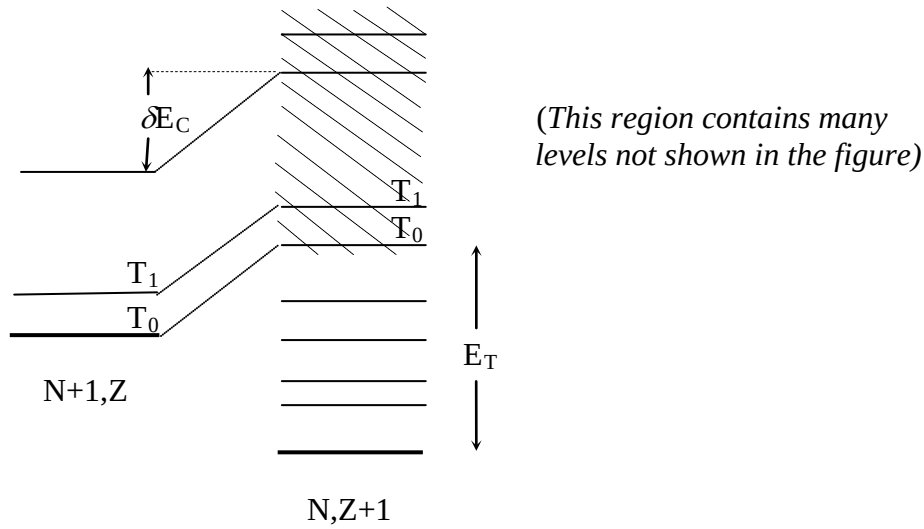
Isobaric analog resonances

Definitions[1,2]

The energy levels of isobaric (equal A) nuclei are relatively insensitive toward the interchange of a proton and a neutron. Given two isobaric nuclei (N,Z+1) and (N+1,Z), if T_0 is the ground state isospin of nucleus (N+1,Z), its isobaric analog state in nucleus (N,Z+1) will be the lowest state where $T=T_0$. The isobaric analog state will have the same properties, but will have a higher energy, δE_C, because of the additional Coulomb energy associated with the extra proton, less the neutron-proton mass difference.



In the above figure, T_0 is the isobaric analog of the ground state of (N+1,Z), T_1 is the analog of the first excited state, *etc*. T_0,T_1, *etc*., are not necessarily adjacent levels. E_T is the excitation energy of the $T = T_0$ state.

Coding

In the case where the experimentalist does not give the excitation energy of the isobaric analog state, the level number of the (N+1,Z) nucleus for which the isobaric analog state is given may be entered in the data section using the field heading `IAS-NUMB`, and the spin and parity, if given, may be specified under the keyword `LEVEL-PROP`.

Example: `LEVEL-PROP` `(23-V-46,IAS-NUMB=0.,SPIN=0.,PARITY=+1.)`
The isobaric analog state for the ground state of ^{46}Ti.

[1] G.R. Satchler, Introduction to Nuclear Reactions, John Wiley & Sons, New York, 1980, pp. 239-242.
[2] P. Marmier and E. Sheldon, Physics of Atomic Nuclei, Vol. I, Academic Press, New York, 1969, p.227 ff.