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

Frédéric Meyer

Hand-Help HP Product Line Manager

Mirion Connect | Annual Users' Conference 2025

Orlando, Florida

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Summary

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

CSPevo and LightLink® Technology Heads-up

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POWERED BY LightLink®

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

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(*) Patent pending

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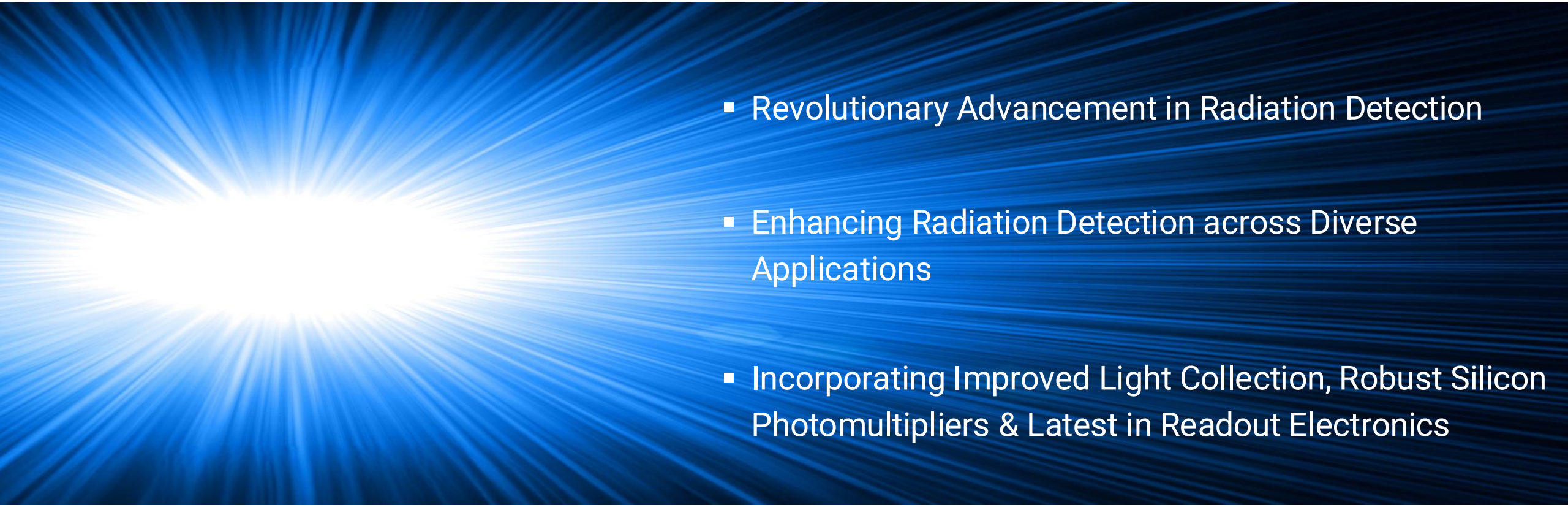
Overview

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

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USB Connectivity

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

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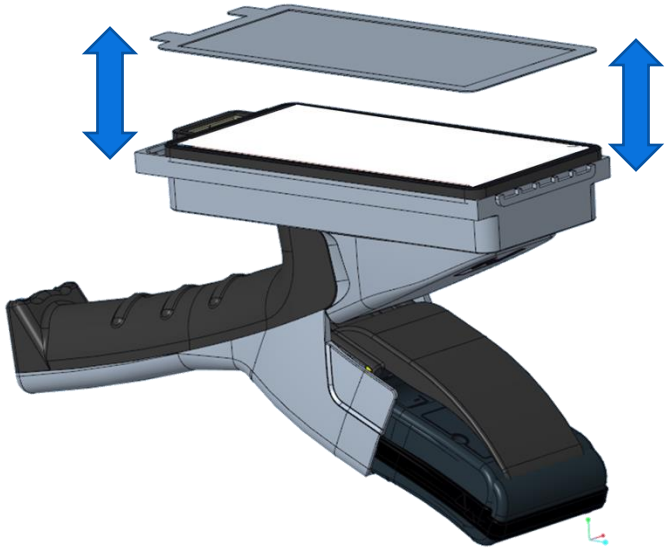
How to replace the Mylar window?

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

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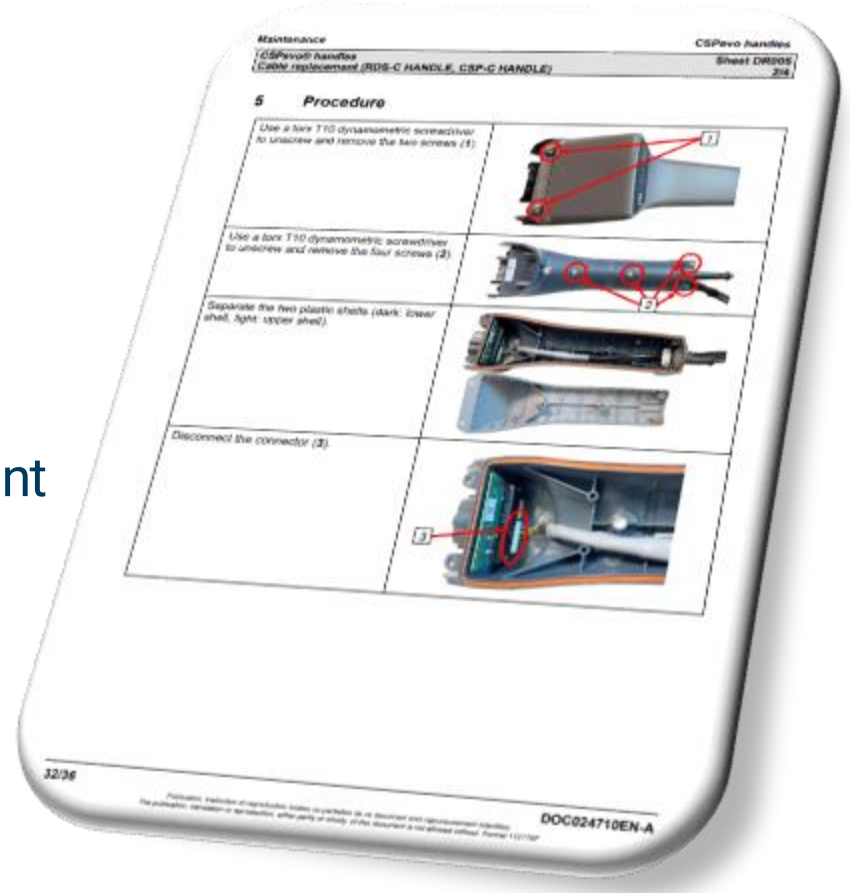
Service Manuals

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



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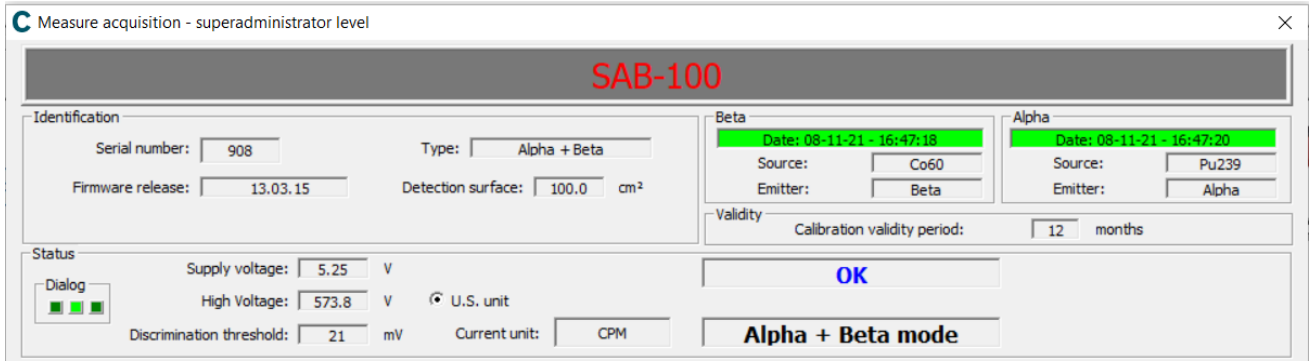
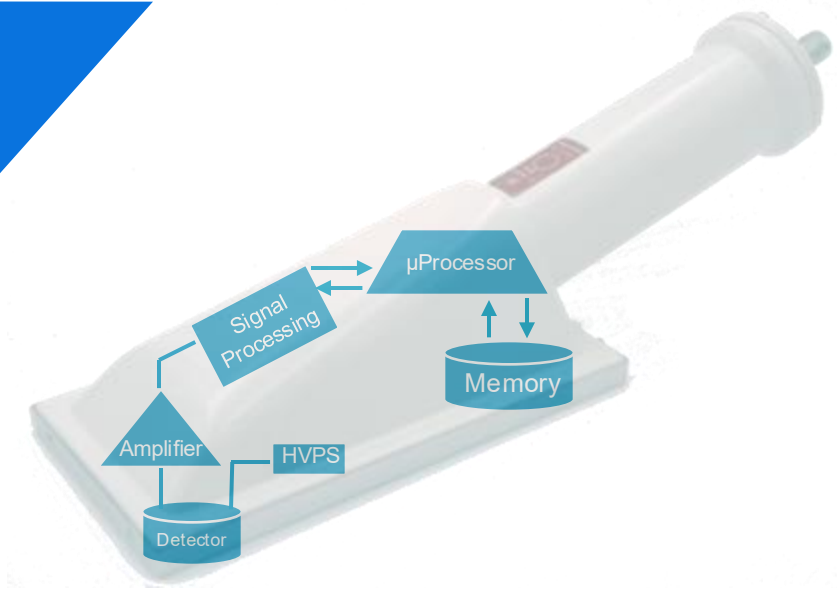
CSPS Overview

