Bibliography

[1] M. A. Riley. *Gammasphere online booklet, Tech. rep.* URL : http://nucalf.physicsfsu.edu/riley/gamma, 2011.

[2] Torbjörn Bäck. *Spectroscopy of neutron deficient nuclei in the A=90 and A=170 mass regions*. PhD thesis, KTH, Physics, 2002. QC 20100521.

[3] Otto Haxel, J. Hans D. Jensen, and Hans E. Suess. On the "magic numbers" in nuclear structure. *Phys. Rev.*, 75:1766–1766, Jun 1949.

[4] Maria Goeppert Mayer. On closed shells in nuclei. ii. *Phys. Rev.*, 75:1969–1970, Jun 1949.

[5] E. A. Stefanova, R. Schwengner, G. Rainovski, K. D. Schilling, A. Wagner, F. Dönau, E. Galindo, A. Jungclaus, K. P. Lieb, O. Thelen, J. Eberth, D. R. Napoli, C. A. Ur, G. de Angelis, M. Axiotis, A. Gadea, N. Marginean, T. Martinez, Th. Kröll, and T. Kutsarova. Structure of high-spin states in ^{89}Sr and ^{90}Sr. *Phys. Rev. C*, 63:064315, May 2001.

[6] G. Rainovski, R. Schwengner, K. D. Schilling, A. Wagner, A. Jungclaus, E. Galindo, O. Thelen, D. R. Napoli, C. A. Ur, G. de Angelis, M. Axiotis, A. Gadea, N. Marginean, T. Martinez, and Th. Kröll. High-spin structure of the spherical nucleus ^{90}Y. *Phys. Rev. C*, 65:044327, Apr 2002.

[7] S. Saha, R. Palit, J. Sethi, S. Biswas, P. Singh, S. Nag, A. K. Singh, I. Ragnarsson, F. S. Babra, U. Garg, A. Goswami, E. Ideguchi, H. C. Jain, S. Kumar, Md. S. R. Laskar, G. Mukherjee, Z. Naik, and C. S. Palshetkar. Observation of rotation about the longest principal axis in ^{89}Zr. *Phys. Rev. C*, 99:054301, May 2019.

[8] P. Dey, D. Negi, R. Palit, P. C. Srivastava, Md. S. R. Laskar, B. Das, F. S. Babra, S. Bhattacharya, Biswajit Das, K. Rojeeta Devi, R. Gala, U. Garg, S. S. Ghugre, E. Ideguchi, S. Kumar, A. Kundu, G. Mukherjee, S. Muralithar, S. Nag, S. Nandi, Neelam, M. Kumar Raja, R. Raut, R. Santra, A. Sharma, S. Sihotra, A. K. Singh, R. P. Singh, and T. Trivedi. Experimental investigation of high-spin states in ^{90}Zr. *Phys. Rev. C*, 105:044307, Apr 2022.

[9] Yi-Heng Wu, Jing-Bin Lu, Zhen Ren, Tian-Jiao Gao, Pei-Yao Yang, Yan Hao, Guan-Jian Fu, Jian Li, Ke-Yan Ma, Xiao-Guang Wu, Yun Zheng, and Cong-Bo Li. Investigation of level structure in the semimagic nucleus ^{91}Nb and systematics of nuclear structure characteristics near $A = 90$. *Phys. Rev. C*, 106:054326, Nov 2022.

[10] Y. Zheng, Y. H. Wu, X. G. Wu, C. B. Li, L. H. Zhu, T. X. Li, P. W. Luo, G. S. Li, C. Y. He, H. W. Li, S. P. Hu, J. J. Liu, J. L. Wang, S. H. Yao, Q. M. Chen, J. Zhong, J. B. Lu, K. Y. Ma, and D. Yang. Reinvestigation of the high-spin level structure of ^{92}Nb: Excitations across the $Z = 38$ and $N = 50$ closed shells. *Phys. Rev. C*, 100:014325, Jul 2019.

[11] T Fukuchi, Y Gono, A Odahara, S Tanaka, M Inoue, Y Wakabayashi, T Sasaki, M Kibe, N Hokoiwa, T Shinozuka, et al. High-spin isomer in ^{93}Mo. *The European Physical Journal A-Hadrons and Nuclei*, 24:249–257, 2005.

[12] S. E. Arnell, D. Foltescu, H. A. Roth, Ö. Skeppstedt, J. Blomqvist, A. Nilsson, T. Kuroyanagi, S. Mitarai, and J. Nyberg. Yrast level structure of the neutron deficient N=49 isotones ^{92}Tc, ^{93}Ru, ^{94}Rh, and ^{95}Pd up to high angular momentum. *Phys. Rev. C*, 49:51–65, Jan 1994.

[13] Philip Walker and George Dracoulis. Energy traps in atomic nuclei. *Nature*, 399(6731):35–40, 1999.

[14] Swati Garg, Bhoomika Maheshwari, Balraj Singh, Yang Sun, Alpana Goel, and Ashok Kumar Jain. Atlas of nuclear isomers—second edition. *Atomic data and nuclear data tables*, 150:101546, 2023.

[15] A. Jain, Bhoomika Maheshwari, and Alpana Goel. Nuclear isomers-a primer, 07 2021.

[16] GD Dracoulis, PM Walker, and FG Kondev. Review of metastable states in heavy nuclei. *Reports on Progress in Physics*, 79(7):076301, 2016.

[17] Oliver J Roberts, CR Niţă, Alison M Bruce, N Mărginean, D Bucurescu, Daniela Deleanu, D Filipescu, NM Florea, I Gheorghe, D Ghiţă, et al. E3 and M2 transition strengths in $^{209}_{83}$Bi. *Physical Review C*, 93(1):014309, 2016.

[18] A.P. Byrne, G.J. Lane, G.D. Dracoulis, B. Fabricius, T. Kibédi, A.E. Stuchbery, A.M. Baxter, and K.J. Schiffer. Octupole coupling and proton-neutron interactions in ^{214}Fr. *Nuclear Physics A*, 567(2):445–476, 1994.

[19] A.P. Byrne, R. Müsseler, H. Hübel, M. Murzel, K. Theine, W. Schmitz, K.H. Maier, H. Kluge, H. Grawe, and H. Haas. Extremely long lived 65-2 isomer in ^{213}Fr. *Physics Letters B*, 217(1):38–42, 1989.

[20] S. Bayer, A.P. Byrne, G.D. Dracoulis, A.M. Baxter, T. Kibédi, F.G. Kondev, S.M. Mullins, and T.R. McGoram. High-spin states, yrast isomers and residual interactions in the odd-odd nucleus ^{212}At. *Nuclear Physics A*, 650(1):3–36, 1999.

[21] A.E. Stuchbery, G.D. Dracoulis, A.P. Byrne, S.J. Poletti, and A.R. Poletti. Spectroscopy and octupole coupling of high-spin states in ^{213}Rn. *Nuclear Physics A*, 482(3):692–724, 1988.

[22] Madhu, Khamosh Yadav, A. Y. Deo, Pragati, P. C. Srivastava, S. K. Tandel, S. G. Wahid, S. Kumar, S. Muralithar, R. P. Singh, Indu Bala, S. S. Bhattacharjee, Ritika Garg, S. Chakraborty, S. Rai, and A. K. Jain. Evolution of nuclear structure through isomerism in ^{216}Fr. *Phys. Rev. C*, 105:034308, Mar 2022.

[23] T. Fukuchi, S. Tanaka, T. Sasaki, Y. Gono, A. Odahara, T. Morikawa, M. Shibata, H. Watanabe, S. Motomura, T. Tsutsumi, O. Kashiyama, K. Saitoh, Y. Wakabayashi, T. Kishida, S. Kubono, and M. Ishihara. Level structure and excitation energy of a high-spin isomer in ^{150}Ho. *Phys. Rev. C*, 73:067303, Jun 2006.

[24] R Broda, M Behar, P Kleinheinz, PJ Daly, and J Blomqvist. Particle plus octupole $m2/e3$ isomers and high-spin particle-hole states in ^{147}Tb and ^{148}Tb. *Zeitschrift für Physik A Atoms and Nuclei*, 293(2):135–149, 1979.

[25] K Arita and H Horie. Shell model calculation of the septuplet in ^{209}Bi. *Physics Letters B*, 30(1):14–15, 1969.

[26] J. R. Beene, O. Häusser, T. K. Alexander, and A. B. McDonald. Electromagnetic properties of particle-vibration coupling states in ^{209}Bi. *Phys. Rev. C*, 17:1359–1364, Apr 1978.

[27] Ikuko Hamamoto. Particle spectra and particle-vibration coupling in the pb region. *Physics Reports*, 10(2):63–105, 1974.

[28] Ben Mottelson. Elementary modes of excitation in the nucleus. *Reviews of Modern Physics*, 48(3):375, 1976.

[29] AP Byrne, GD Dracoulis, C Fahlander, H Hübel, AR Poletti, AE Stuchbery, J Gerl, RF Davie, and SJ Poletti. Spectroscopy of high-spin states in ^{211,212,213}Fr. *Nuclear Physics A*, 448(1):137–188, 1986.

[30] S Bayer, AP Byrne, and GD Dracoulis. Lifetimes of the 212^- and 292^+ states in ^{211}At and their implication for effective charges and quadrupole moments. *Nuclear Physics A*, 591(1):104–116, 1995.

[31] E Wilson, Zs Podolyák, H Grawe, BA Brown, CJ Chiara, S Zhu, B Fornal, RVF Janssens, CM Shand, M Bowry, et al. Core excitations across the neutron shell gap in ^{207}Tl. *Physics Letters B*, 747:88–92, 2015.

[32] B. Alex Brown. Double-octupole states in ^{208}Pb. *Phys. Rev. Lett.*, 85:5300–5303, Dec 2000.

[33] M Cerkaski, J Dudek, P Rozmej, Z Szymanski, and Sven Gösta Nilsson. Particle-hole structure of nuclear isomers at high angular momenta. *Nuclear Physics A*, 315(3):269–290, 1979.

[34] G. Wendell Misch, Surja K. Ghorui, Projjwal Banerjee, Yang Sun, and Matthew R. Mumpower. Astromers: Nuclear isomers in astrophysics*. *The Astrophysical Journal Supplement Series*, 252(1):2, dec 2020.

[35] Peter Mohr. Nucleosynthesis of ^{92}Nb and the relevance of the low-lying isomer at 135.5 kev. *Phys. Rev. C*, 93:065804, Jun 2016.

[36] A. V. Afanasjev, D. B. Fossan, G. J. Lane, and I. Ragnarsson. Termination of rotational bands: disappearance of quantum many-body collectivity. *Phys. Rept.*, 322:1–124, 1999.

[37] S. G. Nilsson. Binding states of individual nucleons in strongly deformed nuclei. *Mat. Fyss. Medd. Dan. Selsk.*, 29(16):3–68, 1955.

[38] Roger D. Woods and David S. Saxon. Diffuse surface optical model for nucleon-nuclei scattering. *Phys. Rev.*, 95(2):577–578, 1954.

[39] S. G. Nilsson and I. Ragnarsson. *Shapes and Shells in Nuclear Structure*. Cambridge: Cambridge University Press, 1955.

[40] Z. Szymański. *Fast Nuclear Rotation*. Oxford Studies in Physics. Clarendon Press, 1983.

[41] G.B. Hagemann. Wobbling phonon excitations in strongly deformed triaxial nuclei. *The European Physical Journal A - Hadrons and Nuclei*, 20:183–188, 4 2003.

[42] C. M. Petrache, M. Fantuzi, G. LoBianco, D. Mengoni, A. Neusser-Neffgen, H. Hübel, A. Al-Khatib, P. Bringel, A. Bürger, N. Nenoff, G. Schönwasser, A. K. Singh, I. Ragnarsson, G. B. Hagemann, B. Herskind, D. R. Jensen, G. Sletten, P. Fallon, A. Görgen, P. Bednarczyk, D. Curien, G. Gangopadhyay, A. Korichi, A. Lopez-Martens, B. V. T. Rao, T. S. Reddy, and Nirmal Singh. Evolution from spherical single-particle structure to stable triaxiality at high spins in ^{140}Nd. *Phys. Rev. C*, 72:064318, Dec 2005.

[43] R. Bengtsson, T. Bengtsson, M. Bergström, H. Ryde, and G.B. Hagemann. On the use of spin adiabatic energy surfaces: Applications to the description of rotational bands in ^{171,172}W. *Nuclear Physics A*, 569(3):469–509, 1994.

[44] B. G. Carlsson, I. Ragnarsson, R. Bengtsson, E. O. Lieder, R. M. Lieder, and A. A. Pasternak. Triaxial shape with rotation around the longest principal axis in ^{142}Gd. *Phys. Rev. C*, 78:034316, Sep 2008.

[45] T. Steinhardt, J. Eberth, and I. Ragnarsson. Stable collective triaxial rotation in ^{77}Kr. *The European Physical Journal A*, 33(4):303–306, 2007.

