# *REFINEMENT OF THE INFORMATION ON THE* $0^+ \rightarrow 0^+$ *TRANSITION IN* $Ce^{140}$

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The $Pr^{140}$ conversion electron spectrum is measured with a high resolution and low background $\beta$ spectrometer. As a result more accurate data have been obtained on some characteristics (energy, K/L ratio) of the $0^+ \rightarrow 0^+$ transition in $Ce^{140}$.

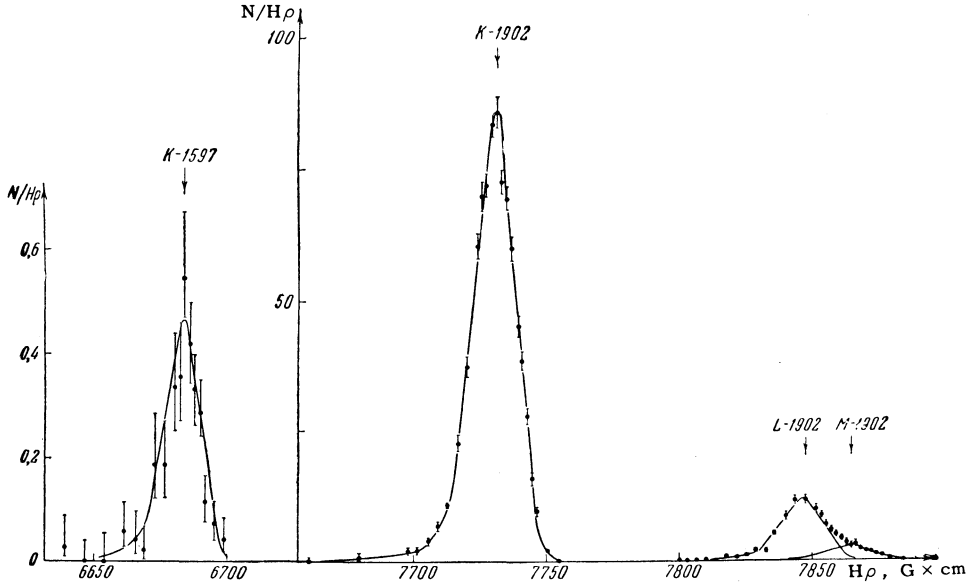
THE $0^+ \rightarrow 0^+$ transition in $Ce^{140}$ is treated in several papers[1-4]. Some details, however, still remain unclear. The investigation of the conversion spectrum of $Pr^{140}$ with the aid of a $\beta$ spectrometer with double focusing at an angle $\pi\sqrt{2}$, with a resolution of 0.2% and a very low coincidence background[5], makes more precise some of the information on the $0^+ \rightarrow 0^+$ transition in $Ce^{140}$. The $Nd^{140} + Pr^{140}$ compounds were prepared, as before[3,4] from Ta bombarded with fast protons (600 MeV).

Two series of measurements were made on the $Pr^{140}$ conversion spectrum regions with energies 1543—1561 and 1841—1907 keV. In the first series the half-value line width was 0.33%; in the second series (with a thinner source) it was 0.24%. The line broadening is governed by the quality of the sources.

The measurement results are listed in the table.

1. Energy of $0^+ \rightarrow 0^+$ transition. Comparison with the K1597 line of $Ce^{140}$ and the K1452 and K1481 lines of $Yb^{170}$ shows the transition energy

| | First series | Second series | Weighted mean of two series | [4] |
|---|---|---|---|---|
| $(K+L+M)_{1902/\beta+}$ | $(1,96\pm0,14)\cdot10^{-3}$ | $(2,28\pm0,17)\cdot10^{-3}$ | $(2,10\pm0,11)\cdot10^{-3}$ | $(2,1\pm0,1)10^{-3}$ |
| $(K+L+M)_{1597/\beta+}$ | $(8,7\pm1,6)\cdot10^{-6}$ | $(11,4\pm1,8)\cdot10^{-6}$ | $(9,9\pm1,2)\cdot10^{-6}$ | $(14\pm5)\cdot10^{-6}$ |
| $(K/L)_{1902}$ | 7,40±0,39 | 7,40±0,65 | 7,40±0,34 | — |
| $(M/L)_{1902}$ | 0,29±0,05 | 0,23±0,07 | 0,27±0,03 | — |



to be 1902 ± 3 keV. The previous values were 1902 keV[1] and 1904 ± 5 keV[4].

2. Ratio $(K/L)_{1902}$. This ratio was first determined by Dzhelepov et al[2] in a study of the $La^{140} \rightarrow Ce^{140}$ decay who found it to be K/L = 8.2. Inasmuch as these measurements were made under difficult conditions (the lines were observed against the $\beta^-$-spectrum background), we redetermined this ratio. Our measurements gave similar results:

$$K/L = 7.40 \pm 0.34.$$

This is in good agreement with the theoretical value K/L = 7.7 obtained for the $0^+ \rightarrow 0^+$ transition by Church and Weneser[6].

As can be seen from the figure, L and M are satisfactorily resolved and the ratio M/L amounts to 0.27 ± 0.03.

3. Ratios $(K+L+M)_{1597/\beta^+}$ and $(K+L+M)_{1902/\beta^+}$. These ratios enable us to establish somewhat more precisely the 1597- and 1902-keV level populations in the $Pr^{140}$ decay:

1597 keV: ~ 1% (previously ~ 2% of the decays[4]).

1902 keV: ~ 0.1% (previously 0.1% of the decays[4]).

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