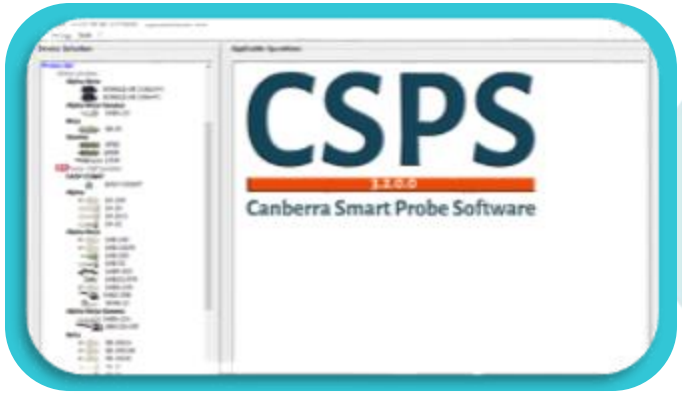
CSP & CSPevo SMART SPECIFICS





- 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



1 Cable Fits ALL

USB CSP CABLE
USB-C for AB-100

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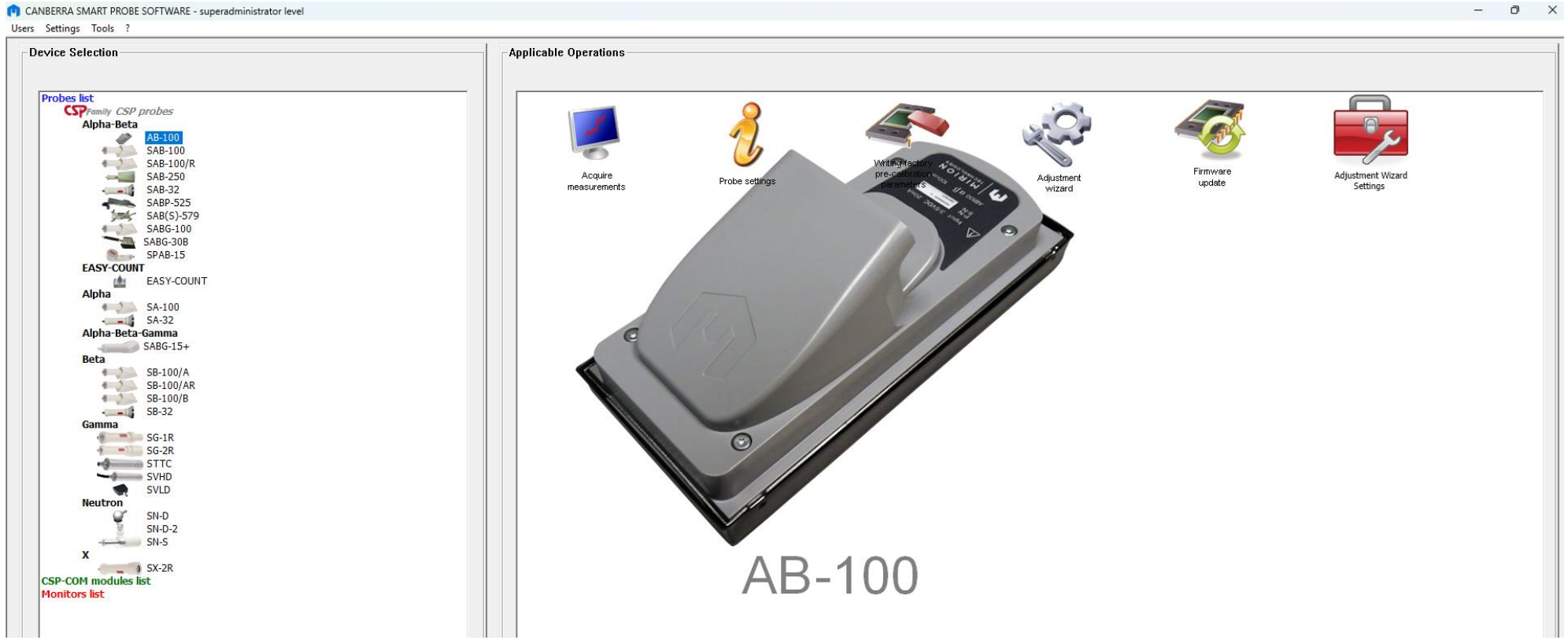
CSPS



Instrument selection

Available functions for the specific instrument

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CSPS FEATURES

- Acquire measurement
  - Daily operational checks
  - Manual acquisitions

- Instrument settings
  - Manual setup of the instrument
  - Calibration date management

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

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

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

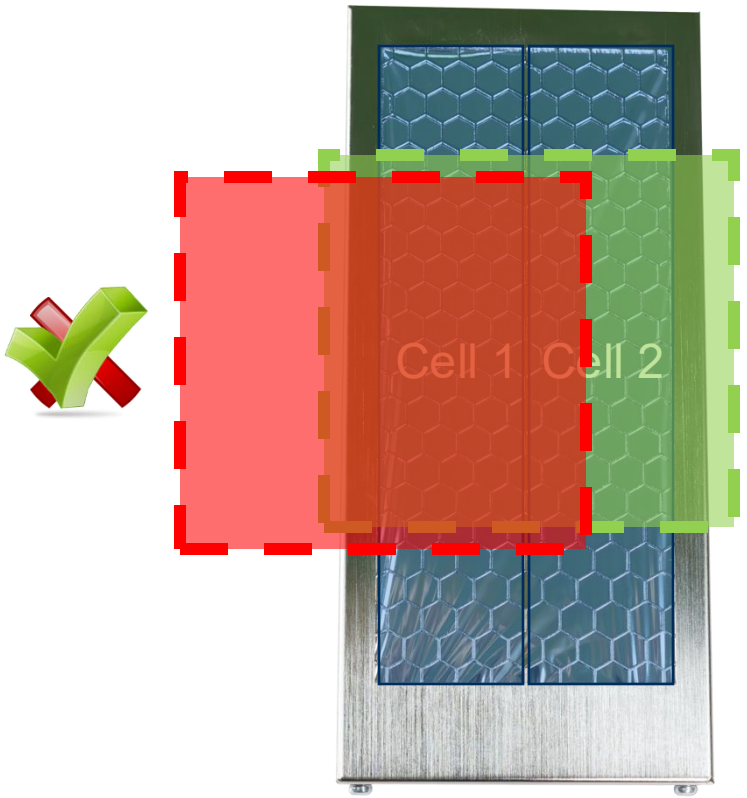
- Adjustment Wizard Settings
  - Setup radiation source to be used for each probe
  - Define expected results for a successful automatic calibration
  - Preset default min and max parameters

LightLink® Specifics to Calibration

POWERED BY

LightLink®

(Patent pending)



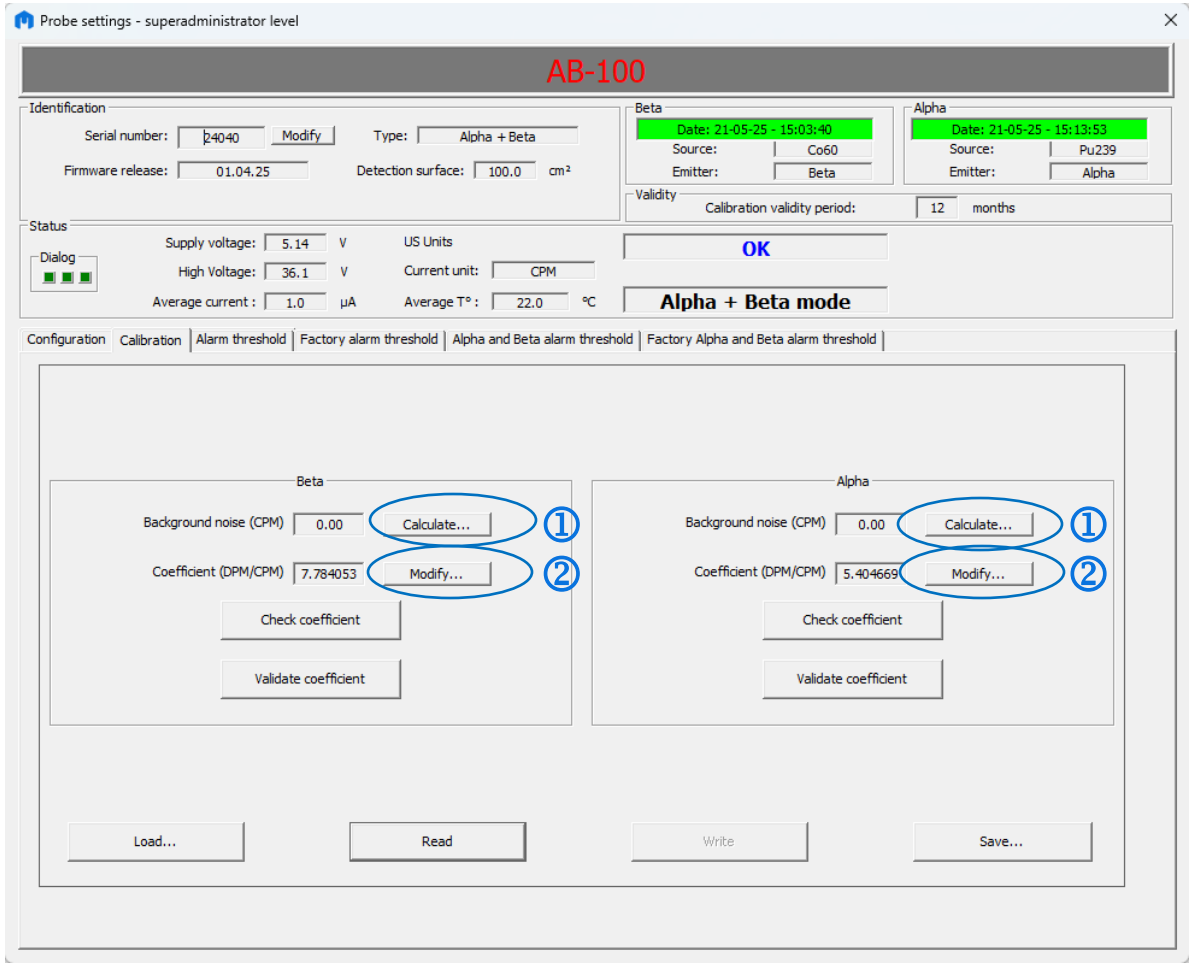
- LightLink is a scalable Technology
  - AB-100 Light Collection is Based on 2 cells
- LightLink ensures no light interference between each cell
  - Electronic Discriminator is the key calibration setting for each cell
    - ➢ Ensure Minimum C-14 Eff is met for temperature range
  - Other calibration 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

