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LAMPIRAN 1.

Listing Program Matlab Untuk Mencari SNR_{sistem}

```
L = 1:0.05:30;   %panjang fiber
PRFin= (10^(3.5))/1000 %W
x=sqrt(2*(PRFin))
Gm = 0.12 %mW/mA
alfa1=0.5 %dB/km
alfa2 = 0.2 %dB/km
P0 = 0.5 %W
rho = 0.75
m = 0.5
nc=2
lc=0.25
ns=(L/5)-1
if ns<0
   ns=0
else
   ns=ns
end
ls=0.5
OL1=2*((alfa1.*L) + (nc*lc) +(ns*ls))
OL2=2*((alfa2.*L) + (nc*lc) +(ns*ls))
Lop1 = 10.^(-OL1/10)
Lop2 = 10.^(-OL2/10)
Id= rho*((1+m*(x)))*P0 %A
q= 1.6*10^(-19)
BW=1.8109 * 10^6
Ishot1 =(2*q*Id.*BW)
k = 1.38*10^(-23)
T=300
R1=50
Ith1 = (4*k*T.*BW/R1)
```

```
PRIN = 10^(-155/10)
Irin1 =(sqrt(PRIN*Id*Id.*BW))
nop1=(Ishot1+Ith1+Irin1)
f= 2300000000; %frekuensi kerja (Hz)
d = 1000;   %jarak pemancar ke penerima (m) --> radius microcell
d0 = 100;   %jarak referensi
s  = 9.6;   %shadow (dB)
a=4;
b= 0.0065;
c=17.1;
hb=32;  %tinggi antena BS (m)
h = 1.5;    %tinggi antena MS (m)
A= 20*(log10(4*pi*f*d/300000000));
gamma = (a-(b*hb)+ (c/hb));
deltaPLf = (6*(log10(f/2000)));
deltaPLh= ((-10.8)*(log10 (h/2)));
Lel = 10^-((A + (10*gamma*log10 (d/d0))+ s + deltaPLf + deltaPLh)/10)
nel=10^-((10*(log10 (k*T))+10*(log10 (5000000))+ 7)/10) %bandwidth subcarrier
512, 64 QAM, 14,26 Mbps
Gop=100
SNR1 = (m^2)*(Id^2)*PRFin*Lop1./(nop1+ (nel*((Lel/Gop)^2)))
SNR2 = (m^2)*(Id^2)*PRFin*Lop2./(nop1+ (nel*((Lel/Gop)^2)))
SNRb1= 10.*log10 (SNR1)
SNRb2= 10.*log10 (SNR2)
plot (L,SNRb1,'r', L,SNRb2,'b' )
grid on
xlabel('panjang serat optik (km)')
ylabel('SNR (dB)')
title('Grafik Pengaruh Panjang Serat Optik Terhadap SNR sistem')
legend('\lambda = 1310 nm','\lambda = 1550 nm')
```

LAMPIRAN 2.

Listing Program untuk Mencari Kapasitas Kanal Optik

```
L = 1:0.05:30;   %panjang fiber
Dm1 =14;%lamda = 1310 nm
Dm2 = 17; %lamda = 1500 nm
dlamda=0.1
tmat1 = Dm1 *dlamda*L
tmat2 = Dm2 *dlamda*L
tsumber = 16;
treceiver = 25;
tsistem1 = sqrt((tsumber^2)+(treceiver^2)+(tmat1.^2))
tsistem2 = sqrt((tsumber^2)+(treceiver^2)+(tmat2.^2))
BWsig1 = 0.44*10^3./(tsistem1.*L)
BWsig2 = 0.44*10^3./(tsistem2.*L)
PRFin= (10^(3.5))/1000 %W
x=sqrt(2*(PRFin))
Gm = 0.12 %mW/mA
alfa1=0.5 %dB/km
alfa2 = 0.2 %dB/km
P0 = 0.5 %W
rho = 0.75
m = 0.5
nc=2
lc=0.25
ns=(L/5)-1
if ns<0
   ns=0
else
   ns=ns
end
ls=0.5
OL1=2*((alfa1.*L) + (nc*lc) +(ns*ls))
```

```
OL2=2*((alfa2.*L) + (nc*lc) +(ns*ls))
Lop1 = 10.^(-OL1/10)
Lop2 = 10.^(-OL2/10)
Id= rho*((1+m*(x)))*P0 %A
q= 1.6*10^(-19)
BW=1.8109 * 10^6
Ishot1 =(2*q*Id.*BW)
k = 1.38*10^(-23)
T=300
R1=50
Ith1 = (4*k*T.*BW/R1)
PRIN = 10^(-155/10)
Irin1 =(sqrt(PRIN*Id*Id.*BW))
nop1=(Ishot1+Ith1+Irin1)
f= 2300000000; %frekuensi kerja (Hz)
d = 1000;   %jarak pemancar ke penerima (m) --> radius microcell
d0 = 100;   %jarak referensi
s  = 9.6;   %shadow (dB)
a=4;
b= 0.0065;
c=17.1;
hb=32;  %tinggi antena BS (m)
h = 1.5;    %tinggi antena MS (m)
A= 20*(log10(4*pi*f*d/300000000));
gamma = (a-(b*hb)+ (c/hb));
deltaPLf = (6*(log10(f/2000)));
deltaPLh= ((-10.8)*(log10 (h/2)));
Lel = 10^-((A + (10*gamma*log10 (d/d0))+ s + deltaPLf + deltaPLh)/10)
nel=10^-((10*(log10 (k*T))+10*(log10 (5000000))+ 7)/10) %bandwidth subcarrier
512, 64 QAM, 14,26 Mbps
Gop=100
SNR1 = (m^2)*(Id^2)*PRFin*Lop1./(nop1+ (nel*((Lel/Gop)^2)))
SNR2 = (m^2)*(Id^2)*PRFin*Lop2./(nop1+ (nel*((Lel/Gop)^2)))
SNRb1= 10.*log10 (SNR1)
```

```
SNRb2= 10.*log10 (SNR2)
C1= BWsig1.*log2(1+10.^(SNRb1/10)) %kapasitas kanal untuk lamda = 1310 nm
C2= BWsig2.*log2(1+10.^(SNRb2/10)) %kapasitas kanal untuk lamda = 1550 nm
plot (L,C1,'r', L,C2, 'b')
grid on
xlabel('panjang serat optik (km)')
ylabel('Kapasitas Kanal (Gbps)')
title('Grafik Pengaruh Panjang Serat Optik Terhadap Kapasitas Kanal')
legend('\lambda = 1310 nm','\lambda = 1550 nm')
```

