

LAMPIRAN



LAMPIRAN 1

-Listing Program Matlab-

```
% perhitungan nilai Lrts  
W=15          %lebar jalan  
f=1800        %frekuensi  
hb=50          %tinggi antena BS  
delta_hm=[1:5:51] '%selisih antara antena UE dengan  
phi=-10+0.354*35    % sudut orrientasi antena dengan jalan 35 derajat  
Lrts==-16.9-10*log10(W)+20*log10(f)+20*log10(delta_hm)+(phi) %rumus  
Lrts
```



LAMPIRAN 2

-Listing Program Matlab-

```
%perhitungan nilai Lms h=30 m, b=30 m
b=150          %jarak antar titik tengah gedung
r=[0.1:0.5:5.1]' %radius
h=30          %tinggi gedung disekitar BS
hb=50          %tinggi antena BS
fc=1800        %frekuensi
x=[1:11]
y=x.^0
z=(y)'
kf=-4+1.5*((fc)/924)-1
delta_hb=20
Lbsh=-10*log10(1+delta_hb)    %rugi-rugi antar BS dengan gedung
disekitar bs
ka=54
kd=18
a=(log10(r))
Lms=(Lbsh)*z+(ka)*(z)+(kd)*(a)+(kf)*log10(fc)*(z)-9*log10(b)*z

%perhitungan nilai Lms h=30 m, b=150 m
b=150          %jarak antar titik tengah gedung
r=[0.1:0.5:5.1]' %radius
h=30          %tinggi gedung disekitar BS
hb=50          %tinggi antena BS
fc=1800        %frekuensi
x=[1:11]
y=x.^0
z=(y)'
kf=-4+1.5*((fc)/924)-1
delta_hb=20
Lbsh=-10*log10(1+delta_hb)    %rugi-rugi antar BS dengan gedung
disekitar bs
ka=54
kd=18
a=(log10(r))
Lms=(Lbsh)*z+(ka)*(z)+(kd)*(a)+(kf)*log10(fc)*(z)-9*log10(b)*z

%perhitungan nilai Lms h=30 m, b=500 m
b=500          %jarak antar titik tengah gedung
r=[0.1:0.5:5.1]' %radius
h=30          %tinggi gedung disekitar BS
hb=50          %tinggi antena BS
fc=1800        %frekuensi
x=[1:11]
y=x.^0
z=(y)'
kf=-4+1.5*((fc)/924)-1
delta_hb=20
Lbsh=-10*log10(1+delta_hb)    %rugi-rugi antar BS dengan gedung
disekitar bs
ka=54
kd=18
a=(log10(r))
Lms=(Lbsh)*z+(ka)*(z)+(kd)*(a)+(kf)*log10(fc)*(z)-9*log10(b)*z

%perhitungan nilai Lms h=30 m, b=1000 m
```



```

b=1000          %jarak antar titik tengah gedung
r=[0.1:0.5:5.1]' %radius
h=30           %tinggi gedung disekitar BS
hb=50           %tinggi antena BS
fc=1800         %frekuensi
x=[1:11]
y=x.^0
z=(y)'
kf=-4+1.5*((fc)/924)-1
delta_hb=20
Lbsh=-10*log10(1+delta_hb)      %rugi-rugi antar BS dengan gedung
disekitar BS
ka=54
kd=18
a=(log10(r))
Lms=(Lbsh)*z+(ka)*(z)+(kd)*(a)+(kf)*log10(fc)*(z)-9*log10(b)*z

%perhitungan nilai Lms untuk kondisi hb>h h=40 m, b=30
Lms=Lbsh+ka+kd*log10(d)+kf*log10(f)-9*log10(b)
b=30           %jarak antar titik tengah gedung
r=[0.1:0.5:5.1]' %radius
h=40           %tinggi gedung disekitar BS
hb=50           %tinggi antena BS
fc=1800         %frekuensi
x=[1:11]
y=x.^0
z=(y)'
kf=-4+1.5*((fc)/924)-1
delta_hb=10
Lbsh=-10*log10(1+delta_hb)      %rugi-rugi antar BS dengan gedung
disekitar BS
ka=54
kd=18
a=(log10(r))
Lms=(Lbsh)*z+(ka)*(z)+(kd)*(a)+(kf)*log10(fc)*(z)-9*log10(b)*z

%perhitungan nilai Lms untuk kondisi hb>h h=40 m, b=150
Lms=Lbsh+ka+kd*log10(d)+kf*log10(f)-9*log10(b)
b=150          %jarak antar titik tengah gedung
r=[0.1:0.5:5.1]' %radius
h=40           %tinggi gedung disekitar BS
hb=50           %tinggi antena BS
fc=1800         %frekuensi
x=[1:11]
y=x.^0
z=(y)'
kf=-4+1.5*((fc)/924)-1
delta_hb=10
Lbsh=-10*log10(1+delta_hb)      %rugi-rugi antar BS dengan gedung
disekitar BS
ka=54
kd=18
a=(log10(r))
Lms=(Lbsh)*z+(ka)*(z)+(kd)*(a)+(kf)*log10(fc)*(z)-9*log10(b)*z
%perhitungan nilai Lms untuk kondisi hb>h h=40 m, b=500
Lms=Lbsh+ka+kd*log10(d)+kf*log10(f)-9*log10(b)
b=500          %jarak antar titik tengah gedung
r=[0.1:0.5:5.1]' %radius
h=40           %tinggi gedung disekitar BS
hb=50           %tinggi antena BS
fc=1800         %frekuensi

```

```

x=[1:11]
y=x.^0
z=(y)'
kf=-4+1.5*((fc)/924)-1
delta_hb=10
Lbsh=-10*log10(1+delta_hb) %rugi-rugi antar BS dengan gedung
disekitar BS
ka=54
kd=18
a=(log10(r))
Lms=(Lbsh)*z+(ka)*(z)+(kd)*(a)+(kf)*log10(fc)*(z)-9*log10(b)*z

%perhitungan nilai Lms untuk kondisi hb>h h=40 m, b=1000
Lms=Lbsh+ka+kd*log10(d)+kf*log10(f)-9*log10(b)
b=1000 %jarak antar titik tengah gedung
r=[0.1:0.5:5.1]' %radius
h=40 %tinggi gedung disekitar BS
hb=50 %tinggi antena BS
fc=1800 %frekuensi
x=[1:11]
y=x.^0
z=(y)'
kf=-4+1.5*((fc)/924)-1
delta_hb=10
Lbsh=-10*log10(1+delta_hb) %rugi-rugi antar BS dengan gedung
disekitar BS
ka=54
kd=18
a=(log10(r))
Lms=(Lbsh)*z+(ka)*(z)+(kd)*(a)+(kf)*log10(fc)*(z)-9*log10(b)*z

%perhitungan nilai LMS hb<h h=60 m, b=30 m
b=30 %jarak antara gedung disekitar BS
r=[0.1:0.5:5.1]' %radius antara BS dengan UE
h=60 %ketinggian gedung disekitar BS
hb=50 %ketinggian antena BS
fc=1800 %frekuensi
x=[1:11]
y=x.^0
z=(y)'
kf=-4+1.5*((fc)/924)-1
delta_hb=-10
Lbsh=0 %rugi-rugi antar BS dengan gedung disekitar BS
ka=54-0.8*(delta_hb)
n=(delta_hb)/(h)
kd=18-15*(n)
a=(log10(r))
Lms=(Lbsh)*z+(ka)*(z)+(kd)*(a)+(kf)*log10(fc)*(z)-9*log10(b)*z

%perhitungan nilai LMS hb<h h=60 m, b=150 m
b=150 %jarak antara gedung disekitar BS
r=[0.1:0.5:5.1]' %radius antara BS dengan UE
h=60 %ketinggian gedung disekitar BS
hb=50 %ketinggian antena BS
fc=1800 %frekuensi
x=[1:11]
y=x.^0
z=(y)'
kf=-4+1.5*((fc)/924)-1
delta_hb=-10
Lbsh=0 %rugi-rugi antar BS dengan gedung disekitar BS

```



```

ka=54-0.8*(delta_hb)
n=(delta_hb)/(h)
kd=18-15*(n)
a=(log10(r))
Lms=(Lbsh)*z+(ka)*(z)+(kd)*(a)+(kf)*log10(fc)*(z)-9*log10(b)*z

%perhitungan nilai LMS hb<h h=60 m, b=500 m
b=500          %jarak antara gedung disekitar BS
r=[0.1:0.5:5.1]' %radius antara BS dengan UE
h=60           %ketinggian gedung disekitar BS
hb=50           %ketinggian antena BS
fc=1800         %frekuensi
x=[1:11]
y=x.^0
z=(y)'
kf=-4+1.5*((fc)/924)-1
delta_hb=-10
Lbsh=0          %rugi-rugi antar BS dengan gedung disekitar BS
ka=54-0.8*(delta_hb)
n=(delta_hb)/(h)
kd=18-15*(n)
a=(log10(r))
Lms=(Lbsh)*z+(ka)*(z)+(kd)*(a)+(kf)*log10(fc)*(z)-9*log10(b)*z

%perhitungan nilai LMS hb<h h=60 m, b=1000 m
b=1000         %jarak antara gedung disekitar BS
r=[0.1:0.5:5.1]' %radius antara BS dengan UE
h=60           %ketinggian gedung disekitar BS
hb=50           %ketinggian antena BS
fc=1800         %frekuensi
x=[1:11]
y=x.^0
z=(y)'
kf=-4+1.5*((fc)/924)-1
delta_hb=-10
Lbsh=0          %rugi-rugi antar BS dengan gedung disekitar BS
ka=54-0.8*(delta_hb)
n=(delta_hb)/(h)
kd=18-15*(n)
a=(log10(r))
Lms=(Lbsh)*z+(ka)*(z)+(kd)*(a)+(kf)*log10(fc)*(z)-9*log10(b)*z

%perhitungan nilai LMS hb<h h=70 m, b=30 m
b=30          %jarak antara gedung disekitar BS
r=[0.1:0.5:5.1]' %radius antara BS dengan UE
h=70           %ketinggian gedung disekitar BS
hb=50           %ketinggian antena BS
fc=1800         %frekuensi
x=[1:11]
y=x.^0
z=(y)'
kf=-4+1.5*((fc)/924)-1
delta_hb=-10
Lbsh=0          %rugi-rugi antar BS dengan gedung disekitar BS
ka=54-0.8*(delta_hb)
n=(delta_hb)/(h)
kd=18-15*(n)
a=(log10(r))
Lms=(Lbsh)*z+(ka)*(z)+(kd)*(a)+(kf)*log10(fc)*(z)-9*log10(b)*z

%perhitungan nilai LMS hb<h h=70 m, b=150 m

