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The first search for the weak interaction between muon and charmonium

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Using about $(10087 \pm 44) \times 10^6$ J/ψ events collected with the BESIII detector at the BEPCII e^+e^- storage ring at the center-of-mass energy of $\sqrt{s} = 3.097$ GeV, we present the first search for the weak interaction between muon and charmonium through the semi-muonic charmonium decay $J/\psi \to D^-\mu^+\nu_\mu + c.c.$. Since no significant signal is observed, we set an upper limit of the branching fraction to be $\mathcal{B}(J/\psi \to D^-\mu^+\nu_\mu + c.c) < 5.6 \times 10^{-7}$ at 90% confidence level. This is the first exploration of muon interaction with quarkonium matter and provides the most stringent constraint globally.

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