Centre Report from NSDD-India

Gopal Mukherjee: *VECC, Kolkata*
Ashok Kumar Jain: *Amity Inst. Nucl. Sc. & Tech., Amity University, Noida*
Sukhjeet Singh Dhindsa: *Akal University, Talwandi Sabo, Punjab*
Paresh K. Joshi: *HBCSE, Tata Inst. Fundamental Research, Mumbai*
Anagha Chakraborty: *Visva Bharati University, Santiniketan, West Bengal*

Other Contributors:

- Sushil Kumar Rathi: Akal University Punjab
- Ritwika Chakrabarti: Mumbai University
- S. Nandi: VECC, Kolkata

- **Mass A Chain Evaluations**
- **Horizontal Evaluations**
- **Code development and**
- **Training**

Variable Energy Cyclotron Centre

A premier R&D unit of Dept.of Atmic Energy, Govt.of India.

One of the three major accelerator centres in India. The other two are

- IUAC, New Delhi
- TIFR, Mumbai

Mostly heavy-beams

Both are Pelletron-LINAC facility

Two heavy ion accelerators installed in late 80's

Unique ion beams at VECC

Three Cyclotrons at VECC:

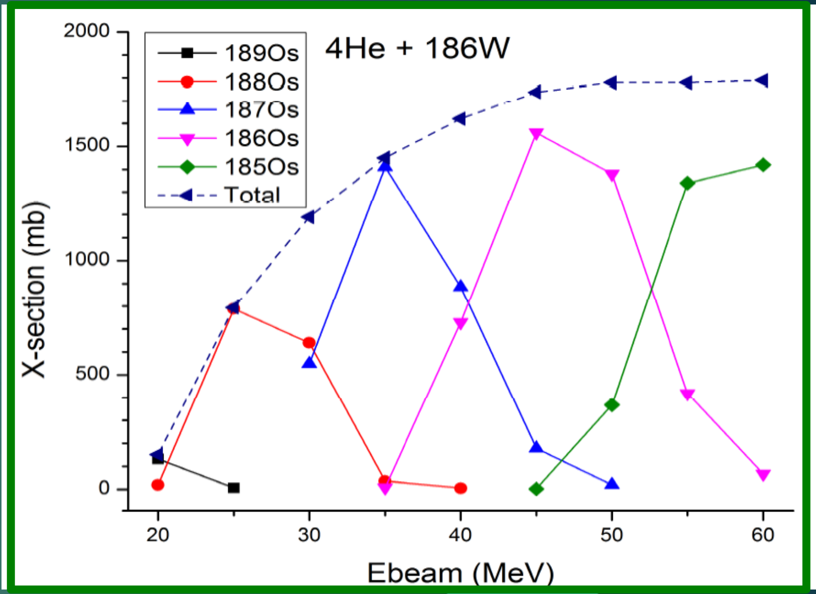
- **K-130 Cyclotron**
- **K-500 Superconducting cyclotron**
- **Cyclone-30 Medical Cyclotron**

Light-ion beams	Heavy-ion beams	Unique in the Country:
Proton : 7 – 20 MeV	^{12}C, ^{16}O, ^{20}Ne, ^{40}Ar, etc	The **high-energy alpha**
Deuteron : 15 – 30 MeV	7 – 10 MeV/A (K-130)	The **Higher energy heavy-ions**
Alpha : 28 – 60 MeV	10 – 50 MeV/A (K-500)	**Inert gases (Ne, Ar, Xe,…)**

Features of light ion-induced reactions

Advantages

- Selective channels are preferentially populated
- Minimum overlap with neighbouring channels
  - Selectivity and Clean spectroscopy
  - Angular distribution from singles data
- Cross section ~ 1000 - 1500 mb
  - Good production yield, "good"statistics within "less" beam time
- Less energy loss of beam within target
  - Thick target can be used for production of a single channel
- Study of nuclei around the stability lines
- Feeding to non-yrast states, not populated by heavy ion reaction
- Horizontal spectroscopy, low-lying vibrational states, exotic shapes (tetrahedral), etc.



Disadvantages

↓ Relatively low angular momentum

↓ Limited number of nuclei can be studied

❖ Complimentary to heavy ion induced reactions

Facilities at VECC : γ-ray spectroscopy

- **High Resolution Gamma Detector Array:**

- **Array of Compton suppressed Clover HPGe detectors**
  VECC array for NUclear Spectroscopy (VENUS)
  Clover and LEPS detectors

- **Indian National Gamma Array (INGA) Clover Ge Array**
  -(National facility) - rotates among VECC, TIFR, IUAC, India

  -Segmented clover detectors (better Doppler correction and γ-ray tracking)

