Lampiran 1. *Listing* Program Matlab Perhitungan *link budget* teknik modulasi adaptif pada jaringan LTE

```
f=2.3;
ht=30;
hr=1.5;
d=0.5:0.5:3;
EIRP=67;
Grx=10;
Lrx=0;
B=10*10^6;
k=1.38*10^-23;
T=290;
SNR=[2 5.5 7.9 12.2 15.3 17.5];

% PERHITUNGAN PATH LOSS
Afs=92.4+20.*log10(d)+20.*log10(f);
Abm=20.41+9.83.*log10(d)+7.894.*log10(f)+9.56.*(log10(f))^2;
Gt=log10(ht/200).*(13.958+5.8.*(log10(d)).^2);
Gr=(42.57+13.7.*log10(f)).*(log10(hr)-0.585);
pl=Afs+Abm-Gt-Gr

% PERHITUNGAN RECEIVE SIGNAL LEVEL
RSL=EIRP-pl+Grx-Lrx

 % PERHITUNGAN RECEIVER SENSITIVITY
Rss=10*log10(1000*k*T*B)+SNR+7

% GRAFIK
figure(1)
plot(d,pl,'-^r');
title('Pengaruh jarak terhadap rugi-rugi propagasi');
xlabel ('jarak (km)')
ylabel ('path loss (dB)')
grid on

figure(2)
plot(d,RSL,'-^r');
title('Pengaruh jarak terhadap Receive Signal Level (RSL)');
xlabel ('jarak (km)')
ylabel ('RSL (dBm)')
grid on

% PERHITUNGAN BATAS SWITCHING POINT
a=4.78;
b=29.38;
c=155.0848-(Rss*-1+77);
x=(-b+sqrt(b^2-4*a*c))/(2*a);
d=10.^(x)
```

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Lampiran 2. *Listing* Program Matlab Perhitungan *delay end to end video conference*

% PERHITUNGAN DELAY PROSES ENKAPSULASI DAN DEKAPSULASI

```
%server
W_data=5752;
MTU=1500;
header_eth=14;
header_UDP=8;
header_IP=40;
FCS=4;
C_server=10^9;
N_frame_eth=W_data/MTU;
W_frame_server=W_data+(4*(header_UDP+header_IP+header_eth+FCS));
te1=(W_frame_server-W_data)*8/C_server;

%PDN-GW
header_GTP=8;
C_PDNGW=10^8;
W_data_PDNGW=W_frame_server-(4*(header_UDP+header_IP+header_eth+FCS));
td1=(W_frame_server-W_data_PDNGW)*8/C_PDNGW;
MSS=MTU-header_GTP-header_UDP-header_IP;
N_dtgrm_PDNGW=W_data_PDNGW/MSS;
W_dtgrm_PDNGW=W_data_PDNGW+(4*(header_GTP+header_UDP+header_IP));
N_frame_eth_PDNGW=W_dtgrm_PDNGW/MTU;
W_frame_PDNGW=W_dtgrm_PDNGW+(4*(header_eth+FCS));
te2=(W_frame_PDNGW-W_data_PDNGW)*8/C_PDNGW;

%SGW
C_SGW=10^8;
W_data_SGW=W_frame_PDNGW-
(4*(header_GTP+header_UDP+header_IP+header_eth+FCS));
td2=(W_frame_PDNGW-W_data_SGW)*8/C_SGW;
N_dtgrm_SGW=W_data_SGW/MSS;
W_dtgrm_SGW=W_data_SGW+(4*(header_GTP+header_UDP+header_IP));
N_frame_eth_SGW=W_dtgrm_SGW/MTU;
W_frame_SGW=W_dtgrm_SGW+(4*(header_eth+FCS));
te3=(W_frame_SGW-W_data_SGW)*8/C_SGW;

%eNB
C_eNB=155.52*(10^6);
header_PDCP=2;
header_MAC=3;
header_RLC=2;
W_data_eNB=W_frame_SGW-
(4*(header_GTP+header_UDP+header_IP+header_eth+FCS));
td3=(W_frame_SGW-W_data_eNB)*8/C_eNB;
N_dtgrm_eNB=W_data_eNB/MTU;
W_frame_PDCP=W_data_eNB+(4*header_PDCP);
N_frame_RLC=W_frame_PDCP/40;
```

