Birzeit University

Faculty of Engineering and Technology

Electrical and Computer Engineering Department

WIRELESS AND MOBILE NETWORKS
ENCS5323

Course Project:
Online Calculator for Wireless and Mobile Networks

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Section: 1

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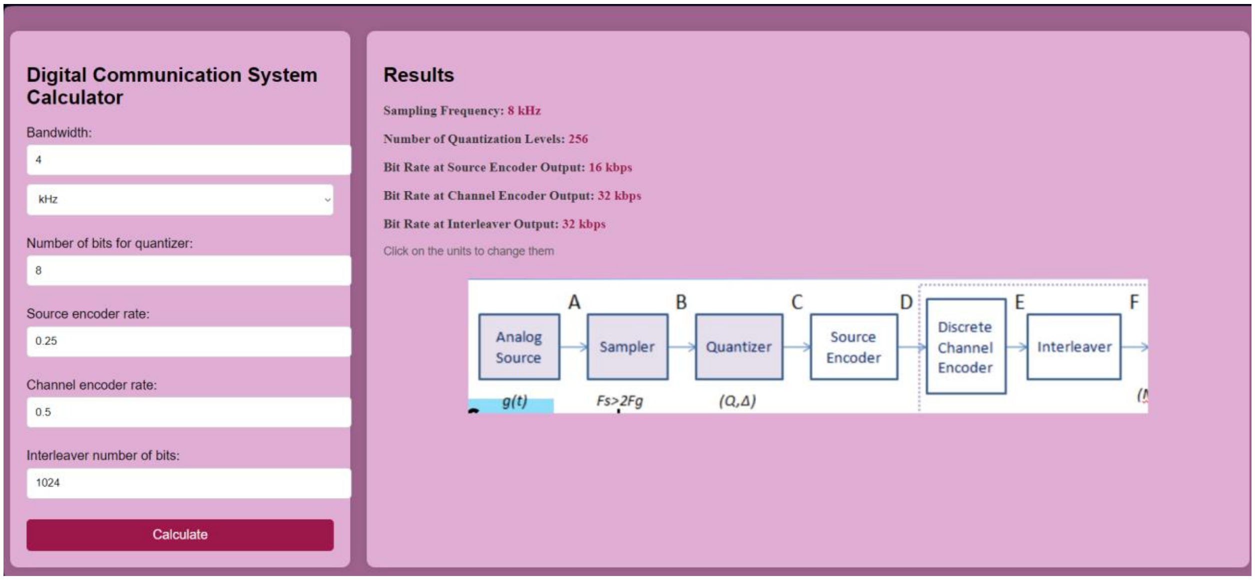
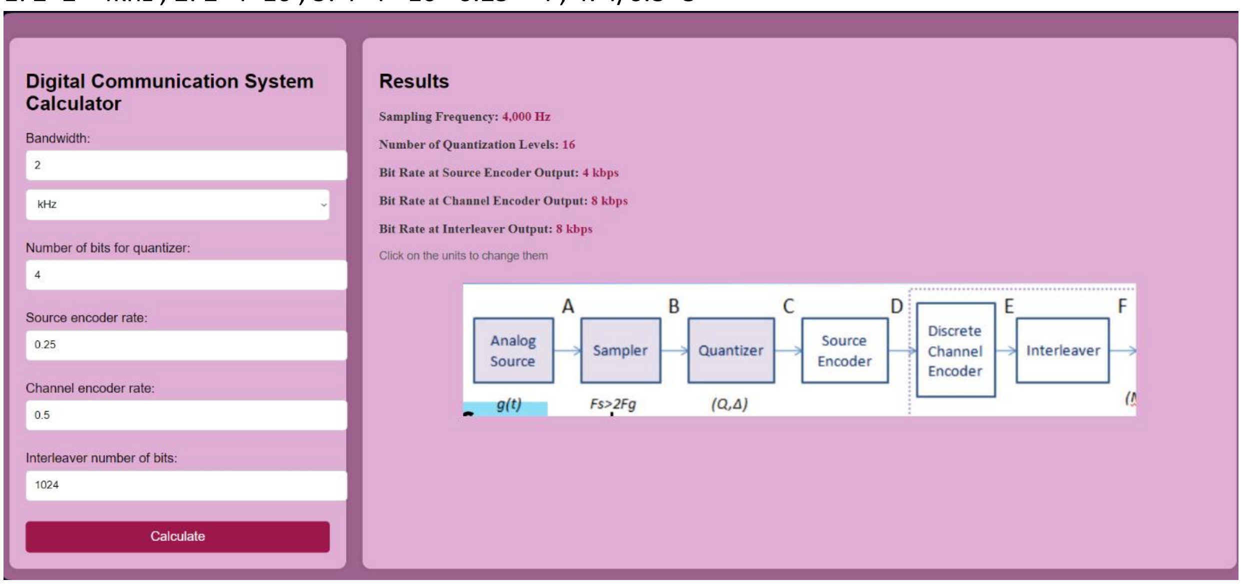
Calculator 1:

