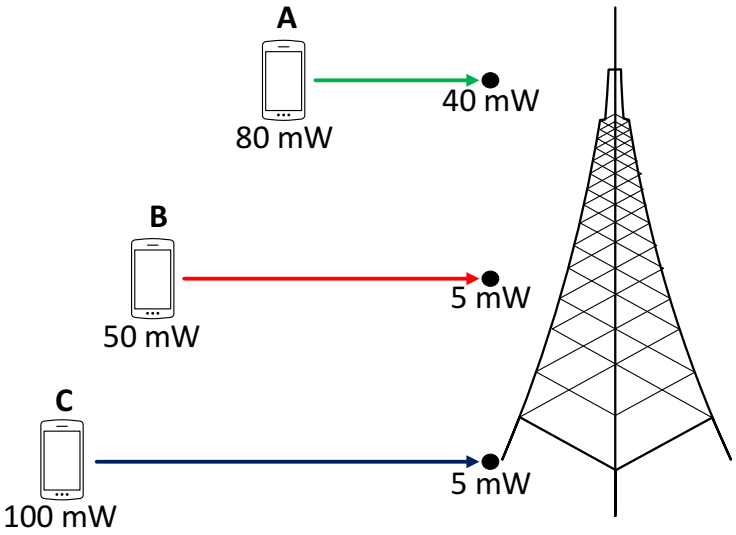
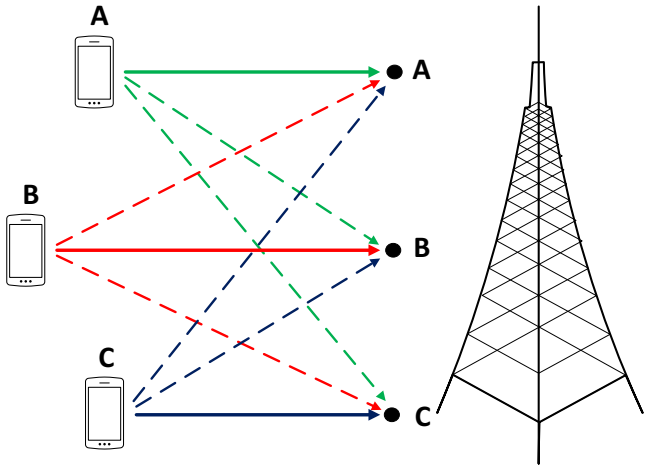
Homework

Chapter 1 Controlling Your Volume

1. (5 points) Consider the following set of three links to a single base station in a cell. Each of their transmit powers are indicated, as well as the received power at the base station (BS). Given that the BS wants to receive each signal at 20 mW, what would the **Transmission Power Control (TPC)** algorithm dictate that the next transmit power of each device should be?



2. (10 points) Now, consider the diagram below, again with three transmitters, with channels labeled accordingly. The channel gains, target SIRs, and receiver noise powers are indicated in the tables. **Each device has an initial transmit power of 1 mW.** Given the target SIRs, what would the **Distributed Power Control (DPC)** algorithm dictate that the next transmit power of each device should be?



Channel Gains	A	B	C
A	1	0.2	0.1
B	0.2	0.9	0.3
C	0.2	0.2	1

Channel gains for this problem. The rows denote the transmitters, and the columns the receivers.

Link	Target SIR	Receiver Noise
A	1.5	0.1
B	3	0.1
C	1.5	0.1

Target SIRs and Receiver Noise parameters for each link in this problem.

3. (5 points) For the channel conditions in the previous question, suppose **DPC** algorithm has been run for a number of iterations and the transmit power levels are currently 0.520 mW for A, 0.693 mW for B, and 0.540 mW for C. Which of the following statements is true?
   a. The algorithm has converged to an equilibrium, because all of the target SIRs have been met.
   b. The algorithm has converged to an equilibrium, even though none of the target SIRs have been met.
   c. The algorithm has not yet converged, because none of the target SIRs have been met.
   d. The algorithm has not yet converged, because the target SIR of Link A has not been met, even though the others have.
   e. The algorithm has not yet converged, because the target SIR of Link B has not been met, even though the others have.

f. The algorithm has not yet converged, because the target SIR of Link C has not been met, even though the others have.