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```
W_frame_RLCtot=144*42;
N_frame_MAC=W_frame_RLCtot/(40+header_RLC);
W_frame_MAC=42+header_MAC;
W_frame_eNB=144*W_frame_MAC;
te4=(W_frame_eNB-W_data_eNB)*8/C_eNB;

%UE
C_UE_QPSK1_2=7.4*(10^6);
C_UE_QPSK3_4=11.1*(10^6);
C_UE_16QAM1_2=14.9*(10^6);
C_UE_16QAM3_4=22.3*(10^6);
C_UE_64QAM2_3=29.8*(10^6);
C_UE_64QAM3_4=33.5*(10^6);
W_data_UE=W_frame_eNB-(4*header_PDCP)-(144*header_RLC)-
(144*header_MAC);
td4QPSK1_2=(W_frame_eNB-W_data_UE)*8/C_UE_QPSK1_2;
td4QPSK3_4=(W_frame_eNB-W_data_UE)*8/C_UE_QPSK3_4;
td416QAM1_2=(W_frame_eNB-W_data_UE)*8/C_UE_16QAM1_2;
td416QAM3_4=(W_frame_eNB-W_data_UE)*8/C_UE_16QAM3_4;
td464QAM2_3=(W_frame_eNB-W_data_UE)*8/C_UE_64QAM2_3;
td464QAM3_4=(W_frame_eNB-W_data_UE)*8/C_UE_64QAM3_4;

tproc_QPSK_1_2=te1+te2+te3+te4+td1+td2+td3+td4QPSK1_2;
tproc_QPSK_3_4=te1+te2+te3+te4+td1+td2+td3+td4QPSK3_4;
tproc_16QAM1_2=te1+te2+te3+te4+td1+td2+td3+td416QAM1_2;
tproc_16QAM3_4=te1+te2+te3+te4+td1+td2+td3+td416QAM3_4;
tproc_64QAM2_3=te1+te2+te3+te4+td1+td2+td3+td464QAM2_3;
tproc_64QAM3_4=te1+te2+te3+te4+td1+td2+td3+td464QAM3_4;

%PERHITUNGAN DELAY TRANSMISI

C_ethernet=10^8;
C_STM1=155.52*10^6;
cr=3.84*(10^6);
rf5=0.01;
tt1=W_frame_server*8/C_ethernet;
tt2=W_frame_PDNGW*8/C_ethernet;
tt3=W_frame_SGW*8/C_STM1;
tt4_qpsk12=(W_frame_eNB*8)/((cr*rf5/2560)*C_UE_QPSK1_2);
tt4_qpsk34=(W_frame_eNB*8)/((cr*rf5/2560)*C_UE_QPSK3_4);
tt4_16qam12=(W_frame_eNB*8)/((cr*rf5/2560)*C_UE_16QAM1_2);
tt4_16qam34=(W_frame_eNB*8)/((cr*rf5/2560)*C_UE_16QAM3_4);
tt4_64qam23=(W_frame_eNB*8)/((cr*rf5/2560)*C_UE_64QAM2_3);
tt4_64qam34=(W_frame_eNB*8)/((cr*rf5/2560)*C_UE_64QAM3_4);

tt_tot_qpsk12=tt1+tt2+tt3+tt4_qpsk12;
tt_tot_qpsk34=tt1+tt2+tt3+tt4_qpsk34;
tt_tot_16qam12=tt1+tt2+tt3+tt4_16qam12;
tt_tot_16qam34=tt1+tt2+tt3+tt4_16qam34;
tt_tot_64qam23=tt1+tt2+tt3+tt4_64qam23;
```

```
tt_tot_64qam34=tt1+tt2+tt3+tt4_64qam34;

%PERHITUNGAN DELAY PROPAGASI

d_server_PDNGW=2000;
d_PDNGW_SGW=3000;
d_SGW_eNB=400;
d_eNB_UE=[500 1000 1114.4 1318.1 1500 1771.7 2000 2258.3 2500 2897.1 3000
3383.5];
c=3*10^8;
tp1=4*d_server_PDNGW/c;
tp2=4*d_PDNGW_SGW/c;
tp3=4*d_SGW_eNB/c;
tp4=144*d_eNB_UE/c;
tp_tot=(tp1+tp2+tp3+tp4);

