The incident field E_z^{inc} consists of a delta function source $V_{1,2}\,\delta(z')$ added to the radiated field incident from the other dipole, and one can write both equations in the following form:

$$\left(\frac{d^2}{dz^2}+k^2\right)\{A_z^1(x_n,\,y_n,\,z)+A_z^2(x_n,\,y_n,\,z)\}=-j\omega\epsilon\delta(z)V_n \qquad (6.9)$$

for x and y on each dipole surface ($n = 1$ or 2). This pair of integrodifferential equations must be solved simultaneously for the currents $I_1(z)$ and $I_2(z)$. The equations above are in the form known as Pocklington's equation [14], but a number of authors have chosen to solve the integrated form due to Hallén [15, 16].

Simple and useful solutions have been obtained using a single *basis function* for the currents $[i_1(z) = I_1 f(z),\, i_2(z) = I_2 f(z)]$, which might be sinusoidal, or other basis functions as in the previous example of an N-port coupled network. With this substitution, the integrals can be performed (numerically) and the equations satisfied at one point on each antenna (a procedure called *point matching*). The resulting simultaneous algebraic equations are solved for I_1 and I_2.

An alternative to point matching is to require that the equations be satisfied to an average sense by multiplying the equations by a weighting function and integrating this weighted average along each antenna element. If the weighting function has the same form as the basis function, this procedure is known as Galerkin's method [17] and possesses stationary characteristics that improve its accuracy.

The procedure outlined above is general and is extended to the case of any array by including all of the elements of a large array in the simultaneous equations and inverting the set to obtain the solution for all currents.

In the general case of an array of dipoles (oriented with axes in the z-direction) and the locations $(x_n,\, y_n,\, z)$, the same equation is written

$$\left(\frac{d^2}{dz^2}+k^2\right)\left\{\sum_m \int i_m(z')\,G(\mathbf{r_n},\,\mathbf{r'_m})\;dz'\right\}=-j\omega\epsilon\delta(z)V_n \qquad 1\le n\le N \qquad (6.10)$$

where

$$G(r_n,\,r'_m)=\frac{e^{-jk|\mathbf{r_n}-\mathbf{r'_m}|}}{4\pi|\mathbf{r_n}-\mathbf{r'_m}|}$$

This integrodifferential equation can be solved approximately by the point matching or Galerkin's method and, if a single basis function is used to represent the current on such element, results in N equations in the N unknown values of coefficients I_n [using $i_n(z) = I_n f(z)$].

More accurate solutions than those obtained with a single basis function can be obtained using higher order expansions of the current and some variation of the method of moments to obtain a matrix solution. Thorough treatments of the