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On the use of numerical models to predict/mitigate indoor radon levels in highly contaminated areas

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The publication of the EURATOM directive BSS 2013/59 [1] has increased considerably the interest on radon studies in all EU countries. Certainly each member state has to establish a national action plan addressing long-term risks from radon exposures in dwellings, buildings with public access and workplaces for any source of radon ingress, whether from soil, building materials or water. The complexity generated by the number of parameters and processes affecting radon generation in the source, transport in source media, entry into dwellings, and its accumulation in the different rooms of the dwelling, makes the development of numerical models a very challenging exercise that might take also into account that the detailed information of the building-soil interface in an existing dwelling is normally not available. A new project funded by the Spanish Nuclear Safety Board (CSN) is starting in 2020. Its main goal is to establish and validate a numerical tool to predict and mitigate indoor radon levels in new and existing buildings in general, but paying special attention to the case of areas contaminated due to NORM industrial activities. Such a numerical tool might be of interest for Radiation Protection authorities to manage highly contaminated areas. In particular, 2 different numerical modelling strategies will be adapted to real sites and compared. The RAGENA [2] code, which was developed in the late 90s, will be updated with the last findings from experimental studies. This code allows modelling all radon sources and processes affecting radon accumulation indoors from a dynamic point of view in a very simple way, but lacks from spatial resolution. On the other hand, a CFD (computational fluid dynamics) model recently developed in Spain [3] numerically solves radon transport equation by finite elements with a good spatial resolution. The project focuses also on the experimental characterization of real sites. In this talk we will introduce the project, discuss the main features of both modelling approaches and describe in more detail the current status of the RAGENA code updating.

References

[1]. Council directive 2013/59/EURATOM laying down basic safety standards for protection against the dangers arising from exposure to ionizing radiation. Official Journal of the European Union. 5 December 2013. https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2014:013:0001:0073:EN:PDF
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[3]. Muñoz, E., Frutos, B., Olaya, M, and Sánchez, J. A finite element model development for simulation of the impact of slab thickness, joints, and membranes on indoor radon concentration. Journal of Enivormental Radioactivity. 2017, 177, 280-289.

Auteur principal: Prof. FONT GUITERAS, Lluís (Universitat Autònoma de Barcelona , Spain)

Orateur: Prof. FONT GUITERAS, Lluís (Universitat Autònoma de Barcelona , Spain)

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