



MIRION
Connect **25**
Annual Users' Conference

INNOVATION AT WORK

Connecting Visionaries in Radiation Safety, Science and Industry

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



MIRION
TECHNOLOGIES

CSPevo AB-100

Service and Calibration

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Mirion Connect | Annual Users' Conference 2025

Orlando, Florida

Summary

- CSPevo and LightLink® Technology
- AB-100 Key Features
- How to replace the Mylar window?
- Key Spare Parts
- CSPA Overview
- How to calibrate for Activity Equivalence?
- Lightlink® specifics to calibration
- How to proceed to full probe calibration

CSPevo and LightLink® Technology Heads-up





POWERED BY LightLink[®]

- Next-Generation Core Technology*
- Reliable & Robust
- Hyper Accurate
- Easily Integrated

Overview

COMBINING EXPERTISE & NEW TECHNOLOGY

- Revolutionary Advancement in Radiation Detection
- Enhancing Radiation Detection across Diverse Applications
- Incorporating Improved Light Collection, Robust Silicon Photomultipliers & Latest in Readout Electronics

Enhancing Radiation Detection

- More Compact Detector assembly
- Robust Silicon Photomultipliers
- Removal of High Voltage Components
- Elimination of Light Decay
- Superior Light Collection Efficiency



Enhanced Ergonomics



Greater Robustness & Longevity



Extended In-Use Time



Reduced Down-Time



Hyper-Accurate & Sensitive

AB-100 Key Features



CSPevo introduction



- A New Alpha/Beta 100 cm² detection Module
 - Fragile PMT is replaced by LightLink®
 - Detection area homogeneity is improved up to 85%
 - Minimized dead area with protection grid
 - Reduced overall Weight and Volume
 - Drop proof from One meter height on concrete
 - Detector alone can be used into third party system
 - USB-C connection
 - ✓ Data transfer to host system
 - ✓ Calibration with CSPS
- A set of handles to adapt to meter usage and leverage installed base
 - CSPevo is 100% compatible with CSP meter already in the field
 - No need to upgrade meter firmware – exception to RDS-32 - **R4.05.20**
 - RDS-32 based one hand configuration
 - No cable needed

One smart detector fits all



One Hand

One Probe

One System



USB Connectivity

- USB-C connector
- COTS cable
- Handle to Detector connection
- Detector to PC
 - Calibration and setup with CSPA™ software
- Integration into third party systems

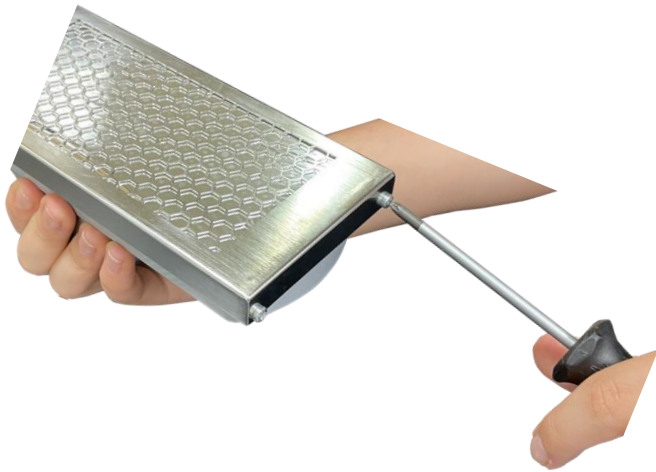


How to replace the Mylar window?



PROTECTION GRID AND MYLAR

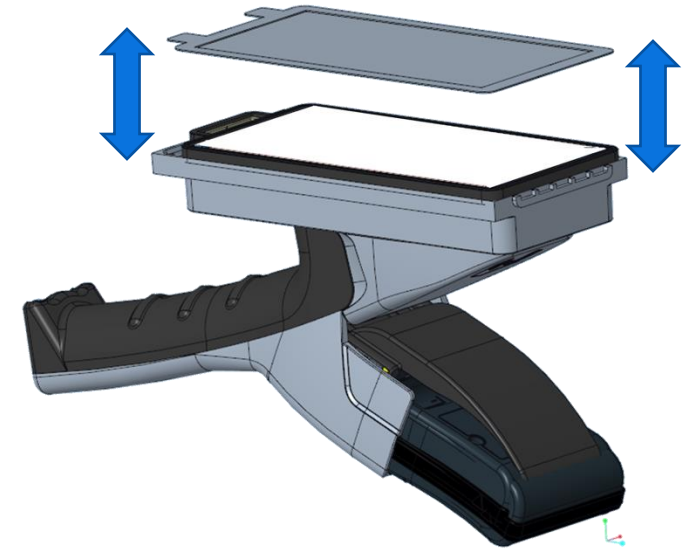
1 : Remove both screws



2 : Remove the grid



3 : Remove the mylar window



- Mylar on frame
 - No tool needed

✔ Wait 10 minutes only after mylar replacement before going back to operation.