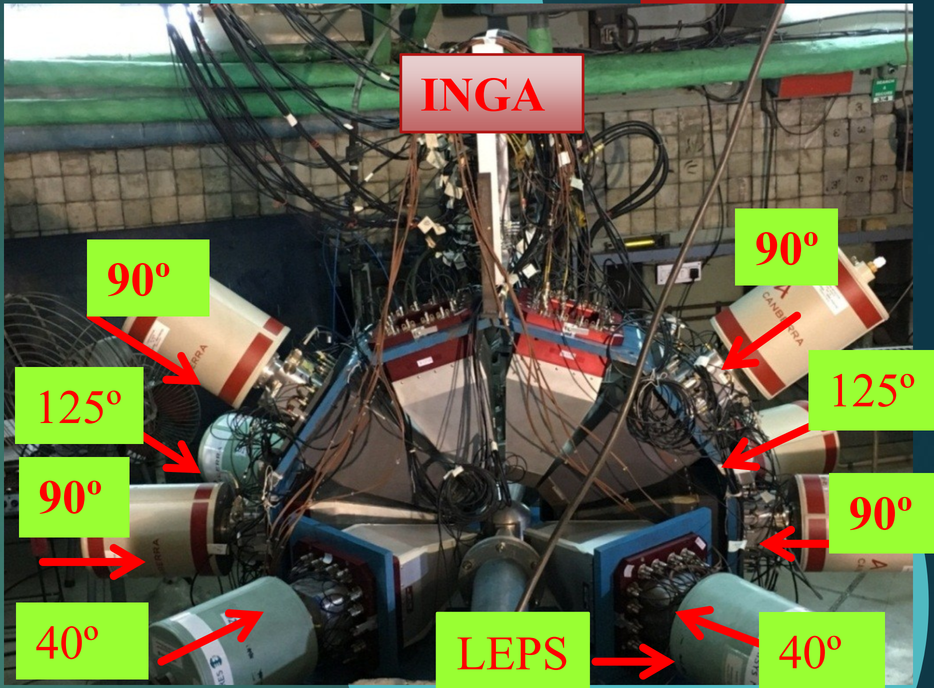
- **Array of fast scintillators (for lifetime measurements)**

- **Decay spectroscopy**

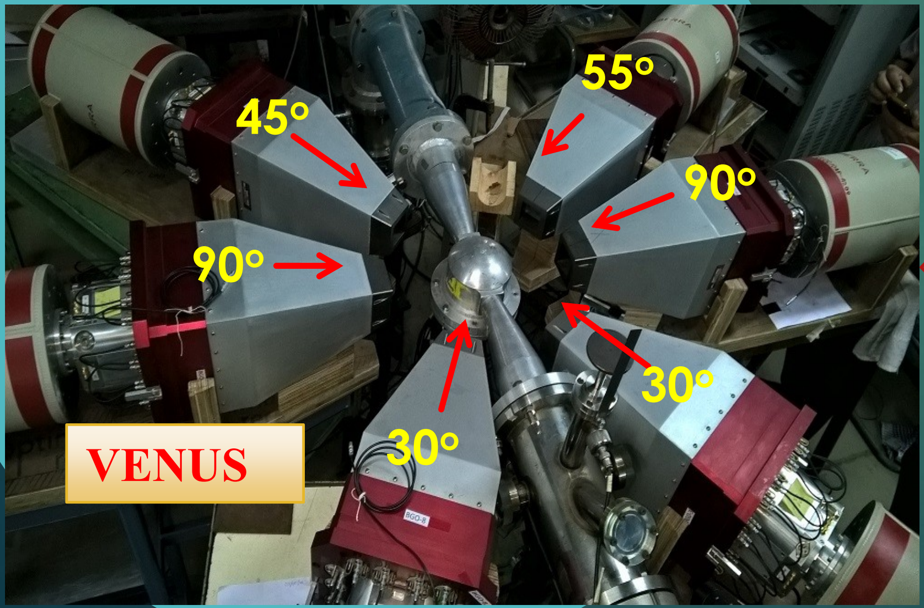
- **Single crystal large HPGe detectors**

VENUS and INGA setup at VECC

- **INGA** contains up to eight Compton suppressed clover HPGe detectors and two LEPS detectors.



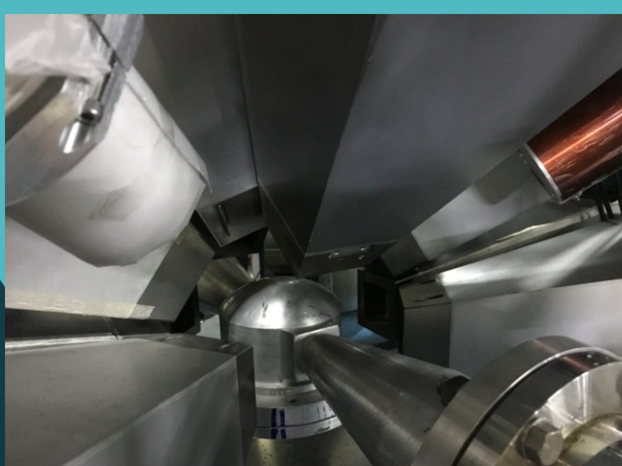
Mechanical structure upgraded to hold up to 12 clovers and 4 Scintillators.



- VEcc NUclear Spectroscopy (**VENUS**) Array contains 6-8 Compton suppressed clover detectors in the horizontal plane.

Now 12 clovers and 3 $LaBr_3$ detectors have been setup

Collaboration of:
VECC
SINP
UGC-DAE-CSR



Local Gamma-ray Spectroscopy Group (VECC, SINP, UGC-DAE-CSR)

Support of a strong team of students who worked together !

Results from INGA at VECC campaigns Published in 2022

"Structural evolution and K mixing in ^{49}V":
Phys. Rev. C 105, 044304 (2022).

"Different manifestations of triaxial shapes of the positive and negative parity bands in ^{187}Os":
Phys. Rev. C 105, 034336 (2022).

