

INNOVATION AT WORK

Connecting Visionaries in Radiation Safety, Science and Industry

Conrad Orlando Resort, FL – July 28th – August 1st



Latest Updates in Gamma Spectroscopy

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Mirion Connect | Annual Users' Conference 2025
Orlando, Florida



Agenda

- Overview of Lynx II ® Multi Channel Analyzer
 - Overview
 - V1.1 firmware



- Genie[™] Spectroscopy Suite
 - Genie V4
 - Overview of licensing
- Genie Review Client



- Apex-Gamma[™] Lab Productivity Suite
 - V1.5.1







QA/Discussion









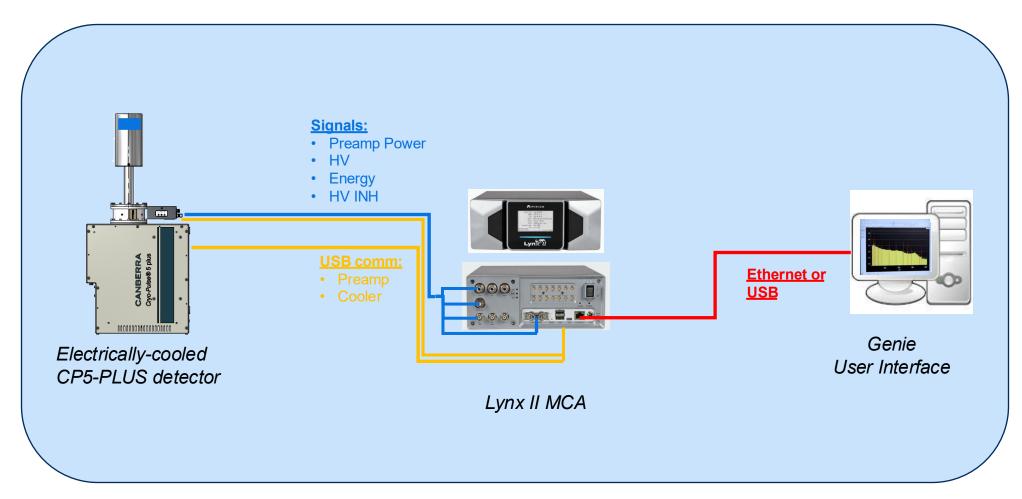




- Lynx II® Launched in July 2022
 - Replaced the highly successful Lynx
 MCA after 14 years
 - Built off the Lynx technology and success
 - Updated design, incorporating many user comments and feedback
 - Designed for the future of integrating spectroscopy systems
 - Lynx II to be the "hub" of future gamma spec systems



Lynx II as the central data hub





Lynx II Highlights

- Faster processing speeds
- Faster communications to Genie, Web App and SDK Clients
- Built in Cyber defenses built on Linux platform
- LCD screen
- Simplified rear panel
 - Separated commonly used connectors from advanced function connectors
- Relocated Reset button
- Easier access to battery for replacement







Cyber Security



- All software technologies within the firmware are scanned using a suite of vulnerability tools.
- Firewalls are in place.
- Transport Layer Security (TLS) authenticates and encrypts communication interfaces.

- Trusted Execution Environment (TEE) ensures the integrity and authenticity of all firmware components.
- Browser communications are secured via authentication and encryption.
- Each update of firmware is reviewed for potential security vulnerabilities and enhancements.



Bottom line: Lynx II is the most cyber secure MCA available today!

