data to isothermal resistivity (Sec. III.A.4), making isothermal resistivity, and hence defect resistivity, higher than if one assumed single shock temperatures to be correct.

Continuity conditions for shocks at interfaces between different materials require continuity of longitudinal stress and particle velocity normal to the interface (Fowles, 1972). So the pressure and particle velocity in silver are determined by the shock state in sapphire. However, the final volume and temperature in silver may have significant dependence on the shock reverberation path as opposed to a single shock path to the final state.

Calculations of the silver-sapphire interaction shows that three wave transits are necessary to bring the silver to within 0.1% of the final shock pressure for a 100 kbar shock. In two transits it is within 0.3% and in one transit within 9%. At 100 kbar the temperature change due to reverberation is 4% lower than that due to a single shock. For comparison, temperature change at 100 kbar on the isentrope centered at the initial state is about 20% lower than the single shock temperature change.

The reverberation shock (P, u) states are found by the method of characteristics in the (P, u) plane. Quadratic fits $-\sigma$ or $P = A_i u + B_i u^2$ to the principal pressure-particle velocity curves are used in the numerical solution. (The principal Hugoniot curve through P = 0, u = 0 was used to generate all characteristics.) For silver, $A_1 = 3.3384$ and $B_1 = 17.448$ and for sapphire, $A_2 = 4.44$ and $B_2 = 1.36$ (P is in Mbar and u in cm/μsec). Fig. 7 sketches the states in the (P, u) and (t, x) planes.

Solution of the simultaneous equations representing the curve intersections in the (P, u) plane for even numbered states is different from the solution for the odd numbered states. For the n^{th} even numbered state the quadratic equation to be solved, $au^2 + bu + c = 0$, has coefficients

$$a = B_1 - B_2$$

$$b = A_1 + A_2 - 2B_1(u_{n-1} - u_R) + 2\ B_2 u_p$$

$$c = -A_1(u_{n-1} - u_R) + B_1(u_{n-1} - u_R)^2 - A_2 u_p - B_2 u_p^2$$

and the positive branch of the quadratic solution is used. Here u_p is twice the particle speed of the final state and u_R is the solution of $B_1 u_R^2 + A_1 u_R - P_{n-1} = 0$. For the odd numbered states,

$$a = B_1 - B_2$$

$$b = -A_1 - A_2 - 2\ B_1(u_{n-1} + u_R)$$

$$c = A_1(u_{n-1} + u_R) + B_1(u_{n-1} + u_R)^2$$

and the negative branch is used.

To find volume and temperature of a reverberation state, consider a shock from an arbitrary known initial state (P_{n-1}, V_{n-1}, T_{n-1}) to a final state (P_n, V_n, T_n). The Rankine-Hugoniot relation is

$$E_n = E_{n-1} + \frac{1}{2} V_o(P_n + P_{n-1})(X_{n-1} - X_n)$$

where $X = V/V_o$.