The new isotopes in Po-Rn region and breaking of the Geiger-Nuttall rule

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Alpha decay is one of the powerful tools for nuclear structure research. One of its well known characteristics is Geiger-Nuttall rule which linearly relates the logarithm of the decay half-life with the square root of the α decay energy.

This contribution reviews the results of the recent experiments at the velocity filter SHIP (GSI, Darmstadt) obtained in the region of neutron deficient isotopes from lead to radon. The synthesis of new very neutron-deficient isotopes $^{186,187}$Po, $^{192}$At and $^{193,194}$Rn and their decay properties will be presented.

Based on this new data we demonstrate the first case when the linear dependence of the Geiger-Nuttall rule is strongly broken in Po isotopes by approaching the neutron mid-shell at N=104. The break of the Geiger-Nuttall law is even much stronger than the well-known and until now the only deviation across the N=126 neutron shell. For example for $^{186}$Po the obtained half-life is almost three orders of magnitude longer as compared to the interpolation between $^{186}$Po and $^{210}$Po.

In this contribution we will link the observed behaviour to the deformation change between the parent Po and daughter Pb nuclei close and beyond the neutron mid-shell at N=104.