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A study of quasi-elastic muon (anti)neutrino scattering in the NOMAD experiment

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We have studied the muon neutrino and antineutrino quasi-elastic (QEL) scattering reactions using a set of experimental data collected by the NOMAD collaboration. We have performed measurements of the cross-section of these processes on a nuclear target (mainly Carbon) normalizing it to the total charged current cross-section. The axial mass parameter was extracted from the measured quasi-elastic neutrino cross-section. The corresponding result is M_A = 1.05 \pm 0.02 (stat) \pm 0.06 (syst) GeV. It is consistent with the axial mass values recalculated from the antineutrino cross-section and extracted from the pure Q^2 shape analysis of the high purity sample of neutrino quasi-elastic 2-track events, but has smaller systematic error. Our measured M_A is found to be in good agreement with the world average value obtained in previous deuterium filled bubble chamber experiments. The NOMAD measurement of M_A is lower than those recently published by K2K and MiniBooNE collaborations. However, within the large errors quoted by these experiments on M_A, these results are compatible with the more precise NOMAD value.

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