Postgraduate Nuclear Models 2019

1 "What Can We Learn About Nuclear Structure From Gamma-Ray Spectroscopy"

1.1 Nuclear Deformation: Shape parameterisation, quadrupole deformation, β and γ parameters, triaxiality

1.2 Vibrational Motion: Spherical harmonic vibrator

2 "Low-Spin Nuclear Structure"

2.1 Pairing, moments of inertia, energy levels of a rotor

2.2 Development of collectivity, particle-vibration coupling, rotation-vibration model, non-adiabatic vibration

2.3 Reflection asymmetry, static and dynamic octupole deformation

3 "Spherical And Deformed Shell Model"

3.1 The nuclear mean field, potential wells, magic numbers, spin-orbit interaction

3.2 Modified harmonic oscillator, Woods-Saxon potential, anisotropic harmonic oscillator and the Nilsson model

4 "Collective Nuclear Rotation"

4.1 Moments of inertia, rotation, signature, particle-rotor coupling

4.2 High-K bands, K isomers, wobbling motion

5 "Pairing And Quasiparticles"

5.1 Pairing, chemical potential, quasiparticles

5.2 Coriolis antipairing effects, backbending

6 "Cranking"

6.1 Routhians and alignments, symmetries of rotating nuclei, signature quantum number

6.2 Cranked shell model, quasiparticle routhians, comparison to experiment

6.3 Strutinsky shell correction, total routhian surfaces

Postgraduate Nuclear Models 2017

7 "Broken Symmetries"

7.1 Reflection asymmetry, chirality, magnetic rotation

7.2 Transitional nuclei

8 "Band Termination"

8.1 Favoured non-collective oblate states, full termination, rigid-rotor plots

8.2 Smooth termination, beyond termination

9 "Electromagnetic Transitions"

9.1 Electromagnetic radiation, charge and current densities, electromagnetic moments

9.2 Multipole expansion, electric and magnetic multipole operators, reduced matrix elements

9.3 Transition probabilities, Weisskopf units, electric quadrupole moments

10 "Experimental Techniques"

10.1 Gamma-ray spectroscopy, fusion-evaporation reactions

10.2 Gamma-gamma coincidences, high-fold analysis

10.3 Angular distributions, multipole mixing ratios, linear polarisation