

Referee Report to the 47th N.P. PAC at JINR

concerning 4.2 project SuperNEMO

“Investigation of the 2-beta-decay processes of Se-82 with the SuperNEMO detector”

Searches for neutrinoless double beta decays belong to the most fundamental experiments in nuclear and particle physics, testing the nature of neutrinos and ultimately also its mass hierarchy. A discovery of neutrinoless 2-beta-decays would establish the Majorana type of neutrinos and signify physics beyond the standard model. A number of experiments in underground laboratories have studied several candidate isotopes, where only 2-beta decays are energetically possible. Some lower limits of half-lives have now already reached or are approaching 10^{26} years, however without any clear signal yet. It is obvious that more efforts with higher sensitivities and improved background suppression must be undertaken.

One of the most promising approaches is made by the NEMO collaboration in the Mondane underground laboratory (LSM). The NEMO-3 detector of which now the final results are being published is using the tracker-calorimeter technique which allows clear kinematic reconstruction of 2-beta events and the use of various 2-beta-candidate isotopes.

To reach the required higher sensitivities a new SuperNEMO detector is being designed, of which a first unit “Demonstrator” with 7 kg of the Se-82 isotope is now almost ready to be assembled and tested at LSM in 2018, with start of the full configuration in 2019, eventually also equipped with other candidate isotopes. The setup of SuperNEMO Demonstrator looks very promising and should be strongly supported.

The Dubna group from DLNP is strongly involved in NEMO for many years in the development and testing of detector components (scintillators, PMs, electronics) and isotopes (chemical purification), software developments, etc. The Dubna team consists of excellent specialists in this field, has a high visibility on the world scale and clearly deserves full support for SuperNEMO by the laboratory.

Therefore, I strongly recommend that JINR continues with full support of the SuperNEMO project at highest priority.

Villigen-PSI, Dec-22-2017

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