ID de Contribution: **130** Type: **ORAL**

Detection limit variation against coarse aerosol during airborne contamination measurement with CAM

mercredi 29 juin 2022 11:15 (15 minutes)

Detection limit variation against coarse aerosol during airborne contamination measurement with CAM

Grégoire Dougniaux, Gwenaël Hoarau

Institut de Radioprotection et de Sûreté Nucléaire (IRSN), PSN-RES, SCA, LPMA, Gif-sur-Yvette, 91192, France

Email: gregoire.dougniaux@irsn.fr

Topic : Environmental Monitoring & Dose Assessment

Type of presentation: ORAL

Abstract

In nuclear facilities, the mandatory airborne contamination surveillance is operated by CAMs (Continuous Air Monitors). A CAM samples the ambient air on a filter and measures the deposited activity. It is designed to trig an alarm whenever the measured activity concentration exceeds a defined threshold. However, in some particular sites, such as dismantling sites, a high rate of false alarm is experienced, mainly for artificial alpha [1].

The effect of the characteristics of aerosol deposited on the filter on the nuclear measurement has been studied [2]–[4]. However, it has been shown that false alarms are directly related to the sudden presence of a large amount of coarse particles, i.e. a variation of the aerosol mass size-distribution [5].

Experiments on the ICARE tests bench [6]–[8] have been carried out to characterize the effect of the aerosol mass size-distribution variation on the CAM's performance [9]. A false alarm is mainly due to a wrong detection limit evaluation. Thus, we compared the detection limits in the artificial alpha region; the first is the actual CAM algorithm, the second is calculated as a function of the radon daughters and aerosol characteristics. This new estimation, covering a wider range of aerosol characteristics, shows a significant improvement over the previous one (Figure 1) and highlights the need to take into account the aerosol characteristics for a correct airborne contamination measurement [10]. Moreover, the zone of false alarms occurrence can be now precisely defined between the current (red) and new (black) detection limits in CAM's working condition.

Figure

Figure 1 Comparison of the experimental relationships between the detection limit calculated by the current CAM algorithm (in red) and a new detection limit for which the estimation is based on the aerosol properties (in black). The dotted red line indicates the equality between the estimated and true detection limits. The latter is calculated from the alpha energy-spectrum.

References

[1] G. Dougniaux et al., *European Aerosol Conference.* **2016**

[2] T. Geryes et C. Monsanglant-Louvet, *Radiat. Prot. Dosimetry* **2011**, 144(1-4), 659-662

[3] M. D. Hoover et G. J. Newton, *Radiat. Prot. Dosimetry*, **1998**, 79(1-4), 499-504

[4] S. Huang et al., *Health Phys.* **2002**, 83(6), 884-891

[5] G. Hoarau, G. Dougniaux, F. Gensdarmes, G. Ranchoux, et P. Cassette, *Health Phys.* **2022** (accepted)

[6] M. Ammerich, *Rapport CEA-R-5484*, **1989**
[7] C. Monsanglant-Louvet et al. , *IEEE Trans. Nucl. Sci.*, **2012**, 59(14), 1414-1420
[8] P. Zettwoog, *J. Res. Natl. Inst. Stand. Technol.*, **1990**, 95(2), 147-153
[9] G. Hoarau, *Thèse de l'Université Paris-Saclay*, **2020**
[10] G. Hoarau, G. Dougniaux, et F. Gensdarmes, *Brevet FR 3110709*, **2021**

Auteur principal: Dr DOUGNIAUX, Grégoire (IRSN)

Co-auteur: Dr HOARAU, Gwenaël

Orateur: Dr DOUGNIAUX, Grégoire (IRSN)

Classification de Session: Nuclear Power Plant Accidents & Risk Communication