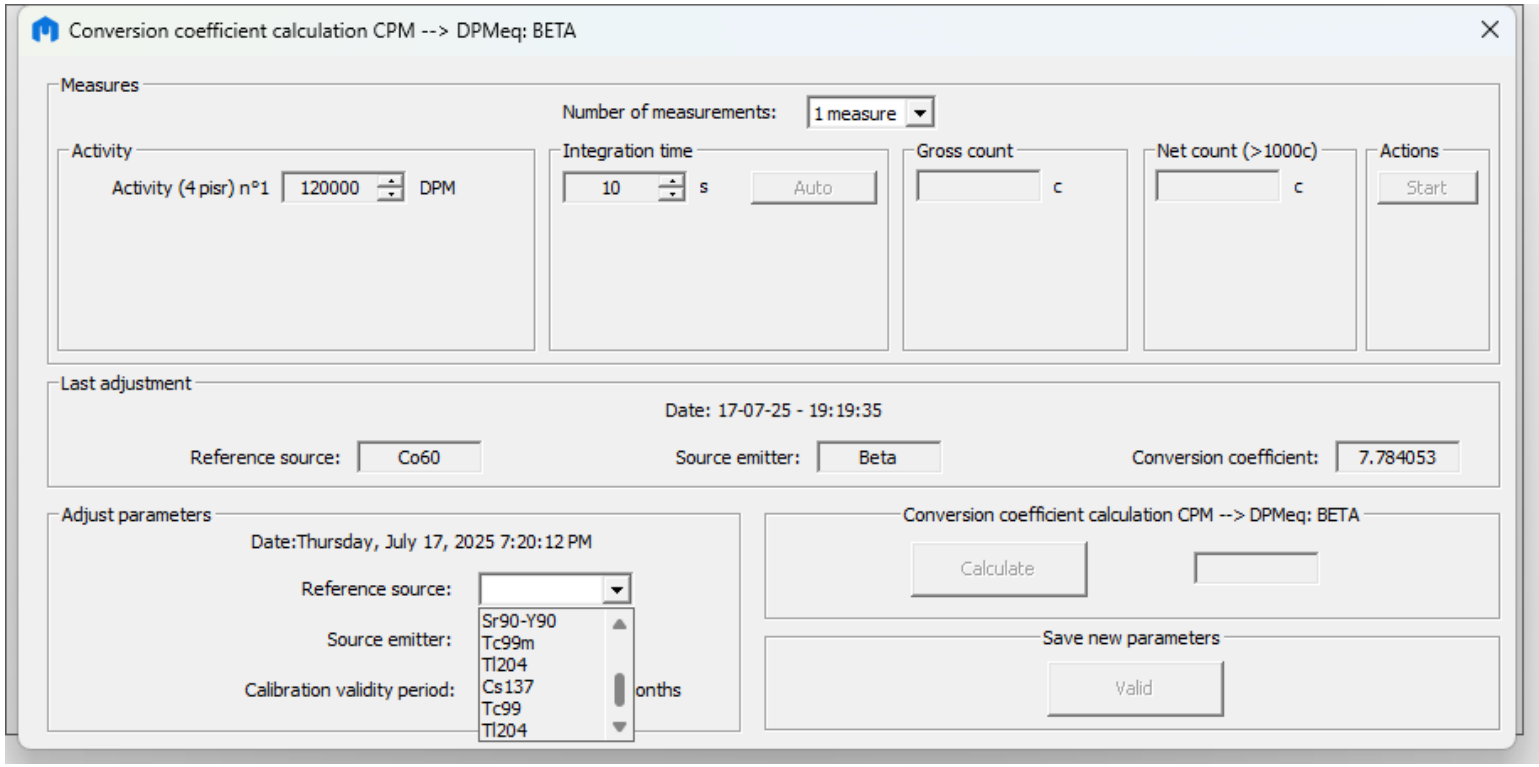
- AB-100 is setup and operational
  - Factory Activity equivalent
    - ➢ Beta: Co-60
    - ➢ Alpha: Pu-239
- User can calibrate to other isotope
  - One isotope at a time
    - ➢ One for Alpha and one for Beta

- **Select Probe settings module**
  1. Proceed to background measurement
  2. Click on Alpha or Beta « Modify » button



MANUAL CALIBRATION

Probe settings



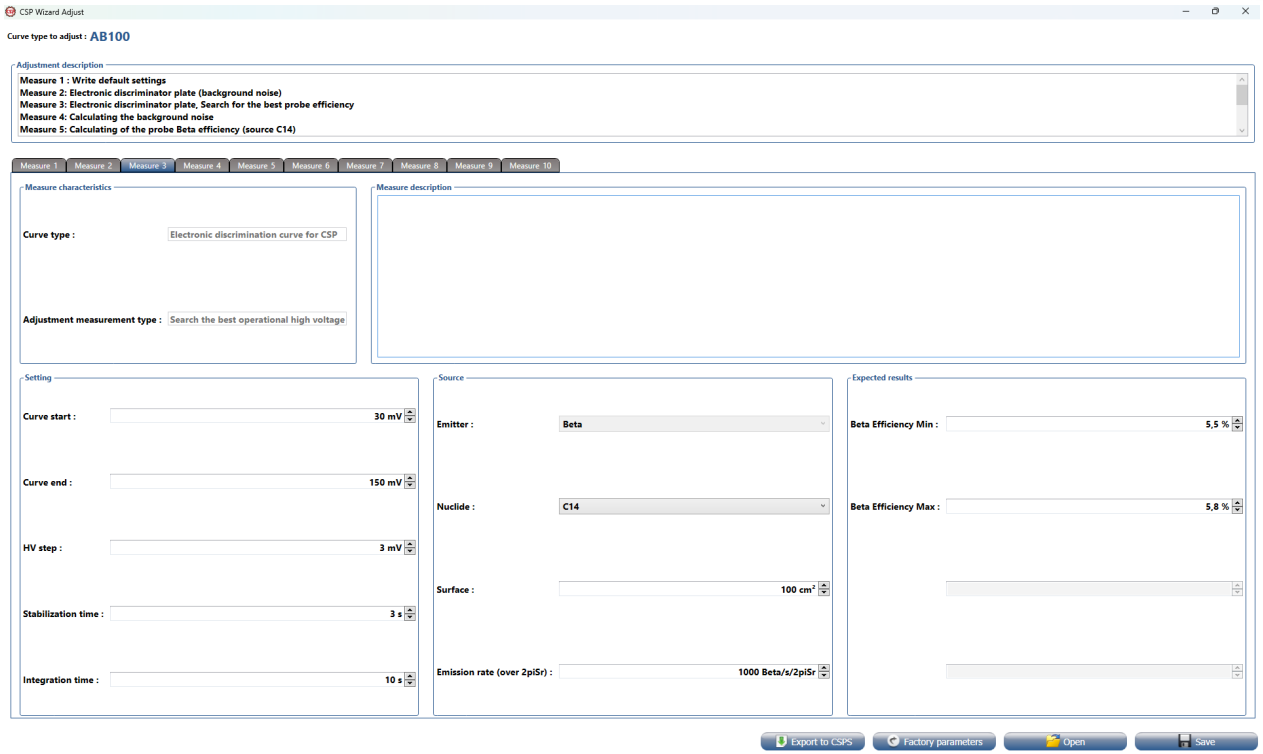
- Chose 1 to 3 measurements (Stat)
- Select Reference Emitter
- Enter Reference Source activity (4PI)
- Integration Time
  - Enter Time in seconds or
  - Click Auto button
    - ➢ SW select most appropriate time
  - ➢ Hit Start button
  - ➢ Hit Calculate button
  - ➢ Hit Valid button to save new parameter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