1.1 This is the scenario that we solved in the midterm exam.



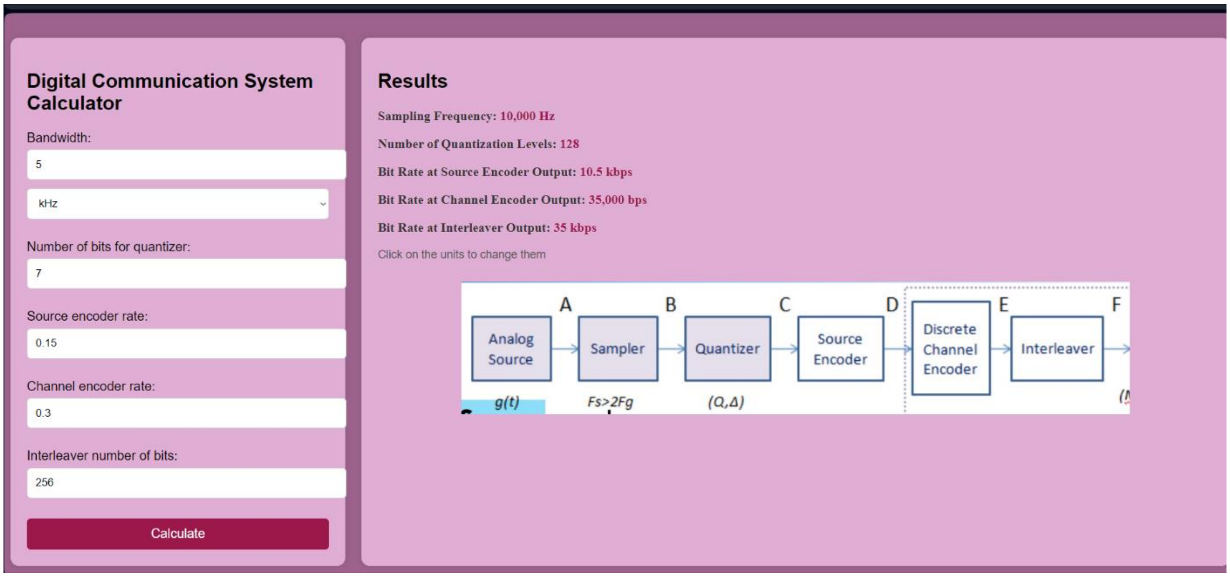
1.2: For the second scenario, I used the following inputs

1: 2*2 =4khz , 2: 2^4=16 , 3: 4*4= 16* 0.25 = 4 , 4: 4/0.5=8



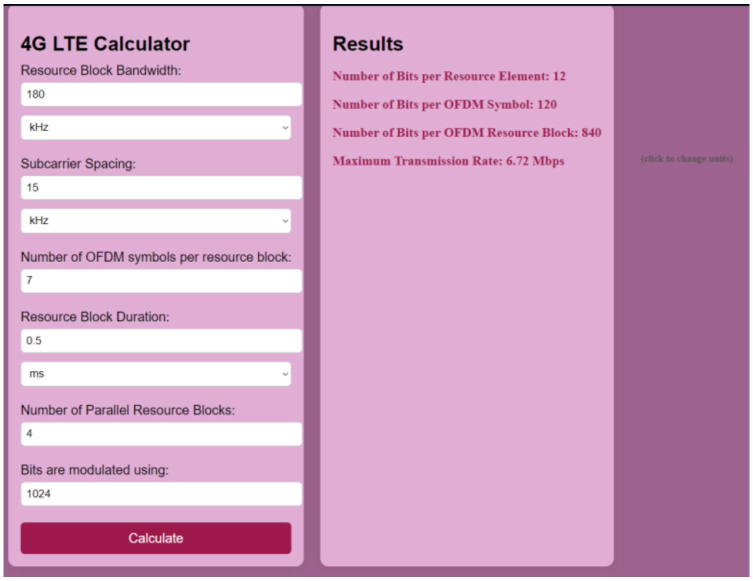
1.3: For the last scenario, I used the following inputs