✘ Hours were required with PMT

Key Spare parts



CSPevo Spare Parts



Main Product Name	Part #	Product Name	Description
AB-100	NOM008009-SAV	AB-100 LightLink KIT	AB-100 Light Collection Sub-Assembly
AB-100	ATR000780-SAV	AB-100 Scintillator	AB-100 Scintillator
AB-100	NOM007732-SAV	AB-100 Window KIT	AB-100 Protection Window kit
AB-100	ANT008595	AB-100 COVER	Protective Cover for CSPevo 100 cm ²
AB-100	NOM007946-SAV	AB-100 MEASUREMENT BOARD	AB-100 Preset Measurement Board
AB-100	ANT008455	CSPevo GRID-100	Protection Grid for CSPevo 100cm ²
RDS-I-HANDLE; RDS-C-HANDLE	NOM008819	RDS HANDLE USB BOARD	USB-C Board for RDS handles
RDS-C-HANDLE	NOM008190-SAV	RDS-C-HANDLE CABLE	Replacement Cable for RDS-C-HANDLE
RDS-I-HANDLE	ANT008346	RDS-I-HANDLE LOCKING TAB	RDS-I-HANDLE Locking Tab for RDS-32
CSP-C-HANDLE	NOM008820	CSP HANDLE USB BOARD	USB-C Board for CSP handles
RDS-C-HANDLE	NOM008190-SAV	RDS-C-HANDLE CABLE	Replacement Cable for RDS-C-HANDLE
CSP-C-HANDLE	NOM008189-SAV	CSP-C-HANDLE CABLE	Replacement Cable for CSP-C-HANDLE



RDS-I-HANDLE



RDS-C-HANDLE



CSP-C-HANDLE

Service Manuals



- Service manuals
 - AB-100 and HANDLES
 - Step by step parts replacement procedure



CSPS Overview



CSP & CSPevo SMART SPECIFICS

C Measure acquisition - superadministrator level

SAB-100

Identification		Beta	Alpha
Serial number:	908	Date: 08-11-21 - 16:47:18	Date: 08-11-21 - 16:47:20
Type:	Alpha + Beta	Source: Co60	Source: Pu239
Firmware release:	13.03.15	Emitter: Beta	Emitter: Alpha
Detection surface:	100.0 cm ²	Validity: Calibration validity period: 12 months	

Status

Dialog ☒ ☒ ☒

Supply voltage: 5.25 V

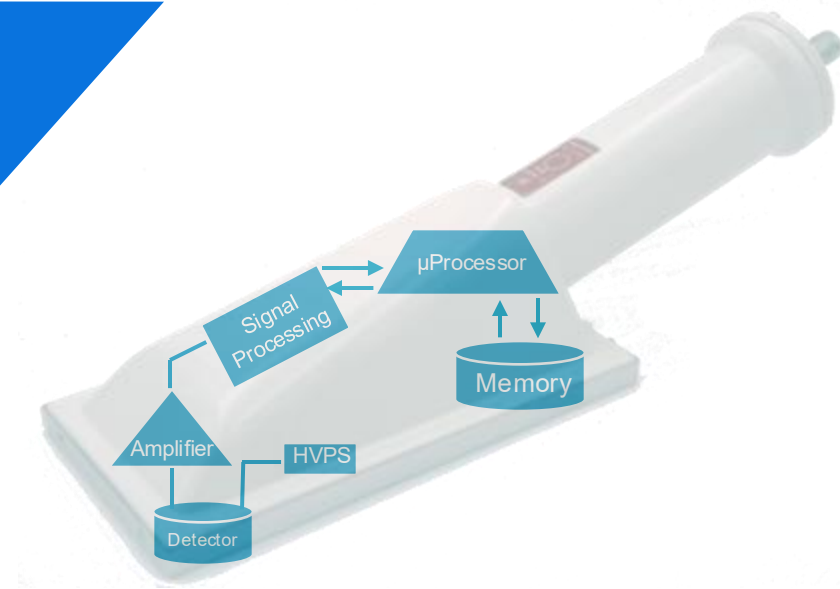
High Voltage: 573.8 V ☒ U.S. unit

Discrimination threshold: 21 mV

Current unit: CPM

Alpha + Beta mode

OK



- CSP probe is a fully integrated sub-system taking and transmitting measurements in real time to host instrument
- All key measurement components (high voltage, amplifier, discriminator and signal processing) are located in the probe
- Each probe stores all calibration & setup related settings
- Full interchangeability without recalibration enables increased uptime of instruments in the field, thereby maximizing the investment

ONE SOFTWARE FOR ALL CSP PROBES CALIBRATION/SETUP



USB CSP CABLE
USB-C for AB-100

SABG-15+ GM Pancake $\alpha\beta\gamma$	SPAB-15 PIPS $\alpha\beta$	SAB-32 Plastic/ZnS $\alpha\beta$	SA-32 ZnS α	SB-32 Plastic β	SAB-100 Plastic/ZnS $\alpha\beta$
SABG-100 Plastic/ZnS $\alpha\beta\gamma$	SA-100 ZnS α	SB-100 Plastic β	SAB-250 Plastic/ZnS $\alpha\beta$		
AB-100 Plastic/ZnS $\alpha\beta$					
SN-D Helium 3 η	SN-S Helium 3 η	SABP-525 Plastic/ZnS $\alpha\beta$	SABS-579 Plastic/ZnS $\alpha\beta$		
SVLD CsI(Tl) γ	TELE-STTC GM Dose γ	STTC (-W) GM Dose γ	SG-2R NaI(Tl) γ	SG-1R NaI(Tl) γ	SX-2R NaI(Tl) $\alpha\chi\gamma$



