

ASC Report

Lifetime measurements of the neutron-rich Cr isotopes

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1) Main objectives

The motivation of the experiment described below was to study the deformation in the Cr isotopic chain driven by particle-hole excitations to the $g_{9/2}$ and $d_{5/2}$ orbitals. In particular, our aim was to investigate the ^{58}Cr isotope, which has been identified as a nucleus at the critical point of the shape phase transition of the E(5) dynamical symmetry, and the collective character of the low spin states in ^{60}Cr . In order to address this issue, the Recoil Distance Doppler Shift method (RDDS) with the AGATA Demonstrator-PRISMA setup was used to measure the lifetimes of the first excited states in the neutron-rich ^{58}Cr and ^{60}Cr .

The nuclei of interest were populated as products of a multinucleon-transfer reaction following the collision of a ^{64}Ni beam onto a ^{238}U target. The ^{64}Ni beam, at a bombarding energy of 460 MeV, was delivered by the LNL Tandem-ALPI accelerator complex.

2) Short statement on the run itself and how AGATA operated

The beam intensity was limited to 2.5 pA to avoid thermal stress of the plunger-target device and to keep the γ counting rate of AGATA at around 60.0 KHz. We spread the run employing only three different target-degrader distances (20 μm , 45 μm and 150 μm) in order to collect statistics in the weak 4 proton channels.

3) Status of the analysis

The Doppler correction has been performed on an event-by-event basis using the velocity obtained by the reconstruction of the recoil trajectories in PRISMA. This multi-nucleon transfer led us enough statistics to perform lifetime measurements up to ^{68}Ni , ^{65}Co , ^{64}Fe , ^{63}Mn and ^{60}Cr .

4) Results

Preliminary results for lifetimes of excited states for the most affordable channels (Ni and Co isotopes).

5) Publications or talks

10th AGATA Week 2010 ,Lyon, France “Lifetime Measurements in neutron-rich Cr isotopes” J.J. Valiente-Dobón.

EGAN 2011, Padova, Italy. “Lifetime Measurements in neutron-rich Cr isotopes” V. Modamio. Workshop on Nuclear Structure, BORMIO 22 - 25 February 2012. V. Modamio.

6) Additional Notes

Future replay of data will be done in order to improve the the event reconstruction. This will take into account the high-counting rate per AGATA crystal (~100 kHz in some runs) and neutron damage.