MAKE VISIBLE THE INVISIBLE FOR A BETTER RADIATION PROTECTION AT EDF

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CHANGER L'ÉNERGIE ENSEMBLE

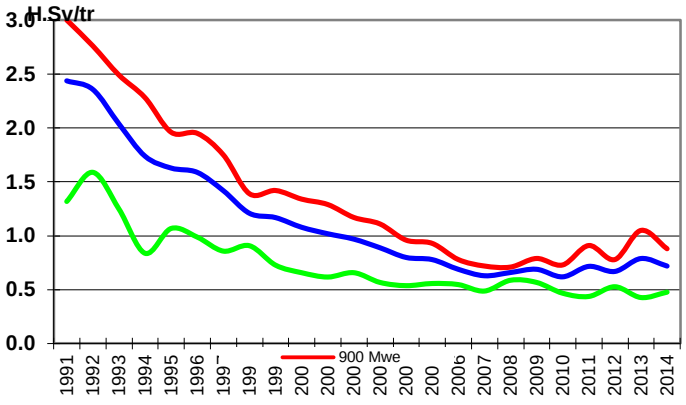
Summary

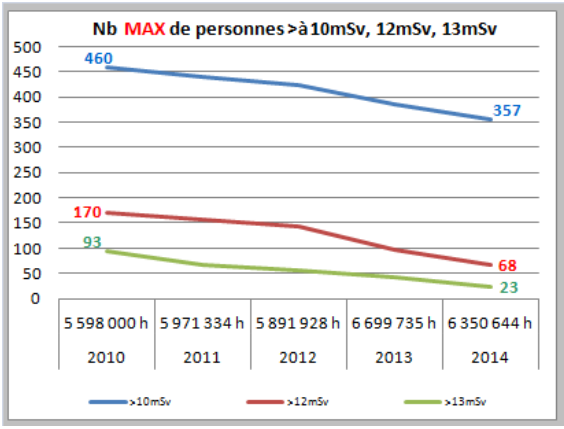
- Context
- Needs for NPPs
- Different tests performed
- How a gamma camera can change our practices
- Conclusion

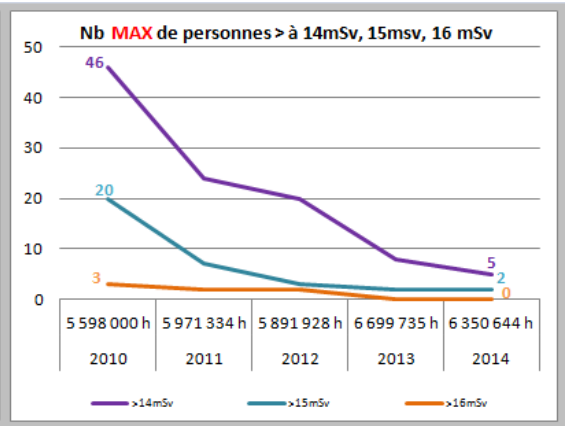
Context

- On the 58 units of EDF, hot spots and active particles generate doses for workers.

Historic evolution of collective dose and individual higher doses :







- **Making visible the invisible thanks to augmented reality :** gamma camera is an help for localization and eradication of radioactive sources, or at least is a tool for a better radiation protection.

