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Connecting Visionaries in Radiation Safety, Science and Industry

MIRION Connect 24

Annual Users' Conference

July 29 - August 2 | Omni Dallas Hotel, Dallas, TX

MIRION TECHNOLOGIES

Latest in Gamma Spectroscopy

Software Solutions and MCAs

Kara Phillips
Peter D'Agostino
Spectroscopy Product Line Mangers

Mirion Connect | Annual Users' Conference 2024

Dallas, Texas

MIRION Connect 24
Annual Users' Conference

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Agenda

- **Part I: Software**
  - *Recent Releases*
    - *Genie 4.0*
    - *Apex-Gamma V1.5.1*
    - *Apex-Guard V1.0*
  - *Future Developments*

- **Part II: MCA**
  - *Lynx-II*
  - *New firmware version and features*
  - *Future developments*

- **Conclusion: Open discussion and questions**

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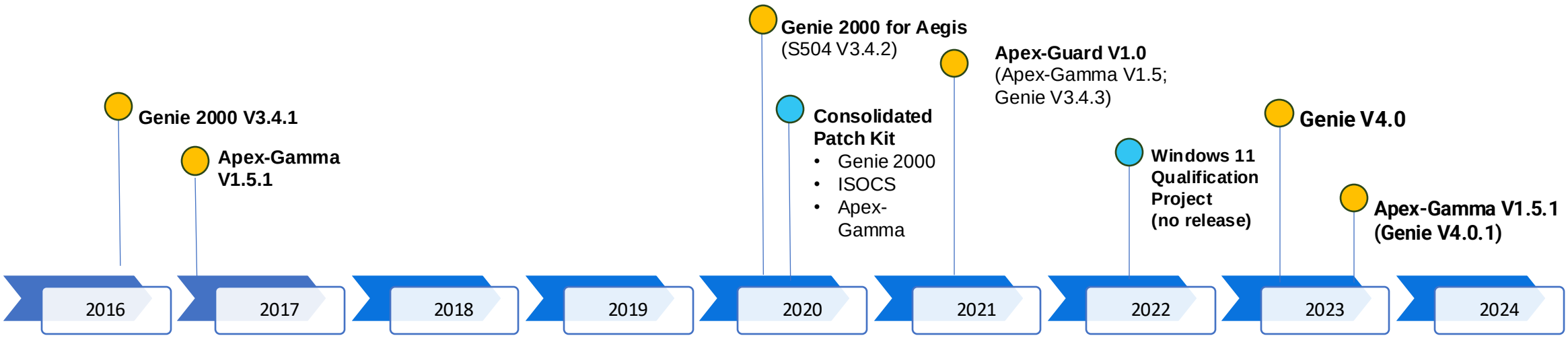
Part I:
Gamma Spec Software

Genie, ISOCS, & Apex-Gamma Recent Releases



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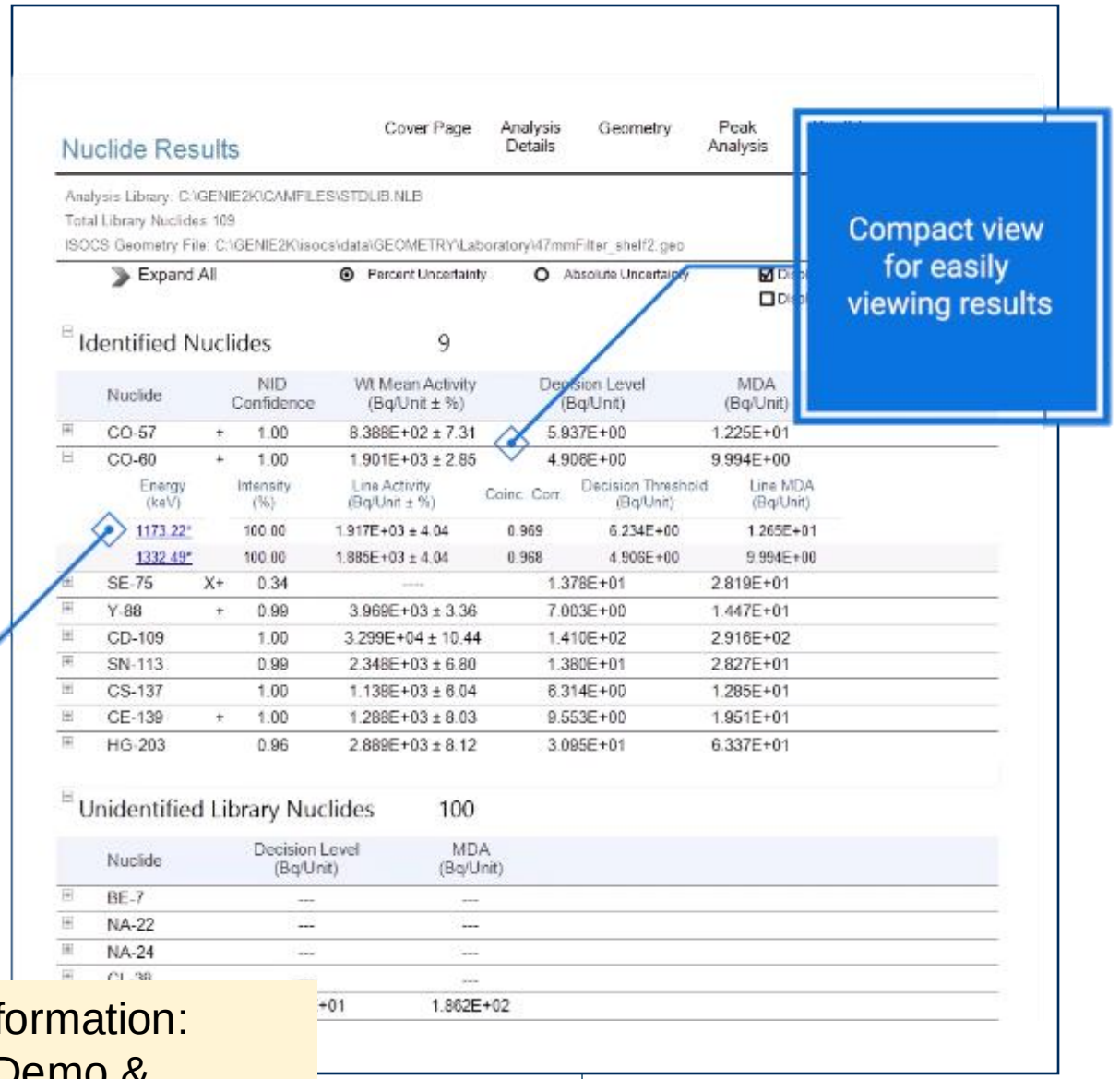
Genie V4.0
Released July 2023