```



```

b=150          %jarak antara gedung disekitar BS
r=[0.1:0.5:5.1]' %radius antara BS dengan UE
h=70          %ketinggian gedung disekitar BS
hb=50          %ketinggian antena BS
fc=1800        %frekuensi
x=[1:11]
y=x.^0
z=(y)'
kf=-4+1.5*((fc)/924)-1
delta_hb=-10
Lbsh=0          %rugi-rugi antar BS dengan gedung disekitar BS
ka=54-0.8*(delta_hb)
n=(delta_hb)/(h)
kd=18-15*(n)
a=(log10(r))
Lms=(Lbsh)*z+(ka)*(z)+(kd)*(a)+(kf)*log10(fc)*(z)-9*log10(b)*z

%perhitungan nilai LMS hb<h h=70 m, b=500 m
b=500          %jarak antara gedung disekitar BS
r=[0.1:0.5:5.1]' %radius antara BS dengan UE
h=70          %ketinggian gedung disekitar BS
hb=50          %ketinggian antena BS
fc=1800        %frekuensi
x=[1:11]
y=x.^0
z=(y)'
kf=-4+1.5*((fc)/924)-1
delta_hb=-10
Lbsh=0          %rugi-rugi antar BS dengan gedung disekitar BS
ka=54-0.8*(delta_hb)
n=(delta_hb)/(h)
kd=18-15*(n)
a=(log10(r))
Lms=(Lbsh)*z+(ka)*(z)+(kd)*(a)+(kf)*log10(fc)*(z)-9*log10(b)*z

%perhitungan nilai LMS hb<h h=70 m, b=1000 m
b=1000         %jarak antara gedung disekitar BS
r=[0.1:0.5:5.1]' %radius antara BS dengan UE
h=70          %ketinggian gedung disekitar BS
hb=50          %ketinggian antena BS
fc=1800        %frekuensi
x=[1:11]
y=x.^0
z=(y)'
kf=-4+1.5*((fc)/924)-1
delta_hb=-10
Lbsh=0          %rugi-rugi antar BS dengan gedung disekitar BS
ka=54-0.8*(delta_hb)
n=(delta_hb)/(h)
kd=18-15*(n)
a=(log10(r))
Lms=(Lbsh)*z+(ka)*(z)+(kd)*(a)+(kf)*log10(fc)*(z)-9*log10(b)*z

```

LAMPIRAN 3

-Listing Program Matlab-

```
%perhitungan pathloss total kondisi NLOS hb>h, lrts pada delta_hm=39,
lms pada h=40 dan b=30
PL_NLOS=32.4+20*log10(d)+20*log10(f)+Lrts+Lms %rumus patloss kondisi
NLOS
d=[0.1:0.5:5.1]' %jarak antara BS dengan UE
f=1800 %frekuensi
Lrts=31.5437 %rugi-rugi roof-top-to-street
Lms=[3.9001 %rugi-rugi multiscreen difraction
17.9069
22.6452
25.5743
27.7001
29.3697
30.7447
31.9136
32.9303
33.8298
34.6364]
x=[1:11]
y=x.^0
z=(y)'
PL_NLOS=32.4+20*log10(d)+20*log10(f)*z+Lrts*z+Lms %pathloss NLOS

%perhitungan pathloss total kondisi NLOS hb>h, lrts pada delta_hm=39,
lms pada h=40 dan b=500
PL_NLOS=32.4+20*log10(d)+20*log10(f)+Lrts+Lms
d=[0.1:0.5:5.1]' %jarak antara BS dengan UE
f=1800 %jarak antara BS dengan UE
Lrts=31.5437 %rugi-rugi roof-top-to-street
Lms=[-7.0965 %rugi-rugi multi screen difraksi
6.9102
11.6486
14.5777
16.7035
18.373
19.7480
20.9169
21.9336
22.8331
23.6398]
x=[1:11]
y=x.^0
z=(y)'
PL_NLOS=32.4+20*log10(d)+20*log10(f)*z+Lrts*z+Lms %Pathloss NLOS

%perhitungan pathloss total kondisi NLOS hb>h, lrts pada delta_hm=29,
lms pada h=30 dan b=500
PL_NLOS=32.4+20*log10(d)+20*log10(f)+Lrts+Lms
d=[0.1:0.5:5.1]' %jarak antara BS dengan UE
f=1800 %frekuensi
Lrts=28.9704 %rugi-rugi roof-top-to-street
Lms=[-9.9048 %rugi-rugi multi screen difraksi
4.102
8.8403
11.7694
```

```

13.8952
15.5648
16.9397
18.1087
19.1253
20.0249
20.8315]
x=[1:11]
y=x.^0
z=(y)'
PL_NLOS=32.4+20*log10(d)+20*log10(f)*z+Lrts*z+Lms %pathloss NLOS

%perhitungan pathloss total kondisi NLOS hb>h, lrts pada delta_hm=29,
lms pada h=30 dan b=30
PL_NLOS=32.4+20*log10(d)+20*log10(f)+Lrts+Lms
d=[0.1:0.5:5.1]' %jarak antara BS dengan UE
f=1800 %jarak antara BS dengan UE
Lrts=28.9704 %rugi-rugi roof-top-to-street
Lms=[1.0919 %rugi-rugi multi screen difraksi
15.0986
19.8369
22.766
24.8918
26.5614
27.9364
29.1053
30.122
31.0215
31.8281]
x=[1:11]
y=x.^0
z=(y)'
PL_NLOS=32.4+20*log10(d)+20*log10(f)*z+Lrts*z+Lms %Pathloss NLOS

%perhitungan pathloss total kondisi NLOS hb<h, lrts pada delta_hm=59,
lms pada h=60 dan b=30, phi=20
PL_NLOS=32.4+20*log10(d)+20*log10(f)+Lrts+Lms
d=[0.1:0.5:5.1]' %jarak antara BS dengan UE
f=1800 %frekuensi
Lrts=42.0595 %nilai Lrts
Lms=[19.8141 %nilai Lms
35.7662
41.1626
44.4985
46.9196
48.821
50.3870
51.7183
52.8761
53.9006
54.8193]
x=[1:11]
y=x.^0
z=(y)'
PL_NLOS=32.4*z+20*log10(d)+20*log10(f)*z+Lrts*z+Lms %rumus PL NLOS

%perhitungan pathloss total kondisi NLOS hb<h, lrts pada delta_hm=59,
lms pada h=60 dan b=500, phi=20
PL_NLOS=32.4+20*log10(d)+20*log10(f)+Lrts+Lms
d=[0.1:0.5:5.1]' %jarak antara BS dengan UE
f=1800 %frekuensi

```



```

Lrts=35.1395 %nilai Lrts
Lms=[8.8174 %nilai Lms
24.7695
30.166
33.5019
35.9229
37.8244
39.3903
40.7216
41.8795
42.904
43.8226]
x=[1:11]
y=x.^0
z=(y)'
PL_NLOS=32.4*z+20*log10(d)+20*log10(f)*z+Lrts*z+Lms %rumus PL NLOS

%perhitungan pathloss total kondisi NLOS hb<h, lrts pada delta_hm=69,
lms pada h=70 dan b=30, phi=20
PL_NLOS=32.4+20*log10(d)+20*log10(f)+Lrts+Lms
d=[0.1:0.5:5.1]' %jarak antara BS dengan UE
f=1800 %frekuensi
Lrts=36.4994 %nilai Lrts
Lms=[26.0284 %nilai Lms
43.37
49.2365
52.863
55.495
57.562
59.2644
60.7117
61.9704
63.0841
64.0828]
x=[1:11]
y=x.^0
z=(y)'
PL_NLOS=32.4*z+20*log10(d)+20*log10(f)*z+Lrts*z+Lms %rumus PL NLOS

%perhitungan pathloss total kondisi NLOS hb<h, lrts pada delta_hm=69,
lms pada h=70 dan b=500, phi=20
PL_NLOS=32.4+20*log10(d)+20*log10(f)+Lrts+Lms
d=[0.1:0.5:5.1]' %jarak antara BS dengan UE
f=1800 %frekuensi
Lrts=36.4994 %nilai Lrts
Lms=[15.0317 %nilai Lms
32.3734
38.2399
41.8664
44.4983
46.5654
48.2678
49.715
50.9738
52.0875
53.0861]
x=[1:11]
y=x.^0
z=(y)'
PL_NLOS=32.4*z+20*log10(d)+20*log10(f)*z+Lrts*z+Lms %rumus PL NLOS