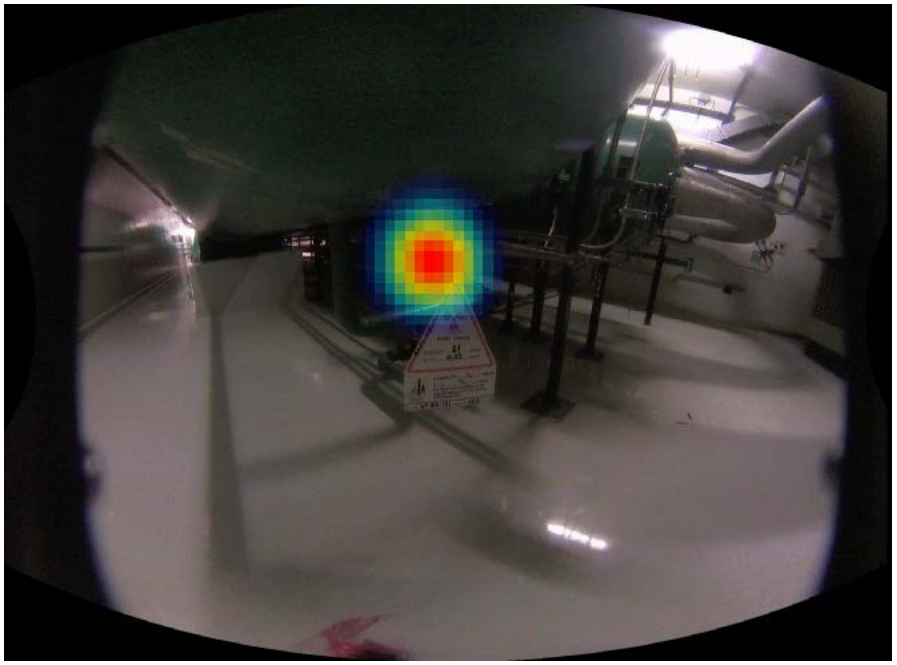
→ Source term reduction contributes to collective and individual dose optimization.

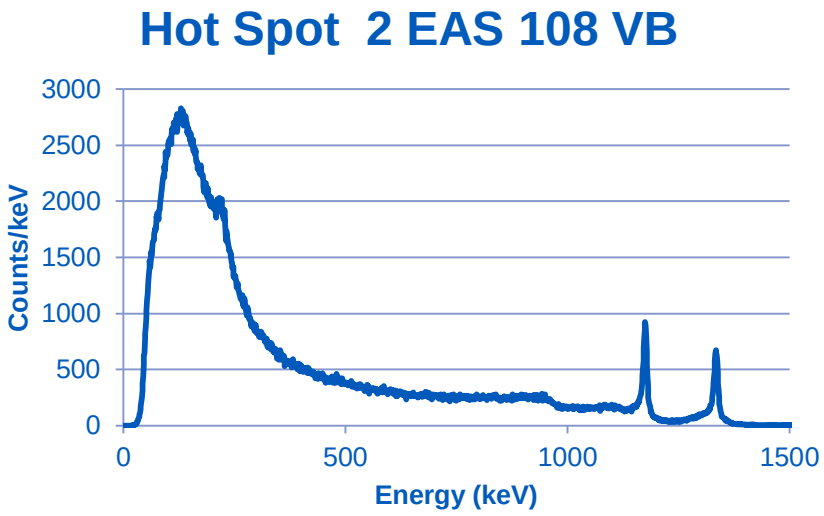
Needs for NPPs

- Ambient mapping and work area characterization: signalization and identification of radioactive sources
  - Tool for planned dose assessment.
  - Check for shielding efficiency.
- Emergency situations : localization of blocked gamma source.
- Fuel evacuation : localization of the maximal radioactive emission point on containers and transportations.
- Floor contamination : signalization and identification of any trace of contamination on roads, outside paths on the NPP.
- Vehicle alarm at the exit portals: investigation for identification of the radioactive source causing the alarm.

Work area characterization/Hot spot localization

Gamma camera permits to localize quickly most emissive radioactive source(s) in a work area.

