

FAKULTÄT für PHYSIK
LUDWIG-MAXIMILIANS-UNIVERSITÄT
MÜNCHEN/GARCHING

PHYSIK-DEPARTMENT
TECHNISCHE UNIVERSITÄT MÜNCHEN
MÜNCHEN/GARCHING

MLL-KOLLOQUIUM

Donnerstag, 24.04.2014, 16¹⁵ Uhr

Seminarraum 127, TUM, Physik II, Erdgeschoss/Nord
Treffen zum gemeinsamen Kaffee 16 Uhr

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Beta-decay of highly charged ions, a tool to study neutrino properties?

One often considers beta-decay to be a purely nuclear phenomenon. But already for electron-capture (EC) decays it is obvious that also the atom as a whole has to be taken into account. We are studying beta-decays of nuclei with no or only a few electrons in their atomic environment at the experimental storage ring ESR at GSI. The changes compared to the decay of a nucleus in a neutral atom can be enormous. We observed the first cases of bound-state beta-decay. This is the process, time-mirrored to EC-decay: the electron is not emitted into the continuum but captured in the atomic K-shell, if this was empty before. And the neutrino is emitted with a sharp energy. This process should have an influence in s-process nucleosynthesis and in nuclear cosmochronology. For EC-decay we observe the stunning, but understandable effect, that a nucleus with just one electron decays faster than with two electrons in the K-shell. Finally, we searched for interference effects in EC-decays due to the emission of neutrinos with different rest mass. Strangely enough, we observe for three different nuclides on top of the exponential decrease of the decay rate an oscillatory behaviour, which is reproducible. The period of the oscillation scales with the mass of the decaying nuclei as one would expect, if the difference in recoil energy due to the emission of different mass neutrinos would cause an interference.

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