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shinjinee dasgupta <shinjinee14@gmail.com>

Meeting for discussion on a Gamma Spectroscopy experiment with INGA at VECC

1 message

Saikat Chakraborty <saikat.c@vecc.gov.in> Fri, Jul 7, 2023 at 1:46 PM

To: Sarmishtha Bhattacharyya <sarmi@vecc.gov.in>, Gopal Mukherjee <gopal@vecc.gov.in>, Tumpa Bhattacharjee <btumpa@vecc.gov.in>, Debasish Mondal <debasishm@vecc.gov.in>, Supriya Mukhopadhyay <supm@vecc.gov.in>, Deepak Pandit <deepak.pandit@vecc.gov.in>, Soumik Bhattacharya <soumik@vecc.gov.in>, Devesh Kumar <devesh.k@vecc.gov.in>, Satya Samiran Nayak <ss.nayak@vecc.gov.in>, Shabir Ahmad Dar <sa.dar@vecc.gov.in>, Sansaptak Basu <s.basu@vecc.gov.in>, Sneha Das <sneha.d@vecc.gov.in>, Shefali Basak <shefali.b@vecc.gov.in>, Suchorita Paul <suchorita.p@vecc.gov.in>, Snigdha Pal <snigdha.pal@vecc.gov.in>, Anandagopal Pal <ag.pal@vecc.gov.in>, sukalyan.chattopadhyay@saha.ac.in, ushasi.dattapramanik@saha.ac.in, aninditakarmakar333@gmail.com, manishasamal0602@gmail.com, joydipdeysinp@gmail.com, writabratasengupta@gmail.com, ssg.iuc@gmail.com, rajarshi.raut@gmail.com, pankajcuj@gmail.com, anils051299@gmail.com, chandraniph@gmail.com, shinjinee14@gmail.com, subhphy@gmail.com, ranabir.banik91@gmail.com, sgpresi78@gmail.com

Cc: dr.saikat@yahoo.com

Dear Sir/Madam/Friends,

One of our proposed experiments, '*Search for the axial and reflection asymmetry in 129Cs*', is scheduled to start from today (07/07/2023; 18:00). To discuss about this experiment, let us have a meeting **TODAY at 4 PM** in **VECC Counting room.**
Please make it convenient to attend the meeting.

Thanks and Regards.
Sincerely,
Saikat

Saikat Chakraborty
National Post-Doctoral Fellow (SERB)
Variable Energy Cyclotron Centre
Kolkata-700064, India.

Gmail

shinjinee dasgupta <shinjinee14@gmail.com>

Experiment at INGA

1 message

Sarmishtha Bhattacharyya <sarmi@vecc.gov.in> Wed, Sep 13, 2023 at 2:13 PM
To: Soumik Bhattacharya <soumik@vecc.gov.in>, Gopal Mukherjee <gopal@vecc.gov.in>, Satya Samiran Nayak <ss.nayak@vecc.gov.in>, Deepak Pandit <deepak.pandit@vecc.gov.in>, Supriya Mukhopadhyay <supm@vecc.gov.in>, Debasish Mondal <debasishm@vecc.gov.in>, Saikat Chakraborty <saikat.c@vecc.gov.in>, Sneha Das <sneha.d@vecc.gov.in>, Suchorita Paul <suchorita.p@vecc.gov.in>, Devesh Kumar <devesh.k@vecc.gov.in>, Anandagopal Pal <ag.pal@vecc.gov.in>, Shefali Basak <shefali.b@vecc.gov.in>, Chandrani Majumder <chandraniph@gmail.com>, Rajarshi Raut <rajarshi.raut@gmail.com>, joydipdeysinp@gmail.com, ranabir.banik91@gmail.com, Shinjinee Dasgupta <shinjinee14@gmail.com>, "Prof. Ushasi Datta" <ushasi.dattapramanik@saha.ac.in>, Sukalyan Chattopadhyay <sukalyan.chattopadhyay@saha.ac.in>

Dear all,

Our INGA beam time for the experiment on "search for positive parity rotational band in in 123Te" is likely to start today.
A meeting is held to discuss about the experiment as per the following details. Please make it convenient to attend.

