

**ECEn 665**  
**Antennas and Propagation for Wireless Communication**

Homework #16  
Due Mar. 15, 2023

1. For the model in the previous assignment, use the correlation matrix formulation to find the equivalent external noise temperature, receiver noise temperature, system noise temperature, and the noise matching efficiency.
2. Change your model to scan the array element spacing from 0 to  $2\lambda$ . Use equal weights at the open circuit reference plane. Plot (a) the directivity, (b) the array gain with external noise only and an isotropic radiator as reference in the broadside direction, and (c) the array gain with the full noise model and element 1 as reference.
3. Redo the previous problem with the beamformer weights that maximize each quantity.
4. Extra credit: For small element spacings, the maximum directivity is a lot higher than the directivity with equal weights. But the maximum array gain with full noise model and element 1 as reference isn't much larger than the array gain with equal weights. What's going on?