# Experimental sign of a weakening of the N=50 spherical shell gap

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Study of nuclei close to $^{78}$Ni is of primary importance to determine directly how the N=50 shell gap evolves at such large neutron excess. A very efficient method to estimate the energy of a shell gap is to study the particle-hole states in which one nucleon is promoted across the gap. For instance, the multiplet of six states with spin values ranging from $2^+$ to $7^+$ corresponds to the N=50 core-excitation ($\nu g_{9/2}^{-1} \otimes \nu d_{5/2}^{+1}$). These high-spin states have been measured in $^{90}$Zr [1] and in $^{88}$Sr [2] with transfer reactions and in $^{86}$Kr using fusion-evaporation reaction with stable projectile [3]. The extension of such measurements to nuclei far from the stability valley can be done using another technique, fission induced by heavy ions.

We will present new results obtained in the $^{84}$Se nucleus produced as fission fragment in the fusion-fission reaction $^{18}$O+$^{208}$Pb at 85 MeV bombarding energy, and studied with the EUROBALL IV array. Its level scheme has been established up to 4.9 MeV excitation energy and a spin of 7ħ. All excited states have been interpreted in both proton and neutron excitations. From comparisons with the heavier N=50 isotones, three excited states with spin $5^+$, $6^+$ and $7^+$ have been interpreted to be due to the neutron-core excitation. A possible weakening of the N=50 spherical shell gap, when Z is decreasing from 38 to 34, has been pointed out [4].

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