Antenna Theory
Exam No. 2
December 1, 2003

Solve the following two problems. These are written as design problems and, therefore, they are, to a certain extent, open ended. That is, it is up to you to specify, or assume, many of the parameters of the solutions. Try to be reasonable in your choices so that the resulting array is practical. The two problems have equal weight. Use properties of free space throughout. If you need to assume anything, please write your assumptions clearly.

e18.98. In chapter18.problems.extra 1.

a. A linear array of half wavelength dipoles is required to have nulls at θ=45° and θ=90°. Find the number of elements required to produce these nulls. You may assume any spacing between the elements and any phase angle between consecutive elements but you must solve for the assumed spacing and phase angle.

b. Sketch the antenna array pattern (that is, the combine array factor and element pattern). At what angles are the nulls of the pattern?

e18.99. In chapter18.problems.extra 2. An antenna is required to produce a normalized field pattern

$$f_e = \sin^2\theta$$

Using the Woodward-Lawson method, design an array with an appropriate array factor which, when combined with an appropriate element will produce the required pattern. You are entirely free to choose the element type, spacing, consecutive phase angle etc., to suit your needs. Find:

a. The number of elements required
b. The excitation coefficients required
c. The array factor produced.
d. The normalized antenna field pattern.