```



```
%perhitungan pathloss total kondisi NLOS hb<h, lrts pada delta_hm=59,
lms
%pada h=60 dan b=30, phi=55
PL_NLOS=32.4+20*log10(d)+20*log10(f)+Lrts+Lms
d=[0.1:0.5:5.1]' %jarak antara BS dengan UE
f=1800 %frekuensi
Lrts=42.0595 %nilai Lrts
Lms=[19.8141 %nilai Lms
35.7662
41.1626
44.4985
46.9196
48.821
50.3870
51.7183
52.8761
53.9006
54.8193]
x=[1:11]
y=x.^0
z=(y)'
PL_NLOS=32.4*z+20*log10(d)+20*log10(f)*z+Lrts*z+Lms %rumus PL NLOS

%perhitungan pathloss total kondisi NLOS hb<h, lrts pada delta_hm=59,
lms pada h=60 dan b=30, phi=50
PL_NLOS=32.4+20*log10(d)+20*log10(f)+Lrts+Lms
d=[0.1:0.5:5.1]' %jarak antara BS dengan UE
f=1800 %frekuensi
Lrts=42.0595 %nilai Lrts
Lms=[8.8174 %nilai Lms
24.7695
30.166
33.5019
35.9229
37.8244
39.3903
40.7216
41.8795
42.904
43.8226]
x=[1:11]
y=x.^0
z=(y)'
PL_NLOS=32.4*z+20*log10(d)+20*log10(f)*z+Lrts*z+Lms %rumus PL NLOS

%perhitungan pathloss total kondisi NLOS hb<h, lrts pada delta_hm=69,
lms
%pada h=70 dan b=30, phi=55
PL_NLOS=32.4+20*log10(d)+20*log10(f)+Lrts+Lms
d=[0.1:0.5:5.1]' %jarak antara BS dengan UE
f=1800 %frekuensi
Lrts=42.0595 %nilai Lrts
Lms=[26.0284 %nilai Lms
43.37
49.2365
52.863
55.495
57.562
59.2644
60.7117
61.9704
```

```

63.0841
64.0828]
x=[1:11]
y=x.^0
z=(y)'
PL_NLOS=32.4*z+20*log10(d)+20*log10(f)*z+Lrts*z+Lms %rumus PL NLOS

```

%perhitungan pathloss total kondisi NLOS hb<h, lrts pada delta_hm=69, lms pada h=70 dan b=500, phi=55

```

PL_NLOS=32.4+20*log10(d)+20*log10(f)+Lrts+Lms
d=[0.1:0.5:5.1]' %jarak antara BS dengan UE
f=1800 %frekuensi
Lrts=42.0595 %nilai Lrts
Lms=[15.0317 %nilai Lms
32.3734
38.2399
41.8664
44.4983
46.5654
48.2678
49.715
50.9738
52.0875
53.0861]
x=[1:11]
y=x.^0
z=(y)'
PL_NLOS=32.4*z+20*log10(d)+20*log10(f)*z+Lrts*z+Lms %rumus PL NLOS

```

%perhitungan nilai pathloss LOS

```

a=[0.1 %radius BS dengan UE
0.6
1.1
1.6
2.1
2.6
3.1
3.6
4.1
4.6
5.1]
b=1800 %jarak antara titik tengah gedung disekitar BS
x=[1:11]
y=x.^0
z=y'

```

```

PL=42.6*z+26*log10(a)+20*log10(b)*z %rumus Pathloss kondisi LOS

```



LAMPIRAN 4

-Listing Program Matlab-

```
%perhitungan nilai level daya terima kondisi hb>h dengan h=30, b=30
Pr=Pt+Gt-Gr-PL-Gkt-Gkr %persamaan level daya terima
x=[1:11]
y=x.^0
z=y'
Pt=46*z
Gt=18*z
Gr=0*z
PL=[107.5678
137.1375
147.1406
153.3242
157.812
161.3367
164.2395
166.7072
168.8535
170.7525
172.4554]
Gkt=2*z
Gkr=0*z
Pr=Pt+Gt-Gr-PL-Gkt-Gkr %rugi-rugi kabel di transmitter
%rugi-rugi kabel di receiver
%rumus level daya terima

%perhitungan nilai level daya terima kondisi hb>h dengan h=30, b=500
m
Pr=Pt+Gt-Gr-PL-Gkt-Gkr %persamaan level daya terima
x=[1:11]
y=x.^0
z=y'
Pt=46*z
Gt=18*z
Gr=0*z
PL=[96.5711
126.1409
136.144
142.3276
146.8154
150.3401
153.2428
155.7106
157.8568
159.7559
161.4588]
Gkt=2*z
Gkr=0*z
Pr=Pt+Gt-Gr-PL-Gkt-Gkr %rugi-rugi kabel di transmitter
%rugi-rugi kabel di receiver
%rumus level daya terima

%perhitungan nilai level daya terima kondisi hb>h dengan h=40, b=30
Pr=Pt+Gt-Gr-PL-Gkt-Gkr %persamaan level daya terima
x=[1:11]
y=x.^0
z=y'
Pt=46*z
Gt=18*z
Gr=0*z %power transmit
%gain antena transmitter
%gain antena receiver
```



```

PL=[112.9493
142.5191
152.5222
158.7058
163.1936
166.7183
169.6211
172.0888
174.2351
176.1341
177.837]
Gkt=2*z
Gkr=0*z
Pr=Pt+Gt-Gr-PL-Gkt-Gkr

%nilai pathloss pada h=40, b= 30 m

%rugi-rugi kabel di transmitter
%rugi-rugi kabel di receiver
%rumus level daya terima

%perhitungan nilai level daya terima kondisi hb>h dengan h=40, b=500
Pr=Pt+Gt-Gr-PL-Gkt-Gkr
x=[1:11]
y=x.^0
z=y'
Pt=46*z
Gt=18*z
Gr=0*z
PL=[101.9527
131.5224
141.5256
147.7092
152.197
155.7216
158.6244
161.0921
163.2384
165.1374
166.8404]
Gkt=2*z
Gkr=0*z
Pr=Pt+Gt-Gr-PL-Gkt-Gkr

%power transmit
%gain antena transmitter
%gain antena receiver
%nilai pathloss pada h=40, b=500 m

%rugi-rugi kabel di transmitter
%rugi-rugi kabel di receiver
%rumus level daya terima

%perhitungan nilai level daya terima kondisi hb<h dengan h=60, b=30,
dan phi 20 derajat
Pr=Pt+Gt-Gr-PL-Gkt-Gkr
x=[1:11]
y=x.^0
z=y'
Pt=46*z
Gt=18*z
Gr=0*z
PL=[132.4591
163.9742
174.6354
181.2258
186.0089
189.7654
192.8592
195.4893
197.7767
199.8007
201.6157]
Gkt=2*z
Gkr=0*z
Pr=Pt+Gt-Gr-PL-Gkt-Gkr

%power transmitt
%gain antena transmitter
%gain antena receiver
%nilai pathloss pada h=60, b= 30 m

%rugi-rugi kabel di transmitter
%rugi-rugi kabel di receiver
%rumus level daya terima

```



```
%perhitungan nilai level daya terima kondisi hb<h dengan h=60, b=500,
dan phi 20 derajat
Pr=Pt+Gt-Gr-PL-Gkt-Gkr %persamaan level daya terima
x=[1:11]
y=x.^0
z=y'
Pt=46*z %power transmitt
Gt=18*z %gain antena transmitter
Gr=0*z %gain antena receiver
PL=[121.4624 %nilai pathloss pada h=60, b= 500
m
152.9775
163.6388
170.2292
175.0122
178.7688
181.8625
184.4926
186.7801
188.8041
190.619]
Gkt=2*z %rugi-rugi kabel di transmitter
Gkr=0*z %rugi-rugi kabel di receiver
Pr=Pt+Gt-Gr-PL-Gkt-Gkr %rumus level daya terima

%perhitungan nilai level daya terima kondisi hb<h dengan h=70, b=30,
dan phi 20 derajat
Pr=Pt+Gt-Gr-PL-Gkt-Gkr %persamaan level daya terima
x=[1:11]
y=x.^0
z=y'
Pt=46*z %power transmitt
Gt=18*z %gain antena transmitter
Gr=0*z %gain antena receiver
PL=[140.0333 %nilai pathloss pada h=70, b= 30 m
m
172.9379
184.0692
190.9502
195.9442
199.8663
203.0965
205.8426
208.2309
210.3441
212.2391]
Gkt=2*z %rugi-rugi kabel di transmitter
Gkr=0*z %rugi-rugi kabel di receiver
Pr=Pt+Gt-Gr-PL-Gkt-Gkr %rumus level daya terima

%perhitungan nilai level daya terima kondisi hb<h dengan h=70, b=500,
dan phi 20 derajat
Pr=Pt+Gt-Gr-PL-Gkt-Gkr %persamaan level daya terima
x=[1:11]
y=x.^0
z=y'
Pt=46*z %power transmitt
Gt=18*z %gain antena transmitter
Gr=0*z %gain antena receiver
PL=[129.0366 %nilai pathloss pada h=70, b= 500 m
m
161.9413
```





