EE 483/583 Antennas for Wireless Communications (Spring 2022)
Homework 10
Wednesday, April 6, 2022

1) Design a rectangular microstrip antenna to operate at the center frequency of UHF TV channel 16 on a polystyrene substrate- assume $h = 0.5$", 2 oz. copper cladding (68 μm), loss tangent $\tan(\delta) = 0.00013$, and a relative dielectric constant $\varepsilon_r = 2.6$. The antenna is to be matched to a 75 Ω microstrip transmission line on this substrate. Discuss and justify design choices. Accurately sketch top view of final design (all dimensions in cm). **EE 583 only**- Include a fully-labeled Smith chart showing $y_1 = y_2$ and y_{2t} (i.e., y_2 translated across length $L + \Delta L$ of microstrip antenna) and discuss results.

2) For the rectangular microstrip antenna of part 1), compute the maximum directivity using <u>both</u> numerical methods discussed in class. Compare the results and discuss any differences. Also, compute the *estimated* half-power beamwidths (HPBW) in the E- and H-planes.

3) For the rectangular microstrip antenna of part 1), compute and graph the E-plane and H-plane **normalized directivity** patterns (both unitless and in dB) with the positive x-axis pointing toward top of page. For the radiation patterns in dB, use a 0 to -40 dB scale. What is the HPBW in the E- and H-planes? How do these HPBWs compare with estimates from part 2)?

Due Monday, April 11, 2022.