Date: 13/09/2023 (Today)
Time: 04:30 PM
Venue: Counting room of VECC

Best regards,

Sarmishtha.

Gmail

shinjinee dasgupta <shinjinee14@gmail.com>

Invitation for collaboration in experiment to study excited states of 207Rn at VECC

2 messages

Soumik Bhattacharya <soumik@vecc.gov.in> Fri, Mar 22, 2024 at 6:33 PM
To: Shinjinee Dasgupta <shinjinee14@gmail.com>, subhendu rajbanshi <subhphy@gmail.com>, Sajad Ali <sajadali113@gmail.com>, ranabir.banik91@gmail.com, Anindita Karmakar <aninditakarmakar333@gmail.com>
Cc: Sarmishtha Bhattacharyya <sarmi@vecc.gov.in>, Gopal Mukherjee <gopal@vecc.gov.in>

Dear All,

I am happy to inform you that our proposal to study the excited states of 207Rn at VECC K130 Cyclotron (16O beam) with VECC-INGA facility has been scheduled from 26.03.2024, Tuesday onward. Its expected to continue upto 1st April, 2024 morning.
Therefore, I am inviting you to participate and contribute to the above experiment as per your convenience. Please let me know your willingness and availability(/unavailability) for the above period.

Looking forward to see you all.

N.B. Please let me know if anybody else (your students ?!) willing to participate in this experiment. In that case please send me there names and affiliations along with their email ids (ASAP!!). That will be required for various permission purposes.

Best regards,
Soumik

डॉ. सौमिक भट्टाचार्या / Dr. Soumik Bhattacharya
वैज्ञानिक अधिकारी (इ) /Scientific Officer (E)
नाभिकीय संरचना अनुभाग, ईएनपीडी, भौतिकी वर्ग / NSS, ENPD, Physics Group
परिवर्ती ऊर्जा साइक्लोट्रॉन केंद्र / Variable Energy Cyclotron Centre
1/ए.एफ., बिधाननगर/1/AF, Bidhannagar,
कोलकाता / Kolkata-700 064.
Ph- (033) 2318-3221

---

shinjinee dasgupta <shinjinee14@gmail.com> Fri, Mar 22, 2024 at 6:37 PM
To: Soumik Bhattacharya <soumik@vecc.gov.in>

Dear Soumik,

Thank you very much for inviting me. I will surely participate in the experiment.

Wishes,
Shinjinee
[Quoted text hidden]

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THE EUROPEAN PHYSICAL JOURNAL A

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Regular Article - Experimental Physics

Revealing new structures in odd–odd ^{54}Mn nucleus

S. Basu[1,2], **G. Mukherjee**[1,2,a], **S. Nandi**[1,2,12], **S. S. Nayak**[1,2], **S. Bhattacharyya**[1,2], **Soumik Bhattacharya**[1,3], **Shabir Dar**[1,2], **Sneha Das**[1,2], **S. Basak**[1,2], **D. Kumar**[1,2], **D. Paul**[1,2], **K. Banerjee**[1,2], **Pratap Roy**[1,2], **S. Manna**[1,2], **Samir Kundu**[1,2], **T.K. Rana**[1,2], **R. Pandey**[1,2], **S. Chatterjee**[4], **R. Raut**[4], **S. S. Ghugre**[4], **S. Samanta**[4,13], **R. Banik**[5], **A. Karmakar**[2,6], **S. Chattopadhyay**[6], **S. Das Gupta**[7], **P. Pallav**[7,8], **S. Rajbanshi**[9], **S. Ali**[10], **H. Pai**[6,11]

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[12] *Present address*: Argonne National Laboratory, 9700 S Cass Ave, Lemont, IL 60439, USA
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Communicated by Navin Alahari

