MIRION
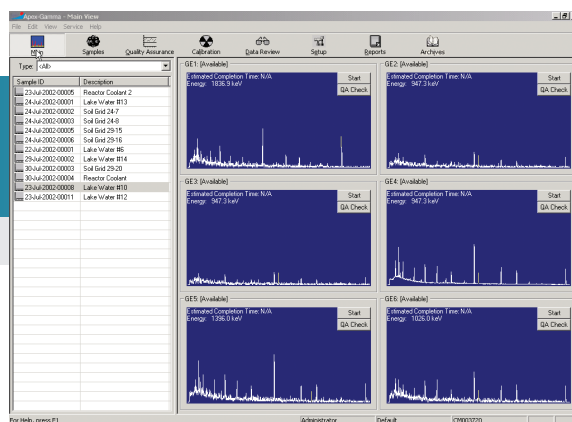## TECHNOLOGIES

Apex-Gamma™

Lab Productivity Suite

KEY FEATURES

- Comprehensive operation and management software for the production-oriented gamma spectroscopy sample-counting lab
- Designed for labs with large numbers of routine gamma samples
- Distributed multi-user functionality provides access and control of the system from any client workstation
- Sample database tracks samples through log-in, counting and data review processes
- Flexible calibration facilities including scheduling, confirmation report and cross-check reports
- Quality assurance facilities including scheduling, failure response and intra-lab comparison reporting
- Data review and reanalysis facilities for routine and non-routine evaluation of assay results
- Comprehensive event logging records every event on the system – with flexible recall
- Comprehensive security system controls access to system functions
- Genie™ 2000 spectroscopy software provides world class analysis facilities
- Support for Oracle and SQL Server database facilities

DESCRIPTION

The Apex-Gamma Lab Productivity Suite breaks the old models of gamma spec operation and offers a whole new level of functionality to improve productivity in lab operations. No longer is the gamma spec counting system a functionally isolated instrument – offering only basic counting, calibration and quality assurance capabilities. Apex-Gamma software integrates the gamma counting system with the complete operation of the laboratory – replacing what are typically manual and off-line processes with built-in, tightly integrated seamless functionality (Figure 1).

With Apex-Gamma software, the complete status of a multi-detector system is available at a glance. Click – and find all the samples waiting to be counted. Log samples into the system from the location where the information is known – in the sample preparation area. Let Apex-Gamma software enforce your calibration/QA schedules and monitor QA results – and automatically take the appropriate action if something goes wrong. Use Apex-Gamma software to perform data review – verifying and correcting results as needed – even years after the initial count. Rely on the Apex-Gamma security system and event logs to control access to the system and construct detailed reports of all system activities.

The key to Apex-Gamma lab productivity lies in the extensive database built directly into the software. As samples are logged into the system, a sample database record is created which stays in the system as the sample moves through various stages of processing – counting, first and second data review, recounting, final results delivery and follow-up inquiry. Built on modern relational database technology, Apex-Gamma software gives you a complete view of what is going on in your lab. How many samples await processing? Apex-Gamma software knows. Which samples await data review? Ask Apex-Gamma software. Which samples were counted on Detector 3, 20 mL water geometry, cooling water library in the last 20 days? It's an easy question for Apex-Gamma software.

Apex-Gamma software is designed on a multi-user, client server model. Networked workstations allow you to operate from anywhere in the system. A typical system may have several workstations located within the lab counting area, one or more in sample receiving areas for sample log-in and additional workstations in supervisor or analyst's office for data review. This flexibility gives you optimum information access and system control – the capability you need exactly when and where you need it.

Apex-Gamma software even lets you operate multiple facilities from a single system – providing common resources to operate separate gamma counting operations. Hot lab/cold lab? Separate Health Physics/Radiochemistry/Training areas? HPGe and NaI detectors coexisting in one operation? All these variants can be controlled from one distributed Apex-Gamma system – separately partitioned for easy management and security access. (Figure 2).

SAMPLE COUNTING AND MANAGEMENT

Until today, samples typically were not "known" to the counting system until the moment the sample was placed on the detector. With Apex-Gamma software, a sample can be logged into the system at the moment the requisite sample information is available – from any location. Locate a client workstation in the sample receiving/preparation area and you can log samples directly into the system as they arrive. In many cases, this can eliminate a paper-based sample information sheet system. Other users will find a simple, customized interface will allow download of sample lists directly from computerized Laboratory Information Management Systems (LIMS). In either case, Apex-Gamma software can eliminate manual processing of records, dramatically reducing transcription and data entry errors.