Future Ready

- Lynx II was designed with future expansion and upgrades in mind.
- Future updates can be performed via the web interface with the click of a mouse.
- Offering a new paradigm of regular firmware and feature updates

Firmware Update			
New firmware image:	Select	No file chosen	
Paraont Complete:		*.swu only	
Percent Complete:		0%	



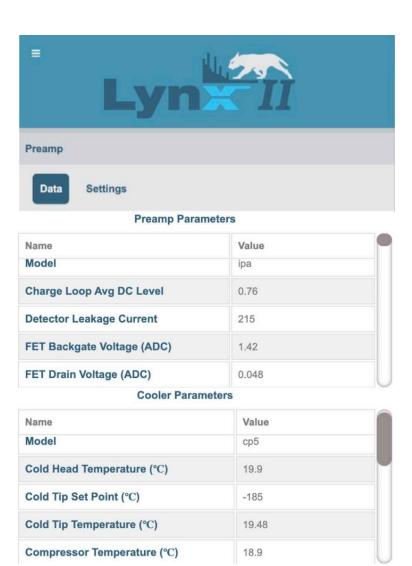
LynXII V1.1

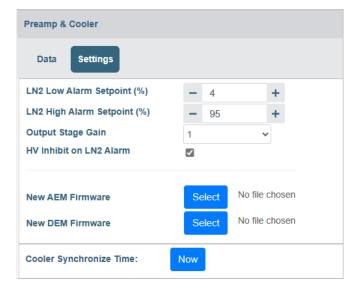


- 1st Step to Lynx being the central hub of the gamma spec system.
- Integrated IPA SOH monitoring
- Integrated Cryocooler SOH monitoring
- Zero configuration setup Simply connect the cooler or preamp to the Lynx II and the MCA will do the following:
 - Automatically connect to the devices.
 - Start collecting data from each device.
 - Store data to a time series database.

Integrated IPA/Cryo-Cooler Integration



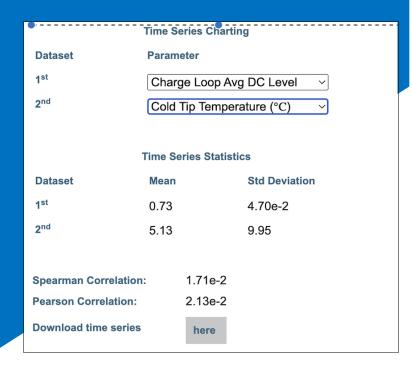




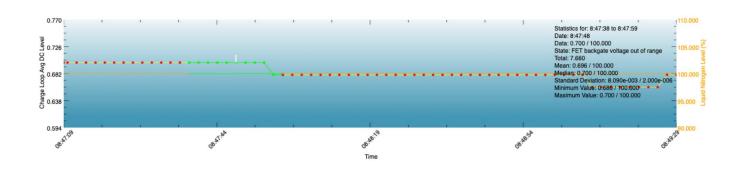


Time Series Plot





- Time series chart is available for displaying parameter variations.
- Two parameters from different or same instruments may be viewed in the same chart for comparing data trends.
- Important statistics are displayed about each of the charted parameters.
- Automated download of data is available via the new FTP options





V1.2 Firmware





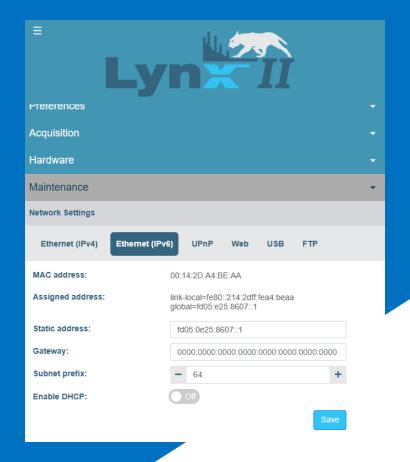
Ability to access documents and files within the

IPA.





V1.2 Firmware



- Internet Protocol Version 6 IPV6
- Requirement for DOE facilities
 - Office of Management and Budget Memorandum M-21-07
 - DOE O 200.1A order August 2023
 - https://www.directives.doe.gov/directivesdocuments/200-series/0200-1-border-a-chg2ltdchg/@@images/file

IPv4 vs IPv6				
Feature	IPv4	IPv6		
Address Size	32 bits	128 bits		
Address Format Dotted decimal (e.g., 192.168.1.1)		Hexadecimal (e.g., 2001:0db8:85a3:0000:0000:8a2e:0 370:7334)		
Address Space About 4.3 billion addresses		About 340 undecillion addresses		



