. To log off, select “Logoff” from the Admin menu or click on the red “closed padlock” icon on the tool bar.

Important
As soon as you set this password, you are logged in as the administrator

IMAGE MISSING

Change Password

To change the administrator password, click on “Admin” → “Change password” to open the following dialog.

IMAGE MISSING

Enter the current password first (if no old password exists, simply leave the field empty). Then enter the new password, confirm it by entering it a second time, and click on “OK” to apply it. Passwords are case-sensitive.

IMAGE MISSING

Important
As soon as you set this password, you are logged in as the administrator

Important
Once a password has been set, it can be changed but not removed completely (i.e., there is no way to revert to the factory “unpassworded” condition). If you forget the password, contact your ORTEC representative or our Global Service Center for assistance.

Set Start Password

LVis allows you to set a password to prevent program start by unauthorized users. If the wrong password is entered on startup, LVis automatically closes. Users who log in with this password do not have Administrator privileges, hence, cannot change any locked data fields or functions.

Important
This password is separate from the administrator password (even if you use the same character string for both passwords). Administrator-level users must know this password to start the program, and the administrator password to access locked program functions. Once a start password has been set, it can be changed but not removed

completely (i.e., there is no way to revert to the factory “unpassworded” condition). If you forget the password, contact your ORTEC representative or our Global Service Center for assistance.

To set the start password, click on “Admin” → “Set start password” on the menu bar.

IMAGE MISSING

You reach the following dialog box:

IMAGE MISSING

Enter the current password first (if no old password exists, simply leave the field empty). Then enter the new password, confirm it by entering it a second time, then click on “OK” to apply it. Passwords are case-sensitive.

The next time the LVis program is started, the start password must be entered.

Important
If you forget the password, contact your ORTEC representative or our Global Service Center for assistance.

LabJournal

The LVis LabJournal is a log (a database) of all your measurements, their related sample and analysis information as well as the corresponding analysis results. The graphical interface of the LabJournal allows easy file filtering, data retrieval, archiving and Microsoft Excel reporting from data of multiple measurements.

IMAGE MISSING

The LVis menu bar gives you two options under “LabJournal”: “Start LabJournal” opens the LabJournal program and “Import measurements” creates a new or updates an existing LabJournal database with the data from all LVM files in your …\LVis database directory\Measurements directory. It is important to note, that the LVis Labjournal database (LabJournal.mdb) is located in the Config folder of your LVis database directory. If this file does not exist, “Import measurements” will create the database for you and will go through all LVM files in your LVis database folder and will add their data into the

LabJournal.

Important
Depending on the number of LVis LVM files on your system the import of analyses into the LabJournal can take some time. LVis should not be interrupted during the import!

Help

The “About LVis” screen provides software version information for this copy of LVis.

IMAGE MISSING

Configuration bar

The configuration sidebar, on the left side of the LVis application window, is the gateway to detector setup and operation.

This bar lists all measurement chains (detectors) and the parameter sets defined for each.

The Reference Sources section of configuration bar gives you access to the reference source editor, a convenient tool for managing the information on your calibration standards; and allows you to use the reference source entries to perform calibrations.

In addition, it provides the Buffer (a virtual detector window) in which GammaVision can load .CHN spectrum files and analyze them using parameter sets.

If any multi-detector configurations are defined, they are listed here.

The Currently open section lists all currently open analysis and spectrum windows.

In addition, you can right-click in the sidebar and create a backup copy of the entire, current LVis configuration.

Detectors

Detector Context Menus

Adding Detectors

Removing Detectors

Reconnecting Detectors (eg after replacement of hardware)

Detector Configuration

Detector Calibration

Parameter Sets

Create and Delete Parameter Sets

Edit Parameter Set

Copy Parameter Set - Insert Parameter Set

Save Parameter Set — Load Parameter Set

Import Parameter Set from existing .LVM-file

Reference Sources

Creation of a New Reference Source

Save and Load Reference Sources

Edit Reference Source

Buffer

Spectrum Summing – Spectrum Subtraction

Multi-Detector Configurations

Creation of a Multi-Detector Configuration

Starting a Multi-Detector Configuration

Edit or Delete a Multi-Detector Configuration

Save and Restore the LVis Configuration

Restoring a Configuration

Currently Open

Desktop

Spectrum Window – Live Detector Display

Measurement Presentation

CALIBRATION

Calibrations contain information regarding energy, full width at half maximum (FWHM) and efficiency calibrations. They must be selected and loaded for analyses (see Analysis Parameters). In LVis GammaVision calibrations (.CLB files) or any calibrated LVis measurement file (.LVM files) can be used as a source of calibration.

