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Comparison of 3 radio-imagers (Cyclone™/Beaver™/µ-imager™ DFINE) to characterize radioactive emissions of 3H, 14C and natural Uranium samples.

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Radio-imagers, mainly dedicated to biological and medicine applications, can be used to reconstruct 2D mapping of radioactivity on a surface. The resulting image, called Digital Autoradiography (DA), gives a non destructive analysis of radioactivity.
Recently, a new scope for the radio-imagers has emerged: nuclear facilities decommissioning. Indeed, in such context, surface contamination need to be accurately localized and characterized in terms of activity and radionuclide identification. DA method appears to be a suitable candidate for this issue.
Currently, various radio-imagers are commercialized, mainly for research purposes, but up to now, there is no device able to investigate surface contamination at the scale of a facility. The MAUD project (Measurement by Digital Autoradiography) aims at designing a new in situ device able to assist in the dismantling process of nuclear facilities. For this purpose, three DA technologies are currently investigated: 1) Cyclone™, a laser used to read phosphor screen and developed by Perkin Elmer, 2) Beaver™, the Gas Detector designed by AI4R company and 3) µ-imager™ DFINE, the Solid Scintillation Detector developed by Biospace Lab.
Autoradiographic measurements of a rock sample containing natural Uranium, and of samples artificially labeled with 3H and 14C, have been acquired using the three radio-imagers quoted above, with an exposure time of 1 hour. The present study proposes a comparison of the resulting images, in terms of qualitative and quantitative results, in order to identify the strength and the weakness of each device.
A preliminary study has shown that a linear correlation should be expected between the counting of the Beaver™ and the DFINE one. It will also be possible to estimate the efficiency of each detector for the three kinds of radionuclide tested.
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