Availability of V1.2



- Includes:
 - IPA functionality
 - IPV6
 - Misc bug fixes and enhancements



- Current Lynx II users will receive a communication soon
- Will be available for download on Mirion.com within the next few weeks
 - https://www.mirion.com/products/technologi es/spectroscopy-scientific-analysis/gammaspectroscopy/detector-electronics/lynx-iidigital-signal-analyzer

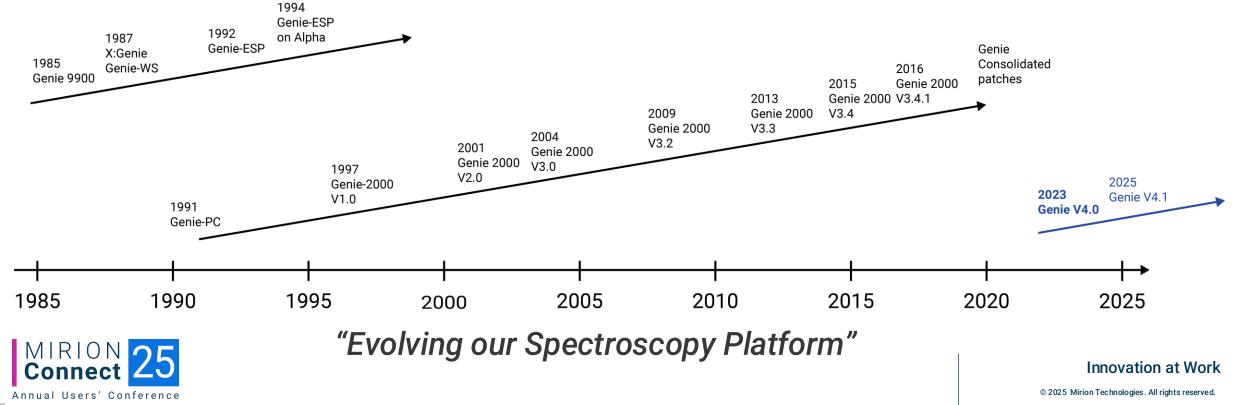




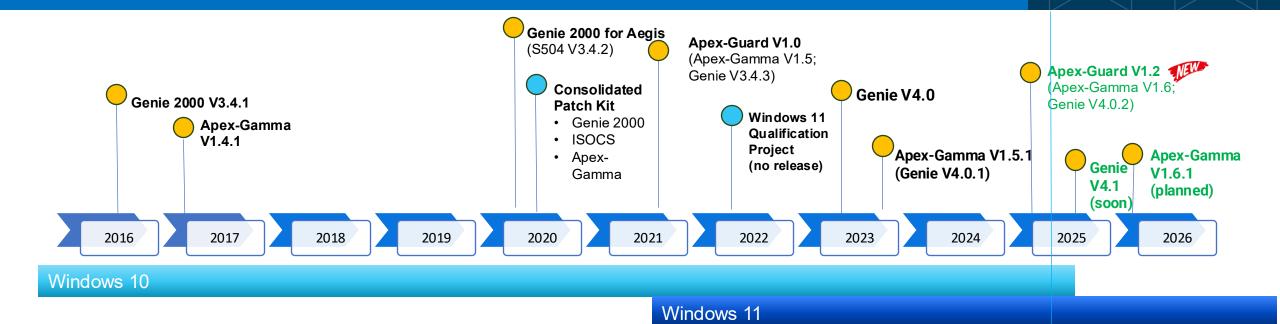


A brief history of Genie applications





Genie & Apex-Gamma Past 10 years





Today

Innovation at Work

Windows 12 (TBD)

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Genie 4.0 Released June 2023

"Evolving our Spectroscopy Platform"

What's New:

- Exciting User Experience improvements with new Interactive Reports
- Driving more accurate and robust results with new algorithms
- Improving automation with new scripting options Python!
- Continuous Support & Updates with new purchasing options and electronic downloads