%PERHITUNGAN DELAY ANTRIAN

miu_PDNGW=C_PDNGW/(W_frame_server*8);
miu_SGW=C_SGW/(W_frame_PDNGW*8);
miu_eNB=C_eNB/(W_frame_SGW*8);
miu_UE_qpsk12=C_UE_QPSK1_2/(W_frame_eNB*8);
miu_UE_qpsk34=C_UE_QPSK3_4/(W_frame_eNB*8);
miu_UE_16qam12=C_UE_16QAM1_2/(W_frame_eNB*8);
miu_UE_16qam34=C_UE_16QAM3_4/(W_frame_eNB*8);
miu_UE_64qam23=C_UE_64QAM2_3/(W_frame_eNB*8);
miu_UE_64qam34=C_UE_64QAM3_4/(W_frame_eNB*8);
ro=14/15;
lamda_PDNGW=miu_PDNGW.*ro;
lamda_SGW=miu_SGW.*ro;
lamda_eNB=miu_eNB.*ro;
lamda_UE_qpsk12=miu_UE_qpsk12.*ro;
lamda_UE_qpsk34=miu_UE_qpsk34.*ro;
lamda_UE_16qam12=miu_UE_16qam12.*ro;
lamda_UE_16qam34=miu_UE_16qam34.*ro;
lamda_UE_64qam23=miu_UE_64qam23.*ro;
lamda_UE_64qam34=miu_UE_64qam34.*ro;
tw1=(lamda_PDNGW./(miu_PDNGW*(miu_PDNGW-
lamda_PDNGW))+(1/miu_PDNGW));
tw2=lamda_SGW./(miu_SGW*(miu_SGW-lamda_SGW))+(1/miu_SGW);
tw3=lamda_eNB./(miu_eNB*(miu_eNB-lamda_eNB))+(1/miu_eNB);
tw4_qpsk12=lamda_UE_qpsk12./(miu_UE_qpsk12*(miu_UE_qpsk12-
lamda_UE_qpsk12))+(1/miu_UE_qpsk12);
tw4_qpsk34=lamda_UE_qpsk34./(miu_UE_qpsk34*(miu_UE_qpsk34-
lamda_UE_qpsk34))+(1/miu_UE_qpsk34);
tw4_16qam12=lamda_UE_16qam12./(miu_UE_16qam12*(miu_UE_16qam12-
lamda_UE_16qam12))+(1/miu_UE_16qam12);
tw4_16qam34=lamda_UE_16qam34./(miu_UE_16qam34*(miu_UE_16qam34-
lamda_UE_16qam34))+(1/miu_UE_16qam34);
```

```
tw4_64qam23=lamda_UE_64qam23./(miu_UE_64qam23*(miu_UE_64qam23-
lamda_UE_64qam23))+(1/miu_UE_64qam23);
tw4_64qam34=lamda_UE_64qam34./(miu_UE_64qam34*(miu_UE_64qam34-
lamda_UE_64qam34))+(1/miu_UE_64qam34);

tw_tot_qpsk12=(tw1+tw2+tw3+tw4_qpsk12);
tw_tot_qpsk34=(tw1+tw2+tw3+tw4_qpsk34);
tw_tot_16qam12=(tw1+tw2+tw3+tw4_16qam12);
tw_tot_16qam34=(tw1+tw2+tw3+tw4_16qam34);
tw_tot_64qam23=(tw1+tw2+tw3+tw4_64qam23);
tw_tot_64qam34=(tw1+tw2+tw3+tw4_64qam34);

%PERHITUNGAN DELAY END TO END

t_codec=301.5*10^-3;

for ii=1:length(d_eNB_UE)
if d_eNB_UE(ii)<=1114.4
    t_tot(ii)=t_codec+tproc_64QAM3_4+tt_tot_64qam34+tp_tot(ii)+tw_tot_64qam34
elseif d_eNB_UE(ii)>1114.4 & d_eNB_UE(ii)<=1318.1
    t_tot(ii)=t_codec+tproc_64QAM2_3+tt_tot_64qam23+tp_tot(ii)+tw_tot_64qam23
elseif d_eNB_UE(ii)>1318.1 & d_eNB_UE(ii)<=1771.7
    t_tot(ii)=t_codec+tproc_16QAM3_4+tt_tot_16qam34+tp_tot(ii)+tw_tot_16qam34
elseif d_eNB_UE(ii)>1771.7 & d_eNB_UE(ii)<=2258.3
    t_tot(ii)=t_codec+tproc_16QAM1_2+tt_tot_16qam12+tp_tot(ii)+tw_tot_16qam12
elseif d_eNB_UE(ii)>2258.3 & d_eNB_UE(ii)<=2897.1
    t_tot(ii)=t_codec+tproc_QPSK_3_4+tt_tot_qpsk34+tp_tot(ii)+tw_tot_qpsk34
else
    t_tot(ii)=t_codec+tproc_QPSK_1_2+tt_tot_qpsk12+tp_tot(ii)+tw_tot_qpsk12
end
end

