Quantum metrology – in search of dark matter

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This is a Precision measurement plays an important role in unveiling new physics by probing beyond the known boundaries of knowledge. In a similar footing, it has a wide range of application in trade and commerce. From fundamental physics viewpoint, the Standard Model (SM) of particle physics though considered to be the most celebrated model in physics is known to have shortcomings as is evident from numerous experimental findings. Precision measurements with simple atomic systems provide the opportunity to explore the possible deviations from the SM. The limit to the uncertainty of any frequency measurement is given by the Heisenberg limit. However as will be shown here, using a time dependent Hamiltonian it is possible to surpass this limit. Using, this technique, a trapped single atomic probe provides a weak limit of the coupling of a electron spin to a certain type of dark matter candidate. Possible new experiments can further improve the limit for more assertive searches.