"Alignment effects in the medium-spin level structure of ^{78}Se":
Phys. Rev. C 105, 034328 (2022)

"Magnetic rotational band in ^{116}Sb":
Nucl. Phys. A1019, 122382 (2022)

"Evidence for competing bi-faceted compound nucleus fission modes in ^{232}Th(α,f) reaction":
Phys. Lett. B 825, 136848 (2022)

"Three-phonon multiplets in ^{116}Sn":
Nucl. Phys. A1018, 122375 (2022)

"First Observation of Multiple Transverse Wobbling Bands of Different Kinds in ^{183}Au":
Phys. Rev. Lett. 125, 132501 (2020)

PHYSICAL REVIEW C 105, 044304 (2022)

Structural evolution and K mixing in ^{49}V

Y. Sapkota,[1] Rozina Rahaman,[1] Abhijit Bisoi,[1,*] Anik Adhikari,[1] Arkabrata Gupta,[1] Ananya Das,[1] H. Ghosh,[1] S. Sarkar,[1] Dibyadyuti Pramanik,[2] Sangeeta Das,[3] Sathi Sharma,[3] S. Ray,[4] S. Rajbanshi,[5] Shabir Dar,[6,7] S. Nandi,[6,7] S. Bhattacharya,[6,7] T. Bhattacharjee,[6,7] G. Mukherjee,[6,7] S. Bhattacharyya,[6,7] S. Samanta,[8] S. Das,[8] S. Chatterjee,[8] R. Raut,[8] and S. S. Ghugre[8]
[1]Indian Institute of Engineering Science and Technology, Shibpur, Howrah 711103, India

PHYSICAL REVIEW C 105, 034336 (2022)

Different manifestations of triaxial shapes of the positive and negative parity bands in ^{187}Os

S. Nandi,[1,2] G. Mukherjee,[1,2,*] A. Dhal,[1,†] R. Banik,[2,3] Soumik Bhattacharya,[1,2] S. Basu,[1,2] Shabir Dar,[1,2] S. Bhattacharyya,[1,2] C. Bhattacharya,[1,2] S. Kundu,[1,2] D. Paul,[1,2] S. Rajbanshi,[4] S. Chatterjee,[5] S. Das,[5] S. Samanta,[5] R. Raut,[5] S. S. Ghugre,[5] H. Pai,[6] Sajad Ali,[7] S. Biswas,[8] and A. Goswami[6,‡]
[1]Variable Energy Cyclotron Centre, Kolkata 700064, India
[2]Homi Bhabha National Institute, Training School Complex, Anushaktinagar, Mumbai 400094, India

PHYSICAL REVIEW C 105, 034328 (2022)

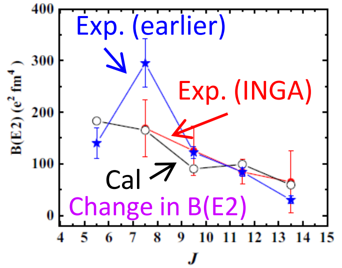
Alignment effects in the medium-spin level structure of ^{78}Se

K. Mandal,[1,2] A. Chakraborty,[1,*] A. K. Mondal,[1,3] U. S. Ghosh,[1] Aniruddha Dey,[1] Saumyajit Biswas,[1,4] B. Mukherjee,[1] S. Rai,[1,5] S. Chatterjee,[6] S. K. Das,[6] S. Samanta,[6] R. Raut,[6] S. S. Ghugre,[6] S. Bhattacharyya,[7,8] S. Nandi,[7,8] S. Bhattacharya,[7,8] G. Mukherjee,[7,8] S. Ali,[9] A. Goswami,[9,†] S. Mukhopadhyay,[10] Krishichayan,[11,12] R. Banik,[8,13] R. Chakrabarti,[14] V. Kumar,[15] and A. Kumar[15]
[1]Department of Physics, Siksha Bhavana, Visva-Bharati University, Santiniketan, West Bengal 731 235, India

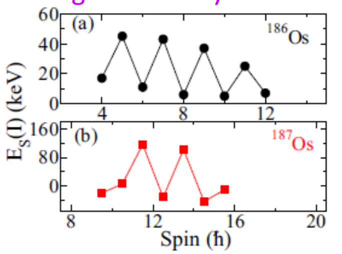
Physics Letters B 825 (2022) 136848
Contents lists available at ScienceDirect
Physics Letters B
www.elsevier.com/locate/physletb

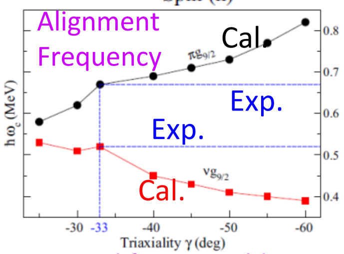
Evidence for competing bi-faceted compound nucleus fission modes in ^{232}Th(α,f) reaction

Aniruddha Dey[a,b], D.C. Biswas[a,c], A. Chakraborty[b,*], S. Mukhopadhyay[a], A.K. Mondal[b,1], K. Mandal[b,2], B. Mukherjee[b], R. Chakrabarti[d], B.N. Joshi[a], L.A. Kinage[a], S. Chatterjee[e], S. Samanta[e], S. Das[e], Soumik Bhattacharya[c,f], R. Banik[g], S. Nandi[c,f], Shabir Dar[c,f], R. Raut[e], G. Mukherjee[c,f], S. Bhattacharyya[c,f], S.S. Ghugre[e], A. Goswami[h,3]

