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The Phase-Amplitude (Ph-A) representation of a wave function, revisited GEORGE RAWITSCHER, University of Connecticut — A very attractive feature of the Ph-A description $\psi(\mathrm{r}) = \mathrm{y}(\mathrm{r})\,\sin(\varphi\,(\mathrm{r}))$ is the slowly varying monotonic nature of both the amplitude y(r) and the phase φ(r) as a function of distance r, even though the wave function may be highly oscillatory. The solution of Milne's non-linear equation for y(r) is done iteratively, using a spectral representation for y in terms of Chebyshev polynomials. For an example with a long range potential of the form $1/\mathrm{r}^3$, an accuracy of better than 1% is achieved over a radial interval from 0 to 3000 units of length, requiring only 64 mesh points. Advantages of the Ph-A representation are a) the storage memory compression, b) the calculation of a scattering wave function for very long range potentials, and c) the economy in the calculation of overlap matrix elements under certain conditions.

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