Contribution ID: **16** Type: **Oral Poster**

RECENT IMPROVEMENT AND LESSONS LEARNED USING IMAGING TOOLS FOR RADIOLOGICAL CHARACTERIZATION

Wednesday, 25 May 2016 15:20 (5 minutes)

During decommissioning and dismantling operations of Nuclear Plants, imaging devices allow a fast and accurate identification of contaminated areas. Since more than twenty years, CEA is developing such cameras to localize hot spots in high and low level dose rate environment. One of the most famous tools is the "gamma camera"dedicated to the localization of gamma sources from 50 keV to 1500 keV. They have been extensively qualified in various plants such as experimental reactors or reprocessing plants, they also have found applications for waste management and hot cells measurements. More recently, the CEA has developed a complementary imaging device dedicated to the alpha contamination detection. This imaging measurement is based on the detection of UV radiation emitted by nitrogen subjected to alpha particles irradiation. Regular alpha contaminated area measurements have to be carried out at contact of the surface due to the low path of alpha particles in air (˜ 4cm for from 241Am source). This new technique allows building images of the sources at distance and through translucent materials. This alpha camera has been tested on site and is currently under industrialization process. The very last studies concern the development of a dual alpha/gamma compact camera based on the feedback of both Aladin gamma camera and the alpha camera. This prototype has been patented in 2015. Finally, The CEA is also qualifying and developing new field of portable gamma camera with low weight.

1. INTRODUCTION
   The knowledge of the radiological state of a process or a facility is of prime importance not only during the initial stages of a dismantling project's initial inventory, but also during the follow-up phases of clean-up and final checks. During a facility's operation, a clear view of the process radiological level is equally necessary, in order to plan maintenance scheduling and optimize interventions by personnel. Radiation protection teams generally ensure worker radiological safety, and also supply dose mappings for each of the areas associated with typical spectra. In most cases, this mapping does not give enough information to be used as input data when preparing maintenance or clean-up work. With advances in activity modeling calculation codes (using 3D), the way measurements are made to recover the best input radiological data on site is a key factor.
2. LESSONS LEARNED FROM USING IMAGING TOOLS
   The CEA has developed many compact characterization tools to follow sensitive operations in a nuclear environment. Usually, these devices are made to carry out radiological inventories, to prepare nuclear interventions or to supervise some special operations. These in situ measurement techniques mainly take place at different stages of clean-up operations and decommissioning projects, but they are also in use to supervise sensitive operations when the nuclear plant is still operating. In addition to this, such tools are often associated with robots to access very highly radioactive areas, and thus can be used in accident situations. The CEA has also carried out more than several hundred radiological investigation using imaging devices like gamma cameras and alpha cameras.
3. RECENT ADVANCES OF IMAGING TOOLS
   The CEA is currently studying the possibility to use only one compact device to measure both alpha contamination and gamma irradiation. As a matter of fact, some nuclear facilities under decommissioning operations have to face these two issues at the same time. A first prototype has been developed and tested. On the other hand, new low-weight and high-sensitive portable gamma camera are also qualified on real application cases (high dose rate).
4. CONCLUSIONS Nuclear instrumentation is still in progress and the evolution of the technologies and software allow us to get imaging information in real time. The gamma camera is going to evolve and to become more compact and more sensitive. New portable gamma cameras have to be tested under high level dose rate. The alpha camera is also evolving : from the first propotype tested on site to solar blind alpha camera (to reduce the influence of light) to the new dual alpha/gamma prototype. REFERENCES [1] C. Le Goaller, G. Imbard et al. « The development and improvement of the Aladin gamma camera to localise gamma activity in nuclear installations », European Commission, Nuclear Science and Technology EUR 18230 EN, 1998 [2] O. P. Ivanov, "Control and image decoding software for portable gamma-ray imaging system with coded aperture", IEEE NSS-MIC, conference record, Seattle (WA), October 26-28 1999 [3] C. Mahé, C. Le Goaller, F. Lamadie, Ph. Girones, F. Delmas, & al. "Imaging

systems: new techniques for decommissioning", ANS DD&R, 2005 [4] C. LEGOALLER et AL., "Gamma imaging: Recent achievements and on-going developments", ENC 2005 [5] F. LAMADIE et AL., "Alpha imaging: first results and prospects", IEEE 2004, Nuclear Science Symposium [6] MAHE, C., "Alpha Camera : Localization of Alpha Contamination into Nuclear Plants", IWORID, 2013

Country or International Organization

CEA

Type "YES" to confirm submission of required
 Forms A and B via the official channels

YES

Primary author: Mr MAHE, CHARLY (CEA)

Co-authors: Mr VENARA, Julien (CEA); Mr BEN MOSBAH, Mehdi (CEA)

Presenter: Mr MAHE, CHARLY (CEA)

Session Classification: Session 4A - 3

Track Classification: Technical and Technological Aspects of Implementing Decommissioning Programmes