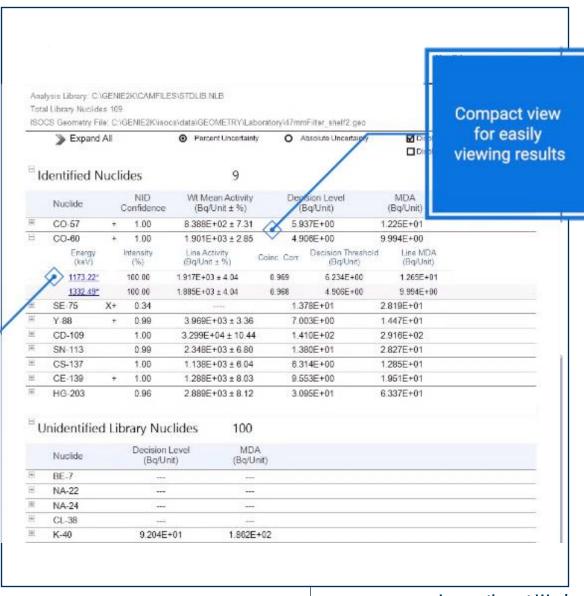


Genie V4.0 Released July 2023

- Interactive Reports for increased usability and streamlined decision making
- Python Integration for increased automation
- Improved Installation
- >40 addressed SPRs
- N42 File Support
- Integrated Aegis Support
- New Analysis Algorithms
- New Licensing



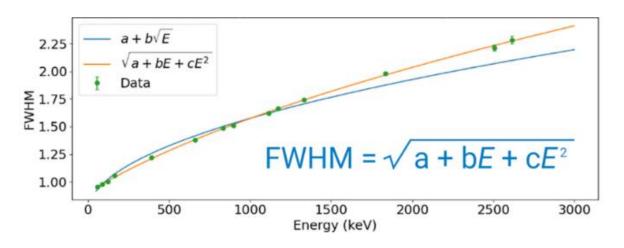
Expand nuclide summary to review line activities



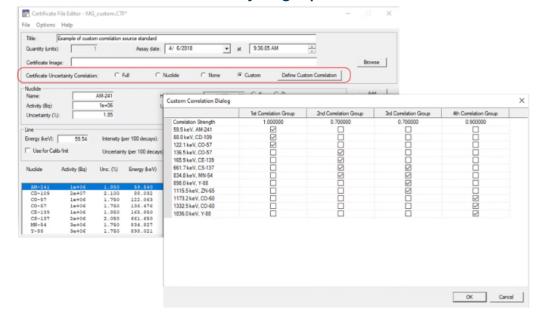
Innovation at Work

Genie V4.0 Algorithm Enhancements

- Full Width Half-Max (FWHM) resolution calibration curve now supports a more precise model.
 - Most relevant for MDAs at very high or low energies



- ➤ Nuclide Activity Uncertainties can now take into account correlations in calibration standards.
 - Most relevant for very high precision measurements





Genie V4.0 Licensing Changes



- ➤ Download common software installation(s).
- ➤ Install the Features you need (i.e., ISOCS, Apex-Gamma, Apex-Guard).
- ➤ Use the 90-Day Trial Period for evaluation and configuration.
- ➤ Activate license for the specific computer using unique License ID & password.
- > Renew as needed.



Choose your model, then choose your license:

1-YEAR LICENSE

Predictable annual pricing ideal for Operational Expense (OpEx) budgeting.

3-YEAR LICENSE

Locked-in pricing for subscription duration, with no need for annual repurchase.

PERPETUAL LICENSE

Upfront purchase option for those unsure about a subscription.

