

# Referee report on the GEMMA (vGeN) experiment (JINR participation)

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The reports given to the Program Advisory Committee of JINR on 21 January 2021 outline the proposal submitted by JINR researchers to carry on activities on the GEMMA experiment (vGeN being the proposed evolution of the initial experiment), to search for the neutrino magnetic moment and to measure neutrino coherent scattering on nuclei exploiting reactor neutrinos, for the years 2022-2024.

The experimental setup is placed very close to the core of the Kalinin power plant, generating a very intense antineutrino flux. The other important feature of the experiment is given by the 50 w.e. overburden, providing excellent shielding against cosmic-ray induced background events. The neutrino detection technique exploits germanium devices. The distance source-detector can be suitably varied.

As far as the measurement of the neutrino magnetic moment is concerned, a potential indicator for new physics, the past activities of the experiment led to sensitive limits. Given the recent results from the COHERENT collaboration, which found indication for the coherent scattering process with a relatively high-energy flux of accelerator neutrino, this subject will be of great relevance for the future operation of the vGEN detector, as well. This process is also a portal towards new physics and features a relatively high cross section. The proposed experiment should benefit from the intense neutrino flux and from the lower energy to obtain a strong and hopefully unambiguous evidence for the process.

Both scientific goals are of great interest and are currently addressed by several international projects, hence determining a strong competition and the consequent need for a sound proposal from the JINR group with realistic expectations of gathering science results in a timely fashion.

Having said that, the referee identifies some elements of concern.

- 1) Already in 2019, the experiment was evaluated by the joint PACs meeting, that ranked the project with B priority. Already at that time it was observed that: *...in view of the competing experiments, the team is encouraged to increase the detection volume much more than anticipated, thus reducing the running time of many years and achieving the objectives in a competitive time scale. For that, the team should be enlarged in terms of FTE. The team should also be encouraged to publish more.* When comparing to the schedule presented in that occasion it seems that an important delay has already been accumulated.

- 2) The proponents do not show papers published after 2015. The score of conference presentations is also not adequate, and only one PhD thesis is in progress.
- 3) On the other hand, the JINR participation is huge in terms of head counts (definitely too much), since a total of 28 between engineers, students and senior researchers is participating. The most disappointing feature is that nobody has an FTE larger than 0.7 and 8 people are at the 0.1 level.

In conclusion, the referee believes that the goal of a meaningful search for neutrino coherent scattering is definitely worth pursuing in the shortest possible time with strong commitment. However, the experiment could be recommended for approval only if a “lighter” and more efficient group is setup, with a few dedicated people and a stronger contingent of young researchers. It is also requested to set up a credible strategy to improve the scientific output and a realistic schedule, including milestones, evaluation of showstoppers and confrontation with the international competition.



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