



Referee report: GEMMA-III

“Investigation of neutrino properties with low-background germanium spectrometer”

Presented in the report are investigations involving the measurement of neutrino properties whose initial formulation in standard model (SM) was based on the notion of a massless neutrino. The provision for the massive neutrino is made via minimally extended standard model which makes a prediction for a very small magnetic moment value (MMV) for the neutrino, which to date has not been observed in the set of current experiments. Key among the major breakthroughs would be the observation of the MMV value higher than the $10^{-14} \mu_B$ which will show evidence that the neutrino is a Majorana particle. Other tests to be undertaken at GEMMA-III which could serve as important tests for the SM include the process of coherent elastic neutrino-nucleus scattering (CENNS) which so far has not been observed with reactor neutrinos.

Owing largely to low cross-sections, these processes are not easily to observe; however, the new level of sensitivity offered by the GEMMA-III configuration will offer new possibilities for these predictions to be investigated. Among the upgrades of the detection system is a replacement of the vGEN spectrometer with new CANBERRA detectors, which will be ready for commissioning in 2018 following the successful testing of the 1 kg detector at the LSM. The high levels of resolution offered by this detector system will allow for measurement at low threshold levels of 200 eV, thereby opening a window for many other interesting investigations to be conducted – including the search for sterile neutrons and reactor monitoring, among others.

These investigations promise to yield results that will address some of the most fundamental questions in particle physics while at the same time addressing practical questions regarding the operations of nuclear reactors. It is evident that a lot of expertise has been gained in the previous studies by the JINR team in this project. I recommend that the JINR continues to support this project with high priority.

A handwritten signature in black ink, appearing to read 'Z Vilakazi'.

Zebulon Z Vilakazi

12th January 2018