LAMPIRAN 3.

Listing Program untuk Menentukan *Bit Rate*

```
L = 1:0.5:30;   %panjang fiber
Dm1 =14;%lamda = 1310 nm
Dm2 = 17; %lamda = 1500 nm
dlamda=0.1
tmat1 = -Dm1 *dlamda*L
tmat2 = -Dm2 *dlamda*L
tsumber = 16;
treceiver = 25;
tsistem1 = sqrt((tsumber^2)+(treceiver^2)+(tmat1.^2))
tsistem2 = sqrt((tsumber^2)+(treceiver^2)+(tmat2.^2))
BR1 = 0.7./(tsistem1*10^-3)    %Bit Rate untuk λ = 1310 nm (bps)
BR2 = 0.7./(tsistem2*10^-3)    % Bit Rate untuk λ = 1550 nm (bps)
plot (L,BR1,'r', L,BR2, 'b')
grid on
xlabel('panjang serat optik (km)')
ylabel('Bit Rate (Gbps)')
title('Grafik Pengaruh Panjang Serat Optik Terhadap Bit Rate Sistem')
```

LAMPIRAN 4.

Listing Program untuk Menentukan BER

```
L = 1:0.05:30;   %panjang fiber
PRFin= (10^(3.5))/1000 %W
x=sqrt(2*(PRFin))
Gm = 0.12 %mW/mA
alfa1=0.5 %dB/km
alfa2 = 0.2 %dB/km
P0 = 0.5 %W
rho = 0.75
m = 0.5
nc=2
lc=0.25
ns=(L/5)-1
if ns<0
   ns=0
else
   ns=ns
end
ls=0.5
OL1=2*((alfa1.*L) + (nc*lc) +(ns*ls))
OL2=2*((alfa2.*L) + (nc*lc) +(ns*ls))
Lop1 = 10.^(-OL1/10)
Lop2 = 10.^(-OL2/10)
Id= rho*((1+m*(x)))*P0 %A
q= 1.6*10^(-19)
BW=1.8109 * 10^6
Ishot1 =(2*q*Id.*BW)
k = 1.38*10^(-23)
T=300
R1=50
Ith1 = (4*k*T.*BW/R1)
```

```
PRIN = 10^(-155/10)
Irin1 =(sqrt(PRIN*Id*Id.*BW))
nop1=(Ishot1+Ith1+Irin1)
f= 2300000000; %frekuensi kerja (Hz)
d = 1000;   %jarak pemancar ke penerima (m) --> radius microcell
d0 = 100;   %jarak referensi
s  = 9.6;   %shadow (dB)
a=4;
b= 0.0065;
c=17.1;
hb=32;  %tinggi antena BS (m)
h = 1.5;    %tinggi antena MS (m)
A= 20*(log10(4*pi*f*d/300000000));
gamma = (a-(b*hb)+ (c/hb));
deltaPLf = (6*(log10(f/2000)));
deltaPLh= ((-10.8)*(log10 (h/2)));
Lel = 10^-((A + (10*gamma*log10 (d/d0))+ s + deltaPLf + deltaPLh)/10)
nel=10^-((10*(log10 (k*T))+10*(log10 (5000000))+ 7)/10) %bandwidth subcarrier
512, 64 QAM, 14,26 Mbps
Gop=100
SNR1 = (m^2)*(Id^2)*PRFin*Lop1./(nop1+ (nel*((Lel/Gop)^2)))
SNR2 = (m^2)*(Id^2)*PRFin*Lop2./(nop1+ (nel*((Lel/Gop)^2)))
SNRb1= 10.*log10 (SNR1)
SNRb2= 10.*log10 (SNR2)
BER1= 0.5*10^5*erfc(sqrt(SNRb1))
BER2= 0.5*10^5*erfc(sqrt(SNRb2))
plot(L,BER1,'r', L,BER2,'b')
grid on
xlabel('panjang serat optik (km)')
ylabel('BER ( x 10^-^5)')
title('Grafik Pengaruh Panjang Serat Optik Terhadap BER sistem')
legend('\lambda = 1310 nm','\lambda = 1550 nm')
```