



Final Results from MuLan: A High Energy Experiment with Low Energy Muons

Three of the most important inputs to the Standard Model of Elementary particle physics are the fine structure constant, the mass of the Z and the Fermi constant, G_F , the last of which is determined through measurements of the muon lifetime. Until 1999, incomplete theoretical calculations limited the precision with which G_F could be extracted from experiment. When van Ritbergen and Stuart finished their work on the missing radiative corrections in 1999, the precision was entirely limited by knowledge of the muon lifetime, paving the way for a new measurement. After several years of technical development, the MuLan experiment, sited at the Paul Scherrer Institut (Villigen, Switzerland), was commissioned in 2004. The collaboration staged major production runs in 2004, 2006 and 2007. Our first result appeared in 2007. The final result (1 ppm on τ_μ , 0.6 ppm on G_F) is the most precise particle lifetime measurement ever made. In my talk, I will explain how this very simple measurement is made and describe our strategies for controlling the systematic errors. I hope to convince you that it is still possible to do interesting and important experiments in particle physics with a relatively small budget.

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January 24, 2012 (Tuesday) at 3:30pm (Refreshments at 3:15pm)

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