Once samples are logged into the system, use the facilities of Apex-Gamma software's Main View (Figure 3) to manage the sample counting and keep your detector assets working for you. Glance at a client workstation – even from across the room – and instantly see the status of up to six detectors on thumbnail views (more by selecting a "next" group button). The color-coded backdrops on the spectrum views show you which detectors are counting, which are busy and which are off-line or unavailable. Take a closer look at your busy detectors and note that Apex-Gamma software gives you an estimated completion time for each measurement in progress (no elapsed/preset "mental math" required!).
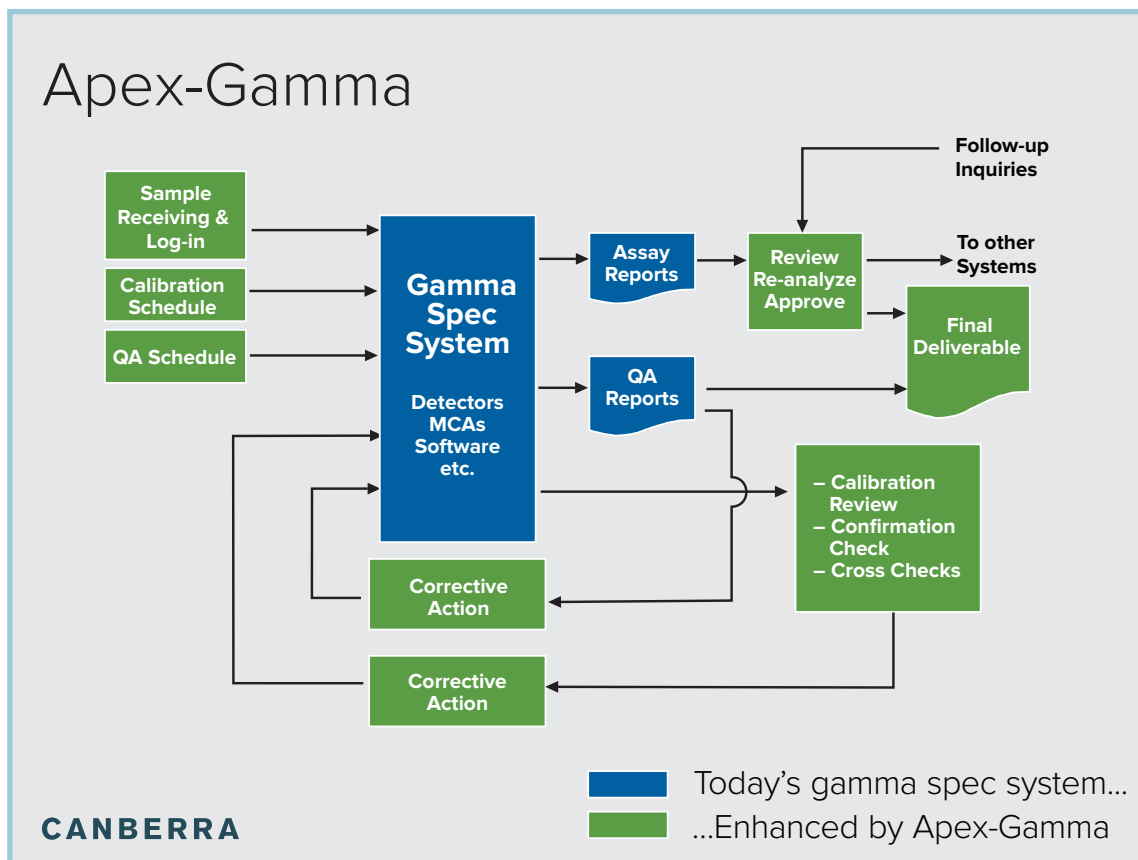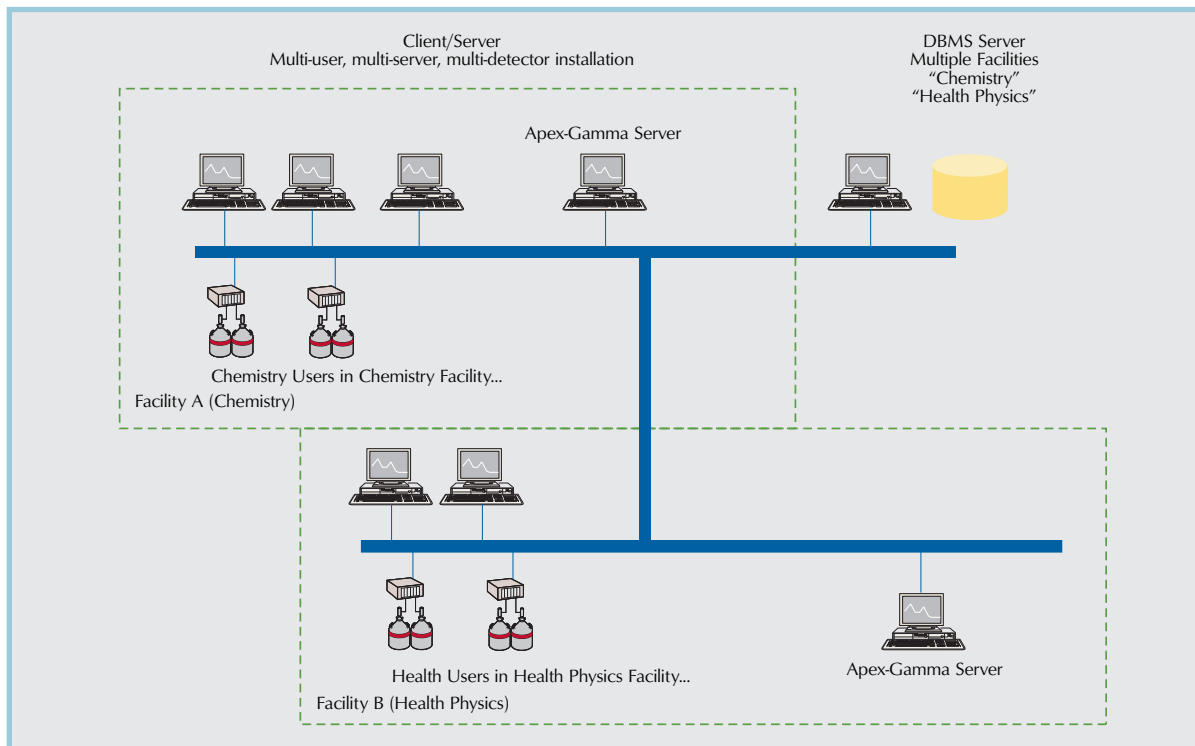