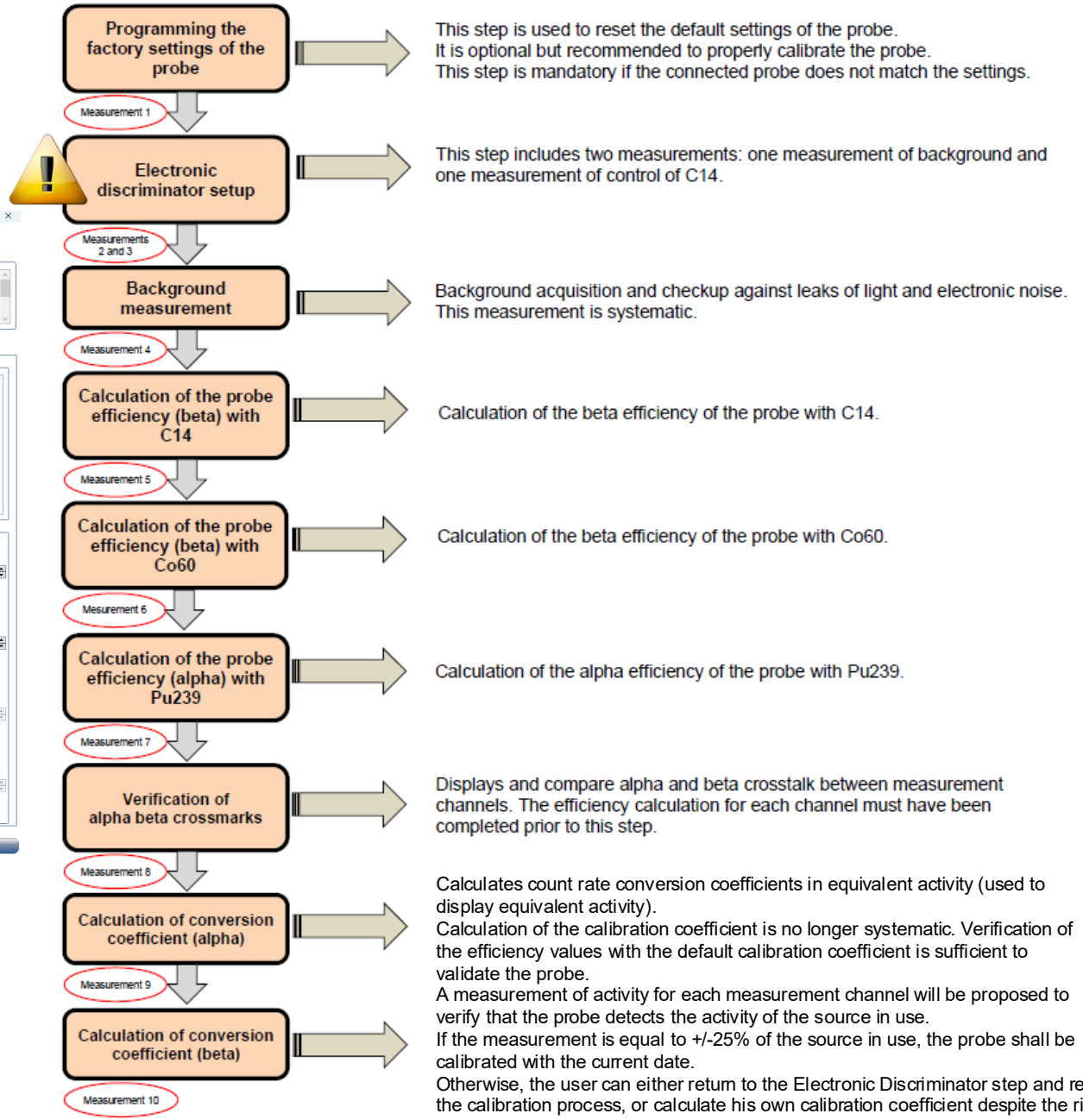
AB-100
Automatic Calibration

Automatic Full Calibration

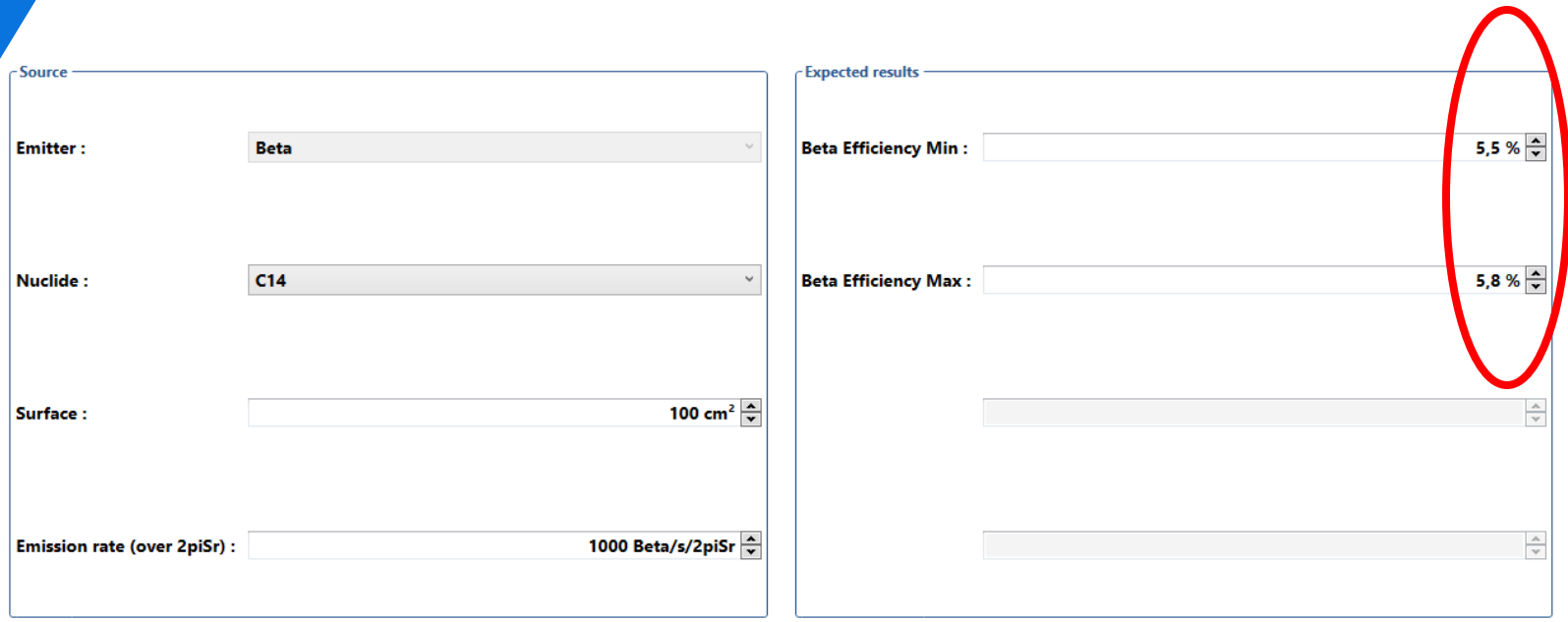
- Needed after AB-100 repair
  - Detector replacement
  - LightLink module replacement
  - If probe response test failed
- Regular check can be performed with CSPS Acquisition module or connected meter

AB-100 Cal Steps



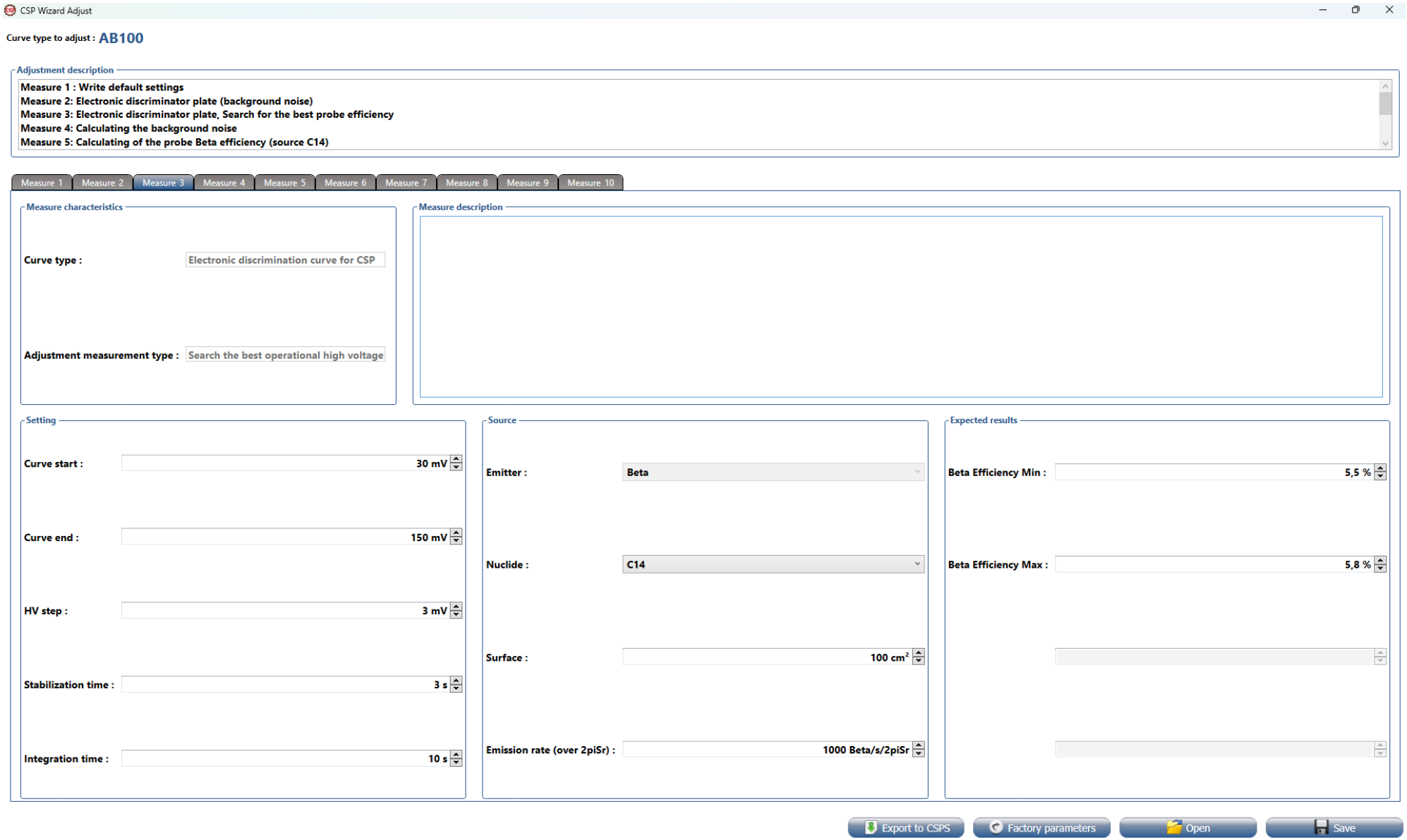


Probe Efficiency



- 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

CSPS Live


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 %
Export to CSPS
Factory parameters
Open
Save