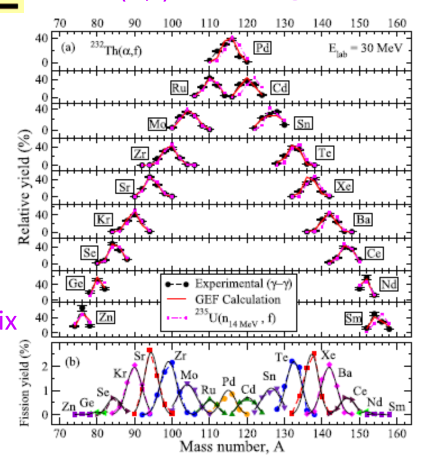


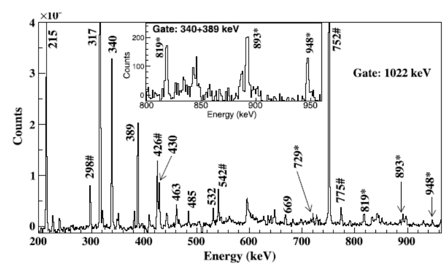
Rigid triaxiality in ^{187}Os





Isotopic and fission yield in ^{232}Th(α,f) reaction @30 MeV





Gated spectra from γ–γ matrix

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Nuclear Physics A 1018 (2022) 122375
www.elsevier.com/locate/nuclphysa

Three-phonon multiplets in ^{116}Sn

Prithwijita Ray, H. Pai, Sajad Ali, A. Mukherjee, S. Rajbanshi, S. Chakraborty, Soumik Bhattacharya, R. Banik, S. Nandi, S. Bhattacharyya, G. Mukherjee, C. Bhattacharya, G. Gangopadhyay, S. Samanta, S. Das, S. Chatterjee, R. Raut, S.S. Ghugre, P.C. Srivastava, S. Jehangir, Bharti Bhoy, N. Rather,

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Nuclear Physics A 1019 (2022) 122382
www.elsevier.com/locate/nuclphysa

Magnetic rotational band in ^{116}Sb

Shabir Dar, Soumik Bhattacharya, S. Bhattacharyya, R. Banik, S. Nandi, G. Mukherjee, S. Rajbanshi, S. Das Gupta, Sajad Ali, S. Chakraborty, S. Chatterjee, S. Das, A. Dhal, S. Ghugre, A. Goswami, D. Mondal, S. Mukhopadhyay, H. Pai, S. Pal, D. Pandit, R. Raut, P. Ray, S. Samanta
Variable Energy Cyclotron Centre, 1/AF Bidhannagar, Kolkata 700064, India

Current status of Mass Chains Assigned to India (A = 215 – 229)

Mass Chain	Year of Evaluation (Cutoff date)	Reference/Journal	Earlier Evaluator	No. of XUNDL data sets / Present status (October, 2022)
215	2013 (Oct. 22, 2013)	NDS 114, 2023 (2013)	B. Singh, GM *et al. (VECC workshop)*	**28 (Being evaluated by Sushil Kumar, SSD, AKJ, GM, BS)**
216	2007 (March 1, 2007)	NDS 108, 1057 (2007)	S.-C. Wu	**21 (25) (Being evaluated)**
217	2018 (Dec. 01, 2017)	NDS 147, 382 (2018)	F.G. Kondev *et al. (Trieste Workshop: 7 authrs from India)*	15 (17)
218	2018 (Oct. 30, 2019)	NDS 160, 405 (2019)	Balraj Singh et al., (Trieste Workshop: 4 authors from India)	4 (21)
219	2021 (May 19, 2021)	NDS 175, 150 (2021)	Balraj Singh, GM et al.	***Published***
220	2011 (Oct. 2010)	NDS 112, 1115 (2011)	E. Browne and JK Tuli	14 (15)
221	2007 (Jan. 15, 2007)	NDS 108, 883 (2007)	P.K. Joshi, R. Chakrabarti	17 ***(Being reevaluated)***
222	2011(Mar. 31, 2011)	NDS 112,2851 (2011)	S. S. Dhindsa, AK. Jain, J. Tuli	15 ***Being evaluated by B. Singh (+ ICTP 2022 Workshop Trainees)***
223	2001 (May 2001)	NDS 93, 763 (2001)	E. Brown	***8 (Being evaluated: P. Joshi, R. Chakrabarti)***
224	2015 (Oct. 15, 2015)	NDS 130, 127 (2015)	Sukhjeet Singh & Balraj Singh	08
225	2009 (Dec. 2008)	NDS 110, 1409 (2009)	A. K. Jain , R. Raut , J. K. Tuli	07 (will be taken up by A. Chakraborty)
226	1996 (Feb. 1996)	NDS 77, 433 (1996)	Y.A.Akowali	***New Evaluation being Completed by SSD and BS)***
227	2016 (15 Jan., 2016)	NDS 132, 257 (2016)	Kondev et al. (8 authors from India)	08 (11)
228	2014 (Dec. 31, 2012)	NDS 116, 163 (2014)	Khalifeh Abusaleem	09 (11)
229	2008 (June 2008)	NDS 109, 2657 (2008)	E. Browne and JK Tuli	21 Being evaluated by J.K. Tuli and B. Singh

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ScienceDirect

Nuclear Data Sheets 160 (2019) 405–471

Nuclear Data Sheets

www.elsevier.com/locate/nds

Nuclear Data Sheets for A=218

Balraj Singh,[1*] M.S. Basunia,[2] Murray Martin,[3] E.A. McCutchan,[4] Indu Bala,[5] R. Caballero-Folch,[6] Rhiann Canavan,[7] Ritwika Chakrabarti,[8] A. Chekhovska,[9] M.M. Grinder,[10] Samra Kaim,[11] Debasmita Kanjilal,[12] D. Kasperovych,[13] M.J. Kobra,[14] H. Koura,[15] Soumen Nandi,[16] Adina Olacel,[17] Abhilasha Singh,[18] and B.P.E. Tee[19].

