Complete Electric Dipole Response in 120Sn: A Test of the Resonance Character of the Pygmy Dipole Resonance (00h00')

Speaker: HEILMANN, Anna Maria

In high-resolution (p,p') experiments under 0^\circ the complete B(E1) strength distribution can be studied in stable nuclei. At the Research Center of Nuclear Physics in Osaka, Japan, the strength distribution under 0^\circ and observables for the polarization transfer of E1 and M1 excitations in 120Sn were measured in an excitation energy range of 5−25 MeV. The systematics of the pygmy dipole resonance (PDR) in stable tin isotopes has been recently studied at the superconductiong linear accelerator S-DALINAC in Darmstadt [1]. From this study it was concluded that knowledge of the complete E1 response would be important to di□erentiate between relativistic an nonrelativistic QRPA models predicting largely di□erent properties of the pygmy dipole resonance. From the present measurement the whole B(E1) strength distribution and the branching ratios of the PDR to ground state can be extracted. First results on the E1 strength will be presented. [1] B. "Ozel, J. Enders, H. Lenske, P. von Neumann-Cosel, I. Poltoraska, V.Yu. Ponomarev, A. Richter, D. Savran, and N. Tsoneva submitted to Phys. Lett. B (2009).

Neutron Vacancies Outside N=82 Isotones (00h00')

Speaker: HOWARD, Alan

Recent work has been carried out linking shifts in single-particle energy levels across several series of isotopes and isotones with the tensor part of the nucleon-nucleon interaction [1][2]. In the present work a systematic study was carried out of the N=81 nuclei 137Ba, 139Ce, 141Nd and 143Sm, all of which exhibit states at low energies characterised by single-neutron hole excitations below the N=82 closed core. These states were populated through the single-neutron removal reactions (p,d) and (3He,alpha) at energies of 23 and 40 MeV, respectively. Light ejectiles were momentum analysed using the Yale split-pole spectrograph. The transferred angular momenta were inferred using angular distributions and ratios of cross sections between the two reactions. The energy centroids of the underlying single-particle states were reconstructed from the observed fragments using spectroscopic factors deduced from a DWBA analysis of the measured cross sections. The results will be discussed with reference to the expected effects of the tensor interaction. [1] T. Otsuka et al., Phys. Rev. Lett. 95, 232502 (2005) [2] B. P. Kay et al., Phys. Lett. B 658, 216-21 (2008)

Particle-Vibration Coupling in Superfluid Nuclei (00h00')

Speaker: IDINI, Andrea

I will present the solution of the Dyson equation (also known as Nambu-Gor'kov equation) for the case of superfluid nuclei. Starting from a mean field obtained with an effective nucleon-nucleon force, one renormalizes the single-particle states through the coupling to the collective vibrations of the system, calculating both the normal and the abnormal self energies, and obtaining a detailed description of the fragmentation of the quasiparticle strength. As a results, aside from a renormalized (Morel-Nozières like) pairing gap, one obtains spectroscopic amplitudes which can be used to calculate both one and two-nucleon transfer reaction cross sections. The formalism is applied to Sn-Isotopes and the resulting gaps, spectroscopic factors and pair transfer cross sections, are compared with the experimental findings.

Analysis of Nucleon-Nucleon Interactions Using Effective Field Theory: Extracting Residual Scattering Strengths (00h00')

Speaker: IPSON, Katie

Effective field theories (EFTs) provide a model independent description of high-energy physics at low-energy scales. Weinberg suggested in the 1960s that one can use chiral perturbation theory (the EFT of QCD) to determine long range nucleon-nucleon (NN) forces. The longest-range contributions are due to one pion exchange (OPE) and two pion exchange (TPE). Following the method outlined in [Birse and McGovern 2004] the 1P1 partial wave was examined within an EFT in which OPE is iterated to all orders. A residual scattering strength (RSS) was obtained using distorted-wave methods to remove the effects of OPE. A more refined RSS was then determined by subtracting the effects of TPE and relativistic corrections to OPE perturbatively. Unlike the more peripheral spin-singlet waves, TPE matrix elements in the 1P1 channel contain a singularity which required regularising and subsequently renormalising. By examining the RSSs rather than the phase shifts, a qualitative scale of the missing physics (~260MeV) was estimated. Such a low value indicates the presence of additional physics which has not been considered. I am currently working on the 3S1-3D1 coupled waves using the same approach.

Two-Proton Decay of 6Be (00h00')

Speaker: KURIHARA, Nozomi

The two-proton (2p) decay is one of the characteristic features in proton-rich nuclei, and has attracted much attention. In particular, 6Be has no bound state and its ground state can directly decay into three-body scattering states. On the other hand, although the 5Li+p threshold opens above the ground state energy, the 6Be nucleus can also decay via the 5Li+p channel due to the broad decay width of 5Li. Therefore, to understand the decay mechanism of the 6Be ground state, it is required to determine how the two possible decay process compete: the direct 2p decay and the sequential decay via the 5Li+p channel. In this contribution, to investigate which decay process is favored in 6Be, we present the obtained reduced width amplitudes and the penetrabilities using the 4He+N+N model [1], and discuss the decay mechanism of 6Be. From the obtained results, the reduced width amplitudes indicate that the 6Be ground state has comparable component for each channel of the direct 4He+2p and the sequential 5Li+p decays. Furthermore, the result of the penetrability shows that the direct 2p decay is favored. Reference [1] Y. Kikuchi, et al. Prog. Theor. Phys. 122 (2009), 499.