MIRION TECHNOLOGIES

IN-VIVO COUNTING

Apex-InVivo™

Whole Body and Lung Counting Productivity Software

An advanced in vivo counting system and a comprehensive management tool that helps monitor and maintain your counters as well as keep track of all the results they generate.

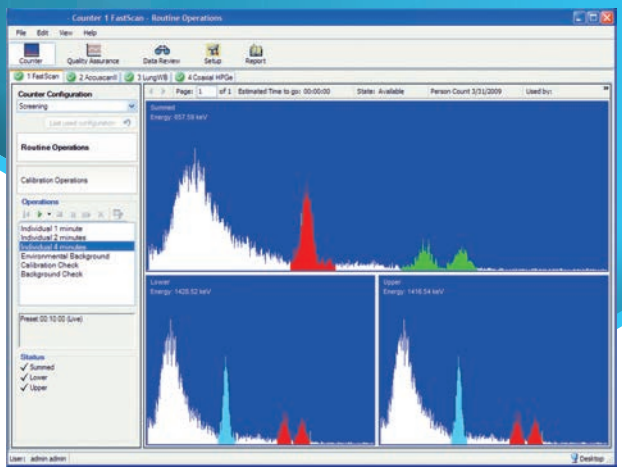

Figure 1 – Counter View

FEATURES

- Comprehensive operation and management features for in vivo counting systems
- Distributed multi-user functionality provides access to counters from any client workstation
- Flexible calibration facilities including a verification report and calibrations that are automatically shared across different configurations
- Quality assurance facilities with enforced scheduling policies, and failure response options
- Data review and reanalysis facilities with analysis tracking, advanced reporting, and evaluation of all results
- Advanced database features help manage all personnel count data, multiple analyses, and advanced search capabilities in key activities
- Comprehensive event logging records key events to provide the traceability and reliability required
- Comprehensive security system that controls access to all system functions and simplifies user interface based on permissions
- Built on Genie™ 2000 spectroscopy software to provide world class analysis facilities
- Live summed detector groups as well as multi-channel scaling (MCS) groups with defined energy ranges

DESCRIPTION

Apex-InVivo is the most advanced whole body and critical organ counting software on the market today. It includes features of Mirion's well known Abacos software products, as well as features that conform to the philosophy and architecture of the Mirion Apex® software product line. This combination results in an advanced in vivo counting system and a comprehensive management tool that helps monitor and maintain your counters as well as keep track of all the results they generate.

The main counting screen shown in Figure 1 has been designed to give a user easy access to the information needed to run the counter. The status of the counter and each detector are easily identified with a glance at the screen. Colors and visual cues will indicate if the counter is in use or idle. The user can also see if a calibration is present or overdue, or if any QA parameters have gone out of tolerance. While a count is in progress, this same screen provides the user with an estimated completion time, and provides access to a variety of tools to review the spectra being collected.

Apex-InVivo™

All detectors and detector groups are accessible and visible during the count. Summed spectra is calculated and displayed during the count so the user can see and analyze the spectrum as the count progresses. The user also has access to the spectrum for each individual detector, and any MCS groups that are defined as part of the current counter configuration.

There are comprehensive features for QA, user security, calibrations, multi-curve efficiency calibrations, customizable biometric equations, data review, batch reanalysis, multi-channel scaling, demographics, and even an enhanced reporting engine with built-in report editor. Apex-InVivo software is packed with many features to address the unique counting needs of any whole body, critical organ, and lung counting system.

ROUTINE COUNTING

All routine counting operations are easily accessible from the main counter view. These predefined operations allow a user to quickly start any task with a simple mouse click. Routine operations can include personnel counts, QA and background counts, as well as calibration counts. The user simply needs to tell the system which operation to run and the system will prompt for any additional information required to begin counting. The personnel search and demographic entry screens are shown in Figure 2.