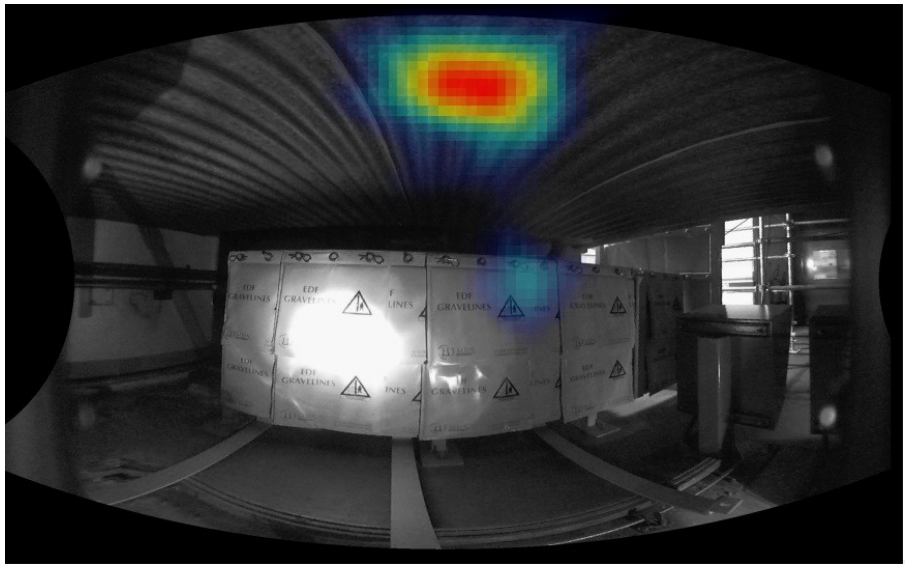


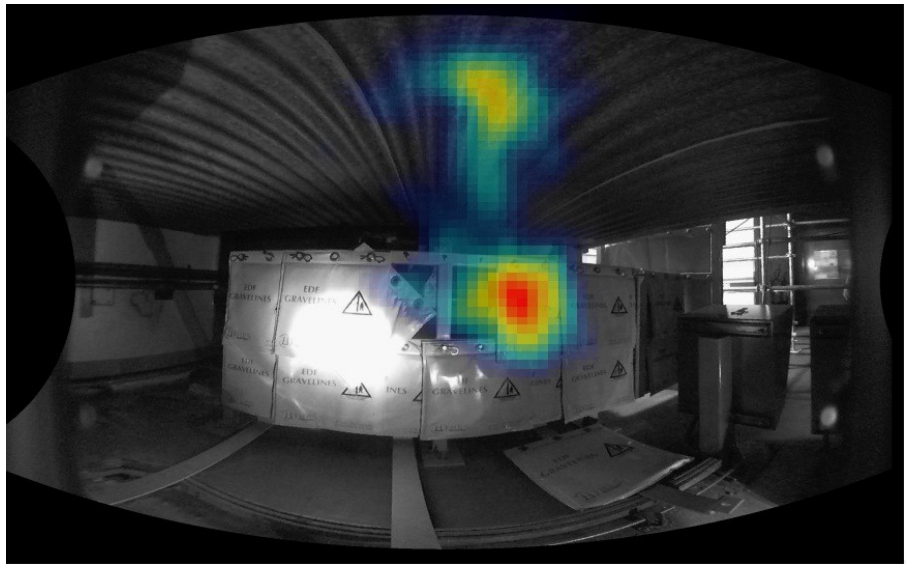


Duration time measurement: 1min35

Check for shielding efficiency

Gamma camera permits validation of shielding efficiency and permits to verify shielding is not moving during outages.

