



2016/10/18

Re: Referee report on the project of JINR participation in the COMET experiment

Dear Sir at JINR,

The physics motivation of the COMET experiment (COherent Muon to Electron Transition) is well appreciated. Flavor transitions between different charged leptons have a great potential to reveal new physics phenomena beyond the Standard Model. Decay processes of $\mu \rightarrow e\gamma$, $\mu \rightarrow eee$ and μ^{-+} N(A,Z) $\rightarrow e^{+}$ N(A,Z) conversion would provide complementary information about possible new physics. The latter process is addressed by the COMET experiment, which is prepared to operate at the JPARC accelerator complex in Japan with its final goal to reach the sensitivity of ~ 10⁻¹⁷. The COMET Project is staged in two successive stages: Phase-I and Phase-II. The aim of Phase-I is to reach a single event sensitivity (SES) at the level of 10⁻¹⁵ and to study background processes including beam background for Phase-II.

The JINR participation in COMET has been approved by the JINR PAC on Nuclear Physics in 2014. A number of the important results have been achieved since then.

The JINR team contributed to the construction of two major detector components: a electromagnetic calorimeter made by LISO crystals, and a straw tracker and also to the detector simulation.

A dedicated test bench to measure the crystal parameters of LYSO crystals for the COMET electromagnetic calorimeter has been constructed at DLNP JINR. It is supposed that all the LYSO crystals chosen by the COMET collaboration will be certified at this setup,

The DLNP JINR group is also fully responsible for manufacturing of all straw tubes for both phases of the COMET experiment. It is important that for the first stage (Phase-I) the set of more than 2500 tubes of 120 and 160 cm length, 9.8 mm diameter and 20 μ m wall thicknesses, was already produced, tested and delivered to Japan. This was done using the dedicated VBLHEP production area. Now it is urgent to construct a similar production area at DLNP in order to produce 12 μ m wall thickness and 5 mm diameter tubes for the COMET Phase-II. The task is not trivial and a lot of R&D work will be needed before reaching regular welding process. It is of critical importance for us to proceed the Phase-II.

Development of the straw tracker and the calorimeter required a lot of simulation works, which were performed at JINR and was included in the Technical Design Report for Phase-I of COMET (June 2016). The JINR authors of the project are planning to extend their scope of their activities in order to have the possibility to perform at JINR also the physics analysis of the data. We suggest that this should be treated as a high priority task of the COMET project at JINR, and a necessary condition of JINR participation in this experiment.



The requested budget of the project seems reasonable.

In conclusion, we would like to propose to approve the project of JINR participation in the COMET experiment with the first priority. It is the most important for the COMET experiment.

Yours Sincerely,

Johlek Kuno

Prof. Dr. Yoshitaka Kuno Department of Physics, Osaka University Spokesperson of the COMET experiment