[46] Z. Q. Li, S. Y. Wang, C. Y. Niu, B. Qi, S. Wang, D. P. Sun, C. Liu, C. J. Xu, L. Liu, P. Zhang, X. G. Wu, G. S. Li, C. Y. He, Y. Zheng, C. B. Li, B. B. Yu, S. P. Hu, S. H. Yao, X. P. Cao, and J. L. Wang. High-spin states in the semimagic nucleus ^{89}Y and neutron-core excitations in the $N = 50$ isotones. *Phys. Rev. C*, 94:014315, Jul 2016.

[47] H. Ejiri and J.A. de Voigt. *Gamma-ray and Electron Spectroscopy in Nuclear Physics*. Oxford Studies in Nuclear Physics Series. Clarendon Press, 1989.

[48] P. E. Hodgson. *Nuclear Reactions and Nuclear Structure*. Clarendon Press, Oxford, first edition, 1971.

[49] N. Bohr. Neutron capture and nuclear constitution. *Nature*, 137(3461):344–348, 1936.

[50] S. N. Ghoshal. An experimental verification of the theory of compound nucleus. *Phys. Rev.*, 80(6):939–942, 1950.

[51] A. Gavron. Statistical model calculations in heavy ion reactions. *Phys. Rev. C*, 21(1):230–236, 1980.

[52] A. Mihailescu and Gh. Cata-Danil. Gamma-ray production in the ^{58}Ni(^{16}O,X) nuclear reaction. *Rom. Journ. Phys.*, 55(7-8):712–723, 2010.

[53] V. S. Barashenkov, F. G. Gereghi, A. S. Iljinov, G. G. Jonsson, and V. D. Toneev. A cascade-evaporation model for photonuclear reactions. *Nuclear Physics A*, 231(3):462–476, 1974.

[54] P. J. Nolan, F. A. Beck, and D. B. Fossan. Large arrays of escape-suppressed gamma-ray detectors. *Annual Review of Nuclear and Particle Science*, 44(1):561–607, 1994.

[55] I. Y. Lee, M. A. Deleplanque, and K. Vetter. Developments in large gamma-ray detector arrays. *Rep. Prog. Phys.*, 66(7):1095–1144, 2003.

[56] C. W. Beausang and J. Simpson. Large arrays of escape suppressed spectrometers for nuclear structure experiments. *J. Phys. G: Nucl. Part. Phys.*, 22(5):527–558, 1996.

[57] G. Duchêne, F. A. Beck, P. J. Twin, G. de France, D. Curien, L. Han, C. W. Beausang, M. A. Bentley, P.J. Nolan, and J. Simpson. The Clover : a new generation of composite Ge detectors. *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, 432(1):90–110, 1999.

[58] P. J. Nolan, F. A. Beck, and D. B. Fossan. Large arrays of escape-suppressed Gamma-ray detectors. *Annual Review of Nuclear and Particle Science*, 44(1):561–607, 1994.

[59] P. K. Joshi, H. C. Jain, A. S. Medhi, S. Chattopadhyay, S. Bhattacharya, and A. Goswami. Study of the characteristics of a clover detector. *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, 399(1):51–56, 1997.

[60] R. Palit. Investigation of exotic nuclear shapes and its evolution using a large Compton suppressed Clover array. *Proceedings of the DAE Symp. on Nucl. Phys*, 55:I11, 2010.

[61] R. Palit. Investigation of exotic shapes, correlations and isomers in nuclei with large Compton suppressed clover array. *AIP Conference Proceedings*, 1336(1):573–575, 2011.

[62] R. Palit, S. Saha, J. Sethi, T. Trivedi, S. Sharma, B. S. Naidu, S. Jadhav, R. Donthi, P. B. Chavan, H. Tan, et al. A high speed digital data acquisition system for the Indian National Gamma Array at Tata Institute of Fundamental Research. *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, 680:90, 2012.

[63] W. R. Leo. *Techniques for nuclear and particle physics experiments : a how-to approach*. Springer-Verlag, 1987.

[64] G. F. Knoll. *Radiation detection and measurement*. Wiley, 2000.

[65] R. Palit, S. Saha, J. Sethi, T. Trivedi, B. S. Naidu, P. B. Chavan, R. Donthi, and S. Jadhav. Performance of Indian National Gamma Array (INGA) coupled with a fast digital data acquisition system for nuclear structure studies. *Journal of Physics: Conference Series*, 420(1):012159–012159, 2013.

[66] Hui Tan et al. Digital data acquisition modules for instrumenting large segmented germanium detector arrays. In *Nuclear Science Symposium Conference Record, 2008, NSS08, IEEE*, pages 3196–3200, 2008.

[67] D. C. Radford. ESCL8R and LEVIT8R : software for interactive graphical analysis of HPGe coincidence data sets. *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, 361(1-2):297–305, 1995.

[68] C. W. Beausang, D. Prevost, M. H. Bergstrom, G. deFrance, B. Haas, J. C. Lisle, Ch. Theisen, J. Timár, P. J. Twin, and J. N. Wilson. Using high-fold data from the new generation of γ-ray detector arrays. *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, 364(3):560–566, 1995.

[69] R. M. Diamond, E. Matthias, J. O. Newton, and F. S. Stephens. Nuclear alignment in heavy-ion reactions. *Phys. Rev. Lett.*, 16(26):1205–1207, 1966.

[70] J. O. Newton, F. S. Stephens, R. M. Diamond, K. Kotajima, and E. Matthias. Angular distributions of gamma rays produced in reactions with heavy ions. *Nuclear Physics A*, 95(2):357–376, 1967.

[71] S. R. D. Groot, H. A. Tolhoek, and W. J. Huiskamp. *Orientation of Nuclei at low Temperatures; Alpha- Beta and Gamma-Ray Spectrosocpy*. North Horald Amsterdam, 1965.

[72] A. J. Ferguston. *Nuclear Correlation Methods in Gamma-Ray Spectroscopy*. North Horald Amsterdam, 1965.

[73] T. Yamazaki. Tables of coefficients for angular distribution of gamma rays from aligned nuclei. *Nuclear Data Sheets. Section A*, 3(1):1–23, 1967.

[74] A. Bödeker, K. P. Lieb, C. J. Gross, M. K. Kabadiyski, D. Rudolph, M. Weiszflog, J. Eberth, H. Grawe, J. Heese, and K. H. Maier. Seniority $v = 5$ states in $^{89}_{41}Nb_{48}$. *Phys. Rev. C*, 48(4):1617–1622, 1993.

[75] Matti Piiparinen, A Ataç, Jan Blomqvist, GB Hagemann, B Herskind, R Julin, S Juutinen, A Lampinen, J Nyberg, G Sletten, et al. High-spin spectroscopy of the ^{142}Eu, ^{143}Eu and ^{144}Eu nuclei. *Nuclear Physics A*, 605(2):191–268, 1996.

[76] K. Starosta, T. Morek, Ch. Droste, S.G. Rohoziński, J. Srebrny, A. Wierzchucka, M. Bergström, B. Herskind, E. Melby, T. Czosnyka, and P.J. Napiorkowski. Experimental test of the polarization direction correlation method (PDCO). *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, 423(1):16–26, 1999.

[77] Subhendu Rajbanshi. Generation on angular momentum for weakly deformed nuclei in mass 140 region. 2016.

[78] L. C. NORTIICLIFFE and R. F. SCtlILLING. *RANGE AND STOPPING - POWER TABLES FOR HEAVY IONS*. NUCLEAR DATA TABLES,, 1970.

[79] N. R. Johnson, J. C. Wells, Y. Akovali, C. Baktash, R. Bengtsson, M. J. Brinkman, D. M. Cullen, C. J. Gross, H.-Q. Jin, I.-Y. Lee, A. O. Macchiavelli, F. K. McGowan, W. T. Milner, and C.-H. Yu. Lifetimes of high-spin states in the $\pi i_{13/2}$ band of ^{173}Re. *Phys. Rev. C*, 55:652–659, Feb 1997.

[80] JC Wells and NR Johnson. Lineshape: a computer program for doppler-broadened lineshape lifetime analysis. *Report No. ORNL-6689*, 44, 1991.

[81] B. A. Brown and D. B. Fossan. High-spin states in ^{92}Nb. *Phys. Rev. C*, 15:2044–2051, Jun 1977.

[82] First lifetime measurement of 9^- isomer in ^{92}Nb, author=Goel, N and Nag, S and Maheshwari, B and Choudhury, D and Palit, R and Malik, V and Dey, P and Laskar, Md SR and Babra, FS and Das, B and others, journal=The European Physical Journal A, volume=60, number=11, pages=1–11, year=2024, publisher=Springer.

[83] Rene Brun and Fons Rademakers. Root — an object oriented data analysis framework. *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, 389(1):81–86, 1997. New Computing Techniques in Physics Research V.

[84] Md. S. R. Laskar, R. Palit, E. Ideguchi, T. Inakura, S. N. Mishra, F. S. Babra, S. Bhattacharya, D. Choudhury, Biswajit Das, B. Das, P. Dey, U. Garg, A. K. Jain, A. Kundu, D. Kumar, D. Negi, S. C. Pancholi, S. Rajbanshi, and S. Sihotra. Enhanced $B(E3)$ strength observed in ^{137}La. *Phys. Rev. C*, 104:L011301, Jul 2021.

[85] L.A. Gurgi, P.H. Regan, T. Daniel, Zs. Podolyák, A.M. Bruce, P.J.R Mason, N. Mărginean, R. Mărginean, V. Werner, T. Alharbi, N. Alkhomashi, A.D. Bajoga, R. Britton, I. Căta-Danil, R.J. Carroll, D. Deleanu, D. Bucurescu, N. Florea, I Gheorghe, D.G. Ghita, T. Glodariu, R. Lice, C. Mihai, K.F. Mulholland, A. Negret, A. Olacel, O.J. Roberts, T. Sava, P.-A. Söderström, L. Stroe, R. Suvaila, S. Toma, E. Wilson, and R.T. Wood. Nanosecond lifetime measurements of I^{π}=9/2$^-$ intrinsic excited states and low-lying B(E1) strengths in ^{183}Re using combined HPGe-LaBr3 coincidence spectroscopy. *Radiation Physics and Chemistry*, 137:7–11, 2017. Proceedings of the 13th International Symposium on Radiation Physics.

[86] N. Bohr and Kalckar. On the transmutation of atomic nuclei by impact of material particles: I. general theoretical remarks. *kgl. Dansk. Vid. Selsk. Skr.*, 14(10):1–40, 1937.

[87] C. F. V. Weizsäcker. Zur theorie der kernmassen. *Zeitschrift für Physik*, 96(7-8):431–458, 1935.

[88] Alex E. S. Green. Coulomb radius constant from nuclear masses. *Phys. Rev.*, 95(4):1006–1009, 1954.

[89] N. Bohr and J. A. Wheeler. The mechanism of nuclear fission. *Phys. Rev.*, 56(5):426–450, 1939.

[90] E. Feenberg and K. C. Hammack. Nuclear shell structure. *Phys. Rev.*, 75(12):1877–1893, 1949.

[91] M. G. Mayer. On closed shells in nuclei. II. *Phys. Rev.*, 75(12):1969–1970, 1949.

[92] M. G. Mayer and J. H. D. Jensen. *On the Elementary Theory of Nuclear Shell Structure*. John Wiley, 1955.

[93] E. Feeberg. *Shell Theory of the nucleus*. Princeton University Press, 1955.

[94] S. G. Nilsson. Binding state of individual nucleon in strongly deformed nuclei. *Mat. Fys. Medd. Dan. Vid. Selsk.*, 29(16):1–72, 1955.

[95] S. G. Nilsson et al. On the nuclear structure and stability of heavy and superheavy elements. *Nucl. Phys. A*, 131(1):1–66, 1969.

[96] Y. X. Luo, J. O. Rasmussen, J. H. Hamilton, A. V. Ramayya, E. Wang, Y. X. Liu, C. F. Jiao, W. Y. Liang, F. R. Xu, Y. Sun, S. Frauendorf, J. K. Hwang, S. H. Liu, S. J. Zhu, N. T. Brewer, I. Y. Lee, G. M. Ter-Akopian, Yu. Oganessian, R. Donangelo, and W. C. Ma. First observation of a rotational band and the role of the proton intruder orbital $\pi 1/2^+[431]$ in very neutron-rich odd-odd ^{106}Nb. *Phys. Rev. C*, 89:044326, Apr 2014.

[97] V.M. Strutinsky. “shells” in deformed nuclei. *Nuclear Physics A*, 122(1):1–33, 1968.

[98] A. Bohr. *Mat. Fys. Medd. Dan. Vid. Selsk.*, 26(14), 1952.

[99] A. Bohr and Mottlesson B. R. *Mat. Fys. Medd. Dan. Vid. Selsk.*, 27(16), 1953.

[100] B. R. Mottleson. Collective motion in nucleus. *Rev. Mod. Phys.*, 29(2):186–190, 1957.

