

Homework 5: ECE 4370

Small-Scale Fading and Loop Antennas

1. A mobile device has an antenna operating in a local area with heavy obstructions to all communicating base station radios. Answer the following questions based on this scenario.
 - a. The mobile radio is receiving -75 dBm of power, on average, in a typical local area. The mobile radio is thermal-noise limited, operating in with a noise floor of -100 dBm, with a minimum SNR that allows correct packet reception and decoding. If we wish to have a packet outage rate of less than 0.1%, what must be the minimum SNR for decoding in this scenario?
 - b. A rogue base station is transmitting, on average, -90 dBm of in-band interference to the same location in (a). What is the probability that this RF interference signal *exceeds* -80 dBm for a random location?

2. A z-directed, electrically short dipole is placed in the middle of an electrically short loop antenna on the xy-plane, centered at the origin. Their input ports are tied together in parallel. If you want a circularly-polarized radiating system with 50-Ohm of radiation resistance, what must the dimensions of the single-turn loop and short dipole antennas?