MATLAB CODE:

alpha = input("enter the alpha value") %absorption coefficent alpha(lambda)

beta = input("enter beta value") %scattering coefficent beta(lambda)

C = alpha + beta

%LOSS(L)

%d is length of water channel

%PT (λ): optical transmitting power

%PR (λ): optical receiver power.

%extinction coefficient C(λ) of the aqueous medium.

pt = input("enter the power of the transmitting end")

pr = input("enter the power of the receiving end")

p = pr+pt/2 %average power between the transmitting and receiving end.

d = input("enter the length of the water channel in meters.")

C =1/d\*log(pt/pr) %The extinction coefficient C(λ) of the aqueous medium consists of the absorption coefficient and the scattering α(λ), β(λ).

%The line of sight (LOS) method has been used between the transmitter and the receiver, so theoretical received optical power equation can be used

%PR=PT\*ηT\*ηR(e^(−C(λ)\*d/cosθ))\*ARec\*cosθ/π\*(d\*tanθo)^2

%ηT : Optical efficiency of the transmitter.

%ηR: Optical efficiency of the receiver.

%θ: is the angle between the perpendicular to the Rx plane and the Tx-Rx trajectory (slop angle).

%θ0: The divergence angle of the transmitter beam laser.

%ARec: the receiver aperture area.

eta1= input("enter the eta1 value") %ηT

eta2 = input("enter the eta2 value") %ηR

theta = input("enter the theta value in degree")

pi = 3.14; %or 22/7

theta1 = theta\*pi/180;

disp(theta1)

Arec = input("enter the receiver aperature area in m^2.")

thetao =input("enter the value for thetao in degree");

theta2 = thetao\*pi/180

pr = pt\*(eta1)\*(eta2)\*(exp((-C\*d/cos(theta1))))\*Arec\*cos(theta1)/(pi\*(d\*tan(theta2))^2)

% calculation of the SNR

p1=input("inital power in 1st medium")

p2=input("change in power found in the next medium")

pn = p1+p2 %noise produced power.

SNR = 10\*log10(pr/pn)

%the extinction coefﬁcient C(λ) in the receiver depending on the line of sight transmission method (LOS) when the slope angle (θ0) between the transmitter and the receiver equal to (0o) and simulate the results

% for calculating refractive index

c= 3\*10^-8;

v = input("enter the velocity")

lambda = input("enter the value of the wavelength in nm")

frequency = v/lambda %frequenccy calculation.

RI = c/v

%for the plot

concentration = 5:2:45;

RI2 = concentration

%title("underwater OC")

figure;

plot(concentration,RI2,'-o')

hold on;

xlabel("concentration")

ylabel("RI")

%pr vs concentration

concentration1 =1:0.005:100;

pr1 = 1./concentration1

%title("power of receiving vs conc")

figure;

plot(concentration1,pr1,'-o')

hold on;

xlabel("concentration1")

ylabel("pr1")

%SNR vs concentration

concentration2 =1:0.5:10;

snr = 1./(concentration2)

%title("snr vs concentration")

figure;

plot(concentration2,snr,'-ob')

hold on;

xlabel("concentration2")

ylabel("snr")

% attenuation vs concentration

concentration3 = 1:0.005:100;

attenuation= concentration3

title("attenuation vs concentration ")

figure;

plot(concentration3,attenuation,'-o')

hold on;

xlabel("concentration3")

ylabel("attenuation1")

%wavelength vs lambda.

wavelength1 = 300:50:700;

attenuation5 = 1./wavelength1

figure;

plot(wavelength1,attenuation5,'-or')

hold on;

grid on;

xlabel("wavelength1")

ylabel("attenuation5")