Counting can start immediately while the subject's demographic data is being reviewed. When the count is complete and the results are analyzed, the reports are generated, printed and stored as specified in the count operation. Counts can be paused, restarted, aborted, or the count time can even be altered if needed.

Once the whole count operation is complete, the counter becomes available and the next count can be started. This whole count cycle is streamlined to help maximize the use of counters during busy times.

DATA REVIEW

Apex-InVivo platform provides a powerful tool that lets the user retrieve and review the counts generated on any counter. As with our other Apex products, data review has two key features, a powerful search engine and a review and analysis work area.

The Search Screen shown in Figure 3 offers many different parameters to make retrieval of counts quick and easy. Users can easily find the counts they are looking for by utilizing date and time filters, in conjunction with personnel information, counter information, and even calibration or nuclide information.

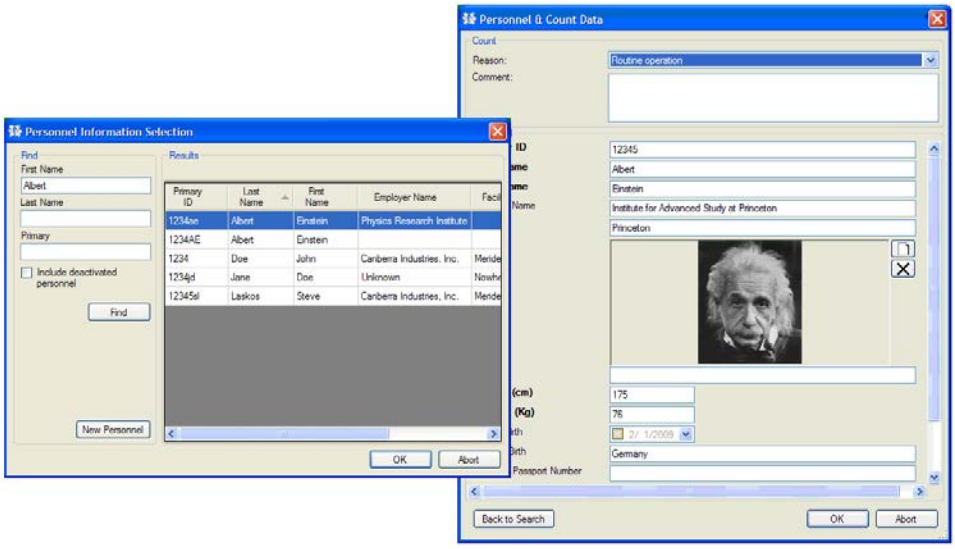

Figure 2 – Routine Counting Personnel Search and Edit

After identifying the counts requiring review, the user can then move on to the review screen. The Review screen (Figure 4) gives the user access to all the information about the count such as details about the person counted, the analysis parameters used, the spectrum and the report. The tools needed to review the data are at the user's fingertips. If something doesn't look right, the user has access to the powerful reanalysis engine. To reanalyze a count, the user is prompted with a dialog that allows many different analysis parameters to be altered. This includes the libraries used, analysis engines used, any of the input parameters to the analysis engines, nuclide libraries, the source distribution and even the energy and efficiency calibrations.

Apex-InVivo software also makes it easy to keep track of every reanalysis performed. Multiple analyses appear as part of the count record and accessing them all is fast and easy. The user can attach comments to each analysis to record what was altered and describe why the reanalysis was performed.

ADVANCED REPORTING ENGINE

To complement this new package, a robust reporting engine was provided to meet any unique reporting needs. This new report engine provides professional looking reports and has a powerful set of features. Each Apex-InVivo software package comes with a graphical report editor built right into the application. Report templates can be copied, customized and then used by any number of counter configurations.

Some of the advanced features include an optional spectral plot embedded in the report, a wide variety of export capabilities including PDF, Excel, Word, XML, HTML, CSV, and many more. If the user needs to perform calculations on peak or nuclide results, the export to Excel capability is very useful. The report viewer can even export a report into any of the supported formats and attach it to an e-mail to make it easy to pass information to other experts for analysis.