173.0726
179.9536
184.9475
188.8697
192.0999
194.8459
197.2343
199.3475
201.2424]
 $G_{kt}=2^*z$
 $G_{kr}=0^*z$
 $P_r=P_t+G_t-G_{kt}-G_{kr}$

%rugi-rugi kabel di transmitter
%rugi-rugi kabel di receiver
%rumus level daya terima

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LAMPIRAN 5

-Listing Program Matlab-

```
%Analisa nilai SNR hb>h (Pr-N0)QPSK dan 16 QAM 1/2 h=40, b=500
Pr=[-39.9527 %nilai level daya terima
-69.5224
-79.5256
-85.7092
-90.197
-93.7216
-96.6244
-99.0921
-101.2384
-103.1374
-104.8404]
x=[1:11]
y=x.^0
z=y'
N0=-130.9484*z %nilai noise sistem
SNR=Pr-N0 % nilai SNR

%Analisa nilai SNR hb>h QPSK 1/2 dan 16 QAM 1/2 (Pr-N0)h=40, b=30
Pr=[-50.9493 %nilai level daya terima
-80.5191
-90.5222
-96.7058
-101.1936
-104.7183
-107.6211
-110.0888
-112.2351
-114.1341
-115.837]
x=[1:11]
y=x.^0
z=y'
N0=-130.9484*z %nilai noise sistem
SNR=Pr-N0 % nilai SNR

%Analisa nilai SNR hb>h QPSK 1/2 dan 16 QAM 1/2(Pr-N0)h=30, b=30
Pr=[-45.5678 %nilai level daya terima
-75.1375
-85.1406
-91.3242
-95.812
-99.3367
-102.2395
-104.7072
-106.8535
-108.7525
-110.4554]
x=[1:11]
y=x.^0
z=y'
N0=-130.9484*z %nilai noise sistem
SNR=Pr-N0 % nilai SNR
```

%Analisa nilai SNR hb>h QPSK 1/2 dan 16 QAM 1/2(Pr-N0)h=30, b=500
 $Pr=[-34.5711 \dots -99.4588]$ %nilai level daya terima

-64.1409

-74.144

-80.3276

-84.8154

-88.3401

-91.2428

-93.7106

-95.8568

-97.7559

-99.4588]

$x=[1:11]$

$y=x.^0$

$z=y'$

$N0=-130.9484*z$

$SNR=Pr-N0$

%nilai noise sistem

% nilai SNR

%Analisa nilai SNR hb>h (Pr-N0)h=40, b=30 16 QAM 3/4 dan 64 QAM 3/4
 $Pr=[-50.9493 \dots -115.837]$ %nilai level daya terima

-80.5191

-90.5222

-96.7058

-101.1936

-104.7183

-107.6211

-110.0888

-112.2351

-114.1341

-115.837]

$x=[1:11]$

$y=x.^0$

$z=y'$

$N0=-129.1874*z$

$SNR=Pr-N0$

%nilai noise sistem

% nilai SNR

%Analisa nilai SNR hb>h (Pr-N0)h=40, b=500 16 QAM 3/4 dan 64 QAM 3/4
 $Pr=[-39.9527 \dots -104.8404]$ %nilai level daya terima

-69.5224

-79.5256

-85.7092

-90.197

-93.7216

-96.6244

-99.0921

-101.2384

-103.1374

-104.8404]

$x=[1:11]$

$y=x.^0$

$z=y'$

$N0=-129.1874*z$

$SNR=Pr-N0$

%nilai noise sistem

% nilai SNR

%Analisa nilai SNR hb>h (Pr-N0)h=30, b=30 16 QAM 3/4 dan 64 QAM 3/4
 $Pr=[-45.5678 \dots -99.3367]$ %nilai level daya terima

