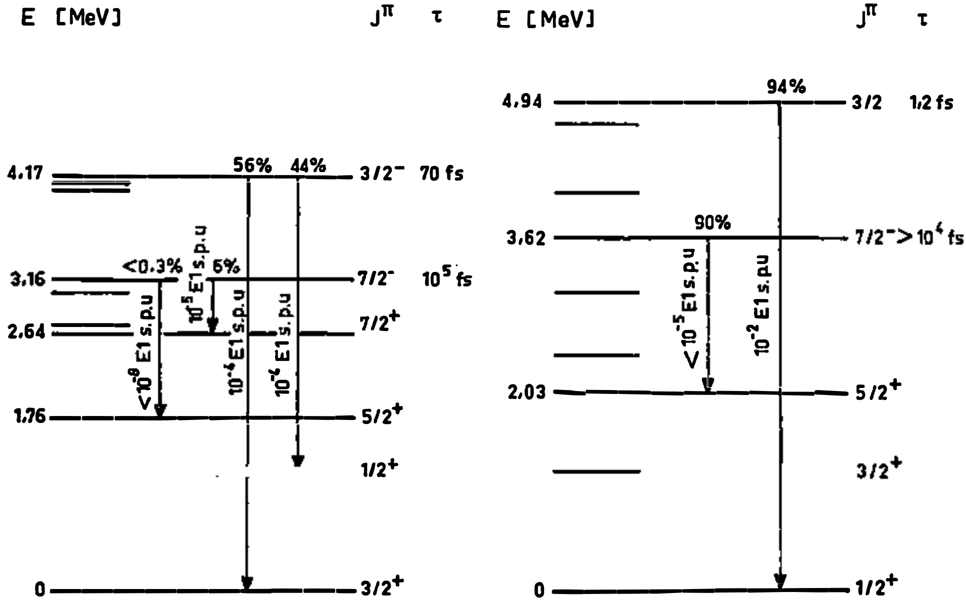
2. The supposed charge independence of the nuclear forces has been questioned in the last few years[3]. The application of the mass formula $M=a+b\cdot T_z+c\cdot T_z^2$



$^{35}_{17}Cl$ $^{29}_{14}Si$

to isobaric analog states over a wide range of A provides a possibility of testing it[4,5]. The higher members of isobaric multiplets in the $2s\,1d$ shell can be reached using the (double) pick-up or stripping reactions.

References

1) M. Kregar, P. Kump, V. Ramšak, M. Vakselj, M. Zupan, D. Brajnik and U. Miklavžič to be published;
2) R. E. Azuma, N. Anyas-Weiss and A. M. Charlesworth, Nucl. Phys. **A109** (1968) 577;
3) D. H. Wilkinson, Proc. of the Conf. on Isobaric Spin 1966;
4) D. H. Wilkinson, Phys. Lett. **12** (1964) 348;
5) Kingston, Nucl. Phys. **A124** (1969) 225.

C9 Isobaric Splitting of the Giant Dipole Resonance in Nuclei

G. KERNEL, *Institute "Jožef Štefan", Ljubljana*

The dipole states in nuclei consist in general of two isotopic spin components, T_0 and T_0+1 (T_0 being the ground state isospin). Exceptions are nuclei with $N=Z$ for which only T_0+1 dipole states are possible. The two groups of giant dipole states with two different isospins are separated by about 1/2 MeV per excess nucleon[1].

The T_0+1 component cannot show up in (γ, n) reactions if they involve only residual nucleus states with the lowest isospin $\left(T_z=T=T_0-\frac{1}{2}\right)$. However, in ($\gamma$, p) reactions the lowest isospin of the residual nucleus is $T_z=T=T_0+\frac{1}{2}$ and the splitting should be observable.

The gamma-ray absorption strength of the T_0+1 excitation decreases with increasing neutron excess[1] thus making the detection of the isospin splitting difficult for heavy nuclei. On the other hand, in light nuclei the two resonances cannot be experimentally separated since the energy difference is low as compared to the giant resonance width. Nuclei around $A=100$ seem to provide a good compromise.

Recently much experimental effort has been concentrated on ^{90}Zr. In this case the ratio of the integrated cross sections for the T_0+1 and T_0 component is expected to be[2] about 1/4. The total cross section for the reactions $^{90}Zr(\gamma, p)$ seems[3] to have its maximum at an energy 5 MeV above the (γ, n) peak, thus apparently confirming the isospin splitting of the giant resonance. On the other hand, $^{89}Y(p, \gamma_0)^{90}Zr$ experiments show little or no evidence for a T_0+1 resonance[4,5]. It seems that the reaction channel with ^{89}Y in ground state is inhibited.

One could explain this result by assuming that the T_0+1 state decays mainly into channels leading to excited states of the residual ^{89}Y nucleus, although there does not appear to be any strong theoretical reason for this. Alternatively, the dominance of high energy protons in a $(\gamma, p_0+p_1+\cdots)$ experiment can be understood in terms of large Coulomb barrier, without having to introduce the concept of isospin splitting. Most probably a final conclusion can only be reached after experimental investigation of separate photonucleon cross sections to different low lying states of the residual nuclei. It is hoped that a deexcitation experiment of the type described in ref.[6] will throw some new light.

References

1) M. H. Macfarlane, in "Isobaric spin in nuclear physics" editted by J. D. Fox and D. Robson, p. 383, Academic Press Inc. 1966;

2) S. Fallieros, B. Goulard and R. H. Venter, Phys. Letters **19** (1965) 398;

3) I. I. Dushkov, B. S. Ishkanov, J. M. Kapitanov and B. A. Yur'ev, Phys. Letters **10** (1964) 310; V. V. Balashov and E. L. Yadrovsky, Phys. Letters **22** (1966) 509;

4) P. Axel, D. M. Drake, S. Whetstone and S. S. Hanna, Phys. Rev. Letters **19** (1967) 1343;

5) W. M. Mason, G. Kernel, J. L. Black and N. W. Tanner, to be published;

6) J. Brajnik, U. Miklavžič, G. Kernel and D. Jamnik, Fizika **1** Suppl. **1** (1969) 31.