Basic Spectroscopy Acquisition

Complete Spectroscopy Acquisition & Analysis

Mathematical Efficiency Calibrations

Genie 2000

- •S500/S502/S504 Genie Basic
- S500/S502/S504 Genie Basic
- S501 Gamma Analysis
- S505 Quality Assurance
- S506 Interactive Peak Fit
- S509 Alpha Analysis
- S561 Genie Batch Commands
- Genie-FieldPro
- S573 ISOCS Software
- S574 LabSOCS Software

Genie 4.0

GenieLite Software (GenieLite-Single or GenieLite-Multi)

The Genie Spectroscopy Suite (Genie-Single or Genie-Multi)

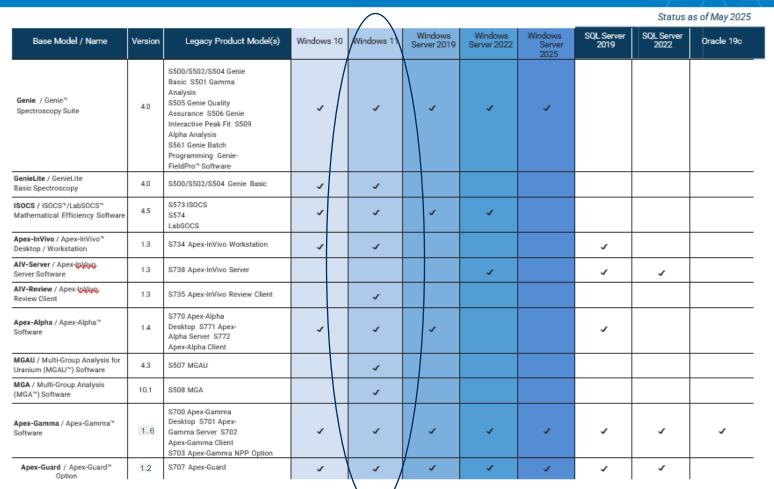
"ISOCS" Software











Product qualification, at time of qualification, for each indicated operating system and configuration is incompliance with the following standards: ISO 9001, ASME NQA-1c-1992, ASME NQA-2-1990 Part 2.7, and latest revision of IEEE 730.1.

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NEW!!! Genie-Review "Data Review" Model



- Intended for reviewing and reanalyzing spectra
- Analysis for:
 - Multiple peak searches,
 - Background Subtract,
 - Energy and Efficiency Calibration,
 - NID w/ Inter. Corr.,
 - Cascade Summing Corr.,
 - Wt. Mean Activity,
 - MDA,
 - Alpha Analysis,
 - Quality Assurance,
 - Interactive Peak Fit

- Software provided by electronic download
- For use on one computer or VM only via electronic licensing
- Qualified on Windows 10 and 11
- Does not support detector acquisitions



What's coming next?

Genie 4.1

Late 2025



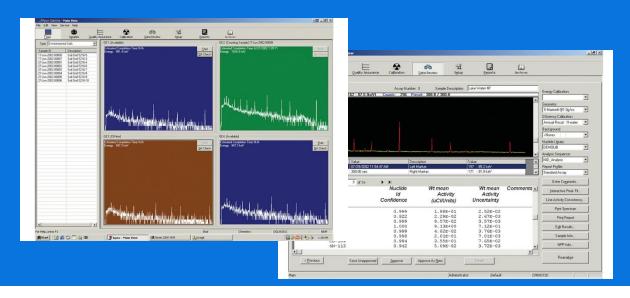
- Fully support all types of gamma-gamma and gamma-Xray coincidences in well geometries
- Improve several "outlier" nuclides in other non-well geometries
- Extends correction to K x-rays and summing with L x-rays
- Easier to add new nuclides to the correction (COI) library
- Allow for propagation of uncertainties for each nuclide's correction



- Updates to CAM file
- Genie 4.1 will also build upon Genie 4.0 features
 - Including Python Scripting improvements
 - Updates including the latest Python versions.
- Internet Protocol Version 6 IPV6
- And more....
- Genie 4.1 will be available for all active subscription licenses











Apex-Gamma Version 1.5.1 Released December 2023

- Support for Correlations in Calibration Standards
- 2. Support for new FWHM calibration fit
- 3. Support for Python Scripting
- 4. "Analyses" data review history
- 5. Aegis[™] MCA support
- 6. Consolidated installation and electronic licensing