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



For more information:
Spotlight Demo &
www.Mirion.com/Genie4

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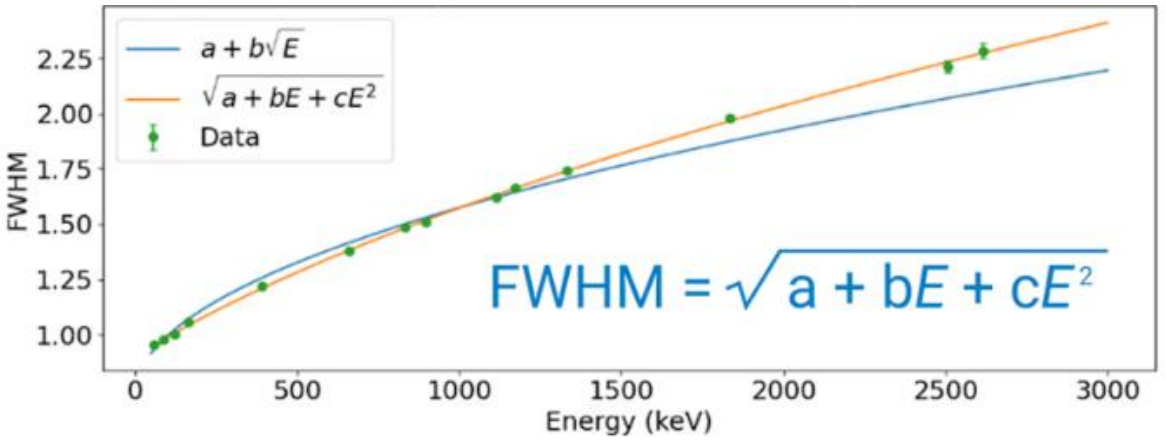
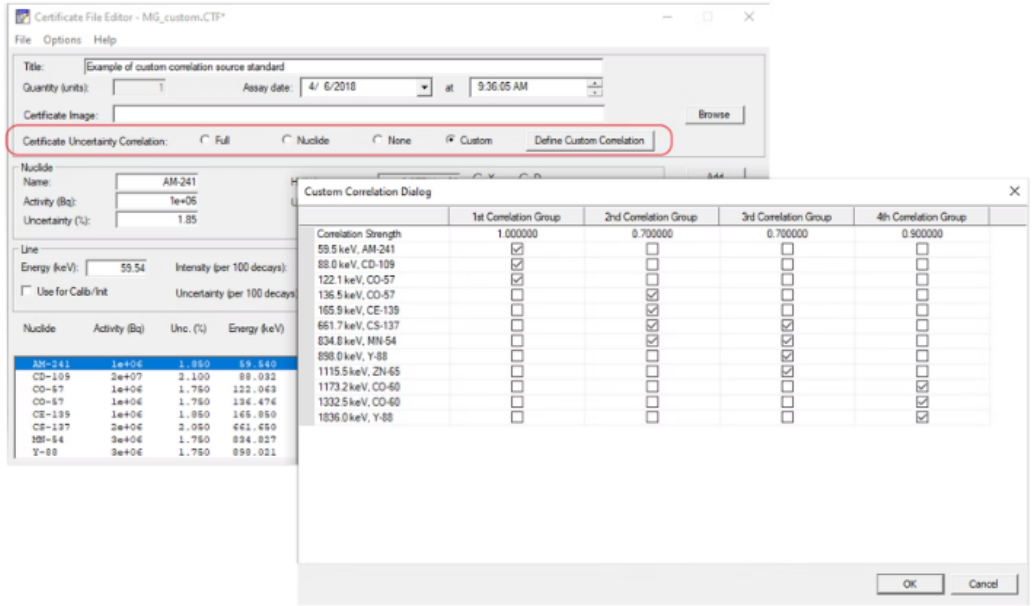
Genie V4.0
Algorithm Enhancements

- 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



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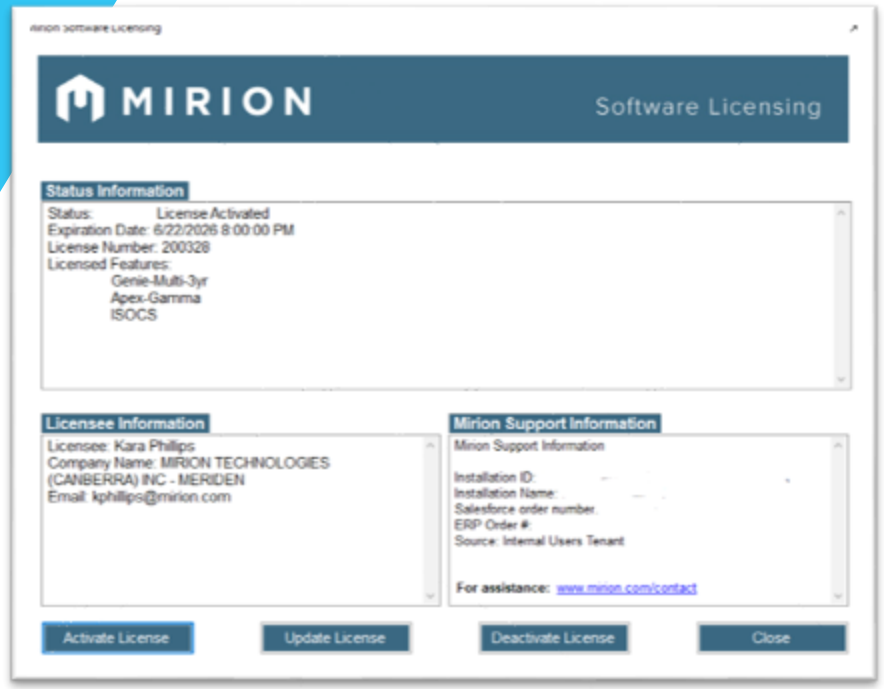
Genie V4.0
Licensing Changes



- 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.

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Apex-Gamma
Version 1.5.1
Released December 2023

1. 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

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Apex-Gamma Version 1.5.1 (Continued)

Apex-Gamma V1.5.1 Resolved Software Performance Reports

SPR Number	Description
P8470511	An issue was reported where the Apex-Gamma report multiplied the continuum counts in the peak area by the error multiplier. This is incorrect and was also inconsistent with the value displayed by Genie reports. If the error multiplier was set to 1, no discrepancy is seen. Additionally, this affected only the reported continuum counts. The calculation of peak area or The display of continuum counts in the A updated to not be multiplied by the error
H2699092	An issue was reported for incorrect displ the setting applied for Apex-Gamma's V specifically occurred only when the optic and fill height was selected. The report c for the computed density and fill height. to display the sample-specific density ar
G1291294	An issue was reported that caused a sec 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 adc
H6078049	The Apex-Gamma application has been Server installations requiring Windows a
G2232013	Several issues were reported that the Ap Oracle MGInstall fails when retrieving th Investigation revealed that an incompati (Versions 19.1.0.0.20190522 or earlier) The Apex-Gamma installer was updated and provide more meaningful error mess
G2785152	Occasionally, an "Efficiency Count to Pe complete successfully. This has been a
H7571602	For systems running an XML Import fun it was reported that the partial sample ic cause of this was due to the broadcast f routine to the Apex-Gamma application SampleSetup record is detected by the C been addressed.