Instrument selection

Available functions for the specific instrument

CSPS FEATURES



Acquire measurements

- Acquire measurement

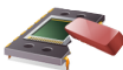
- Daily operational checks
- Manual acquisitions



Probe settings

- Instrument settings

- Manual setup of the instrument
- Calibration date management



Writing factory pre-calibration parameters

- Write factory pre-calibration parameters

- Post maintenance: load default operational parameters to carry-on calibration



Adjustment wizard

- Adjustment Wizard

- Execute instrument automatic calibration
- Follow step by step calibration process guidance



Firmware update

- Firmware upgrade

- Load latest firmware in CSP instruments
- Freely available on MIRION web site



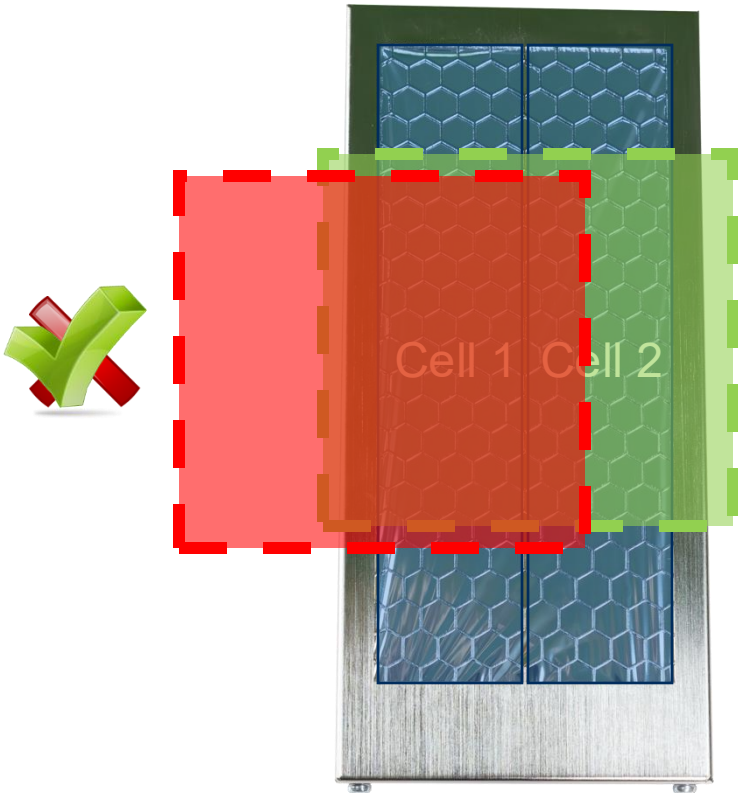
Adjustment Wizard Settings

- Adjustment Wizard Settings

- Setup radiation source to be used for each probe
- Define expected results for a successful automatic calibration
- Preset default min and max parameters

LightLink[®] Specifics to Calibration





- LightLink is a scalable Technology
 - AB-100 Light Collection is Based on 2 cells
- LightLink ensures no light interference between each cell
 - Electronic Discriminator is the key calibration setting for each cell
 - Ensure Minimum C-14 Eff is met for temperature range
 - Other calibration steps do not differentiate cells
 - They are seen as one 100 cm² detector
 - Calibration source must always be visible equally by total probe width

How to calibrate AB-100 for Activity Equivalence?



ACTIVITY EQUIVALENT

- AB-100 is setup and operational
 - Factory Activity equivalent
 - Beta: Co-60
 - Alpha: Pu-239
- User can calibrate to other isotope
 - One isotope at a time
 - One for Alpha and one for Beta

■ Select Probe settings module

1. Proceed to background measurement
2. Click on Alpha or Beta « Modify » button



Probe settings

Probe settings - superadministrator level

AB-100

Identification

Serial number: 24040 Modify Type: Alpha + Beta

Firmware release: 01.04.25 Detection surface: 100.0 cm²

Beta

Date: 21-05-25 - 15:03:40

Source: Co60

Emitter: Beta

Alpha

Date: 21-05-25 - 15:13:53

Source: Pu239

Emitter: Alpha

Validity

Calibration validity period: 12 months

Status

Supply voltage: 5.14 V US Units

High Voltage: 36.1 V Current unit: CPM

Average current: 1.0 µA Average T°: 22.0 °C

OK

Alpha + Beta mode

Configuration Calibration Alarm threshold Factory alarm threshold Alpha and Beta alarm threshold Factory Alpha and Beta alarm threshold

Beta

Background noise (CPM) 0.00 Calculate... ①

Coefficient (DPM/CPM) 7.784053 Modify... ②

Check coefficient

Validate coefficient

Alpha

Background noise (CPM) 0.00 Calculate... ①

Coefficient (DPM/CPM) 5.404669 Modify... ②

Check coefficient

Validate coefficient

Load... Read Write Save...

