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#7-44 UGV-related radiologic sensors developments for gamma and neutron spectroscopy and alpha/beta contamination scan in D&D applications

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The dismantling and decommissioning (D&D) of nuclear facilities have become an increasingly significant global endeavour, driven by the number of infrastructures, aging, and technology evolution and awareness in the field. Dimensions of the infrastructures, harsh radiological environment, safety requirements, reliable process, and not least costs, are some of the technical aspects affecting D&D activities. At the same the improvements in the automation sector, the industry 4.0 is becoming part of our lives driving all the operation that are critical.

The dismantling of these facilities necessitates these advanced techniques to meet international safety standards, minimize radiation exposure, ensure operational efficiency and reduce costs and operational. In response to these challenges CAEN is involved in two EU-funded projects, CLEANDEM (H2020 -GA945335) and XS-ABILITY (Horizon GA101166392) to develop and upgrade radiologic sensors for inspections and monitoring of the environment. This work represents the results obtained for the sensors developed within CLEANDEM, focusing on the Gamon-UGV drone and a large area contaminameter and their expected evolution in XS-Ability.

The Gamon-UGV drone is a gamma and neutron detection system with spectroscopic capabilities, based on the NaIL scintillator. A description of the realization and characterization performed within the CLEANDEM project will be described tests as well the ones performed at the AINT laboratory and the integration in the DigitalTwin platform. The prototype obtained good results within CLEANDEM, but it highlights also aspects that have to be re-evaluated. One concern the possibility to work with more compact electronics to better meets UGV requirements within XS-Ability.

The second system that will be described is a large surface contamination monitor system for alpha and beta contamination measurements. It can work in continuous mode to scan extensive surfaces, an extremely useful capability during the dismantling phase to verify absence of remaining of superficial contamination. The system was embedded in the TECNALIA UGV used in CLEANDEM and was tested at the ENEA laboratory and results will be reported based on standard protocols of the category. It will also be described the new development for the XS-Ability project. A robotic platform will also be used to scan large surfaces at higher heights, enhancing the ability to detect radiation over extended areas.

The successful outcomes of CLEANDEM demonstrate that unmanned systems not only reduce worker exposure to radiation but also enhance the overall efficiency of D&D processes. These systems can be further adapted for broader applications, including radiologic safety, security, and crisis management, where remote and autonomous interventions are critical for minimizing risk.

We will also prepare a description of the XS-Ability prj and its primary objective to develop and deploy a swarm of autonomous Unmanned Ground Vehicles (UGVs) and Unmanned Aerial Vehicles (UAVs) equipped with advanced radiation detection technologies. The robotic systems developed in XS-ABILITY will be designed to address several key challenges in nuclear D&D, including accessing hard-to-reach areas.

In conclusion, CLEANDEM and XS-ABILITY represent a significant step forward in the application of autonomous robotics in the nuclear D&D sector. The technologies developed under these projects will enhance safety, improve operational efficiency, and reduce the financial and logistical burden of D&D processes.

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