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#07-103 Performance assessment of amplification and discrimination electronic devices for active neutron measurements

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The knowledge of the fissile material mass is a key challenge to enhance radioactive waste management and to ensure a high level of safety in nuclear industry. The assessment of plutonium fissile mass by passive coincidence measurements is usually obtained by detecting the neutrons generated by the spontaneous fissions of Pu isotopes. The detection and the quantification of a fissile mass in radioactive waste can also be carried out using active neutron interrogation with a pulsed D-T neutron generator. The 14 MeV neutrons are moderated to induce fissions in the uranium and plutonium contaminated waste. The emerging neutron signal can be analyzed by taking into account their detection time after the generator pulse. Data is analyzed according to the principles of the neutron measurement techniques. Currently, the ACH-NA98 charge amplifier from Mirion Technologies (France) are used as reference electronics in industrial facilities specially dedicated for the reprocessed fuel assembly (ORANO/La Hague, France) and for the radioactive waste characterization(CEA/Cadarache). However, it is primordial to evaluate the performance of the other commercially available electronics in order to maintain and/or improve the performances of the several neutron measurement set-up presently implanted. This paper describes the performance assessment for active neutron measurement of different commercially available electronics from Mirion Technologies (ACH-NA98), Precision Data Technology (PDT10A and PDT10M+PDT12S modules), Mesytec (MRS2000-1 and MRS2000-2 amplifiers), as well as MONACO electronics originally developed by CEA LIST for fission chamber measurements in experimental reactors. The experimental campaign has been carried out in the DANAIDES facility located in the Cadarache Research Center of CEA (French National nuclear energy Commission). The experimental tests consist in comparative active neutron measurements for different neutron emission rates of the SODERN D-T neutron generator. These measurements for neutron emission rates up to 2.3×10^8 n/s give quantitative information on the behaviour of the amplification electronics such as the count loss according to the time.

Primary author: ELEON, Cyrille (CEA, DES, IRESNE, Nuclear Measurement Laboratory, F-13108 Saint--Paul-lez-Durance, France)

Co-authors: Dr BEN MOSBAH , Mehdi (CEA, DES, IRESNE, Nuclear Measurement Laboratory, F-13108 Saint--Paul-lez-Durance, France); Dr PASSARD, Christian (CEA, DES, IRESNE, Nuclear Measurement Laboratory, F-13108 Saint-Paul-lez-Durance, France); Dr PEROT, Bertrand (CEA, DES, IRESNE, Nuclear Measurement Laboratory, F-13108 Saint-Paul-lez-Durance, France); LORIDON, Joel (CEA, DES, IRESNE, Nuclear Measurement Laboratory, F-13108 Saint-Paul-lez-Durance, France); Dr BARBOT, Loic (CEA, DES, IRESNE, LDCI, F-13108 Saint-Paul-lez-Durance, France)

Presenter: ELEON, Cyrille (CEA, DES, IRESNE, Nuclear Measurement Laboratory, F-13108 Saint-Paul-lez-Durance, France)

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