

The background of the slide features a light blue-grey color with a network of thin, grey, intersecting lines. There are also several small, semi-transparent colored circles (green, yellow, pink) scattered across the background.

Radiation protection culture: the importance of training and the benefit of the use of innovative tools

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Contents

- Introduction of both speakers and companies
- INSTN Missions
- DosiCase® simulation presentation
- Pratical trainings at INSTN
- Use of DosiCase® for INSTN
- Examples in the field and feedback from users



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instn

National Institute for Nuclear Energy and Technology

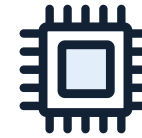
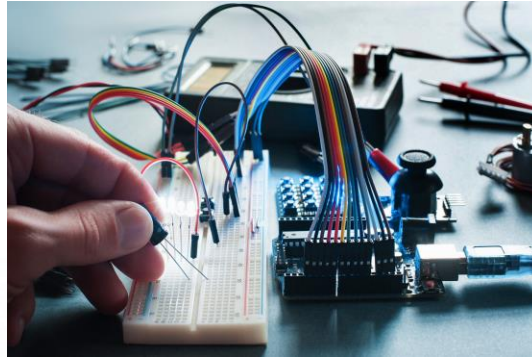
- Managed by CEA (Alternative Energies and Atomic Energy Commission), **French public research organization**
- **A higher and continuing education institution**
 - delivering **highly specific education programs** and **continuing professional development courses** since its creation in 1956
 - ✓ from operator to engineer / researcher
 - ✓ in the fields of nuclear energy, new energy technologies and health technologies
 - ✓ in France and abroad

7,000 trainees/y
1,300 students/y
300 training courses
1,100 teachers, lecturers, experts...



1

Engineering of Communication-
Based Measurement Systems in
the Nuclear Field



2

DosiCase 

SIMULATOR FOR TRAINING
AGENTS SUBJECTED TO THE RISK
OF **IRRADIATIONS** AND
PREPARING FOR INTERVENTIONS
IN A DOSING ENVIRONMENT



Training: practice, an undeniable asset

- Training in the field of **transport of radioactive material**:

- For driver
- For sender
- For other person involved in the transport chain
- For safety adviser



- **Theory + practical exercises**

+ For training with an **operational purpose**, use of INSTN's facilities dedicated to role-playing and training



Mock-up training facilities (e.g. nuclear reactor or fuel cycle research center-type)



Digital solutions (3D immersion simulators...)



Used in training for drivers

Hands-on work laboratories



Practical work within drivers' training

- **Mandatory** according to French regulations → *Its implementation have to be specifically indicated in the annual activity report that training organizations are required to provide to the Authority*



RP teaching unit



Added by INSTN



Use of low-activity sealed radioactive sources + detection devices



Radiological control of a package of radioactive material before shipping, and labeling

- Use of an irradiation simulation tool (DosiCase[®]) to create situations with moderate / high RP issues for trainees **without actually exposing them**
- Possibility of letting them have inappropriate behaviors in terms of RP during the role-playing phase, without radiological consequences

DosiCase[®]

SIMULATOR



DOSIMETER(S)



SOURCE(S)



SURVEY
METER(S)



