Laser-Assisted Muon Decay

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Muons decay in vacuum mainly *via* the leptonic channel to an electron, an electron neutrino and a muon antineutrino. Previous investigations into the effect of a strong electromagnetic background on muon decay have concluded [1] that the muonic strong-field parameter must be of order unity to have a significant effect on the muon lifetime, which is well out of reach of current lab-based experimental parameters.

However, previous analyses have assumed the muon intensity parameter is much smaller than unity (for example when interacting with a monochromatic wave [2]) or much larger than unity (for example in the interaction with constant crossed fields [3]). With the prospect of modern lasers reaching electron intensity parameters of $\xi_e \sim O(100)$, or equivalently muon intensity parameters of $\xi_\mu \sim O(1)$, it seems a good time to revisit the problem of muon decay in a laser pulse using modern descriptions which do not restrict the value of the muon intensity parameter.

We present results for muon decay in a laser pulse and find new dependencies on laser parameters which circumvent the restriction that previous analyses arrived at using constant fields.

References

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