To verify the result,
1: 5*2 =10KHZ , 2: 2^7=128 , 3: 10*7=70 * 0.15 = 10.5 , 4: 10.5/0.3=35

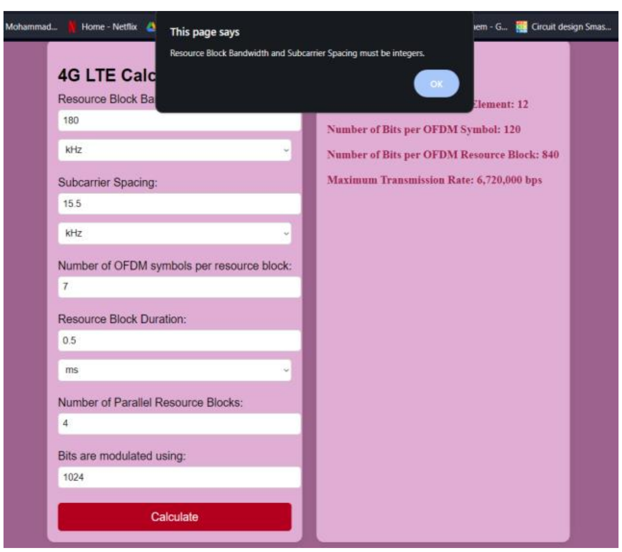


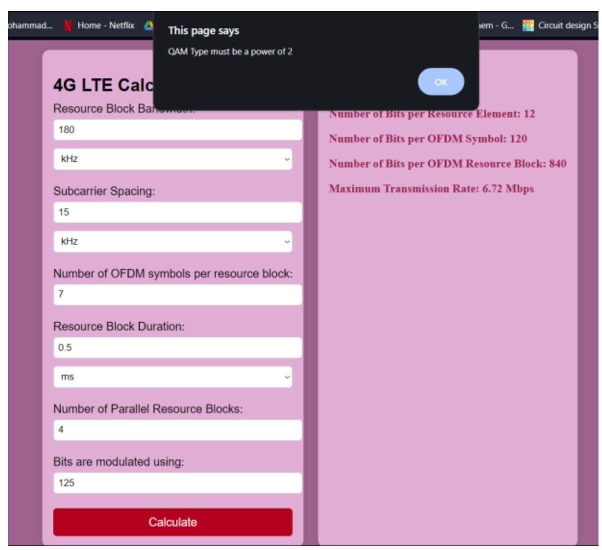
Calculator 2:

2.1: This is the scenario that we solved in the midterm exam.



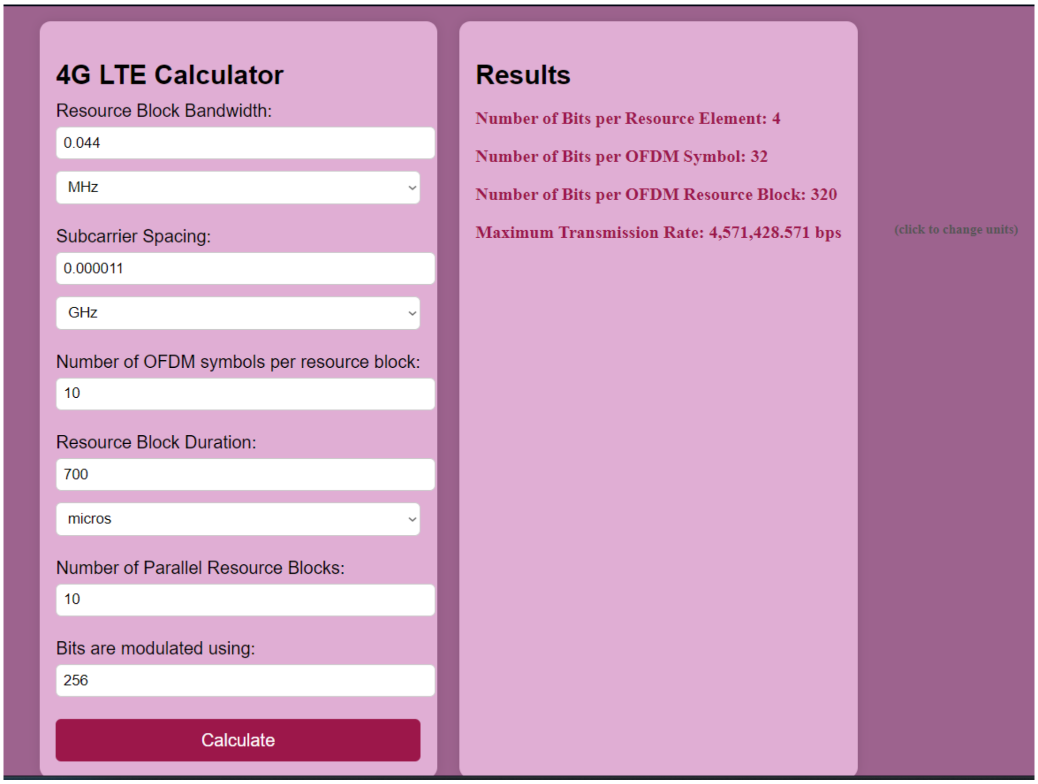
2.2: For the second scenario, I tried to enter non-integer numbers in the Bandwidth and Subcarrier spacing Text Fields, also I tried to modulate the bits using input not accepted for log base 2 as shown below.





