```
%% 1: Cellular network
planning%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
Fband = 2400000000;   %% Frequency Band 400MHz
fdmaBW = 100000 ;     %% Bandwidth of each FDMA carrier
Emax = 0.075;         %% Max traffic intensity for an
average user in one cell
Ntdma = 6;            %% Number of TDMA channels in each
carrier
Npf = 85;             %% Number of patients on each floor
GOS = 1;              %% Grade of service
gamma = 2.2;
Numfloors = 9;        %% Total number of floors
w = 25;               %% width of the hospital
l = 30;               %% length of the hospital
h = 3;                %% height of the hospital
% set number of floors per cell = F
% set reuse factor N
F = 3;               %% 1 cel for every 3 floors.
N = 2;               %% reuse factor of 4
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
Ncells = (ceil(Numfloors/F))
U = F*Npf            %% max number of users in cell
T = U*Emax           %% max traffic in each cell
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
%% determine number of channels in each cell using the
erlang-b function
GOStest = T.^m/factorial(m) / sum(T.^[0:m] ./
factorial([0:m]))
%% Having determined the value for m
TotalS = (Ncells*m) + 4   %% S = total number of channels
%% Calculate total number of carriers and system bandwidth
%%%
ChannelsPerCell = ceil(TotalS/Ncells)
CarriersPerCell = ceil(ChannelsPerCell /Ntdma)
TotCarriers = CarriersPerCell*Ncells
Nfdma = CarriersPerCell*N       %% Total nuber of FDMA
carriers in system
BW = Nfdma*fdmaBW               %% calcuate bandwidth of the
system
Stotal = CarriersPerCell*Ntdma*Ncells  %% total number of
channels throughout entire hospital
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%% 2: Wireless channel characterization%%%%%%%%%%%%%%%%%

K = 32 ;                    %% attenuation constant
gamma = 2.2 ;               %% path-loss exponent
PAF = 2 ;                   %% partition attenuation factor
FAF = 12 ;                  %% floor attenuation factor
a =  1;
b =  35000;
pmax = 15 ;

p_axis = [-pmax:pmax];      %% vector for plots
tau_axis = [0:.0001:.06]; %% vector for plots

%% Q1: general path-loss representation
%%%%%%%%%%%%%%%%%%%%%

n = 3;                      %% enter number of attenuators:

d = [1:.001:dmax+1];
j = [1:length(d)];
L(j) = K + 10*gamma*log10(d);
plot(j/1000, L)
axis([0 dmax+1 0 max(L)+1]);
title('Representation of Path-Loss Attenuation ',
'fontsize', 20)
xlabel('Distance(meters)', 'fontsize', 20)
ylabel('Attenuation(dB)','fontsize', 20)
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

%%Q2: Calc average received power %%%%%%%%%%%%%%%%%%%%%%%
sensitivity_dBm = -100; %% sensitivity in dB
sensitivity = 10^(sensitivity_dBm/10);    %% calculate
sensitivity
prob = 0.01;   % probability that received signal will be <
-100dB

syms pow;    %% define unknown average received power value
pow = 2*sigma^2;
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% Power Distribution formula
% x is the received signal power (x = r^2).
% r is received signal envelope
syms x;
%% variable for recieved power:  p(x) =
(1/(2*sigma^2))*exp(-x/(2*sigma^2));

% prob(x<sensitivity) == int(p(x)dx) limits: [0-
>sensitivity]:
%% result: (1 - 1/exp(1/(10000000000*pow))

q = int((1/(pow))*exp(-x/pow),x,0,sensitivity)

AvgPower = double(solve(q-prob))
%% equation: prob = prob == (1 - 1/exp(1/(10000000000*pow))
AvgPow_dBm = 10*(log10(AvgPower))     %% minimum power in
dBm
```

```
%% 3: Communication system design and link
budget%%%%%%%%%%%
K = 32 ;                      %% attenuation constant
gamma = 2.2 ;                 %% path-loss exponent
Access_Pt =  3;               %% Access point antenna gain 3dbi
Coord =  0;                   %% coordinator antenna gain
PAF = 2 ;                     %% partition attenuation factor
FAF =  12;                    %% floor attenuation factor
N = 3;                        %% Cell size
M = 1;                        %% Number of interfering cells
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d = 16.15 ;              %%the most distant  loaction of my
cell

L = K + 10*gamma*log10(d);    %% path loss at the most
distant
L_lin = 10^(L/10);            %% path loss linear

%% Calc min TX power for access point
Tx_pow_AP = Pr(dbm)- Access_Pt + L
% Calc min tx power for coordinators
Tx_pow_Coord = Pr(dbm)- Coord + L


%% Calculate SIR
SIR = (1/M)*((sqrt(3*N))^gamma)
```