-75.1375

-85.1406

-91.3242

-95.812

-99.3367



```
-102.2395
-104.7072
-106.8535
-108.7525
-110.4554]
x=[1:11]
y=x.^0
z=y'
N0=-129.1874*z %nilai noise sistem
SNR=Pr-N0 % nilai SNR

%Analisa nilai SNR hb>h (Pr-N0)h=30, b=500 16 QAM 3/4 dan 64 QAM 3/4
Pr=[-34.5711
-64.1409
-74.144
-80.3276
-84.8154
-88.3401
-91.2428
-93.7106
-95.8568
-97.7559
-99.4588]
x=[1:11]
y=x.^0
z=y'
N0=-129.1874*z %nilai noise sistem
SNR=Pr-N0 % nilai SNR

%Analisa nilai SNR hb>h (Pr-N0)h=40, b=30 64 QAM 4/5
Pr=[-50.9493
-80.5191
-90.5222
-96.7058
-101.1936
-104.7183
-107.6211
-110.0888
-112.2351
-114.1341
-115.837]
x=[1:11]
y=x.^0
z=y'
N0=-127.9381*z %nilai noise sistem
SNR=Pr-N0 % nilai SNR

%Analisa nilai SNR hb>h (Pr-N0)h=40, b=500 64 QAM 4/5
Pr=[-39.9527
-69.5224
-79.5256
-85.7092
-90.197
-93.7216
-96.6244
-99.0921
-101.2384
-103.1374
-104.8404]
x=[1:11]
y=x.^0
```

```
z=y'  
N0=-127.9381*z           %nilai noise sistem  
SNR=Pr-N0                 % nilai SNR  
  
%Analisa nilai SNR hb>h (Pr-N0)h=30, b=30 64 QAM 4/5  
Pr=[-45.5678               %nilai level daya terima  
-75.1375  
-85.1406  
-91.3242  
-95.812  
-99.3367  
-102.2395  
-104.7072  
-106.8535  
-108.7525  
-110.4554]  
x=[1:11]  
y=x.^0  
z=y'  
N0=-127.9381*z           %nilai noise sistem  
SNR=Pr-N0                 % nilai SNR  
  
%Analisa nilai SNR hb>h (Pr-N0)h=30, b=500 64 QAM 4/5  
Pr=[-34.5711               %nilai level daya terima  
-64.1409  
-74.144  
-80.3276  
-84.8154  
-88.3401  
-91.2428  
-93.7106  
-95.8568  
-97.7559  
-99.4588]  
x=[1:11]  
y=x.^0  
z=y'  
N0=-127.9381*z           %nilai noise sistem  
SNR=Pr-N0                 % nilai SNR  
  
%Analisa nilai SNR hb<h (Pr-N0)h=60, b=30 QPSK 1/2 DAN 16 qAM 1/2  
Pr=[-70.4591               %nilai level daya terima  
-101.9742  
-112.6354  
-119.2258  
-124.0089  
-127.7654  
-130.8592  
-133.4893  
-135.7767  
-137.8007  
-139.6157]  
x=[1:11]  
y=x.^0  
z=y'  
N0=-130.9484*z           %nilai noise sistem  
SNR=Pr-N0                 % nilai SNR  
  
%Analisa nilai SNR hb<h (Pr-N0)h=60, b=500 QPSK 1/2 DAN 16 QAM 1/2  
Pr=[-59.4624               %nilai level daya terima  
-90.9775
```

```
-101.6388
-108.2292
-113.0122
-116.7688
-119.8625
-122.4926
-124.7801
-126.8041
-128.619]
x=[1:11]
y=x.^0
z=y'
N0=-130.9484*z %nilai noise sistem
SNR=Pr-N0 % nilai SNR

%Analisa nilai SNR hb<h (Pr-N0)h=70, b=30 QPSK 1/2 dan 16QAM 1/2
Pr=[-78.0333
-110.9379
-122.0692
-128.9502
-133.9442
-137.8663
-141.0965
-143.8426
-146.2309
-148.3441
-150.2391]
x=[1:11]
y=x.^0
z=y'
N0=-130.9484*z %nilai noise sistem
SNR=Pr-N0 % nilai SNR

%Analisa nilai SNR hb<h (Pr-N0)h=70, b=500 QPSK 1/2 dan 16 QAM 1/2
Pr=[-67.0366
-99.9413
-111.0726
-117.9536
-122.9475
-126.8697
-130.0999
-132.8459
-135.2343
-137.3475
-139.2424]
x=[1:11]
y=x.^0
z=y'
N0=-130.9484*z %nilai noise sistem
SNR=Pr-N0 % nilai SNR

%Analisa nilai SNR LOS QPSK dan 16 QAM 1/2
Pr=[-19.7055
-39.9374
-46.7817
-51.0126
-54.0832
-56.4948
-58.4809
-60.1693
-61.6378
-63.1555
-64.6732
-66.1909
-67.7086
-69.2263
-70.7441
-72.2618
-73.7795
-75.2972
-76.8149
-78.3326
-79.8503
-81.3680
-82.8857
-84.4034
-85.9211
-87.4388
-88.9565
-90.4742
-91.9919
-93.5096
-95.0273
-96.5450
-98.0627
-99.5804
-101.0981
-102.6158
-104.1335
-105.6512
-107.1689
-108.6866
-110.2043
-111.7220
-113.2397
-114.7574
-116.2751
-117.7928
-119.3105
-120.8282
-122.3459
-123.8636
-125.3813
-126.8990
-128.4167
-129.9344
-131.4521
-132.9698
-134.4875
-135.9952
-137.5129
-139.0306
-140.5483
-142.0660
-143.5837
-145.1014
-146.6191
-148.1368
-149.6545
-151.1722
-152.6899
-154.2076
-155.7253
-157.2430
-158.7607
-160.2784
-161.7961
-163.3138
-164.8315
-166.3492
-167.8669
-169.3846
-170.9023
-172.4190
-173.9367
-175.4534
-176.9711
-178.4888
-179.9965
-181.5132
-183.0309
-184.5476
-186.0643
-187.5810
-189.0977
-190.6144
-192.1311
-193.6488
-195.1655
-196.6822
-198.2000
-199.7167
-201.2334
-202.7501
-204.2678
-205.7845
-207.3012
-208.8180
-210.3347
-211.8514
-213.3681
-214.8848
-216.4015
-217.9182
-219.4349
-220.9516
-222.4683
-223.9850
-225.5017
-227.0184
-228.5351
-229.0518
-230.5685
-231.0852
-232.6019
-233.1186
-234.6353
-235.1520
-236.6687
-237.1854
-238.6921
-239.2088
-240.7255
-241.2422
-242.7589
-243.2756
-244.7923
-245.3090
-246.8257
-247.3424
-248.8591
-249.3758
-250.8925
-251.4092
-252.9259
-253.4426
-254.9593
-255.4760
-256.9927
-257.5094
-258.0261
-259.5428
-260.0595
-261.5762
-262.0929
-263.6106
-264.1273
-265.6450
-266.1617
-267.6784
-268.1951
-269.7118
-270.2285
-271.7452
-272.2619
-273.7786
-274.2953
-275.8120
-276.3287
-277.8454
-278.3621
-279.8788
-280.3955
-281.9122
-282.4189
-283.9356
-284.4523
-285.9690
-286.4857
-287.0024
-288.5191
-289.0358
-289.5525
-290.0692
-290.5859
-291.1026
-291.6193
-292.1360
-292.6527
-293.1694
-293.6861
-294.2028
-294.7195
-295.2362
-295.7529
-296.2696
-296.7863
-297.3030
-297.8197
-298.3364
-298.8531
-299.3708
-299.8875
-300.4042
-300.9209
-301.4376
-301.9543
-302.4710
-302.9877
-303.5044
-304.0211
-304.5378
-305.0545
-305.5712
-306.0879
-306.6046
-307.1213
-307.6380
-308.1547
-308.6714
-309.1881
-309.7048
-310.2215
-310.7382
-311.2549
-311.7716
-312.2883
-312.8050
-313.3217
-313.8384
-314.3551
-314.8718
-315.3885
-315.9052
-316.4219
-316.9386
-317.4553
-317.9720
-318.4887
-318.9954
-319.5121
-319.9988
-320.5245
-321.0512
-321.5779
-322.1046
-322.6313
-323.1580
-323.6847
-324.2114
-324.7381
-325.2648
-325.7915
-326.3182
-326.8449
-327.3716
-327.8983
-328.4250
-328.9517
-329.4784
-329.9951
-330.5028
-331.0295
-331.5562
-332.0829
-332.6096
-333.1363
-333.6630
-334.1907
-334.7174
-335.2441
-335.7708
-336.3075
-336.8342
-337.3609
-337.8876
-338.4143
-338.9410
-339.4677
-339.9944
-340.5211
-341.0478
-341.5745
-342.1012
-342.6279
-343.1546
-343.6813
-344.2080
-344.7347
-345.2614
-345.7881
-346.3148
-346.8415
-347.3682
-347.8949
-348.4216
-348.9483
-349.4750
-349.9917
-350.5054
-351.0321
-351.5588
-352.0855
-352.6122
-353.1389
-353.6656
-354.1923
-354.7190
-355.2457
-355.7724
-356.3001
-356.8268
-357.3535
-357.8802
-358.4069
-358.9336
-359.4603
-359.9870
-360.5037
-361.0304
-361.5571
-362.0838
-362.6105
-363.1372
-363.6639
-364.1906
-364.7173
-365.2440
-365.7707
-366.3004
-366.8271
-367.3538
-367.8805
-368.4072
-368.9339
-369.4606
-369.9873
-370.5043
-371.0310
-371.5577
-372.0844
-372.6111
-373.1378
-373.6645
-374.1912
-374.7179
-375.2446
-375.7713
-376.3000
-376.8267
-377.3534
-377.8801
-378.4068
-378.9335
-379.4602
-379.9869
-380.5036
-381.0303
-381.5570
-382.0837
-382.6104
-383.1371
-383.6638
-384.1905
-384.7172
-385.2449
-385.7716
-386.3003
-386.8260
-387.3537
-387.8804
-388.4071
-388.9338
-389.4605
-389.9872
-390.5042
-391.0309
-391.5576
-392.0843
-392.6110
-393.1377
-393.6644
-394.1911
-394.7178
-395.2445
-395.7712
-396.3009
-396.8266
-397.3533
-397.8800
-398.4067
-398.9334
-399.4601
-399.9865
-400.5038
-401.0305
-401.5572
-402.0839
-402.6106
-403.1375
-403.6642
-404.1909
-404.7176
-405.2443
-405.7710
-406.3007
-406.8264
-407.3531
-407.8808
-408.4065
-408.9332
-409.4608
-409.9875
-410.5041
-411.0308
-411.5575
-412.0842
-412.6109
-413.1376
-413.6643
-414.1910
-414.7177
-415.2444
-415.7711
-416.3008
-416.8265
-417.3532
-417.8809
-418.4066
-418.9333
-419.4609
-419.9876
-420.5042
-421.0309
-421.5577
-422.0845
-422.6112
-423.1379
-423.6646
-424.1913
-424.7180
-425.2447
-425.7714
-426.3011
-426.8268
-427.3535
-427.8812
-428.4069
-428.9336
-429.4613
-429.9879
-430.5046
-431.0313
-431.5570
-432.0847
-432.6114
-433.1377
-433.6644
-434.1911
-434.7178
-435.2445
-435.7712
-436.3009
-436.8266
-437.3533
-437.8800
-438.4067
-438.9334
-439.4601
-439.9865
-440.5038
-441.0305
-441.5572
-442.0839
-442.6106
-443.1375
-443.6642
-444.1909
-444.7176
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-727.8812
-728.4069
-728.9336
-729.4613
-729.9879
-730.5046
-731.0313
-731.5570
-732.0847
-732.6114
-733.1377
-733.6644
-734.1911
-734.7178
-735.2445
-735.7712
-736.3009
-736.8266
-737.3533
-737.8800
-738.4067
-738.9334
-739.4601
-739.9865
-740.5038
-741.0305
-741.5572
-742.0839
-742.6106
-743.1375
-743.6642
-744.1909
-744.7176
-745.2443
-745.7710
-746.3007
-746.8264
-747.3531
-747.8808
-748.4065
-
```

```
-62.9372
-64.1023]
x=[1:11]
y=x.^0
z=y'
N0=-130.9484*z      %nilai noise sistem
SNR=Pr-N0             % nilai SNR

%Analisa nilai SNR LOS 16 QAM 3/4 DAN 64 QAM 3/4
Pr=[-19.7055          %nilai level daya terima
-39.9374
-46.7817
-51.0126
-54.0832
-56.4948
-58.4809
-60.1693
-61.6378
-62.9372
-64.1023]
x=[1:11]
y=x.^0
z=y'
N0=-129.1874*z      %nilai noise sistem
SNR=Pr-N0             % nilai SNR

%Analisa nilai SNR LOS 16 QAM 4-5
Pr=[-19.7055          %nilai level daya terima
-39.9374
-46.7817
-51.0126
-54.0832
-56.4948
-58.4809
-60.1693
-61.6378
-62.9372
-64.1023]
x=[1:11]
y=x.^0
z=y'
N0=-127.9381*z      %nilai noise sistem
SNR=Pr-N0             % nilai SNR
```