Genie V4.0 Resolved Software Performance Reports

SPR Number	Description
H4989776	Addresses an issue where Apex-Gamma would crash following a specific set of steps when selecting Shape option in calibration review.
H1624093	Addresses an issue where it was not possible to perform LABSOCS efficiency calibration when a space is used in the Detector.txt name
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 icon in the Apex geometry setup screen would fail to launch.
W8315480	Corrects overestimated uncertainties for variable source-detector distance.
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.
J4324940	Inconsistent Peak Area Fitting for Significantly Large Multiplets

Apex-Gamma V1.5.1 Resolved Software Performanc

SPR Number	Description
W944407	In Apex-Gamma 1.4, an update was appl certificate name and date with an efficie Some customers reported that adding th date present on the header of the analys Therefore, the certificate name is now su an analysis report and is only displayed efficiency confirmation count.
P2391927	In Genie 4.0, a bug was introduced for ef insufficient number of data points when 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.

Genie V4.0 Resolved Software Performance Reports

SPR Number	Description
H10429922	On a customer-specific configuration system, the Apex spectral plot window does not display
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 area in each peak hangs after the minimum preset is reached. This occurs when not all the peaks in the certificate have reached the specified peak area after the minimum count time and all the certificate peaks are present in the spectrum.
H4846189	Addresses an issue where Apex-Gamma would crash at the start of a count on some systems.
H1417792	Addresses an issue where Apex-Gamma would crash when using cascade summing correction on an efficiency calibration in some situations.
G9511329	The QA chart investigate and boundary limit lines were not displayed correctly.

6. Consolidation of many previous patched issues

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

7. Improvements in network communications

   Previously released as part of the "Tenable" patch release to mitigate conflicts with the common antivirus software.

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

   Originally released as a standalone application in 2021.

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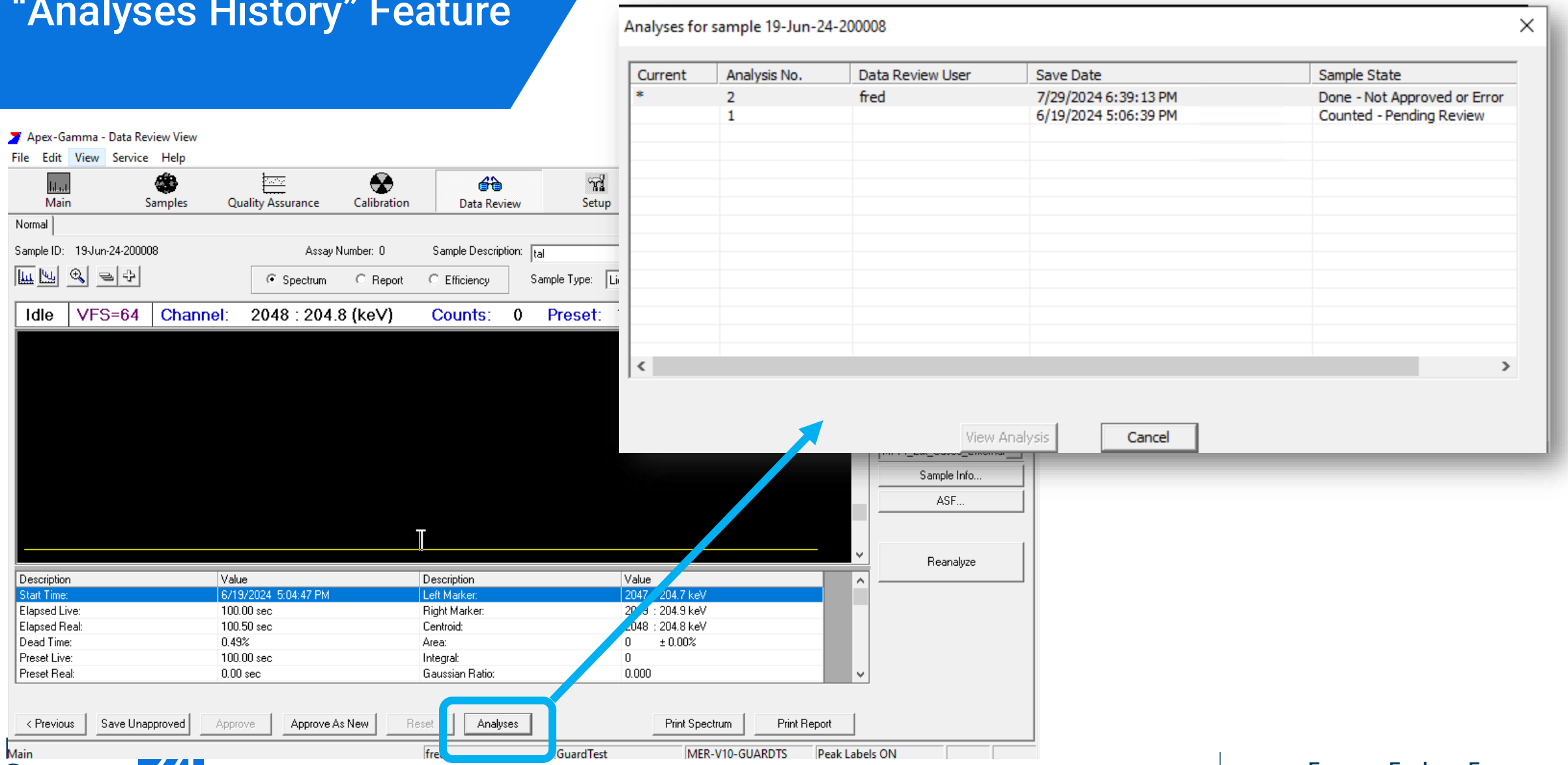
Apex-Gamma V1.5.1
"Analyses History" Feature



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Upgrading from Genie 2000 to Genie V4.0 or Apex-Gamma V1.4.1 to Apex-Gamma V1.5.1 >> What to Know

- 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:
  - 45+ SPRs (bugs) addressed
  - Incremental improvements in network communications
- New Features
  - Additional algorithm per user requests
  - Python interface supporting automation
  - Interactive reports in Genie
  - And more coming

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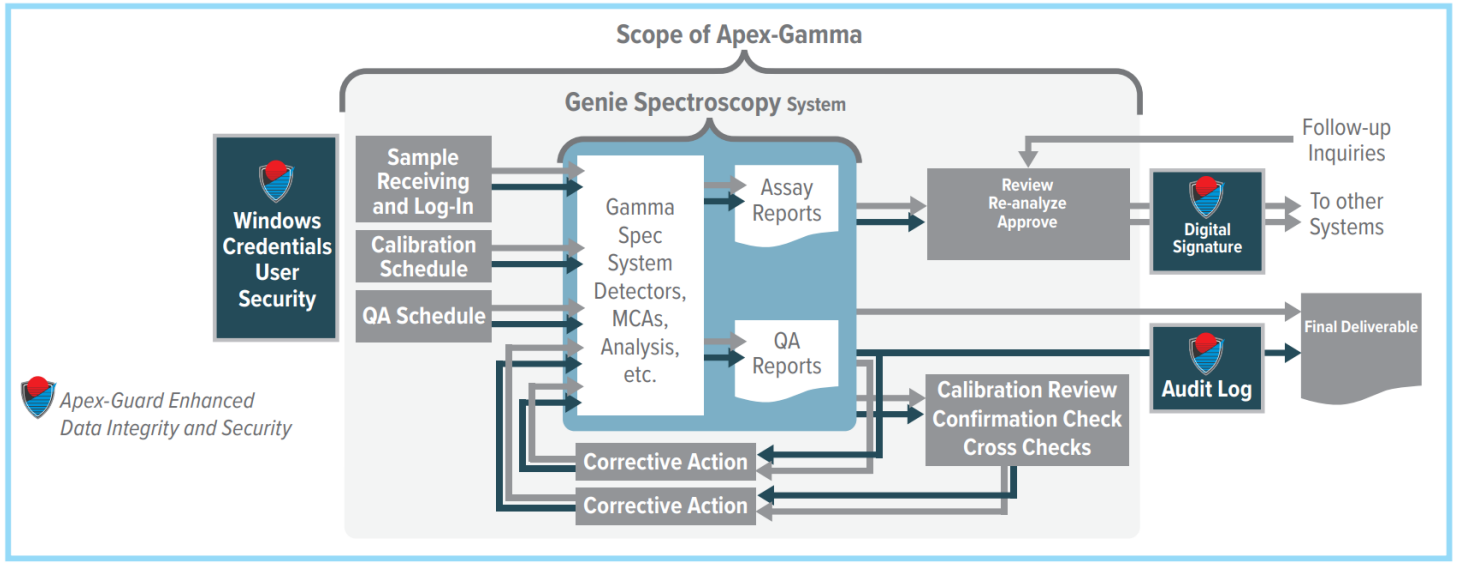
Apex-Guard V1.0
Released October 2021