[101] G. Andersson, S. E. Larsson, G. Leander, P. Möller, S.G. Nilsson, I. Ragnarsson, S. Åberg, R. Bengtsson, J. Dudek, B. Nerlo-Pomorska, K. Pomorski, and Z. Szymański. Nuclear shell structure at very high angular momentum. *Nuclear Physics A*, 268(2):205–256, 1976.

[102] David Lawrence Hill and John Archibald Wheeler. Nuclear constitution and the interpretation of fission phenomena. *Phys. Rev.*, 89(5):1102–1145, 1953.

[103] D. R. Inglis. Particle derivation of nuclear rotation properties associated with a surface wave. *Phys. Rev.*, 96(4):1059–1065, 1954.

[104] D. R. Inglis. Dynamics of nuclear deformation. *Phys. Rev.*, 97(3):701–706, 1955.

[105] R. Bengtsson and S. Frauendorf. An interpretation of backbending in terms of the crossing of the ground state band with an aligned two-quasiparticle band. *Nuclear Physics A*, 314(1):27–36, 1979.

[106] R. Bengtsson and S. Frauendorf. Quasiparticle spectra near the yrast line. *Nuclear Physics A*, 327(1):139–171, 1979.

[107] R. Bengtsson, S. Frauendorf, and F. R. May. Quasiparticle levels in rotating rare earth nuclei: A cranked shell-model dictionary. *Atomic Data and Nuclear Data Tables*, 35(1):15–122, 1986.

[108] F. S. Stephens. Coriolis effects and rotation alignment in nuclei. *Rev. Mod. Phys.*, 47(1):43–65, 1975.

[109] F. S. Stephens and R. S. Simon. Coriolis effects in the yrast states. *Nuclear Physics A*, 183(2):257–284, 1972.

[110] M. J. A. de Voigt, J. Dudek, and Z. Szymański. High-spin phenomena in atomic nuclei. *Rev. Mod. Phys.*, 55(4):949–1046, 1983.

[111] N. Goel et al. Core-excited states leading to the high-spin band structure in ^{93}Nb nucleus. *Eur. Phys. J. A*, 60(11):230, 2024.

[112] A.V. Afanasjev, D.B. Fossan, G.J. Lane, and I. Ragnarsson. Termination of rotational bands: disappearance of quantum many-body collectivity. *Physics Reports*, 322(1-2):1–124, 1999.

[113] Ragnar Bengtsson, S E Larsson, G Leander, P Möller, Sven Gösta Nilsson, Sven Åberg, and Z Szymanski. Yrast bands and high-spin potential-energy surfaces. *Physics Letters. Section B: Nuclear, Elementary Particle and High-Energy Physics*, 57(4):301–305, 1975. The information about affiliations in this record was updated in December 2015. The record was previously connected to the following departments: Department of Physics (011013000), Mathematical Physics (Faculty of Technology) (011040002).

[114] K. Neergård and V. V. Pashkevich. Shell corrections to the deformation energies of very high spin nuclei (I $\leq$ 100). *Physics Letters B*, 59(3):218–222, 1975.

[115] Tord Bengtsson and Ingemar Ragnarsson. Rotational bands and particle-hole excitations at very high spin. *Nuclear Physics A*, 436(1):14–82, 1985.

[116] A. V. Afanasjev and I. Ragnarsson. The coexistence of the intruder $\nu i_{13/2}$, superdeformed and terminating bands in the A $\sim$ 135 mass region. *Nuclear Physics A*, 608(2):176–201, 1996.

[117] B. G. Carlsson and I. Ragnarsson. Calculating the nuclear mass in the very high angular momentum regime. *Phys. Rev. C*, 74(1):011302R(1–5), 2006.

[118] K. Pomorski and J. Dudek. Nuclear liquid-drop model and surface-curvature effects. *Phys. Rev. C*, 67(4):044316(1–13), 2003.

[119] W. D. Myers and W. J. Swiatecki. Nuclear properties according to the Thomas-Fermi model. *Nuclear Physics A*, 601(2):141–167, 1996.

[120] William D. Myers and Wladyslaw J. Swiatecki. Nuclear masses and deformations. *Nuclear Physics*, 81(2):1–60, 1966.

[121] V. M. Strutinsky. “shells” in deformed nuclei. *Nuclear Physics A*, 122(1):1–33, 1968.

[122] Stanisław G. Rohoziński. Parametrization of nonaxial deformations in rotational nuclei. *Phys. Rev. C*, 56(1):165–174, 1997.

[123] K. Starosta, C. J. Chiara, D. B. Fossan, T. Koike, D. R. LaFosse, G. J. Lane, J. M. Sears, J. F. Smith, A. J. Boston, P. J. Nolan, E. S. Paul, A. T. Semple, M. Devlin, D. G. Sarantites, I. Y. Lee, A. O. Macchiavelli, and I. Ragnarsson. Smooth band termination at high spin in ^{113}I. *Phys. Rev. C*, 64(1):014304(1–19), 2001.

[124] D. Glas, U. Mosel, and P. G. Zint. The cranked harmonic oscillator in coordinate space. *Zeitschrift für Physik A Atoms and Nuclei*, 285(1):83–87, 1978.

[125] I Ragnarsson, VP Janzen, DB Fossan, NC Schmeing, and R Wadsworth. Smooth termination of collective rotational bands. *Physical review letters*, 74(20):3935, 1995.

[126] Jing-ye Zhang, N. Xu, D. B. Fossan, Y. Liang, R. Ma, and E. S. Paul. Nilsson parameter set in the $A \approxeq 120$ - 140 region. *Phys. Rev. C*, 39(2):714–716, 1989.

[127] G. Andersson, S. E. Larsson, G. Leander, P. Möller, S. G. Nilsson, I. Ragnarsson, S. Åberg, R. Bengtsson, J. Dudek, B. Nerlo-Pomorska, K. Pomorski, and Z. Szymański. Nuclear shell structure at very high angular momentum. *Nuclear Physics A*, 268(2):205–256, 1976.

[128] Ingemar Ragnarsson, Zheng Xing, Tord Bengtsson, and Mark A Riley. Properties of terminating bands in nuclei. *Physica Scripta*, 34(6A):651–668, 1986.

[129] Waheed Akram Yuri Amelin Maria Schönbächler Tsuyoshi Iizuka, Yi-Jen Lai. The initial abundance and distribution of ^{92}Nb in the solar system. *Earth and Planetary Science Letters*, 439:172–181, 2016.

[130] Yuki Hibiya, Tsuyoshi Iizuka, Hatsuki Enomoto, and Takehito Hayakawa. Evidence for enrichment of Niobium-92 in the outer protosolar disk. *The Astrophysical Journal Letters*, 942(1):L15, jan 2023.

[131] S. Saha, R. Palit, J. Sethi, S. Biswas, P. Singh, S. Nag, A. K. Singh, I. Ragnarsson, F. S. Babra, U. Garg, A. Goswami, E. Ideguchi, H. C. Jain, S. Kumar, Md. S. R. Laskar, G. Mukherjee, Z. Naik, and C. S. Palshetkar. Observation of rotation about the longest principal axis in ^{89}Zr. *Phys. Rev. C*, 99:054301, May 2019.

[132] Yi-Heng Wu, Jing-Bin Lu, Zhen Ren, Guan-Jian Fu, Jian Li, Ke-Yan Ma, Ying-Jun Ma, Xiao-Guang Wu, Yun Zheng, Cong-Bo Li, and Jun Wen. Level structure of the ^{93}Nb nucleus and systematics of features in neighboring nuclei. *Phys. Rev. C*, 105:034344, Mar 2022.

[133] G. Wendell Misch, T. M. Sprouse, and M. R. Mumpower. Astromers in the radioactive decay of r-process nuclei. *The Astrophysical Journal Letters*, 913(1):L2, may 2021.

[134] Swati Garg, Bhoomika Maheshwari, Balraj Singh, Yang Sun, Alpana Goel, and Ashok Kumar Jain. Atlas of nuclear isomers—second edition. *Atomic Data and Nuclear Data Tables*, 150:101546, January 2023.

[135] B. A. Brown, P. M. S. Lesser, and D. B. Fossan. Properties of high-spin states in ^{91}Nb and ^{91}Zr via ^{6}Li-induced reactions. *Phys. Rev. C*, 13:1900–1921, May 1976.

[136] D.H. Gloeckner. Shell-model systematics of the zirconium and niobium isotopes. *Nuclear Physics A*, 253(2):301–323, 1975.

[137] M.B. Chadwick, P. Obložinský, M. Herman, et al. ENDF/B-VII.0: Next generation evaluated nuclear data library for nuclear science and technology. *Nuclear Data Sheets*, 107(12):2931–3118, December 2006.

[138] R. Palit, S. Saha, J. Sethi, T. Trivedi, S. Sharma, B.S. Naidu, S. Jadhav, R. Donthi, P.B. Chavan, H. Tan, and W. Hennig. A high speed digital data acquisition system for the indian national gamma array at tata institute of fundamental research. *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, 680:90–96, 2012.

[139] Yi-Heng Wu, Jing-Bin Lu, Peng-Wei Luo, Guang-Sheng Li, Hong-Wei Li, Xiao-Guang Wu, Chuang-Ye He, Yun Zheng, Ke-Yan Ma, Dong Yang, et al. High-spin states in the odd-odd nucleus ^{92}Nb. *Chinese Physics Letters*, 31(4):042102, 2014.

[140] CVK Baba, DB Fossan, T Faestermann, F Feilitzsch, MR Maier, P Raghavan, RS Raghavan, and C Signorini. Lifetime and g-factor results for the 132- 1985 kev level in ^{91}Nb and the 152- 2288 kev level in ^{91}Zr. *Nuclear Physics A*, 257(1):135–143, 1976.

[141] G. Goldring, R. Kalish, International Union of Pure, and Applied Physics. *Hyperfine Interactions in Excited Nuclei*. Number v. 4 in Hyperfine Interactions in Excited Nuclei. Gordon and Breach Science Publishers, 1971.

[142] N.J. Stone. Table of nuclear magnetic dipole and electric quadrupole moments. *Atomic Data and Nuclear Data Tables*, 90(1):75–176, 2005.

[143] H. Mach, E. K. Warburton, R. L. Gill, R. F. Casten, J. A. Becker, B. A. Brown, and J. A. Winger. Meson-exchange enhancement of the first-forbidden ^{96}Y^{g}(0^{-})$\rightarrow$^{96}Zr^{g} (0^{+}) β transition: β decay of the low-spin isomer of ^{96}Y. *Phys. Rev. C*, 41:226–242, Jan 1990.

[144] Gargano, Angela, De Gregorio, Giovanni, and Fukui, Tokuro. Nuclear structure studies within the realistic shell model. *EPJ Web Conf.*, 304:04002, 2024.

[145] S. Saha, R. Palit, J. Sethi, T. Trivedi, P. C. Srivastava, S. Kumar, B. S. Naidu, R. Donthi, S. Jadhav, D. C. Biswas, U. Garg, A. Goswami, H. C. Jain, P. K. Joshi, G. Mukherjee, Z. Naik, S. Nag, V. Nanal, R. G. Pillay, S. Saha, and A. K. Singh. Experimental investigation of shell-model excitations of ^{89}Zr up to high spin. *Phys. Rev. C*, 86:034315, Sep 2012.

[146] Z. G. Wang, M. L. Liu, Y. H. Zhang, X. H. Zhou, S. Guo, J. G. Wang, X. G. Lei, Y. Zheng, Y. D. Fang, Y. H. Qiang, N. T. Zhang, B. Ding, G. S. Li, F. Ma, X. L. Yan, S. C. Wang, B. S. Gao, F. Fang, B. T. Hu, X. G. Wu, C. Y. He, and Y. Zheng. High-spin level structures of the near-spherical nuclei ^{91,92}Zr. *Phys. Rev. C*, 89:044308, Apr 2014.

[147] Z. Q. Li, S. Y. Wang, C. Y. Niu, B. Qi, S. Wang, D. P. Sun, C. Liu, C. J. Xu, L. Liu, P. Zhang, X. G. Wu, G. S. Li, C. Y. He, Y. Zheng, C. B. Li, B. B. Yu, S. P. Hu, S. H. Yao, X. P. Cao, and J. L. Wang. Erratum: High-spin states in the semimagic nucleus ^{89}Y and neutron-core excitations in the N=50 isotones [phys. rev. c 94, 014315 (2016)]. *Phys. Rev. C*, 102:019902, Jul 2020.

[148] Zhen Ren, Jing-Bin Lu, Guo-Xiang Dong, Yun Zheng, Yi-Heng Wu, Tian-Jiao Gao, Pei-Yao Yang, Yan Hao, Ke-Yan Ma, Xiao-Guang Wu, Cong-Bo Li, Zhen Huang, Guang-Xin Zhang, Shi-Peng Hu, Hui-Bin Sun, Huan-Qiao Zhang, D. Testov, J. J. Valiente-Dobon, A. Goasduff, M. Siciliano, F. Galtarossa, D. Mengoni, D. Bazzacco, and Gao-Long Zhang. Level scheme of ^{92}Nb and observation of an oblate collective rotational band. *Phys. Rev. C*, 108:044301, Oct 2023.

