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**MOBILE COMMUNICATION**

**HOMEWORK 4**

**Question**

Estimate the feasibility of a 5km link, with one access point and one client radio. The access point is connected to antenna with 10dBi gain with transmitting power of 20dBm and a receiving sensitivity of -89dBm

The client is connected to an antenna with 14dBi gain with transmitting power of 15dBm and receiving sensitivity of -82dBm

The cables in both cases have loss of 2dB at each side of 2.4GHz frequency of operation.

* Draw the block diagram representation of the link
* Calculate the path loss for 5km distance. State any assumptions made.
* Calculate the uplink (from station to client)
* Calculate the downlink (from client to base station)
* Using the parameters provided, is it possible to transmit using the power to reach the distance (5km)
* Do the reverse; from client to base station

**Solution**

Receiver

Radio

Cable

Rx Antenna

Transmitter

Radio

Tx Antenna

Cable

Block Diagram

*Base station to Client Transmission*

Considering transmission from station to client, first we calculate total gain:

Next, the path loss from station to client along 5km distance

Subtracting total gain from path loss:

**Analysis:** since the signal of -73dB is higher than the minimum sensitivity of the client antenna which is -82dBm, the client’s radio will have good reception. There is a 9dB gap, which is enough for transmission. But in extreme weather conditions, the signal may be distorted.

*Client to Base Station Transmission*

First, we add up all the gains and subtract the losses:

The path loss remains the same as 113dB. The effective signal is:

**Analysis**: The signal strength is higher than the -89dBi sensitivity level of the antenna, with a fading margin of 11dB. This will provide clear signal reception. An increase in the size of the antenna dish could boost the signal strength.