Geant4 simulations of two types of CdZnTe-based γ-ray spectrometers for the monitoring of the radioactivity in the marine environment

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Background: Radioactivity is omnipresent in the marine environment, but it is still generally under-measured and under-studied with the current instrumentation on both short and long-term scales. The newly funded EU H2020 FET project RAMONES aims at closing the existing gap in continuous-*in situ* measurements of natural and artificial radioactivity in the marine environment. To achieve its main objectives, RAMONES will design, develop, and validate (via lab measurements, field tests and simulations) a fleet of autonomous underwater gliders, an autonomous surface vehicle, and a static benthic laboratory, all equipped with prototype radiological instruments.
Materials and methods: Simulations with the Geant4 software toolkit were performed for two types of CdZnTe-based gamma-ray spectrometers with our first goal being to match the simulated results with the experimental data collected at the lab and in the marine environment. The novel spectrometers were irradiated with point-like calibration sources (^{137}Cs,^{152}Eu). Energy spectra were extracted from the simulations for different distances between the source and the detector. Additionally, simulations were conducted under various setup scenarios to evaluate the response of both spectrometers in the marine environment.
Preliminary results: A comparison between the simulated results and the experimental data resulted in optimizing the geometrical features of the spectrometers and estimating the efficiency of the spectrometers in the harsh marine environment, thus providing the necessary step to perform dosimetry using GATE in the near future.