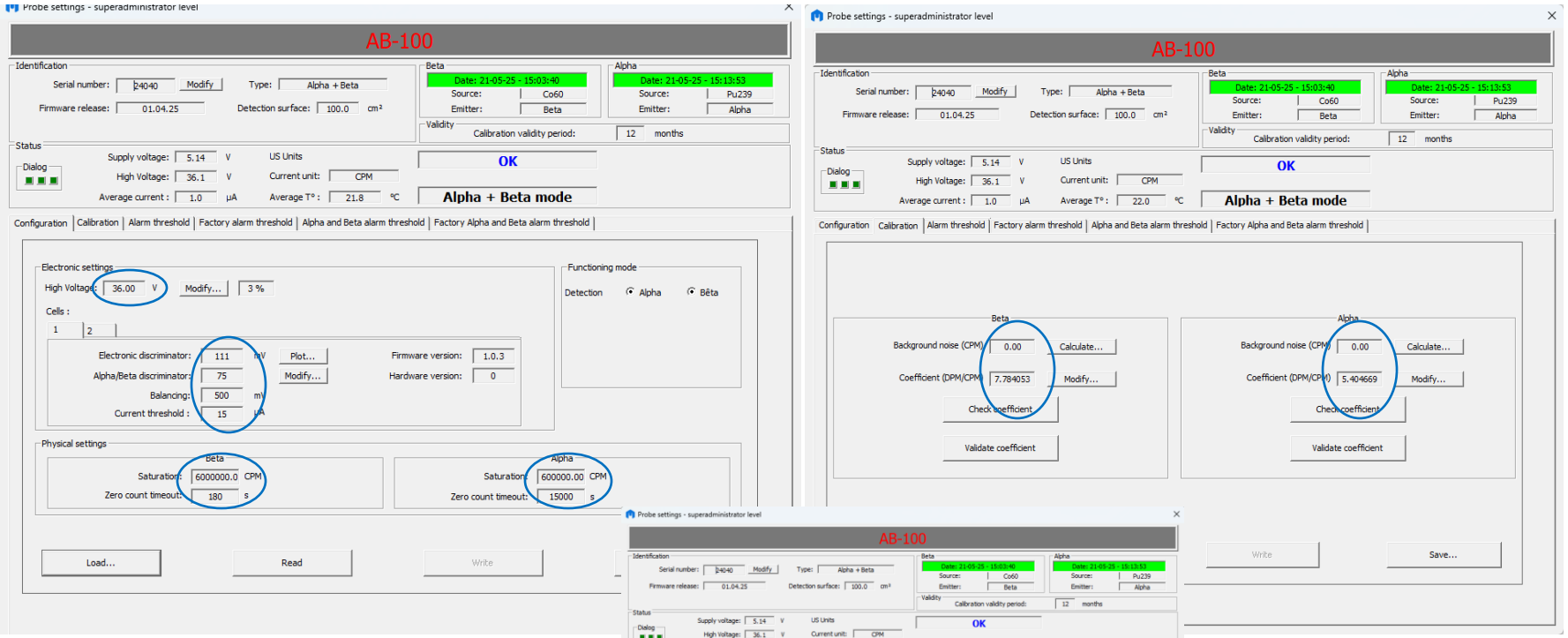
STEP 1

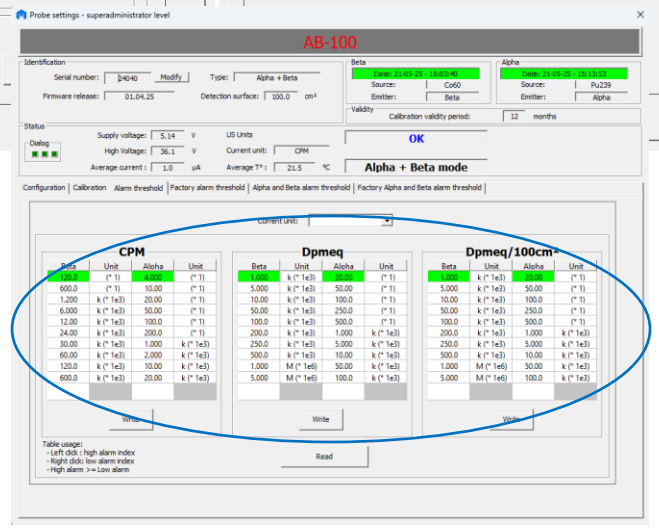
Programming the factory settings of the probe

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.

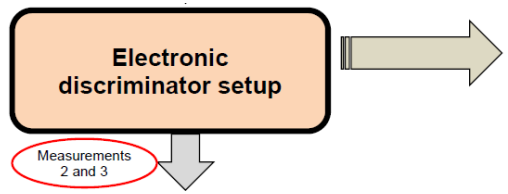
- Software loads all default parameters
  - Known to ensure good operation
  - Mandatory after a probe repair
    - « High Voltage »
    - Discriminators
    - Current threshold (saturation)
    - Saturations points
    - ZERO count time-out
    - Background level
    - Count to Activity coefficient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



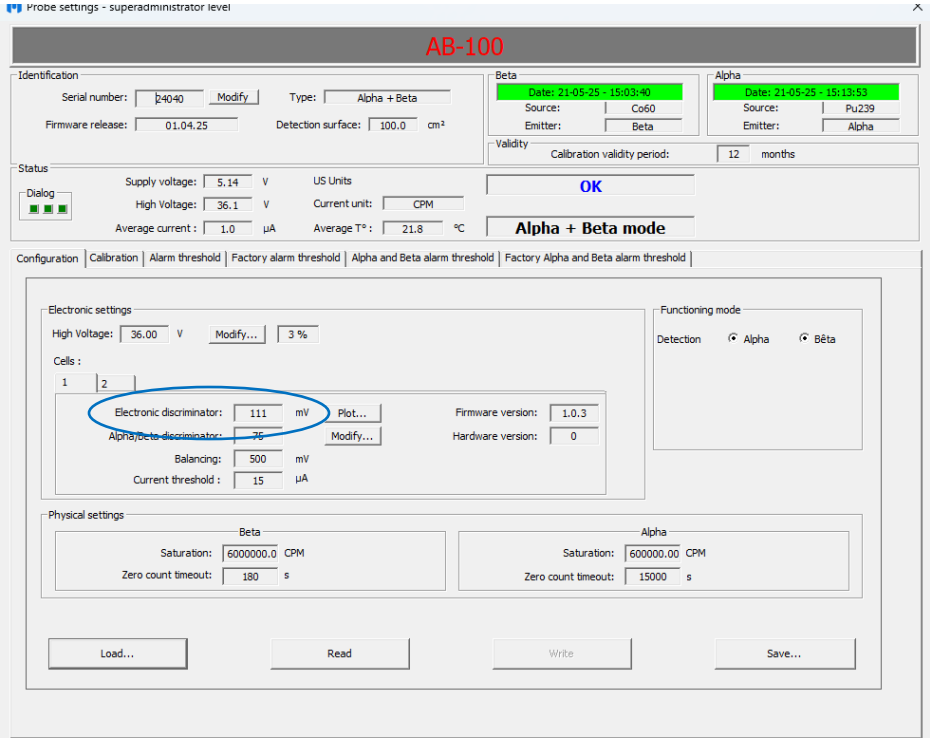


Can skip this step

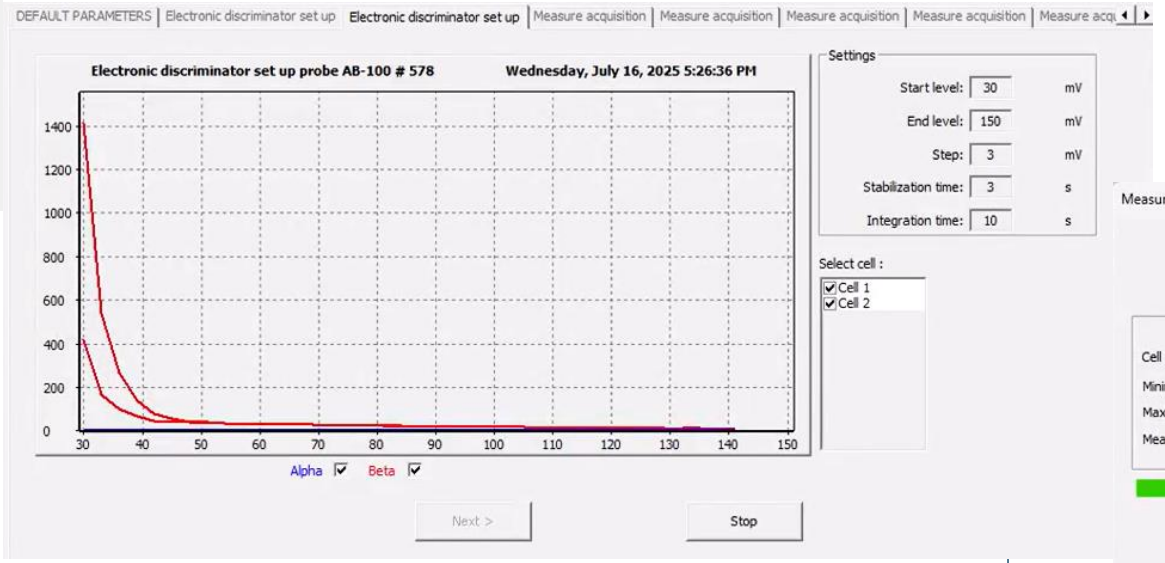
STEP 2&3



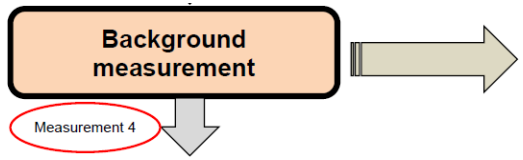
This step includes two measurements: one measurement of background and one measurement of control of C14.



