



GEMS: underwater spectrometer for long-term radioactivity measurements

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GEMS (Gamma Energy Marine Spectrometer) is a prototype of an autonomous radioactivity sensor for underwater measurements, developed in the framework of the KM3NeT Design Study (DS) EC project. The spectrometer is sensitive to gamma rays produced by ^{40}K decays and it is also able to detect other natural (e.g., ^{238}U , ^{232}Th) and anthropogenic radionuclides (e.g. ^{137}Cs). The decay of ^{40}K , contained in sea salt, particulate and sediments, is one of the main sources of photon background in the underwater environment.

GEMS was first calibrated in the laboratory using known sources, also in order to evaluate the performance of the instrument. In November 2008 GEMS was deployed at a depth of 3200 m in the area of Capo Passero (in the Ionian Sea) to acquire data autonomously. After recovery of the spectrometer six months later (May 2009) it was found that the instrument had worked within the specifications and acquired data over the full deployment period. These data allowed us to investigate over a long period the possible variations of activity at the Capo Passero site.

GEMS is suitable to be used either in autonomous mode or as payload of seafloor observatories or vehicles.