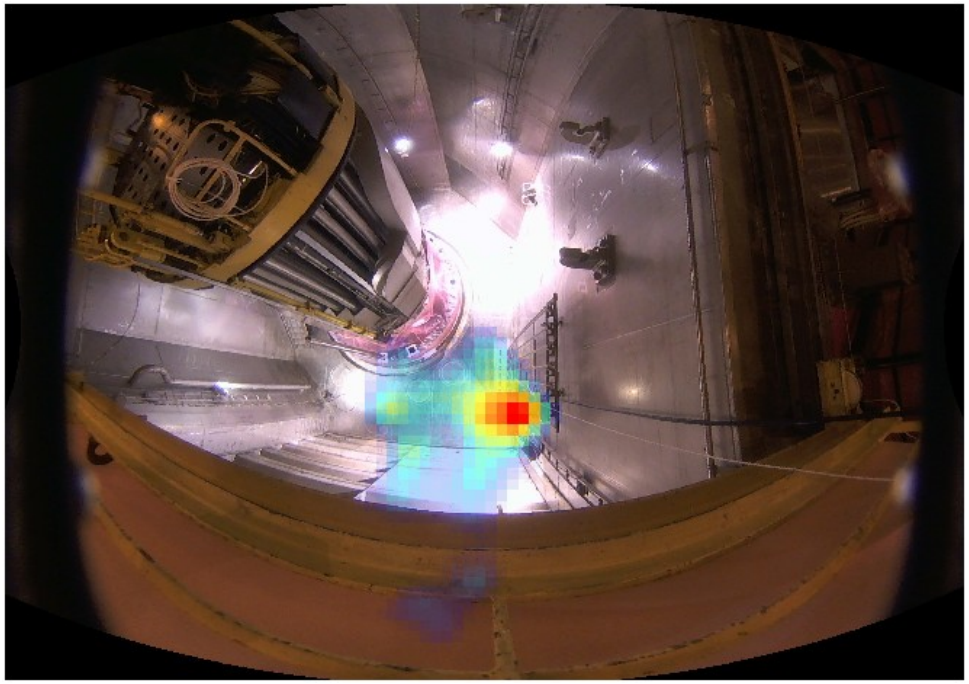


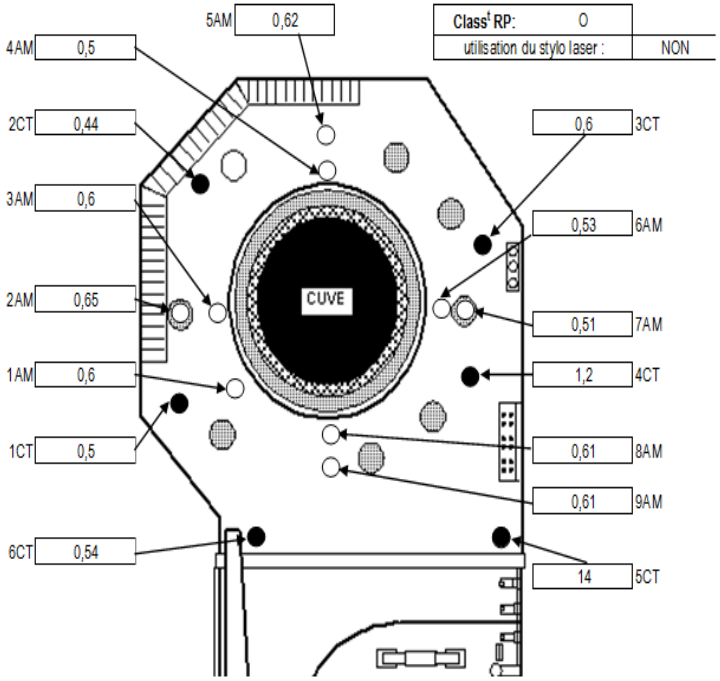


Duration time measurement: 1min

Localization and identification of pool contamination areas

Gamma camera permits localization and identification for adapted treatment and decontamination, to optimize dose.

