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Observation of Quadrupole Splitting of B-12 in a Single Crystal

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structing high energy scattering amplitudes. The effect of long-range correlations has been estimated by using a macroscopic collective model to describe the low-lying 2^+(4.44 MeV), 0^+(7.6 MeV), and 3^-(9.6 MeV) states. These states make a correction to the optical potential through the second-order correlation function which usually includes only Pauli and center-of-mass correlations. These corrections considerably improve the agreement between theory and experiment. In addition, the differential cross-section for scattering and excitation of the low-lying states has been calculated using the same model and is in substantial agreement with experiment.

FF 2 Partial-Wave Contribution in π-Nucleus Scatterings Near the 3-3 Resonance. RYOICHI SEKI, San Fernando Valley State College.--Within the frame work of the multiple scattering formalism which we proposed previously[1], we have examined how much each (π-nucleus) partial wave contributes to the π-nucleus total cross sections near the 3-3 resonance. It is found that the appreciable contribution comes from partial waves up to a little larger than kR, where k is the pion wave number and R is the geometric radius of the nucleus seen by the pion, and also found that the largest contribution comes from partial waves $\sim kr-\frac{1}{2}$, where r is the RMS radius of the nucleus: The π-nucleus scatterings show remarkably well a feature of the simple black-body scatterings caused by formation of the 3-3 resonance in the nucleus[1]. The result of our calculation seems to be in agreement with a partial wave analysis of the π-C^{12} scatterings by use of an impact parameter method[2].

[1] R. Seki, Bull. Am. Phys. Soc. 14, 52 (1969) and Phys. Rev. C 3, 454 (1971).
[2] J. Beiner and P. Huguenin, Helv. Phys. Acta 43, 421 (1970).

FF 3 Deuteron Wave Function at large r. H.WONG*, C. BURNAP*†, and J.S. LEVINGER, Rensselaer Polytech. --We substitute analytical expressions for the deuteron wave function ($r \geq 4$ F.) into the Schrödinger equation to find the central and tensor potentials.[1] We compare with OPEP and Reid. We consider: i) Iwadare's wave function[2] which gives a poor fit; ii) modified Iwadare, varying 4 of his parameters (to B = 0.350, $\beta = 1.235$ F^{-1}, D = 2.65 F^2, $\gamma = 0.640$ F^{-1}) to obtain a good fit to Reid's potentials; iii) Hulthen-Sugawara wave function[3] which gives a poor fit.

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[1] Burnap et al. Phys. Lett. 33B, 337 (1970).
[2] Iwadare et al. Prog. Theor. Phys. 16, 455 (1956).
[3] Hulthen and Sugawara, Physics Handbook, 39, 91 (1957).

FF 4 Photodisintegration of ^{13}C Leading to Excited States of ^{12}C and ^{12}B. E. J. WINHOLD, Rensselaer Polytechnic Institute and AERE Harwell, UK, E. M. BOWEY, B. H. PATRICK, and J. M. REID*, AERE Harwell, UK.--Ge(Li) detector measurements were made of gamma ray spectra from the ^{13}C(γ,$\frac{p}{n}\gamma'$) reactions. These reactions were initiated by bremsstrahlung from the Harwell linac, and excitation functions for the production of particular gamma lines were obtained as a function of bremsstrahlung end-point energy over the range from 15 to 40 MeV. The T=0 4.44 MeV state and the T=1 15.1 MeV state of ^{12}C are both strongly populated, as Murray[1] has observed. However the cross section for (γ,n) leading to the 15.1 MeV level is peaked at 25 MeV, while that leading to the 4.44 MeV level peaks below 15 MeV. The 0.95 MeV state in ^{12}B is weakly excited. These results appear generally consistent with ^{13}C giant resonance calculations[2] which predict a substantial isospin splitting of the resonance.

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[1] K. M. Murray, Nuovo Cimento Letters 1, 571 (1971).
[2] B. R. Easlea, Phys. Letters 1, 163 (1962); Measday et al, Nucl. Phys. 61, 269 (1965).

FF 5 Observation of Quadrupole Splitting of ^{12}B in a Single Crystal.* R. L. WILLIAMS, JR., R. C. HASKELL† and L. MADANSKY, The Johns Hopkins University--The quadrupole coupling of ^{12}B implanted in ^{9}Be has been observed using a single crystal of Be. One sees a narrow resonance line, the location of which depends in the normal way on the orientation of the crystalline c-axis with respect to the external magnetic field direction. The coupling constant is given by $e^2qQ/h = 54.9(6)$ kHz. This is consistent with our previous measurement[1] using a Be foil. Using the field gradient at ^{9}Be lattice sites, calculated by Pomerantz and Das,[2] one finds $Q(^{12}B) \simeq 34.6$ mb.

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[1] R. L. Williams, Jr., L. Pfeiffer, J. C. Wells, Jr and L. Madansky, Phys. Rev. C2, 1219 (1970).
[2] M. Pomerantz and T. P. Das, Phys. Rev. 119, 70 (1960).

FF 6 Comparison of the Precessions of Angular Correlations Produced by Magnetic Dipole and Axially Symmetric Quadrupole Interactions.* ∤ O. KLEPPER, MIT - According to the semi-classical vector model a magnetic dipole interaction or an axially symmetric quadrupole interaction can result in spin precessions, but in the latter case the spin precesses in opposite directions for +M and -M substates. Developing the attenuation factors $G^{NN}_{k_1k_2}(t)$ for the electric case analogously to the magnetic, one can show that a polarization of the nucleus results in a net rotation of the angular correlation. Generally, one gets a superposition of correlations precessing with different frequencies $n\omega_0$ and a non-rotating part due to the alignment of the nucleus.[1] Experiments at the Rutgers-Bell-Tandem will be mentioned which use Coulomb excitation with scattering angles $\vartheta < 180^\circ$ to excite, polarize, and implant nuclei into single crystals and allow measurement of the sign of ω_0.

* Submitted by A.M.Bernstein
∤ Work supported in part by the U.S.Atomic Energy Comm.
[1] L.Grodzins and O. Klepper, Phys.Rev. C3 (1971),1019.

FF 7 Measurement of the Nuclear Magnetic Dipole Moment of ^{8}Li by Implantation in Metal Foils.* R. C. HASKELL†, R. L. WILLIAMS, JR., and L. MADANSKY, The Johns Hopkins University--Polarized ^{8}Li nuclei have been produced through the ^{7}Li(d,p) reaction using the 3.5-MeV Van de Graaff accelerator at Brookhaven National Laboratory. The observed polarization was a slowly-varying function of deuteron energy over the range 1.3-2.9 MeV, reaching a maximum of about +1.6%. The recoiling nuclei were stopped in Au, Pt and Pd foils and the effective dipole moments were measured by a resonant depolarization method. The results were $1.65362(22)\mu_N$, $1.65288(20)\mu_N$ and $1.65270(30)\mu_N$, respectively. These are consistent with the work of Connor,[1] who found $\mu(^8Li) = 1.6530(8)\mu_N$ in a LiF crystal. An upper limit for the ^{8}Li quadrupole moment will also be discussed.

*Work supported by the U.S. Atomic Energy Commission.
†NSF Predoctoral Fellow.

[1] D. Connor, Phys. Rev. Letters 3, 429 (1959).