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[3]Oak Ridge National Laboratory, Oak Ridge, TN, USA.
[4]National Nuclear Data Center, Brookhaven National Laboratory, Upton, NY, USA.
[5]Inter-University Accelerator Centre, New-Delhi, India.
[6]TRIUMF, Vancouver, BC, Canada.
[7]University of Surrey, Guildford, UK; and N.P.L. Teddington, UK
[8]University of Mumbai, Mumbai, India.
[9]Kharkov Institute of Physics and Technology, Kharkiv, Ukraine.
[10]NSCL, Michigan State University, East Lansing, MI, USA.
[11]Universite Freres Mentouri Constantine 1, Constantine, Algeria.
[12]Raiganj Surendranath Mahavidyalaya, Raiganj, India.
[13]Institute for Nuclear Research, National Academy of Sciences, Kiev, Ukraine
[14]Department of Physics, Rajshahi University, Rajshahi, Bangladesh.
[15]Japan Atomic Energy Agency, Tokai, Ibaraki, Japan.
[16]Variable Energy Cyclotron Centre, Kolkata, India.
[17]Horia Hulubei National Institute of Physics and Nuclear Engineering, Bucharest, Romania.
[18]CEA, LIST, Laboratoire National Henri Becquerel (LNE-LNHB), CEA-Saclay 91191 Gif/Yvette cedex, France.
[19]Australian National University, Canberra, ACT, Australia.
*Corresponding author, balraj@mcmaster.ca

(Received 29 March 2019; Revised 17 September 2019)

9	A=165	Singh, Chen	Being Evaluated
10	A=226	Singh, Singh, Kumar	Being Evaluated
11	A=5	Kelley	Being Evaluated
12	A=80	Singh, Chen	Being Evaluated
13	A=103	Timar, Elekes	Being Evaluated
14	A=107	Lalkovski	Being Evaluated
15	A=118	Pascu, Negret, McCutchan	Being Evaluated
16	A=120	Kitao	Being Evaluated
17	A=124	Katakura	Being Evaluated
18	A=151	Singh,Chen	Being Evaluated
19	A=173	Kibedi	Being Evaluated
20	A=174	Browne, Tuli, Kibedi	Being Evaluated
21	A=215	Kumar, Dhindsa, et al.	Being Evaluated
22	A=216	Nandi,Martin	Being Evaluated
23	A=221	PKJ, Chakraborty	Being Evaluated
24	A=222	Singh	Being Evaluated
25	A=223	PKJ, Chakraborty	Being Evaluated
26	A=229	Singh,Tuli	Being Evaluated
27	A=165	Singh, Chen	Being Evaluated
28	A=148	Nica	Being Evaluated
29	A=24	Basunia	Editorial Review
30	A=137	Nesaraja	Editorial Review
57	A=246	Nesaraja	Under Review
58	A=30	Basunia	Under Review
59	A=200	Kondev	Under Review

+ A. Chakraborty

Evaluation of Other Mass Chains

In addition to the Assigned (A = 215 – 219) mass chains, following other mass chains have been / being evaluated

A = 90
S.K. Basu and E.A. McCutchan
Nucl. Data Sheets 165 (2020) 1- 32

A = 23
M.S. Basunia and A. Chakraborty
Nucl. Data Sheets 171 (2021) 1–252

A = 24
M.S. Basunia and A. Chakraborty
Being Evaluated (Editorial Review)

A = 30
M.S. Basunia and A. Chakraborty
Under Review

Proposed future activities by A. Chakraborty :

✓A research contract proposal entitled "Mass Chain Evaluation of Light and Heavy Mass regions for Basic and Applied Research" has been submitted to IAEA for partial financial support

✓A = 225 mass chain evaluation work would be carried out as a part of the concerned Proposal. The proposed work would be initiated very soon.

✓Previous evaluation work for A = 225 mass chain was carried out in the year of 2009 by A.K. Jain, R. Raut, and J.K. Tuli [NDS 110 (2009) 1409]

Horizontal Evaluations

Magnetic and Anti-Magnetic Rotational Bands:

Sushil Kumar, Sukhjeet Singh, Balraj Singh, A.K. Jain

(work in progress)

- Updation of previos compilations of MR bands by Amita et al. [ADNDT 74(2000) 283 & Preprint: December 20, 2006 (available at NNDC,BNL)].
- Updated compilation will have 57 newly added MR bands in 36 nuclides, with 301 M1 and 100 E2 transitions.
- Additionally, 35 existing MR bands are also updated.
- The experimental data of 21 AMR bands in 14 different nuclides with 125 E2 transitions (for $46 \leq Z \leq 66$, $54 \leq N \leq 78$ and $100 \leq A \leq 144$) would also be included.

