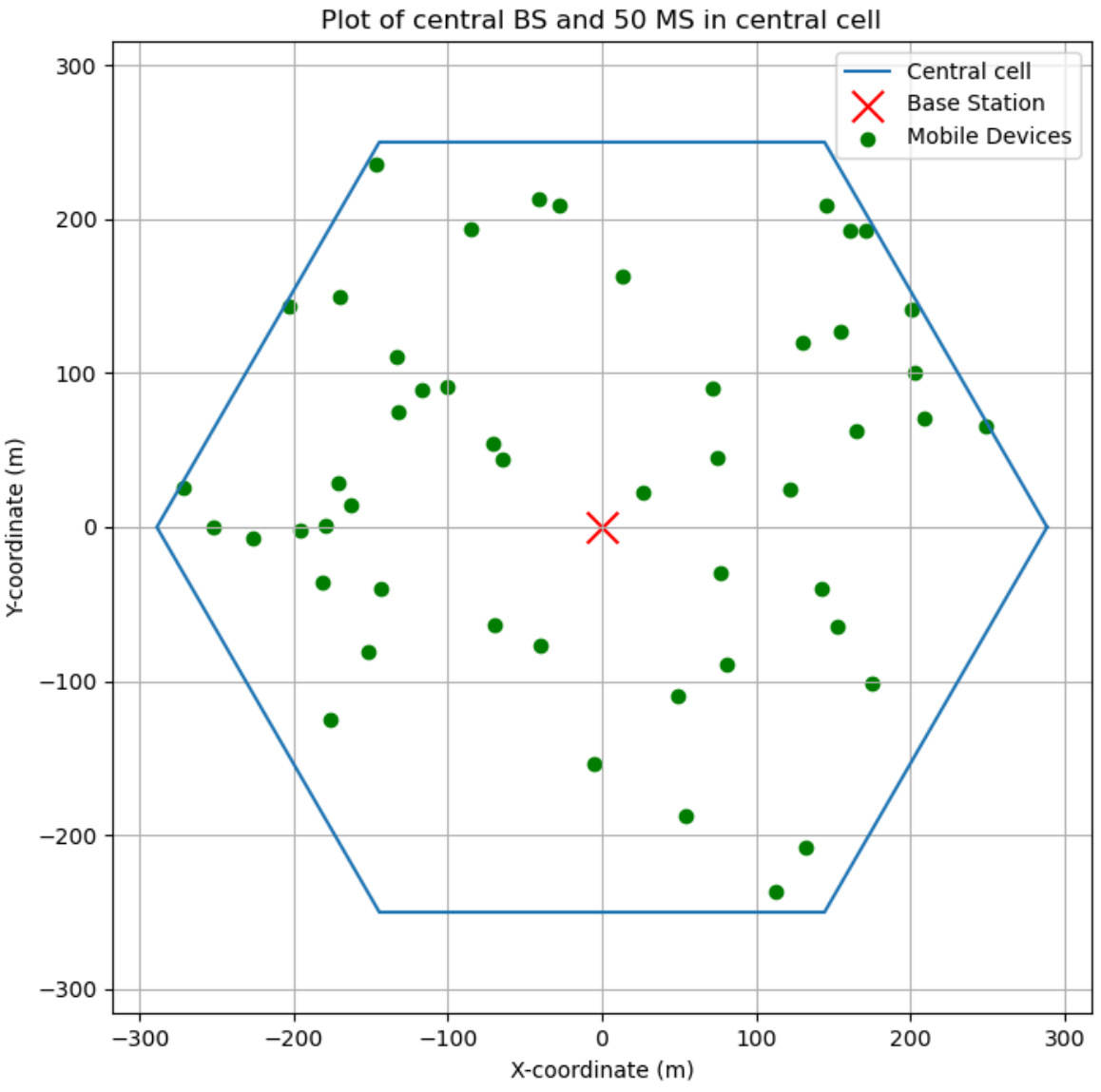
Homework 4 Report

1. Downlink, CBR

1-1



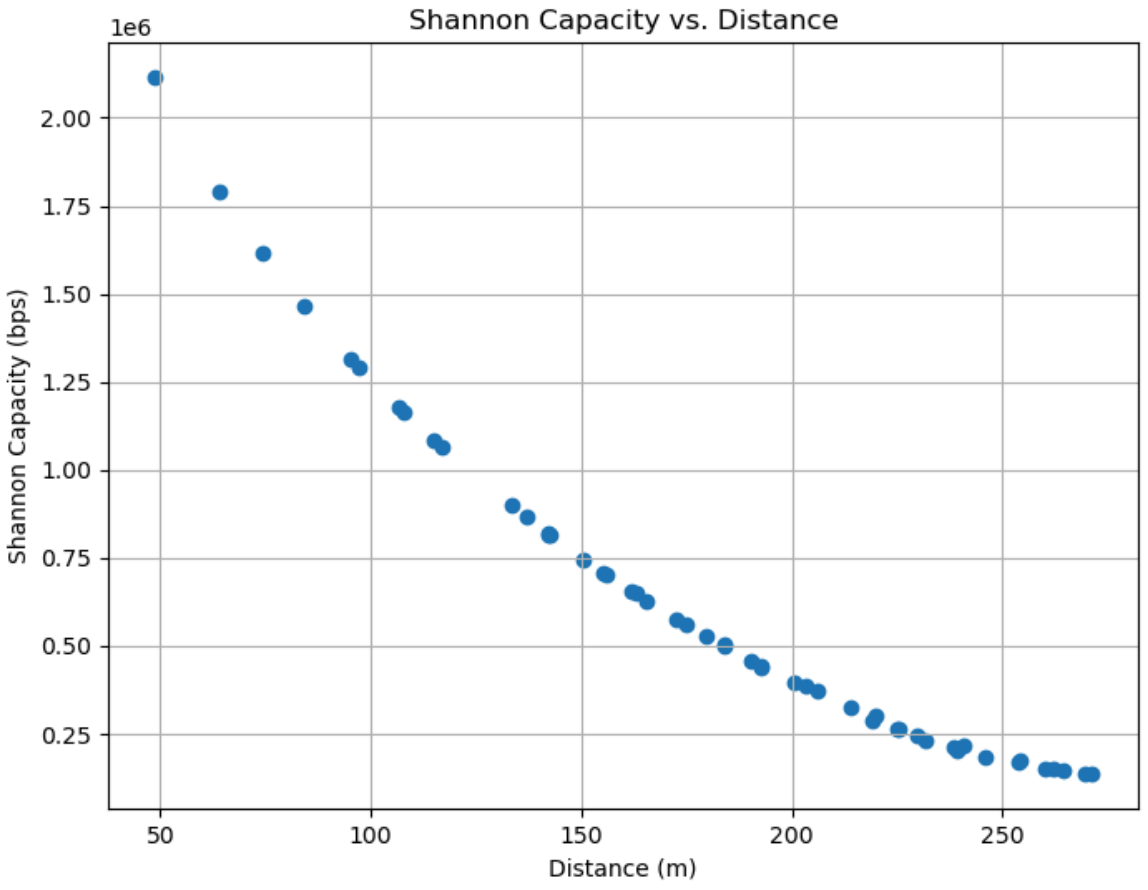
1-2

I calculated the Shannon capacity using the modified version of formula in slides 33, Lec 2.
Define:

- The distance from i-th mobile station to j-th base station: $d(i,j)$, where the central BS is $j=1, 1 \leq j \leq 19$.
- The height of each MS from ground $h_r = 1.5$, and each BS from ground $h_t = 51.5$
- $k = 1.38 \times 10^{-23}$ is the Boltzmann constant
- $T = 300$ is temperature in kelvin
- $B = 10^7$ is bandwidth in cell.
- $n = 50$ is number of MS
  Shannon capacity of i-th MS is thus calculated by:

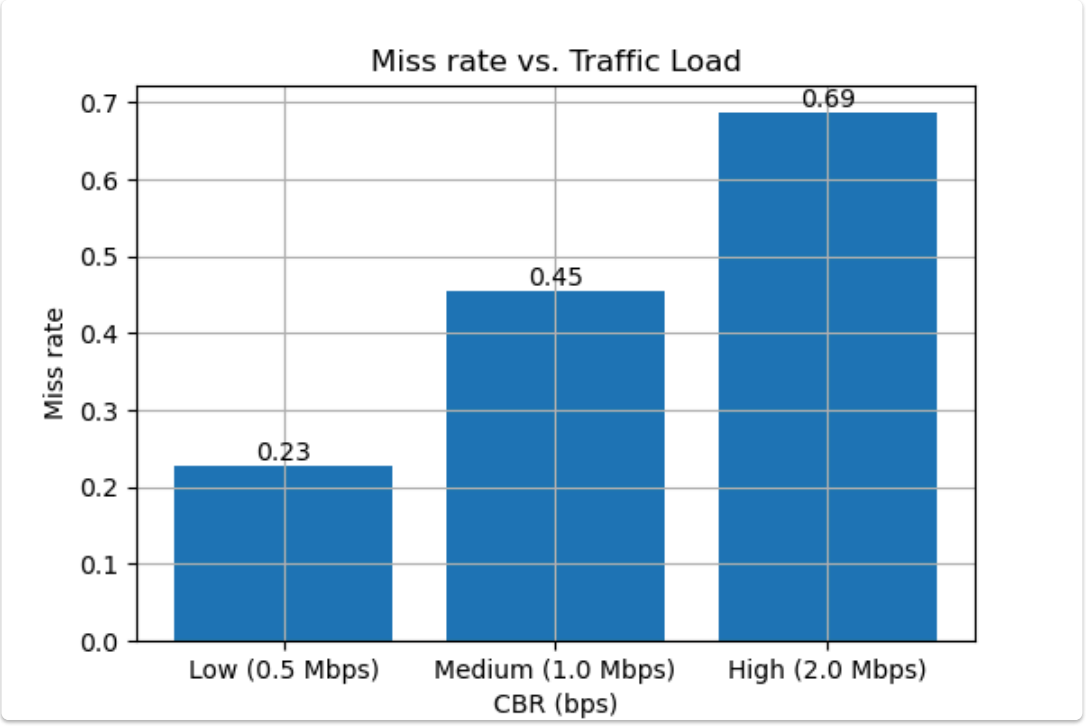
$$C(i) = \frac{B}{n} \times log_2(1 + \frac{S}{I+N}), 1 \leq i \leq n$$

where $S = (h_t h_r)^2 / d(i,1)^4, I = \sum_{j \neq 1} (h_t h_r)^2 / d(i,j)^4, N = kT(B/n)$.



