The lifetimes for the 4d9 5p configuration have been determined by zero field level crossing technique. The results are (in nsec):

\[
\begin{align*}
\tau(3P_{1/2}) &= 7.5 \pm 0.4 \\
\tau(3P_{3/2}) &= 6.9 \pm 0.8 \\
\tau(3D_{3/2}) &= 5.0 \pm 0.5 \\
\tau(3D_{5/2}) &= 4.9 \pm 0.8 \\
\tau(3D_{5/2}) &= 8.1 \pm 0.5 \\
\tau(3F_{4/2}) &= 8.1 \pm 0.5 \\
\tau(3F_{5/2}) &= 7.0 \pm 0.5 \\
\tau(3F_{3/2}) &= 9.0 \pm 0.6 \\
\tau(3F_{3/2}) &= 7.9 \pm 0.6 \\
\tau(3F_{4/2}) &= 7.1 \pm 0.6 \\
\tau(3F_{3/2}) &= 7.1 \pm 0.6 \\
\tau(3F_{4/2}) &= 9.0 \pm 0.6 \\
\tau(3F_{3/2}) &= 7.0 \pm 0.6 \\
\tau(3F_{3/2}) &= 8.4 \pm 0.6 \\
\tau(3F_{3/2}) &= 7.9 \pm 0.6 \\
\tau(3F_{4/2}) &= 7.1 \pm 0.6 \\
\tau(3F_{3/2}) &= 8.4 \pm 0.6 \\
\tau(3F_{3/2}) &= 7.9 \pm 0.6 \\
\end{align*}
\]

An atomic beam of natural Palladium, produced in an oven of coaxial construction, was irradiated by the light of a hollow cathode lamp [1]. By absorption of the corresponding resonance lines (Fig. 1) the atoms were raised from the ground state 4d10 1S0 and from the metastable D-states of the configuration 4d9 5s to the excited states of the 4d9 5p configuration. (At an oven temperature of about 1850 K the metastable D-states are noticeably populated.)

Fig. 1. Part of the level scheme of the Pd I spectrum (the wavelength are indicated in Table 1).
recently become available [6]. Taking into account approximately the spectral distribution of the incident light the resulting shapes of the signals were calculated due to the Breit formula and fitted to the measured values with the aid of a mini-computer (PDP 11/45) making use of the experimental $g_J$-values [7, 8]. The results are given in column 6 of Table 1. The errors include uncertainties made by fitting as well as systematic errors.

If the measured Hanle signals are fitted simply with one Lorentzian curve without regard of the lamp profile we get lifetimes that are at most 2.5% smaller. This seems to be a little surprising in view of the odd-even isotope shift [6] and the large hfs-splitting in the D-states of the $4d^95s$ configuration [9] and the states of the configuration $4d^95p$ [10]. (Table 1 also includes the results of earlier measurements of lifetimes in the Pd I spectrum [11, 12].) The lifetime of the $3\Pi_0^0$-state has already been measured by Budick [13]. His result was $\tau(3\Pi_0^0) = 8.7 (9)$ nsec. Another measurement was performed by Hese and Weise [14]. In the last column in Table 1 we calculated the $\tau$-values from the transition probabilities of Corliss and Bozman [15]. As can be seen, there is no systematic trend in the deviation.

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