2.3: For the last scenario, I used the following inputs:
To verify the result,

0.044MHZ = 44000HZ , 0.000011GHZ =11000HZ
1: 44000/ 11000 = 4 , 2: 4*log(256) = 4*8=32 , 3: 32*10 = 320 , 4: 10*320/700*10^-6 =4571428.571 bps= 4.571Mbps



Calculator 3:

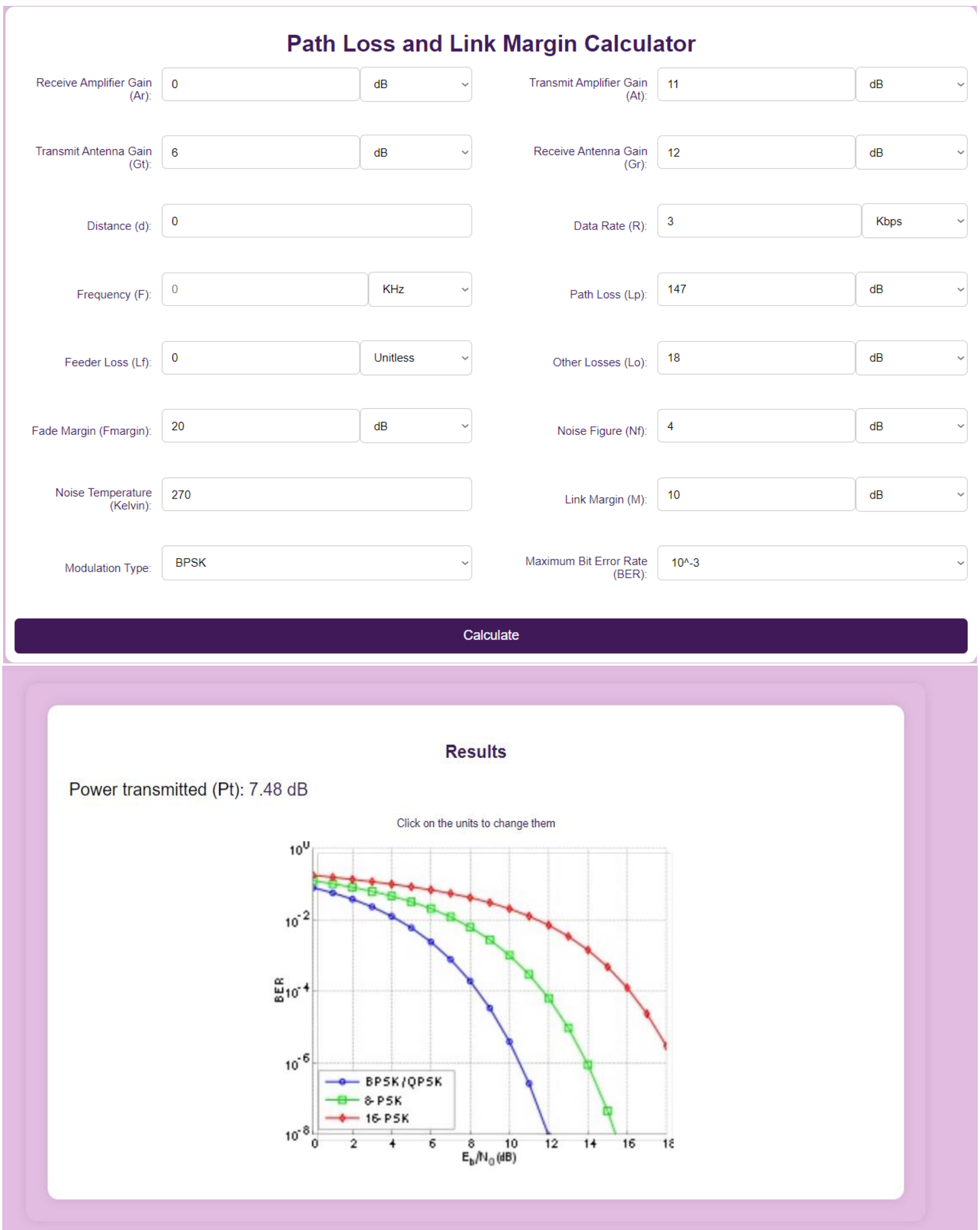
3.1: This is the scenario that we solved in the midterm exam.