- Gamma Spectroscopy for the FDA-regulated count room
- Includes key features for Part 11 Compliance



- Enhanced User Security
  - User logins with Windows Credentials
  - Automatic Logoffs
  - Change Control Dialog with Password re-verification
  - “Locked Down” MCA and file access outside Apex
- Increased Audit Log Functionality
  - Who made the change
  - When the change was made
  - The parameter being changed
  - The value before and after the change
  - Justification / comment entered at time of change
- Digital Signatures

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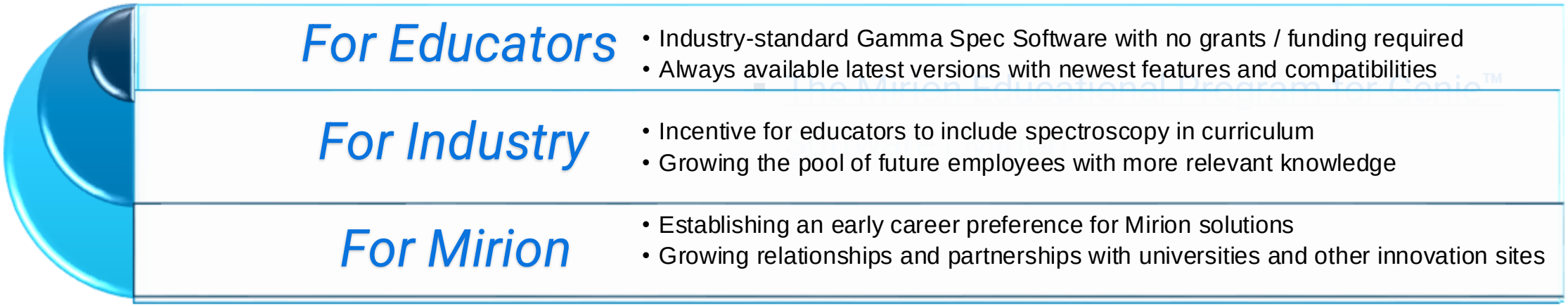
The Mirion Educational Program for Genie Software

WHAT ARE WE OFFERING?

- 1-Year Genie-Single and ISOCS Subscription (available for up to 20 systems) for any eligible educator *free of charge*
- Use simulators or canned spectrum if MCA and detector system is unavailable.

WHAT'S REQUIRED?

- Each year, provide evidence of relevant and published course curriculum.
- Limited to teaching applications
- Link Here (or go to Mirion.com and search for "Genie Education")



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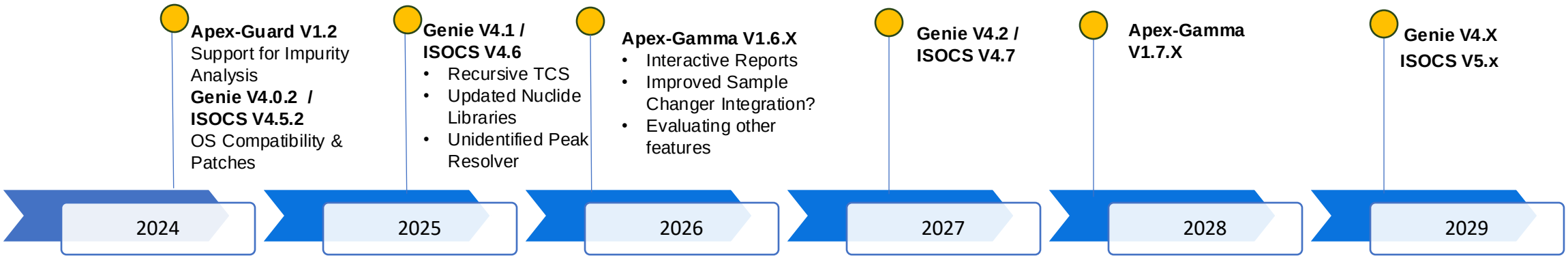
Genie, ISOCS, & Apex-Gamma Planned Releases 2024 +

Disclaimer: Roadmap is subject to change



Windows 10

Windows 11

Windows 12 (Anticipated, not announced)…

Placeholder Windows Update

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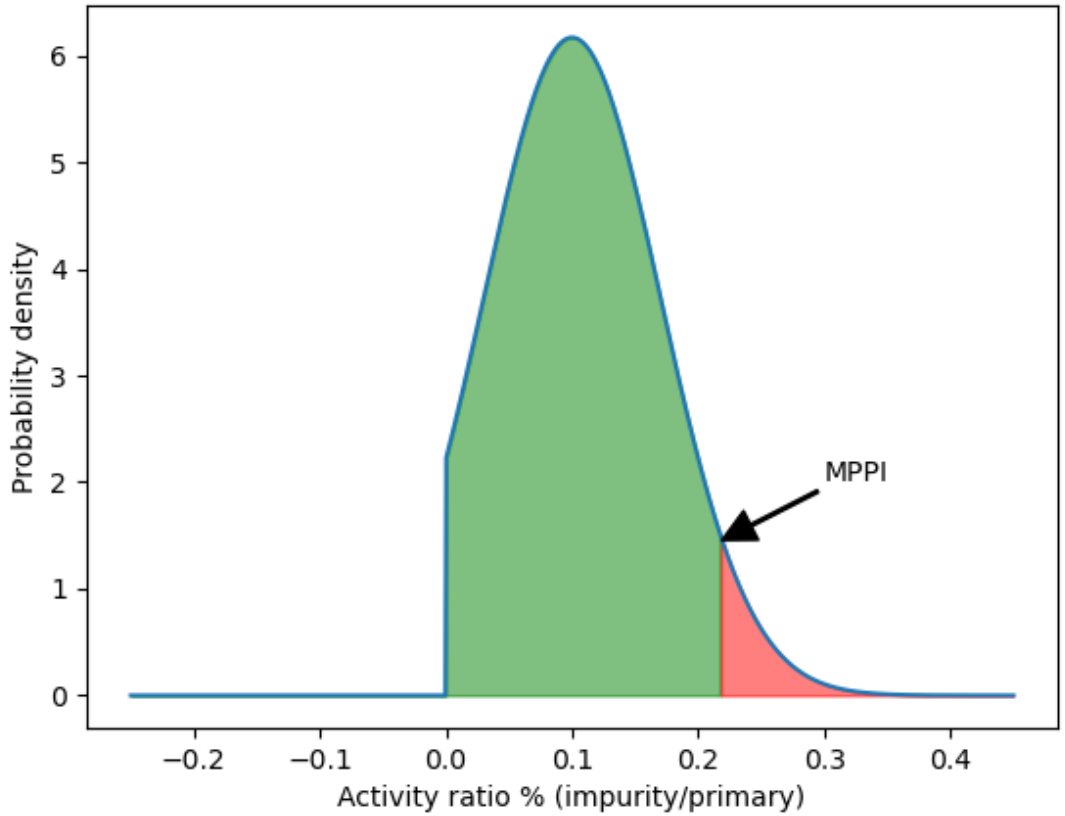
Apex-Guard V1.2
*Apex-Gamma V1.6
*Genie V4.0.2