In each LVis measurement, the calibration is presented in its own tab (see as well Changing a Calibration in an .LVM file).

Quality Control (QA)

QA Settings

QA Measurements

Verification of Energy and FWHM Calibration

Verification of the Efficiency Calibration

Background Verification

QA Report

The LabJournal

Using the LabJournal to find existing Measurements

Using the LabJournal to backup, delete or move files

Reporting from the LVis LabJournal

Analysis Parameters in Detail

Analysis Parameters of the Library

Library File

Match Width

Fraction Limit

Calibration and Activity Units

Calibration File

Multiplier and Divisor

Unit of the Activity

General Analysis Settings

Peak Search Sensitivity

Peak cutoff

Channels for Background Determination

Automatic

X-Point Average

X.X * FWHM

Analysis Range

Corrections

Decay Corrections

Decay Correction from Sampling Date

Decay Correction During Measurement

Background Correction (PBC File)

PBC by nuclide (By Energy option OFF)

Match by Energy Only (By Energy option ON)

Correction Libraries (LVF File)

Geometry Correction (GEO File)

Random-Summing Correction

Correction of true Coincidences using the GammaVision

Method

Reports

Uncertainty Calculation in GammaVision and LVis

Total Uncertainty Estimate

Peak Counting Uncertainty

Peaked Background Correction and Uncertainty Calculations

Single PBC Subtraction

Multiple PBC Subtraction

Addition normally distributed Uncertainty Estimate

Random Summing Correction Uncertainty Estimate

Absorption Correction Uncertainty Estimate

Nuclide Uncertainty Estimate

Efficiency Uncertainty Estimate

Calibration Counting Uncertainty

Calibration Fit Uncertainty

TCC-Polynomial

Interpolative

Matrix Solution

Matrix Inversion

Uncertainty of the Fit

Geometry Uncertainty Estimate

Uniformly distributed Uncertainty Estimate

Additional user-defined Uncertainty Factors

Sample Size Uncertainty

Average Nuclide Activity

ROI Analysis with LVis

The ROI Analysis in Detail – Mathematics

Gross ROI Counts

Net ROI counts & count rates

Uncertainty of the net area

Efficiency

Relative Uncertainty of the efficiency

Nuclide & method specific calibration factor

Relative uncertainty of the nuclide & method specific calibration factor

Activity

Uncertainty of the activity

Critical Level (Detection Threshold)

Detection Limit

Setup of a NaI Detector for ROI Analysis in LVis

Configuring the digiBase with MCB Properties and Maestro

Installing LVis & configuring the Detector

Configuring a new detector in LVis

Defining the QA Settings for a new ROI Detector

Defining ROIs

Calibrating the Detector for ROI Analysis

Defining Calibration Sources

Setting up the energy calibration parameters and performing an energy calibration

Setting up the energy calibration

Performing an energy calibration

Performing a gain stabilization check

Setting up the ROI efficiency calibration parameters

Performing an ROI efficiency calibration

Defining ROI Counting Routines

Initializing ROI Counting Routines

Executing ROI Counting Routines

Analysis Database Structure

General

Table Data

Geometry1

Geometry2

GeometryQA

UfoHeader

UfoNuclides

UfoPeaks

PeaksInRange

LibHeader

LibNuclides

LibPeaks

IntLibPeaks

SusLibHeader

SusLibNuclides

SusLibPeaks

Calibration

Calibration Chart

Certificate Table

Efficiency Calibration

Energy Calibration

Source

SumSpec

Detector

Install

Column title	Description
ID	Unique number
Organization	Information about the organization LVis is working for (as provided during setup)
System	Information about the system LVis is working in (as provided during setup)