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How do we infer shell effects at high excitation energies?

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Deviations from a smooth trend in the separation energy extracted from atomic masses are typically associated with a sudden onset of deformation or the rise of a magic number. This information is limited to ground and isomeric states. A new way to investigate shell effects at high excitation energies is presented here and inferred from empirical drops in nuclear polarizabilities. Deviations from the effect of giant dipole resonances reveal the presence of shell effects in semi-magic nuclei with neutron magic numbers N = 50, 82 and 126. Similar drops of polarizability in the quasi-continuum of nuclei with, or close to, magic numbers N = 28, 50 and 82, could reflect the continuing influence of shell closures up to the nucleon separation energy. These findings strongly support recent large-scale shell-model calculations in the quasi-continuum region, which describe the origin of the low-energy enhancement of the photon strength function as induced paramagnetism, and assert the generalized Brink-Axel hypothesis as more universal than originally expected.

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