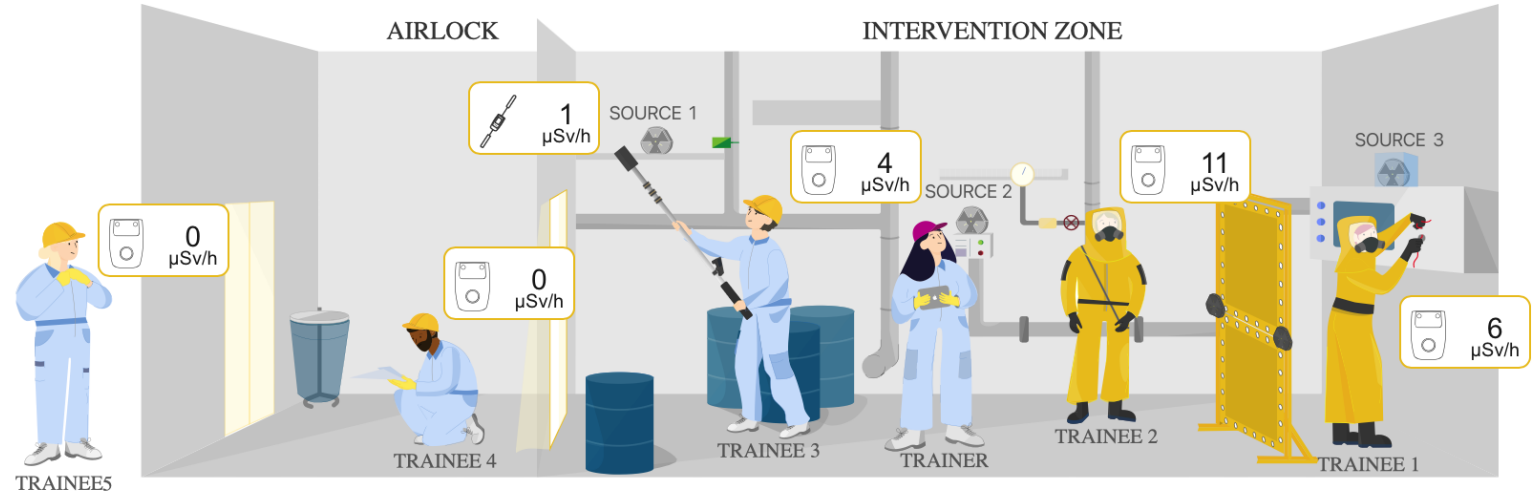
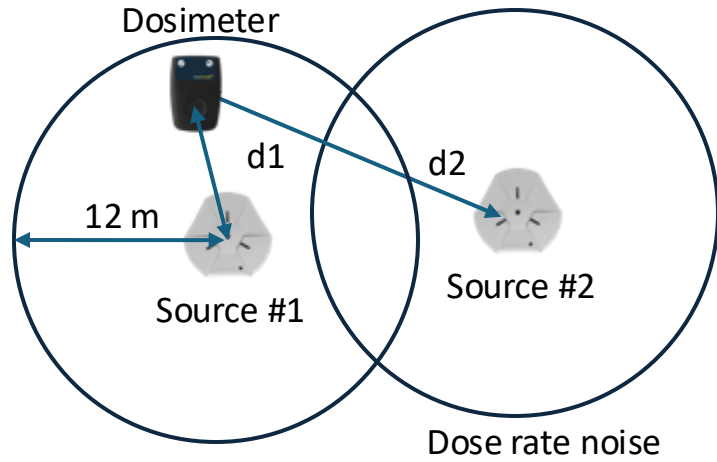
PROBE



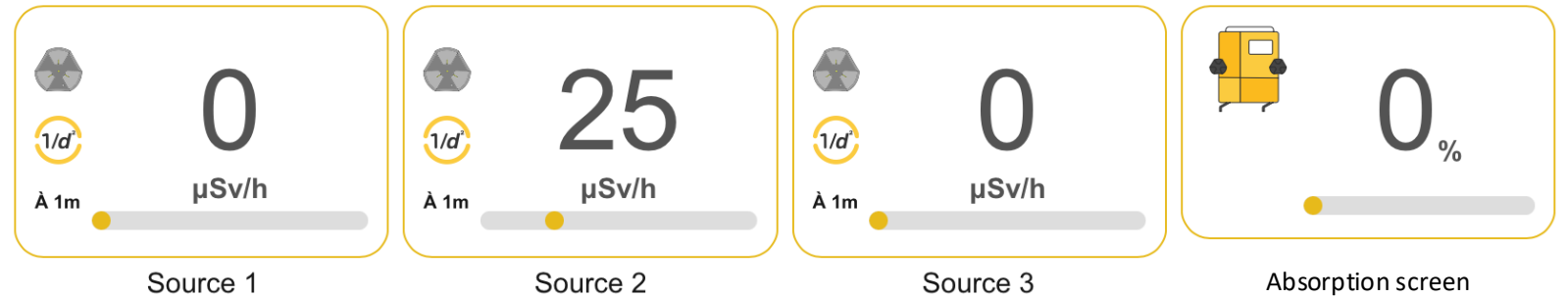
ABSORPTION
SHIELD

DosiCase

SIMULATOR



YOU CAN CHANGE THE VALUE OF THE SOURCES TO INTERACT WITH THE SCENARIO



DosiCase

SIMULATOR

Since 2016
2nd generation

 CUSTOMIZABLE

 REALISTIC

 SCALABLE

 READY TO USE

 AUTONOMOUS

 QUICK

 IMMERSIVE

 INTERACTIVE



Practical work within drivers' training (Continued)