3.2 For the second scenario, I used the previous inputs, but I changed the units.

3.3: For the last scenario, I used the following inputs:
To verify the result,

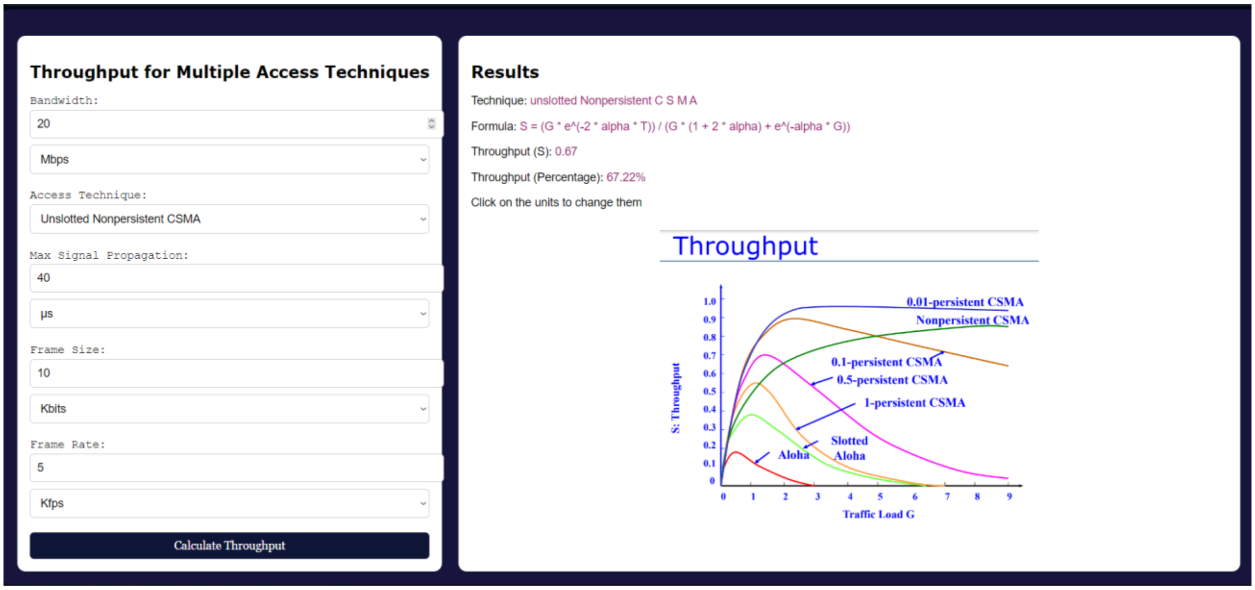
Pt = M -Gt – Gr - Ar - At + Lp + Lf + Lo - K + T + Nf + EB/N0 +R

From the plot we can find EB/N0 when BPSK is used = 7 ,
Pt= 10-6-12-11+147+20+18-228.6+24.3+4+7+34 = 7.89dB which is 5.60Watt as shown below.