Modified as: ***"Multi-qp structures in high-spin physics dominated by dipole (M1) transitions of dipole bands in Nuclear landscape"***

NSR, ENSDF, XUNDL databases were consulted and compiled the experimental data of definite/tentative 235 MR bands observed in 120 nuclei.

Following criteria to label a dipole band as definite MR band :

- Large BM1 values
- Decreasing BM1 values
- Low BE2 values
- Large BM1/BE2 values
- Configuration assignments
- Agreement with theoretical model predictions

It is now a bigger project and so will take little longer. Expecting its completion by 2023.

Delhi University 2022

Reduced $B(E3)$ Transition rates for E3 decay in nuclear chart: Compilation and Evaluation

Prerna Singh Rawat, Dr. Suresh Kumar

In Z=82-92

Proton configurations: $i_{13/2}$ and $f_{7/2}$
Neutron configurations: $j_{15/2}$ and $g_{9/2}$

- Strong octupole correlations predicted near particle numbers 34, 56, 88 & 134.

Large number of experimentally observed E3 gamma-transitions from isomeric states in these octupole regions

Total Compiled: 235
Total Evaluated: 25

- Even-Even (80)
- Even-Odd (55)
- Odd-Even (55)
- Odd-Odd (45)

Why need this Compilation ?

- ✓ An easy access to the experimental nuclear data.
- ✓ Useful in understanding the systematics of the octupole isomers.
- ✓ Useful in evaluating suitable values of different level and gamma-ray parameters depending upon different measurements.
- ✓ To identify various unexplored problems in nuclear physics

✓ **Sources of Data :**
ENSDF
XUNDL
NSR

General Policies used in compilation of Data

- Data Collection : 'ENSDF Dataset' and 'NSR references'
- Data is compiled in the form of three Tables:

Table I :

Nuclei	J_i^π	Ex. Energy (keV)	$T_{1/2}$	J_f^π	Decay transition	Branching	Transition Strength (W.u.)	G-ray (keV)	Remarks

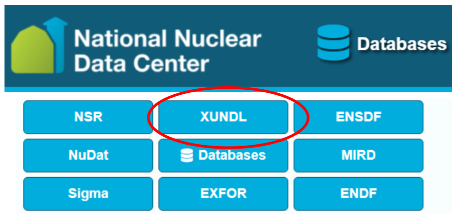
Table II :

Nuclei	J_i^π	Ex. Energy (keV)	G ray (keV)	branching	Decay transition	Ang. Dist. Coeff.	CC Coeff.	Pol.	DCO	references

Table III :

Nuclei	Ex. Energy (keV)	$T_{1/2}$	Configuration involved		Reference
			Initial State	Final State	

