



Engage. Explore. Empower.
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

New Alpha/Beta 100 cm² Smart Probe

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Mirion Connect | Annual Users' Conference 2024

Dallas, Texas

SUMMARY

- What Smart Means to CSP Probes
- Product Range Overview
- CSP Calibration
- CSP: A Sensor for Third Party Systems
- Introduction to LightLink
- Problems with Current Probe Technology
- Mirion Solution
- Probe Details

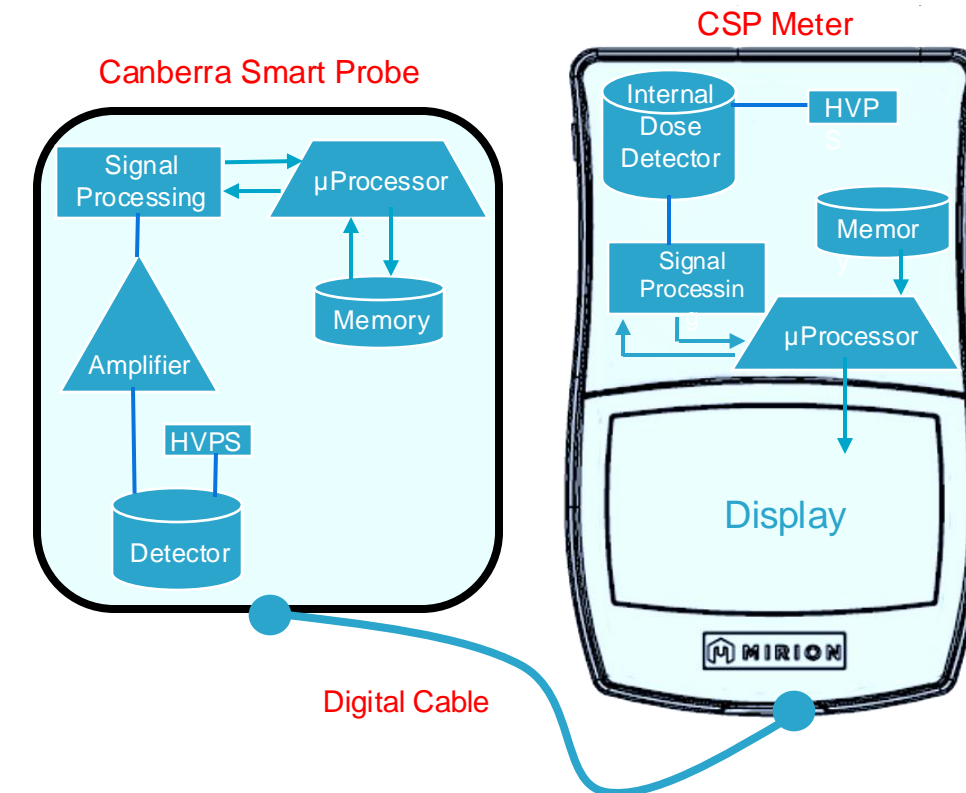
What Smart Means to CSP Probes?



THE SMART APPROACH



- Fully integrated solution for hand-held health physics
- Maximize efficiency and reduce Total Cost of Ownership
- Wide range of dose rate and survey meters and probes
 - Solutions to suit many applications
 - Maximize training and expertise
- Plug any Canberra Smart Probe (CSP) to any CSP compatible survey meter
 - No further setup required, no need to re-calibrate the instrument
 - Each probe is self-contained and separately calibrated with computer
- Extremely efficient power consumption
 - Ten times lower than that of conventional PMT based probes
 - Supports direct connection to a laptop USB port via Canberra Smart Probe Software (CSPS)
 - Perform daily checks and/or calibration
 - Enables the host instrument to remain in use
- Digital communication – minimizes cable quality issues
- Easily use CSP probes in third party systems with CSP-PL programming library
 - Speeds and simplifies custom developments



METERS AND PROBES DELIVER SIGNIFICANT BENEFITS

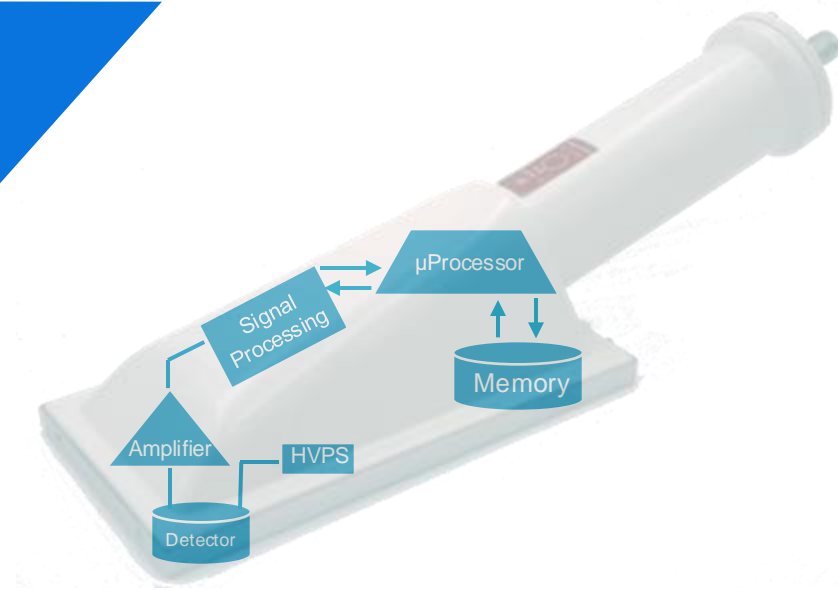


- More instruments are available in the field
- Considerably less calibration and set-up time
- 100% compatibility with all instruments
- Reduced daily workload
- Reduced need for paper and logbooks
- Improved accuracy of data transcription



REAL TIME MEASUREMENT DISPLAY ON METERS AND COMPUTERS

The screenshot displays the 'Measure acquisition - superadministrator level' window for the SAB-100. It features a header with 'SAB-100' in red. Below, the 'Identification' section includes fields for 'Serial number: 908', 'Type: Alpha + Beta', 'Firmware release: 13.03.15', and 'Detection surface: 100.0 cm²'. The 'Status' section shows 'Supply voltage: 5.25 V', 'High Voltage: 573.8 V', 'Discrimination threshold: 21 mV', and 'Current unit: CPM'. On the right, 'Beta' and 'Alpha' measurement data are shown with dates and times, sources (Co60 and Pu239), and emitters (Beta and Alpha). A 'Validity' section indicates a 'Calibration validity period: 12 months'. At the bottom, there are 'OK' and 'Alpha + Beta mode' buttons.