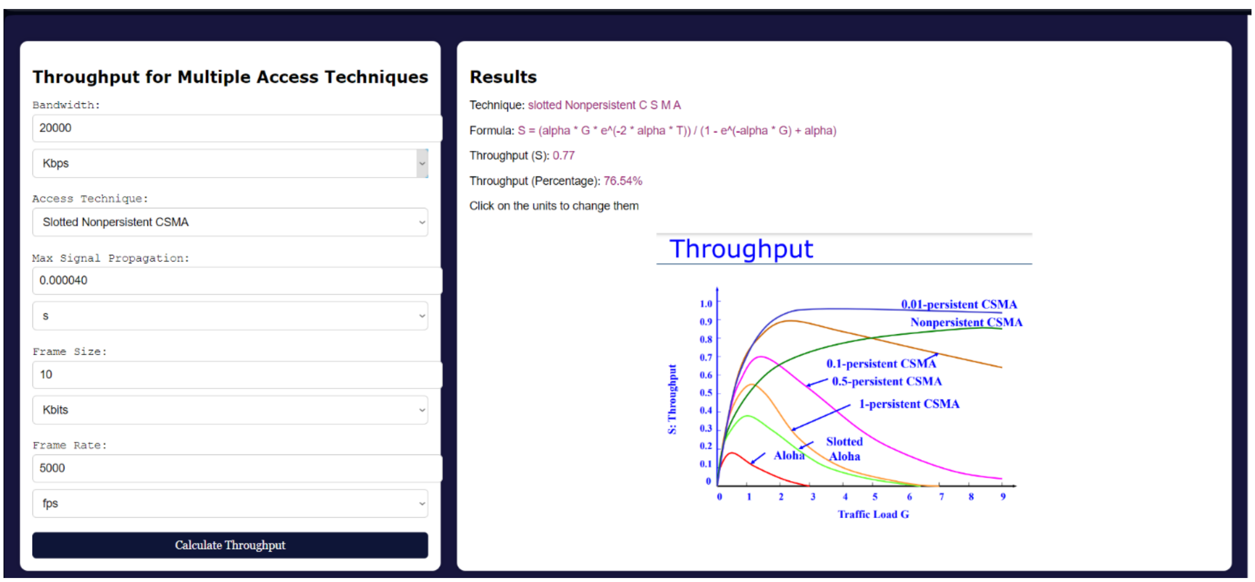
Calculator 4:

4.1 This is the scenario that we solved in the midterm exam. Using Unslotted Nonpersistent CSMA access technique.



4.2: For the second scenario, I used the previous inputs , but I changed the units and the access technique to Slotted Nonpersistent CSMA

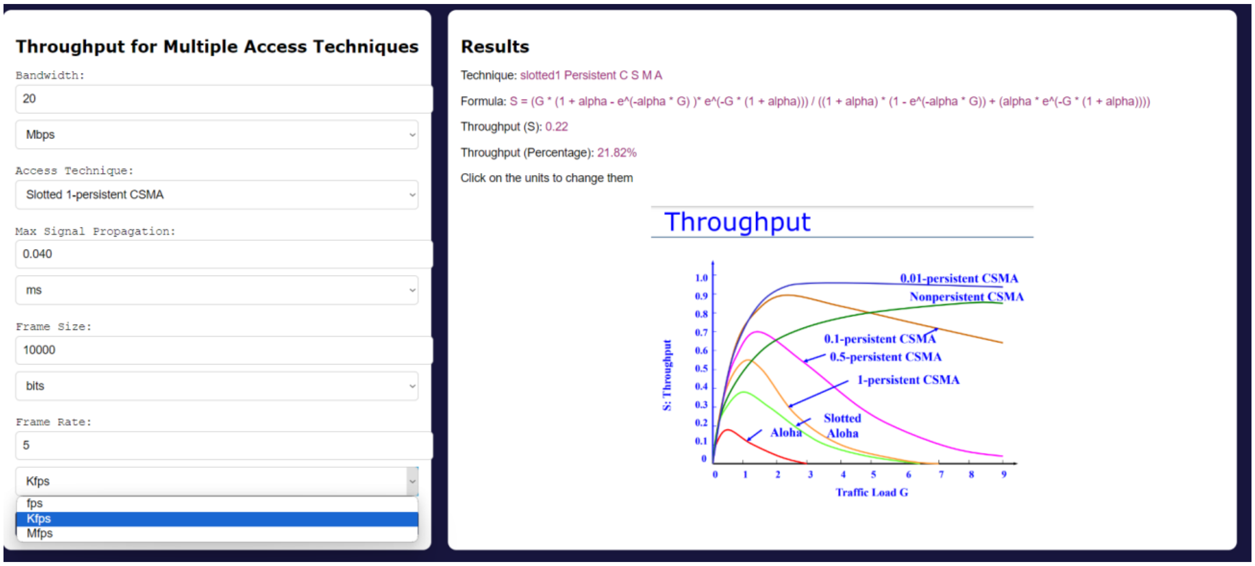
To verify the result, using the formula: S = (alpha * G * e^(-2 * alpha * T)) / (1 - e^(-alpha * G) + alpha) = (0.08 * 2.5 * e^(-2 * 0.08* 0.5 * 10^-3)) / (1 - e^(-0.08 * 2.5) + 0.08) = 76%, where T= 10*10^3 / 20*10^6 = 0.5*10^-3 , alpha = 40*10^-6/0.5*10^-3 = 0.08, G=5*10^3*0.5*10^-3 =2.5



