GAMMA DECAY STUDIES OF $^{194}$Pb(9.2m), $^{195m+}$Pb (15.0m + <1m) AND $^{196}$Pb(36.4 m)

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Initially we studied the $^{197}$Au($^6$Li,xn)$^{203}$-xnPb reaction in conjunction with Exp. #69, "Investigation of the Decay Modes of High-Spin Compound Nuclei in $^6$Li Induced Fusion Reactions," by measuring the Pb activation yields using Ge(Li) $\gamma$-ray spectroscopy. The excitation functions for the production of $^{194}$-199Pb isotopes were measured in the energy range of 55-95 MeV. Those results were in good agreement with the yields measured in-beam by H. Karwowski (IUCF Thesis, 1980). In our study we observed the $^{197}$Pb ground state as part of the $^{197}$Pb(42m) isomeric decay. Subsequently in further measurements we determined the half-life of $^{197}$Pb to be 6.2m and detailed the decay schemes of the isomeric pair. Results of that study were recently published.1)

A new experiment was proposed (Exp. #137) which was motivated in part as a search for an analogous low-spin isomer of $^{195}$Pb. The experiment involved a detailed $\gamma$-ray singles and $\gamma$-$\gamma$ coincidence study of $^{194}$Pb, $^{195}$Pb and $^{196}$Pb produced in the $^{197}$Au($^6$Li,xn)$^{203}$-xnPb reactions at 95 MeV. Singles $\gamma$-ray spectra were accumulated from multiple bombardments of ~50mg/cm$^2$ $^{197}$Au targets for short periods of time during the first 15 minutes to search for short-lived activities ($T_{1/2} \sim 1$-5 min). Longer bombardment times were used to study the long-lived products. The $\gamma$-$\gamma$ coincidence study required accumulating results from 30 bombardments of the Au targets. Eleven new $\gamma$-rays were found in the decays of $^{194}$Pb and $^{195}$Pb. In addition, the half-lives of the isotopes were measured to a nominal 15% uncertainty. Previous2) decay schemes were confirmed and some decay ambiguities were resolved. The $^{195}$Pb ground state decay was studied in detail but only a limit could be set on its half-life. The isomeric decay of $^{195m}$Pb(15.0m) was deduced to be 17% which is to be compared with 35% for $^{197}$Pb(42 m). In Figure 1 are shown the results of the $^{195m}$Pb isomer study.

A manuscript of this study is currently being prepared for submission to Nuclear Physics.


2) "Table of Isotopes," ed. by C.M. Lederer and V.S. Shirley, 7th ed., 1978, John Wiley and Sons, N.Y.
Figure 1. Decay schemes of the $^{195}_{\text{Pb}}$ isomer deduced in the present study.