[149] P. Dey, R. Palit, P. C. Srivastava, Biswajit Das, A. Kundu, Md. S. R. Laskar, Vishal Malik, D. Negi, and Shweta Sharma. Experimental investigation of high-spin states in ^{91}Nb. *Phys. Rev. C*, 109:034313, Mar 2024.

[150] Z. Huang, G. X. Zhang, G. L. Zhang, S. P. Hu, S. M. Lenzi, D. Mengoni, J. L. Ferreira, Y. F. Lv, J. B. Lu, B. Paes, E. N. Cardozo, H. Q. Zhang, H. B. Sun, J. J. Valiente-Dobón, D. Testov, A. Goasduff, D. Bazzacco, P. R. John, D. R. Napoli, F. Galtarossa, F. Recchia, G. de. Angelis, M. Siciliano, R. Menegazzo, and J. Lubian. Level scheme study of ^{92}Mo: Searching for evidence of core excitation. *Phys. Rev. C*, 106:064331, Dec 2022.

[151] F. Ghazi Moradi, C. Qi, B. Cederwall, A. Ataç, T. Bäck, R. Liotta, M. Doncel, A. Johnson, G. de France, E. Clément, A. Dijon, R. Wadsworth, T. W. Henry, A. J. Nichols, H. Al-Azri, J. Nyberg, A. Gengelbach, T. Hüyük, B. M. Nyakó, J. Timár, D. Sohler, Zs. Dombrádi, I. Kuti, K. Juhász, M. Palacz, G. Jaworski, S. M. Lenzi, P. R. John, D. R. Napoli, A. Gottardo, V. Modamio, A. Di Nitto, B. Yilmaz, Ö. Aktas, and E. Ideguchi. Character of particle-hole excitations in ^{94}Ru deduced from γ-ray angular correlation and linear polarization measurements. *Phys. Rev. C*, 89:014301, Jan 2014.

[152] Yasuo Wakabayashi, Tomonori Fukuchi, Yasuyuki Gono, Atsuko Odahara, Shuichi Tanaka, Masaki Inoue, Takafumi Sasaki, Michiya Kibe, Naho Hokoiwa, Tsutomu Shinozuka, Masahiro Fujita, Akiyoshi Yamazaki, Tetsu Sonoda, Chun Sik Lee, Young Kwan Kwon, Jun Young Moon, and Ju Hahn Lee. High-spin states in ^{93}Nb. *Journal of the Physical Society of Japan*, 76(11):114202, 2007.

[153] A. Chakraborty, Krishichayan, S. S. Ghugre, R. Goswami, S. Mukhopadhyay, N. S. Pattabiraman, S. Ray, A. K. Sinha, S. Sarkar, P. V. Madhusudhana Rao, U. Garg, S. K. Basu, M. B. Chaterjee, M. Saha Sarkar, L. Chaturvedi, A. Dhal, R. K. Sinha, I. M. Govil, R. K. Bhowmik, A. Jhingan, N. Madhavan, S. Muralithar, S. Nath, R. P. Singh, and P. Sugathan. Spectroscopy of ^{90}Nb at high spin. *Phys. Rev. C*, 72:054309, Nov 2005.

[154] Y. Gono, A. Odahara, T. Fukuchi, E. Ideguchi, T. Kishida, T. Kubo, H. Watanabe, S. Motomura, K. Saito, O. Kashiyama, T. Morikawa, B. Cederwall, Y.H. Zhang, X.H. Zhou, M. Ishihara, and H. Sagawa. Systematics of high-spin isomers in $N = 83$ isotones and a high-spin isomer beam. *Eur. Phys. J. A*, 13(1), 2002.

[155] E. Dafni, J. Bendahan, C. Broude, G. Goldring, M. Hass, E. Naim, M.H. Rafailovich, C. Chasman, O.C. Kistner, and S. Vajda. Nuclear polarization and signs of quadrupole moments of high-spin gd isomers. *Nuclear Physics A*, 443(1):135–156, 1985.

[156] T Døssing, K Neergård, and H Sagawa. Yrast spectra in the ^{146}Gd region. *Physica Scripta*, 24(1B):258, jul 1981.

[157] A. Odahara, Y. Gono, S. Mitarai, T. Morikawa, T. Shizuma, M. Kidera, M. Shibata, T. Kishida, E. Ideguchi, K. Morita, A. Yoshida, H. Kumagai, Y.H. Zhang, A. Ferragut, T. Murakami, M. Oshima, H. Iimura, M. Shibata, S. Hamada, H. Kusakari, M. Sugawara, M. Ogawa, M. Nakajima, B.J. Min, J.C. Kim, S.J. Chae, and H. Sagawa. High-spin isomer and level structure of ^{145}Sm. *Nuclear Physics A*, 620(3):363–384, 1997.

[158] Purnima Singh, R Palit, D Choudhury, S Biswas, S Saha, J Sethi, C Ghosh, HC Jain, PC Srivastava, S Mukhopadhyay, et al. Search for high-spin isomers near N= 50 shell closure. In *Proceedings of the DAE-BRNS Symp. on Nucl. Phys*, volume 60, page 298, 2015.

[159] Z. Q. Li, S. Y. Wang, C. Y. Niu, B. Qi, S. Wang, D. P. Sun, C. Liu, C. J. Xu, L. Liu, P. Zhang, X. G. Wu, G. S. Li, C. Y. He, Y. Zheng, C. B. Li, B. B. Yu, S. P. Hu, S. H. Yao, X. P. Cao, and J. L. Wang. High-spin states in the semimagic nucleus ^{89}Y and neutron-core excitations in the N=50 isotones. *Phys. Rev. C*, 94:014315, Jul 2016.

[160] E. S. Paul, C. W. Beausang, D. B. Fossan, R. Ma, W. F. Piel, N. Xu, L. Hildingsson, and G. A. Leander. Collective oblate band in ^{131}La due to the rotational alignment of $h_{11/2}$ neutrons. *Phys. Rev. Lett.*, 58:984–987, Mar 1987.

[161] AV Afanasjev and I Ragnarsson. The high-energy cost for building states with I $\sim 30\hbar$ in Z> 40, N< 50 nuclei. *Nuclear Physics A*, 586(3):377–395, 1995.

[162] S. Frauendorf T. Bengtsson and F. R. May. Quasiparticle levels in rotating rare earth nuclei : A cranked shell-model dictionary. *At. Data Nucl. Data Tables*, 35(1):15, 1986.

[163] D Galeriu, D Bucurescu, and M Ivascu. Nuclear deformations in the A$\approx$ 80-100 region. *Journal of Physics G: Nuclear Physics*, 12(4):329, apr 1986.

[164] K. Pomorski and J. Dudek. Nuclear liquid-drop model and surface-curvature effects. *Phys. Rev. C*, 67:044316, Apr 2003.

[165] Purnima Singh, Somnath Nag, A. K. Singh, H. Hübel, A. Al-Khatib, P. Bringel, C. Engelhardt, A. Neußer-Neffgen, I. Ragnarsson, M. P. Carpenter, R. V. F. Janssens, T. L. Khoo, T. Lauritsen, G. B. Hagemann, C. R. Hansen, B. Herskind, G. Sletten, A. Bracco, G. Benzoni, F. Camera, P. Fallon, R. M. Clark, P. Chowdhury, and

H. Amro. Noncollective aligned and antialigned states in ^{125}I. *Phys. Rev. C*, 82:034301, Sep 2010.

[166] Somnath Nag, A. K. Singh, A. N. Wilson, J. Rogers, H. Hübel, A. Bürger, S. Chmel, I. Ragnarsson, G. Sletten, B. Herskind, M. P. Carpenter, R. V. F. Janssens, T. L. Khoo, F. G. Kondev, T. Lauritsen, S. Zhu, A. Korichi, Hoa Ha, P. Fallon, A. O. Macchiavelli, B. M. Nyakó, J. Timár, and K. Juhász. Collective and noncollective states in ^{120}Te. *Phys. Rev. C*, 85:014310, Jan 2012.

[167] Purnima Singh, A. K. Singh, A. N. Wilson, J. Rogers, H. Hübel, A. Bürger, S. Chmel, I. Ragnarsson, G. Sletten, B. Herskind, M. P. Carpenter, R. V. F. Janssens, T. L. Khoo, F. G. Kondev, T. Lauritsen, S. Zhu, A. Korichi, Hoa Ha, P. Fallon, B. M. Nyakó, J. Timár, and K. Juhász. Core excitations beyond maximally aligned configurations in ^{123}I. *Phys. Rev. C*, 85:034319, Mar 2012.

[168] Somnath Nag, A. K. Singh, I. Ragnarsson, H. Hübel, A. Al-Khatib, P. Bringel, C. Engelhardt, A. Neußer-Neffgen, G. B. Hagemann, B. Herskind, G. Sletten, M. P. Carpenter, R. V. F. Janssens, T. L. Khoo, T. Lauritsen, R. M. Clark, P. Fallon, G. Benzoni, A. Bracco, F. Camera, and P. Chowdhury. Collective and noncollective excitations in ^{122}Te. *Phys. Rev. C*, 88:044335, Oct 2013.

[169] H. A. Roth, S. E. Arnell, D. Foltescu, Ö. Skeppstedt, J. Blomqvist, A. Nilsson, T. Kuroyanagi, S. Mitarai, and J. Nyberg. Gaps in the yrast level structure of the n=50 isotones ^{93}Tc, ^{94}Ru, and ^{95}Rh at high angular momentum. *Phys. Rev. C*, 50:1330–1345, Sep 1994.

[170] P. Ring and P. Schuck. *The nuclear many-body problem*. Springer-Verlag, New York, 1980.

[171] Andrius Juodagalvis, Ingemar Ragnarsson, and Sven Åberg. Triaxiality in ^{48}Cr. *Physics Letters B*, 477(1):66–72, 2000.

[172] A. Görgen, G. B. Hagemann, I. Hamamoto, R. Bengtsson, R. M. Clark, M. Cromaz, P. Fallon, H. Hübel, I. Y. Lee, A. O. Macchiavelli, G. Sletten, and D. Ward. Quadrupole Moments And Gamma Deformation Of Wobbling Excitations In ^{163}Ln. *AIP Conference Proceedings*, 764(1):9–14, 04 2005.

[173] Dieter Kurath and R. D. Lawson. M2 transitions in nuclei. *Phys. Rev.*, 161:915–924, Sep 1967.

[174] Vishal Malik, R Palit, P C Srivastava, P Dey, Deepak Patel, Biswajit Das, D Negi, U Garg, R Raut, Nidhi Goel, A Kundu, A Sindhu, and Somnath Nag. Core excitation in ^{92}Mo up to high spin. *Journal of Physics G: Nuclear and Particle Physics*, 52(2):025101, dec 2024.

[175] T Zerrouki, CM Petrache, R Leguillon, K Hauschild, A Korichi, A Lopez-Martens, S Frauendorf, Ingemar Ragnarsson, H Hübel, A Neußer-Neffgen, et al. Shape evolution and magnetic rotation in ^{141}Nd. *The European Physical Journal A*, 51:1–21, 2015.

[176] S. E. Arnell, D. Foltescu, H. A. Roth, Ö. Skeppstedt, J. Blomqvist, A. Nilsson, T. Kuroyanagi, S. Mitarai, and J. Nyberg. Yrast level structure of the neutron deficient N=49 isotones ^{92}Tc, ^{93}Ru, ^{94}Rh, and ^{95}Pd up to high angular momentum. *Phys. Rev. C*, 49:51–65, Jan 1994.

[177] Dirk Rudolph, KP Lieb, and H Grawe. Multiparticle-hole states of high spin in N< 50, A≈ 90 nuclei: 4. systematics of level energies and electromagnetic properties. *Nuclear Physics A*, 597(2):298–326, 1996.

[178] H Herndl and BA Brown. Shell-model calculations for the properties of nuclei with A= 86–100 near the proton drip line. *Nuclear Physics A*, 627(1):35–52, 1997.

[179] N. Yoshinaga, K. Higashiyama, and P. H. Regan. High-spin structure of neutron-rich se, as, ge, and ga isotopes. *Phys. Rev. C*, 78:044320, Oct 2008.

[180] EK Warburton, JW Olness, CJ Lister, RW Zurmühle, and JA Becker. High-spin state spectroscopy of ^{88,90}Zr. *Physical Review C*, 31(4):1184, 1985.

[181] SS Ghugre and SK Datta. Shell model study of the high spin states in the N= 50 isotones ^{92}Mo, ^{93}Tc, ^{94}Ru, and ^{95}Rh. *Physical Review C*, 52(4):1881, 1995.