The Reporting view shown in Figure 5 has exceptional viewing capabilities and even allows for the combination of multiple analyses into a single report. For example, a single report can be created to incorporate both the whole body and lung analysis results for a count.

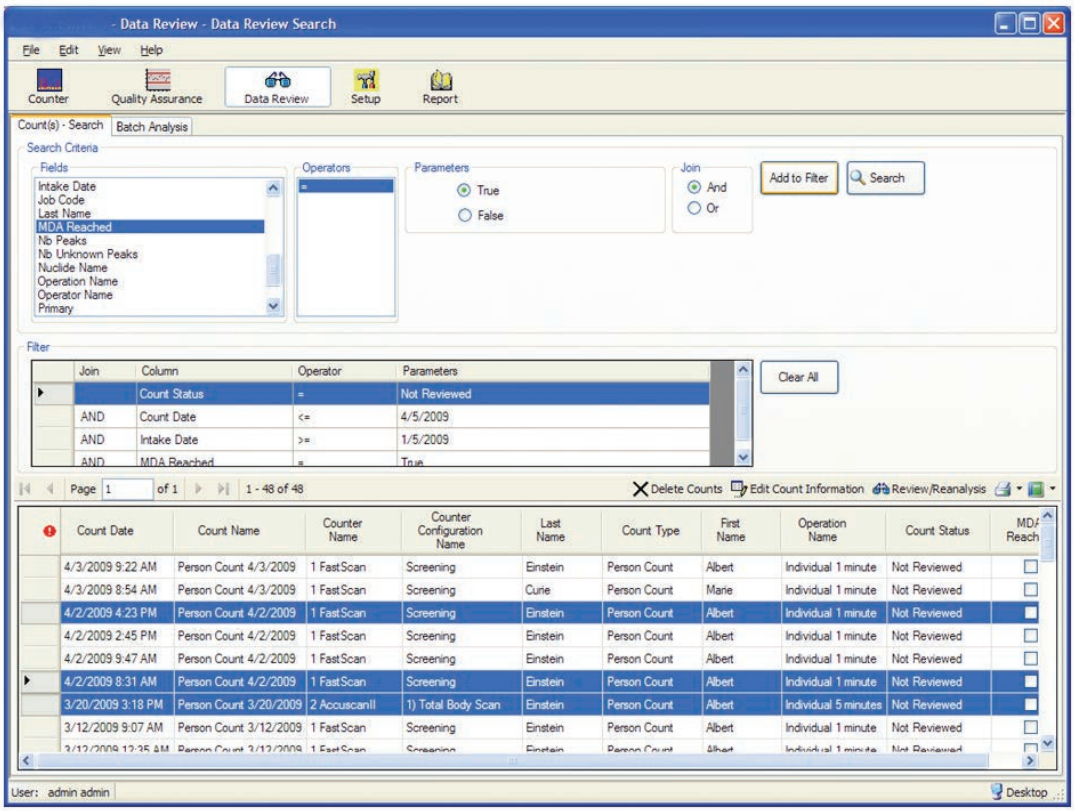

Figure 3 – Data Review Search Screen

CENTRALIZED DATA AND ADMINISTRATION

For multi-site organizations who want to track personnel counts across all sites, Apex-InVivo software has the ability to consolidate all data to a central database. This makes it fast and easy to find all of a worker's counts across all counters and work sites.

Although the data is stored centrally, counter workstations will always retain the data and files needed to continue performing counts even if the network is down.

The use of a central database and the synchronization features of Apex-InVivo software simplify administration and standardization of counting policies. With standardized management of counters across sites, technicians can easily move between sites and experience consistent policies and procedures at each location.

