```
%*********************************************************************
%******************BINARY PHASE SHIFT KEYING ******************
%***************DIRECT SEQUENCE SPREAD SEQUENCE***************
%************Sinyal yang dipancarkan tidak dimasukkan gangguan***********
%*********************************************************************


function program1

f_data=1;
f_chip=11;
fc=220;
fs=fc*3;
N=fs/f_chip;
data=1000;
M=2;

matches=0;
errors=0;
count=1;



SNRpbit=0;
SNR=SNRpbit;
rand('state',12345);
randn('state',54321);

numplot=100;

input=randsrc(data,1,[0:M-1]);
   figure(1);
   plot(input)
   title('Sinyal Input');xlabel('Informasi Ke-');ylabel('Amplitudo');

PN_sequence=randsrc(11,1,[0:1]);
   figure(2);
   plot(PN_sequence)
   title('Sinyal PN Sequence Pengirim');
   xlabel('Informasi Ke-');ylabel('Amplitudo');
```

```
% Spreading
j=1;
for i = 1:data
   for k = j:j+f_chip
      spreading(k) = input(i);
   end;
   spreading(j:(j+f_chip-1)) = xor(spreading(j:(j+f_chip-1))',PN_sequence(1:f_chip));
   j = f_chip*i+1;
end;

len_spreading=length(spreading);


% Modulasi
tx=dmod(spreading,fc,f_chip,fs,'psk',M);
len_tx=length(tx);
   figure(3);
   plot(tx)
   title('Sinyal yang Dipancarkan');
   xlabel('Informasi Ke-');ylabel('Amplitudo');



   SNR=SNRpbit;
   rand('state',12345);
   randn('state',54321);

  %  Tanpa Noise Sinyal yang dipancarkan = Sinyal yang diterima

   rx= tx;
   figure(4);
   plot(rx)
   title('Sinyal yang Diterima');
   xlabel('Informasi Ke-');ylabel('Amplitudo');

  % Demodulasi
   demod=ddemod(rx,fc,f_chip,fs,'psk',M);
   figure(5);
   plot(demod)
   title('Sinyal Demodulasi');
   xlabel('Informasi Ke-');ylabel('Amplitudo');
```

```
% Despreading
 j=1;
 for i = 1:data
   demod(j:(j+f_chip-1)) = xor(demod(j:(j+f_chip-1))',PN_sequence(1:f_chip));
   j = f_chip*i+1;
 end;


 j=1;
 for i = 1:data
   sum=0;


   for k = j:j+f_chip-1
     sum=sum+demod(k);
   end;
   if (sum >=f_chip/2)
     output(i)=1;
   else
     output(i)=0;
   end;
 j = f_chip*i+1;
 end;
 t=1:length(input);
 figure(6);
 plot(output)
 title('Sinyal Output');
 xlabel('Informasi Ke-');ylabel('Amplitudo');

figure(7);
plot(t,output(1:length(t)),'r-')
hold on
plot(t,input(1:length(t)),'b-')
title('Sinyal Input Banding Sinyal Output');
xlabel('Informasi Ke-');ylabel('Amplitudo');
```

```
% Menghitung Error

  for i=1:data;
   if (output(1,i)== input(i,1))
        matches=matches+1;
   else
        errors=errors+1;
   end ;
 end;
 matches
 errors


 BER=errors/data
```

```
%*********************************************************************
%********************BINARY PHASE SHIFT KEYING *****************
%***************DIRECT SEQUENCE SPREAD SEQUENCE***************
%*****Sinyal yang diterima bercampur dengan sinyal White Noise*************
%*********************************************************************


function program_utama

f_data=1;
f_chip=11;
fc=220;
fs=fc*3;
N=fs/f_chip;
data=1000;
M=2;

matches=0;
errors=0;
count=1;



SNRpbit=0;
SNR=SNRpbit;
rand('state',12345);
randn('state',54321);

numplot=100;

input=randsrc(data,1,[0:M-1]);
   figure(1);
   plot(input)
   title('Sinyal Input');xlabel('Informasi Ke-');ylabel('Amplitudo');

PN_sequence=randsrc(11,1,[0:1]);
   figure(2);
   plot(PN_sequence)
   title('Sinyal PN Sequence Pengirim');
   xlabel('Informasi Ke-');ylabel('Amplitudo');

% Spreading
j=1;
for i = 1:data
```

```
    for k = j:j+f_chip
        spreading(k) = input(i);
    end;
    spreading(j:(j+f_chip-1)) = xor(spreading(j:(j+f_chip-1))',PN_sequence(1:f_chip));
    j = f_chip*i+1;
end;

len_spreading=length(spreading);


% Modulasi
tx=dmod(spreading,fc,f_chip,fs,'psk',M);
len_tx=length(tx);
    figure(3);
    plot(tx)
    title('Sinyal yang Dipancarkan');
    xlabel('Informasi Ke-');ylabel('Amplitudo');



    SNR=SNRpbit;
    rand('state',12345);
    randn('state',54321);

   % White Noise
    data_rx=awgn(tx,-20,'measured','dB');


    rx= data_rx;
    figure(4);
    plot(rx)
    title('Sinyal yang Diterima');
    xlabel('Informasi Ke-');ylabel('Amplitudo');

   % Demodulasi
    demod=ddemod(rx,fc,f_chip,fs,'psk',M);
    figure(5);
    plot(demod)
    title('Sinyal Demodulasi');
    xlabel('Informasi Ke-');ylabel('Amplitudo');

   % Despreading
    j=1;
    for i = 1:data
```

```
    demod(j:(j+f_chip-1)) = xor(demod(j:(j+f_chip-1))',PN_sequence(1:f_chip));
    j = f_chip*i+1;
  end;


  j=1;
  for i = 1:data
    sum=0;


    for k = j:j+f_chip-1
      sum=sum+demod(k);
    end;
    if (sum >=f_chip/2)
      output(i)=1;
    else
      output(i)=0;
    end;
  j = f_chip*i+1;
  end;
  t=1:length(input);
  figure(6);
  plot(output)
  title('Sinyal Output');
  xlabel('Informasi Ke-');ylabel('Amplitudo');

figure(7);
plot(t,output(1:length(t)),'r-')
hold on
plot(t,input(1:length(t)),'b-')
title('Sinyal Input Banding Sinyal Output');
xlabel('Informasi Ke-');ylabel('Amplitudo');


% Menghitung Error

  for i=1:data;
   if (output(1,i)== input(i,1))
        matches=matches+1;
   else
        errors=errors+1;
   end ;
  end;
  matches
```

