

The role of convergence methods as fitting functions in the context of the MUonE experiment

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The MUonE experiment is designed to extract the hadronic contribution to the electromagnetic coupling in the spacelike region $\Delta\alpha_{had}(t)$ from elastic $e\mu$ scattering. The leading-order hadronic vacuum polarization contribution to the muon $g-2$, $a^{HVP;LO}$, can then be obtained from a weighted integral over $\Delta\alpha_{had}(t)$. This, however, requires knowledge of $\Delta\alpha_{had}(t)$ in the whole domain of integration, which cannot be achieved by experiment. In this work, we propose to use Pade and D-Log Pade approximants as a systematic and model-independent method to fit and reliably extrapolate the future MUonE experimental data, extracting $a^{HVP;LO}$ with a conservative but competitive uncertainty, using no or very limited external information. The method relies on fundamental analytic properties of the two-point correlator underlying $a^{HVP;LO}$ and provides lower and upper bounds for the result for $a^{HVP;LO}$. We demonstrate the reliability of the method using toy datasets generated from a model for $\Delta\alpha_{had}(t)$ reflecting the expected statistics of the MUonE experiment.

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