Abstract The excited states of odd–odd ^{54}Mn ($Z = 25, N = 29$) nucleus have been investigated using the fusion evaporation reaction ^{55}Mn(α, αn)^{54}Mn at the beam energy of 34 MeV. A new and improved level scheme of ^{54}Mn has been proposed in this work with the placement of 22 new γ-ray transitions. Spin and parity (J$^{\pi}$) of most of the levels in the revised level scheme have been firmly assigned. The placement of some of the already known γ rays in the level scheme and J$^{\pi}$ assignments of some of the levels reported earlier have also been revised. The new level scheme, which has been extended up to ∼6 MeV, provides new insight and interesting structural aspects of the generation of high angular momentum in this odd–odd Mn isotope with neutron number ($N = 29$) just above the $N = 28$ shell gap. Three octupole-phonon-coupled negative parity states have been identified for the first time in this nucleus. $E3$ transitions have also been observed to decay from these states. Shell model calculations with two different interactions i.e. kb3gpn and gx1pn have been performed which well reproduced the low-lying, few-particle states but fail to reproduce the higher-lying multi-particle states. These higher-lying states have been understood as resulting from collective excitations. An oblate minimum obtained from the Total Routhian Surface calculations provides support to this conjecture.

[a] e-mail: gopal@vecc.gov.in (corresponding author)

1 Introduction

The odd–odd ^{54}Mn ($Z = 25, N = 29$) is an interesting nucleus from the point of view of nuclear structure. The proton and neutron Fermi energy levels in ^{54}Mn lie below and above the $Z, N = 28$ shell gap, respectively. In fact, the last proton and the last neutron may occupy the f$_{7/2}$ and f$_{5/2}$ orbitals, the ℓ.s splitting of which creates the shell gap at 28. This is the first shell gap created due to the ℓ.s term which lowers the 1f$_{7/2}$ orbital from the rest of the fp space towards the 1d$_{3/2}$ orbital [1]. The $N = Z = 28$ nucleus ^{56}Ni is considered as a "soft core" [1,2] compared to the other doubly magic cores in the nuclear chart. For the nuclei in the $A \sim 55$ mass region, the active orbitals are mainly 1f$_{7/2}$, 2p$_{3/2}$,1f$_{5/2}$ and 2p$_{1/2}$. All of these are negative parity orbitals. Therefore, in case of odd–odd nuclei in this region, the excited states are mostly positive parity [3–16]. The negative parity states are mainly observed in the lighter odd–odd nuclei below $A = 50$ [17,18] and only a few negative parity states are known in the nuclei above $A = 50$.

High-spin level structure of ^{209}Rn

Sneha Das,[1,2] S. Bhattacharyya,[1,2,*] Soumik Bhattacharya,[1] S. Chakraborty,[1] Sakshi Shukla,[3] Praveen C. Srivastava,[3] R. Banik,[1,†] S. Nandi,[1,‡] G. Mukherjee,[1,2] Indu Bala,[4] S. S. Bhattacharjee,[4] S. Das Gupta,[5] A. Dhal,[1,§] Debasish Mondal,[1] S. Muralithar,[4] R. Raut,[6] A. Sharma,[7] R. P. Singh,[4] and V. Srivastava[4,∥]

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The excited states of ^{209}Rn ($Z = 86$, $N = 123$) have been populated by the heavy-ion induced fusion evaporation reaction ^{198}Pt(^{16}O, $5n$)^{209}Rn at a beam energy of 102 MeV. The de-excited γ rays were detected with the Compton suppressed clover HPGe detectors of the Indian National Gamma Array (INGA) set-up. The high spin spectroscopic study of ^{209}Rn has been carried out up to an excitation energy of 7.9 MeV and spin $(55/2)\hbar$. Spin-parity assignments of the excited levels have been determined and are confirmed on the basis of the ratio of directional correlation and polarization asymmetry measurement. The possible presence of new isomeric states has been observed and the half-lives have been estimated. A negative parity sequence of $M1$ transitions has been observed which exhibits the property of magnetic rotation and is interpreted in the framework of semiclassical model calculation. The large basis shell-model calculation has been performed for all the nuclear levels and is found to be in well agreement with the experimental results.