MANUAL CALIBRATION



Probe settings

- Chose 1 to 3 measurements (Stat)
- Select Reference Emitter
- Enter Reference Source activity (4PI)
- Integration Time
 - Enter Time in seconds or
 - Click Auto button
 - SW select most appropriate time
 - Hit Start button
 - Hit Calculate button
 - Hit Valid button to save new parameter in sw memory

The screenshot shows a software window titled "Conversion coefficient calculation CPM --> DPMeq: BETA". It is divided into several sections:

- Measures:** Contains fields for "Activity (4 pi sr) n°1" (set to 120000 DPM), "Integration time" (set to 10 s, with an "Auto" button), "Gross count" (empty), "Net count (>1000c)" (empty), and an "Actions" column with a "Start" button.
- Last adjustment:** Shows "Date: 17-07-25 - 19:19:35", "Reference source: Co60", "Source emitter: Beta", and "Conversion coefficient: 7.784053".
- Adjust parameters:** Includes a date field "Date: Thursday, July 17, 2025 7:20:12 PM", a "Reference source:" dropdown menu, a "Source emitter:" dropdown menu (showing a list: Sr90-Y90, Tc99m, Tl204, Cs137, Tc99, Tl204), and a "Calibration validity period:" field (empty) followed by "onths".
- Bottom section:** Contains a "Calculate" button, a "Valid" button, and a "Save new parameters" label.

AB-100

Automatic Calibration





Automatic Full Calibration

- Needed after AB-100 repair
 - Detector replacement
 - LightLink module replacement
 - If probe response test failed
- Regular check can be performed with CSPA Acquisition module or connected meter

AB-100 Cal Steps



CSP Wizard Adjust

Curve type to adjust: **AB100**

Adjustment description

Measure 1: Write default settings
Measure 2: Electronic discriminator plate (background noise)
Measure 3: Electronic discriminator plate, Search for the best probe efficiency
Measure 4: Calculating the background noise
Measure 5: Calculating of the probe Beta efficiency (source C14)

Measure 1 Measure 2 Measure 3 Measure 4 Measure 5 Measure 6 Measure 7 Measure 8 Measure 9 Measure 10

Measure characteristics

Curve type: Electronic discrimination curve for CSP

Adjustment measurement type: Search the best operational high voltage

Setting

Curve start: 30 mV
Curve end: 150 mV
HV step: 3 mV
Stabilization time: 3 s
Integration time: 10 s

Source

Emitter: Beta
Nuclide: C14
Surface: 100 cm²
Emission rate (over 2piSr): 1000 Beta/s/2piSr

Expected results

Beta Efficiency Min: 5.5 %
Beta Efficiency Max: 5.8 %

Export to CSPS Factory parameters Open Save

Programming the factory settings of the probe

This step is used to reset the default settings of the probe. It is optional but recommended to properly calibrate the probe. This step is mandatory if the connected probe does not match the settings.

Measurement 1
Electronic discriminator setup

This step includes two measurements: one measurement of background and one measurement of control of C14.

Measurements 2 and 3
Background measurement

Background acquisition and checkup against leaks of light and electronic noise. This measurement is systematic.

Measurement 4
Calculation of the probe efficiency (beta) with C14

Calculation of the beta efficiency of the probe with C14.

Measurement 5
Calculation of the probe efficiency (beta) with Co60

Calculation of the beta efficiency of the probe with Co60.

Measurement 6
Calculation of the probe efficiency (alpha) with Pu239

Calculation of the alpha efficiency of the probe with Pu239.

Measurement 7
Verification of alpha beta crossmarks

Displays and compare alpha and beta crosstalk between measurement channels. The efficiency calculation for each channel must have been completed prior to this step.

Measurement 8
Calculation of conversion coefficient (alpha)

Calculates count rate conversion coefficients in equivalent activity (used to display equivalent activity). Calculation of the calibration coefficient is no longer systematic. Verification of the efficiency values with the default calibration coefficient is sufficient to validate the probe.

Measurement 9
Calculation of conversion coefficient (beta)

A measurement of activity for each measurement channel will be proposed to verify that the probe detects the activity of the source in use. If the measurement is equal to +/-25% of the source in use, the probe shall be calibrated with the current date. Otherwise, the user can either return to the Electronic Discriminator step and repeat the calibration process, or calculate his own calibration coefficient despite the risks.

Measurement 10

Probe Efficiency



Source		Expected results	
Emitter :	Beta	Beta Efficiency Min :	5,5 %
Nuclide :	C14	Beta Efficiency Max :	5,8 %
Surface :	100 cm ²		
Emission rate (over 2piSr) :	1000 Beta/s/2piSr		

- Measurements 3 to 7: Discriminator setting, C-14, Co-60 and Pu-239 efficiencies control
 - Emission rate introduction is expected
 - Ensure the process is not source dependent – only probe dependent
- If only source activity is known
 - Enter Activity but change the expected results with the Wizard adjustment



CSP Wizard Adjust

Curve type to adjust : **AB100**

Adjustment description

Measure 1 : Write default settings
Measure 2: Electronic discriminator plate (background noise)
Measure 3: Electronic discriminator plate, Search for the best probe efficiency
Measure 4: Calculating the background noise
Measure 5: Calculating of the probe Beta efficiency (source C14)

Measure 1

Measure 2

Measure 3

Measure 4

Measure 5

Measure 6

Measure 7

Measure 8

Measure 9

Measure 10

Measure characteristics

Curve type :
Electronic discrimination curve for CSP

Adjustment measurement type :
Search the best operational high voltage

Measure description

Setting

Curve start :
30 mV

Curve end :
150 mV

HV step :
3 mV

Stabilization time :
3 s

Integration time :
10 s

Source

Emitter :
Beta

Nuclide :
C14

Surface :
100 cm²

Emission rate (over 2piSr) :
1000 Beta/s/2piSr

Expected results

Beta Efficiency Min :
5,5 %

Beta Efficiency Max :
5,8 %

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Export to CSPS

Factory parameters

Open

Save

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STEP 1

Programming the factory settings of the probe

Measurement 1

This step is used to reset the default settings of the probe. It is optional but recommended to properly calibrate the probe. This step is mandatory if the connected probe does not match the settings.