- 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

Product Range Overview





FAMILY



Cable Adapter

SABG-15+ GM Pancake

$\alpha\beta\gamma$

SPAB-15 PIPS

α/β

SAB-32 Plastic/ZnS

α/β

SA-32 ZnS

α

SB-32 Plastic

β

SAB-100 Plastic/ZnS

α/β

SABG-100 Plastic/ZnS

$\alpha/\beta\gamma$

SA-100 ZnS

α

SB-100 Plastic

β

SAB-250 Plastic/ZnS

α/β

SN-D Helium 3

η

SN-S Helium 3

η

SABP-525 Plastic/ZnS

α/β

SABS-579 Plastic/ZnS

α/β

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)

$\alpha\chi\gamma$



FAMILY

8 cm²

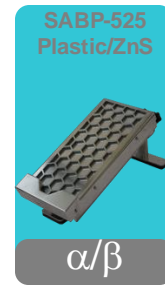
15 cm²

32 cm²

100 cm²

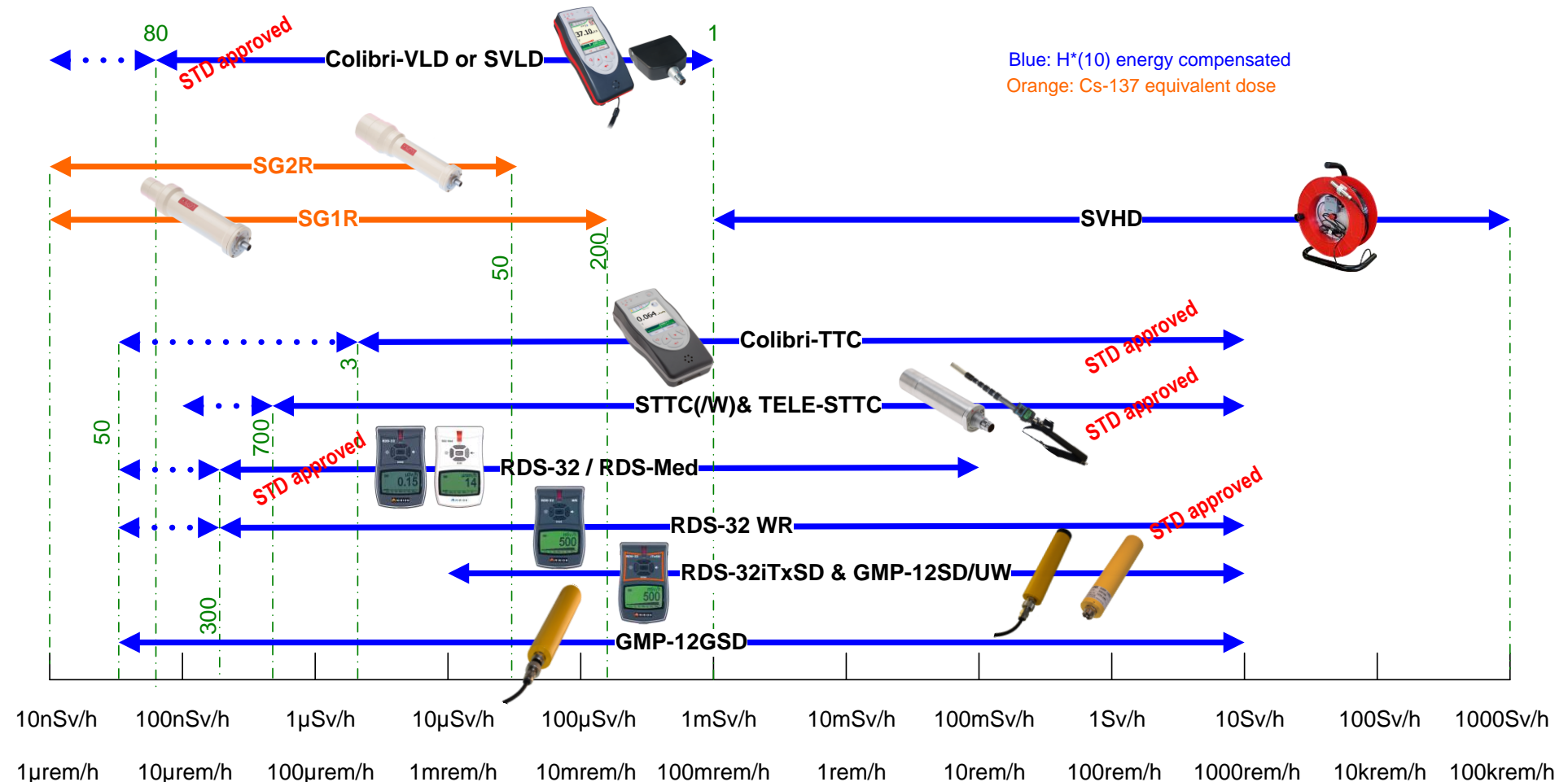
250 cm²

>500 cm²



DOSE EQUIVALENT RATE RANGES

SG-1R and SG-2R are measuring Dose-Rate equivalent to Cs-137



COMPATIBILITY MATRIX

																						
		Multi-purpose contamination probe	Alpha-Beta discrimination in high gamma background	Contamination check in high Gamma/Neutron background	Personal Beta contamination check	Alpha/Beta discrimination for personal testing	Large area Alpha contamination check	Large area Beta contamination check	Alpha/Beta discrimination on large contamination area and personal testing	Large area Alpha/Beta testing or hand counting	Alpha/Beta counting on foot	Alpha/Beta contamination control on floor	Real Alpha/Beta SweepFilter Counter	Low dose rate and gamma contamination probe	Very low dose rate and gamma contamination probe	Low energy Gamma/X and Alpha contamination check in hand environment	Neutron presence detection	Neutron dose equivalent rate	Very low H*(10) dose equivalent rate probe for public working area checks	Wide range H*(10) dose equivalent rate to ICRP-60	Wide range H*(10) dose equivalent rate to ICRP-60	Very high dose rate probe for hail control
Measurement Type		$\alpha \beta \gamma$	α/β	α	β	α/β	α	β	$\alpha/\beta (\gamma)$	α/β	α/β	α/β	α/β	γ	γ	$\alpha X \gamma$	n rate	n dose	γ dose	γ dose	γ dose	γ dose
Calibration & Setup		HV plateau	No	HV plateau	HV plateau	HV plateau - α/β crosstalk	HV plateau	HV plateau	HV plateau - α/β crosstalk	HV plateau - α/β crosstalk	HV plateau - α/β crosstalk	HV plateau - α/β crosstalk	HV plateau - α/β crosstalk	HV plateau - Isotope dose equivalent	HV plateau - Isotope dose equivalent	HV plateau	HV plateau	Dose coefficient	Dose coefficient	Dose coefficient	Dose coefficient	Dose coefficient
Data-logging transfer		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Acquisition		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PC cable		EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288
CSP.COM		No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No
Minimum Firmware version		V11.0	V11.0	V11.0	V3.0.2	V3.0.3	V11.0	V11.0	V11.0	V3.0.5	V31.0.0	V3.0.2	V2.20	V2.0.0	V2.0.0	V1.2.0	V2.0	V31.0.0	V3.0.0	V2.0	V2.0	TBD
Radiagem™ 2000 Meter		Cable	Cable Set 1 + Direct connection	Cable Set 1 + Direct connection	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	N/A	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	In pole	Cable set 1
Minimum Firmware version		V2.23	V2.23	V2.23	V2.23	V2.23	V2.23	V2.23	V2.23	V2.23	V2.23	V2.23	N/A	V2.23	V2.23	V2.23	V2.23	V2.28	V2.25	V2.23	V2.23	V2.23