Methodology for Evaluation of Data



→ Checked for unevaluated $T_{1/2}$, B(E3), Eγ or Iγ measurements

↓ If relevant measurement is found

prepare .ens file with new evaluated parameters

→ Generally edited the old adopted gamma dataset files

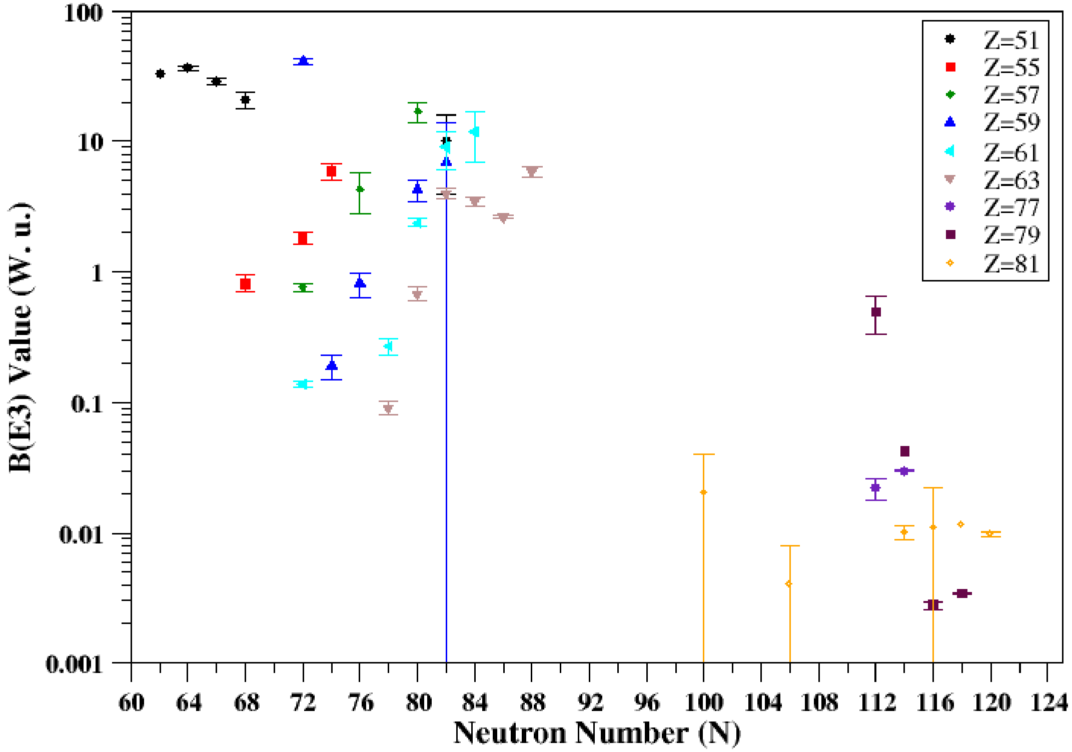
↓

Run various ensdf evaluation tools to get new adopted B(E3) value

<u>Evaluation Tools: ENSDF Uitility and Analysis Codes</u>

AveLib
FMTCHK
GTOL
BrIcc
RULER

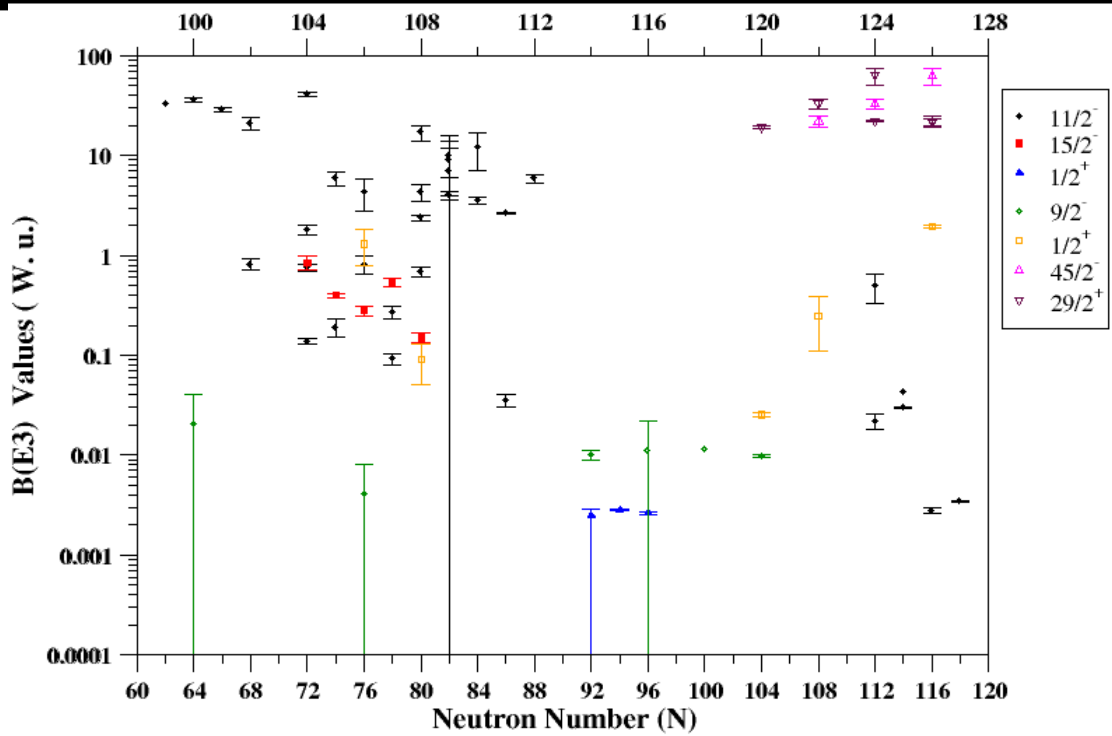
Systematics of Isomeric states in odd-even nuclides



Trend in B(E3) reduced transition probabilities for E3 branch from 11/2⁻ (octupole E3 transition) and 9/2⁻ (single particle E3 transition) isomeric states as a function of neutron number

- Enhancement in reduced transition strength are observed in case of octupole Δj = Δl = 3 decay branch
- Transition strength increases (for Δj = Δl = 3 cases) while approaching shell closure.

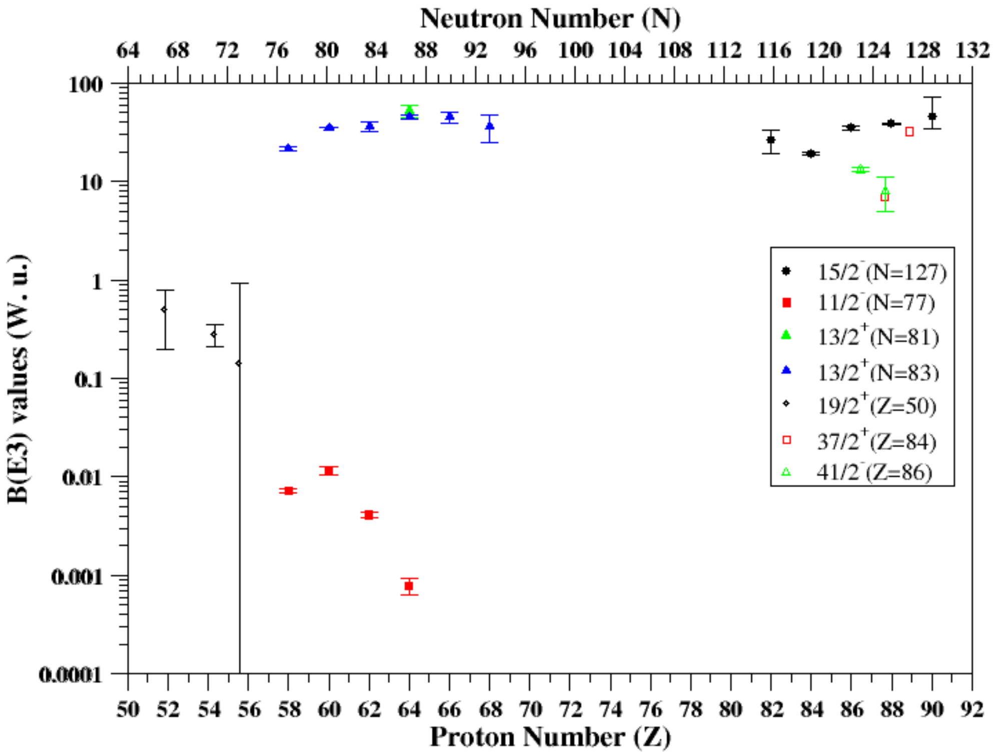
Systematics of Isomeric states in odd-even nuclides



