KB2. Range-Parameter Expansion for High-Density Plasma.* J. L. Lebowitz, *Yeshiva University*, and G. Stell, *New York University*.—We have developed an expansion for the thermodynamic functions of a mixture (solution) of charged particles $F(d/D,\rho d^3)$ in orders of the ratio d/D, where d is a characteristic length of the short-range interaction, D is the Debye length, and ρ is a typical density. A similar expansion is valid for the radial-distribution functions *after* they are divided into a short range and an asymptotic part: $g_{\alpha\beta}(r,d/D) = g_{\alpha\beta}^s(r,d/D) + g_{\alpha\beta}^a(y,d/D)$, where $y=r/D$. To lowest order, $g^a(y)$ goes as e^{-by}/y and reduces to the linearized Debye–Hückel distribution when b becomes equal to unity. This occurs when $\rho d^3=0$, or (somewhat surprisingly) when the short-range interactions are independent of the species. For a one-component plasma in a uniform background, $b=[(dp_0/d\rho)/kT]^{-\frac{1}{2}}$, where p_0 is the pressure when the charge vanishes. Explicit computations for the case of hard-sphere short-range interactions are facilitated by using the exact solution of the generalized Percus–Yevick equation for such a mixture.[1]

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[1] J. L. Lebowitz, Phys. Rev. (to be published).