Apex-Gamma Version 1.5.1 (Continued)

Apex	-Gamma V1.5.1 Resolved Software Performance	e Reports	
SPR Number	Description		
P8470511 An issue was reported where the Apex-Gr the continuum counts in the peak area by is incorrect and was also inconsistent wit Genie reports. If the error multiplier was is seen. Additionally, this affected only the		the error multiplier. This h the value displayed by set to 1, no discrepancy is	
	counts. The calculation of peak area or		e V4.0 Resolved Software Performance Reports
	The display of continuum counts in the /	SPR Number	Description
	updated to not be multiplied by the error	H4989776	Addresses an issue where Apex-Gamma would crash following a
H2699092 An the spe and	An issue was reported for incorrect displ the setting applied for Apex-Gamma's Va		specific set of steps when selecting Shape option in calibration review.
	specifically occurred only when the optic and fill height was selected. The report of for the computed density and fill height.	H1624093	Addresses an issue where it was not possible to perform LABSOCS efficiency calibration when a space is used in the Detector.txt name
G1291294	to display the sample-specific density ar 1291294 An issue was reported that caused a se- generated in a report. This occurred wh acquisition function was enabled in an A is recommended when using Cosmic Gu suppression systems. This has been add	M9997482	Issue with initialization of variable geometry templates, where the symptom of failure is the error message "Variable sample material is not supported for this geometry" in geometry setup screen.
		W8315480	Issue with initialization of non-English local variable geometry templates, where the symptom of failure is that the variable geometry ioon in the Apex geometry setup screen would fail to launch.
H6078049	The Apex-Gamma application has been Server installations requiring Windows a	W8315480	Corrects overestimated uncertainties for variable source-detector distance.
G2232013 Several issues were reported that the Ap Oracle MGinatall fails when retrieving th Investigation revealed that an incompati (Versions 19.1.0.0.20190522 or earlier) v	D2553521	Issue with custom beaker templates used in variable geometry setup for European locals. The symptom of failure includes an error message when trying to define the variable geometry limits of fill height by mass or volume.	
	The Apex-Gamma installer was updated and provide more meaningful error mess	J4324940	Inconsistent Peak Area Fitting for Significantly Large Multiplets
G2785152	Occasionally, an "Efficiency Count to Per	Genie	e V4.0 Resolved Software Performance Reports
	complete successfully. This has been a	SPR Number	Description
it was reported that the partial s cause of this was due to the bro routine to the Apex-Gamma app	For systems running an XML Import func it was reported that the partial sample ic cause of this was due to the broadcast f	H10429922	On a customer-specific configuration system, the Apex spectral plot window does not display
	routine to the Apex-Gamma application (SampleSetup record is detected by the C	P10690089	Apex-Gamma limits control of Sample changer to one designated workstation. This has now been updated to allow control of a sample changer from any Apex-Gamma workstation.
		G2785152	Addresses an issue for when an efficiency count to a specified
Apex-Gamma V1.5.1 Resolved Software Performance			area in each peak hangs after the minimum preset is reached. This occurs when not all the peaks in the certificate have reached the
SPR Number W944407	Description In Apex-Gamma 1.4, an update was appl		specified peak area after the minimum count time and all the certificate peaks are present in the spectrum.
	certificate name and date with an efficie Some customers reported that adding th	H4846189	Addresses an issue where Apex-Gamma would crash at the start of a count on some systems.
	date present on the header of the analys Therefore, the certificate name is now su an analysis report and is only displayed t	H1417792	Addresses an issue where Apex-Gamma would crash when using cascade summing correction on an efficiency calibration in some situations.
	I see a		

G9511329

Genie 4.0, a bug was introduced for e

insufficient number of data points when again

was used. If there are only 3 calibration points for the high part of the polynomial, an error message was incorrectly generated and prevented a fit from being applied. This is now resolved. The QA chart investigate and boundary limit lines were not

displayed correctly.

7. Consolidation of many previous patched issues

Previously released as the Genie/Apex-Gamma Consolidated Patch Kit in 2020.