Data-logging control (2)		Yes in probe memory	Yes in probe memory	Yes in probe memory	Yes in probe memory	Yes in probe memory	Yes in probe memory	Yes in probe memory	Yes in probe memory	Yes in probe memory	Yes in probe memory	Yes in probe memory	N/A	Yes in probe memory	Yes in probe memory	Yes in probe memory	Yes in probe memory	Yes in probe memory	Yes in probe memory	Yes in probe memory	Yes in probe memory	Yes in probe memory
CSP.COM		No	No	No	No	No	No	No	No	No	No	No	N/A	No	No	No	No	No	No	No	No	No
RDS-32™		Cable	Cable Set 2	Cable Set 2	Cable Set 2	Cable Set 2	Cable Set 2	Cable Set 2	Cable Set 2	Cable Set 2	Cable Set 2	Cable Set 2	Cable Set 2	Cable Set 2	Cable Set 2	Cable Set 2	Cable Set 2	Cable Set 2	Cable Set 2	Cable Set 2	In pole	Cable Set 2
Minimum Firmware version		V4.05.2	V4.05.2	V4.05.2	V4.05.2	V4.05.2	V4.05.2	V4.05.2	V4.05.2	V4.05.2	V4.05.2	V4.05.2	V4.05.2	V4.05.2	V4.05.2	V4.05.2	V4.05.2	V4.05.2	V4.05.2	V4.05.2	V4.05.2	TBD
Colibri ®		Cable	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	In pole	Cable set 1
Minimum Firmware version		V2.2	V2.2	V2.2	V3.0.3 Platform 1.1	V3.1.1 Platform 1.1	V2.2	V2.2	V2.2	V3.4 Platform 1.1	V3.4 Platform 1.1	V3.0.3 Platform 1.1	V3.0.1 Platform 1.1	V2.2	V2.2	V2.2	V2.0	V3.0.3 Platform 1.1	V2.6	V2.2	V2.2	TBD
Data-logging control		Yes in Colibri memory	Yes in Colibri memory	Yes in Colibri memory	Yes in Colibri memory	Yes in Colibri memory	Yes in Colibri memory	Yes in Colibri memory	Yes in Colibri memory	Yes in Colibri memory	Yes in Colibri memory	Yes in Colibri memory	Yes in Colibri memory	Yes in Colibri memory	Yes in Colibri memory	Yes in Colibri memory	Yes in Colibri memory	Yes in Colibri memory	Yes in Colibri memory	Yes in Colibri memory	Yes in Colibri memory	Yes in probe memory
CSP.COM-BT		(f)	(f)	(f)	(f)	(f)	(f)	(f)	(f)	(f)	(f)	(f)	(f)	(f)	(f)	(f)	(f)	(f)	(f)	(f)	(f)	(f)
AVIOR®-2/ MIP-2™		Cable	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	Cable Set 1	N/A	Cable set 1
Minimum Firmware version		V1.0.0	V1.0.0	V1.0.0	V1.0.0	V1.0.0	V1.0.0	V1.0.0	V1.0.0	V1.0.0	V1.1.2	V1.0.0	V1.0.0	V1.0.0	V1.0.0	V1.0.0	V1.0.0	V1.0.0	V1.0.0	V1.0.0	N/A	TBD
Data-logging control		Yes in instrument memory	Yes in instrument memory	Yes in instrument memory	Yes in instrument memory	Yes in instrument memory	Yes in instrument memory	Yes in instrument memory	Yes in instrument memory	Yes in instrument memory	Yes in instrument memory	Yes in instrument memory	Yes in instrument memory	Yes in instrument memory	Yes in instrument memory	Yes in instrument memory	Yes in instrument memory	Yes in instrument memory	Yes in instrument memory	Yes in instrument memory	N/A	Yes in probe memory
Hand/Foot mode		No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	N/A	No
CSP.COM		No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	N/A	No
Specific Application Software Development		PC cable	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78466 / NOM006288	EM78467 / NOM006288
CSP-PLD SDK compatibility		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CSP.COM-BT		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CSP.COM Ethernet		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Cable Set 1: EM77336 / NOM006282: 1.5 meter straight cable / EM77337 / NOM006283: 0.7 – 1.5 meter coil cable / EM99006 / NOM006513: 10 meter straight cable / EM98830 / NOM006512: 20 meter straight cable
Cable Set 2: 1233-318: 0.4 meter straight cable / 1233-319: 1.5 meter straight cable / 1233-320: 0.7 – 1.6 meter coil cable