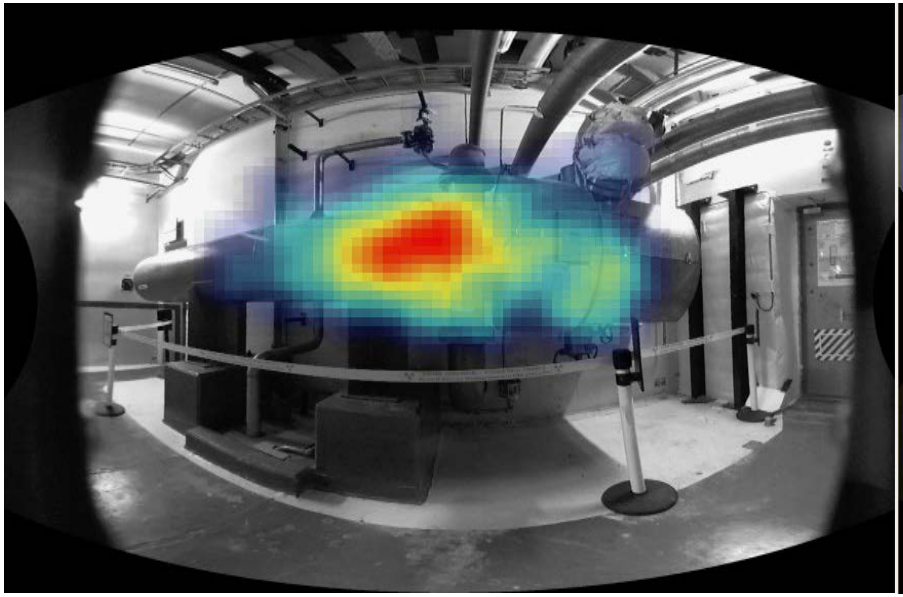


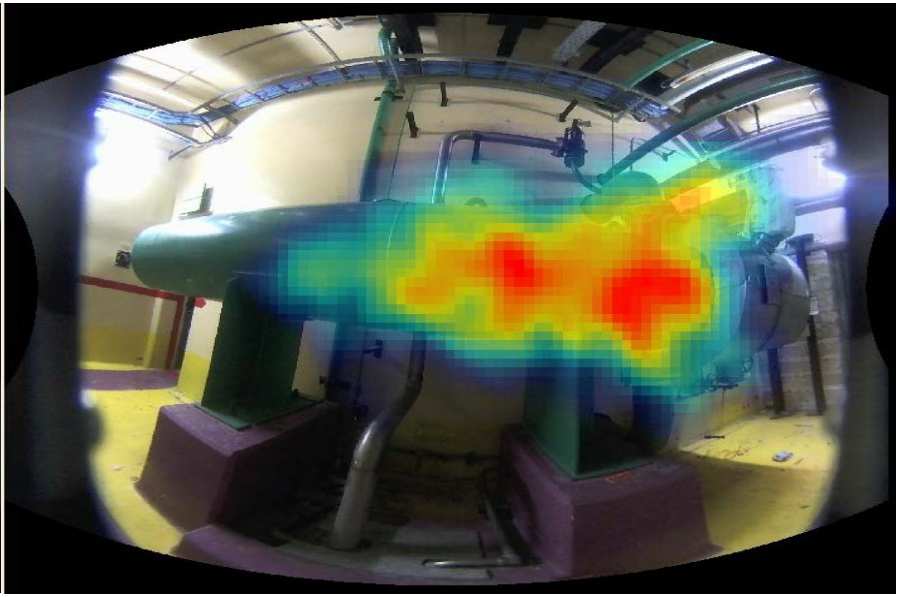


Duration time measurement: 5min40

Radioactive areas localization and verification of decontamination treatments efficiency

Gamma camera permits high dose rate areas localization in pipes, and checking of hot spots and surface contamination disappearance after treatment.



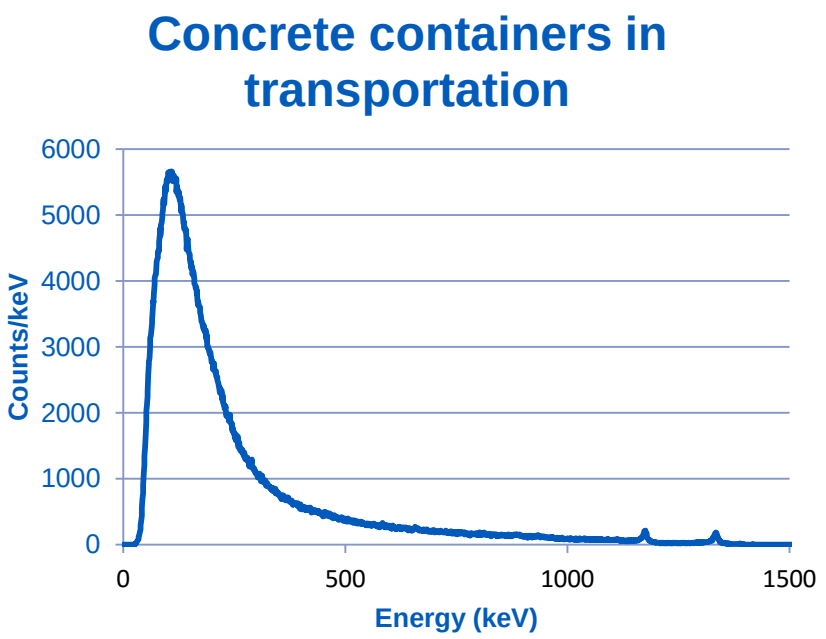


Duration time measurement: 6min

Characterization of radioactive transportations

According to rules, value of the most high dose rate point on transportations and containers has to be known.