Isomer	Dominant Configuration Involved
$11/2^-$	$\pi(h_{11/2}) \rightarrow \pi(d_{5/2})$
$15/2^-$	$\pi(g_{7/2} \otimes 7^-) \rightarrow \pi\ (g_{7/2} \otimes 2^-)$
$1/2^+$	$\pi(s_{1/2}) \rightarrow \pi(h_{11/2})$
$9/2^-$	$\pi(h_{9/2}) \rightarrow \pi(d_{3/2})$
$1/2^+$	$\pi(s_{1/2}) \rightarrow \pi(f_{7/2})$
$45/2^-$	$\pi(i_{13/2}) \rightarrow \pi(f_{7/2})$
$29/2^+$	$\pi(i_{13/2}) \rightarrow \pi(f_{7/2})$

B(E3) reduced transition probabilities for isomeric states in odd-even nuclides as a function of neutron number (the lower x-axis corresponds to filled symbols and upper x-axis corresponds to empty symbols)

Systematics of Isomeric states in even-odd nuclides



B(E3) reduced transition probabilities for isomeric states in even-odd nuclides as a function of proton and neutron number (the lower x-axis corresponds to filled symbols and upper x-axis corresponds to empty symbols

Isomer	Dominant Configuration Involved
$15/2^-$	$\nu(j_{15/2}) \rightarrow \nu(g_{9/2})$
$11/2^-$	$\nu(h_{11/2}) \rightarrow \nu(d_{5/2})$
$13/2^+$	$\nu(f_{7/2}\otimes 3^-) \rightarrow \nu(f_{7/2}\otimes 0^+)$
$19/2^+$	?
$37/2^+$	$\nu(j_{15/2}) \rightarrow \nu(g_{9/2})$
$41/2^-$	$\pi(i_{13/2}) \rightarrow \pi(h_{9/2})$

Interaction of $\Delta j = \Delta l = 3$ orbitals → Comparatively enhanced transition strength.

Publications & Others

Publications

- P. S.Rawat, S. Kumar, H. Chutani and M. Goyal, J. Nucl. Phys. Mat. Sc. Rad. A., Vol. 9, No. 2 (2022) pp.177-185
- P. S. Rawat and S. Kumar, Proceedings of the DAE Symp. on Nucl. Phys. 65 (2021) pp.130-131

Others

- **INGA Workshop 2021, IUAC, New Delhi**: Compilation of Experimental Angular Distribution Coefficients for transitions in Z=80-92 region has been used to evaluate RDCO values for octupole transitions in dipole, quadrupole and octupole gates.
- Presented in IAEA-ICTP Joint Workshop at Trieste, Italy, 2022

Code Development and maintenance

ALPHAD_RadD-v1.0 and RadD-v1.0)

Sukhjeet Singh, Sushil Kumar and Balraj Singh

Nuclear radius parameters (r_0) for even-even nuclei from alpha decay

Sukhjeet Singh, Balraj Singh, et al.

- Deduced r_0 parameters: Published in **Nuclear Data Sheets 167, 1-35 (2020):** Cut off date July 2020. The data file of these parameters is included in the ALPHAD_RadD code.

Status of revised r_0 parameters of even-even alpha emitters

The literatures up to **October 2022** have been consulted. The summary of even-even alpha emitters in which updates appeared in Q-values, parent half-life, %α and Iα is given below:

- **Alpha decay Q-values (2021Wa16) : 44**
- **Parent half-lives : 21**
- **Branching (%α) : 08**
- **Alpha Intensities (Iα) : 12**
- **Newly observed alpha emitters : 02 (^{284}Cn → ^{280}Ds and ^{214}U → ^{210}Th)**

Status of revised r_0 parameters of even-even alpha emitters

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Newly appeared experimental references which have been consulted in addition to recent ENSDF and XUNDL databases :

2020Ku23, 2021Az03, 2021Ke10, 2021Ni08, 2021Te08, 2021Zh22, 2022OG05)

All the alpha decay data sets are being updated as per discussion with Dr. B. Singh and will be sent to Dr. Jun Chen soon (within 2022)

Training and Workshop

- 8 Ph.D students from India attended the Trieste Workshop (Won 2 of the prizes!)
- Involved in the XUNDL and ENSDF activities taken up at the workshop
- Contribution as speaker and XUNDL coordinator.

Summary

- Many of the assigned mass chains are up-to-date. A few are under evaluation.
- Collaboration with other centres in the evaluation of the assigned mass chains of India Centre and also on other mass chains.
- Horizontal evaluations on multi-qp dipole bands and octupole transitions
- Updation of r_o parameters is under way.
- A sizeable number of trainees (8) from India attended the ICTP-IAEA Joint Workshop at Trieste, Italy a

Thank You