1. Plot principal plane patterns (for a plane containing the loop and for two orthogonal planes parallel to the axis of the loop, one of those containing the feed) for the following 2 cases:

a. small loop (current may be constant) of $0.1\lambda$ circumference

b. finite size loops of circumference $0.5\lambda$, $1\lambda$, and $1.5\lambda$. Follow procedure by Richtscheid, or in references [2] and [16].

c. Determine and plot the radiation resistance for finite size loops from circumference of approximately $0$ to $1.5\lambda$.

Carefully document the programs you’ve developed to do this and turn it in along with the plots.

2. You are to investigate the development of a 4 element array of $\lambda/2$ dipoles. The arrangement is as shown in the figure below. Plot principal E and principal H patterns for cases of:

a) broadside radiation
b) beam steered to $30^\circ$ from broadside
c) beam steered to $60^\circ$ from broadside

3. Develop a routine that can be used to determine real part of the input impedance for a dipole of arbitrary length (you may assume that the wire is very thin). Compare the predictions of your routine with the plots provided in your text. Note that integrations must be performed numerically, i.e., don’t just plot the analytical expressions given in the text.