Figure 1

Figure 2
Apex-Gamma Multiple Facility Model

Drag and drop logged-in samples to any available detector start count

"Estimated Completion Time" makes it easy to establish which detector is available next

Color code shows detector availability at a glance.
Green – Busy
Blue – Available
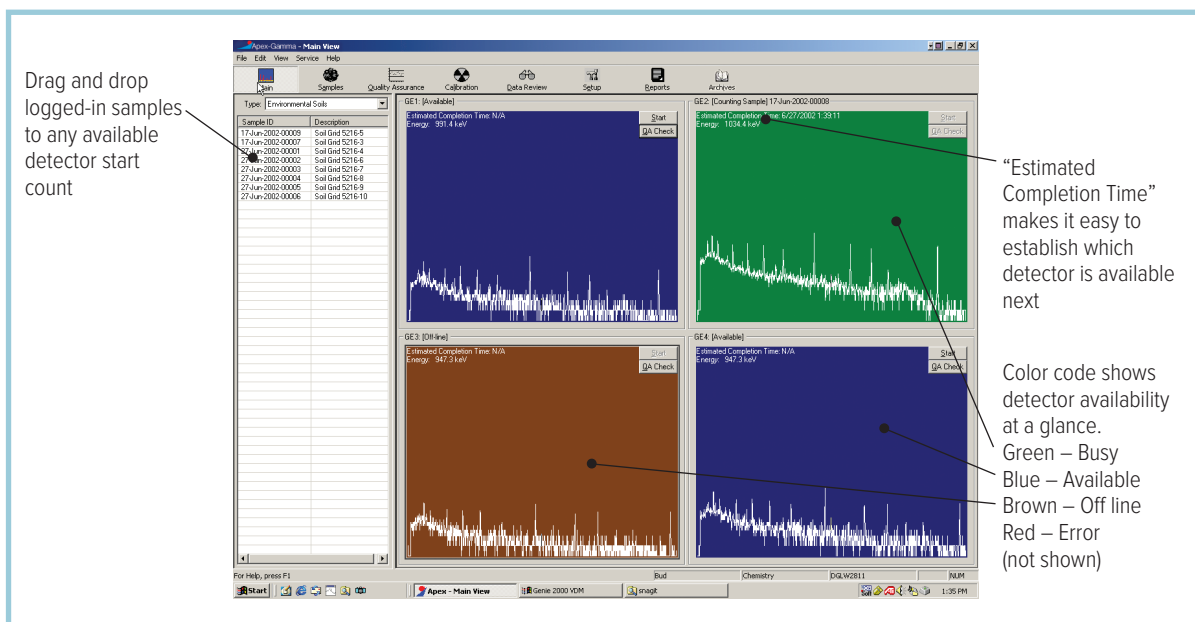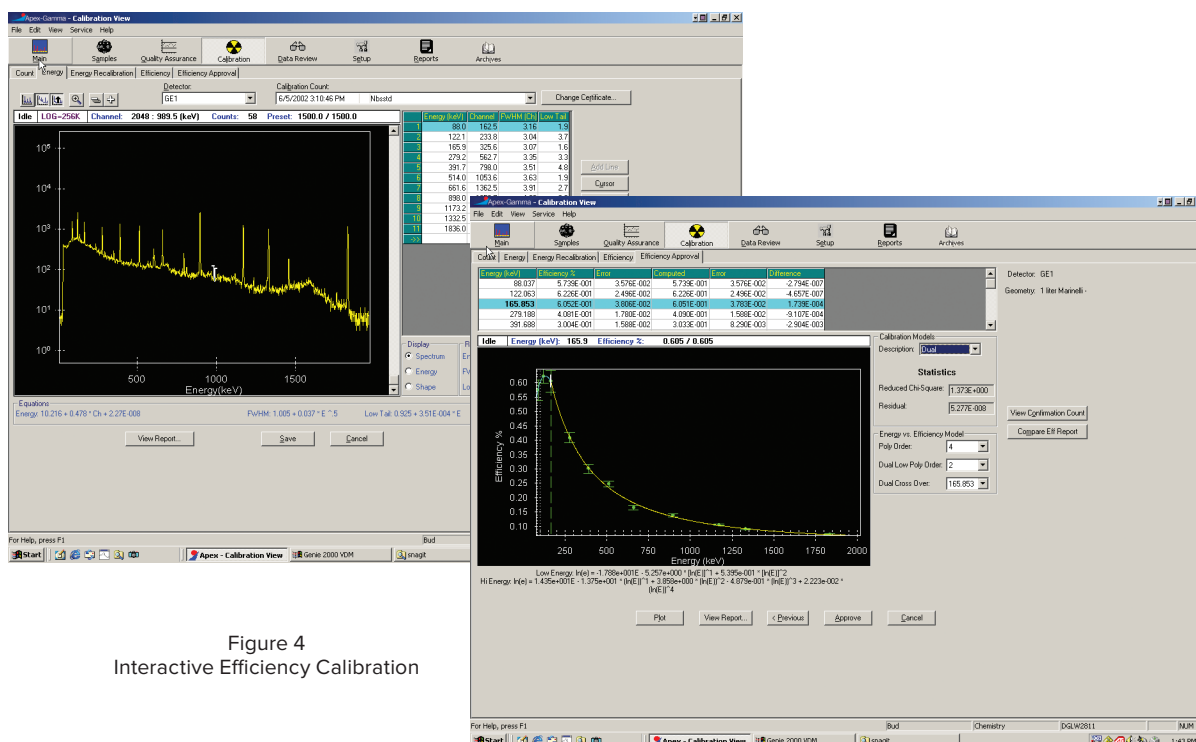Brown – Off line
Red – Error
(not shown)

Figure 3

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Figure 4
Interactive Efficiency Calibration

When a detector becomes available, drag and drop from the sample queue to the detector display to start counting. Defining the samples couldn't be easier – whether logging them in advance or performing an immediate count. Simply enter a sample ID (or let the system give you one automatically), select a counting Procedure and enter sample information (date, time, quantity, etc.).

