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Lifetime determination of excited states in ^{104}Ru and ^{130}Te via a new Doppler-shift attenuation approach

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The Doppler-shift attenuation method after proton scattering is a well-established technique to determine nuclear-level lifetimes in the range of sub-picoseconds [1,2]. In the last years, (p,p'γ) experiments have been performed using the combined detector array SONIC@HORUS consisting of 14 HPGe detectors and 12 Silicon detectors [3]. Measuring the emitted de-exciting gamma ray as well as the backscattered proton in coincidence provides complete knowledge of the reaction kinematics. To extract a lifetime the so called attenuation factor F(τ) has to be determined, which is linked to the continuously attenuating velocity of the recoiling nucleus. In the established analysis this is done by comparing the Doppler-shifted photon energy E_γ at different photon emission angles θ and using that F(τ) represents the slope of $E_\gamma(cos(\theta))$. Alternatively, the spectra measured at different angles can be corrected for their expected Doppler shifts assuming different F(τ) values. The optimal attenuation factor, which minimises the Doppler broadening of the analysed γ peak in the summed up spectra, yields the lifetime. First results on ^{130}Te, obtained via the new approach, are in good agreement with known level lifetimes. This procedure might be more efficient to determine lifetimes of weakly excited states leading to low statistics in the spectra.
Recently, a DSAM experiment on ^{104}Ru has been performed to further analyse systematics concerning the Ru-isotopic chain with increasing neutron number and to benchmark the new technique.
In this contribution, ongoing investigations on the new DSA approach will be presented as well as first results from the experiment on ^{104}Ru using this method.
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Primary author(s) : BOHN, Anna (University of Cologne, Institute for Nuclear Physics, Germany); Mrs. EVERWYN, Vera (University of Cologne, Institute for Nuclear Physics, Germany); Mr. HEIM, Felix (University of Cologne, Institute for Nuclear Physics, Germany); Mr. KLUWIG, Florian (University of Cologne, Institute for Nuclear Physics, Germany); MÜSCHER, Miriam (University of Cologne, Institute for Nuclear Physics, Germany); Prof. PETKOV, Pavel (National Institute for Physics and Nuclear Engineering, Bucharest-Magurele, Romania); PRILL, Sarah; Dr. SCHOLZ, Philipp (University of Cologne, Institute for Nuclear Physics, Germany); Mr. WEINERT, Michael (University of Cologne, Institute for Nuclear Physics, Germany); Mr. WILHELMY, Julius (University of Cologne, Institute for Nuclear Physics, Germany); Prof. ZILGES, Andreas (University of Cologne, Institute for Nuclear Physics, Germany)

Presenter(s) : BOHN, Anna (University of Cologne, Institute for Nuclear Physics, Germany)

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