errors

BER=errors/data

```
%*********************************************************************
%********************BINARY PHASE SHIFT KEYING *****************
%***************DIRECT SEQUENCE SPREAD SEQUENCE**************
%*****Sinyal yang diterima bercampur dengan noise nonstasioner**********
%*********************************************************************

f_data=1;
PN=11;
fc=990;
fs=fc*3;
N=fs/PN;
data=1000;
M=2;

sama=0;
errors=0;


rand('state',12345);
randn('state',54321);

unspread=randsrc(data,1,[0:M-1]);

figure(1);
plot(unspread)
title('Sinyal Input');
xlabel('Informasi Ke-');ylabel('Amplitudo');



PN_sequence=randsrc(11,1,[0:1]);

figure(2);
plot(PN_sequence)
title('Sinyal PN Sequence Pengirim');
xlabel('Informasi Ke-');ylabel('Amplitudo');

%SPREADED
j=1;
for i = 1:PN
   for k = j:j+PN
      orig(k) = unspread(i);
   end;
   orig(j:(j+f_chip-1)) = xor(orig(j:(j+PN))',PN_sequence(1:PN));
```

```
   j = PN*i+1;
end;

pjg_orig=pjg(orig);


% Modulasi siyal Spread Spectrum
tx=dmod(orig,fc,PN,fs,'psk',M);
length _tx= length (tx);
figure(3);
plot(tx)
title('Sinyal yang Dipancarkan');
xlabel('Informasi Ke-');ylabel('Amplitudo');



rand('state',12345);
randn('state',54321);

% Noise NonStasioner
rand('state',23456);
randn('state',65432);
data_rx=randsrc(tx,1,[0:1]);
rx= data_rx;

figure(4);
plot(rx)
title('Sinyal yang Diterima');
xlabel('Informasi Ke-');ylabel('Amplitudo');

%Demodulasi Sinyal Spread Spectrum
demod=ddemod(rx,fc,PN,fs,'psk',M);
figure(5);
plot(demod)
title('Sinyal Demodulasi');
xlabel('Informasi Ke-');ylabel('Amplitudo');

% Despreading Sinyal
 j=1;
 for i = 1:data
 demod(j:(j+PN-1)) = xor(demod(j:(j+PN-1))',PN_sequence(1:PN));
 j = PN*i+1;
 end;
```

```
 j=1;
 for i = 1:data
     a=0;

    for k = j:j+PN-1
        a=a+demod(k);
    end;
 if (a >=PN/2)
     output(i)=1;
     else
       output(i)=0;
     end;
j =PN*i+1;
 end;

t=1: length (unspread);
figure(6);
plot(output)
title('Sinyal Output');
xlabel('Informasi Ke-');ylabel('Amplitudo');

%Perbandingan Sinyal Input dan Sinyal Output
figure(7);
plot(t,output(1:length(t)),'r-')
hold on
plot(t,unspread(1:length(t)),'b-')
title('Sinyal Input Banding Sinyal Output');
xlabel('Informasi Ke-');ylabel('Amplitudo');

  % Menghitung Error Sinyal

  for i=1:data;
    if (output(1,i)== unspread(i,1))
         sama=sama+1;
    else
         errors=errors+1;
    end ;
  end;

   sama
   errors
   BER=errors/data
```

TABEL KARAKTERISTIK – KARAKTERISTIK BAND KOMUNIKASI UNNGUIDED

Band Frekuensi	Nama	Data Analog		Data Digital		Aplikasi- Aplikasi Utama
		Modulasi	Bandwidth	Modulasi	Rate Data	
30 – 300 kHz	LF (Low Frequency)	Biasanya tidak dipraktekkan		ASK, FSK, MSK	0.1 to 100 bps	Navigasi
300 – 3000 kHz	MF (Medium Frequency)	AM	to 4 kHz	ASK, FSK, MSK	10 to 1000 bps	Radio AM komersil
3 – 30 MHz	HF (High Frequency)	AM, SSB	to 4 kHz	ASK, FSL, MSK	10 to 3000 bps	Radio gelombang pendek
30 – 300 MHz	VHF (Very High Frequency)	AM,SSB,FM	5 kHzto 5 MHz	FSK, PSK	to 100 kbps	Televisi VHF, radio FM
300 – 3000 MHz	UHF (Ultra High Frequency)	FM,SSB	to 20 MHz	PSK	to 10 Mbps	Televisi UHF, gelombang mikro terrestrial
3 – 30 GHz	SHF (Super High Frequency)	FM	to 500 MHz	PSK	to 100 Mbps	Gelombang mikro terrestrial, gelombang mikro satelit
30 – 300 GHz	EHF (Extenemely High Frequency)	FM	to 1 GHz	PSK	to 750 Mbps	Percobaan jangkauan pendek titik ke titik