Apex-InVivo software is a solution that can grow with the needs of the organization. Systems can be implemented one site at a time, and even the central server can be added later. The architecture is powerful, flexible and opens a new way of organizing in vivo data across sites.

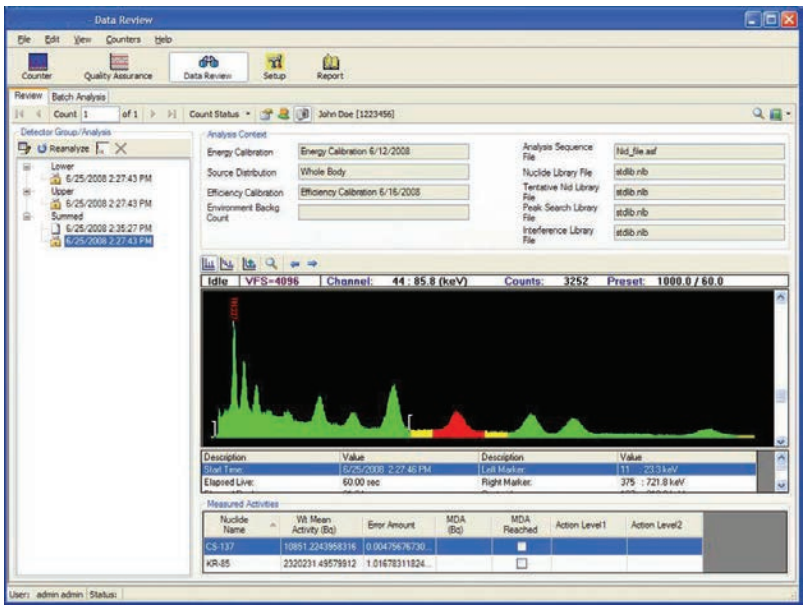

Figure 4 – Review and Reanalysis Screen

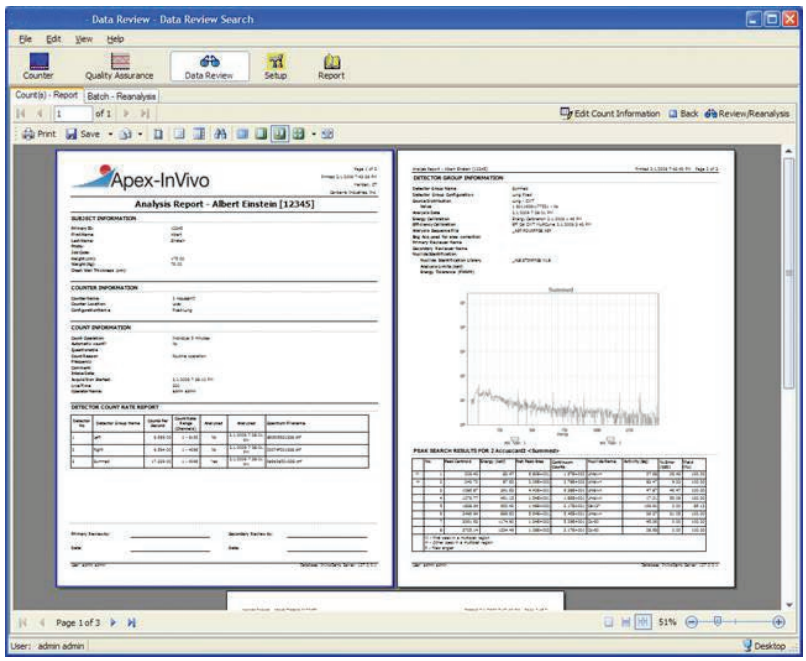

Figure 5 – Data Review Report Viewer

SYSTEM ARCHITECTURE

Apex-InVivo software is designed as a multi-user distributed networking application. It provides excellent access to all counters as well as to the data they generate. The robust networking capabilities of Apex-InVivo software allow its features to be accessed from any client PC on the network. Count operations, administration, calibrations, reporting, QA, and even hardware adjustments can be performed across the network. Users have access to the features and data they need from wherever they are.