(f) Except for Colibri-Basic version (not Bluetooth® capable)
(2) Requires CSPS platform to read data-logging with computer

CSP Calibration



ONE SOFTWARE FOR ALL CSP PROBES CALIBRATION/SETUP



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 $\alpha\beta$		
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



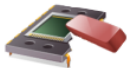
Data Logging

- Data-Logging
 - Setup (Integration time, index preference,...)
 - Download data stored in the field
 - Save in MS-Excel file



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



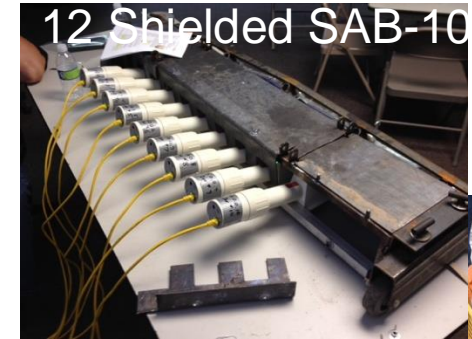
Adjustment Wizard Settings

- 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

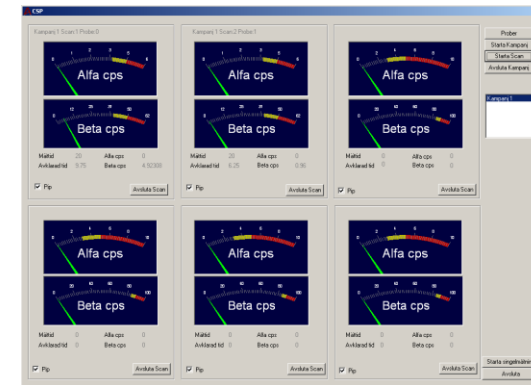
CSP: a Sensor for Third Party Systems



OPTIMIZED APPLICATION SUPPORT FOR COMPUTER BASED SYSTEMS



- CSP-PL: Windows® Programming library to support CSP probe integration in third party applications
- CSP-COM: Wired (Ethernet) or wireless (BT) Communication modules that extend CSP probe applications





OTHER APPLICATIONS



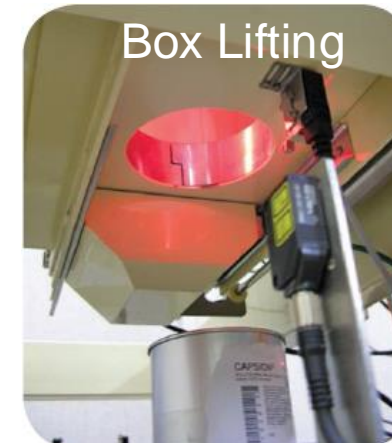
*Automatic Hot Spot
Localization on concrete drum*



Shielded enclosure



Automatic Conveyor



Box Lifting



PLC Station

- CSP Protocol: Non-Windows® Based Systems
- Direct Serial Communication
- CSP-COM with Cable Extension

*Transportation Index Control on
RadioPharma Shipping Boxes*

LightLink™ Technology





POWERED BY LightLinkTM

- 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



Enhanced Ergonomics

- Reduced Weight of Hand-Held Products
- Additional capabilities for drone applications
- Simplified Integration into 3rd Party Systems
- Easier Shielding
- Reduced Dead Zones



Extended In-Use Time

- Improved Signal to Background Ratio
 - Reduced Measurement Time
- Faster Light Decay Post-Servicing increasing Up-Time
- Improved concept of operations for handheld applications



Robustness & Longevity

- Less Susceptible to Breakage
- Reduced Downtime due to Repair
- State of the Art Electronics
- No Dark Room Requirement for Servicing
- Wide range of environmental use



Hyper Accurate & Sensitive

- High Tolerance to Microphonics / Vibrations
- Homogeneous Response Across Detector Surface
- No Sensitivity to Magnetic Fields
- Excellent Minimum Detectable Activity

Summary



- Introducing a Cutting-Edge Technology from Mirion Technologies
- Enhancing a Wide Range of Products Ranging from Handheld Devices to Contamination Monitors
- Improving Industry Standards in Productivity & Reliability
- New Solution supporting your Health Physics daily duties

We want to improve user experience



Think out of
the box



Leverage new
technology



Facilitate user
daily duties



Improve instrument
smartness

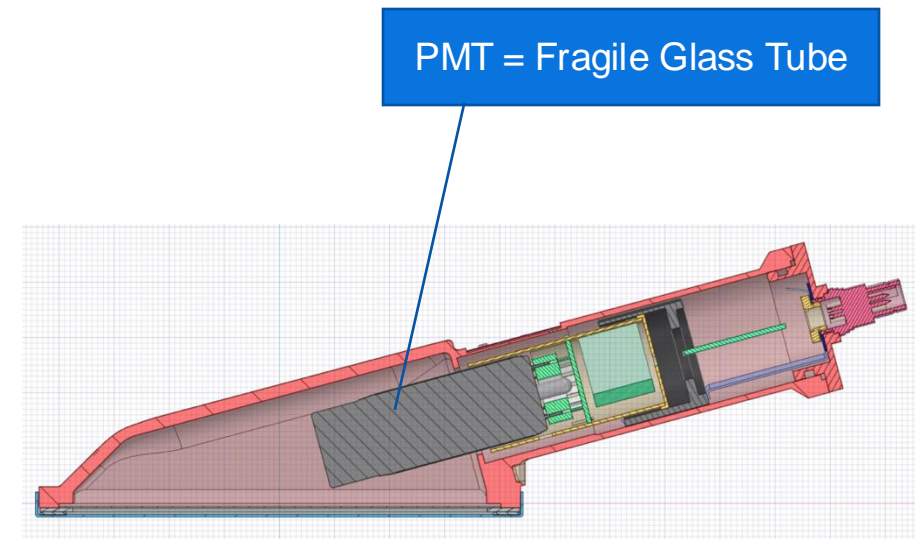


Problems with Current Probe Technology



Many contamination probes use PMT*

- Problem with PMT*
 - ✗ Breaks when dropped
 - ✗ Requires earth magnetic protection (adding weight)
 - ✗ Light collection
 - Big enclosure
 - Mediocre surface detection homogeneity
 - ✗ Waiting time after entrance window replacement
 - Light decay to avoid burning the PMT – up to few hours
 - ✗ Microphonics
 - ✗ Drives handle use (no real choice!)
 - ✗ Difficult to integrate in systems
 - Mechanical arrangement
 - Shielding



