Superallowed Fermi Beta Decay and the Unitarity of the Cabibbo-Kobayashi-Maskawa Matrix

Abdullah Engin Çalık^a, Murat Gerçeklioğlu^a, and Djevad Irfan Salamov^b

^a Department of Physics, Faculty of Science, Ege University, 35100 Bornova, İzmir, Turkey
^b Department of Physics, Faculty of Science, Anadolu University, Eskişehir, Turkey

Reprint requests to M. G.; E-mail: murat.gerceklioglu@ege.edu.tr

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In this work, the unitarity of the Cabibbo-Kobayashi-Maskawa (CKM) mixing matrix has been investigated by studying the eleven well-known superallowed Fermi Beta decays; their parent nuclei are 10 C, 14 O, 26 Al, 34 Cl, 38 K, 42 Sc, 46 V, 50 Mn, 54 Co, 62 Ga, and 74 Rb. The numerical value of the V_{ud} element of the CKM mixing matrix has been calculated following the standart procedure. Using a different method from those of the previous studies, the effect of the isospin breaking due to the Coulomb forces has been evaluated more accurately. Here, the shell model has been modified by Pyatov's restoration because of the isospin breaking and the transition matrix elements have been found by means of the random phase approximation (RPA).

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