LAMPIRAN 6

- Listing Program Matlab -

```
%ber untuk QPSK h=40 m, b=30 m
Eb_N0=[76.9922 %nilai Eb/N0
47.4224
37.4193
31.2357
26.7479
23.2232
20.3204
17.8527
15.7064
13.8074
12.1045]
Pb=1/2*erfc(sqrt(Eb_N0)) %persamaan nilai BER QPSK

%ber untuk QPSK h= 40 m, b= 500 m
Eb_N0=[87.9888
58.4191
48.4159
42.2323
37.7445
34.2199
31.3171
28.8494
26.7031
24.8041
23.1011]
Pb=1/2*erfc(sqrt(Eb_N0)) %persamaan nilai BER QPSK

%ber untuk QPSK h= 30 m , b= 30 m
Eb_N0=[82.3737
52.804
42.8009
36.6173
32.1295
28.6048
25.702
23.2343
21.088
19.189
17.4861]
Pb=1/2*erfc(sqrt(Eb_N0)) %persamaan nilai BER QPSK

%ber untuk QPSK h=30 m, b=500 m
Eb_N0=[93.3704
63.8006
53.7975
47.6139
43.1261
39.6014
36.6987
34.2309
32.0847
30.1856
28.4827]
```



```
Pb=1/2*erfc(sqrt(Eb_N0)) %persamaan nilai BER QPSK

%ber untuk n16 QAM 1/2 baru
m=16 %jumlah bit per simbol
Eb_N0=[ 73.9819 %nilai Eb/N0
44.4121
34.409
28.2254
23.7376
20.2129
17.3101
14.8424
12.6961
10.7971
9.0942]
x=[1:11]
y=x.^0
z=y'
a=(4*(sqrt(m)-1)/(sqrt(m)*log2(m))) %persamaan BER
b=sqrt(3*log2(m)/(4*(m-1))*Eb_N0) %persamaan BER
c=erfc(b) %fungsi erc
d=a*c %hasil nilai BER

%ber untuk n16 QAM 1/2 baru
m=16 %jumlah bit per simbol
Eb_N0=[ 84.9785 %nilai Eb/N0
55.4088
45.4056
39.222
34.7342
31.2096
28.3068
25.8391
23.6928
21.7938
20.0908]
x=[1:11]
y=x.^0
z=y'
a=(4*(sqrt(m)-1)/(sqrt(m)*log2(m))) %persamaan BER
b=sqrt(3*log2(m)/(4*(m-1))*Eb_N0) %persamaan BER
c=erfc(b) %fungsi erc
d=a*c %hasil nilai BER

%ber untuk n16 QAM 1/2 baru
m=16 %jumlah bit per simbol
Eb_N0=[ 79.3634 %nilai Eb/N0
49.7937
39.7906
33.607
29.1192
25.5945
22.6917
20.224
18.0777
16.1787
14.4758]
a=(4*(sqrt(m)-1)/(sqrt(m)*log2(m))) %persamaan BER
b=sqrt(3*log2(m)/(4*(m-1))*Eb_N0) %persamaan BER
c=erfc(b) %fungsi erc
d=a*c %hasil nilai BER
```

```
%ber untuk n16 QAM 1/2 baru
m=16 %jumlah bit per simbol
Eb_N0=[90.3601 %nilai Eb/N0
60.7903
50.7872
44.6036
40.1158
36.5911
33.6884
31.2206
29.0744
27.1753
25.4724]
a=(4*(sqrt(m)-1)/(sqrt(m)*log2(m)))
b=sqrt(3*log2(m)/(4*(m-1))*Eb_N0)
c=erfc(b)
d=a*c

%persamaan BER
%persamaan BER
%fungsi erc
%hasil nilai BER

%ber untuk n16 QAM 3/4 baru
m=16 %jumlah bit per simbol
Eb_N0=[72.2209 %nilai Eb/N0
42.6511
32.648
26.4644
21.9766
18.4519
15.5491
13.0814
10.9351
9.0361
7.3332]
a=(4*(sqrt(m)-1)/(sqrt(m)*log2(m))) %persamaan BER
b=sqrt(3*log2(m)/(4*(m-1))*Eb_N0) %persamaan BER
c=erfc(b) %fungsi erc
d=a*c %hasil nilai BER

%ber untuk n16 QAM 3/4 baru
m=16 %jumlah bit per simbol
Eb_N0=[83.2175 %nilai Eb/N0
43.6446
37.461
32.9732
29.4486
26.5458
24.0781
21.9318
20.0328
18.3298]
a=(4*(sqrt(m)-1)/(sqrt(m)*log2(m))) %persamaan BER
b=sqrt(3*log2(m)/(4*(m-1))*Eb_N0) %persamaan BER
c=erfc(b) %fungsi erc
d=a*c %hasil nilai BER

%ber untuk n16 QAM 3/4 baru
m=16 %jumlah bit per simbol
Eb_N0=[77.6024 %nilai Eb/N0
48.0327
38.0296
```

```
31.846  
27.3582  
23.8335  
20.9307  
18.463  
16.3167  
14.4177  
12.7148]  
a=(4*(sqrt(m)-1)/(sqrt(m)*log2(m))) %persamaan BER  
b=sqrt(3*log2(m)/(4*(m-1))*(Eb_N0)) %persamaan BER  
c=erfc(b) %fungsi erc  
d=a*c %hasil nilai BER  
  
%ber untuk n64 QAM 4/5 baru  
m=64 %jumlah bit per simbol  
Eb_N0=[80.2073 %nilai Eb/N0  
50.6376  
40.6344  
34.4508  
29.963  
26.4384  
23.5356  
21.0679  
18.9216  
17.0226  
15.3196]  
a=(4*(sqrt(m)-1)/(sqrt(m)*log2(m))) %persamaan BER  
b=sqrt(3*log2(m)/(4*(m-1))*(Eb_N0)) %persamaan BER  
c=erfc(b) %fungsi erc  
d=a*c %hasil nilai BER  
  
%ber untuk n64 QAM 4/5 baru  
m=64 %jumlah bit per simbol  
Eb_N0=[69.2107 %nilai Eb/N0  
39.6409  
29.6378  
23.4542  
18.9664  
15.4417  
12.5389  
10.0712  
7.9249  
6.0259  
4.323]  
a=(4*(sqrt(m)-1)/(sqrt(m)*log2(m))) %persamaan BER  
b=sqrt(3*log2(m)/(4*(m-1))*(Eb_N0)) %persamaan BER  
c=erfc(b) %fungsi erc  
d=a*c %hasil nilai BER  
  
%ber untuk n64 QAM 4/5 baru  
m=64 %jumlah bit per simbol  
Eb_N0=[74.5922 %nilai Eb/N0  
45.0225  
35.0194  
28.8358  
24.348  
20.8233  
17.9205  
15.4528  
13.3065  
11.4075
```



```

9.7046]
a=(4*(sqrt(m)-1)/(sqrt(m)*log2(m)))%persamaan BER
b=sqrt(3*log2(m)/(4*(m-1))*(Eb_N0))%persamaan BER
c=erfc(b)                                %fungsi erc
d=a*c                                     %hasil nilai BER

%ber untuk n64 QAM 4/5 baru
m=64                                         %jumlah bit per simbol
Eb_N0=[85.5889  %nilai Eb/N0
56.0191
46.016
39.8324
35.3446
31.8199
28.9172
26.4494
24.3032
22.4041
20.7012]

a=(4*(sqrt(m)-1)/(sqrt(m)*log2(m)))%persamaan BER
b=sqrt(3*log2(m)/(4*(m-1))*(Eb_N0))%persamaan BER
c=erfc(b)                                %fungsi erc
d=a*c                                     %hasil nilai BER

```



LAMPIRAN 7

-Listing Program Matlab-

```
%Grafik nilai Lrts
a=[-0.2776      %Nilai Lrts phi = 20 derajat
5.743
9.2649
11.7636
13.7018
15.2855
16.6244
17.7842
18.8073
19.7224
20.5503
21.3061
22.0013
22.645
23.2443
23.8048
24.3314
24.8279
25.2975
25.743
26.1668
26.5709
26.957
27.3266
27.6812
28.0219
28.3497
28.6656
28.9704
29.2649
29.5497
29.8254
30.0927
30.352
30.6038
30.8485
31.0865
31.3181
31.5437
31.7636
31.9781
32.1874
32.3918
32.5915
32.7867
32.9776
33.1644
33.3472
33.5263
33.7018
33.8738
34.0425
34.2079
34.3703
```



34.5297
34.6862
34.8399
34.991
35.1395
35.2855
35.429
35.5703
35.7092
35.846
35.9807
36.1133
36.2439
36.3726
36.4994
36.6244]
 $b=[6.6424$
12.663
16.1849
18.6836
20.6218
22.2055
23.5444
24.7042
25.7273
26.6424
27.4703
28.2261
28.9213
29.565
30.1643
30.7248
31.2514
31.7479
32.2175
32.663
33.0868
33.4909
33.877
34.2466
34.6012
34.9419
35.2697
35.5856
35.8904
36.1849
36.4697
36.7454
37.0127
37.272
37.5238
37.7685
38.0065
38.2381
38.4637
38.6836
38.8981
39.1074
39.3118
39.5115
39.7067

%Nilai Lrts phi =55 derajat



```
39.8976  
40.0844  
40.2672  
40.4463  
40.6218  
40.7938  
40.9625  
41.1279  
41.2903  
41.4497  
41.6062  
41.7599  
41.911  
42.0595  
42.2055  
42.349  
42.4903  
42.6292  
42.766  
42.9007  
43.0333  
43.1639  
43.2926  
43.4194  
43.5444]  
c=[1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36
```

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%Nilai delta hm



```
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60  
61  
62  
63  
64  
65  
66  
67  
68  
69  
70]  
plot(c,a,c,b)  
xlabel('delta-hm')  
ylabel('nilai Lrts')  
grid on
```