(*) *PhotoMultiplier Tube*

MIRION Solution



MIRION Solution: CSPevo

POWERED BY
LightLink™

- Integration of LightLink™ in replacement to PMT*
 - ✓ More durable in the field (Drop Proof)
 - ✓ No additional protection material needed
 - ✓ More efficient light collection
 - flat enclosure
 - Improved surface detection homogeneity
 - ✓ Entrance window replacement does not require more than 10 min before going back to operation
 - Quicker available in the field
 - ✓ No microphonics
 - ✓ Handle is designed with no constraint other than ergonomics
 - ✓ Detection module is easy to integrate into system
 - Mosaic arrangement with minimal dead area
 - Optimized shielding volume



Probe details



POWERED BY
LightLinkTM



CSPevo introduction



➤ A New 100 cm² detector

- Fragile PMT is replaced by LightLink
 - Detection area homogeneity is improved up to 85%
 - Minimized dead area with protection grid
 - Handle is designed to serve as a handle
 - ✓ No more a consequence of PMT placement
- Detector alone can be used into third party system
 - USB-C connection
 - ✓ Data transfer to host system
 - ✓ Calibration with CSPA

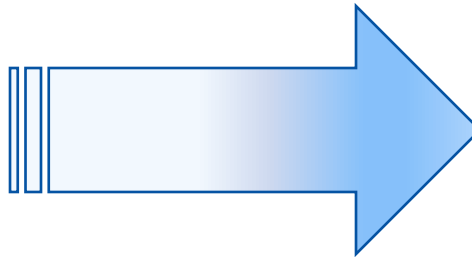
➤ A set of handles to adapt to meter usage and leverage installed base

- CSPevo is 100% compatible with CSP meter already in the field
 - No need to upgrade meter firmware
- RDS-32 based one hand configuration
 - No cable needed

FROM SAB-100 to SAB-100evo



- Economical solution
 - SAB-100 required additional cable
 - Handle now includes the cable



ONE HAND OPERATIONAL SYSTEM

- CSPevo with RDS-32
 - No cable needed

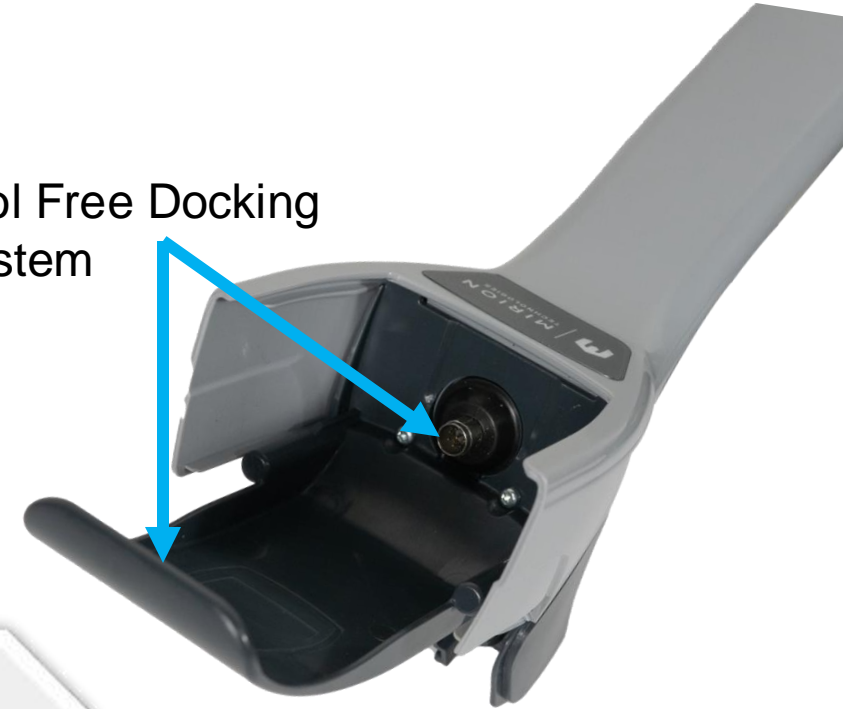


ONE HAND OPERATIONAL SYSTEM

- CSPevo for RDS-32
 - One screw to lock handle on the detector
 - Simple RDS-32 sliding into handle