System flexibility does not come at the expense of stability. Because a central server might be located across a large LAN or even a Wide Area Network (WAN), Apex-InVivo software was designed to ensure that all counter workstations are self sufficient. They keep a local database and file repository to store all data that is required to perform counting. Even if network access to a centralized server is unavailable, each counter workstation will have the capability to record new personnel counts and fully control and maintain the counters that it is connected to.

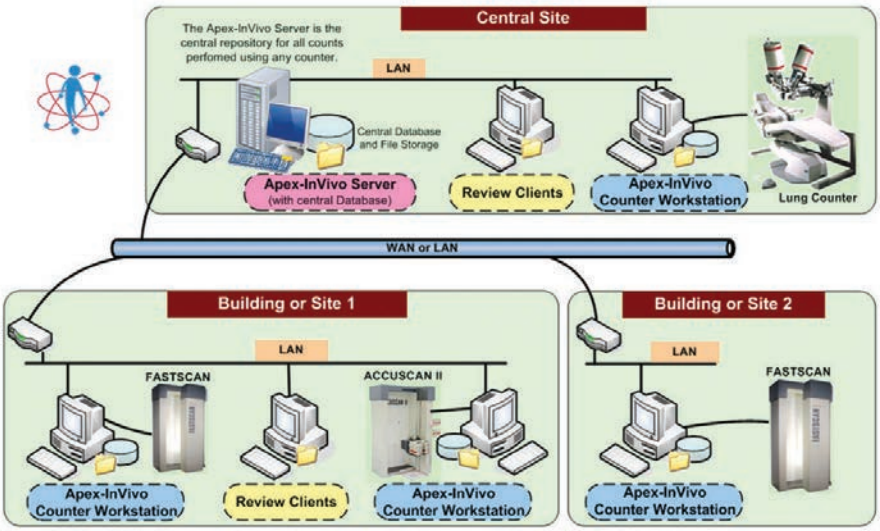

Figure 6 – Apex-InVivo Network Architecture

There are three main components to the Apex-InVivo product:

1. S734 Apex-InVivo Counter Workstation

This is a core component of the Apex-InVivo system. Its key ability is to control one or more counters and make those counters available to other Apex-InVivo clients on the network. Generally this is located in close proximity to the counters it manages so that technicians can position the people or calibration sources to be counted and then initiate the counts.

The workstation can be run as a Desktop system that is able to fully manage counters and count data. In this configuration, all operations must be performed on this workstation and all data is stored on this computer. It has a local database that is used to manage all of its count data. It also contains a file repository to store all files necessary to run the counters.

A Counter Workstation can also be used in conjunction with an Apex-InVivo Server. Switching from a Desktop mode of operation to a Client/Server mode is easily done thereby making it easy to add a Server at a later date. When a Counter Workstation is reconfigured to work with a server, all of the count data it has collected will be pushed up to the central server. This will help free up the disk space needed on this computer and allow this data to be seen from other clients.

2. S738 Apex-InVivo Server

For facilities that have multiple counters to manage over a distributed area, an Apex-InVivo Server can be added to centralize all administrative tasks as well as all count data. Once a server is added, counter workstations can be reconfigured to start synchronizing their data with this server. This provides a great advantage for organizations that manage multiple counters across a large site or even across multiple sites. When data is centralized, key administrative and health physics resources will have easy access to the data and operations they need. This reduces the need for duplication of expertise at each counter location and enables easier collaboration for in-depth analysis as well as administrative functions such as calibrations.

3. S735 Apex-InVivo Review Client

The review client software is a lightweight version of a Counter Workstation. It has all the functional capabilities of a Counter Workstation when it comes to performing tasks. A review client can view all counters that are being served up by the Counter Workstations on the network. It can also view and manipulate all the count data generated from any Counter. All key functionality such as site administration, QA, data review, calibrations, reporting, and much more can be performed from this client.

