

ECHO:

An innovative device for the measurements of β contamination in high and fluctuating γ environments

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OUTLINE



- CONTEXT
- TIMELINE OF THE PROJECT
- PRESENTATION OF THE SOLUTION
- PERFORMANCES





- Controlling the radiological cleanliness of environment is a major issue whatever the fields (security, industry, environment, health).
- To limit the spread of contamination it requires the ability to carry out controls as close as possible to the worksites where the presence of γ background can be high and fluctuating.
- Today, in most of the cases, these measurements can not be realized. The devices commonly used are disturbed or inoperative (false alarm, not stable, detection limits higher than the cleanliness radiological thresholds).
- Problem identified by EDF
- Aim : develop a device able to realize contamination measurements in harsh γ environment.
 □ Detect 40Bq spread on a surface of 100cm² in 1µSv/h (⁶⁰Co) in 4s.
 □ Must include sensors of distance and speed (reliable of the measurement).



HISTORY OF THE PROJECT





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GENERAL PRESENTATION



The development of the ECHO probe has been jointly realised by CNRS (LabCom P2R) and Carmelec

- Detects and measures beta contamination in harsh gamma environement (high and fluctuating).
- Based on two channels and an innovative algorithm (made in collaboration with CNRS)
- Permanently displays the limits of detection
- Adapted for an use in an industrial environment
- Alarm : Sound, visual and vibration. 2 configurable thresholds
- Speed and distance sensors
- Supervisable remotely (wired connection)
- Automatic recording of measurement



Mass	1,42 kg
Dimensions	L 320 mm x l 130 mm x h 88 mm
Autonomy (measure)	> 30 h (in 10 µSv/h)
Autonomy (standby)	>130 h









Туре	Plastic scintillator of 100 cm ²
Entry window	Metallized PET
Typical β yield (c/s/Bq)	⁶⁰ Co (reference) : 0,23 ¹⁴ C : 0,17 ³⁶ Cl : 0,28
Typical α sensitivity (c/s)/(α.s ⁻¹)	0,58
Effective measurement range [Bq/cm²]	0,1 to 1000
Response uniformity	± 15%
Distance sensor	from 0 to 100 mm
Speed sensor	from 0 to 200 mm/s







ACCESSORIES – INDIRECT MEASUREMENTS AID



Easily slide onto the front of the probe to allow the positioning and measurement of sampling (filters, smears, wipes) or calibration sources.

- Ergonomics for easy handling
- Provided with thin mylar window to avoid contamination
- ✤ Weigth < 800 g</p>



FEEDBACK : GRAVELINES NPP

• Surprising ergonomics at first sight but proves to be well balanced.



- Intuitive and simple human machine interface. The display of the limits of detection highly simplify the use of the device and the results interpretation by the RP technicians. The probe clearly indicates the background variations.
- The distance/speed sensors are real benefits for securing the contamination measurements.
- Tender requirements : measure 40Bq distributed on a 100 cm² surface in 1µSv/h with a false alarm rate of 0,25 % and a rate of non detection of 2,5%
- Change of the false alarm rate to 2,5 %
- Calibrated sources used : 16Bq, 60Bq, 4kBq of ⁶⁰Co
- Good and stable operation of the proble in irradiating areas, able to detect:
 0,4Bq/cm² in 1µSv/h
 1,2Bq/cm² in 21µSv/h (3,5 m access)
 3,2Bq/cm² in 60µSv/h (24m PZR casemate)
 - \Box 7,0Bq/cm² in 106µSv/h (24m PZR casemate)



COMMERCIALISATION EDF

- 2022 : beginning of the marketing
- Include the accessories and the after-sale service.
- 2 technical updates following the marketing.
- UNIE support for the RP technicians on the control procedures (speed/distance sensors).
- UNIE support for the deployment to identify use cases, particularly in the context of contamination management.
 - Controlled area exit
 - □ RP organization of contamination measurements on work sites.
 - □ ECU contamination measurements







Thank you for your attention