%GRAFIK
plot(d_eNB_UE,t_tot,'-^r');
title('Pengaruh jarak terhadap delay end to end');
xlabel ('jarak (m)')
ylabel ('delay end to end (s)')
grid on
```

Lampiran 3. *Listing* Program Matlab Perhitungan probabilitas *packet loss* dan *throughput video conference*

SNR=[27.4392 18.8925 17.5 15.3 13.4915 12.2 9.4798 7.9 6.2652 5.5 3.5721 2];
B=10*10^6;

%PERHITUNGAN PROBABILITAS *PACKET LOSS*

```
for ii=1:length(SNR)
if SNR(ii)>=17.5
   EbNo(ii)=SNR(ii)+4+10*log10(B/(33.5*10^6))
   k=4.5;
   M=2^k;
   x(ii)=sqrt(3*k*EbNo(ii)/(M-1));
   Pb(ii)=(4/k)*(1-1/sqrt(M))*(1/2)*erfc(x(ii)/sqrt(2))
elseif SNR(ii)<17.5 & SNR(ii)>=15.3
   EbNo(ii)=SNR(ii)+4+10*log10(B/(29.8*10^6))
   k=4;
   M=2^k;
   x(ii)=sqrt(3*k*EbNo(ii)/(M-1));
   Pb(ii)=(4/k)*(1-1/sqrt(M))*(1/2)*erfc(x(ii)/sqrt(2))
elseif SNR(ii)<15.3 & SNR(ii)>=12.2
   EbNo(ii)=SNR(ii)+3+10*log10(B/(22.3*10^6))
   k=3;
   M=2^k;
   x(ii)=sqrt(3*k*EbNo(ii)/(M-1));
   Pb(ii)=(4/k)*(1-1/sqrt(M))*(1/2)*erfc(x(ii)/sqrt(2))
elseif SNR(ii)<12.2 & SNR(ii)>=7.9
   EbNo(ii)=SNR(ii)+3+10*log10(B/(14.9*10^6))
   k=2;
   M=2^k;
   x(ii)=sqrt(3*k*EbNo(ii)/(M-1));
   Pb(ii)=(4/k)*(1-1/sqrt(M))*(1/2)*erfc(x(ii)/sqrt(2))
elseif SNR(ii)<7.9 & SNR(ii)>=5.5
   EbNo(ii)=SNR(ii)+2.5+10*log10(B/(11.1*10^6))
   k=1.5;
   M=2^k;
   x(ii)=sqrt(3*k*EbNo(ii)/(M-1));
   Pb(ii)=(4/k)*(1-1/sqrt(M))*(1/2)*erfc(x(ii)/sqrt(2))
else
   EbNo(ii)=SNR(ii)+2.5+10*log10(B/(7.4*10^6))
   k=1;
   M=2^k;
   x(ii)=sqrt(3*k*EbNo(ii)/(M-1));
   Pb(ii)=(4/k)*(1-1/sqrt(M))*(1/2)*erfc(x(ii)/sqrt(2))
end
end

Pvc=10^-4;
P=1-((1-Pb)*(1-Pvc))
```

```
d=[500 1000 1114.4 1318.1 1500 1771.7 2000 2258.3 2500 2897.1 3000 3383.5];
figure(1)
plot(d,P,'-^r');
title('Pengaruh jarak terhadap probabilitas packet loss');
xlabel ('jarak (m)')
ylabel ('probabilitas packet loss')
grid on

Wdata=5752*8;
Wdikirim=6480*8;
Npaket_loss=P.*Wdikirim;
paketloss=(Npaket_loss./(Npaket_loss+Wdata))*100;