- Software loads all default parameters
 - Known to ensure good operation
 - Mandatory after a probe repair
 - « High Voltage »
 - Discriminators
 - Current threshold (saturation)
 - Saturations points
 - ZERO count time-out
 - Background level
 - Count to Activity coefficient
 - Alarm setpoints
- Requests S/N introduction
 - Usefull if Main Board was replaced

The image displays three screenshots of the 'Probe settings - superadministrator level' software interface for the AB-100 probe. The interface is divided into several sections:

- Identification:** Fields for Serial number (24040), Type (Alpha + Beta), Firmware release (01.04.25), Detection surface (100.0 cm²), and Source (Co60, Pu239).
- Status:** Fields for Supply voltage (5.14 V), High Voltage (36.1 V), Current unit (CPM), Average current (1.0 µA), and Average T* (21.8 °C).
- Electronic settings:** Fields for High Voltage (36.00 V), Cells (1, 2), Electronic discriminator (111), Alpha/Beta discriminator (75), Balancing (500 mV), and Current threshold (15 µA).
- Physical settings:** Fields for Saturation (6000000.00 CPM) and Zero count timeout (180 s).
- Functioning mode:** Radio buttons for Detection (Alpha, Beta).
- Background noise and Coefficient:** Fields for Background noise (CPM) and Coefficient (DPM/CPM) with 'Calculate...' and 'Validate coefficient' buttons.
- Data Tables:** Three tables showing CPM, Dpmeq, and Dpmeq/100cm² for Beta and Alpha sources, with columns for Unit, Value, and Unit.



Can skip this step

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STEP 2&3

Electronic discriminator setup

Measurements
2 and 3

This step includes two measurements: one measurement of background and one measurement of control of C14.

- Electronic discriminator (LLD) Setup **for each cell**
- **Important** for nominal temperature range use
- 2 measurement sequences
 - Background measurement for each step
 - C-14 measurement for each step (≥ 60 kCPM emission)
 - $5.5\% < \text{RESULT} < 5.8\%$

Probe settings - superadministrator level

AB-100

Identification

Serial number: b4040 Modify Type: Alpha + Beta

Firmware release: 01.04.25 Detection surface: 100.0 cm²

Status

Supply voltage: 5.14 V US Units

High Voltage: 36.1 V Current unit: CPM

Average current: 1.0 µA Average T°: 21.8 °C

OK

Alpha + Beta mode

Configuration | Calibration | Alarm threshold | Factory alarm threshold | Alpha and Beta alarm threshold | Factory Alpha and Beta alarm threshold

Electronic settings

High Voltage: 36.00 V Modify... 3 %

Cells: 1 2

Electronic discriminator: 111 mV Plot...

Alpha/Beta discriminator: 76 mV Modify...