Tool Free Docking System



One smart detector fits all



One Hand



One Probe



One System

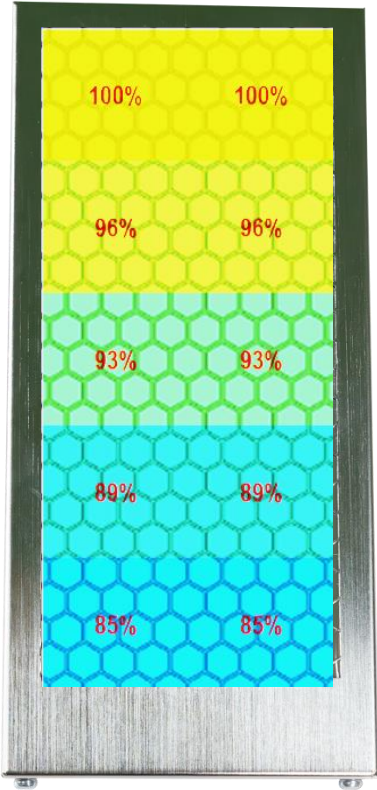


USB CONNECTIVITY

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

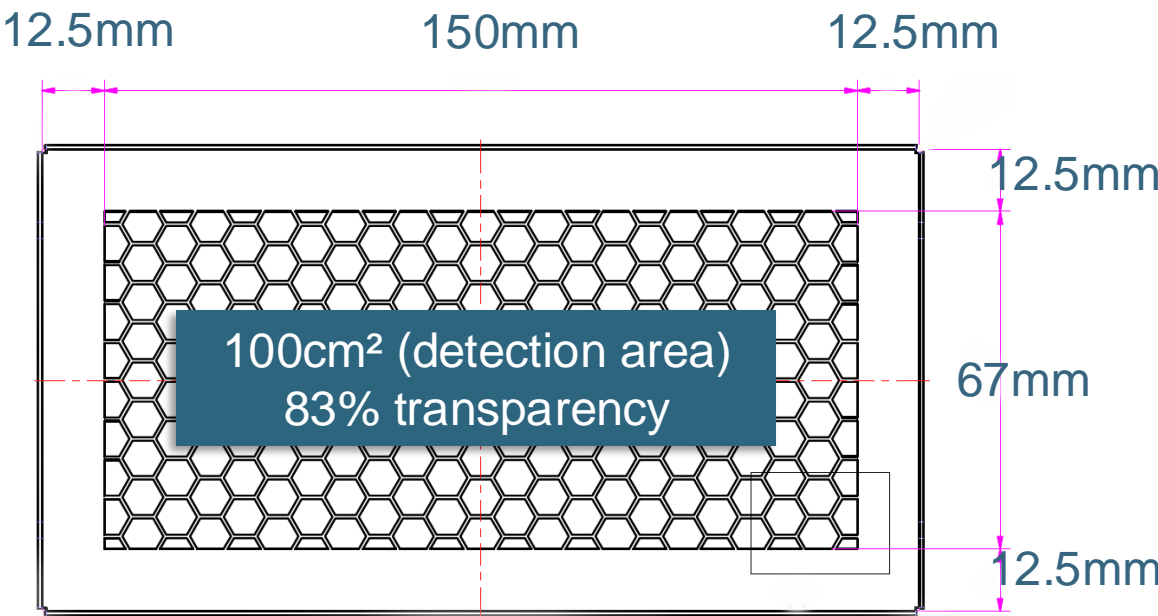
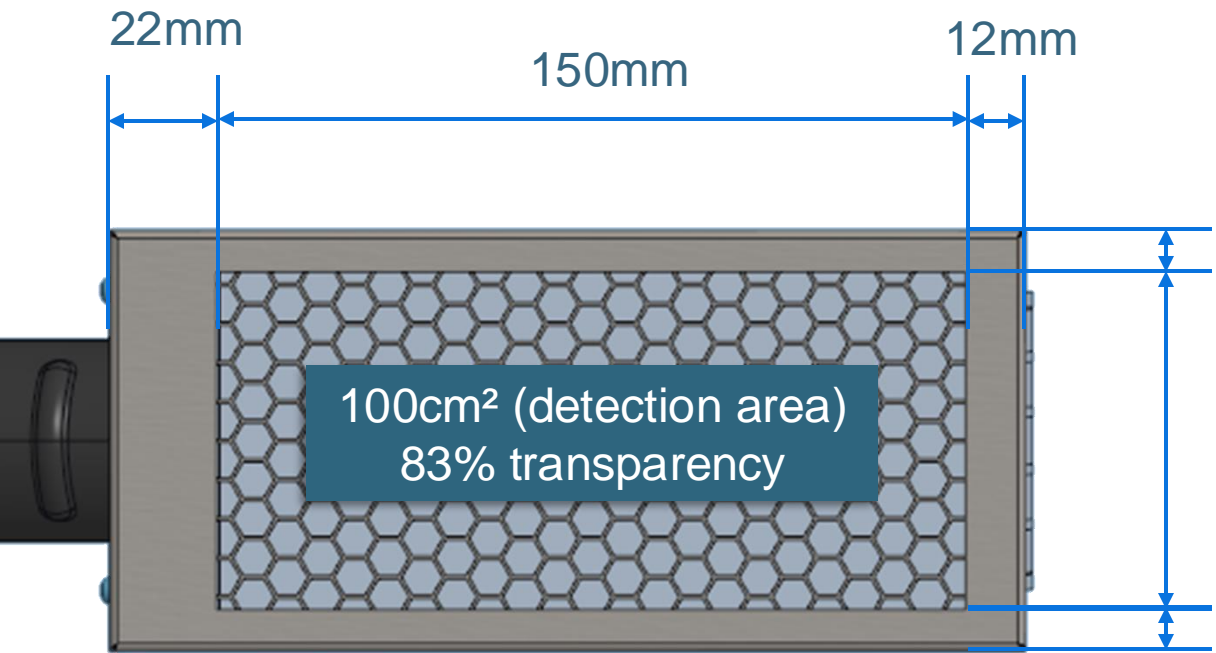


DETECTION AREA HOMOGENEITY



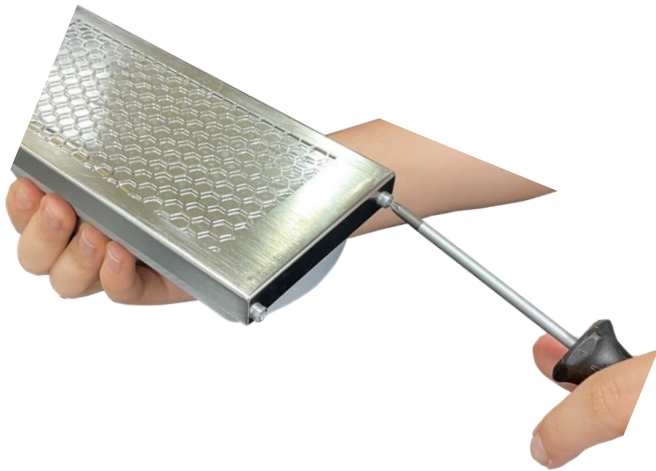
- Improved Beta detection homogeneity
 - Better than 85%
 - Referenced to IEC60325 method
 - ✓ Minimum requirement > 50%
 - Makes more consistent measurements in the field
 - Frisking or smear measurement
 - ✓ Less than 15% error regardless of position

