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Proton configuration and mass variations are observed in each of the 3036 isotopes studied. EUGENE PAMFILOFF, Dept. of Physics, Univ. of Georgia, UGA, - Optigon R & D, Vivitar, VPDM, retired — The fission and decay transitions of unstable isotopes are studied with particular detailed analysis of nuclei masses, proton - neutron substructure, and the change in mass experienced by individual nucleons of parent, daughter and product isotopes. The data shows the 3036 isotopes studied contain nucleons of a mass unique to each isotope, and further, indicating 3036 proton variations, each differentiated by a distinct mass. Of these, 283 proton variations are further distinguished by belonging to stable benchmark isotopes. The same variations were found with bound neutrons. A direct correlation is observed between the nearest stable benchmark mass and the mass of the nucleon returning to ground state during the transition, indicating a mass dependence to nuclear stability. These findings indicate that a nucleus in an excited state cannot stabilize or return to the ground state until it adjusts mass to match the nearest $Z - N$ and mass per nucleon benchmark. These conclusions were further tested with the analysis of nucleon mass adjustments occurring within the natural and artificial alpha emitter nuclei. The developed system of analysis provided good results when tested against the incident and product particles of high and low energy interactions and events of nuclear transmutation. Every transition to a stable product demonstrates a strong correlation with a specific mass per nucleon benchmark as a third condition of nuclear stability.

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