Study of the Decay of ^{133}I and Analogy to ^{95}Mo

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The ^{133}I nucleus has been studied experimentally using radioactive decay and theoretically by coupling three protons in the Z=50-82 shell to the quadrupole vibration. The six lowest-lying positive-parity states in $^{133}_{53}I$ are compared with the six lowest-lying positive-parity states in $^{95}Mo_{53}$. In ^{133}I, the three-proton cluster appears with $j=g_{7/2}$ as the lowest-lying single-particle state; in ^{95}Mo, the three-neutron cluster with $j=d_{5/2}$ appears as the lowest single-particle state. In both cases, the lowest-lying doublet I=j,j-1 is followed by a quadruplet consisting of the states I=j-2, j-1, j, j+1, j+2 with about 0.2 MeV splitting. The electromagnetic moments and level deexcitations have been calculated for ^{133}I using the model wave functions. The calculated static quadrupole moments of the ground state are $Q(7/2^+_1)=-0.29$ (eb), $\mu(7/2^+_1)=2.2\mu_N$, while the corresponding experimental values are -0.27 (eb) and 2.8 μ_N, respectively. Of all 15 cases, where experimental information is available, the strongest transition of each branch is correctly predicted, except for the 1.333 MeV $(5/2^+)$ level. The lowest experimental negative-parity state is $19/2^-$. This may reveal the presence of a different type of core from that for the other state. In fact, a recent SU(6)-based model for odd nuclei and quadrupole vibrations[1] predicts a band based on $19/2^-$ in the presence of the $h_{11/2}$ configuration. However, this cannot be tested by the present experiment, but an experiment that selectively excited yrast states is desirable.

1) S. Brant, V. Paar and G. Leander, to be published.