The user interface is simple and straightforward – and flexible. Need to enter a number of nearly identical samples? Define the first one, then use the "copy" facility to create more – changing only the information that varies from one to the next. Need to recount a sample? Hit the recount button and navigate the sample information database – using database filters – to locate the sample and load it back to the queue.

The key to sample entry simplicity in Apex-Gamma software is the Procedure. Within the Procedure editor, you assign a natural language name for the procedure – plus all of the constructs that fully define a specific type of assay. Within the procedure lies the count time (or Count to MDA), analysis sequence, sample geometry, library, required reports, sample information needed, required data review(s), etc.

MANAGING CALIBRATION OPERATIONS

Calibration is an area where labs keep extensive records – many of them manually. Apex-Gamma software not only provides simple and accurate calibration facilities – but also provides the management tools to ensure your records are up to date; calibrations are properly verified, approved and performed according to the required schedule.

The calibration operation itself is simple. First, count the calibration spectra in a screen designed just for calibration – including hardware MCA adjustment facilities.

Energy and efficiency calibrations are then performed on dedicated, interactive "one page" calibration screens that let you adjust calibration parameters and inputs and instantly see the results (Figure 4). Efficiency calibrations may be performed using traditional source methods (including automatic combination of multiple counts) or the Mirion patented* LabSOCS™ mathematical calibration method.

Efficiency calibrations may optionally require a separate approval process – generally performed at a higher security level – before being available for use. Efficiency calibration and calibration approval screens provide advanced capabilities to adjust the calibration. There are also facilities to generate an Efficiency Confirmation Report – comparing the decay corrected source certificate activity to a recount of the standard with a standard gamma analysis and calculating variances. Similarly, an Efficiency Comparison Report compares a newly generated efficiency to a previous one.

*US Patent 6228664 B1

In order to ensure that multiple detectors are performing identically, Apex-Gamma software provides a Detector Cross Check Report that compares decay corrected certificate activities to activities calculated from counting the standard on multiple detectors. Variances are calculated as well as other figures of merit to ensure that all of the detectors in the lab are performing comparably for a given sample geometry.

The productive gamma spec operation needs to ensure that the equipment is always calibrated according to a fixed schedule. Apex-Gamma software includes a number of facilities that ensure calibration down-time can be planned in advance and that the use of uncalibrated instruments is controlled or prohibited. Energy and efficiency calibration summaries show last calibration information (dates, by whom, etc.), as well as the date the next calibration is due – calculated automatically from a "calibration frequency" parameter entered in setup.

If a user attempts to use a detector with an overdue energy calibration, or in a detector/geometry where the efficiency calibration is past due, Apex-Gamma software can either log the error, warn the operator, or prevent counting on that configuration entirely (as specified by the System Administrator). In the case of an energy calibration past due – which means that the detector should not be used in any geometry – the detector can be taken completely off-line.

With Apex-Gamma software, numerous standard calibration practices – once done only manually in a time consuming, off-line manner – can now be done directly on the counting system, without manual transcription, calculators and spreadsheets.

THE QUALITY ASSURANCE PROGRAM

Quality assurance is another area where practices that were once only implemented outside of the system are integrated directly inside of Apex-Gamma software.

Routine QA checks for calibration and background are initiated directly from the main view. QA counting parameters are set up and defined ahead of time, making the interface exceptionally simple for the operator. Setup defines the reports and control charts to be produced automatically at the end of each QA check. An easy-to-use report and chart review tool also lets the user quickly review QA data for a given detector – paging sequentially through all control charts and reports in one operation.

In many cases, radiological assessment projects require the inclusion of a specific period of QA data with each sample assay report. This can be set up to occur automatically with Apex-Gamma software as part of the counting procedure, avoiding inefficient and costly collating/photocopying projects.

The user with a need to perform a special QA study of a given detector can initiate a series of QA counts in a single step. Thus, if you wish to perform a series of QA counts over a weekend, you can ask for consecutive calibration QA checks at one hour intervals – and let the system collect information for you without intervention.