- Introducing a new metric: The Maximum Potential Percent Impurity (MPPI)
  - MPPI is to Impurity measurements what MDA is to activity measurements.
  - For a given count, MPPI will give confidence that the impurities are at or below a target percentage of primary reference activity.
  - The MPPI is based on a statistical and defendable approach, including uncertainties of both activity and impurity measurements
  - In many cases, the MPPI can justify reducing count times.



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Apex-Guard V1.2
(Continued)

Radionuclide Impurity Report

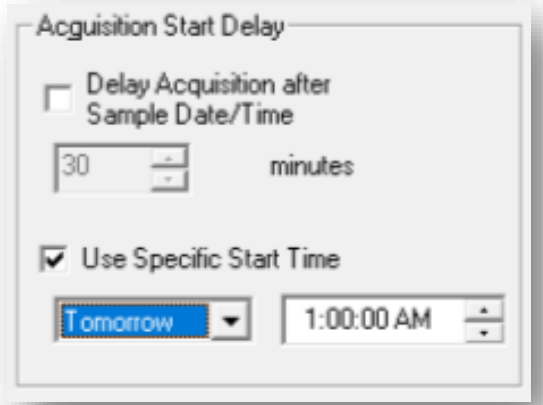
MPPI Activity Reference: Activity of Primary Radionuclide only
Alpha Confidence: 5.000 %
Nuclide Library: C:\CANBERRA\APEX\ROOT\GuardTest\Library\LU177_FULL_MODIFIED.NLB

Reference Date: 3/21/2024 10:59:58AM

Radionuclide	*Impurity Analysis Category*	*Activity (Bq/units)*	Activity Uncertainty at 1.000 sigma	*MDA / Reference Activity*	*Maximum Potential Percent Impurity*	*Percent Impurity Limit*
Lu-177	Primary	4.81E+05	7.67E-03%	0.00E+00%	<NA>	<NA>
Yb-169	Impurity	5.01E+01	1.75E-01%	7.47E-05%	0.009%	0.010%
Yb-175	Impurity	4.66E+02	3.71E-02%	3.61E-05%	0.104%	0.100%
Lu-177m	Impurity	0.00E+00	<NA>	2.54E-05%	0.002%	0.100%
Sum of Impurities :					0.115%	<NA>
>> Radionuclidic Purity :					99.885%	

The maximum potential percent impurity (MPPI) is the greatest relative percent activity of the impurity compared to the activity reference at the alpha confidence for this measurement, taking into account their respective uncertainties. There is a 95.00% probability that the true impurity percent is at or below the MPPI.

- New Consolidated Impurity Report
- "Dual Reference Date" reporting
- New Count Features
  - Count only as long as you need to (to Impurity Limit, to Peak Area)
  - Scheduled Delayed Start



Come see more @
Thursday Spotlight Demo

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Genie V4.1
Sometime in late 2025

- The "Recursive Cascade Summing" Algorithm
  - 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

- The Unidentified Peak Resolver (UPR)
  - The Problem: Resolving unidentified peaks in the spectrum can be a very time-consuming process.
  - Can we automate this manual process?
  - Preliminary results
    - Co-60, Cs-137, Eu-152 Spectrum: Resolved 36 of 39 unknown peaks
    - Reactor Coolant Spectrum: Resolved 14 of 17 unknown peaks
    - Fission Fragments Spectrum: 26 typical fission fragment radionuclides. Added 4 missing nuclides

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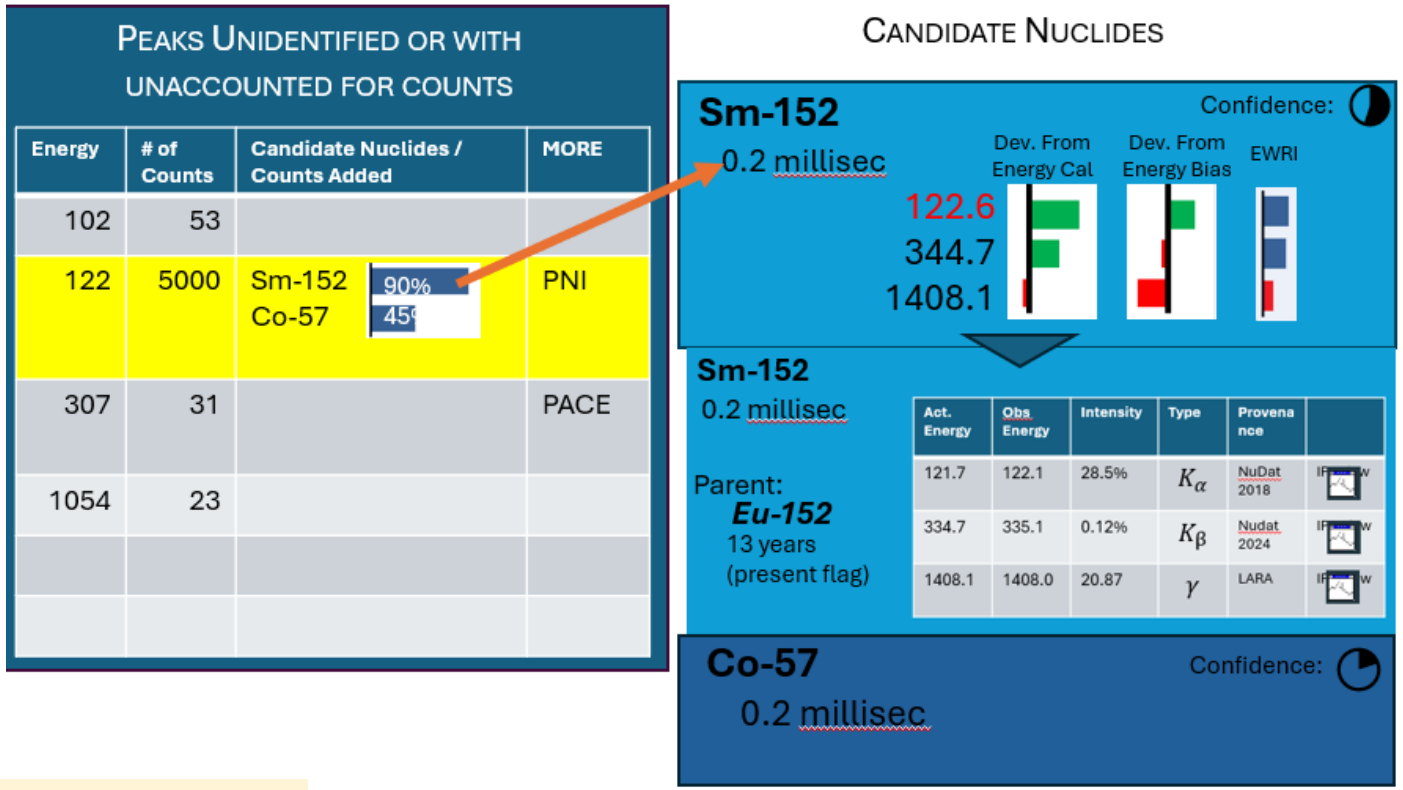
Genie V4.1
Unidentified Peak Resolver User Interface Design