- 8. Improvements in network communications

 Previously released as part of the "Tenable" patch

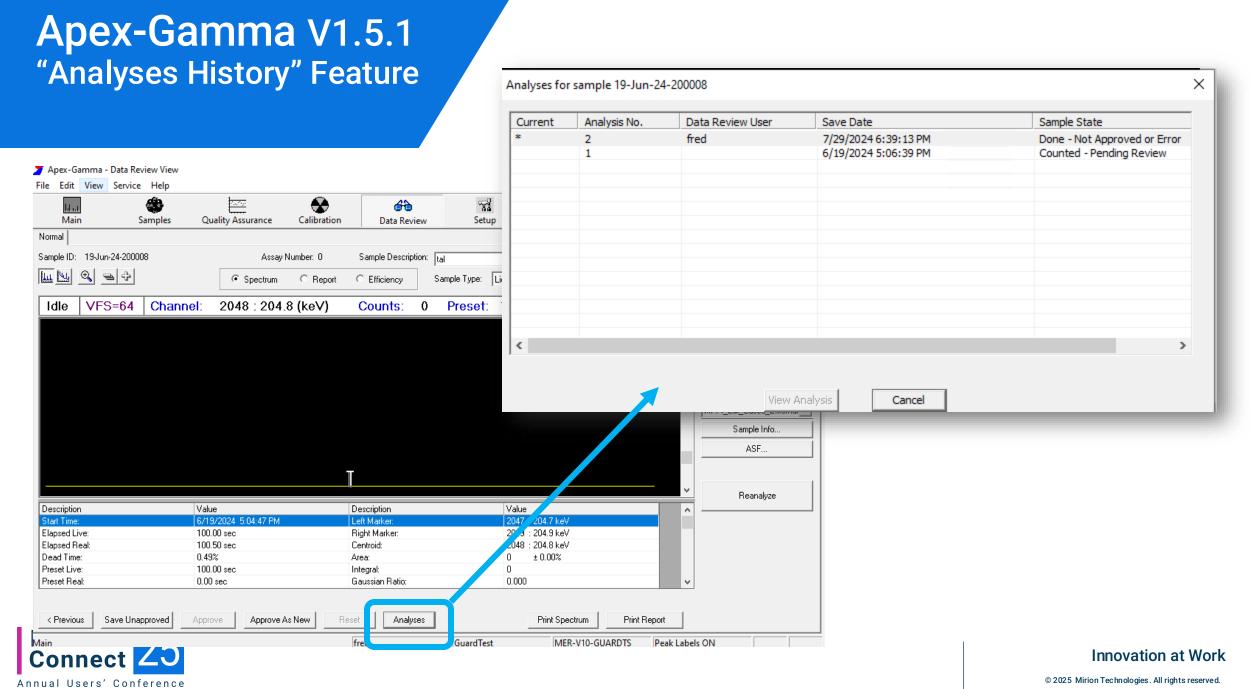
 release to mitigate conflicts with the common antivirus

 software.
- 9. Apex-Guard application as an integrated option for enhanced data integrity

Originally released as a standalone application in 2021.



P2391927



Apex Gamma Version 1.6

released March 2025



Count to Peak Area

 Define the energy of a peak and determine the peak area associated with that energy improving the precision of sample analysis.

Acquisition Start Delay

- Start a count at a fixed date and time, allowing users to schedule counts relative to the sample date for up to 3 days.
- Enhances the flexibility of sample analysis timing and ensures that counts can be accurately scheduled and executed.