The Apex-Gamma QA system is designed not only to perform routine QA checks – but also to ensure that they are done – and to take corrective action if the system goes out of tolerance. Each QA count type: calibration check, background check and long system background – has a frequency associated with it in the system setup along with a response if the period is exceeded. Thus, if our lab operations require daily calibration checks and weekly background checks – we can set those for 24 hours and 168 hours, respectively. At the initiation of each sample count, the time since the last QA check is calculated and if the period is exceeded, warning or detector lockout (selected by setup) is initiated automatically.

Similarly, the user can define responses to be taken in the event that a detector goes out of tolerance. As an example, you might set the system for a warning in the event of an "investigate" level violation (typically 2-Sigma) and a lock out in the event of an "action" level violation (typically 3-Sigma).

Using the advanced QA facilities of Apex-Gamma software, the lab operator can ensure that all assays are being performed on instruments with up-to-date, successful QA checks. Paperwork burdens and off-line activities are drastically reduced. Just as important, QA program compliance can be demonstrated to an outside auditor or regulator with ease.

DATA REVIEW, REANALYSIS AND APPROVAL

Following the assay of a sample, yesterday's counting systems simply stored a file and left it to the user to review results. Corrections to the assay, if made at all, were performed off-line – or if done on the system, were done with no history or record.

With the Apex-Gamma Lab Productivity Suite, the data review and correction process is built in. Data reviews can be either optional or mandatory (set by system wide default or by procedure). If mandatory, a counted sample is held with a status of "pending review" until a user with the requisite security authorization reviews and approves – at which time the sample status advances to "done".
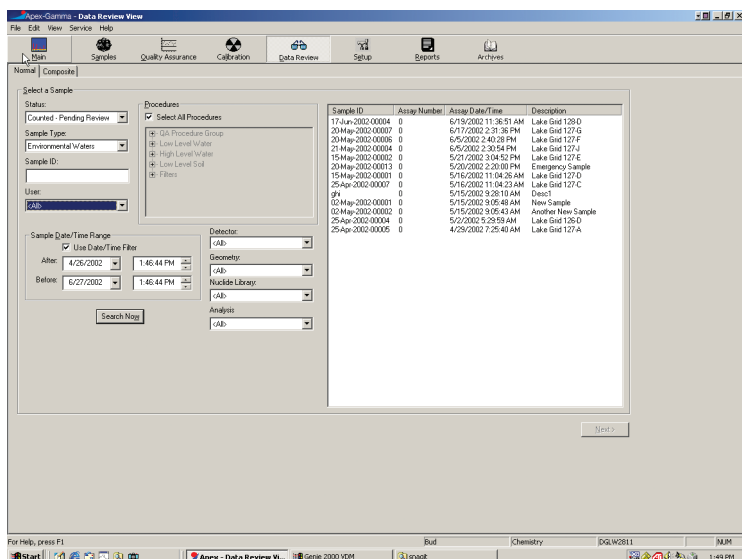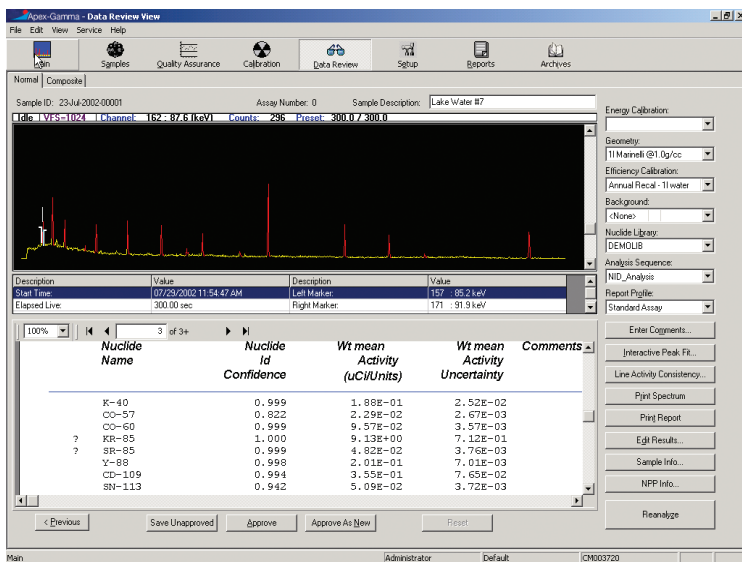
Figure 5
Data Review: Enter sample filter criteria to locate just the sample you want...