- The UPR User Experience:
  - Black box or with suggested results?
  - How to help users determine when to add new nuclide or new nuclide lines?
- Currently exploring layouts
  - What information is needed to make the right decision?
  - Can we display this information in a compact, easy-to-interpret way?



To give your input, visit me in demo room or email kaphillips@mirion.com indicating your interest

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Part II: MCA

Lynx II

- Lynx II – Launched in July 2022
  - Replaced the highly successful Lynx MCA after 14 years
  - Built off of 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**

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Benefits of Lynx II

- Faster processing speeds
- Faster communications to Genie, Web App and SDK Clients
- USB
- 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

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Lynx II Digital Signal Analyzer

- LCD containing
  - MCA friendly name for UPNP
  - USB address
  - **IP address**
  - MAC address
  - MCA Status and mode
  - Incoming Count Rate (ICR)
  - Deadtime
  - High Voltage Status and Range.
  - Current firmware version
  - Date and Time

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Lynx II Back Panel

- Easily accessible Reset button
- USB host control

- Simplified rear panel
- Common function connections
- Advanced function panel

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Backward Compatibility

- Lynx II is **fully backward** compatible with existing Mirion software, licenses and cables.
- **Same Size**
  - Lynx II footprint is the same size as the legacy Lynx.
  - Lynx II can be easily swapped and placed in the same location as Lynx may have been
  - New rackmount hardware is available that will accommodate the Lynx II and Lynx simultaneously.
- **Same Connections**
  - All Lynx connections remain
  - Some advanced functions have been conveniently located under an easily removable cover.
  - Advanced function in MCX connector form with MCX to BNC cables provided
- Same Features
  - **All features of Lynx remain**
- Same Software
  - **Fully compatible with Genie, Apex, Prospect and SDK**

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

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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

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Lynx II V1.1

- 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.

Images are Proof of Concept only

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Typical Setup

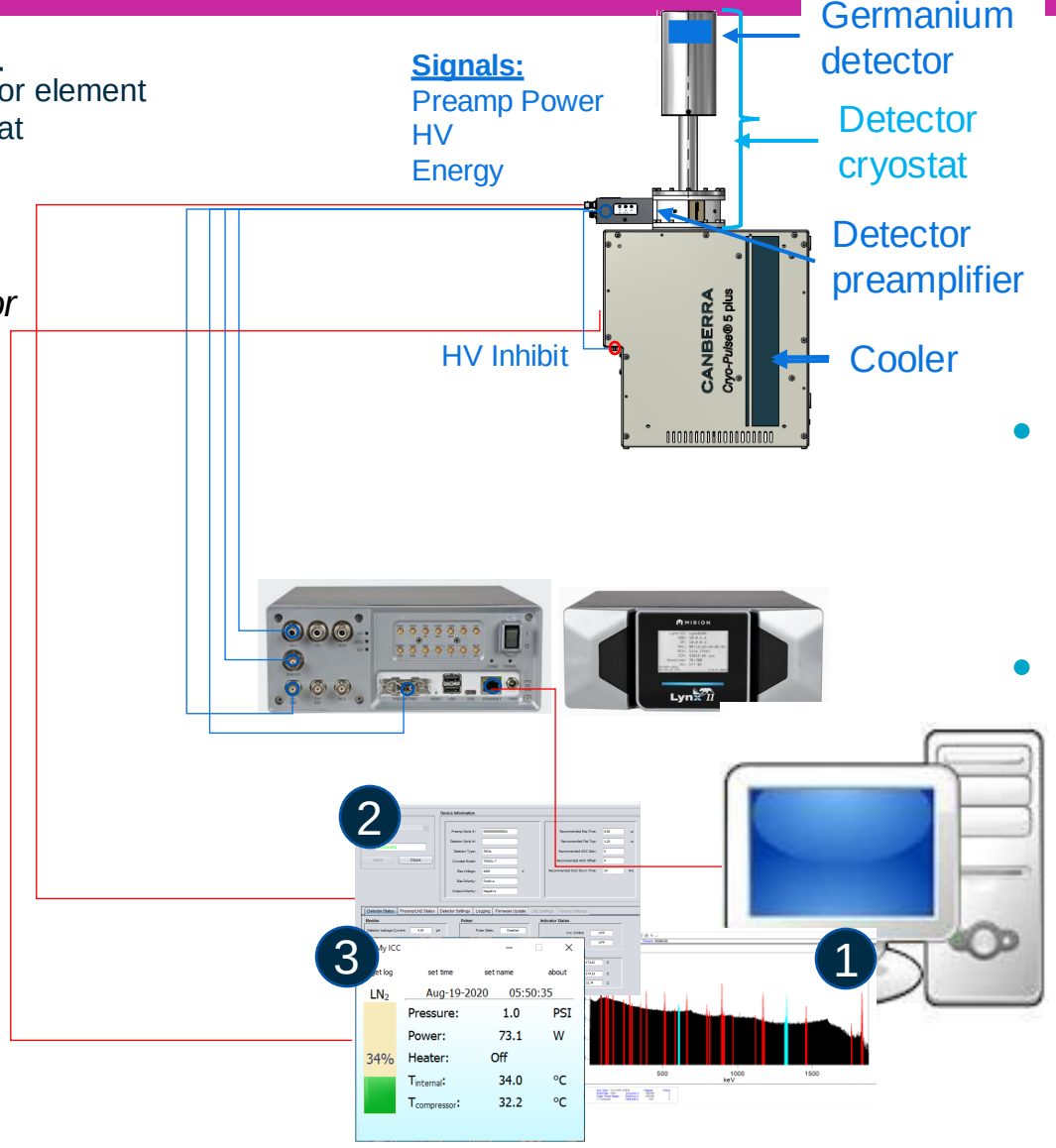
iPA SoH:
- Detector element
- Cryostat
- iPA

Signals:
Preamp Power
HV
Energy

Electrically-cooled detector

Lynx II MCA

User Interface



- HPGe detector
  - Detector element
  - Detector preamplifier
  - Cryocooler
  - Detector cryostat
- MCA
  - Detector signal control/analysis
  - Storing spectral information
- User interface
  1. Genie / Apex
  2. iPA SoH
  3. iCC SoH