[182] R Schubart, A Jungclaus, A Harder, MK Kabadiyski, KP Lieb, Dirk Rudolph, M Weiszflog, S Albers, T Burkardt, J Eberth, et al. Multiparticle-hole states of high spin in N< 50, A≈ 90 nuclei: 3. the odd-odd nucleus ^{88}Nb. *Nuclear Physics A*, 591(3):515–532, 1995.

[183] DH Gloeckner and FJD Serduke. Shell model study of N= 50 nuclei. *Nuclear Physics A*, 220(3):477–490, 1974.

[184] FJD Serduke, RD Lawson, and DH Gloeckner. Shell-model study of the N= 49 isotones. *Nuclear Physics A*, 256(1):45–86, 1976.

[185] SS Ghugre, SB Patel, M Gupta, RK Bhowmik, and JA Sheikh. High spin states in ^{93}Tc. *Physical Review C*, 47(1):87, 1993.

[186] Pragya Singh, RG Pillay, JA Sheikh, and HG Devare. Spectroscopy of high spin states in ^{92}Mo and ^{90}Mo. *Physical Review C*, 45(5):2161, 1992.

[187] Guang-yi Zhao, Guang-sheng Li, Xiao-guang Wu, Xiang-an Liu, Shu-xian Wen, Jing-bin Lu, Guan-jun Yuan, and Chun-xiang Yang. Structure of high spin states in ^{87}Zr. *Chinese physics letters*, 16(5):345–346, 1999.

[188] S. S. Ghugre, B. Kharraja, U. Garg, R. V. F. Janssens, M. P. Carpenter, B. Crowell, T. L. Khoo, T. Lauritsen, D. Nisius, W. Mueller, W. Reviol, L. L. Riedinger, and R. Kaczarowski. High-spin states in ^{97,98}Rh. *Phys. Rev. C*, 58:3243–3251, Dec 1998.

[189] S. Ray, N. S. Pattabiraman, R. Goswami, S. S. Ghugre, A. K. Sinha, and U. Garg. Experimental study of nuclear structure of ^{91}Mo at high spin. *Phys. Rev. C*, 69:054314, May 2004.

[190] WF Piel Jr, DB Fossan, R Ma, ES Paul, N Xu, and JB McGrory. High-spin structure of N= 51 ^{96}Rh and ^{97}Pd : A shell-model study. *Physical Review C*, 41(3):1223, 1990.

[191] S. S. Ghugre, S. B. Patel, M. Gupta, R. K. Bhowmik, and J. A. Sheikh. Spectroscopy of ^{95}Ru at high spins. *Phys. Rev. C*, 50:1346–1354, Sep 1994.

[192] E Galindo, M Hausmann, A Jungclaus, Klaus-Peter Lieb, O Yordanov, IP Johnstone, R Schwengner, A Dewald, A Fitzler, O Möller, et al. Transition strengths between particle hole excitations in ^{95}Ru. *Physical Review C—Nuclear Physics*, 69(2):024304, 2004.

[193] P Chowdhury, BA Brown, U Garg, RD McKeown, TP Sjoreen, and DB Fossan. Nuclear structure in ^{95,97}Ru nuclei. *Physical Review C*, 32(4):1238, 1985.

[194] SS Ghugre, S Naguleswaran, RK Bhowmik, U Garg, SB Patel, W Reviol, and JC Walpe. High-spin states in ^{94}Tc and the shell-model interpretation. *Physical Review C*, 51(5):2809, 1995.

[195] AJ Kreiner, J Davidson, M Davidson, D Abriola, C Pomar, and P Thieberger. Band structure in ^{180}Re and the different coupling schemes in a deformed doubly odd nucleus. *Physical Review C*, 36(6):2309, 1987.

[196] L Funke, G Winter, J Döring, L Käubler, H Prade, R Schwengner, E Will, Ch Protochristov, W Andrejtscheff, LG Kostova, et al. Neutron-core excitations in the N= 50 nucleus ^{89}Y. *Nuclear Physics A*, 541(2):241–265, 1992.

[197] E. A. Stefanova, R. Schwengner, J. Reif, H. Schnare, F. Dönau, M. Wilhelm, A. Fitzler, S. Kasemann, P. von Brentano, and W. Andrejtscheff. Influence of neutron-core excitations on high-spin states in ^{88}Sr. *Phys. Rev. C*, 62:054314, Oct 2000.

[198] G Winter, R Schwengner, J Reif, H Prade, L Funke, R Wirowski, N Nicolay, A Dewald, P von Brentano, H Grawe, et al. Study of excited states in ^{85}Kr and ^{86}Kr: Evidence for neutron-core excitations in the N= 50 nucleus ^{86}Kr. *Physical Review C*, 48(3):1010, 1993.

[199] Nidhi Goel P. Dey, Somnath Nag and R. Palit. Collective rotation in 90zr beyond shell model excitations. *Proceedings of the DAE Symp. on Nucl. Phys. 66*, 2022.

[200] Ingemar Ragnarsson. Additivity in superdeformed bands. *Physics Letters B*, 264(1-2):5–10, 1991.

Appendix A

Appendix

A.1 Tables

Table A.1 Energies, intensities, branching ratio, internal conversion coefficients, spin and multipolarities assignments of γ-ray transitions of ^{92}Nb.

γ-ray Energy $E_\gamma$keV	Intensity $^{(a)}$ I_γ	Branching ratios (%)$^{(b)}$	Internal conversion coefficients (α)$^{(c)}$	$I_i^\pi \rightarrow I_f^\pi$	Multipolarity assignment
115.4(3)	15.3(29)	100	0.680	$11^- \rightarrow 9^-$	$E2$
142.2(2)	9.5(9)	13	0.323	$9^- \rightarrow 7^-$	$E2$
147.6(1)	70.0(70)	-	-	$10^- \rightarrow 9^-$	$E2$
327.7(1)	100.0(69)	-	0.017	$13^+ \rightarrow 11^+$	$E2$
500.6(9)	3.0(2)	-	-	$6^+ \rightarrow 7^+$	$M1$
711.1(1)	42.9(44)	-	-	$11^+ \rightarrow 9^+$	$E2$
762.2(1)	63.9(64)	-	-	$11^+ \rightarrow 10^-$	$E1$
795.2(21)	3.8(19)	-	-	$11^+ \rightarrow 11^-$	-
1444.4(2)	2.5(9)	-	-	$7^- \rightarrow 6^+$	-

γ-ray Energy E_γ keV	Intensity[(a)] I_γ	Intensity ratios[(c)] R_θ	$\delta_{assym} \times 10^{-2}$	$I_i^\pi \rightarrow I_f^\pi$	Multipolarity assignment
1586.0(12)	3.0(10)	4	-	$9^- \rightarrow 6^+$	-
1944.6(5)	3.8(9)	-	-	$7^- \rightarrow 7^+$	-
2087.3(1)	60.0(55)	83	-	$9^- \rightarrow 7^+$	$M2/E3$
2211.0(8)	5.1(26)	-	-	$(13^-) \rightarrow 11^-$	$E2$
2286.6(1)	37.6(39)	-	-	$9^+ \rightarrow 7^+$	$E2$

[(a)]Intensity reported with gate on 327.7-keV .

[(b)] branching ratios are calculated for the transitions which are essential for the measurement of mentioned isomeric lifetimes.

[(c)] Internal conversion coefficients were taken from the [137].

Table A.2 The average occupancies of active orbitals for various spin states in set 1 shell model calculations of ^{92}Nb. The columns $< L_p >$ and $< L_n >$ list the expectation of orbital angular momentum contributions from the proton and neutron sides, respectively. The l_s value (just below orbital) indicates the nature of the orbital, where l denotes the orbital angular momentum as 0,1,2,3,4..., and s as a suffix signifies the spin angular momentum, with $'+'$ and $'-'$ denoting $+1/2$ and $-1/2$ values, respectively.

J_i^p	proton variable occupation					neutron average occupation					$< L_p >$	$< L_n >$
	$f_{7/2}$ 3_+	$f_{5/2}$ 3_-	$p_{3/2}$ 1_+	$p_{1/2}$ 1_-	$g_{9/2}$ 4_+	$g_{9/2}$ 4_+	$g_{7/2}$ 4_-	$d_{5/2}$ 2_+	$d_{3/2}$ 2_-	$s_{1/2}$ $0_{+/-}$		
6_1^+	8.000	5.869	3.649	1.548	1.934	10.000	0.003	0.991	0.004	0.001	3.694	1.501
6_2^+	8.000	5.659	3.689	1.261	2.391	10.000	0.080	0.454	0.448	0.019	3.720	1.852
7_1^+	8.000	5.924	3.696	1.717	1.663	10.000	0.003	0.993	0.002	0.002	4.028	1.977
7_2^+	8.000	5.418	3.705	1.097	2.780	10.000	0.032	0.940	0.015	0.013	4.340	1.754
11_1^+	8.000	5.588	3.659	0.671	3.082	10.000	0.005	0.887	0.018	0.090	8.021	1.688
11_2^+	8.000	5.059	3.740	1.130	3.072	10.000	0.008	0.909	0.019	0.064	8.887	1.459
13_1^+	8.000	5.655	3.661	0.611	3.073	10.000	0.006	0.988	0.003	0.002	9.572	1.966
13_2^+	8.000	4.988	3.811	1.132	3.069	10.000	0.007	0.895	0.010	0.088	10.690	1.549
7_1^-	8.000	5.933	3.785	1.124	2.157	10.000	0.002	0.847	0.053	0.098	6.140	0.176
7_2^-	8.000	5.920	3.630	1.275	2.175	10.000	0.004	0.809	0.016	0.172	5.495	0.969
9_1^-	**8.000**	**5.887**	**3.614**	**1.335**	**2.164**	**10.000**	**0.004**	**0.865**	**0.024**	**0.108**	**6.696**	**1.345**
9_2^-	8.000	5.892	3.485	1.445	2.179	10.000	0.004	0.979	0.012	0.005	6.216	1.928
10_1^-	8.000	5.953	3.691	1.207	2.149	10.000	0.004	0.991	0.005	0.001	7.166	1.821
10_2^-	8.000	5.951	3.787	1.092	2.170	10.000	0.008	0.987	0.003	0.001	7.435	1.613

11_1^-	8.000	5.930	3.836	1.079	2.155	10.000	0.004	0.994	0.001	0.001	7.916	1.997
11_2^-	8.000	5.057	3.780	1.788	2.376	10.000	0.008	0.961	0.009	0.022	7.987	1.885

Table A.3 The average occupancies of active orbitals for various spin states in set 2 shell model calculations of ^{92}Nb. The columns $< L_p >$ and $< L_n >$ list the expectation of orbital angular momentum contributions from the proton and neutron sides, respectively. The l_s value (just below orbital) indicates the nature of the orbital, where l denotes the orbital angular momentum as 0,1,2,3,4..., and s as a suffix signifies the spin angular momentum, with $'+'$ and $'-'$ denoting $+1/2$ and $-1/2$ values, respectively.

J_i^p	proton variable occupation					neutron average occupation					$< L_p >$	$< L_n >$
	$f_{7/2}$ 3_+	$f_{5/2}$ 3_-	$p_{3/2}$ 1_+	$p_{1/2}$ 1_-	$g_{9/2}$ 4_+	$g_{9/2}$ 4_+	$g_{7/2}$ 4_-	$d_{5/2}$ 2_+	$d_{3/2}$ 2_-	$s_{1/2}$ $0_{+/-}$		
6_1^+	7.992	5.925	3.746	1.752	1.585	9.947	0.038	0.982	0.025	0.009	3.692	1.631
6_2^+	7.992	5.927	3.775	1.742	1.564	9.004	0.025	1.680	0.139	0.151	2.612	2.741
7_1^+	7.992	5.948	3.772	1.836	1.452	9.954	0.035	0.984	0.019	0.008	4.015	2.155
7_2^+	7.992	5.928	3.775	1.743	1.562	9.001	0.025	1.683	0.140	0.150	3.038	3.203
11_1^+	7.991	5.902	3.762	1.681	1.664	9.000	0.025	1.728	0.144	0.103	4.050	5.783
11_2^+	7.992	5.930	3.782	1.778	1.519	9.001	0.021	1.784	0.163	0.031	3.933	5.894
13_1^+	7.992	5.940	3.787	1.809	1.473	9.000	0.024	1.767	0.199	0.011	4.047	7.603
13_2^+	7.990	5.638	3.705	0.669	2.998	9.937	0.047	0.973	0.027	0.017	9.550	2.169
7_1^-	7.993	5.931	3.796	1.122	2.157	9.935	0.040	0.856	0.070	0.099	6.039	0.396
7_2^-	7.993	5.804	3.814	1.165	2.224	9.022	0.036	1.642	0.135	0.165	2.332	4.257
9_1^-	**7.994**	**5.892**	**3.648**	**1.305**	**2.161**	**9.943**	**0.041**	**0.862**	**0.042**	**0.112**	**6.683**	**1.528**
9_2^-	7.993	5.888	3.468	1.478	2.172	9.943	0.042	0.971	0.030	0.014	6.214	2.104
10_1^-	7.993	5.952	3.702	1.203	2.150	9.954	0.038	0.977	0.023	0.009	7.159	1.970
10_2^-	7.993	5.949	3.796	1.094	2.167	9.934	0.047	0.979	0.027	0.014	7.431	1.746
11_1^-	7.994	5.930	3.841	1.081	2.155	9.946	0.042	0.981	0.021	0.011	7.916	2.174
11_2^-	7.993	5.895	3.801	1.158	2.154	9.028	0.040	1.554	0.164	0.214	6.364	3.808

Table A.4 Energies, intensities, angular distribution ratios, multipolarities and spin assignments of γ-ray transitions of ^{93}Nb. The experimentally observed values are given for γ transition energy whereas the level energies are the output of the Gamma-to-Level (GTOL) least-squares fitting code developed at NNDC [137].