...Then review, modify, re-analyze and approve the samples.

In some labs, the technician who counts the sample is required to do a cursory review (perhaps only allowing edit of sample date or quantity) while an analyst or chemist can perform a more sophisticated review with more comprehensive tools. To meet this need, Apex-Gamma software allows two levels of sequential data review – with both being required before a sample is considered "done".

Retrieval of samples for review couldn't be easier – database filters (Figure 5) are applied to locate just the sample or group of samples that are to be reviewed. This flexibility is particularly important where the Data Review section is used to respond to follow-up needs. For example, an environmental lab may receive an inquiry about a specific type of sample from a specific project. By utilizing date and time filters in conjunction with procedure, sample type and other information, the user can easily isolate the specific samples in question.

Or a nuclear power plant may discover an unknown peak in cooling water and associate it with a previously unseen corrosion product. This may result in a library change after which we will look back in time to detect the exact point where the new nuclide began to appear. For Apex-Gamma software, it's a simple problem – apply time and library filters to find the set of affected samples – reanalyze and reapprove with the new library. What was once a massive disruption to lab operation is now a simple process. Similar procedures can be applied to recover from the impact of questionable calibrations, detectors, procedures – even operators!

Another unique data review facility is the creation of a "composite sample" – combining results from several measurements into a single report. This can be used in any case where samples may be split for separate counts – but the need is to report the results for the original sample on a single report. Nuclear power plants often need to measure the particulate and iodine components of an integrated filter separately, then combine the results.

Or a cooling water sample may need to be measured immediately, then again after decay of short half-life isotopes. Or an environmental lab may receive a large sample that must be counted in multiple containers – then recombined into a report on the total sample.

Data are combined in the Composite Sample Report by either summing or averaging the results for identical nuclides (with full error propagation). Additionally, a setup screen lets the user select which nuclides from which samples to include in the final report.
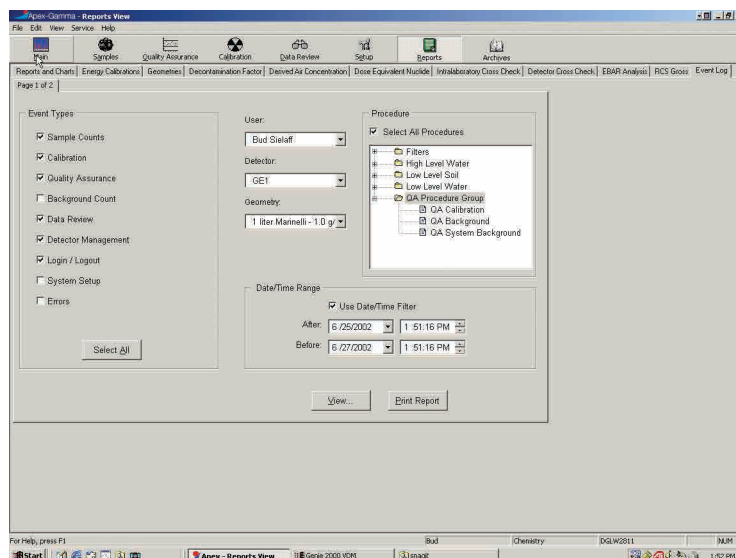
Figure 6
Event Log Retrieval Filters

EVENT LOGGING

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

In Apex-Gamma software, every event is logged into a database table. Every log-on/off, sample count, calibration, QA check, data review, etc. is recorded and can be recalled as needed. Database keys direct recall of the event information, so you can retrieve whatever specific information you are looking for (see Figure 6).

The potential utility of this feature is endless. Need a list of work done on a day, shift or week? Ask for all events on a given time/date period. Need documented proof that daily QA checks were done on a specific detector for the last month? Request a list of all QA events for the month on that detector. Need to verify the activities of a specific user? Or get a list of the samples counted with a specific library, a specific geometry, and/or a specific detector? Just ask the Apex-Gamma Event Log.

All of these records are available on demand and created automatically on the system. Use them any time you need to reconstruct activities on the system.