- 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% < RESULT < 5.8%

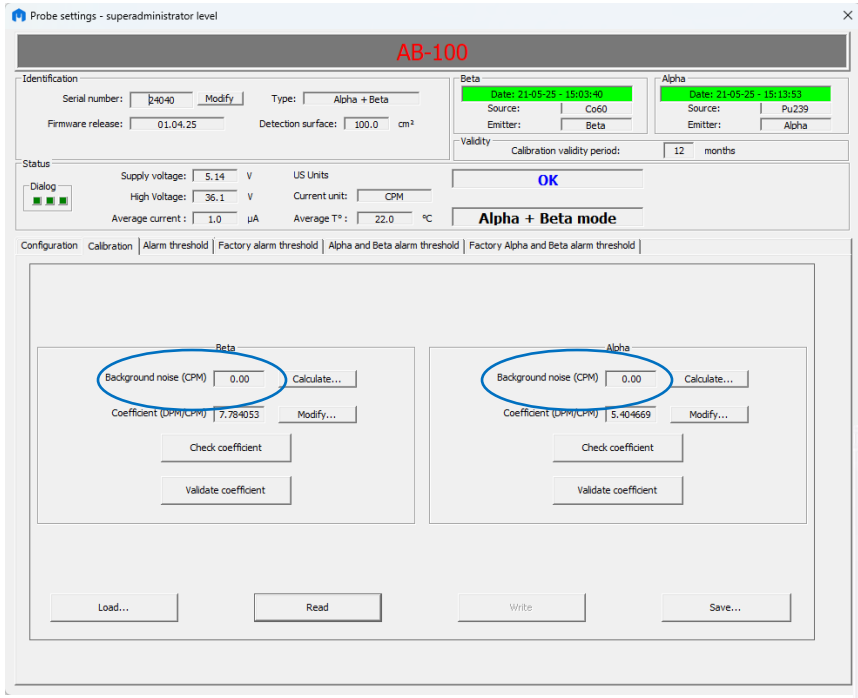


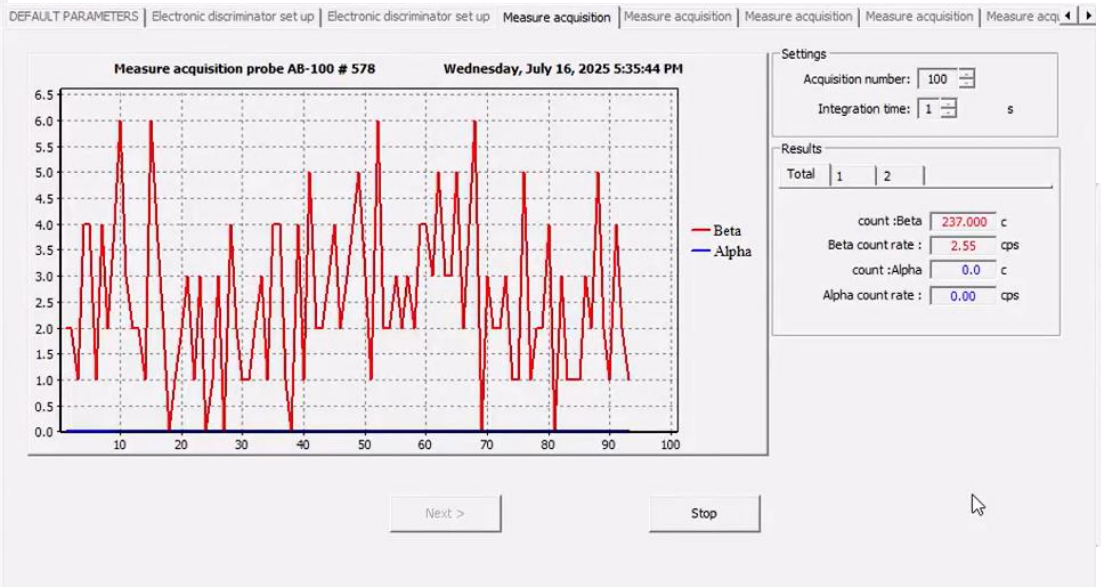
STEP 4

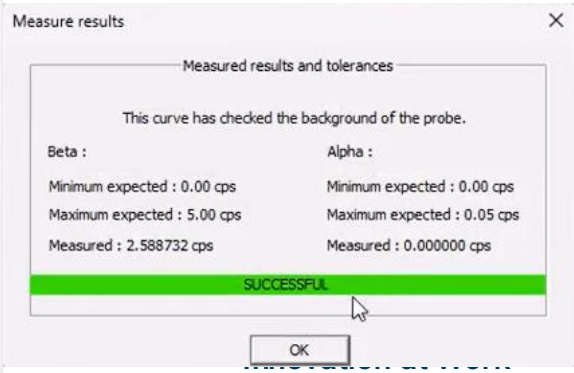


Background acquisition and checkup against leaks of light and electronic noise. This measurement is systematic.

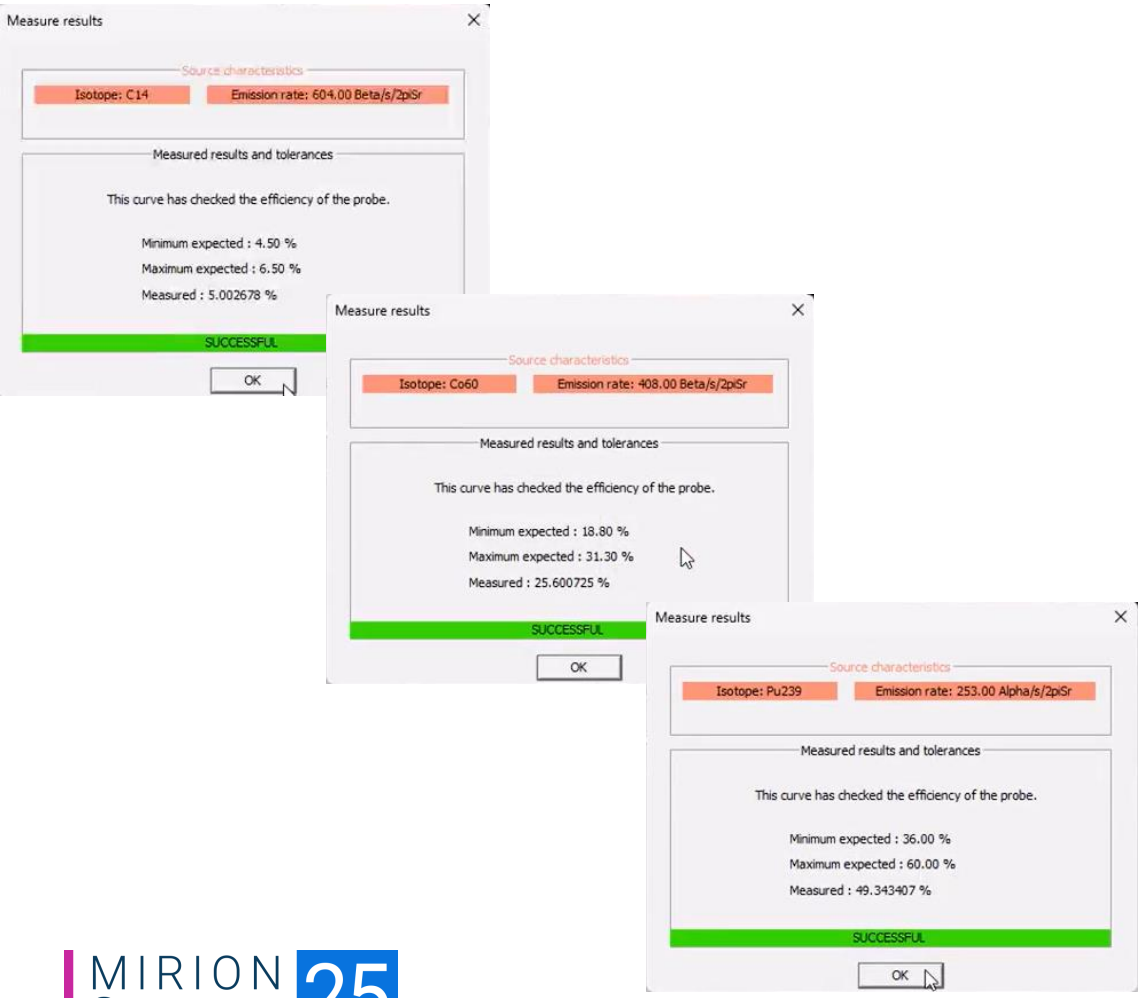
- Background acquisition
  - To be deduced from measurements to follow
    - C-14, Co-60 and Pu-239 efficiencies
    - Count-rate to activity coefficent
  - Confirm AB-100 quality
    - Detection module is light tight
    - Electronic noise does not interfere with measurement