γ-ray Energy $E_\gamma$keV	Intensity $^{(a)}$ I_γ	Intensity ratios$^{(c)}$ R_θ	Δ_{assym} $\times 10^{-2}$ $^{(d)}$	$I_i^\pi \rightarrow I_f^\pi$	Initial level energy$^{(e)}$ (E_i) keV	Multipolarity assignment
156.5(13)	3.5(8)	0.6(2)	-	$15/2^+ \rightarrow 17/2^+$	1490.5(3)	$M1$
223.7(7)	3.2(8)	0.7(1)	-	$41/2^{(-)} \rightarrow 39/2^{(-)}$	9918.1(9)	($M1$)
290.9(11)	2.5(7)	-	-	$(23/2) \rightarrow 21/2^+$	2384.4(5)	-
300.3(6)	2.9(7)	0.7(3)	-	$39/2 \rightarrow 37/2^-$	7731.3(8)	D
330.7(3)	4.1(11)	1.5(6)	-	$37/2^{(+)} \rightarrow 33/2^+$	6231.5(5)	($E2$)
384.8(1)	100.0(69)	1.4(1)	10.1(29)	$17/2^+ \rightarrow 13/2^+$	1334.3(2)	$E2$
392.8(2)	13.6(16)	0.6(1)	-8.2(46)	$39/2^- \rightarrow 37/2^-$	7823.8(5)	$M1$
419.0(4)	5.5(12)	0.7(2)	-	$29/2^+ \rightarrow 27/2^{(+)}$	4403.9(3)	($M1$)
485.5(4)	6.0(14)	0.7(2)	-	$45/2^{(-)} \rightarrow 43/2^{(-)}$	9420.3(8)	($M1$)
496.4(3)	10.2(13)	0.7(1)	-	$43/2^{(-)} \rightarrow 41/2^-$	8934.8(7)	($M1$)
503.3(8)	1.9(6)	-	-	$(33/2^-) \rightarrow 29/2^{(-)}$	4904.4(16)	-
521.6(7)	2.6(7)	-	-	$33/2^+ \rightarrow 31/2^{(+)}$	5900.8(4)	($M1$)
541.0(3)	7.8(15)	0.7(2)	-	$15/2^+ \rightarrow 13/2^+$	1490.5(3)	$M1$
572.9(4)	5.3(9)	0.7(2)	-	$19/2^{(+)} \rightarrow 17/2^-$	2752.7(6)	($E1$)
586.5(8)	5.3(8)	1.4(3)	-	$25/2^{(-)} \rightarrow 21/2^{(-)}$	3672.6(10)	($E2$)
614.6(3)	11.8(17)	0.7(1)	-7.8(36)	$41/2^- \rightarrow 39/2^-$	8438.4(6)	$M1$
689.3(5)$^{(b)}$	8.8(15)	0.7(2)	-	$17/2^- \rightarrow 15/2^+$	2179.8(5)	$E1$
693.6(13)	5.2(13)	0.7(2)	-	$35/2 \rightarrow 33/2^+$	6594.4(14)	D
728.5(8)	4.0(11)	1.5(5)	-	$29/2^{(-)} \rightarrow 25/2^{(-)}$	4401.1(13)	($E2$)
748.2(4)	3.2(11)	0.6(2)	-	$25/2^+ \rightarrow 23/2$	3132.6(2)	(D)
759.2(1)	86.5(49)	1.4(1)	8.1(24)	$21/2^+ \rightarrow 17/2^+$	2093.5(2)	$E2$
771.4(10)	2.8(12)	-	-	$- \rightarrow 39/2$	8502.7(13)	-
787.7(6)	5.7(11)	0.7(1)	-	$41/2^{(-)} \rightarrow 39/2^{(-)}$	9918.1(9)	($M1$)
828.4(10)	3.2(14)	1.4(6)	-	$25/2 \rightarrow 21/2^+$	2921.9(11)	Q
834.1(9)	2.5(9)	-	-	$(29/2^+) \rightarrow 25/2^+$	3966.7(10)	($E2$)
845.6(8)	8.5(16)	0.6(1)	-	$17/2^- \rightarrow 17/2^+$	2179.8(5)	-
852.0(5)	5.9(15)	0.8(2)	-	$27/2^{(+)} \rightarrow 25/2^+$	3984.8(4)	($M1$)
906.2(4)	6.8(12)	1.4(3)	-	$21/2^{(-)} \rightarrow 17/2^-$	3086.0(7)	($E2$)
941.4(4)	5.7(13)	0.6(2)	-	$39/2^{(-)} \rightarrow 37/2^-$	8372.5(6)	($M1$)
949.5(1)$^{(b)}$	120.0(60)	1.4(1)	-	$13/2^+ \rightarrow 9/2^+$	949.5(1)	$E2$
975.4(14)	3.3(11)	0.8(2)	-	$31/2^{(+)} \rightarrow 29/2^+$	5379.2(7)	($M1$)
982.2(10)	4.2(12)	0.7(2)	-	$41/2 \rightarrow 39/2^{(-)}$	10112.6(14)	D
1005.1(5)	8.4(13)	1.3(3)	-	$39/2^{(-)} \rightarrow 35/2^{(-)}$	8372.5(6)	($E2$)
1032.4(4)	9.1(19)	0.7(2)	-	$43/2^{(-)} \rightarrow 41/2^{(-)}$	10950.5(10)	($M1$)
1039.1(1)	82.7(86)	1.4(1)	10.6(24)	$25/2^+ \rightarrow 21/2^+$	3132.6(2)	$E2$
1234.2(12)	3.1(13)	0.7(2)	-	$35/2 \rightarrow 33/2^+$	7135.0(13)	D
1262.1(14)	1.7(10)	-	-	$19/2^{(+)} \rightarrow 15/2^+$	2752.7(6)	($E2$)

γ-ray Energy E_γ (keV)	Intensity[a] I_γ	Intensity ratios[c] R_θ	Δ_{assym} $\times 10^{-2(d)}$	$I_i^\pi \rightarrow I_f^\pi$	Initial level energy[e] (E_i) (keV)	Multipolarity assignment
1271.3(2)	68.5(76)	1.4(1)	8.7(23)	$29/2^+ \rightarrow 25/2^+$	4403.9(3)	$E2$
1403.8(11)	2.0(8)	-	-	$- \rightarrow 17/2^+$	2738.1(11)	-
1416.4(14)	1.5(8)	-	-	$19/2^{(+)} \rightarrow 17/2^+$	2752.7(6)	$(M1)$
1461.1(21)	2.9(10)	0.7(3)	-	$35/2 \rightarrow 33/2^+$	7361.9(22)	-
1466.8(6)	6.7(13)	0.7(2)	-	$35/2^{(-)} \rightarrow 33/2^+$	7367.5(6)	$(E1)$
1481.2(10)	3.5(9)	1.4(5)	-	$29/2^{(-)} \rightarrow 25/2^{(-)}$	5153.8(15)	$(E2)$
1496.9(2)	64.1(71)	1.4(1)	10.7(29)	$33/2^+ \rightarrow 29/2^+$	5900.8(4)	$E2$
1530.2(2)	42.6(48)	1.3(1)	-21.0(55)	$37/2^- \rightarrow 33/2^+$	7431.0(4)	$M2$
1545.4(8)	1.8(10)	-	-	$- \rightarrow 29/2^+$	5949.3(9)	-
1699.1(11)	7.7(17)	0.8(2)	-	$39/2^{(-)} \rightarrow 37/2^-$	9130.3(9)	$(M1)$
2055.2(18)	2.8(13)	-	-	$- \rightarrow 31/2^{(+)}$	7434.5(20)	-
2263.5(7)	3.5(10)	0.7(2)	-	$39/2^{(-)} \rightarrow 37/2^-$	9694.5(8)	$(M1)$
2473.0(9)	2.2(12)	1.3(4)	-	$33/2 \rightarrow 29/2^+$	6876.9(10)	-
2544.0(30)	2.3(12)	-	-	$- \rightarrow 21/2^+$	4638.0(30)	-
2770.5(11)	1.1(14)	-	-	$- \rightarrow 25/2^+$	5903.2(12)	-
2992.0(20)	1.9(10)	-	-	$- \rightarrow 25/2^+$	6124.7(20)	-
2997.0(20)	1.8(10)	-	-	$- \rightarrow 29/2^+$	7400.9(21)	-
3064.0(8)	1.4(10)	-	-	$- \rightarrow 25/2^+$	6196.7(9)	-

[a] Intensity reported with gate on 384.8-keV .
[b] Assigned parity from previous paper.
[c] Angular distribution ratio measured with 949.5-keV gate.
[d] δ_{assym} measurement using gate on 949.5-keV transition.
[e] Uncertainties in level energy are fitted uncertainties in energy from GTOL.

Table A.5 Energies, intensities, angular distribution ratios, multipolarities and spin assignments of γ-ray transitions of ^{92}Nb. The experimentally observed values are given for γ transition energy whereas the level energies are the output of the Gamma-to-Level (GTOL) least-squares fitting code developed at NNDC [137].

γ-ray Energy $E_\gamma$keV	Intensity [a] I_γ	Intensity ratios[c] R_θ	$\delta_{assym} \times 10^{-2}$	$I_i^\pi \rightarrow I_f^\pi$	Initial level energy[f] $E_i$keV	Multipolarity assignment
108.5(4)	2.8(5)	-	-	$16 \rightarrow -$	5990.8(3)	-
115.4[b](4)	15.3(29)	-	-	$11^- \rightarrow 9^-$	2202.8(4)	$E2$
142.2[b](6)	9.5(9)	-	-	$9^- \rightarrow 7^-$	2087.4(1)	$E2$
147.6[b](1)	70.0(70)	-	-	$10^- \rightarrow 9^-$	2235.1(1)	$E2$
170.3(11)	1.8(5)	-	-	$19^{(-)} \rightarrow (18^-)$	1944.9(4)	

199.9(16)	1.7(4)	-	-	$-\rightarrow 14^+$	5882.2(5)	-
255.8(11)	-	-	-	$10^{(-)}\rightarrow$ -	2235.1(1)	-
269.2(2)	9.0(10)	0.7(1)	-	$20^{(+)}\rightarrow 19^{(+)}$	10735.9(8)	$M1$
291.2(15)	1.3(7)	-	-	$15^{(-)}\rightarrow(14^-)$	5485.2(4)	-
318.0(8)	1.9(5)	-	-	$(14^-)\rightarrow 14^{(-)}$	5193.3(6)	
322.2(2)	16.6(12)	0.7(1)	-7.6(34)	$15^+\rightarrow 14^+$	6004.1(3)	$M1$
327.7(1)	100.0(69)	1.4(1)[c1]	10.5(49)[d]	$13^+\rightarrow 11^+$	3325.0(2)	$E2$
353.1(5)	1.9(5)	-	-	$15^{(+)}\rightarrow(14)$	4940.0(4)	-
419.1(6)	2.5(6)	0.7(3)	-	$15^{(+)}\rightarrow 14$	5402.1(7)	D
470.9(4)	6.0(8)	0.7(2)	7.2(30)	$14^-\rightarrow 13^+$	3795.7(4)	$E1$
489.8(3)	3.0(7)	1.5(4)		$16\rightarrow 14^+$	5990.8(3)	Q
500.4[b](9)	3.0(2)	-	-	$6^+\rightarrow 7^+$	500.7(5)	$M1$
503.1(4)	10.1(5)	0.80(2)	-	$15^+\rightarrow 14^+$	6004.1(3)	$M1$
509.9(10)	-	-	-	$9^+\rightarrow$ -	2286.3(1)	-
513.4(9)	4.6(28)	0.7(2)	-	$18^{(-)}\rightarrow 17^{(-)}$	7321.8(6)	D
520.2(3)	1.2(5)	-	-	$(17^-)\rightarrow 16^{(+)}$	7205.1(7)	-
533.3(9)	2.7(19)	-	-	$(17^-)\rightarrow 16^{(-)}$	6950.0(6)	-
540.1(5)	5.5(13)	0.4(2) [c3]	-	$19^{(+)}\rightarrow 18^{(+)}$	10466.7(8)	D
549.9(2)	3.1(8)	-	-	$20^{(-)}\rightarrow 19^{(-)}$	8521.9(7)	-
574.5(17)	2.0(5)	-	-	$(14)\rightarrow$ -	4586.8(5)	-
580.2(2)	5.9(7)	0.7(1)	-9.3(30)	$16^{(-)}\rightarrow 15^{(-)}$	6065.4(4)	$M1$
597.2(8)	3.0(15)	-	-	$(18^-)\rightarrow(17^-)$	7802.1(9)	-
602.4(16)	5.2(9)	0.8(3)	-	$15^+\rightarrow 15^{(+)}$	6004.1(3)	D
610.1(3)	5.8(12)	0.7(2)	-6.8(38)	$15^{(-)}\rightarrow 14^{(-)}$	5485.2(4)	$M1$
625.8(8)	4.8(6)	-	-	$14^+\rightarrow 14^{(-)}$	5500.9(3)	-
674.8(4)	3.6(6)	0.6(1)	-	$17^{(-)}\rightarrow 16^{(-)}$	6740.2(5)	$M1$
687.4(7)	1.9(5)	-	-	- $\rightarrow 13^+$	4012.4(7)	-
702.8(15)	3.3(7)	0.6(4)	-	$17^{(-)}\rightarrow 16^{(-)}$	7542.4(16)	D
711.1(1)	42.9(45)	1.4(1)[c1]	5.6(20)	$11^+\rightarrow 9^+$	2997.3(1)	$E2$
718.7(3)	2.7(7)	0.6(2)	-	$19^{(-)}\rightarrow 18^{(-)}$	7972.0(7)	D
729.6(2)	2.1(9)	-	-	$(18^-)\rightarrow(17^-)$	7679.6(6)	-
737.7(7)	3.0(7)	0.8(5)[c3]	-	$17^{(+)}\rightarrow 16^{(+)}$	8370.1(8)	D
740.4(5)	4.4(8)	0.5(3)[c3]	-	$(20^-)\rightarrow(19^-)$	9188.4(9)	D
745.3(13)	1.6(7)	-	-	- $\rightarrow 13^+$	4070.9(9)	-
762.2(1)	63.9(64)	0.7(1)[c2]	-	$11^+\rightarrow 10^-$	2997.3(1)	$E1$

