

EFT description of the $g - 2$

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Outline

- 1 Motivation
- 2 EFT description
- 3 Summary

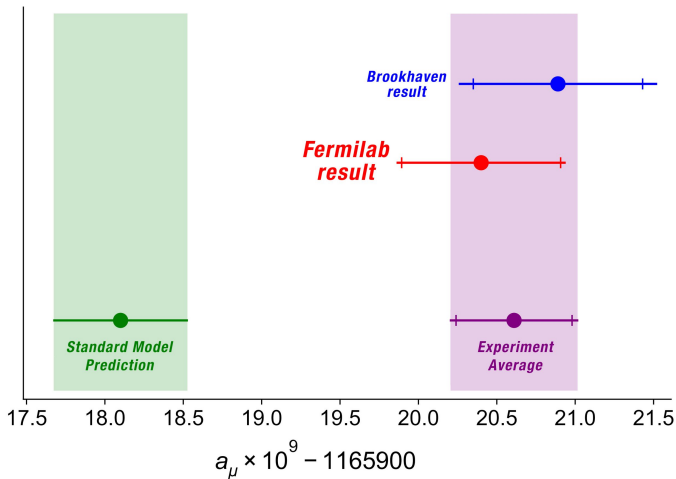
based on: [2102.08954](#), in collaboration with Wouter Dekens, Elizabeth Jenkins, Aneesh Manohar, Dipan Sengupta and Peter Stoffer

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$(g - 2)_\mu$ discrepancy

Muon g-2 collaboration: 2104.03247



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Weak Effective Theory (WET)

$$\begin{aligned}
 \Delta a_{\mu}^{60 \text{ GeV}} = \text{Re} & \left[2.2 \times 10^{-2} L_{\mu\mu}^{e\gamma} - 5.3 \times 10^{-5} L_{\mu\mu bb}^{T,RR} \right. \\
 & + \left(3.5 + 0.65c_T^{(c)} \right) \times 10^{-5} L_{\mu\mu cc}^{T,RR} + 9.0 \times 10^{-6} L_{\mu\tau\tau\mu}^{S,RR} - 1.4 \times 10^{-6} L_{\mu\tau\tau\mu}^{V,LR} \\
 & + 9.8 \times 10^{-7} L_{\mu\mu\mu\mu}^{S,RR} - (10c_T - 0.64) \times 10^{-7} L_{\mu\mu\mu\mu}^{T,RR} \\
 & + (5.0c_T - 14) \times 10^{-7} L_{\mu\mu ss}^{T,RR} + (5.0c_T - 0.70) \times 10^{-7} L_{\mu\mu dd}^{T,RR} \\
 & - 1.6 \times 10^{-7} L_{\mu\mu\tau\tau}^{S,RR} - \left(5.9 + 2.3c_T^{(c)} + 0.45c_S^{(c)} \right) \times 10^{-8} L_{\mu\mu cc}^{S,RR} \\
 & - 8.0 \times 10^{-8} L_{\mu\mu\mu\mu}^{V,LR} - 3.3 \times 10^{-8} L_{\mu\mu bb}^{S,RR} - 2.4 \times 10^{-8} L_{\mu\mu\mu\mu}^{S,RR} + 8.8 \times 10^{-9} L_{\mu\mu\mu\mu}^{S,RR} \\
 & \left. - 4.5 \times 10^{-9} c_S^{(c)} L_{\mu\mu cc}^{S,RL} + 3.5 \times 10^{-9} c_T L_{\mu\mu\mu\mu}^{S,RR} - 1.2 \times 10^{-9} L_{\mu\mu ss}^{S,RR} \right]
 \end{aligned}$$

SM Effective Theory (SMEFT)

$$\Delta a_{\mu}^{10 \text{ TeV}} = \text{Re} \left[1.7 \times 10^{-6} C_{eB}^{\mu\mu} - 9.2 \times 10^{-7} C_{eW}^{\mu\mu} - 2.2 \times 10^{-7} C_{\ell eq}^{(3)\mu\mu 33} \right. \\ \left. - \left(2.5 + 0.22 C_T^{(c)} \right) \times 10^{-9} C_{\ell eq}^{(3)\mu\mu 22} \right]$$

A Python package, which includes

SMEFT running

Complete 1-loop RGEs

Alonso/Jenkins/Manohar/Trott: 1312.2014, 1308.2627, 1310.4838

Matching

Complete tree-level matching

JA/Crivellin/Fael/Greub:1512.02830
Jenkins/Manohar/Stoffer:1709.04486

Complete one-loop matching

Dekens/Stoffer:1908.05295

WET running

Complete 1-loop running

JA/Fael/Greub/Virto:1704.06639
Jenkins/Manohar/Stoffer:1711.05270

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Summary

Current discrepancy

$$(g - 2)_\mu$$

EFT description

WET, SMEFT

wilson

Complete running and matching