Muon (g-2) and measurement of hadronic cross-sections at CMD-3

Ivan Logashenko[a,b]
on behalf of the CMD-3 collaboration

[a] *Budker Institute of Nuclear Physics*
[b] *Novosibirsk State University*

Precise measurement of the muon anomalous magnetic moment $a_\mu = (g_\mu - 2)/2$ provides a stringent test of the Standard Model and a tool for a search of physics beyond the Standard Model at the laboratory. There is a long-standing 3–4 standard deviations difference between the result of the latest measurement of a_μ in Brookhaven National Laboratory [1] and the Standard Model prediction of a_μ [2, 3]. In 2018 a new experiment E989 [4] to measure a_μ has started data taking at Fermilab with an ultimate goal of 4-fold improvement in precision compared to the BNL measurement.

There are world-wide efforts to improve the accuracy of the Standard Model prediction of a_μ to match the expected precision of the Fermilab measurement. The dominant contribution to the theoretical error comes from the evaluation of the hadronic contribution. While a lattice-based approach to calculate the hadronic contribution from the first principles shows great progress over last years, the best precision is still achieved with the traditional dispersive approach, based on the integration of the measured total cross-section of $e^+e^- \to hadrons$. The calculation is heavily dominated by low-energy data, in particular, by data at $\sqrt{s} < 2$ GeV.

The CMD-3 experiment at the VEPP-2000 collider [5] in Novosibirsk carries out the comprehensive program of measurements of the exclusive cross-sections $e^+e^- \to hadrons$ in the energy range from the threshold to $\sqrt{s} < 2$ GeV. The first round of data taking in the whole available energy range was done in 2011-2013 . After a three-year break for collider and detector upgrades, data taking resumed in 2017.

We'll present the overview of the field and the status and current results from the CMD-3 experiment.

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