768.4(3)	2.6(13)	-	-	$(19^-) \to (18^-)$	8448.0(7)	-
779.1(5)	4.2(21)	0.6(2)	-	$(14^-) \to (13^-)$	5193.3(6)	(D)
790.5(11)	0.8(4)	-	-	$(14) \to 14^-$	4586.8(5)	-
794.5(10)	3.8(29)	-	-	$11^+ \to 11^-$	2997.3(1)	-
806.8(7)	1.3(5)	-	-	$14^+ \to 14^{(-)}$	5681.9(3)	-
835.5(4)	4.5(9)	0.6(1)	-	$16^{(-)} \to 15^+$	6839.6(5)	D
839.8(8)	3.2(9)	1.3(6)	-	$(18^-) \to 16^{(-)}$	7679.6(6)	Q
846.6(2)	4.7(10)	0.8(2)	-	$(21^-) \to (20^-)$	10035.0(9)	(D)
877.6(11)	2.4(3)	-	-	$18^{(-)} \to 17^{(-)}$	8420.0(20)	-
904.7(10)	0.9(5)	-	-	$(19^-) \to 17^{(-)}$	8448.0(7)	-
1003.1(4)	4.4(9)	1.5(3)	-	$16^{(+)} \to 14^+$	6685.1(4)	$E2$
1014.3(4)	3.3(9)	0.7(2)	-	$16^{(-)} \to 15^{(+)}$	6416.4(7)	D
1115.6(2)	2.6(7)	1.2(4)	-	$16 \to 14^{(-)}$	5990.8(3)	Q
1189.9(7)	2.6(7)	-	-	$16^{(-)} \to 14^{(-)}$	7321.8(6)	Q
1256.3(11)	1.7(0.7)	-	-	$17^{(-)} \to 15^{(-)}$	6740.2(5)	Q
1261.7(8)	3.2(7)	-	-	$(14) \to 13^+$	4586.8(5)	-
1331.0(5)	1.3(6)	-	-	- $\to$ 16	7321.8(6)	-
1444.4$^{(b)}$(12)	2.5(9)	-	-	$7^- \to 6^+$	1944.9(4)	-
1478.4(6)	-	-	-	- $\to 6^+$	1479.1(7)	-
1543.5(5)	2.5(9)	-	-	- $\to 14^-$	5339.2(7)	-
1550.3(2)	8.3(13)	0.8(1)	4.7(43)	$14^{(-)} \to 13^+$	4875.2(2)	*(E1)*
1556.3(8)	0.7(4)	-	-	$18^{(+)} \to 17^{(+)}$	9926.5(6)	-
1586.4$^{(b)}$(8)	3.0(10)	-	-	$9^- \to 6^+$	2087.4(1)	-
1610.5(12)	1.5(7)	-	-	$14^+ \to$ -	5681.9(3)	-
1615.2(7)	2.7(8)	1.25(2)	-	$15^{(+)} \to 13^+$	4940.0(4)	Q
1628.2(5)	4.8(11)	0.8(2)	-	$16^{(+)} \to 15^+$	7632.3(6)	D
1657.8(7)	2.3(8)	0.8(2)	-	$14 \to 13^+$	4982.9(6)	D
1664.1(5)	3.9(9)	1.3(3)	-	$17^{(+)} \to 15^+$	7668.2(6)	Q
1720.0(6)	2.6(17)	-	-	$(17^-) \to 15^{(-)}$	7205.1(7)	-
1745.0(4)	1.3(7)	-	-	$16^{(+)} \to 15^{(+)}$	6685.1(4)	-
1776.7(5)	4.2(12)	0.8(2)	-	$8^+ \to 7^+$	1776.7(5)	D
1810.0(5)	2.2(9)	-	-	$16^{(+)} \to 14^+$	6685.1(4)	-
1944.6$^{(b)}$(6)	3.8(9)	-	-	$7^- \to 7^+$	1944.9(4)	-
2076.9(15)	3.4(21)	1.5(5)	-	$15^{(+)} \to 13^+$	5402.1(7)	Q
2087.3$^{(b)}$(1)	60.0(55)	-	-	$9^- \to 7^+$	2087.4(1)	$M2/E3$

2175.7(3)	6.5(11)	0.7(1)	-	$14^+ \rightarrow 13^+$	5500.9(3)	*D*
2211.0(8)	5.1(26)	-	-	$(13^-) \rightarrow 11^-$	4414.1(6)	-
2258.3(4)	3.2(22)	0.7(2)	-	$18^{(+)} \rightarrow 17^{(+)}$	9926.5(6)	*D*
2286.3[(b)](1)	37.6(40)	-	-	$9^+ \rightarrow 7^+$	2286.3(1)	*E*2
2294.3(6)	1.8(9)	-	-	$18^{(+)} \rightarrow 16^{(+)}$	9926.5(6)	-
2356.6(5)	16.0(18)	0.8(1)	-6.8(24)	$14^+ \rightarrow 13^+$	5681.9(3)	*M*1
2679.3(6)	7.0(11)	1.4(1)	-	$15^+ \rightarrow 13^+$	6004.1(3)	*E*2

[(a)]Intensity reported with gate on 327.7-keV .

[(b)]Assigned spin and parity from previous papers.

[(c1)]Angular distribution ratio measured with 2286.3-keV gate.

[(c2)]Angular distribution ratio measured with 147.6-keV gate.

[(c3)]Angular distribution ratio measured with 762.3-keV gate due to possible contaminated transitions from ^{92}Mo [11].

[(c)] Angular distribution ratio for the rest of transitions measured with 327.7-keV gate.

[(d)] δ_{assym} measurement using gate on 762.3-keV transition and δ_{assym} for rest of transitions measured with 327.7-keV gate.

[(e)]Uncertainties in level energy are fitted uncertainties in energy from GTOL.

Table A.6 The calculated shell model wave functions corresponding to different energy states in ^{92}Nb.

State	Energy(MeV)	Probability	Seniority	Configuration
7_1^+	0.000	65.1%	$v=2$	$\pi(f_{5/2}^6 p_{3/2}^4 p_{1/2}^2 g_{9/2}^1) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		13.4%	$v=2$	$\pi(f_{5/2}^6 p_{3/2}^4 p_{1/2}^0 g_{9/2}^3) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		12.5%	$v=2$	$\pi(f_{5/2}^6 p_{3/2}^2 p_{1/2}^2 g_{9/2}^3) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
6_1^+	0.450	50.0%	$v=2$	$\pi(f_{5/2}^6 p_{3/2}^4 p_{1/2}^2 g_{9/2}^1) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		21.9%	$v=2$	$\pi(f_{5/2}^6 p_{3/2}^4 p_{1/2}^0 g_{9/2}^3) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		13.5%	$v=2$	$\pi(f_{5/2}^6 p_{3/2}^2 p_{1/2}^2 g_{9/2}^3) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
9_1^+	2.440	43.0%	$v=4$	$\pi(f_{5/2}^6 p_{3/2}^4 p_{1/2}^0 g_{9/2}^3) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		19.2%	$v=4$	$\pi(f_{5/2}^4 p_{3/2}^4 p_{1/2}^2 g_{9/2}^3) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		9.7%	$v=4$	$\pi(f_{5/2}^5 p_{3/2}^4 p_{1/2}^1 g_{9/2}^3) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
11_1^+	3.362	49.6%	$v=4$	$\pi(f_{5/2}^6 p_{3/2}^4 p_{1/2}^0 g_{9/2}^3) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		14.3%	$v=4$	$\pi(f_{5/2}^4 p_{3/2}^4 p_{1/2}^2 g_{9/2}^3) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		7.9%	$v=6$	$\pi(f_{5/2}^6 p_{3/2}^3 p_{1/2}^1 g_{9/2}^3) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
13_1^+	3.547	58.0%	$v=4$	$\pi(f_{5/2}^6 p_{3/2}^4 p_{1/2}^0 g_{9/2}^3) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		12.9%	$v=4$	$\pi(f_{5/2}^4 p_{3/2}^4 p_{1/2}^2 g_{9/2}^3) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		9.9%	$v=6$	$\pi(f_{5/2}^6 p_{3/2}^3 p_{1/2}^1 g_{9/2}^3) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
11_2^+	4.013	66.5%	$v=6$	$\pi(f_{5/2}^5 p_{3/2}^4 p_{1/2}^1 g_{9/2}^3) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		11.1%	$v=4$	$\pi(f_{5/2}^5 p_{3/2}^3 p_{1/2}^2 g_{9/2}^3) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		9.7%	$v=6$	$\pi(f_{5/2}^6 p_{3/2}^3 p_{1/2}^1 g_{9/2}^3) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
14_1^+	4.817	59.0%	$v=4$	$\pi(f_{5/2}^6 p_{3/2}^4 p_{1/2}^0 g_{9/2}^3) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} g_{7/2}^1)$
		12.1%	$v=6$	$\pi(f_{5/2}^6 p_{3/2}^3 p_{1/2}^1 g_{9/2}^3) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} g_{7/2}^1)$
		10.0%	$v=4$	$\pi(f_{5/2}^4 p_{3/2}^4 p_{1/2}^2 g_{9/2}^3) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} g_{7/2}^1)$

TABLE II (Continued)