4.3: For the last scenario, I used the same data, the access technique to Slotted Nonpersistent CSMA

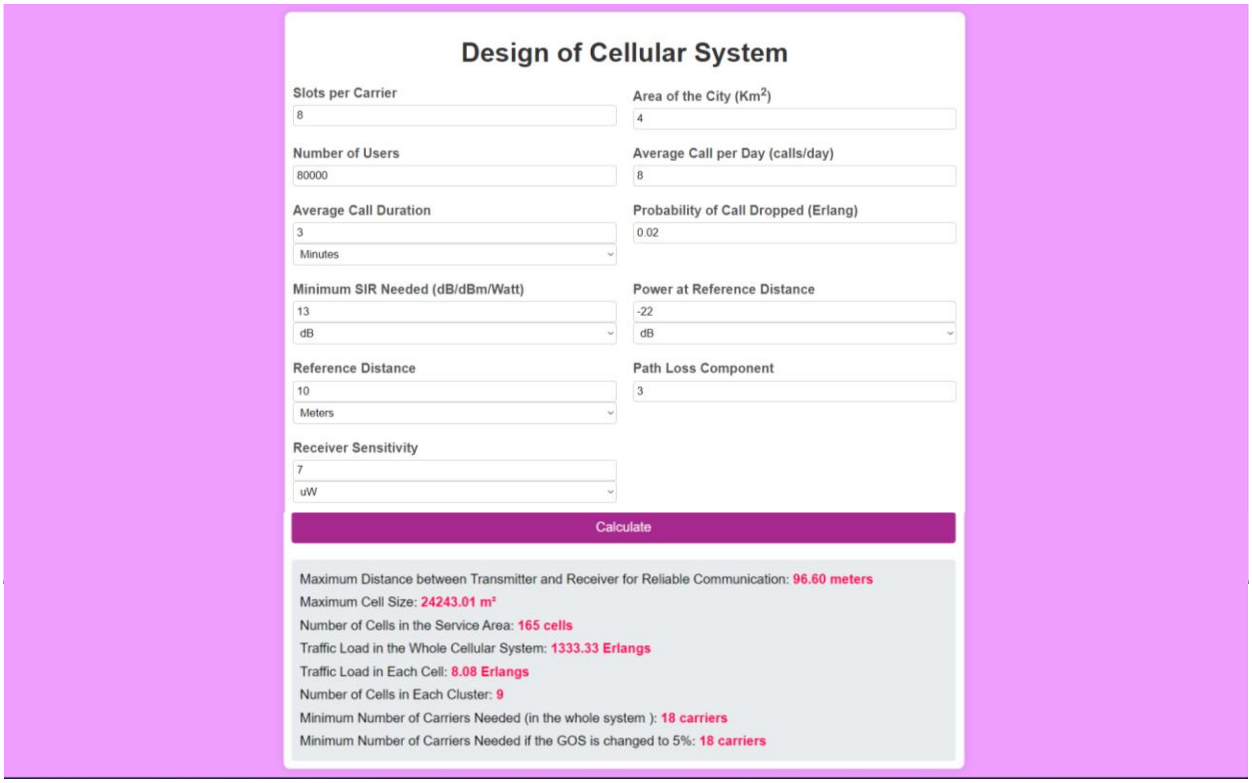
To prove the result , using the formula S = (G * (1 + alpha - e^(-alpha * G))* e^(-G * (1 + alpha))) / ((1 + alpha) * (1 - e^(-alpha * G)) + (alpha * e^(-G * (1 + alpha))))

= (2.5 * (1 + 0.08 - e^(-0.08 * 2.5))* e^(-2.5 * (1 + 0.08))) / ((1 + 0.08) * (1 - e^(-0.08 * 2.5 + (0.08 * e^(-2.5 * (1 + 0.08)))) = 21%