%grafik sumbu x dan y
%label sumbu x
%label sumbu y
%layout grafik

LAMPIRAN 8

-Listing Program Matlab-

```
%gambaran grafik nilai Pathloss hb>h
a=[112.9493      %nilai pathloss h=40 b= 30m
142.5191
152.5222
158.7058
163.1936
166.7183
169.6211
172.0888
174.2351
176.1341
177.837]
b=[101.9527      %nilai pathloss h=40, b=500 m
131.5224
141.5256
147.7092
152.197
155.7216
158.6244
161.0921
163.2384
165.1374
166.8404]
c=[107.5678      %Nilai pathloss h=30, b=30
137.1375
147.1406
153.3242
157.812
161.3367
164.2395
166.7072
168.8535
170.7525
172.4554]
d=[96.5711      %nilai pathloss h=30 b=500
126.1409
136.144
142.3276
146.8154
150.3401
153.2428
155.7106
157.8568
159.7559
161.4588]
r=[0.1:0.5:5.1]'
plot(r,a,r,b,r,c,r,d)          %ploting grafik
grid on                         %layout grafik
xlabel('Radius (km)')           %label sumbu x
ylabel('Nilai Pathloss')         %label sumbu y

%grafik PL hb<h untuk phi=55
a=[139.3791      %nilai pathloss h=60 b=30 m
170.8942
181.5554
```

```
188.1458
192.9289
196.6854
199.7792
202.4093
204.6967
206.7207
208.5357]
b=[128.3824           %nilai pathloss h=60, b=500
159.8975
170.5588
177.1492
181.9322
185.6888
188.7825
191.4126
193.7001
195.7241
197.539]
c=[145.5934           %nilai pathloss h=70, b=30
178.498
189.6293
196.5103
201.5043
205.4264
208.6566
211.4027
213.791
215.9042
217.7992]
d=[134.5967           %nilai pathloss h=70, b=500
167.5014
178.6327
185.5137
190.5076
194.4298
197.66
200.406
202.7944
204.9076
206.8025]
r=[0.1
0.6
1.1
1.6
2.1
2.6
3.1
3.6
4.1
4.6
5.1]
plot(r,a,r,b,r,c,r,d)           %ploting grafik
grid on                         %layout grafik
xlabel('Radius (km)')           %label sumbu x
ylabel('Nilai Pathloss hb<h phi 55 derajat')      %label sumbu y
%grafik PL hb<h untuk phi = 20 derajat
a=[132.4591           %nilai pathloss h=60 b=30 m
163.9742
174.6354
```

```

181.2258
186.0089
189.7654
192.8592
195.4893
197.7767
199.8007
201.6157]
b=[121.4624           %nilai pathloss h=60, b=500
152.9775
163.6388
170.2292
175.0122
178.7688
181.8625
184.4926
186.7801
188.8041
190.619]
c=[140.0333           %nilai pathloss h=70, b=30
172.9379
184.0692
190.9502
195.9442
199.8663
203.0965
205.8426
208.2309
210.3441
212.2391]
d=[129.0366           %nilai pathloss h=70, b=500
161.9413
173.0726
179.9536
184.9475
188.8697
192.0999
194.8459
197.2343
199.3475
201.2424]
r=[0.1                 %radius
0.6
1.1
1.6
2.1
2.6
3.1
3.6
4.1
4.6
5.1]
plot(r,a,r,b,r,c,r,d)      %ploting grafik
grid on                      %layout grafik
xlabel('Radius (km)')        %label sumbu x
ylabel('Nilai Pathloss NLOS hb<h phi 20 derajat')    %label sumbu y

%grafik pl LOS
a=[0.1      %radius
0.6

```

```
1.1  
1.6  
2.1  
2.6  
3.1  
3.6  
4.1  
4.6  
5.1]  
b=[81.7055 %Nilai pathloss  
101.9374  
108.7817  
113.0126  
116.0832  
118.4948  
120.4809  
122.1693  
123.6378  
124.9372  
126.1023]  
plot(a,b)      %plotting grafik  
grid on        %layout grafik  
xlabel('Radius (km)')    %label sumbu x  
ylabel('Nilai Pathloss') %label sumbu y
```



LAMPIRAN 9

-Listing Program Matlab-

```
%grafik nilai Pr hb<h untuk phi = 20 derajat
a=[0.1      %Radius
0.6
1.1
1.6
2.1
2.6
3.1
3.6
4.1
4.6
5.1]
b=[-70.4591 %nilai level daya terima h=60, b=30 m
-101.9742
-112.6354
-119.2258
-124.0089
-127.7654
-130.8592
-133.4893
-135.7767
-137.8007
-139.6157]
c=[-59.4624 %nilai level daya terima h=60, b=500m
-90.9775
-101.6388
-108.2292
-113.0122
-116.7688
-119.8625
-122.4926
-124.7801
-126.8041
-128.619]
d=[-78.0333 %nilai level daya terima h=70, b=30 m
-110.9379
-122.0692
-128.9502
-133.9442
-137.8663
-141.0965
-143.8426
-146.2309
-148.3441
-150.2391]
e=[-67.0366 %nilai level daya terima h=70, b=500 m
-99.9413
-111.0726
-117.9536
-122.9475
-126.8697
-130.0999
-132.8459
-135.2343
```

```

-137.3475
-139.2424]
plot(a,b,a,c,a,d,a,e)          %plotting grafik
grid on                         %layout grafik
xlabel('Radius (km)')           %label sumbu x
ylabel('Nilai Pr (dBm)')         %label sumbu y

%grafik nilai Pr hb<h untuk phi = 55 derajat
a=[0.1                           %radius
0.6
1.1
1.6
2.1
2.6
3.1
3.6
4.1
4.6
5.1]
b=[-77.3791                      %nilai level daya terima h=60, b=30 m
-108.8942
-119.5554
-126.1458
-130.9289
-134.6854
-137.7792
-140.4093
-142.6967
-144.7207
-146.5357]
c=[-66.3824                      %nilai level daya terima h=60, b=500m
-97.8975
-108.5588
-115.1492
-119.9322
-123.6888
-126.7825
-129.4126
-131.7001
-133.7241
-135.539]
d=[-83.5934                      %nilai level daya terima h=70, b=30 m
-116.498
-127.6293
-134.5103
-139.5043
-143.4264
-146.6566
-149.4027
-151.791
-153.9042
-155.7992]
e=[-72.5967                      %nilai level daya terima h=70, b=500 m
-105.5014
-116.6327
-123.5137
-128.5076
-132.4298
-135.66
-138.406
-140.7944

```



```

-142.9076
-144.8025]
plot(a,b,a,c,a,d,a,e) %plotting grafik
grid on %layout grafik
xlabel('Radius (km)') %label sumbu x
ylabel('Nilai Pr (dBm)') %label sumbu y

%grafik nilai Pr hb>h
a=[0.1      %radius
0.6
1.1
1.6
2.1
2.6
3.1
3.6
4.1
4.6
5.1]
b=[-50.9493   %Nilai level daya terima h=40, b=30
-80.5191
-90.5222
-96.7058
-101.1936
-104.7183
-107.6211
-110.0888
-112.2351
-114.1341
-115.837]
c=[-39.9527   %Nilai level daya terima h=40, b=500 m
-69.5224
-79.5256
-85.7092
-90.197
-93.7216
-96.6244
-99.0921
-101.2384
-103.1374
-104.8404]
d=[-45.5678   %Nilai level daya terima h=30, b= 30 m
-75.1375
-85.1406
-91.3242
-95.812
-99.3367
-102.2395
-104.7072
-106.8535
-108.7525
-110.4554]
e=[-34.5711   %nilai level daya terima h=30, b=500 m
-64.1409
-74.144
-80.3276
-84.8154
-88.3401
-91.2428
-93.7106
-95.8568

```





```
-97.7559
-99.4588]
plot(a,b,a,c,a,d,a,e)
grid on
xlabel('Radius (km)')
ylabel('Nilai Pr (dBm)')

%plotting grafik
%layout grafik
%label sumbu x
%label sumbu y
```

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LAMPIRAN 10

-Listing Program Matlab-

```
%grafik nilai SNR hb>h QPSK 1-2
x=[1:11]
y=x.^0
z=y'
a=[0.1           %radius
0.6
1.1
1.6
2.1
2.6
3.1
3.6
4.1
4.6
5.1]
b=[79.9991      %Nilai SNr h=40, b=30 m
50.4293
40.4262
34.2426
29.7548
26.2301
23.3273
20.8596
18.7133
16.8143
15.1114]
c=[90.9957      %nilai SNR h=40, b=500 m
61.426
51.4228
45.2392
40.7514
37.2268
34.324
31.8563
29.71
27.811
26.108]
d=[85.3806      %nilai SNR h=30, b=30 m
55.8109
45.8078
39.6242
35.1364
31.6117
28.7089
26.2412
24.0949
22.1959
20.493]
e=[96.3773      %nilai SNR h=30, b=500 m
66.8075
56.8044
50.6208
46.133
42.6083
39.7056]
```



```

37.2378
35.0916
33.1925
31.4896]
f=[2]*z          %batas SNR minimal
plot(a,b,a,c,a,d,a,e,a,f)      %plotting grafik
grid on          %layout grafik
xlabel('Radius (km)')           %label sumbu x
ylabel('Nilai SNR (dB)')        %label sumbu y

%grafik nilai SNR hb>h 16QAM 1-2
x=[1:11]
y=x.^0
z=y'
a=[0.1          %radius
0.6
1.1
1.6
2.1
2.6
3.1
3.6
4.1
4.6
5.1]
b=[79.9991     %Nilai Snr h=40, b=30' m
50.4293
40.4262
34.2426
29.7548
26.2301
23.3273
20.8596
18.7133
16.8143
15.1114]
c=[90.9957     %nilai SNR h=40, b=500 m
61.426
51.4228
45.2392
40.7514
37.2268
34.324
31.8563
29.71
27.811
26.108]
d=[85.3806     %nilai SNR h=30, b=30 m
55.8109
45.8078
39.6242
35.1364
31.6117
28.7089
26.2412
24.0949
22.1959
20.493]
e=[96.3773     %nilai SNR h=30, b=500 m
66.8075
56.8044

