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Measuring Background Radiation with a Novel Ionisation Detector Aboard A North Atlantic Voyage

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Radon and its progeny are well-documented sources of natural radioactivity which can be used as benchmarks for testing a novel ionisation detector. The miniaturised ionisation detector was deployed aboard the NRP Sagres on a SAIL mission in July 2021 which travelled between the Açores and Lisbon in the North Atlantic Ocean. On its voyage, the detector profiled natural background radiation and in-directly detected cosmic ray muons, providing both spectroscopic energy discrimination and count rate data. The detector was simultaneously run with a NaI(Tl) gamma ray counter and other meteorological instruments.

The small form factor and low-power detector, composed of a $1 \times 1 \times 0.8 \text{ cm}^3$ CsI(Tl) microscintillator coupled to a PiN photodiode, was able to identify gamma peaks from Bi-214 and K-40, having been calibrated using laboratory gamma sources up to 1.3 MeV. This research aims to investigate the performance of the ionisation detector and behaviour of discrete gamma energies over the duration of the voyage. Additionally, we will show a comparison of the CsI(Tl) based ionisation detector against the gamma ray counter which features a larger NaI(Tl) scintillator.