Because a review client accesses all of its data from the server, it does not have a local database or file repository. A review client must be used in conjunction with an Apex-InVivo Server and it cannot serve up a counter. It is mainly used as an alternative workstation in which any type of user can perform tasks.

COMPLEX COUNTERS MADE SIMPLE

In vivo counters come in a wide variety of configurations. They include multi-detector systems, those that have multiple scanning modes, they may contain NaI and Ge detectors, and some have a mixture of all of these. The use of these counters often requires the ability to define detector groups that will sum the spectra from multiple detectors together.

To start, Apex-InVivo software has a configuration wizard that makes it easy to define even the most complex counting systems. When defining a new counter, a wizard walks the user through key definitions for the counter and then creates typical configurations based on a set of templates. The generated configurations include QA settings, calibration settings, count operations, detector groups and even motor controller setup for scanning systems.

Configurations can then be customized further to meet any specific counting scenario. The goal of this system is to make setup of a new counter quick and easy. Within minutes a counter can be ready for use.

Although counter setup is made easy, Apex-InVivo software also contains the features required to take full advantage of any counter. The secret to this flexibility is the use of user-defined counter configurations. These configurations contain all of the acquisition and analysis logic required. They specify how detectors are grouped and summed together in Composite and MCS detector groups. They can also control the visual layout of detectors on the counter screen, which detector groups get analyzed, what algorithms to use, which analysis report template to use, and whether reports are automatically saved and printed.

Any configuration can also be replicated to allow organizations to have consistent configurations for a specific type of counter. Counter configurations also minimize complexity for the end user performing the counts, so training needs are reduced, and mistakes are prevented.

ROLE-BASED SECURITY AND A SIMPLIFIED USER INTERFACE

Security requirements are critical for in vivo software systems. To keep your system operational and in good working order, personnel must only perform operations that they are qualified to perform. Without this security, the integrity of your systems will be threatened.

The security capabilities in Apex-InVivo software are extensive, yet they are designed to be easy to administer. Privileges are assigned to roles and these roles are then assigned to your personnel. By defining the different roles that workers may have, it is easy to introduce new users into the system. A qualified calibration expert can be given access to the functionality their role requires by simply assigning them the Calibration role that has been established.

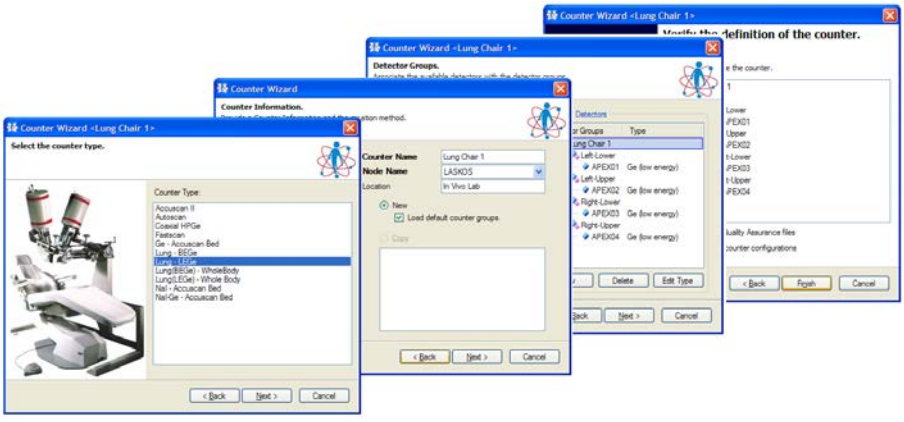

Figure 7 – Counter Configuration Wizard

When a user logs onto the Apex-InVivo system the application will only show them the parts of the application that they have access to use. This keeps the application very simple for those with limited roles. For example a count technician might only need access to the main screen to start personnel counts as well as a daily calibration check and background counts. When they log onto the system, they will not see any options or screens that do not apply to them such as calibrations, data review, QA charts and reports.

