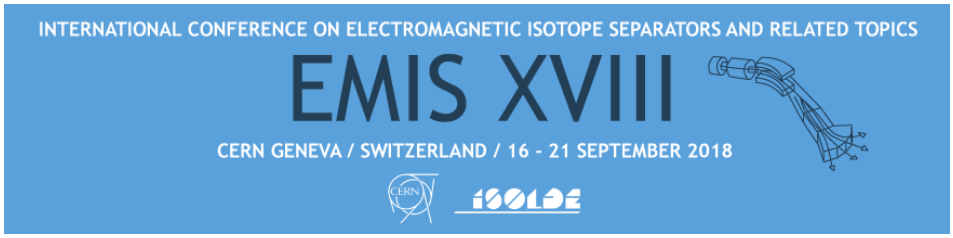

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Beta-detected Nuclear Magnetic Resonance: From nuclear physics to biology

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β-NMR is a powerful tool which takes advantage of the anisotropic nature of β decay, to obtain information about the environment in which the radioisotope is implanted or to study the properties of the radioisotope itself. Nuclei are first polarized, then implanted into a crystal or sample of interest from which β-decay intensities are measured in opposing directions. The relevant information is extracted from an excitation radio-frequency applied to the system, which resonantly destroys the nuclear polarization. This technique has the advantage of being significantly more sensitive (up to 10 orders of magnitude) than traditional NMR. The new VITO beamline has been developed over the last two years at the ISOLDE facility (CERN) to provide beams of spin polarized radioactive nuclei for study. This culminated in a successful commissioning experiment measuring the β-decay asymmetry of 26Na and 28Na in a crystal of NaF, the results of which were published in March of 2017 [1].

A recent proposal is to apply this powerful technique to study biological systems. One such example is to observe how Na+ cations interact with DNA G-quadruplex structures in solution, the subject of campaign IS645 [2]. This contribution will focus on the results from these initial studies.

[1] M Kowalska et al J. Phys. G: Nucl. Part. Phys .44 084005 (2017)
[2] M. Kowalska, V. Araujo Escalona et al. Interaction of Na ions with DNA G-quadruplex structures studied directly with Na b-NMR spectroscopy. INTC-P-521 https://cds.cern.ch/record/2299798/files/INTC-P-521-ADD-1.pdf

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