Balancing: 500 mV

Current threshold: 15 µA

Firmware version: 1.0.3

Hardware version: 0

Functioning mode

Detection: Alpha Beta

Physical settings

Beta

Saturation: 6000000.0 CPM

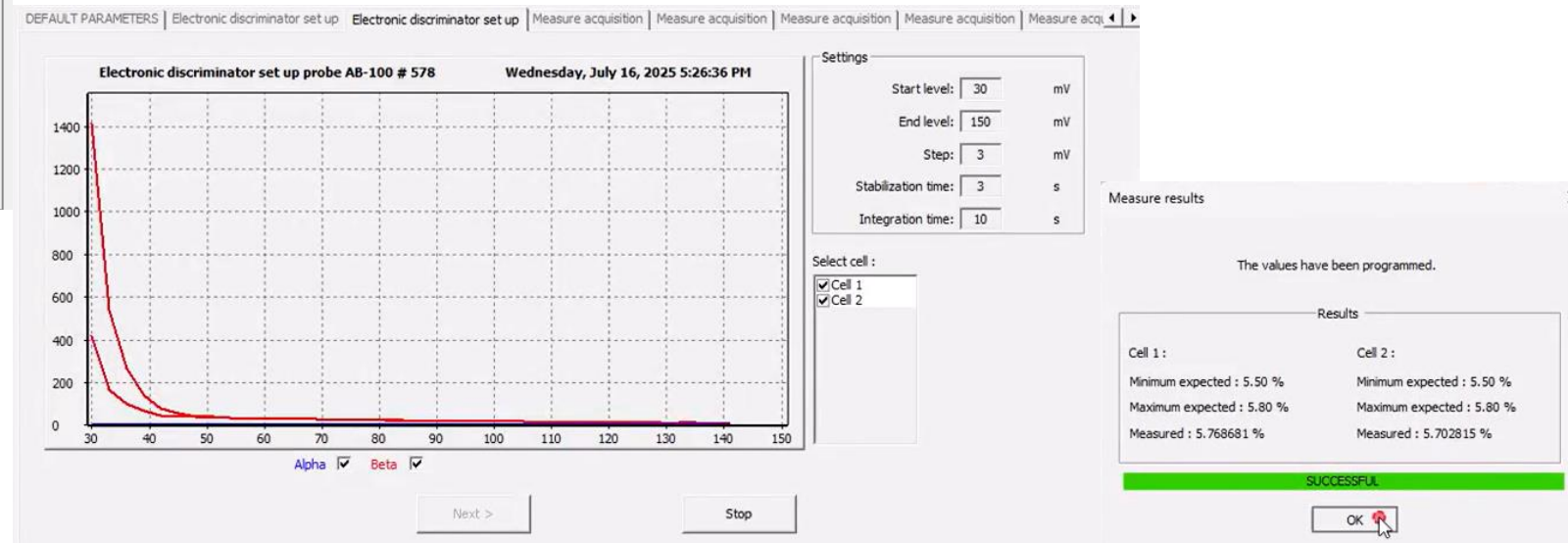
Zero count timeout: 180 s

Alpha

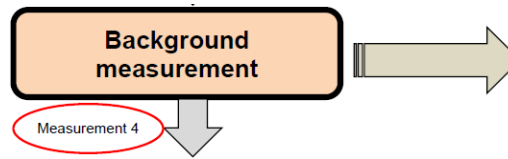
Saturation: 6000000.0 CPM

Zero count timeout: 15000 s

Load... Read Write Save...



STEP 4



Background acquisition and checkup against leaks of light and electronic noise. This measurement is systematic.

- Background acquisition
 - To be deduced from measurements to follow
 - C-14, Co-60 and Pu-239 efficiencies
 - Count-rate to activity coefficient
 - Confirm AB-100 quality
 - Detection module is light tight
 - Electronic noise does not interfere with measurement

Probe settings - superadministrator level

AB-100

Identification

Serial number: 24040 Modify Type: Alpha + Beta

Firmware release: 01.04.25 Detection surface: 100.0 cm²

Status

Supply voltage: 5.14 V US Units

High Voltage: 36.1 V Current unit: CPM

Average current: 1.0 µA Average T[°]: 22.0 °C

OK

Alpha + Beta mode

Configuration Calibration Alarm threshold Factory alarm threshold Alpha and Beta alarm threshold Factory Alpha and Beta alarm threshold

Beta

Background noise (CPM) 0.00 Calculate...

Coefficient (CPM/CPM) 7.784053 Modify...

Check coefficient

Validate coefficient

Alpha

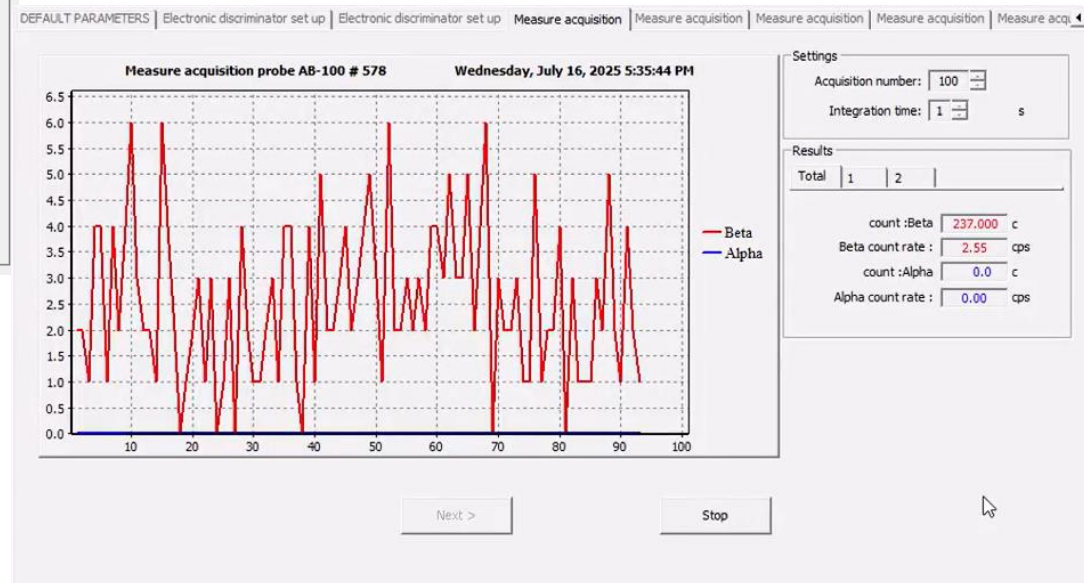
Background noise (CPM) 0.00 Calculate...

Coefficient (CPM/CPM) 5.404669 Modify...

Check coefficient

Validate coefficient

Load... Read Write Save...



Measure results

Measured results and tolerances

This curve has checked the background of the probe.