Keeping the user interface simple reduces training requirements for the various users and prevents confusion and errors.

QUALITY ASSURANCE PROGRAM

Ensuring that counters are in good condition and properly configured is an important aspect to health physics requirements. Apex-InVivo software helps to monitor the health and accuracy of counters and helps prevent counts from being invalid and needing to be redone.

The QA system in Apex-InVivo software is designed to perform routine QA checks, ensure they get done at the intervals configured, and ensures that corrective action is taken if the system goes out of tolerance. Each QA count type: calibration check, background check, and environmental background has a frequency associated with it along with a response if the period is exceeded. When a counter goes out of tolerance for any QA parameters being monitored, Apex-InVivo software can be configured to log the error, display a warning, or even lock the counter until the problem is resolved.

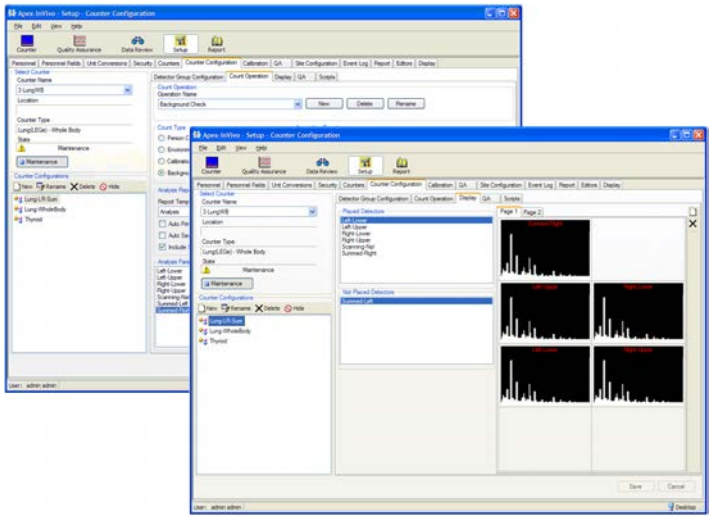

Figure 8 – Counter Configuration Screens

Using the QA facilities within the Apex-InVivo system ensures the quality of all measurements, reduces paperwork burdens, and allows QA program compliance to be easily demonstrated to an outside auditor.

CALIBRATION MANAGEMENT

Apex-InVivo software includes a number of facilities that ensure personnel counts are being performed on a well-calibrated system.

At the beginning of each count operation, the health of the counter is validated. As part of that validation, the calibrations in use are checked to ensure they adhere to the schedule defined by the administrator. If any detector that is about to be used has a missing calibration or one that is past due, the system will respond as specified in the site settings. The event is placed in the event log, a warning can be displayed, and the count can even be prevented.

When calibrations need to be performed, the Apex-InVivo system provides a full set of tools and features to help with the effort. Apex-InVivo software helps perform the calibration counts needed and allows them to be easily used during the calibration process. Calibrations can be made from a single mixed source acquisition or from several different acquisitions which are combined to yield a single optimized curve.

To reduce calibration efforts, energy and efficiency calibrations are reused by the system wherever possible across all of a counter's configurations. For example, energy calibrations can be used across all counter configurations that have the same energy range of interest. Efficiency calibrations are shared among all configurations that also share the same detector and source geometries.

The counter summary report allows the user to review all configurations and also indicates which ones have valid calibrations in effect.

MULTI-CURVE EFFICIENCY CALIBRATIONS

For counting geometries such as lung counting, Apex-InVivo software provides a multi-curve attenuation correction feature. Efficiency can vary based on the thickness of attenuating tissues between the detector and the source of the activity. To get the most accurate activity results, a multi-curve efficiency engine is used that will interpolate an efficiency curve based on the subject's chest wall thickness.