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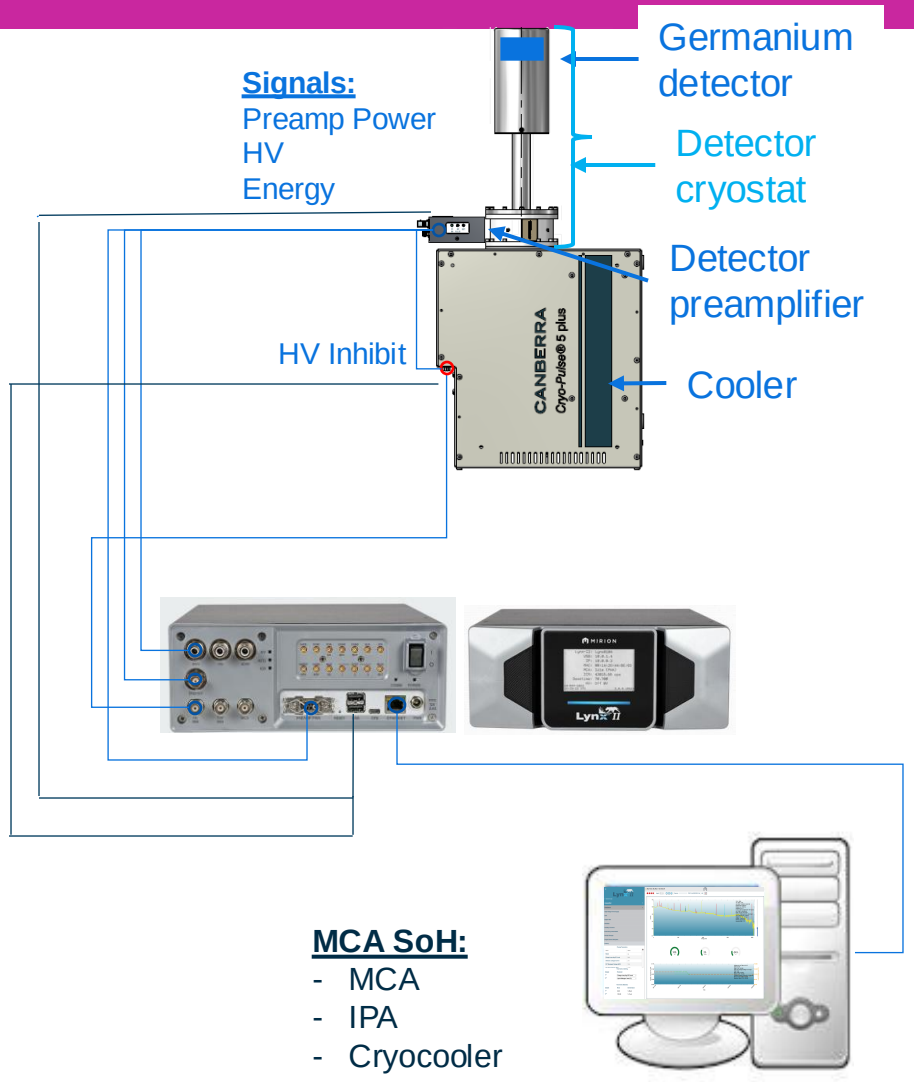
Basic setup with Lynx II as the “HUB”

Electrically-cooled detector

MCA

User Interface



- HPGe detector
  - Detector element
  - Detector preamplifier
  - Cryocooler
  - Detector cryostat
- MCA
  - Detector signal control/analysis
  - Storing spectral information
- User interface

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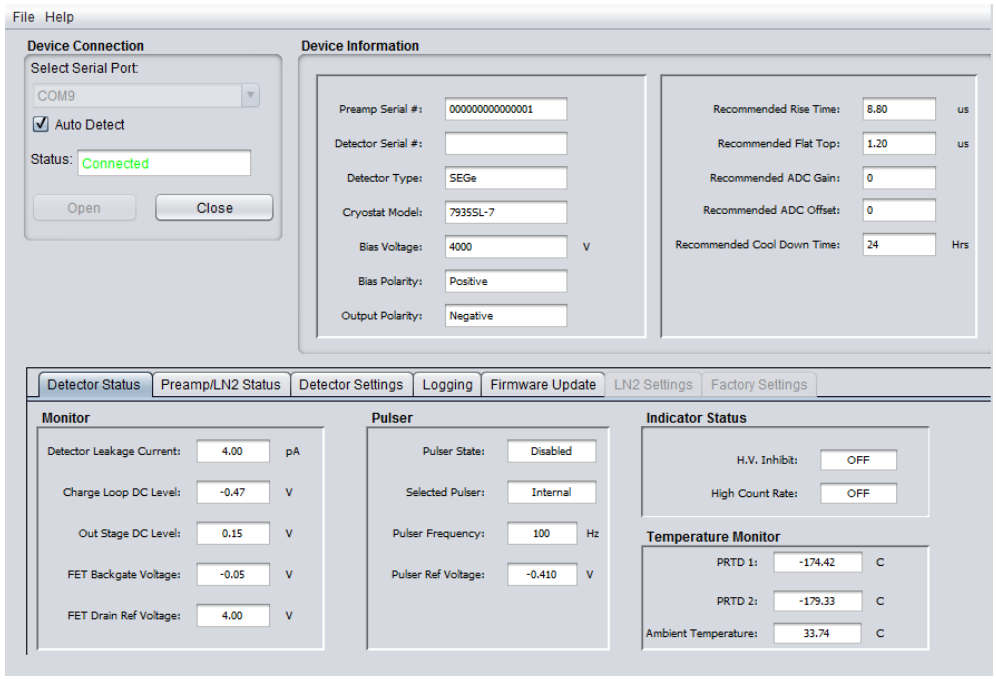
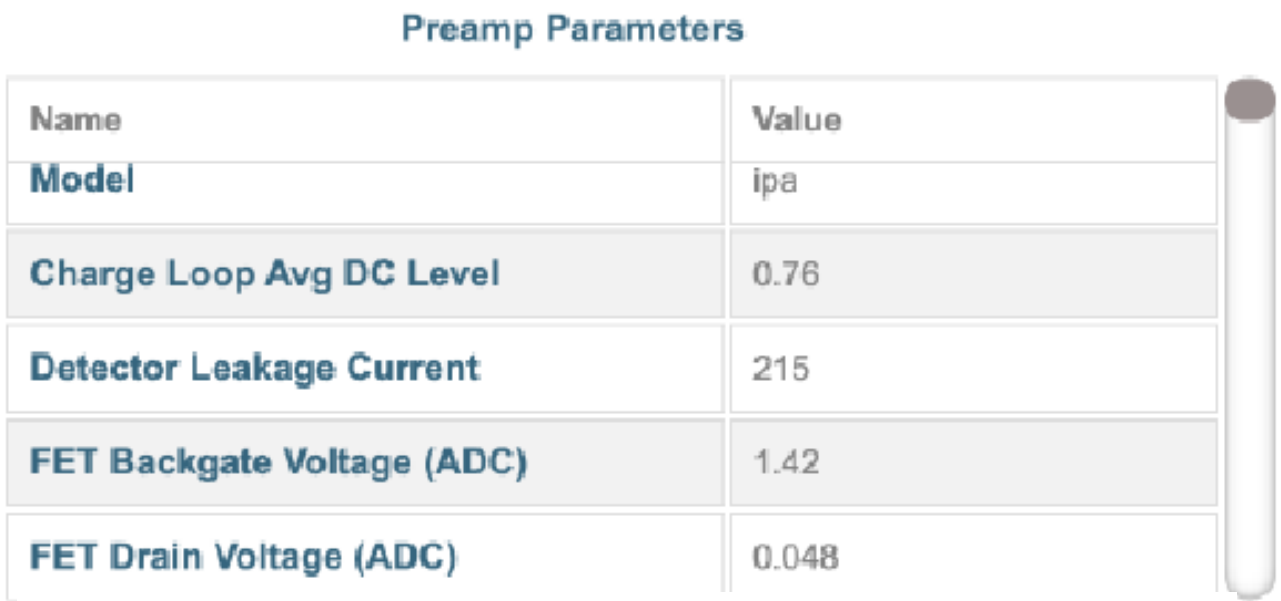
Integrated IPA SOH monitoring