Beta :

Minimum expected : 0.00 cps

Maximum expected : 5.00 cps

Measured : 2.588732 cps

Alpha :

Minimum expected : 0.00 cps

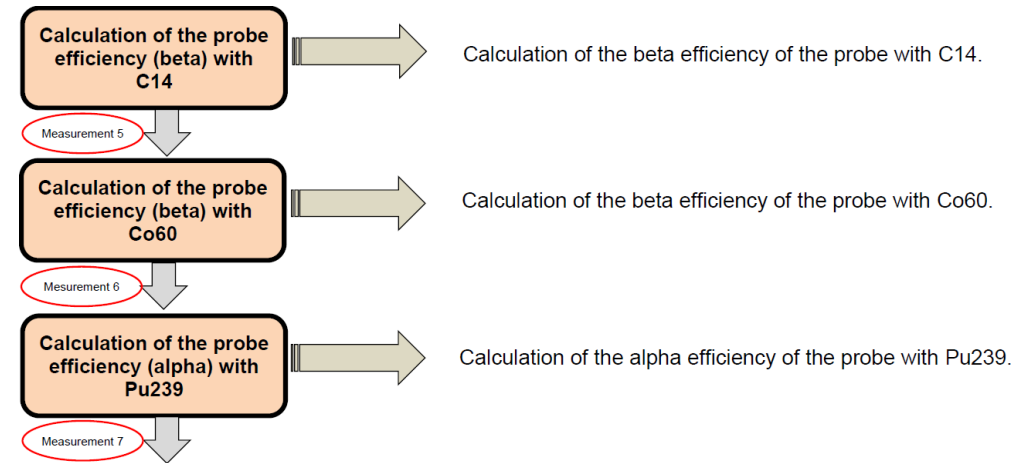
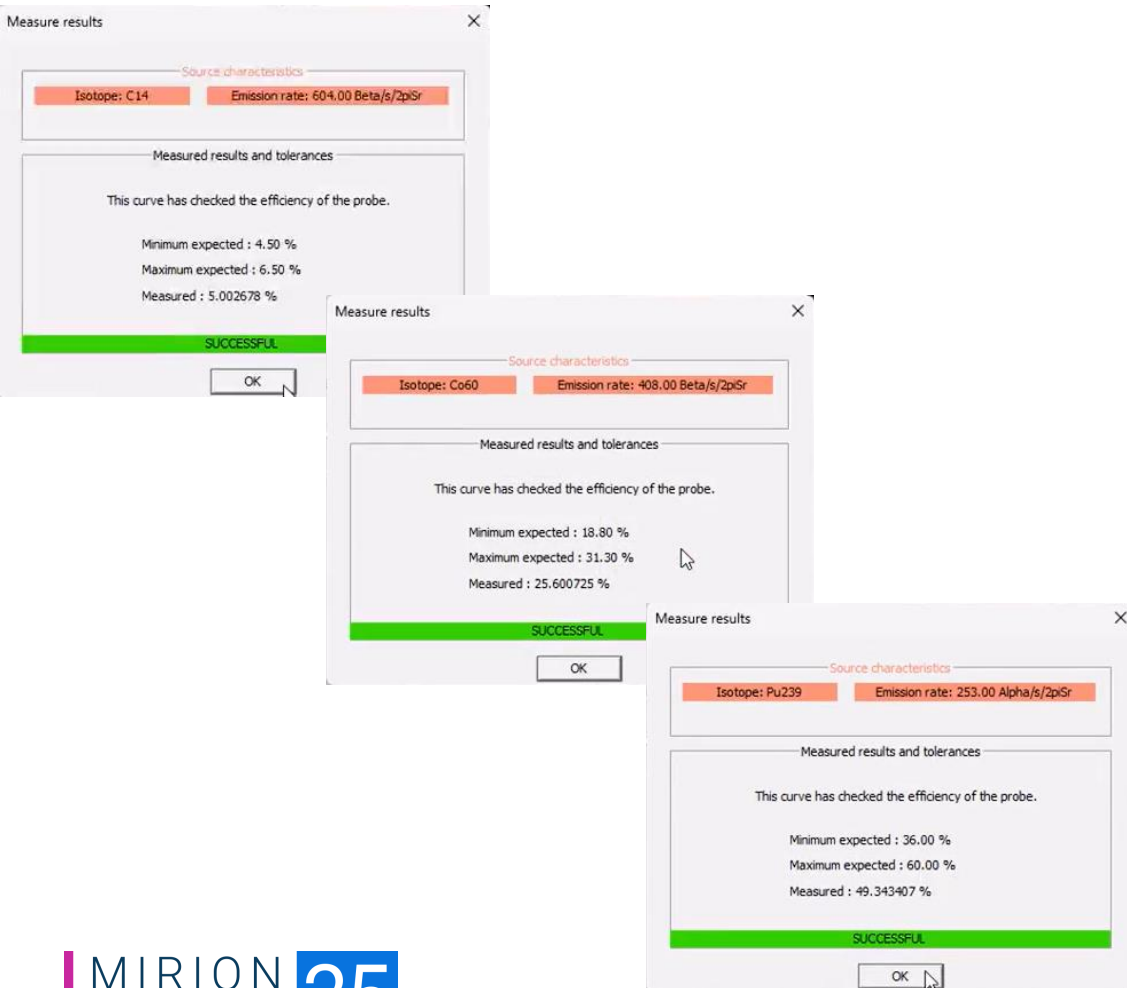
Maximum expected : 0.05 cps

Measured : 0.000000 cps

SUCCESSFUL

OK

STEPS 5-7



- Efficiency calculation for focussed isotopes
 - C-14: 4.5% < RESULT < 6.5%
 - Co-60: 18.8% < RESULT < 31.3%
 - Pu-239: 36% < RESULT < 60%
- Ensure probe response to Beta low energies and Alpha is correct

STEP 8

Verification of alpha beta crossmarks

Measurement 8

Displays and compare alpha and beta crosstalk between measurement channels. The efficiency calculation for each channel must have been completed prior to this step.