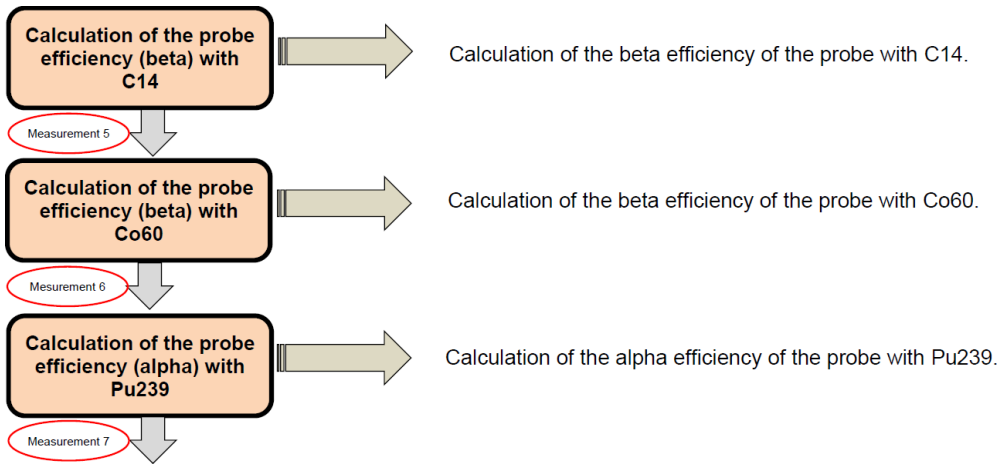






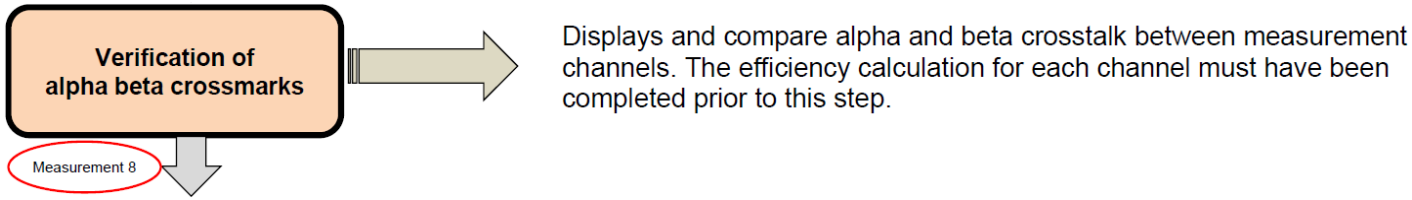
STEPS 5-7

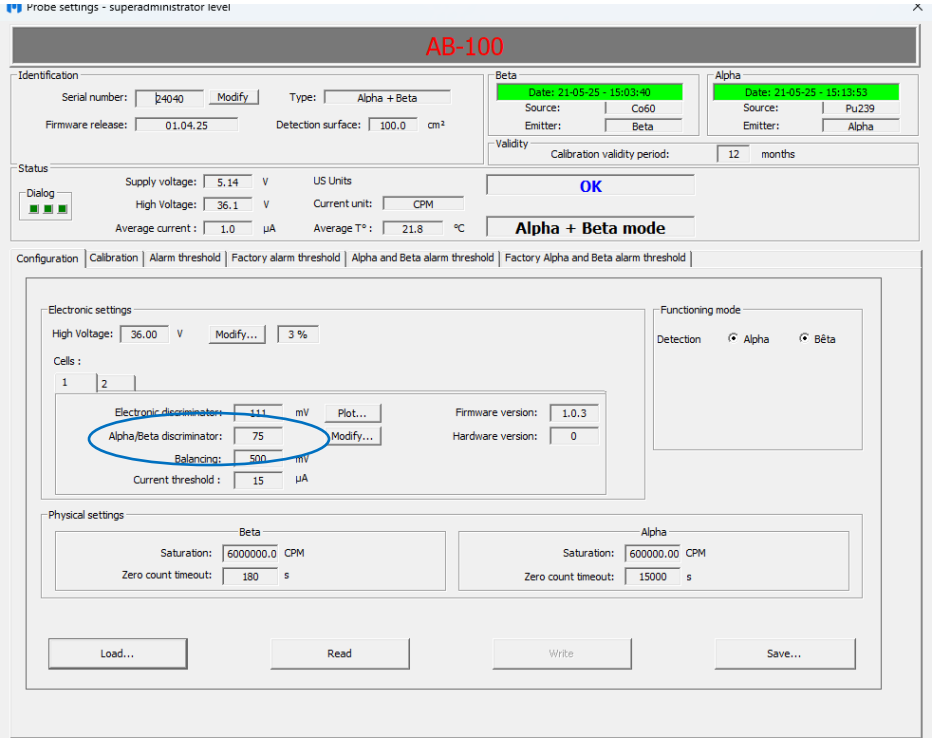




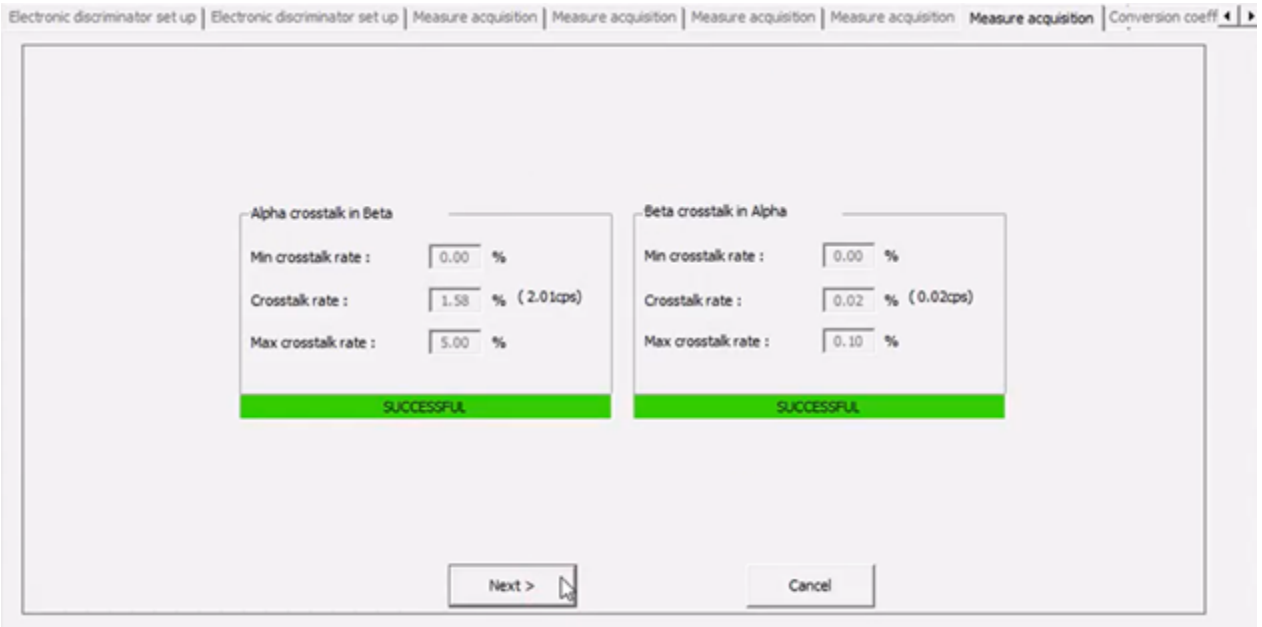
- Efficiency calculation for focussed isotopes
  - C-14: 4.5% < RESULT < 6.5%
  - Co-60: 18.8% < RESULT < 31.3%
  - Pu-239: 36% < RESULT < 60%
- **Ensure probe response to Beta low energies and Alpha is correct**

STEP 8





- Alpha/Beta Crosstalk check
  - Beta to Alpha < 5%
  - Alpha to Beta < 0.1%
- Automatic result following Efficiencies calculation



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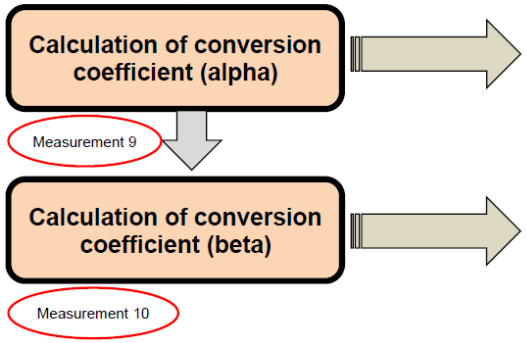
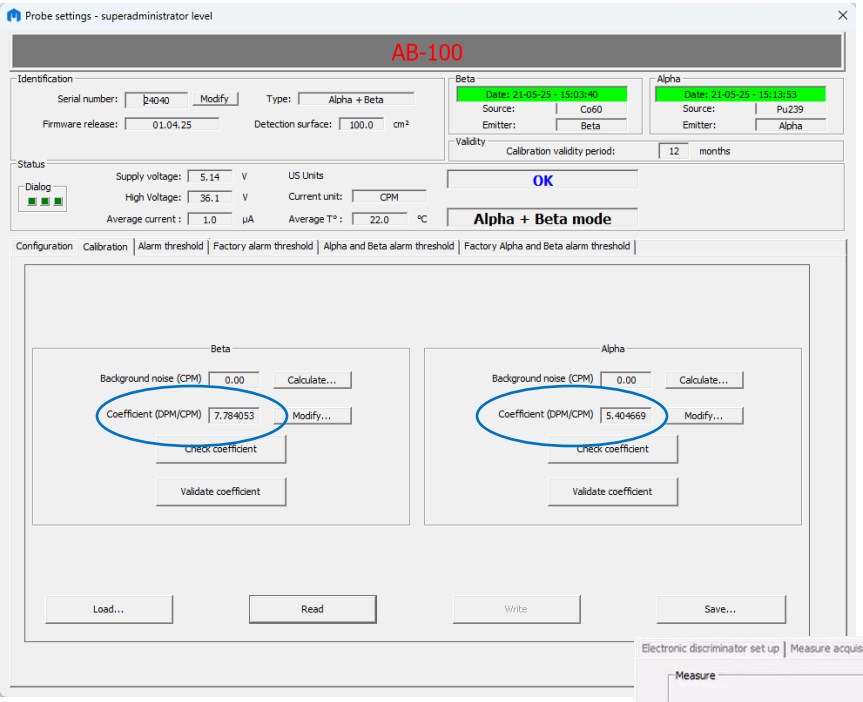
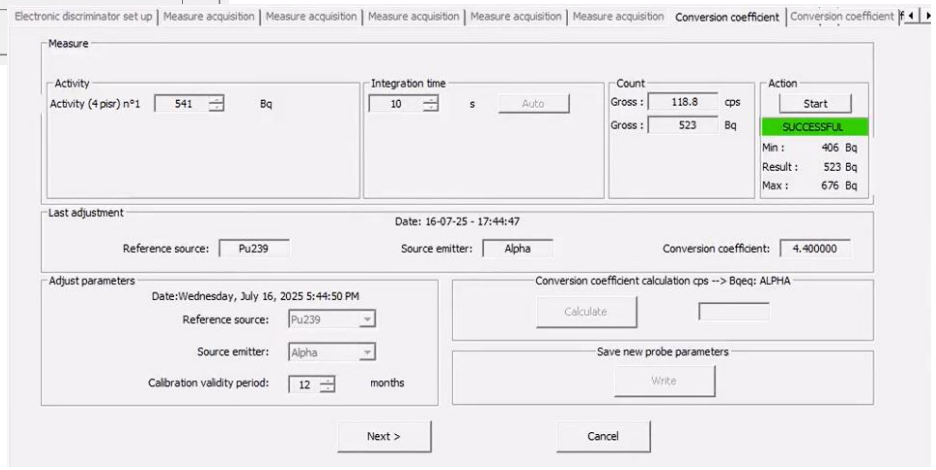
STEP 9&10