State	Energy(MeV)	Probability	Seniority	Configuration
14_2^+	5.096	64.4%	$v=6$	$\pi(f_{5/2}^5 p_{3/2}^4 p_{1/2}^1 g_{9/2}^3)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		23.0%	$v=6$	$\pi(f_{5/2}^5 p_{3/2}^3 p_{1/2}^2 g_{9/2}^3)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		3.1%	$v=6$	$\pi(f_{5/2}^4 p_{3/2}^4 p_{1/2}^2 g_{9/2}^3)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
15_1^+	5.328	72.0%	$v=6$	$\pi(f_{5/2}^5 p_{3/2}^4 p_{1/2}^1 g_{9/2}^3)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		21.2%	$v=6$	$\pi(f_{5/2}^5 p_{3/2}^3 p_{1/2}^2 g_{9/2}^3)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		2.6%	$v=6$	$\pi(f_{5/2}^5 p_{3/2}^2 p_{1/2}^1 g_{9/2}^5)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
15_2^+	5.796	76.9%	$v=6$	$\pi(f_{5/2}^5 p_{3/2}^4 p_{1/2}^1 g_{9/2}^3)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		14.1%	$v=6$	$\pi(f_{5/2}^5 p_{3/2}^3 p_{1/2}^2 g_{9/2}^3)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		3.3%	$v=6$	$\pi(f_{5/2}^4 p_{3/2}^4 p_{1/2}^2 g_{9/2}^3)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
16_1^+	5.902	80.4%	$v=6$	$\pi(f_{5/2}^5 p_{3/2}^4 p_{1/2}^1 g_{9/2}^3)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		12.9%	$v=6$	$\pi(f_{5/2}^5 p_{3/2}^3 p_{1/2}^2 g_{9/2}^3)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		3.5%	$v=6$	$\pi(f_{5/2}^5 p_{3/2}^2 p_{1/2}^1 g_{9/2}^5)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
16_2^+	6.557	76.8%	$v=6$	$\pi(f_{5/2}^5 p_{3/2}^4 p_{1/2}^1 g_{9/2}^3)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} g_{7/2}^1)$
		14.9%	$v=6$	$\pi(f_{5/2}^5 p_{3/2}^3 p_{1/2}^2 g_{9/2}^3)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} g_{7/2}^1)$
		3.3%	$v=6$	$\pi(f_{5/2}^5 p_{3/2}^2 p_{1/2}^1 g_{9/2}^5)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} g_{7/2}^1)$
17_1^+	6.602	79.8%	$v=6$	$\pi(f_{5/2}^5 p_{3/2}^4 p_{1/2}^1 g_{9/2}^3)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} g_{7/2}^1)$
		12.3%	$v=6$	$\pi(f_{5/2}^5 p_{3/2}^3 p_{1/2}^2 g_{9/2}^3)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} g_{7/2}^1)$
		4.9%	$v=6$	$\pi(f_{5/2}^5 p_{3/2}^2 p_{1/2}^1 g_{9/2}^5)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} g_{7/2}^1)$
17_2^+	8.503	47.6%	$v=6$	$\pi(f_{5/2}^4 p_{3/2}^4 p_{1/2}^2 g_{9/2}^3)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		25.7%	$v=6$	$\pi(f_{5/2}^4 p_{3/2}^4 p_{1/2}^0 g_{9/2}^5)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		13.9%	$v=6$	$\pi(f_{5/2}^5 p_{3/2}^3 p_{1/2}^2 g_{9/2}^3)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$

TABLE II (Continued)

State	Energy(MeV)	Probability	Seniority	Configuration
18_1^+	8.649	65.4%	$v=6$	$\pi(f_{5/2}^4 p_{3/2}^4 p_{1/2}^0 g_{9/2}^5) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} g_{7/2}^1)$
		22.1%	$v=8$	$\pi(f_{5/2}^4 p_{3/2}^3 p_{1/2}^1 g_{9/2}^5) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} g_{7/2}^1)$
		3.2%	$v=6$	$\pi(f_{5/2}^4 p_{3/2}^4 p_{1/2}^2 g_{9/2}^3) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} g_{7/2}^1)$
20_1^+	9.474	64.3%	$v=8$	$\pi(f_{5/2}^4 p_{3/2}^4 p_{1/2}^0 g_{9/2}^5) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} g_{7/2}^1)$
		31.7%	$v=10$	$\pi(f_{5/2}^4 p_{3/2}^3 p_{1/2}^1 g_{9/2}^5) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} g_{7/2}^1)$
		2.0%	$v=8$	$\pi(f_{5/2}^4 p_{3/2}^2 p_{1/2}^2 g_{9/2}^5) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} g_{7/2}^1)$
19_1^+	9.668	65.6%	$v=8$	$\pi(f_{5/2}^4 p_{3/2}^4 p_{1/2}^0 g_{9/2}^5) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} g_{7/2}^1)$
		29.5%	$v=10$	$\pi(f_{5/2}^4 p_{3/2}^3 p_{1/2}^1 g_{9/2}^5) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} g_{7/2}^1)$
		1.9%	$v=8$	$\pi(f_{5/2}^4 p_{3/2}^2 p_{1/2}^2 g_{9/2}^5) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} g_{7/2}^1)$
19_2^+	9.781	67.0%	$v=8$	$\pi(f_{5/2}^4 p_{3/2}^4 p_{1/2}^0 g_{9/2}^5) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		27.8%	$v=10$	$\pi(f_{5/2}^4 p_{3/2}^3 p_{1/2}^1 g_{9/2}^5) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		1.7%	$v=8$	$\pi(f_{5/2}^4 p_{3/2}^2 p_{1/2}^2 g_{9/2}^5) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
18_2^+	9.893	41.8%	$v=8$	$\pi(f_{5/2}^4 p_{3/2}^4 p_{1/2}^0 g_{9/2}^5) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		22.6%	$v=6$	$\pi(f_{5/2}^4 p_{3/2}^4 p_{1/2}^0 g_{9/2}^5) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} g_{7/2}^1)$
		15.8%	$v=8$	$\pi(f_{5/2}^4 p_{3/2}^3 p_{1/2}^1 g_{9/2}^5) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
7_1^-	1.897	71.8%	$v=4$	$\pi(f_{5/2}^6 p_{3/2}^4 p_{1/2}^1 g_{9/2}^2) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		9.0%	$v=4$	$\pi(f_{5/2}^6 p_{3/2}^3 p_{1/2}^2 g_{9/2}^2) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		5.8%	$v=4$	$\pi(f_{5/2}^6 p_{3/2}^4 p_{1/2}^1 g_{9/2}^2) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} s_{1/2}^1)$
10_1^-	2.029	72.5%	$v=4$	$\pi(f_{5/2}^6 p_{3/2}^4 p_{1/2}^1 g_{9/2}^2) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		18.0%	$v=4$	$\pi(f_{5/2}^6 p_{3/2}^3 p_{1/2}^2 g_{9/2}^2) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		4.0%	$v=4$	$\pi(f_{5/2}^6 p_{3/2}^2 p_{1/2}^1 g_{9/2}^4) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
9_1^-	2.209	45.9%	$v=4$	$\pi(f_{5/2}^6 p_{3/2}^4 p_{1/2}^1 g_{9/2}^2) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		29.5%	$v=4$	$\pi(f_{5/2}^6 p_{3/2}^3 p_{1/2}^2 g_{9/2}^2) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		8.9%	$v=4$	$\pi(f_{5/2}^5 p_{3/2}^4 p_{1/2}^2 g_{9/2}^2) \otimes \nu(p_{1/2}^2 g_{9/2}^{10} s_{1/2}^1)$

TABLE II (Continued)

State	Energy(MeV)	Probability	Seniority	Configuration
11_1^-	2.245	83.4%	$v=4$	$\pi(f_{5/2}^6 p_{3/2}^4 p_{1/2}^1 g_{9/2}^2)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		4.9%	$v=4$	$\pi(f_{5/2}^6 p_{3/2}^2 p_{1/2}^1 g_{9/2}^4)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		4.1%	$v=4$	$\pi(f_{5/2}^5 p_{3/2}^4 p_{1/2}^2 g_{9/2}^2)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
13_1^-	4.481	47.8%	$v=4$	$\pi(f_{5/2}^5 p_{3/2}^4 p_{1/2}^2 g_{9/2}^2)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		29.7%	$v=4$	$\pi(f_{5/2}^5 p_{3/2}^4 p_{1/2}^0 g_{9/2}^4)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		8.1%	$v=4$	$\pi(f_{5/2}^5 p_{3/2}^2 p_{1/2}^2 g_{9/2}^4)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
14_1^-	5.303	54.0%	$v=4$	$\pi(f_{5/2}^5 p_{3/2}^4 p_{1/2}^0 g_{9/2}^4)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} g_{7/2}^1)$
		12.5%	$v=4$	$\pi(f_{5/2}^5 p_{3/2}^4 p_{1/2}^2 g_{9/2}^2)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} g_{7/2}^1)$
		9.3%	$v=6$	$\pi(f_{5/2}^5 p_{3/2}^3 p_{1/2}^1 g_{9/2}^4)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} g_{7/2}^1)$
14_2^-	5.666	47.9%	$v=6$	$\pi(f_{5/2}^5 p_{3/2}^4 p_{1/2}^0 g_{9/2}^4)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		15.7%	$v=6$	$\pi(f_{5/2}^5 p_{3/2}^4 p_{1/2}^0 g_{9/2}^4)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} s_{1/2}^1)$
		12.8%	$v=6$	$\pi(f_{5/2}^5 p_{3/2}^3 p_{1/2}^1 g_{9/2}^4)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
15_1^-	6.113	55.7%	$v=6$	$\pi(f_{5/2}^5 p_{3/2}^4 p_{1/2}^0 g_{9/2}^4)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		16.3%	$v=6$	$\pi(f_{5/2}^5 p_{3/2}^3 p_{1/2}^1 g_{9/2}^4)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		15.0%	$v=6$	$\pi(f_{5/2}^4 p_{3/2}^4 p_{1/2}^1 g_{9/2}^4)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
15_2^-	6.457	53.4%	$v=6$	$\pi(f_{5/2}^5 p_{3/2}^4 p_{1/2}^0 g_{9/2}^4)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} g_{7/2}^1)$
		18.3%	$v=6$	$\pi(f_{5/2}^4 p_{3/2}^4 p_{1/2}^1 g_{9/2}^4)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} g_{7/2}^1)$
		18.2%	$v=6$	$\pi(f_{5/2}^5 p_{3/2}^3 p_{1/2}^1 g_{9/2}^4)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} g_{7/2}^1)$

TABLE II (Continued)

State	Energy(MeV)	Probability	Seniority	Configuration
16_1^-	6.488	54.0%	$v=6$	$\pi(f_{5/2}^5 p_{3/2}^4 p_{1/2}^0 g_{9/2}^4)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} g_{7/2}^1)$
		20.0%	$v=6$	$\pi(f_{5/2}^5 p_{3/2}^3 p_{1/2}^1 g_{9/2}^4)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} g_{7/2}^1)$
		17.5%	$v=6$	$\pi(f_{5/2}^4 p_{3/2}^4 p_{1/2}^1 g_{9/2}^4)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} g_{7/2}^1)$
17_1^-	6.829	65.7%	$v=6$	$\pi(f_{5/2}^5 p_{3/2}^4 p_{1/2}^0 g_{9/2}^4)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		21.2%	$v=8$	$\pi(f_{5/2}^5 p_{3/2}^3 p_{1/2}^1 g_{9/2}^4)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		4.8%	$v=8$	$\pi(f_{5/2}^4 p_{3/2}^4 p_{1/2}^1 g_{9/2}^4)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
18_1^-	7.179	62.8%	$v=6$	$\pi(f_{5/2}^5 p_{3/2}^4 p_{1/2}^0 g_{9/2}^4)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} g_{7/2}^1)$
		26.1%	$v=8$	$\pi(f_{5/2}^5 p_{3/2}^3 p_{1/2}^1 g_{9/2}^4)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} g_{7/2}^1)$
		5.1%	$v=8$	$\pi(f_{5/2}^4 p_{3/2}^4 p_{1/2}^1 g_{9/2}^4)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} g_{7/2}^1)$
19_1^-	9.047	74.8%	$v=8$	$\pi(f_{5/2}^4 p_{3/2}^4 p_{1/2}^1 g_{9/2}^4)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		12.5%	$v=8$	$\pi(f_{5/2}^4 p_{3/2}^3 p_{1/2}^2 g_{9/2}^4)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
		8.6%	$v=8$	$\pi(f_{5/2}^5 p_{3/2}^3 p_{1/2}^1 g_{9/2}^4)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} d_{5/2}^1)$
20_1^-	9.299	82.6%	$v=8$	$\pi(f_{5/2}^4 p_{3/2}^4 p_{1/2}^1 g_{9/2}^4)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} g_{7/2}^1)$
		14.7%	$v=8$	$\pi(f_{5/2}^4 p_{3/2}^3 p_{1/2}^2 g_{9/2}^4)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} g_{7/2}^1)$
		1.5%	$v=8$	$\pi(f_{5/2}^4 p_{3/2}^2 p_{1/2}^1 g_{9/2}^6)\otimes\nu(p_{1/2}^2 g_{9/2}^{10} g_{7/2}^1)$

4. Vishal Malik, R Palit, P C Srivastava, P Dey, Deepak Patel, Biswajit Das, U Garg, **Nidhi Goel**, A Kundu, Somnath Nag, and D Negi, Experimental investigation of shell-model excitation in ^{90}Nb up to high spin states, Phys. Rev. C **111**, 024323 (2025).

Conferences

1. Oral presentation on “Rotation of ^{92}Nb nucleus about different principal axes” **Nidhi Goel** *et al.*, Proceedings of the DAE Symp. on Nucl. Phys. 65, pp. 66-67 (2021).

2. Poster presentation on “Collective rotation in ^{90}Zr beyond shell model excitations” **Nidhi Goel** *et al.*, Proceedings of the DAE Symp. on Nucl. Phys. 66, pp. 100-101 (2022).

3. Poster presentation on "Shape coexistence in ^{72}Se within framework of cranked Nilsson Strutinsky model" **Nidhi Goel** *et al.*, Proceedings of the DAE Symp. on Nucl. Phys. 66, pp. 248-249 (2022).

4. Poster presentation on "Rotation of ^{89}Y nucleus about the longest principal axes" **Nidhi Goel** *et al.*, Proceedings of the DAE Symp. on Nucl. Phys. 67, pp. 81-82 (2023).