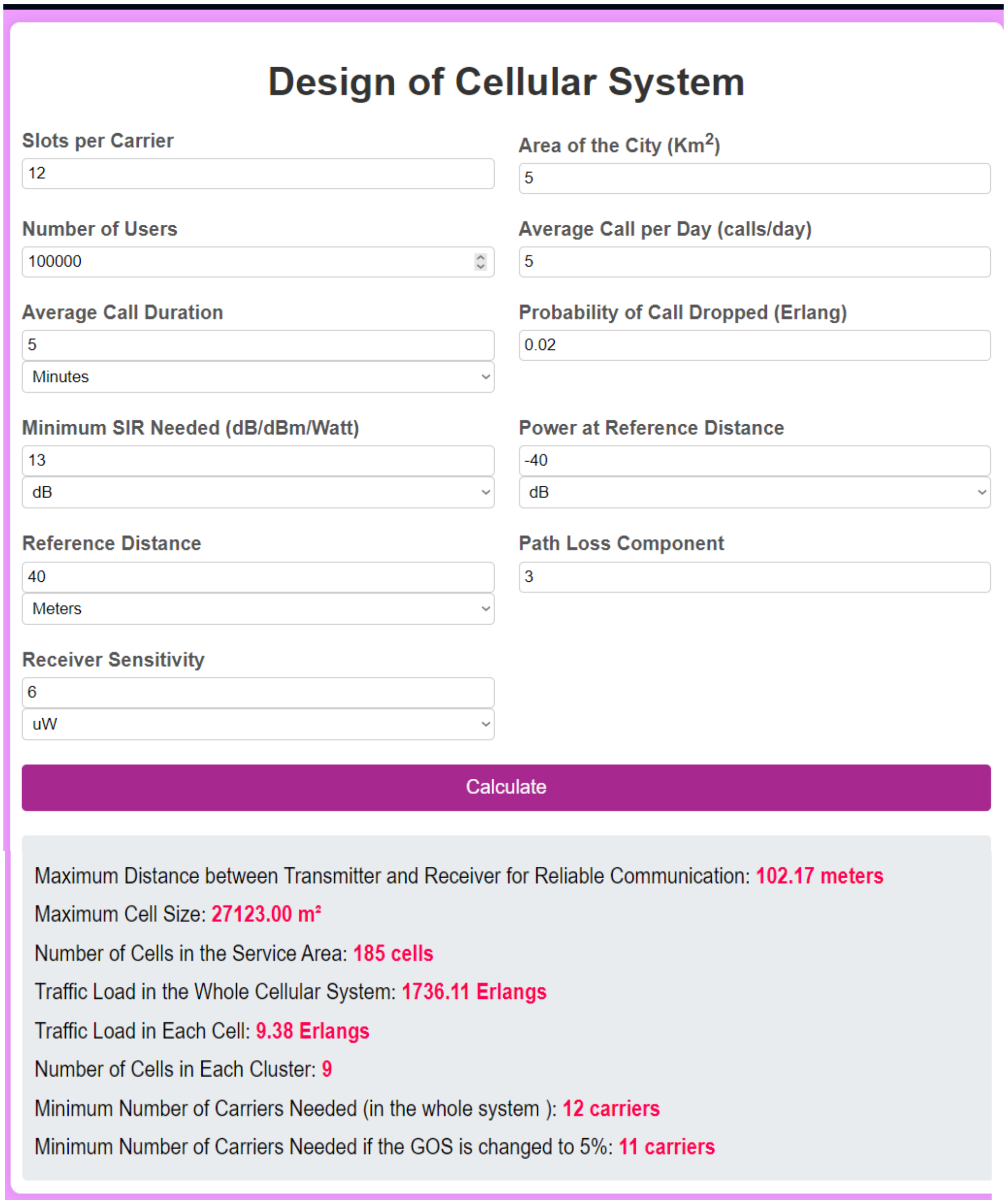
Calculator 5:

5.1 This is the scenario that we solved in the Homework.



5.2

For the last scenario, I used the following inputs:



To verify the result,

D = 40/(6*10^-6)^(1/3) = 102.17 meter , cellSize = 3sqrt(3)/2(102.17)^2 = 27123m^2

#ofCells= 5000000/27123 =185 cell, A= 100000/ (5*5/6-*24) = 1736.1 erlang
Acell = 1736.1/185 = 9.38 erlang, N => 13db = (sqrt(3N)) ^3 / 6 -> N= 9
at Gos = 0.02 -> # of channels = 16 => (16/12) *9= 12 carrier

at Gos = 0.05 -> # of channels = 14 => (14/12) *9= 11 carrier