Abstract Submitted
for the HAW05 Meeting of
The American Physical Society

Fission properties of superheavy nuclei and a limit of existence of nuclei HIROYUKI KOURA, Advanced Science Rerearch Center, JAERI — We present a chart of nuclear decay modes for alpha decay, beta decay, proton emission, and spontaneous fission ranging from light nuclei to superheavy ones between neutron and proton drip lines with the use of a phenomenological atomic mass formula [1] to estimate decay rates of the above ones. The standard deviation of this mass formula from known masses is 0.67 MeV, and below 0.4 MeV from some separation energies. The WKB methods are applied to calculate decay rates without beta decay one, which is calculated with the gross theory. With these calculations, we find some regions of fissioning nuclei along the proton-drip line from N $\approx$130 to 160, around Z $\approx$108 and N $\approx$168, and from Z $\approx$100 and N $\approx$190 to heavier ones. The first one indicates a disappearance of proton emission in this region, the second one is qualitatively consistent with some recent experimental results in Dubna, and the third one indicates that a production of superheavy nuclei by the r-process nucleosynthesis in star is unexpected. We also calculate total half-lives in the "island of stability for the superheavy nuclei" and obtain an alpha-decay-dominant nucleus with the longest half-life on the beta-stability line in an order of 100 year with a certain ambiguity. We also estimate nuclei beyond the superheavy regions and will discuss the limit of existence of nuclei, which is given not by proton emission, but by fission. [1] H. Koura, et al., Prog. Theor. Phys. **113** (2005) 305.

Hiroyuki Koura
Advanced Science Rerearch Center, JAERI

Date submitted: 25 May 2005 Electronic form version 1.4