%PERHITUNGAN DELAY PROSES

%server
W_data=5752;
MTU=1500;
header_eth=14;
header_UDP=8;
header_IP=40;
FCS=4;
C_server=10^9;
N_frame_eth=W_data/MTU;
W_frame_server=W_data+(4*(header_UDP+header_IP+header_eth+FCS));
te1=(W_frame_server-W_data)*8/C_server;

%PDN-GW
header_GTP=8;
C_PDNGW=10^8;
W_data_PDNGW=W_frame_server-(4*(header_UDP+header_IP+header_eth+FCS));
td1=(W_frame_server-W_data_PDNGW)*8/C_PDNGW;
MSS=MTU-header_GTP-header_UDP-header_IP;
N_dtgrm_PDNGW=W_data_PDNGW/MSS;
W_dtgrm_PDNGW=W_data_PDNGW+(4*(header_GTP+header_UDP+header_IP));
N_frame_eth_PDNGW=W_dtgrm_PDNGW/MTU;
W_frame_PDNGW=W_dtgrm_PDNGW+(4*(header_eth+FCS));
te2=(W_frame_PDNGW-W_data_PDNGW)*8/C_PDNGW;

%SGW
C_SGW=10^8;
W_data_SGW=W_frame_PDNGW-
(4*(header_GTP+header_UDP+header_IP+header_eth+FCS));
td2=(W_frame_PDNGW-W_data_SGW)*8/C_SGW;
N_dtgrm_SGW=W_data_SGW/MSS;
W_dtgrm_SGW=W_data_SGW+(4*(header_GTP+header_UDP+header_IP));
N_frame_eth_SGW=W_dtgrm_SGW/MTU;
W_frame_SGW=W_dtgrm_SGW+(4*(header_eth+FCS));
te3=(W_frame_SGW-W_data_SGW)*8/C_SGW;
```

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```
%eNB
C_eNB=155.52*(10^6);
header_PDCP=2;
header_MAC=3;
header_RLC=2;
W_data_eNB=W_frame_SGW-
(4*(header_GTP+header_UDP+header_IP+header_eth+FCS));
td3=(W_frame_SGW-W_data_eNB)*8/C_eNB;
N_dtgrm_eNB=W_data_eNB/MTU;
W_frame_PDCP=W_data_eNB+(4*header_PDCP);
N_frame_RLC=W_frame_PDCP/40;
W_frame_RLCtot=144*42;
N_frame_MAC=W_frame_RLCtot/(40+header_RLC);
W_frame_MAC=42+header_MAC;
W_frame_eNB=144*W_frame_MAC;
te4=(W_frame_eNB-W_data_eNB)*8/C_eNB;

%UE
C_UE_QPSK1_2=7.4*(10^6);
C_UE_QPSK3_4=11.1*(10^6);
C_UE_16QAM1_2=14.9*(10^6);
C_UE_16QAM3_4=22.3*(10^6);
C_UE_64QAM2_3=29.8*(10^6);
C_UE_64QAM3_4=33.5*(10^6);
W_data_UE=W_frame_eNB-(4*header_PDCP)-(144*header_RLC)-
(144*header_MAC);
td4QPSK1_2=(W_frame_eNB-W_data_UE)*8/C_UE_QPSK1_2;
td4QPSK3_4=(W_frame_eNB-W_data_UE)*8/C_UE_QPSK3_4;
td416QAM1_2=(W_frame_eNB-W_data_UE)*8/C_UE_16QAM1_2;
td416QAM3_4=(W_frame_eNB-W_data_UE)*8/C_UE_16QAM3_4;
td464QAM2_3=(W_frame_eNB-W_data_UE)*8/C_UE_64QAM2_3;
td464QAM3_4=(W_frame_eNB-W_data_UE)*8/C_UE_64QAM3_4;

tproc_QPSK_1_2=te1+te2+te3+te4+td1+td2+td3+td4QPSK1_2;
tproc_QPSK_3_4=te1+te2+te3+te4+td1+td2+td3+td4QPSK3_4;
tproc_16QAM1_2=te1+te2+te3+te4+td1+td2+td3+td416QAM1_2;
tproc_16QAM3_4=te1+te2+te3+te4+td1+td2+td3+td416QAM3_4;
