in such a manner as to satisfy the changing symmetry character of the electrons at the extremes of temperature and, at the same time, approximately conserve their total number at $E = E_F$. The phenomenology proposed in this note in no way resolves the dilemma of why the dHvA Fermi surface studies show no large differences to the energy surfaces in $\vec{k}$ space for the three metals. It is our belief that were it possible to do dHvA, cyclotron-resonance, etc., experiments at somewhat higher temperatures (~50-100°K), noticeable differences might become apparent in the electron dynamics. Strong evidence already exists for this contention insofar as the temperature dependence of the thermoelectric power of $AuGa_2$ differs markedly from that of the other two metals.[7]

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$E2$ CORE POLARIZATION BY THE $h_{9/2}$ PROTON

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The half-life of the 8^+ state of ^{210}Po has been measured. An effective charge of $(1.68 \pm 0.09)e$ (including proton charge) for the $h_{9/2}$ proton orbit has been deduced from the analysis of the three experimental $B(E2)$ values with use of the radial integral for a Saxon-Woods potential.

As reported in a recent paper of Yamazaki and Ewan,[1] the nanosecond time analysis of γ rays in the reaction ^{208}Pb$(\alpha, 2n)^{210}$Po revealed a new isomeric state of about 150-nsec half-life which was assigned to the expected 8^+ member of the $(h_{9/2})^2$ configuration (see Fig. 1). Since those states, as shown in Fig. 1, are practically of unique $(h_{9/2})^2$ configuration from the shell-model point of view,[2] each $B(E2)$, after being divided by the corresponding statistical factor S, should yield an effective charge common to all the $E2$ transitions within the band. Yamazaki[3] made such a discussion of the $E2$ effective charge derived from this half-life as well as already known half-lives[4] of the 4^+ and 6^+ members, but a small discrepancy among $B(E2)/S$ values was observed. It might be ascribed to an uncertainty in the previous experi-

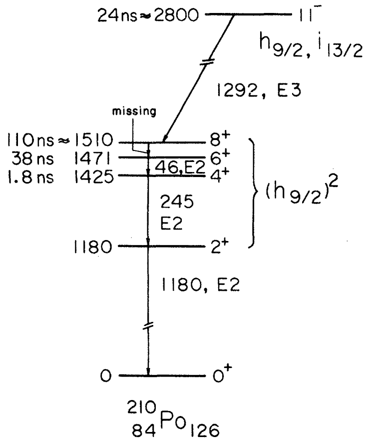

FIG. 1. Level scheme of ^{210}Po established by Yamazaki and Ewan (Ref. 1). The new half-life is entered.

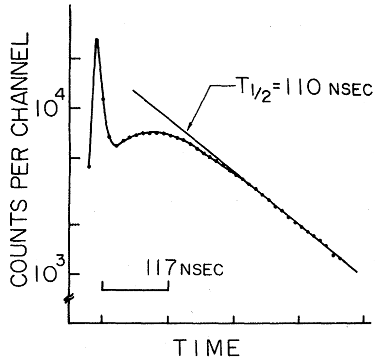

FIG. 2. Time distribution of the 245-keV γ ray in the pulsed beam of 5-nsec width and 1.17-μsec interval. The initial growth is due to the partial population of the 8^+ state through the 24-nsec 11^- state.

ment, where the half-life of about 150 nsec was measured between natural beam bursts of only 160-nsec intervals. In the present note we report a measurement of the time distribution over a wider time range and discuss the effective charge deduced from the new set of $B(E2)$.

The 30-MeV α-particle beam from the cyclotron at the Institute for Nuclear Study at the University of Tokyo was deflected electrostatically so that every tenth burst reached a target, thus yielding sharp bunches of 5-nsec width at 1.17-μsec intervals. Gamma rays from a target of natural lead metal were detected by a 10-cm^3 Ge(Li) detector. The electronics system for time analysis was similar to that given in Ref. 1. A time distribution obtained for the 245-keV transition is presented in Fig. 2. The initial part shows a striking growth effect due to partial population of the 8^+ state through the 24-nsec 11^- state. Hence, we obtain a revised half-life of 110 ± 8 nsec for the 8^+ state.

