**A new radioactivity system to inspect suspicious material/objects for maritime security needs [[1]](#footnote-1)**

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Monitoring radioactive isotopes in aquatic environments is essential for environmental safety, early detection of nuclear accidents and research in various scientific fields like geology, seismology and oceanography. A lot of monitoring activities have been performed in the marine environment have been performed applying low and medium resolution underwater gamma-ray spectrometers such as the KATERINA [1] and GeoMAREA [2] detection systems. In this work a new nuclear detection system (named Mini KATERINA) is develop to be integrated in robotic vehicles for providing data in controlled aquatic environments. The system was tested in the laboratory using reference sources and various simulants prepared to train the system for suspicious objects identification under the hull of the ships. It operates a 2’x2’ NaI(Tl) scintillation crystal coupled with a Silicon Photomultiplier to minimize dimensions, weight and maneuverability in the sea. All calibrations were performed with and without its enclosure. Gamma-ray spectra were acquired using point sources in the air environment with a special frame and geometry. The underwater detection system was immersed in a water tank with radioactive isotopes in order to calibrate it in terms of energy, energy resolution and efficiency. The activity concentrations of the gamma-ray emitters enriched into the water was determined by applying the calibrated KATERINA underwater spectrometer [1]. Simulation results were obtained using the MCNP5 code [3] reproducing well the experimental data. The underwater nuclear detection system together with robotic vehicle will be applied first for nuclear security needs and then in cases of identifying nuclear substances under the hull of the ships. The system will be applied in general inspection tasks that would be performed in collaboration with the port authorities. Moreover, the integrated system (robot and nuclear detector) is requested by the private sector to identify potential leak detection in applications related to pipeline inspection where special radiotracers (gamma-ray emitters) are applied.

**References**

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[3] X-5 Monte Carlo Team, MCNP – A General Monte Carlo N-Particle Transport Code, LA-UR-03-1987, Los Alamos National Laboratory, 2003.

1. UnderSec EU Project (HORIZON [↑](#footnote-ref-1)
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