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#08-179 Updates on a real-time in-line monitoring of tritium in water for Fukushima

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Tokyo Electric Power Company (TEPCO), in order to enhance the monitoring capability for site contamination and surrounding environment is looking to continuously monitor Tritium (3H) concentration in seawater. We hereby present the latest developments of a system by CEA List, in partnership with TEPCO, to achieve the challenging real-time/in-line monitoring of Tritium (3H) in water.

During Phase 1 of the project, a prototype has been developed, based on the SAFEWATER real-time in-line beta/gamma contamination monitoring system. Initially based, for SAFEWATER, on coated scintillating fibers, the TEPCO-dedicated design is based on ZnS-coated PMMA plates to make it sensitive to 3H. Digital pulse processing is performed to improve the 3H detection. An experimental campaign undertaken at Laboratoire National Henri Becquerel (LNE-LNHB), France's National Metrology Laboratory in the field of ionizing radiation, showed promising results. This experimental campaign run during the first Phase of the project, while conclusive with 3H measurable at a concentration of 1.5 kBq/L has highlighted some possible paths for improvement.

The focus of the current Phase 2 work, is to take into account the feedback and lessons learned from the promising Phase 1 results, in order to improve the design, for a better measuring efficiency and robustness of the system.

The first part of the present study is dedicated to the design of the new measurement apparatus, using computer models and simulations carried out using the MCNP6.2 code and Solidworks CAD software; in order to design and eventually confirm assumptions made during Phase 1. The second part is focused on two measurements campaigns, and the adjustments that were made in-between, both undertaken at LNHB, in order to achieve metrology-grade assessment of the 3H concentration.

Primary authors: MICHEL, Maugan (Institut LIST, CEA, Université Paris-Saclay); Dr CORRE, Gwenolé (Institut LIST, CEA, Université Paris-Saclay); BOURBOTTE, Jean-Michel (Institut LIST, CEA, Université Paris-Saclay); WOO, Romuald (Institut LIST, CEA, Université Paris-Saclay);   Dr SABOT, Benoit (Institut LIST-Laboratoire National Henri Becquerel (LNE-LNHB), CEA, Université Paris-Saclay); CORBEL, Margot (Institut LIST-Laboratoire National Henri Becquerel (LNE-LNHB), CEA, Université Paris-Saclay);   Dr LOURENCO, Valérie (Institut LIST-Laboratoire National Henri Becquerel (LNE-LNHB), CEA, Université Paris-Saclay); DABAT-BLONDEAU, Alexandre (Institut LIST, CEA, Université Paris-Saclay); Dr MAGNE, Sylvain (Institut LIST, CEA, Université Paris-Saclay); Dr SARI, Adrien (Institut LIST, CEA, Université Paris-Saclay);   KONDRASOVS, Vladimir (Institut LIST, CEA, Université Paris-Saclay); Dr CARREL, Frédérick (Institut LIST, CEA, Université Paris-Saclay); Dr BERTRAND, Guillaume (Institut LIST, CEA, Université Paris-Saclay); TROCMÉ, Mathieu (Institut LIST, CEA, Université Paris-Saclay); Dr DUMAZERT, Jonathan (Institut LIST, CEA, Université Paris-Saclay); Dr CASSETTE, Philippe (Institut LIST-Laboratoire National Henri Becquerel (LNE-LNHB), CEA, Université Paris-Saclay); Dr FRECHOU, Carole (Institut LIST-Laboratoire National Henri Becquerel (LNE-LNHB), CEA, Université Paris-Saclay); Dr THIAM, Cheick (Institut LIST-Laboratoire National Henri Becquerel (LNE-LNHB), CEA, Université Paris-Saclay)

Presenter: MICHEL, Maugan (Institut LIST, CEA, Université Paris-Saclay)

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