SECURITY

Security requirements are critical in most routine sample counting facilities. It is imperative that personnel only perform operations that they are qualified to perform – to allow otherwise risks the integrity of the lab operation.

The security capability in Apex-Gamma software is both extensive and flexible. The system administrator plans the security setup – determining just what classes of operators there are and what capabilities are allowed for each class. A group profile is set up for each class of operators – lab technicians, sample preparation technicians, chemists, analysts, supervisors, etc. – with specific privileges assigned to each group. For example, lab technicians may be allowed to perform sample counts, but not calibrations. Sample preparation technicians may be allowed to log samples in but not count them. Perhaps only chemists are given the capability for data review.

Once the groups are assigned, individual users are assigned to the groups (Figure 7). Each user has a log-in password and all activities performed while a user is logged on are associated with that user in the database. With this approach, the security system is easy to maintain. As users come and go through the organization, they are simply added to or deleted from system – you do not need to re-create a complete security profile for each user.

There are not defined "levels" in the profiles, only access or non-access to specific functions. For example, a technician may have privilege to count a sample, but no access to data review. A chemist can be set up to perform data review, but not counting. Thus, the security profile need not be hierarchical.
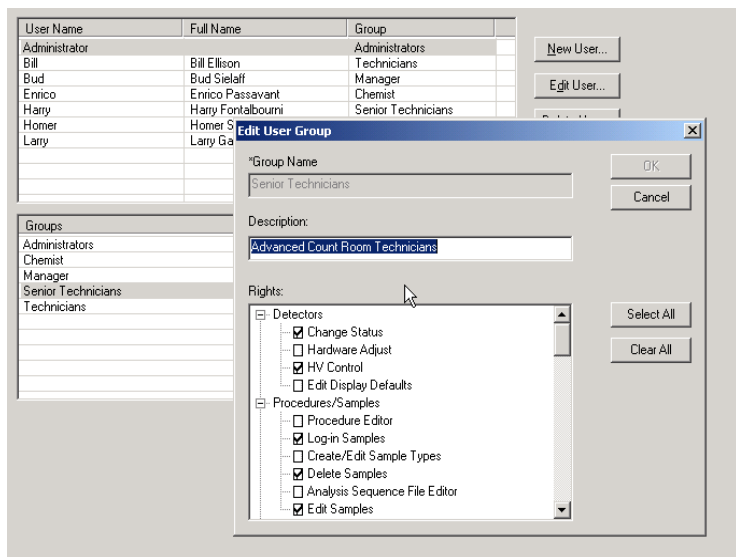
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Figure 7
Apex-Gamma Security Setup

MULTI-FACILITY CAPABILITY

Many lab operations are physically separated. A nuclear power plant may have separate health physics, chemistry and environmental operations. A lab on a nuclear site may have separate low level and "hot" labs.

Apex-Gamma software allows these separate facilities to be operated from a single database – maintaining separation of critical structures (detectors, calibrations, procedures), while allowing sharing of others (client workstations, file and database servers). In this manner, the operation of a large counting facility can be segmented – for convenience and for economy of operation. Totally separate labs within a site can be operated from one database – with most resources separated.

SPECIFICATIONS

MINIMUM SYSTEM REQUIREMENTS
- Apex-Gamma Clients and Apex-Gamma Server.
- 1.0 Ghz Pentium or Xeon (multi-core recommended), 1 GB RAM, 250 MB Disk (*500 MB for server).
- 1024 x 768 minimum resolution, 1280 x 1024 or better recommended.
- Windows XP Professional SP3. Windows 7, Windows Server 2003 or Server 2008 operating systems (32-bit versions).
- Database Server.
- Oracle 10g or 11g (for 10g, version 10.2.0.5 or higher is recommended).
- Microsoft Server 2005 or 2008.

ORDERING INFORMATION
- S700C Apex-Gamma Gamma Desktop License.
- S701C Apex-Gamma Gamma Server License.
- S702C Apex-Gamma Gamma Client License.
- S703C Apex-Gamma Gamma Nuclear Power Option.
- S704C Apex-Gamma Server Redundancy Option.
- S705C Apex-Gamma Desktop/Genie-2000 Package.

* Data storage requirements are approximately 500 assays per 1 GB.

CANBERRA