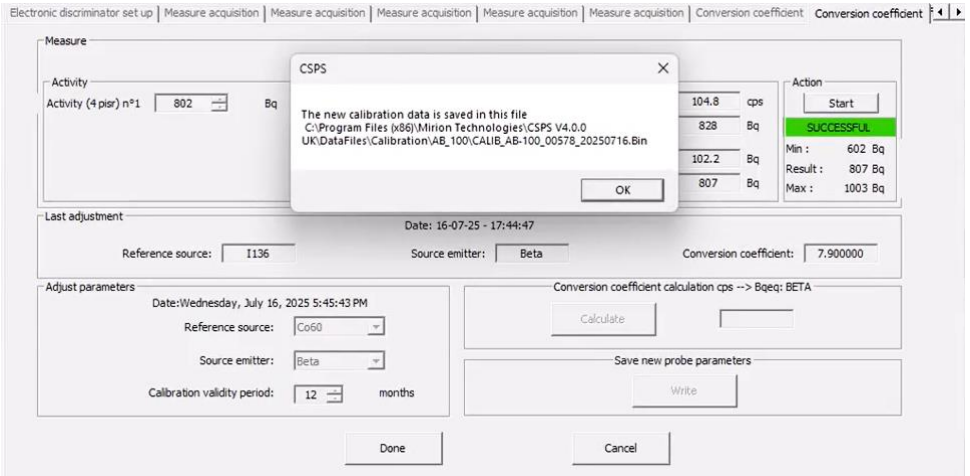


Calculates count rate conversion coefficients in equivalent activity (used to display equivalent activity).
Calculation of the calibration coefficient is no longer systematic. Verification of the efficiency values with the default calibration coefficient is sufficient to validate the probe.
A measurement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

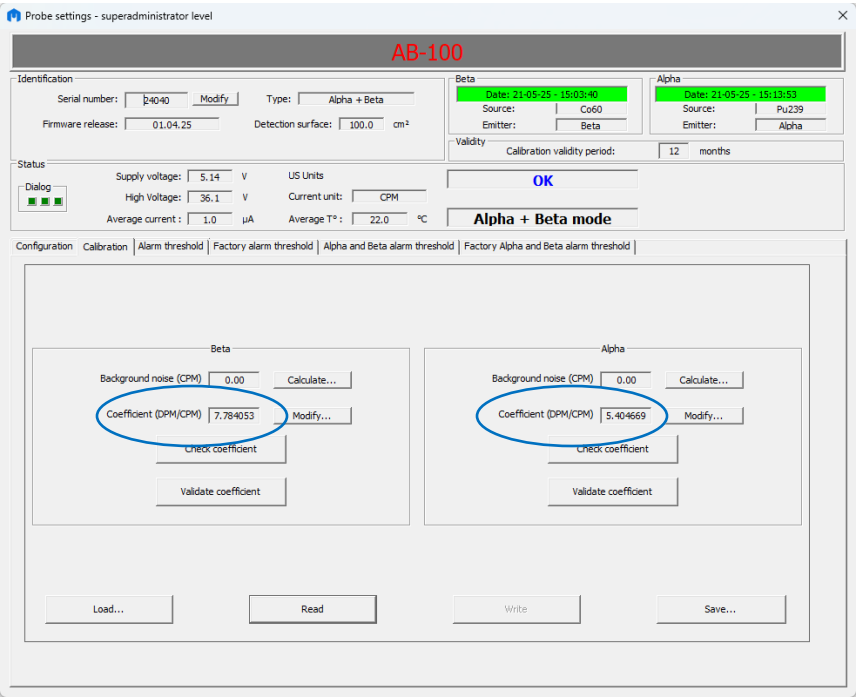


- Alpha and Beta Count-rate to activity equivalent check
- **If successfull with default parameters/isotopes**
  - Automatic calibration is completed
- **If not sucessful**
  - Restart the calibration process from Electronic discriminator or re-cal manually



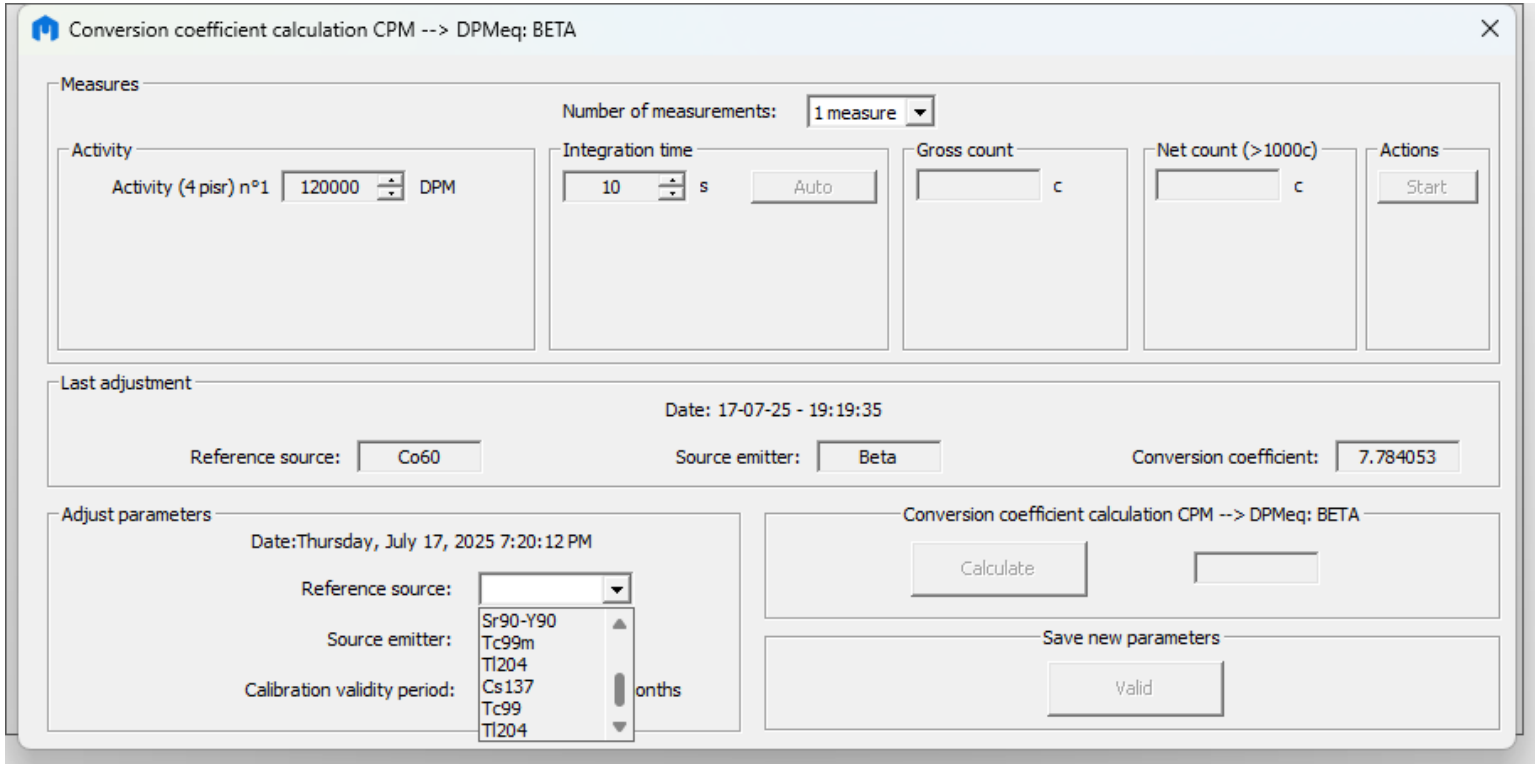


MANUAL CALIBRATION



Probe settings

- 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



Thank you