Nuclear measurement device:
Piloting aid for highly radioactive deposit retrieval operations

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Following a leakage from a process valve, NUGG fuel dissolution solutions spread over the floor of corridor 223-23 in the UP1/MAR 200 facility at the MARCOULE site, thus forming a deposit. During the remediation of this corridor area, several deposit clean-up operations were carried out using BROKK-type remotely handled equipment.

The preparations for these retrieval operations included setting up a device which would ensure the compliance of the waste packages with the rules set for transport and with the specifications for the intended waste route. To condition this highly radioactive waste, it was decided to use an inner metallic packaging which would then be placed in a pre-cemented F2-type drum.

To check that the waste complied with the requirements of the ANDRA low and intermediate level waste storage site (CSFMA), two characterization steps were implemented.

The first step involved checking that conditioning the deposits in the metallic container did not exceed the acceptance thresholds set for transport and for the ANDRA site. To do this, a nuclear measurement device equipped with two STTC probe positioned at the top and bottom of the container was set up near the job site. The isotropic nature of the detector readings was checked with a certified source of ^{137}Cs before the device was set up on the site (Figure 1,2). Digital modeling and simulations (MERCURAD software) taking into account the variability of deposit density and data on the typical waste spectrum enabled the successful piloting of container filling during the retrieval operations.

The second step consisted of carrying out three in situ gamma spectrometry measurements at positions separated by an angle of 120° from each other, in contact with the F2-type pre-cemented drum. The transfer function indicating the number of photons detected by the detector crystal as a function of that emitted by the waste itself was obtained by digital modeling and simulations. The deposit density and the drum filling volume were taken into account.

In order to verify the efficiency of the cleaning-up operation, gamma measurement has been performed.

This study enabled the retrieval of the deposits present in the corridor: 41 pots/drums were prepared, reconditioned in CBFK containers, and are now ready to be sent to the ANDRA site.

Figure 1. Laboratory experimental device to verify the isotropic nature of the detectors readings

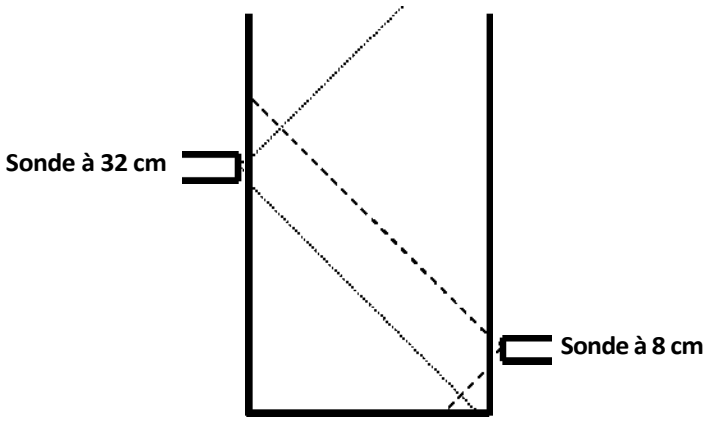
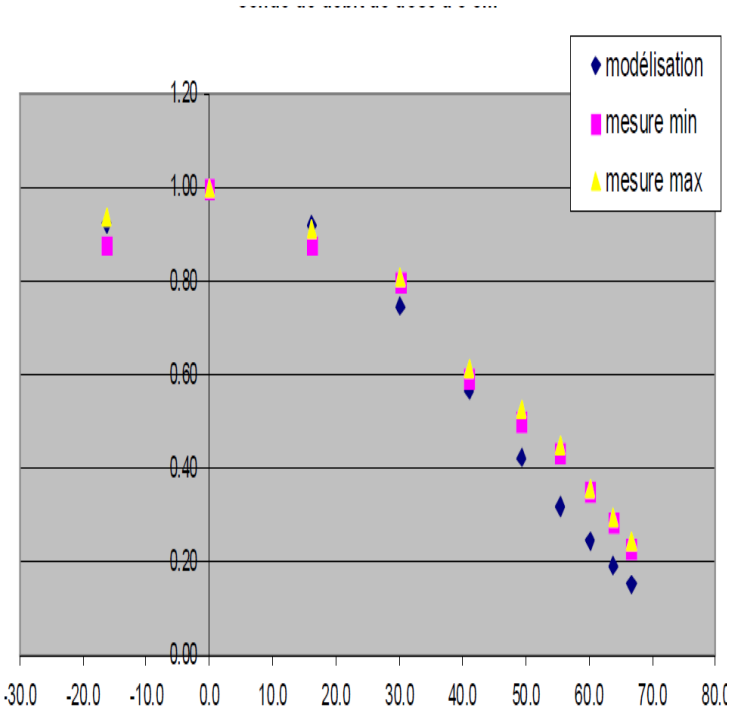
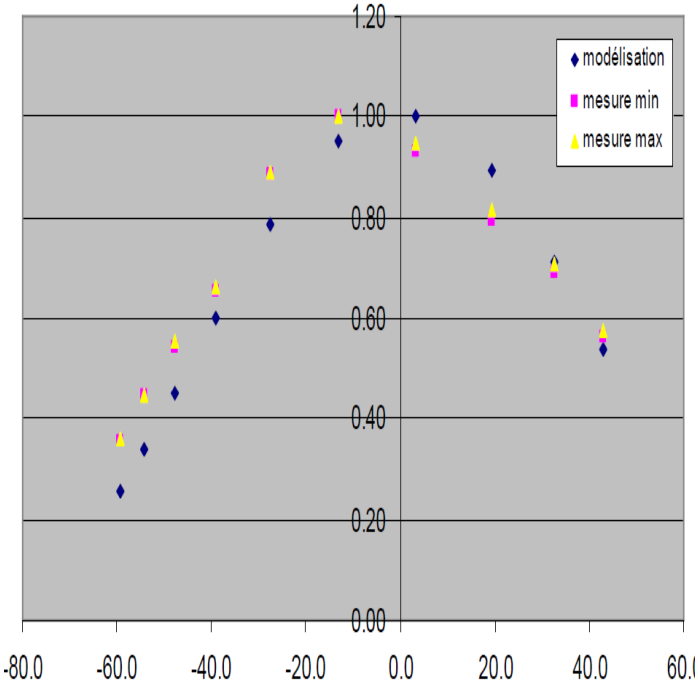


Figure 2. Results on the isotropic nature of the detectors readings



Probe positioned at 8cm from the bottom



probe positioned at 32cm from the bottom