Referee review

of the proposal **"Search for new physics in the lepton sector"**

Searches for new physics beyond the Standard Model will dominate in particle physics for decades. The proposal comprises well known experiments which are at the forefront of international research in the study of charged-lepton flavor-violating (cLFV) processes. It is expected that high intensity muon beams will provide the probes for testing a variety of the new physics models including SUSY, Extra Dimensions, Double Higgs, etc. The proposed experiments will overcome significantly the current limits for cLFV.

COMET experiment will search for the flavor transitions between the charged leptons in the process $\mu+N(A,Z)\rightarrow e+N(A,Z)$ at J-PARC accelerator in Japan, aimed to reach a single event sensitivity (SES) of about 10^{-17}. The experiment will be staged in two periods. The initial goal is to study muon beam contamination and to reach SES at the level of 3.1×10^{-15} after 150 days of operation. The JINR has carried out R&D dedicated to the major components of the COMET detector - electromagnetic calorimeter based on LYSO crystals and straw tracker made of thin wall straw tubes. A big number of crystals have been already characterized, and 2700 full size straw tubes of 20 μm wall thickness have been produced in Dubna and transported safely to Japan. These excellent achievements are very important for the success of the experiment resulting in high visibility of the JINR team. *The proposal presents details of the individual crystal measurements (energy resolution and non-uniformity) but it remains unclear how stable they are (ageing tests) and how it will affect the calorimeter performance (calibration & monitoring). The JINR team members also participate in the detector simulation program, but no group commitments are presented for realization of the physics program.*

Mu2e experiment at Fermilab and MEG-II experiment at PSI will significantly (a few orders of magnitudes) extend the sensitivity limits for observation of cLFV processes, like $\mu^- N\rightarrow e^- N$ and $\mu^+\rightarrow e^+\gamma$. A big technical contribution is made by the JINR team in development of the cosmic ray veto system of the Mu2e detector and its electromagnetic calorimeter. More R&D work is planned but *it is not clear from the proposal how the responsibilities are shared among the participating colleagues.* The JINR plans for participation in the MEG-II experiment are also of technical origin but more software oriented aiming at the development of event display, simulation work and the drift chamber maintenance. Currently the experiment is in the commissioning stage, *but again no plan is presented about future participation in the physics analyses. This request is valid for all three teams.*

It is clear from the proposal that, generally speaking, we have three independent experiments with no overlap in manpower. Another reason to put them into one project in addition to the similarity of the research topics could be the opportunity for better resource management. *This point is missing in the "SWAT analysis" chapter where strategy for the case of the resources shortage should be discussed.*

In conclusion, I consider that continuation of the JINR participation in these experiments is justified by their scientific merits and also by significant contribution which Dubna teams have already made. The requested resources including travel budgets are adequate taking into account the participation of the team members in the detector assemblying, testing and commissioning. I recommend to approve continuation of the JINR participation in the COMET, Mu2e and MEG-II experiments for the period of 2021-2023.

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