9th Workshop on Nuclear Level Density and Gamma Strength

Contribution ID: 74

## Depletion and Activation analysis of the JEEP-I reactor

The energy released from nuclear fission has been harnessed since the 1940s and is a major contributor for power production in many countries around the world today. In total there are 439 operable reactors in the world, as of March 2024, with a total production capacity of almost 400,000 MWe [1]. Countries like the Unites States, China and France are major nuclear electricity producers, and France gets over 62% of its electricity from nuclear power.

Understanding how the effects of radiation from different types of radioactive emis- sions affect matter is vital for the safe operation of these reactors, in addition to the effects of spent fuel on matter. In shielding applications, this is especially important, however reflectors and shields may themselves become radioactive through activation. This is most common through neutron absorption reactions  $(n,\gamma)$ , where the isotopic configuration of a substance is altered.

In Norway, there have been four operating nuclear research reactors, JEEP-I, JEEP-II, NORA and the HBWR. The JEEP-I reactor was the first of these reactors, going critical for the first time in the summer of 1951 and was decommissioned in 1967. Nevertheless, the reactor tank is the only part of the reactor building that has actually been removed. As a part of the decommissioning work, my thesis will simulate the neutron flux inside the reactor and investigate the activation of materials surrounding the reactor tank, looking for traces of  $^{14}$ C from the graphite reflector and radioactive Eu isotopes from the concrete in the basement under the reactor vessel.

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Session Classification: Day 1