tproc_64QAM2_3=te1+te2+te3+te4+td1+td2+td3+td464QAM2_3;
tproc_64QAM3_4=te1+te2+te3+te4+td1+td2+td3+td464QAM3_4;

%PERHITUNGAN DELAY TRANSMISI

C_ethernet=10^8;
C_STM1=155.52*10^6;
cr=3.84*(10^6);
rf5=0.01;
tt1=W_frame_server*8/C_ethernet;
tt2=W_frame_PDNGW*8/C_ethernet;
```

```
tt3=W_frame_SGW*8/C_STM1;
tt4_qpsk12=(W_frame_eNB*8)/((cr*rf5/2560)*C_UE_QPSK1_2);
tt4_qpsk34=(W_frame_eNB*8)/((cr*rf5/2560)*C_UE_QPSK3_4);
tt4_16qam12=(W_frame_eNB*8)/((cr*rf5/2560)*C_UE_16QAM1_2);
tt4_16qam34=(W_frame_eNB*8)/((cr*rf5/2560)*C_UE_16QAM3_4);
tt4_64qam23=(W_frame_eNB*8)/((cr*rf5/2560)*C_UE_64QAM2_3);
tt4_64qam34=(W_frame_eNB*8)/((cr*rf5/2560)*C_UE_64QAM3_4);

tt_tot_qpsk12=tt1+tt2+tt3+tt4_qpsk12;
tt_tot_qpsk34=tt1+tt2+tt3+tt4_qpsk34;
tt_tot_16qam12=tt1+tt2+tt3+tt4_16qam12;
tt_tot_16qam34=tt1+tt2+tt3+tt4_16qam34;
tt_tot_64qam23=tt1+tt2+tt3+tt4_64qam23;
tt_tot_64qam34=tt1+tt2+tt3+tt4_64qam34;

%PERHITUNGAN DELAY PROPAGASI

d_server_PDNGW=2000;
d_PDNGW_SGW=3000;
d_SGW_eNB=400;
d_eNB_UE=[500 1000 1114.4 1318.1 1500 1771.7 2000 2258.3 2500 2897.1 3000 3383.5];
c=3*10^8;
tp1=4*d_server_PDNGW/c;
tp2=4*d_PDNGW_SGW/c;
tp3=4*d_SGW_eNB/c;
tp4=144*d_eNB_UE/c;
tp_tot=(tp1+tp2+tp3+tp4);

%PERHITUNGAN THROUGHPUT

for jj=1:length(d_eNB_UE)
if d_eNB_UE(jj)<=1114.4
  alfa(jj)=3+2*tp_tot(jj)/tt_tot_64qam34;
  y(jj)=P(jj)*(alfa(jj));
  t(jj)=((1-P(jj))./(tt_tot_64qam34*(1+y(jj))))
elseif d_eNB_UE(jj)>1114.4 & d_eNB_UE(jj)<=1318.1
  alfa(jj)=3+2*tp_tot(jj)/tt_tot_64qam23;
  y(jj)=P(jj)*(alfa(jj));
  t(jj)=((1-P(jj))./(tt_tot_64qam23*(1+y(jj))))
elseif d_eNB_UE(jj)>1318.1 & d_eNB_UE(jj)<=1771.7
  alfa(jj)=3+2*tp_tot(jj)/tt_tot_16qam34;
  y(jj)=P(jj)*(alfa(jj));
  t(jj)=((1-P(jj))./(tt_tot_16qam34*(1+y(jj))))
elseif d_eNB_UE(jj)>1771.7 & d_eNB_UE(jj)<=2258.3
  alfa(jj)=3+2*tp_tot(jj)/tt_tot_16qam12;
  y(jj)=P(jj)*(alfa(jj));
  t(jj)=((1-P(jj))./(tt_tot_16qam12*(1+y(jj))))
elseif d_eNB_UE(jj)>2258.3 & d_eNB_UE(jj)<=2897.1
  alfa(jj)=3+2*tp_tot(jj)/tt_tot_qpsk34;
```

```
  y(jj)=P(jj)*(alfa(jj));
  t(jj)=((1-P(jj))./(tt_tot_qpsk34*(1+y(jj))))
else
  alfa(jj)=3+2*tp_tot(jj)/tt_tot_qpsk12;
  y(jj)=P(jj)*(alfa(jj));
  t(jj)=((1-P(jj))./(tt_tot_qpsk12*(1+y(jj))))
end
end
t=t*6480*8/10^6
figure(2)
plot(d_eNB_UE,t,'-^r');
title('Pengaruh jarak terhadap throughput');
xlabel ('jarak (m)')
ylabel ('throughput')
grid on
```