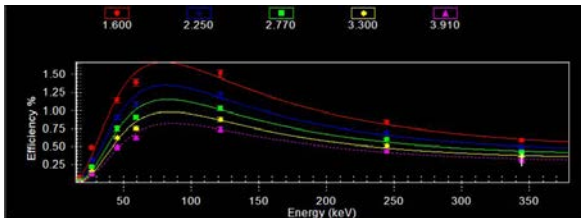

Figure 9 – Multi-Curve Efficiency Calibration

If an accurate chest wall thickness for the subject is not available, a custom biometric equation can be specified that will estimate chest wall thickness based on data that is much easier to collect such as height, weight and gender. The biometric equation can utilize any field in the personnel demographic data.

Multi-curve features are included as part of the system and can be used for lung counting, as well as whole body counting if desired.

EVENT LOGGING

The ability to retrieve information, retrace steps, review history – at any time – is very important. Whether for purposes of system performance review, or perhaps to respond to a legal challenge of your counter operations – rapid and complete information retrieval can save time and money.

In the Apex-InVivo platform, every event is logged by the system. Every log-on/off, personnel count, calibration, QA check, data review, etc. is recorded and can be recalled as needed. Use of the database allows direct recall of event information based on filters you specify.

INTERFACE TO IMBA

IMBA (Integrated Modules for Bioassay Analysis) is a suite of software modules for internal dosimetry. It was developed by Radiation Protection Division of the UK Health Protection Agency. IMBA implements all of the biokinetic and dosimetric models currently recommended by the International Commission on Radiological Protection (ICRP). It also enables the users to specify their own parameter values and apply sophisticated data handling techniques to their customized internal dose calculations.

An add-on module has been developed for IMBA which allows a user to import analysis results from any count performed on the Apex-InVivo system. The import module connects to the Apex-InVivo database and provides a search tool that makes it easy to find the counts and analysis results needed for dose assessment.

PLATFORM REQUIREMENTS

S734 Apex-InVivo Counter Workstation

- A network-capable PC with a 1 GHz Pentium processor or better, multi-core CPU recommended
- 1 GB RAM or higher, 2 GB RAM or higher recommended.
- 200 GB hard disk or larger
- CD-ROM (or other CD-compatible) drive
- Video Resolution of 1024 x 768 or higher
- 32-bit versions of Windows 7, Windows Vista, Windows XP SP2 or higher, Windows 2003 or 2008 Server
- SQL Server 2005 Express is automatically installed if it's not already present

S738 Apex-InVivo Server

- A network-capable PC with a 2 GHz Pentium processor or better, multi-core CPU recommended
- 2 GB RAM or higher, 3 GB RAM recommended
- 300 GB hard disk or larger. Disk requirements should increase as the following items increase: number of counters being managed, number of counts per year, and number of years count data is retained prior to archival
- CD-ROM (or other CD-compatible) drive
- Video Resolution of 1024 x 768 or higher
- 32-bit versions of Windows 2003 or 2008 Server
- Relational Database: SQL Server 2005 or 2008, Oracle 9i, 10g, or 11g

S735 Apex-InVivo Review Client

- A network-capable PC with a 1 GHz Pentium processor or better
- 1 GB RAM or higher
- 80 GB hard disk or larger
- CD-ROM (or other CD-compatible) drive
- SVGA or higher graphics capable of 1024 x 768 screen resolution
- 32-bit versions of Windows 7, Windows Vista, Windows XP SP2 or higher

Genie 2000 Prerequisites for all the above packages

- S500: Basic Spectroscopy Multi-Input Software – Minimum Version 3.2
- S501: Gamma Analysis Software – Minimum Version 3.2
- S505: Quality Assurance Software – Minimum Version 1.3
- S506: Interactive Peak Fit Software – Minimum Version 1.3
  and/or
- S520: Genie 2000 Multi-Input, Right to Copy (To copy the above software to an additional computer)

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