Schedule:

Day1

Day2

Day3

Matin	Après-midi	Soir	Remarques
Day 1			
08h00 - 09h00	09h00 - 10h00	10h00 - 11h00	Théorie : Les principes de la radioprotection des sources et des appareils de détection.
11h00 - 12h00	12h00 - 13h00	13h00 - 14h00	Théorie : Les principes de la radioprotection des sources et des appareils de détection.
14h00 - 15h00	15h00 - 16h00	16h00 - 17h00	Théorie : Les principes de la radioprotection des sources et des appareils de détection.
Day 2			
08h00 - 09h00	09h00 - 10h00	10h00 - 11h00	Théorie : Les principes de la radioprotection des sources et des appareils de détection.
11h00 - 12h00	12h00 - 13h00	13h00 - 14h00	Théorie : Les principes de la radioprotection des sources et des appareils de détection.
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Day 3			
08h00 - 09h00	09h00 - 10h00	10h00 - 11h00	Théorie : Les principes de la radioprotection des sources et des appareils de détection.
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14h00 - 15h00	15h00 - 16h00	16h00 - 17h00	Théorie : Les principes de la radioprotection des sources et des appareils de détection.

Theory + practical exercises

Practical work:

- Part 1 - Handling of radioactive sources and detection devices
- Part 2 - Performing radiological controls on a package of radioactive material before shipping, and labelling it:

- ✓ Use of an irradiation simulation tool (Dosicase®) **without informing them**



Case n°2
increasing RP issues

- ✓ Case n°1
- ✓ Successively 2 groups of 2 volunteer trainees for the execution. Other trainees as **observers**.
- ✓ Trainer: semi-accompanying, semi-observing
- ✓ Final **debriefing on good practices and inappropriate behaviors** observed

- Measurements on and around the package
- Comparison with regulatory thresholds
- Calculations of an indicator used to provide control on radiation exposure
- Final identification of the hazard label to be affixed on the package



DEVICE	SETTINGS FOR CASE #1	SETTINGS FOR CASE #2
Source	- Dose rate at contact : 300 $\mu\text{Sv/h}$ $1/d^2$ decline low*	Dose rate at contact : 3000 $\mu\text{Sv/h}$ $1/d^2$ decline low*
Survey Meter	<i>No dose rate alarm</i>	<i>No dose rate alarm</i>
Dosimeter	Dose alarm : 20 μSv <i>dose rate alarm > 300 $\mu\text{Sv/h}$</i>	Dose alarm : 20 μSv <i>dose rate alarm > 3000 $\mu\text{Sv/h}$</i>

* Where « d » is the distance between source and device

SOURCES

Source 01

 No scheduled doserate

 360°
 $1/d^2$

INITIAL DOSE RATE 300 $\mu\text{Sv/h}$

RADIAMETERS

Radiometer 01

 DOSE RATE

 400 $\mu\text{Sv/h}$

No accessory

DOSIMETERS

Dosimeter 01

 DOSE

 20 mSv

 DOSE RATE

 400 $\mu\text{Sv/h}$

INITIAL DOSE 0 μSv

Practical work within drivers' training (Continued)

➤ Inappropriate behaviors observed and noted by other trainees and by the trainer - Examples:



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Case n°2:
3 mSv/h
at the contact
of the package



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Practical work within drivers' training (Continued)

- Final debriefing on good practices and inappropriate behaviors observed - Lessons learned (examples)

Increase of the distance from the package

(taking measurements with the arm outstretched, without approaching the package unnecessarily)

Reading the results throughout the entire measurement phase, including when approaching the package

Preparation of measurements

Carrying out measurements

Comment/interpretation of results

while being/remaining right next to the package

Nearly lie down against the package to measure the opposite side
(<--> distance from the package)

Take measurements only on 1 or 2 sides of the package
(<--> heterogeneity of the contents)



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Conclusion : the importance of training and the benefit of the use of innovative tools

Positive feedback from such practical work by **trainers** and **learners**

Realistic behavior of the devices within the simulation

Possibility to repeat the exercises **without exposure** for staff and trainees

Improvement of practical skills thanks to the **DosiCase®** simulator

Partnership between **INSTN** and **Ob'do** on the evolution of the new functionalities integrated in the DosiCase® by feedback from field trainers

Questions ?

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