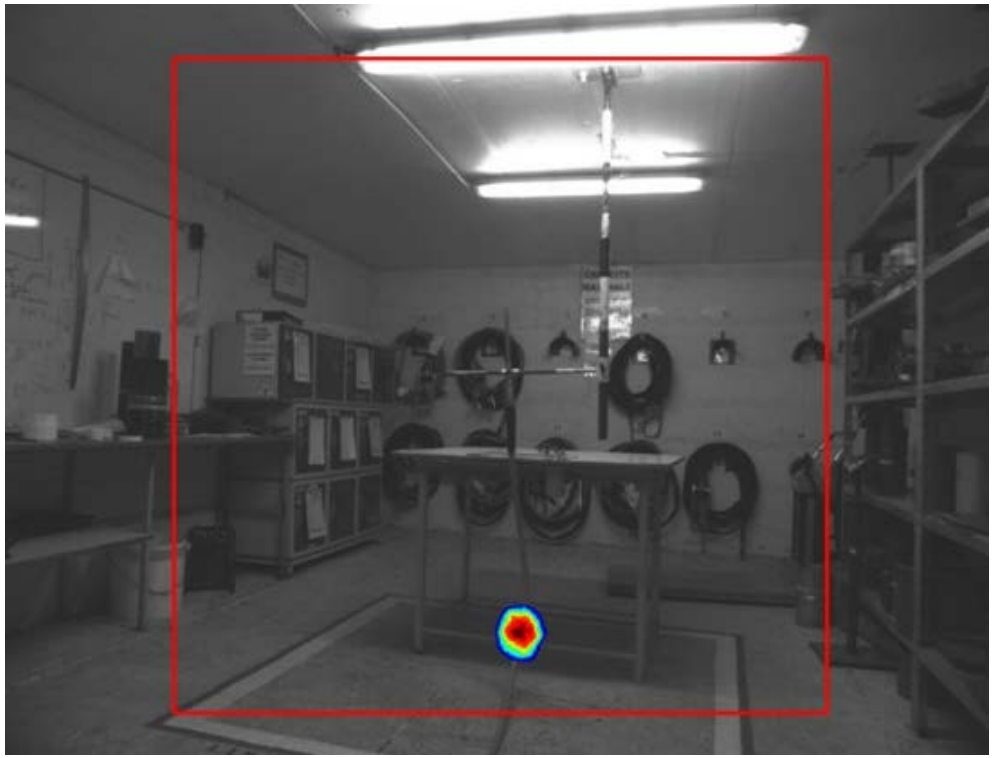
→ Gamma camera permits localization and characterization the most emissive area, to focus the measurement.



Duration time measurement: 8min15 (less than a minute for visualization)

Localization of blocked gamma source

Gamma camera permits localization of gamma source from radiography in emergency situation.



Duration time measurement: less than a minute

How a gamma camera can change our practices

- Dose reduction can be achieved using gamma camera for hotspot localization in very high dose rate areas.
- Time can be saved for some systematic activities (RP mapping, transportation and waste control, …) so occupational exposure can be reduced.
- Images are more understandable than notes to illustrate work documents.
- Assessment of chemical decontamination and shielding efficiency.

Conclusion

- Tests have been performed in 2015 with industrialized devices, and continue in 2016. EDF compares what is available on the market to its needs: identification of the gaps and technical improvements by manufacturers when it seems possible.

- A call for tender will be organized at the end of 2016, as a first step towards industrial deployment.

- A nuclear power plant will test the chosen equipment as a pilot for 1 or 2 years before decision of generalization on the fleet.

THANK YOU FOR YOUR ATTENTION

QUESTIONS ?