```

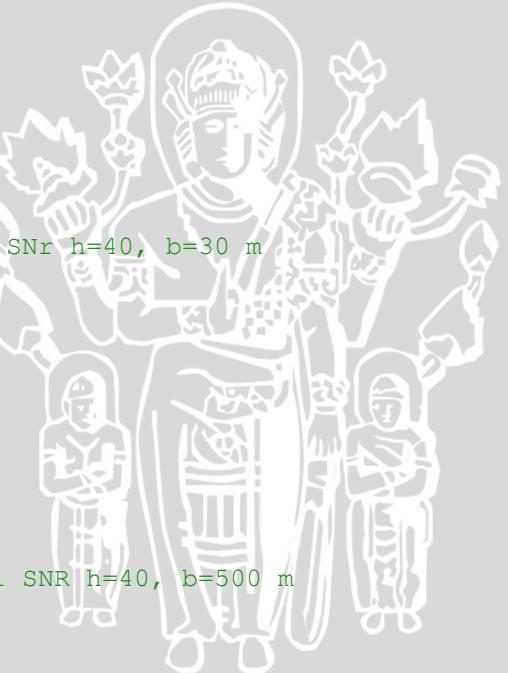
```

50.6208
46.133
42.6083
39.7056
37.2378
35.0916
33.1925
31.4896]
f=[7.9]*z          %batas SNR minimal
plot(a,b,a,c,d,a,e,a,f)      %plotting grafik
grid on             %layout grafik
xlabel('Radius (km)')       %label sumbu x
ylabel('Nilai SNR (dB)')    %label sumbu y

%grafik nilai SNR hb>h 16 QAM 3/4
x=[1:11]
y=x.^0
z=y'
a=[0.1           %radius
0.6
1.1
1.6
2.1
2.6
3.1
3.6
4.1
4.6
5.1]
b=[78.2381      %Nilai SNR h=40, b=30 m
48.6683
38.6652
32.4816
27.9938
24.4691
21.5663
19.0986
16.9523
15.0533
13.3504]
c=[89.2347      %nilai SNR h=40, b=500 m
59.665
49.6618
43.4782
38.9904
35.4658
32.563
30.0953
27.949
26.05
24.347]
d=[83.6196      %nilai SNR h=30, b=30 m
54.0499
44.0468
37.8632
33.3754
29.8507
26.9479
24.4802
22.3339

```

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```

20.4349
18.732]
e=[94.6163           %nilai SNR h=30, b=500 m
65.0465
55.0434
48.8598
44.372
40.8473
37.9446
35.4768
33.3306
31.4315
29.7286]
f=[12.2]*z          %batas SNR minimal
plot(a,b,a,c,a,d,a,e,a,f)      %plotting grafik
grid on                   %layout grafik
xlabel('Radius (km)')       %label sumbu x
ylabel('Nilai SNR (dB)')     %label sumbu y

%grafik nilai SNR hb>h 16 QAM 3/4
x=[1:11]
y=x.^0
z=y'
a=[0.1           %radius
0.6
1.1
1.6
2.1
2.6
3.1
3.6
4.1
4.6
5.1]
b=[78.2381      %Nilai SNr h=40, b=30 m
48.6683
38.6652
32.4816
27.9938
24.4691
21.5663
19.0986
16.9523
15.0533
13.3504]
c=[89.2347      %nilai SNR h=40, b=500 m
59.665
49.6618
43.4782
38.9904
35.4658
32.563
30.0953
27.949
26.05
24.347]
d=[83.6196      %nilai SNR h=30, b=30 m
54.0499
44.0468
37.8632
33.3754

```



```

29.8507
26.9479
24.4802
22.3339
20.4349
18.732]
e=[94.6163      %nilai SNR h=30, b=500 m
65.0465
55.0434
48.8598
44.372
40.8473
37.9446
35.4768
33.3306
31.4315
29.7286]
f=[17.5]*z      %batas SNR minimal
plot(a,b,a,c,a,d,a,e,a,f)    %plotting grafik
grid on                %layout grafik
xlabel('Radius (km)')      %label sumbu x
ylabel('Nilai SNR (dB)')    %label sumbu y

%grafik nilai SNR hb>h  64 QAM 4/5
x=[1:11]
y=x.^0
z=y'
a=[0.1      %radius
0.6
1.1
1.6
2.1
2.6
3.1
3.6
4.1
4.6
5.1]
b=[76.9888    %Nilai SNR h=40, b=30 m
47.419
37.4159
31.2323
26.7445
23.2198
20.317
17.8493
15.703
13.804
12.1011]
c=[87.9854    %nilai SNR h=40, b=500 m
58.4157
48.4125
42.2289
37.7411
34.2165
31.3137
28.846
26.6997
24.8007
23.0977]
d=[82.3703    %nilai SNR h=30, b=30 m

```

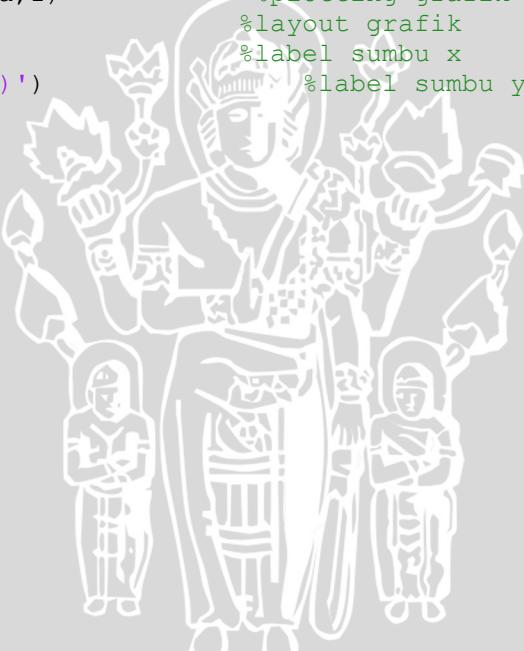


```

52.8006
42.7975
36.6139
32.1261
28.6014
25.6986
23.2309
21.0846
19.1856
17.4827]
e=[93.367 %nilai SNR h=30, b=500 m
63.7972
53.7941
47.6105
43.1227
39.598
36.6953
34.2275
32.0813
30.1822
28.4793]
f=[18.6]*z %batas SNR minimal
plot(a,b,a,c,a,d,a,e,a,f) %plotting grafik
grid on %layout grafik
xlabel('Radius (km)') %label sumbu x
ylabel('Nilai SNR (dB)') %label sumbu y

```

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LAMPIRAN 11

-Listing Program Matlab-

```
%gambar grafik BER LOS
x=[0.1           %radius
 0.6
 1.1
 1.6
 2.1
 2.6
 3.1
 3.6
 4.1
 4.6
 5.1]
a=10^-29*[0.0001
 0.0001
 0.0001
 0.0001
 0.0003
 0.0023
 0.0125
 0.0551
 0.2040
 0.6599]
b=10^-6*[ 0.0001
 0.0041
 0.0169
 0.0405
 0.0764
 0.1257
 0.1896
 0.2690
 0.3647
 0.4776
 0.6082]
c=10^-6*[0.0001
 0.0059
 0.0243
 0.0583
 0.1099
 0.1810
 0.2731
 0.3875
 0.5256
 0.6884
 0.8769]
d=[0.0001
 0.0004
 0.0006
 0.0009
 0.0011
 0.0014
 0.0016
 0.0018
 0.002
 0.0022
 0.0001
 0.0001
 0.0001
 0.0001
 0.0003
 0.0023
 0.0125
 0.0551
 0.2040
 0.6599]
%nilai BER QPSK
%Nilai BER 16 QAM 1/2
%nilai BER 16 QAM 3/4
%nilai BER 64 QAM 3/4
```

```
0.0025]  
e=[0.0001 %nilai BER 64 QAM 4/5  
0.0004  
0.0007  
0.001  
0.0012  
0.0015  
0.0017  
0.002  
0.0022  
0.0025  
0.0027]  
semilogy(x,a,x,b,x,c,x,d,x,e) %logaritmik plotting grafik  
grid on %layout grafik  
xlabel('Radius') % %label sumbu x  
ylabel('Nilai BER') %label sumbu y  
  
x=[0.1 %radius  
0.6  
1.1  
1.6  
2.1  
2.6  
3.1  
3.6  
4.1  
4.6  
5.1]  
a=[0*10.^-6 %Nilai BER QPSK 1/2  
0*10.^-6  
0*10.^-6  
0*10.^-6  
0*10.^-6  
0*10.^-6  
0*10.^-6  
0.0001*10.^-6  
0.0011*10.^-6  
0.0104*10.^-6  
0.074*10.^-6  
0.4321*10.^-6]  
b=[0.0000 %Nilai BER 16 QAM 1/2  
0.0000  
0.0002  
0.0008  
0.0021  
0.0045  
0.0085  
0.0148  
0.0242  
0.0377  
0.0565]  
c=[0.0000 %Nilai BER 16 QAM 3/4  
0.0000  
0.0002  
0.0009  
0.0023  
0.0049  
0.0095  
0.0166  
0.0274  
0.043  
0.0651]
```

```

d=[0.0009 %Nilai BER 64 QAM 3/4
 0.0091
 0.0208
 0.0352
 0.0521
 0.0715
 0.0936
 0.1187
 0.1472
 0.1797
 0.2172]
e=[0.001 %Nilai BER 64 QAM 4/5
 0.0101
 0.0231
 0.0392
 0.0582
 0.0802
 0.1054
 0.1344
 0.1676
 0.2062
 0.252]
semilogy(x,a,x,b,x,c,x,d,x,e)
grid on
xlabel('Radius')
ylabel('Nilai BER')

%logaritmik plotting grafik
%layout grafik
%label sumbu x
%label sumbu y

```

