In QFT, the electric dipole moment, analogy with magnetic dipole moment $\vec{\mu} = g \frac{e}{2mc} \vec{s}$, is given by:

$$d = \eta \frac{e}{2mc}$$

$$d \mu \sim 10^{-36} e \text{ cm} \text{ (SM Prediction)}$$

Contributing processes to a lepton EDM are at the 3-loop level in the Standard Model and in Beyond Standard Model Physics (e.g. Higgs Doublet).

There are direct and indirect limits on the muon EDM Direct:

$$|d_\mu| < 1.8 \times 10^{-19} e \text{ cm} \text{ (95% C.L.)}$$

Based on BNL Muon g-2 experiment (Phys.Rev.D. 80 (2009), 052008)

Indirect limit: $|d_\mu| < 1.9 \times 10^{-20} e \text{ cm}$

Based on $d_{H^2}, d_{THO}$ EDM (Phys.Rev.Lett. 128 (2022) 13, 131803)

Muon EDM is a sensitive probe to BSM physics;

A more sensitive search for muon EDM is currently underway at Fermilab Muon g-2

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