

## **Review of the proposal „Search for new physics in experiments with the Fermilab high-intensity muon beams”**

High precision experiments with muons offer very interesting opportunities to search for new physics beyond the Standard Model. Examples are the measurement of the muon anomalous magnetic moment and the search for the charged lepton flavour violating decay  $\mu^- N \rightarrow e^- N$  which have complementary sensitivity to new physics. Both types of experiments will see a significant improvement in sensitivity due to the upgrade of the Fermilab accelerator complex and the setup of new facilities at the Muon Campus.

Currently there is a very intriguing difference between the very precisely measured and theoretically calculated anomalous moment of the muon:  $\Delta a_\mu = (274 \pm 76) \cdot 10^{-11}$  which constitutes a  $3.6 \sigma$  discrepancy. Due to the more intense muon source a new experiment being commissioned now at Fermilab will be able to reduce the experimental part of this error by a factor of four to  $16 \cdot 10^{-11}$ . Together with improvements in theory calculations this has the potential to firmly establish this deviation from the Standard Model as a sign for new physics. The comparison of the measured anomalous muon magnetic moment with the prediction constitutes one of the most sensitive test of the Standard Model and therefore has a very strong physics case.

In the Standard Model the charged lepton flavour violating process  $\mu^- N \rightarrow e^- N$  has an extremely low rate of  $10^{-50}$  and hence is not observable. On the other hand the experimental observation of such a signal would undoubtedly prove physics beyond the Standard Model. The experiment at Fermilab is being constructed and will start data taking in 2020. Again, due to the improved muon source it will have a sensitivity much superior to previous experiments of its type, about four orders of magnitude, down to branching fraction of  $O(10^{-17})$ .

The new beam facility and the experiments are making very good progress on the way to timely their completion. The JINR group made significant contributions to this success and is playing a visible and important role in both experiments. In summary, I consider the proposed project with the Fermilab high-intensity muon beams very interesting with a very high scientific potential. And I strongly recommend the continuation of this project.

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