PROTECTION GRID



PROTECTION GRID AND MYLAR

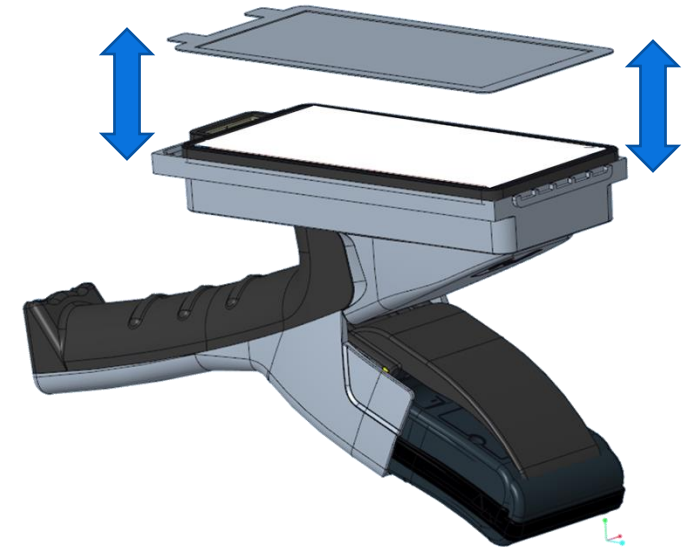
1 : Remove both screws



2 : Remove the grid



3 : Remove the mylar window

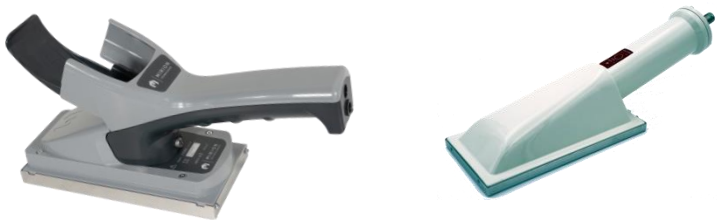


- Mylar on frame
 - No tool needed

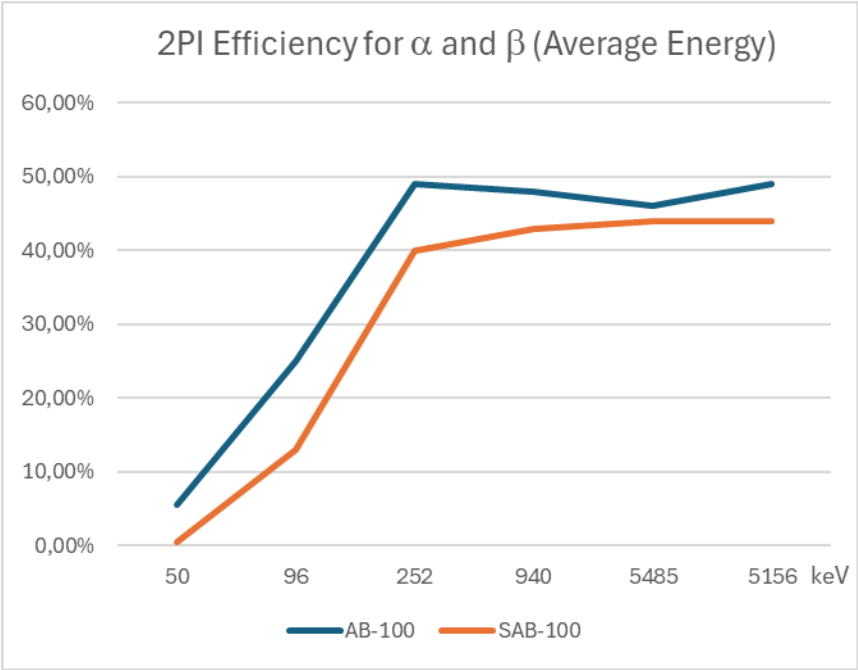
✔ Wait 10 minutes only after mylar replacement before going back to operation.

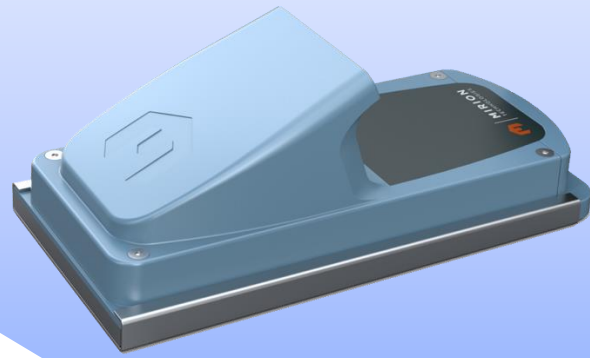
✘ Hours were required with PMT

AB-100 vs SAB-100



	AB-100 + RDS-I HANDLE	SAB-100
Weight	560 g (20 oz)	710 g (25 oz)
Beta Detection Homogeneity	> 85%	>50%
Alpha Detection Homogeneity	> 85%	>70%
Alpha Max Count-rate	10 KCPS - 600 KCPM	10 KCPS -600 KCPM
Beta Max Count-rate	100 KCPS - 6,000 KPM	
C-14 Efficiency (50 kev)	5,50%	0,50%
Co-60 efficiency (96 keV)	25%	13%
Cl-36 Efficiency (252 keV)	49%	40%
Sr/Y-90 (940 keV)	48%	43%
Am-241	46%	44%
Pu-239	49%	44%
Beta to Alpha Crosstalk	<0.1%	
Alpha to Beta Crosstalk	<5%	
Battery Life with RDS-32	180 hours	65 hours
Ingress Protection	IP53	IP20
Operational Voltage	+ 5V and +3.3V	+5V
Operating Temperature	-20°C to +50°C (-4 °F to 122 °F)	

