Coulex of Neutron-rich Isotopes around ^{132}Sn @ REX-ISOLDE ◇

T. Behrens, V. Bildstein, D. Habs, R. Gernhäuser, Th. Kröll, R. Krücken, R. Lutter, M. Mahgoub, P. Maierbeck, T. Morgan, P.G. Thirolf, I. Stefanescu [a], N. Warr [b], and J. van de Walle [c]
[a] KU Leuven [b] Universität zu Köln [c] CERN

1. Introduction

Recent studies on isotopes around the doubly magic ^{132}Sn have shown that despite decreasing excitation energies $E(2_1^+)$ the B(E2;$0_1^+ \rightarrow 2_1^+$) = B(E2↑) values for Te and Sn isotopes above the N=82 shell closure are lower than expected from a general systematic established as "Grodzins' rule" [1]. A proposed theoretical explanation for this behaviour is a reduced neutron pairing gap above the shell closure [2]. As a continuation of former experimental campaigns the aim of the experiment reported here was to measure the B(E2↑) values of neutron-rich Xe and Cd isotopes to test their evolution in this mass region.

2. Experimental Setup

2.1 Coulomb Excitation

The experiment was performed using radioactive ^{144}Xe and ^{124,126}Cd beams from REX-ISOLDE. For the Cd runs, a laser ionisation source has been used and alternating Laser-On/Off measurements for determining the beam contamination have been performed. The segmented HPGe detector array MINIBALL has been used for measuring the γ rays from the $2^+ \rightarrow 0^+$ transition following Coulomb excitation. A double sided Silicon strip detector (so-called CD) provides angles and energies of both ejectiles and recoils. These can be separated and identified very well.

2.2 Data Analysis

The data analysis is performed with a code that has been developed at the MPI-K in Heidelberg [3]. It includes kinematical reconstruction of the energy and angle of the remaining nucleus of the collision from the nucleus detected in the CD. This was especially necessary for the ^{144}Xe runs, where the recoil has not been detected in the CD. Therefore, the gamma spectra have been doppler corrected for both the projectile and target excitation (cf. Fig.1,2).

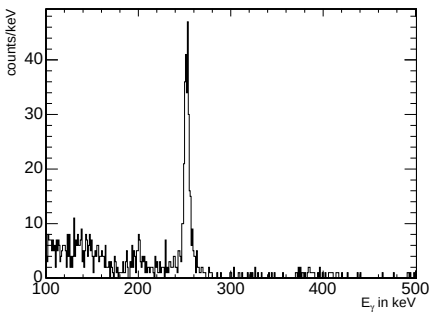

Fig. 1: Doppler corrected gamma energy spectrum with the $2^+ \rightarrow 0^+$ transition peak from ^{144}Xe at 253 keV.

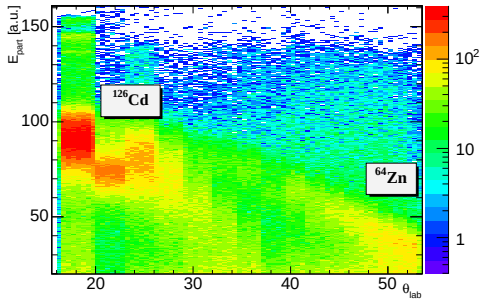

Fig. 2: Doppler corrected gamma energy spectrum with the $2^+ \rightarrow 0^+$ transition peak from ^{126}Cd at 652 keV. The uncorrected target excitation at 1000keV can also be seen.

3. Results

The runs of ^{144}Xe and ^{126}Cd have good statistics and a first measurement of their B(E2↑) values has been possible. Preliminary results of the analysis are shown (cf. table). The beam intensity of ^{124}Cd could be improved compared to the run in 2004.

beam	E [MeV/A]	target	intensity [10^4 ions/s]	time [h]	B(E2↑) [e^2b^2]
^{144}Xe	2.7	^{96}Mo	5.4	19	0.73(18)
^{124}Cd	2.85	^{64}Zn	0.9-1.5	15	0.35(6)
^{126}Cd	2.85	^{64}Zn	1.4	26	0.22(3)

Table 1: Statistics of the experiment and preliminary results are shown. Only the statistical error is given here.

4. Conclusion & Outlook

This experiment has successfully improved the data available for the B(E2↑) values of neutron-rich Xe and Cd isotopes around the N=82 shell closure. The B(E2↑) values of ^{144}Xe and ^{126}Cd were determined for the first time and seem to agree very well with "Grodzins' rule". Therefore the deviation from the systematic by the Te isotopes seems to be only a local effect. Further experiments have to confirm that. A beam time for measuring B(E2↑) values of heavy Ba isotopes with the same experimental method has been approved. For this, the development of molecular BaF^+ beams at ISOLDE is necessary. It could also be shown that a continuation of this campaign with ^{128}Cd is feasible.

References

[1] D.C. Radford *et al.*, Phys.Rev.Lett. **88** (2002) 222501
[2] J. Terasaki *et al.*, Phys.Rev. C **66** (2002) 054313
[3] O.T. Niedermaier, PhD thesis (2005) MPI-K Heidelberg

◇ work supported by the BMBF (06MT238) and EURONS (506065)