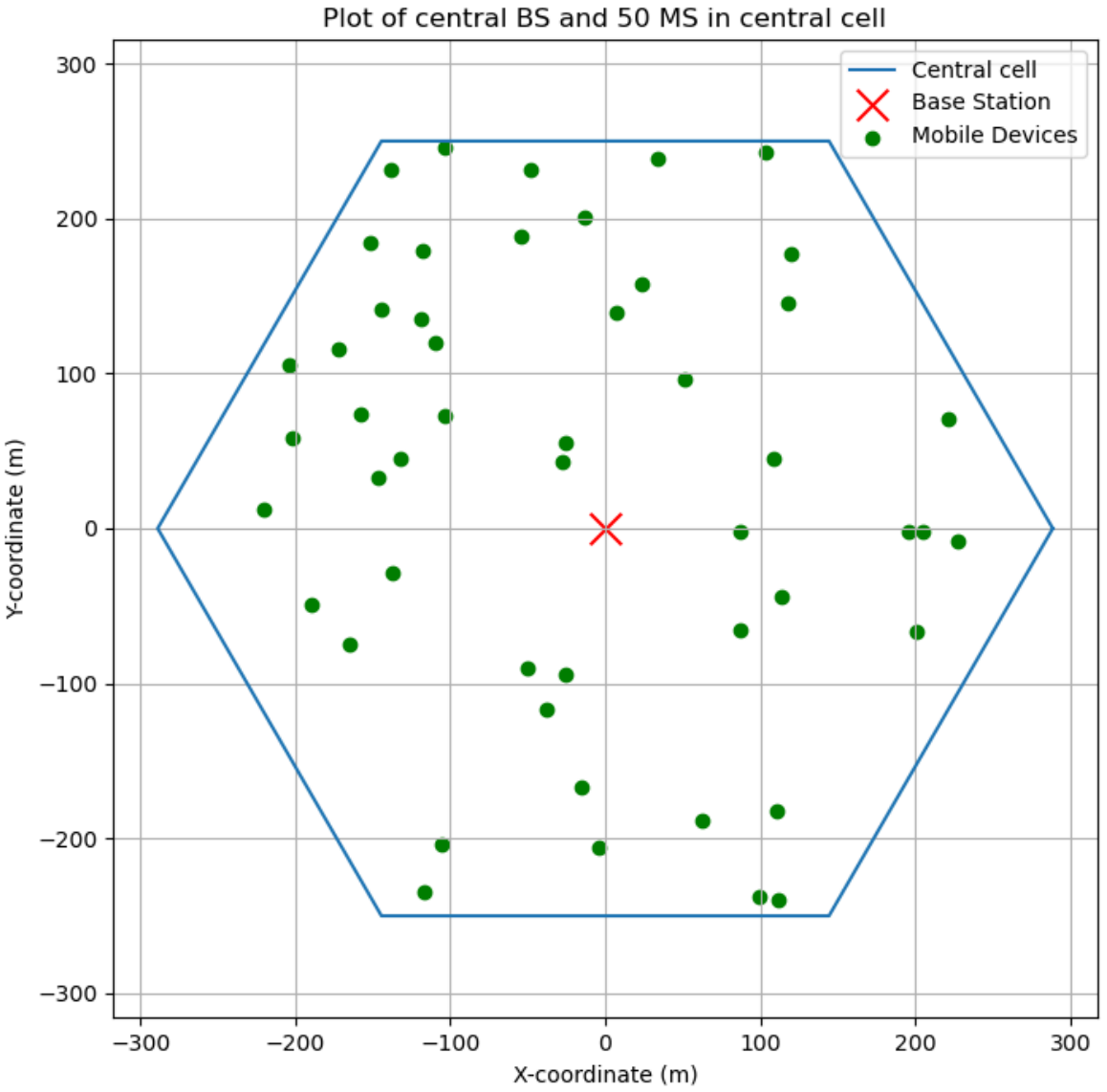
1-3

I let the low, medium and high traffic load's respective traffic rate be: $\{X_l = 0.5, X_m = 1, X_h = 2\}$ Mbps. The simulation time is 1000s and the buffer size is unchanged as 6M bits.



2. Downlink, Poisson Packet Arrival

B-1

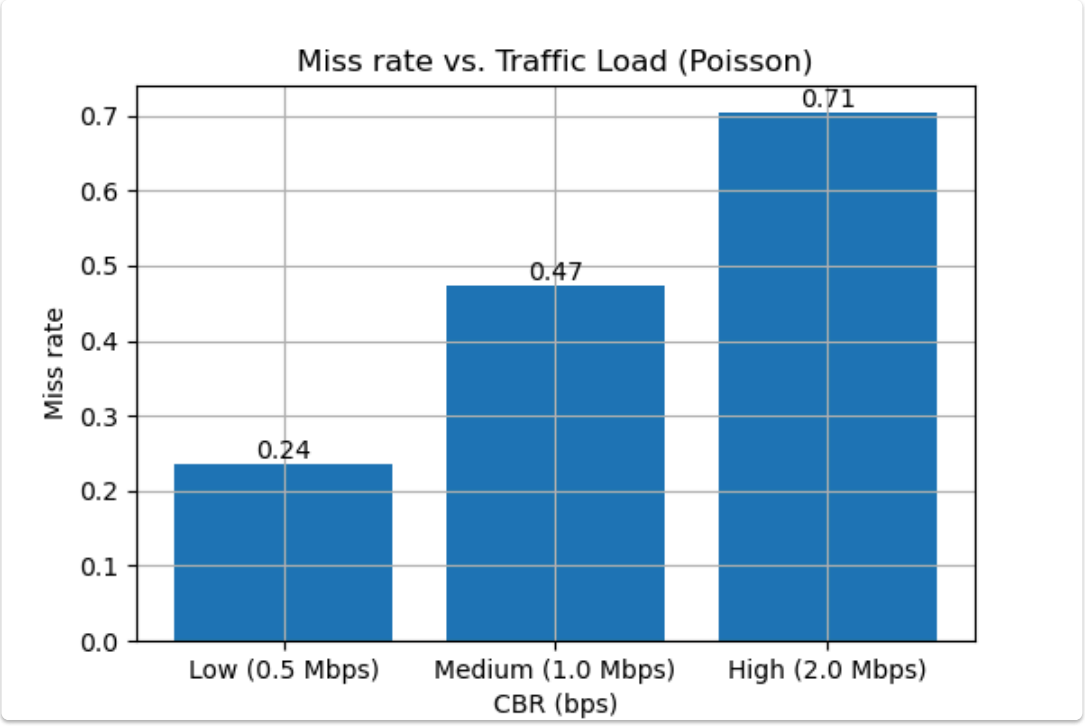


B-2

The calculation is the same as in 1-2.

B-3

I let the low, medium and high traffic load's respective poisson traffic arrival parameter be: $\{\lambda_l = 0.5, \lambda_m = 1, \lambda_h = 2\}$ Mbps. The simulation time is 1000s and the buffer size is unchanged as 6M bits.



In fact, if we compare the miss rate for CBR and Poisson based on the same MS map, they're the same (at least when rounded to 2 decimal places) They're different here because the maps are different.