



MEASURES TAKEN TO AVOID THE NON PERCEPTION OF ALARMS FROM EPD

ISOE European Symposium

Elisa CANAL, Javaraly FAZILEABASSE, Nicolas VALENDRU
Patrice ROMANE

SUMMARY

1. HISTORY
2. BENCHMARKING
3. TECHNOLOGY CHOSEN
4. EDF REQUIREMENTS
5. TESTS OF IMS[®] TECHNICAL PROPOSAL
6. FINAL GOAL

HISTORY

■ Experience feedback:

- Several events related to non perception of alarms (5 in 2011, 4 in 2012, statement processing for 2013)
- Causes identified : noisy or flashy environment, use of Personal Protective Equipment (mainly Respiratory Protective Devices), working positions without the EPD in sight,...

■ Action Plan associated :

- Upgrade the sound level of EPD Saphydose Gamma i[®] (Saphymo[®]) from 80 dBA to 85 dBA
- Initialise a proper treatment plan to avoid these events again

BENCHMARKING

- Normative base (CEI 61526) :

- 6.10.4 Alarm output

- a) Location

- The audible and/or visual alarm shall be located so that when the dosimeter is worn on the body, the audible alarm can be heard and the visual alarm seen by the wearer.

- b) Audible alarm

- The frequency shall be within the 1 kHz to 5 kHz range. Where an intermittent alarm is provided, the signal interval shall not exceed 2 s. The A-weighted sound level (impulse level for intermittent alarm) shall exceed 80 dBA and not exceed 100 dBA at 30 cm from the alarm source. A visual signal or earphones capability should be available for high noise environments.

- Benchmark with other international nuclear developers (through ISOE network, among others), and partly solved adding type of alarm « vibrator »

- Review of report's system already existing :

- They are not convenient for industrial environment : wired connection and too voluminous for chest pocket

TECHNOLOGY CHOSEN

- **The choice of EDF is in favour of Bluetooth technology :**

- High battery life,
- Weak emission distance (about 2 meters),
- No electromagnetic disturbance



This technology has been validated by tests on Flamanville NPP in 2012 (feasibility study leaded with EPD Sgi[®] modified)

EDF REQUIREMENTS

■ Functionnal Specifications :

- Dosimeter **Sgi® not modified** intrinsically (added module)
- **Wireless** and **compact** (held in chest pocket of work suit)
- **Easy** use and **solid** system
- **Non disturbing** for operators
- **Efficient** in **any positions and situations** required in activities (with PPE, EPD not in field of vision,...)
- **Guarantee** of **alarm knowledge** in **any working situation** (noisy, « flashy », ...)
- Several individual remote modules wich can be used at the same time (differeents way of receiving the alarm)

■ Technical Specifications :

- Compliance with the standard **CEI 61526** for **each element** of the system and accessories (alarm levels, physical characteristics, drop tests, mecanical resistance, EMC, ...)
- Performance of **Sgi® undisturbed** (especially by transmitter module added to it)
- **2 separate systems used close undisturbed**

TESTS OF IMS[®] TECHNICAL PROPOSAL

■ Factory tests:

○ Vibration perception



○ Modules pairing (by software simulation)



○ Charge tests (protect modules from deep discharge)

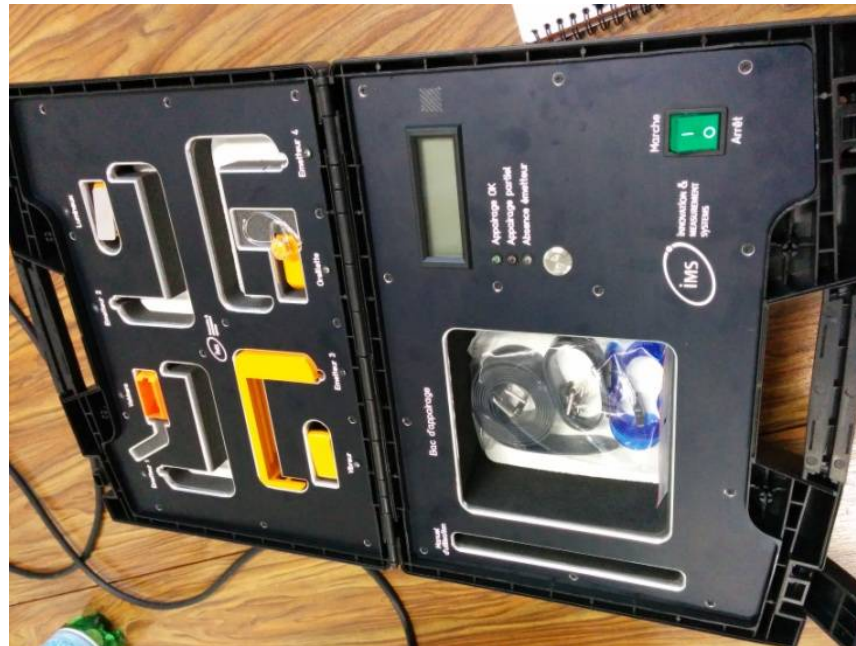
○ Detection tests (improve detection field from RFID antennas)

○ Decreasing probability of both SGI[®] alarm's non detection (and by the way non reporting) and erroneous detection → hardware and software solution still studied for improvement

TESTS OF IMS[®] TECHNICAL PROPOSAL

■ NPP tests (still ongoing) :

- 5 NPP volunteers (representative sample of EDF's nuclear production)
- Material: 5 kits each composed of 8 modules and their wearing accessories (4 transmitters, 1 vokkero receiver, 1 headset receiver, 1 vibrator receiver, 1 luminous receiver) in a suitcase allowing charging elements and pairing



FINAL GOAL

- **IMS[®] finalises the device** : Q2 of 2014
- **Finish the tests of the 5 kits** : Q3 and Q4 of 2014
- **Select the final solution for serial production, with approved modules** : Q1 and Q2 of 2015
- **Equip 19 NPP (+ 1 EPR) → 58 PWR (+ 1) reactors** : Q3 and Q4 of 2015
- **It remains to organise** the solution :
 - Communicate around it and its added value
 - Organise training on devices
 - Lead a Human Factor study → how to make it easier for operators ?
 - Lead a cost's impact analysis → how to handle the device ? which quantities of modules ?

THANK YOU

QUESTIONS