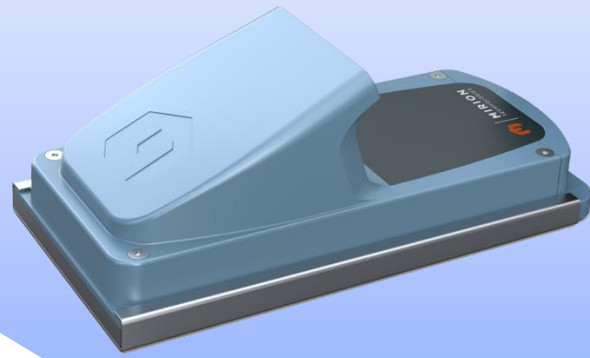




EXT dpm
 α 3230.3
 β 1337.3
 γ 7 μ rem/h



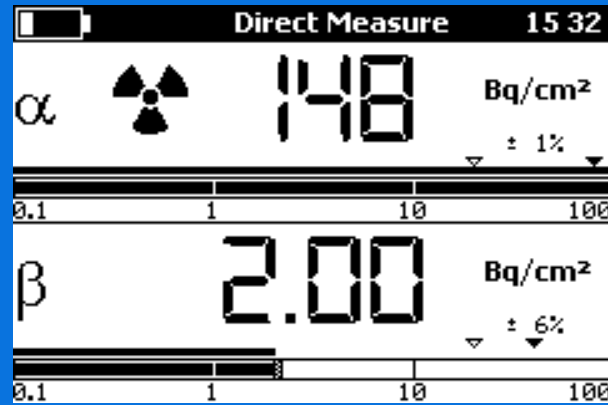
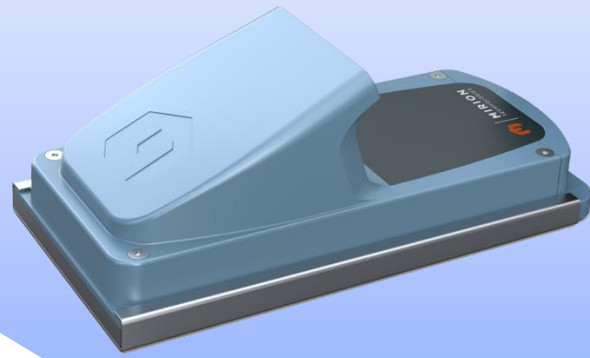
One Hand



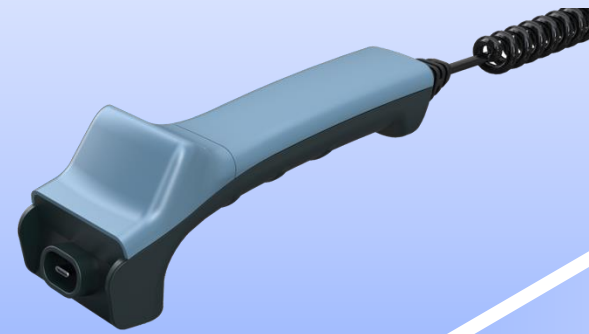
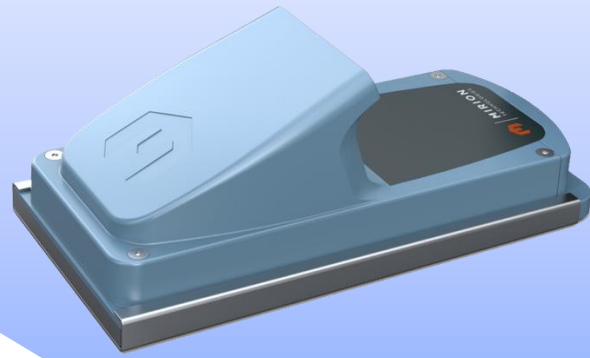
EXT dpm
 α 3230.3
 β 1337.3
 γ 7 μ rem/h



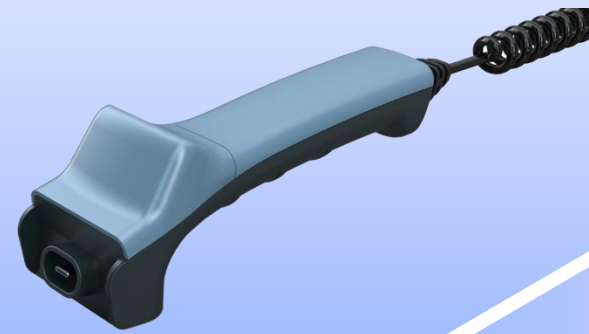
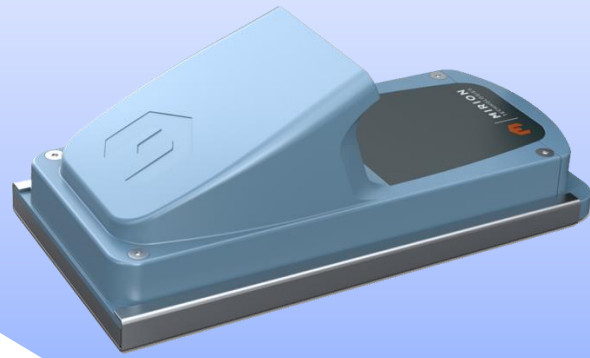
One Probe with RDS-32



One Probe with AVIOR-2



One Probe with COLIBRI

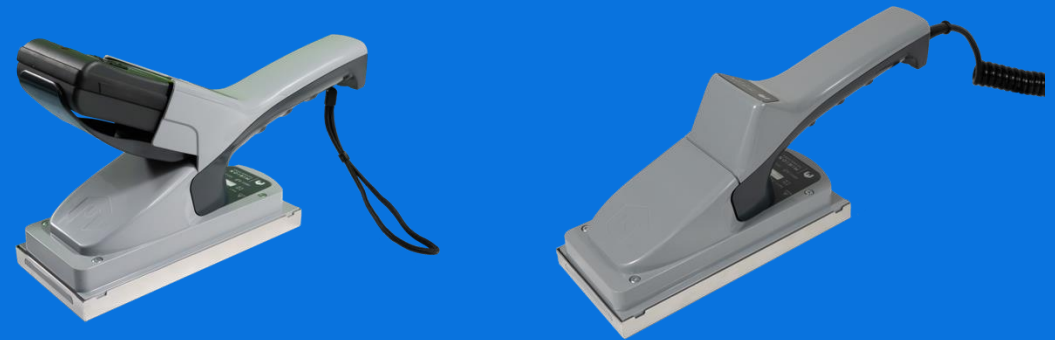


One Probe with Radiagem

Key Dates



- Full product qualification: Q3/4-2024
- First units' availability: December 2024
 - Ready for field testing



- First shipment on orders: Q1-2025

Thank you

