Overview of JYFLTRAP mass measurements and testing the unitarity of the CKM matrix

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The JYFLTRAP Penning trap setup [1], connected to the IGISOL [2] facility, has been extensively used for mass measurements of short-lived radioactive ions. Using fusion and fission reactions, both the neutron deficient and neutron rich side of the nuclide chart can be accessed. Since the IGISOL technique is chemically rather insensitive, refractory elements such as zirconium and molybdenium are available as ion beams.

On the neutron deficient side, atomic masses in the ^{100}Sn region have been extensively studied. These studies—complemented with other Penning trap facilities—offer valuable information on astrophysical rp- and νp- process paths [3, 4]. Similarly on the neutron rich side, mass measurements close to the r-process path have been performed [5]. Also, accurate atomic masses can be a sensitive tool to probe shell effects [6].

In terms of testing the Cabibbo-Kobayashi-Maskawa (CKM) quark-mixing matrix, atomic mass measurements can provide the β decay Q values. At JYFLTRAP the parent and daughter ions are simultaneously available, therefore the Q value or the mass difference can be rather precisely determined since the measured nuclei are A/q doublets. So far, several Q_{EC} values have been determined with a precision better than 100 eV [7]. The decay energy is one of the incredients that is needed in order to determine the V_{ud} matrix element of the CKM matrix and it enters the ft value to the 5th power.

Recently several Q values related to neutrino mass studies have been determined. These include double-beta decay Q value measurements of ^{100}Mo, ^{116}Cd and ^{112}Sn [8]. This contribution will summarize the above mentioned topics.

References

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