After correction for internal conversion rate, $B(E2)$ values have been deduced, as shown in column 4 of Table I. Theoretically, each $B(E2)$ is expressed in terms of a radial matrix element as follows[3]:

$$B(E2, (h_{\frac{9}{2}})^2 I \to (h_{\frac{9}{2}})^2 I') = S(I \to I')(1/4\pi)|\langle h_{\frac{9}{2}}| e_{\text{eff}} r^2 | h_{\frac{9}{2}}\rangle|^2, \quad (1)$$

where the statistical factor $S(I \to I')$ is given by

$$S(I \to I') = \{2 \times 5^{1/2}[(2I'+1)(2j+1)]^{1/2} \times W(jjI'2; Ij)\langle j, \tfrac{1}{2}, 2, 0 | j, \tfrac{1}{2}\rangle\}^2, \quad (2)$$

and presented in column 5 of Table I. An excellent agreement among the ratios $B(E2)/S$, as given in column 6 of Table I, is observed, and hence we obtain as an average

$$(e_{\text{eff}}^2/4\pi)|\langle h_{\frac{9}{2}}| r^2 | h_{\frac{9}{2}}\rangle|^2 = (280 \pm 30)e^2 \text{ fm}^4. \quad (3)$$

The radial wave function for the Saxon-Woods potential calculated by Blomqvist and Wahlborn[5] yields

$$(1/4\pi)|\langle h_{9/2}| r^2 | h_{9/2}\rangle|^2 = 96 \text{ fm}^4. \quad (4)$$

Dividing (3) by (4), we deduce

$$e_{\text{eff}}/e = 1.68 \pm 0.09.$$

The increment of charge, $\Delta e_{\text{eff}}/e = 0.68$ is usually ascribed to the $E2$ core polarization as a consequence of the nonspherical field generated by the extra particle.[6,7] Therefore the effective charge depends on how strongly the extra particle is bound with the core. If it moves in a harmonic-oscillator potential, $\Delta e_{\text{eff}}/e = Z/A$. Szymanski evaluated Δe_{eff} from the self-consistent field induced by an extra particle in a square-

Table I. Reduced $E2$ transition probabilities of the three transitions within the $(h_{9/2})^2$ band of ^{210}Po.

Transition $I_i \to I_f$	Transition energy	$T_{1/2}$ (nsec)	$B(E2)$ (e^2 fm^4)	$S(I_i \to I_f)$	$B(E2)/S$[d]
$8^+ \to 6^+$	(35)[a]	110 ± 8[b]	87	0.31	290 ± 30
$6^+ \to 4^+$	46	38 ± 5[c]	245	0.77	320 ± 40
$4^+ \to 2^+$	245	1.8 ± 0.2[c]	285	1.11	255 ± 30

[a] Assumed, as the γ ray is missing. However, $T_{1/2}$ has almost no dependence on transition energy due to the competing conversion process in this energy region.

[b] Present value.

[c] From the work of Funk et al. (Ref. 4).

[d] Relative error of about 10 % is assigned to these values, supposed to arise from uncertainty in deducing $B(E2)$ from $T_{1/2}$ and from errors in $T_{1/2}$.

well potential.[8] With the notation

$$\Delta e_{\text{eff}}/e \equiv \gamma(Z/A),$$

Szymanski obtained $\gamma = 3.6$ for the $h_{9/2}$ proton. The present experimental value of $\gamma = 1.7$ may be reproduced by a potential like the Saxon-Woods potential.

Finally we would like to point out that $\Delta e_{\text{eff}}/e = 0.4$ deduced from the static quadrupole moment of the $h_{9/2}$ ground state[9] of ^{209}Bi seems to be somewhat smaller than that derived from the $E2$ transitions in ^{210}Po. This fact, if it is real, might indicate that the $E2$ core polarization in a two-particle system is enhanced compared with that in a one-particle system. However, due to the experimental uncertainty it is not conclusive. A more precise measurement of the quadrupole moment will elucidate this point.

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POLARIZATION IN PROTON-^{4}He SCATTERING AT 540 MeV

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The asymmetry of polarized protons scattered from ^{4}He has been measured for laboratory angles between 4 and 42° at the proton energy of 540 MeV. The result is compared with the elastic p-^{4}He scattering cross section at 588 MeV.

The multiple-scattering approximation of Glauber[1] as applied by Czyż and Leśniak[2] and Bassel and Wilkin[3] describes the observed elastic scattering of high-energy protons from light nuclei adequately.[4] In a previous Letter[5] we have shown that this description applies also for the scattering of 600-MeV protons. However, the nucleon-nucleon interaction used in these analyses[2-5] contained no spin dependence. Further tests of the validity of the approximation are needed before one can extract information on nuclear properties from scattering data. A simultaneous analysis of the differential cross section and the polarization using spin-dependent nucleon-nucleon scattering amplitudes may constitute such a test.[6] To make such an analysis