Current IPA software



Lynx II



IPA Gauges

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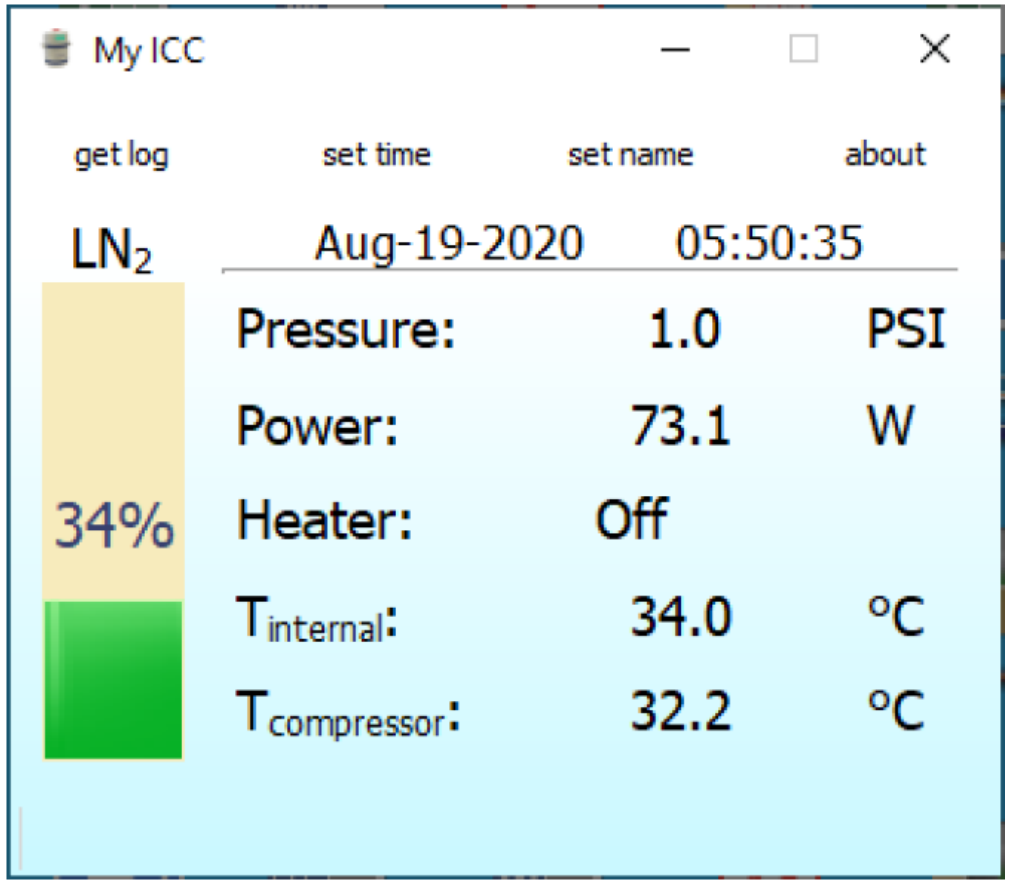
Integrated Cryocooler SOH monitoring

Current ICC software



Lynx II

Cooler Parameters

Name	Value
Model	cp5
Cold Head Temperature (℃)	19.9
Cold Tip Set Point (℃)	-185
Cold Tip Temperature (℃)	19.48
Compressor Temperature (℃)	18.9

ICC Gauges

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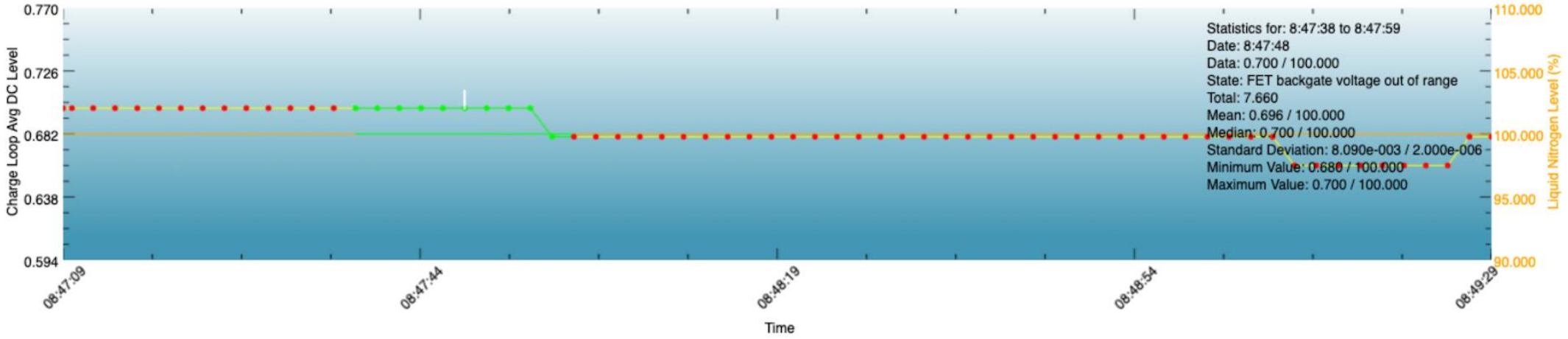
Time Series Plot



- 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

- Red Dot = Fault
- Tool tips
- TROI – Time Region of Interest

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Lynx II V1.1 How to get

- **Available Now!**
  - Download via Mirion.com
    - https://www.mirion.com/products/technologies/spectroscopy-scientific-analysis/gamma-spectroscopy/detector-electronics/lynx-ii-digital-signal-analyzer

  - Any existing Lynx II should have been emailed a product update notice.

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Going Forward - V2.0

- In planning phase…
- Continue to build on the “HUB” approach.
  - Mirion Gamma Spec EcoSystem
- Add new features
  - Auto Setup
  - State of Health diagnostics
  - IPv6 compatibility
  - Etc…
- What else do you need?

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Questions?

Open Discussion

Contact Us

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Peter D'Agostino

- pmdagostino@mirion.com

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Thank you