EC597 – WIRELESS COMMUNICATIONS ELECTRONICS
SU00 - DRV

Homework#11 - Due Monday, 21 August

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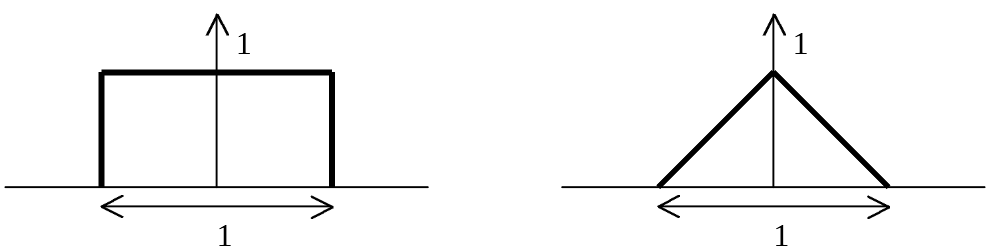
1. Commercial FM broadcast stations enhance their coverage by using vertical arrays of omni-directional antennas. The goal of these arrays is to reduce the radiation pattern into space and to concentrate it along the surface of the earth. To estimate this strategy, consider a 4-element array of vertically-stacked, isotropic radiators. The elements are separated by $\lambda/4$ and have zero phase shift between elements.
   A. Obtain an expression for the array factor (AF) for this array.
   B. Plot the power pattern as a function of the azimuthal angle θ.

2. The fundamental property that the far-field radiation pattern is the Fourier transform of the excitation can be used to compare the beamwidth and side-lobe levels of different current distributions. Consider a uniform current distribution and a triangular current distribution both of unit amplitude and unit width as shown below.
   A. Plot the far-field patterns for these excitations.
   B. Compare the 3 dB beamwidths and sidelobe levels of the corresponding far-field patterns.



3. A resonant $\lambda/2$, dipole antenna at 100 MHz has an input impedance of $Z_{IN}=73\ \Omega$. On the other hand, when the dipole is shortened to L=1.29 m, the dipole has an input impedance of $Z_{IN}=50-j149\ \Omega$.
   A. Calculate the length of the resonant dipole.
   B. Design a network that will match the shortened dipole to a 50 Ω line; sketch the matching network.