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I. INTRODUCTION

The nuclei in the vicinity of the doubly magic shell closure of $^{208}_{82}$Pb have been the topic of significant physics interest in the recent years. These nuclei exhibit a variety of nuclear structural phenomena, such as, shears band, neutron core excitation across $N = 126$ shell closure, and presence of several short-lived and long-lived isomers. With few proton particles above $Z = 82$ and few neutron holes in the $N = 126$ shell closure, the nuclear structure in these nuclei are mainly dominated by the single particle excitations. As the number of the valence nucleons are increased, the single particle configurations evolve towards the mixture of multinucleon configurations. Hence, the nuclei in this region provide a fertile ground to test the validity of the large basis shell-model calculations. Moreover, several shell-model calculations have been performed in this near Pb region by considering ^{208}Pb as a stable core [1,2]. Further, the presence of the large spin differences between the close lying high-j neutron and proton orbitals give rise to several high-spin isomers in this region [3]. The $13/2^+$ isomeric state has been observed to be present systematically for all odd-A isotopes of the nuclei above $Z = 82$ [4]. The study of these isomeric states in this region provides further understanding in level structure of these nuclei.

The occupation of the high-j orbitals, e.g., $\pi h_{9/2}$, $\pi i_{13/2}$, $\nu i_{13/2}$, etc., by the valence proton particles and the neutron holes gives rise to the magnetic rotation (MR) band in this region. In this case, the higher spin states are mainly generated by the closing of the two blades of shears formed by the aligned proton and neutron angular momentum vectors. The rotational band resulting from this mechanism possesses increasing $B(M1)/B(E2)$ ratio, and decreasing $B(M1)$ value with increasing rotational frequency. While the presence of the MR band is a very common phenomenon around the neutron-deficient Pb region [5–7], the observation of the MR band [8–11] in the above Pb region ($Z = 82$) around $N = 126$ neutron shell closure is rare due to insufficient experimental data at the high spin. The presence of the MR band in this region has already been reported for ^{203,204}At ($Z = 85$) [12,13], ^{202}Bi ($Z = 83$) [14], ^{201,202}Pb ($Z = 82$) [15], and ^{206}Fr ($Z = 87$) [16]. For, Rn ($Z = 86$) isotopes, only the high spin spectroscopic study of ^{205}Rn indicates the presence of a MR band, based on the observation of a cascade of magnetic

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Letter

Coexistence of low-K oblate and high-K prolate $g_{9/2}$ proton-hole bands in ^{115}Sb

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Low-K
High-K
INGA
PSM

ABSTRACT

A positive parity sequence of $\Delta I = 2$ γ transitions has been identified above $I^\pi = 9/2^+$ state ($E_x = 2019$ keV) in ^{115}Sb through in-beam γ ray spectroscopic technique. Rotational features of this sequence are found similar to a low-K decoupled band. Observation of this newly identified low-K decoupled band, along with the earlier reported strongly coupled high-K band in this nucleus, provides the first experimental evidence for prolate-oblate shape coexistence associated with $g_{9/2}$ proton-hole configuration around $Z = 50$ shell closure. Experimental results are reproduced reasonably well in the frameworks of the projected shell model and the total Routhian surface calculations.

As a many-body quantal system, atomic nuclei are excellent laboratories for testing various quantum mechanical phenomena. The shape coexistence in the realm of atomic nuclei has long been a topic of interest as its exploration across the Segrè chart can provide insight into the underlying nucleonic shell structures. The phenomenon of nuclear shape coexistence was started with the observation of the deformed $I^\pi = 0_2^+$ state in the doubly magic ^{16}O nucleus along with the spherical $I^\pi = 0_1^+$ ground state [1–3]. Thereafter, such coexistence of spherical and deformed shapes were also identified near different shell closures across the nuclear landscape [4–6]. The best evidence to date for a coexistence of the states corresponding to prolate, oblate and spherical shapes at low excitation energy was found in ^{186}Pb [7].

The nuclei in $A \approx 110-120$ region mainly exhibit weak deformation at lower angular momentum with the observation of non-collective single-particle excitations. Of special interest in this region of the Segrè chart, lying close to the $Z = 50$ shell closure, is the observation of rotational bands associated with the shape-driving high-j orbitals. Most of these deformed rotational bands have elongated cigar-like prolate deformation. The particle-hole excitations across the $Z = 50$ closed shell play a dominant role to develop the deformation in these nuclei. Consequently, coexistence of the collective and non-collective structures was reported in several even-even, odd-A and odd-odd nuclei in this mass region [8–18]. In addition, shape transition from collective prolate to non-collective oblate over a range of angular momentum and excita-

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