■ Alpha/Beta Crosstalk check

- Beta to Alpha < 5%
- Alpha to Beta < 0.1%

■ Automatic result following Efficiencies calculation

Probe settings - superadministrator level

AB-100

Identification

Serial number: [b4040] Modify Type: Alpha + Beta

Firmware release: 01.04.25 Detection surface: 100.0 cm²

Status

Supply voltage: 5.14 V US Units

High Voltage: 36.1 V Current unit: CPM

Average current: 1.0 µA Average T²: 21.8 °C

Validity Calibration validity period: 12 months

OK

Alpha + Beta mode

Configuration | Calibration | Alarm threshold | Factory alarm threshold | Alpha and Beta alarm threshold | Factory Alpha and Beta alarm threshold

Electronic settings

High Voltage: 36.00 V Modify... 3 %

Cells : 1 2

Electronic discriminator: 111 mV Plot...

Alpha/Beta discriminator: 75 mV Modify...

Balancing: 500 mV

Current threshold: 15 µA

Firmware version: 1.0.3

Hardware version: 0

Functioning mode

Detection ☒ Alpha ☐ Beta

Physical settings

Beta

Saturation: 6000000.0 CPM

Zero count timeout: 180 s

Alpha

Saturation: 600000.00 CPM

Zero count timeout: 15000 s

Load... Read Write Save...

Electronic discriminator set up | Electronic discriminator set up | Measure acquisition | Measure acquisition | Measure acquisition | Measure acquisition | Measure acquisition | Conversion coeff

Alpha crosstalk in Beta

Min crosstalk rate : 0.00 %

Crosstalk rate : 1.58 % (2.01cps)

Max crosstalk rate : 5.00 %

SUCCESSFUL

Beta crosstalk in Alpha

Min crosstalk rate : 0.00 %

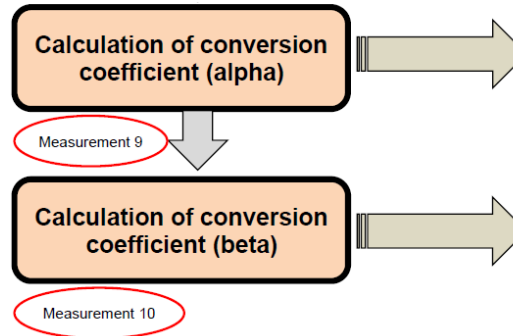
Crosstalk rate : 0.02 % (0.02cps)

Max crosstalk rate : 0.10 %

SUCCESSFUL

Next > Cancel

STEP 9&10



Calculates count rate conversion coefficients in equivalent activity (used to display equivalent activity).
 Calculation of the calibration coefficient is no longer systematic. Verification of the efficiency values with the default calibration coefficient is sufficient to validate the probe.
 A measurement of activity for each measurement channel will be proposed to verify that the probe detects the activity of the source in use.
 If the measurement is equal to $\pm 25\%$ of the source in use, the probe shall be calibrated with the current date.
 Otherwise, the user can either return to the high voltage step and repeat the calibration process, or calculate his own calibration coefficient despite the risks.

- Alpha and Beta Count-rate to activity equivalent check
- If successful with default parameters/isotopes
 - Automatic calibration is completed
- If not successful
 - Restart the calibration process from Electronic discriminator or re-cal manually

MANUAL CALIBRATION



Probe settings

Probe settings - superadministrator level

AB-100

Identification

Serial number: Type:

Firmware release: Detection surface: cm²

Status

Supply voltage: V US Units

High Voltage: V Current unit:

Average current: μ A Average T⁺: °C **Alpha + Beta mode**

Configuration Calibration Alarm threshold Factory alarm threshold Alpha and Beta alarm threshold Factory Alpha and Beta alarm threshold

Beta

Background noise (CPM)

Coefficient (DPM/CPM)

Alpha

Background noise (CPM)

Coefficient (DPM/CPM)

- If activity needs to be reported to another isotope
- **Select Probe settings module**
 - Click on Alpha or Beta « Modify » button
 - Fill all input boxes and start measurement

Conversion coefficient calculation CPM --> DPMeq: BETA

Measures

Number of measurements:

Activity

Activity (4 pistr) n°1

Integration time

s

Gross count

c

Net count (>1000c)

c

Actions

Last adjustment

Date: 17-07-25 - 19:19:35

Reference source: Source emitter: Conversion coefficient:

Adjust parameters

Date: Thursday, July 17, 2025 7:20:12 PM

Reference source:

Source emitter:

Calibration validity period: months

Conversion coefficient calculation CPM --> DPMeq: BETA

Save new parameters

Thank you

