First direct lifetime determination of the 2_1^+ state of ^{210}Pb*

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Investigating transitions from the 2_1^+ state to the ground state in nuclei which are in the vicinity of the doubly-magic ^{208}Pb enables constraining parameters of nuclear models, as for example the effective charges of the shell model. Nuclei with only two valence nucleons, such as ^{210}Po with two valence protons or ^{206}Hg with two valence proton holes, and ^{210}Pb with two valence neutrons or ^{206}Pb with two valence neutron holes are of particular interest [1] due to the dominance of the respective seniority-2 excitations for their lowest-lying states.

Using the 10 MV FN Tandem accelerator at the Institute for Nuclear Physics of the University of Cologne, a two-neutron transfer reaction was performed on a ^{208}Pb target allowing the direct population of the 2_1^+ state of ^{210}Pb. Its lifetime was determined by applying the Recoil Distance Doppler-Shift method [2] where the distance between the target and the stopper was varied using the Cologne plunger device. The gamma radiation from de-excitaion was detected by eleven high purity germanium detectors at two different angles and the back-scattered particles were measured by six silicon detectors.

Two contaminations in the energy region of the stopped and the Doppler-shifted components of the 2_1^+ state of ^{210}Pb were identified and the data was corrected accordingly.

Thus, the lifetime of the 2_1^+ state of ^{210}Pb was directly determined for the first time using the Differential Decay Curve Method. The resulting value of 20.2(14) ps is in agreement with an indirectly obtained result from a previous triton measurement [3], but considerably more precise.

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* Supported by the BMBF under Grant No. 05P21RDCI2.