Cascade Summing Corrections for Lu-177 and Rb-82 now supported

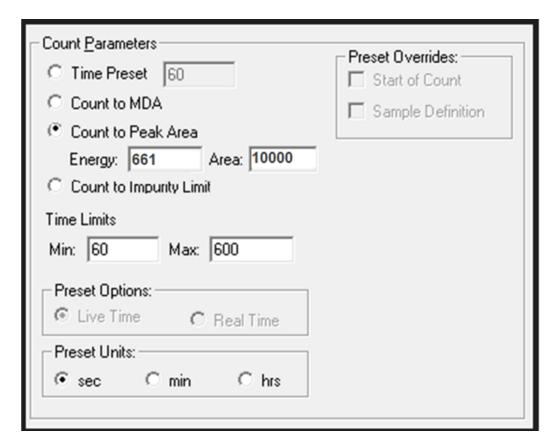
- Added correction factors for Lu-177 and Rb-82.
- Rb-82 are based on data from ENSDF, March 2019.
- Lu-177 are based on data from ENSDF August 2019.

Decays Per Minute unit now supported

- Decays Per Minute (DPM) units as a reportable activity.
- 10+ bug fixes and enhancements
- Significant improvements in the speed of reanalysis in Data Review.



Count to Peak Area



- Supports counting to a specified area for a specific peak energy
- Available in the "Procedures Setup" section
- Specify the peak energy; the analysis then users the largest peak within the ASF tolerance value
- Counting behavior will:
 - Go to the minimum to the count preset
 - Then estimates how much time is required to reach peak area
 - Iterates estimations to reach this value
 - Will not exceed the maximum time limit



Apex-Guard (option)

Gamma Spectroscopy for your regulated Count Room

Confidence in Results

- Features & controls necessary for compliance to U.S. FDA Title 21 CFR Part 11
- Role-based security with Windows User logons and automatic timed logoffs
- Enhanced security for analysis, device control, and data processing files
- Comprehensive audit logs with change control and auditing capabilities
- Electronic Signatures
- Automatic timed log-off feature

Scales with your Needs

- Premium local support options and software updates with subscription service
- Training classes, IQ/OQ services, and startup assistance available

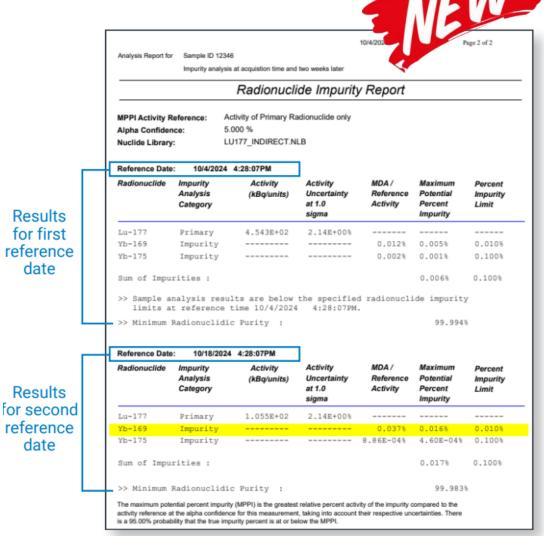




Apex-Guard Option Version 1.2

released March 2025

- Builds on Apex-Guard V1.0/V1.1 to introduce standardized and robust radionuclidic impurity analysis and reporting
 - Novel new algorithm to determine the "Maximum Potential" **Percent Impurity**" in a gamma spec analysis
 - Includes concise and targeted report, including comparison to user-defined limits and total radionuclidic purity.
 - Ability to report at multiple reference dates (i.e., time of assay and time of future injection)
 - Other counting features, such as count to MPPI and delayed start for a specific time
- Combine with Application Setup Assistance to fully configure libraries and analyses for a specific application



date

date



Upgrading from Genie 2000 to Genie V4.0 or Apex-Gamma V1.4.1 to Apex-Gamma V1.5.1 or 1.6

- Backwards Compatibility
 - All core functionality remains
 - All previous analysis results reproducible
- Qualification Procedure Changes
 - Installation is updated
 - Licensing is updated
 - The rest, including most menu options, are consistent with previous Genie/Apex versions.

- Ordering changes
 - Same software but with consolidated sales models
 - Availability of subscription
- Sustaining Updates:
 - 60+ SPRs (bugs) addressed
 - Incremental improvements in network communications
- New Features



QA/Discussion





Thank you



