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The Strange Case of 210Hg: an Unexpected Structure

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The neutron-rich lead and mercury region has been so far scarcely explored due to its high mass and neutron excess, which force the use of fragmentation reactions with relativistic beams. Neut on rich nuclei beyond 208Pb were populated by using a 1 GeV/A 238U beam at GSI. The resulting fragments were separated and analyzed with the FRS-RISING setup. Many neutron-rich isotopes were identified for the first time and a significant number of new isomers were hence discovered, enabling us to study the structure of these isotopes. The new exotic isotopes bserved extend up to 218Pb along the Z=82 shell closure and up to N=134 and N=138 for the proton-hole and proton-particle Tl and Bi nuclei, respectively. New isomers were observed in 212-216Pb, in 217Bi, in 211,213Tl and in 210Hg. The isomers in 212-216Pb correspond to the expected seniority scheme, with an 8+ isomer from neutrons coupling in the g9/2 shell. Considering that the same isomers was observed in 208Hg, one would expect the two-proton hole Hg isotopes to follow the same scheme. On the contrary, the observed isomeric states in 210Hg correspond to the expected seniority scheme and to an unexpectedly low-lying state, indicating a sudden change in nuclear structure with respect to 208Hg. A similar situation happens in 211,213Tl isotopes with respect to the standard seniority isomer observed in 209Tl. Therefore, the experimental data seem to suggest a modification of the expected nuclear structure in this scarcely-explored region of the nuclide chart. Several possibilities will be discussed, considering the systematics of electromagnetic transition rates and the predictions of shell model with realistic interactions.

Primary authors: GOTTARDO, Andrea (INFN Legnaro); BENZONI, Giovanna (INFN Milano); VALIENTE DOBON, Jose' Javier (INFN Legnaro); Prof. LUNARDI, Santo (University and INFN Padova)

Presenter: GOTTARDO, Andrea (INFN Legnaro)

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