```
%%%%% DATOS %%%%%
fc=1e9;
d=86000;
pn=-95-30;
pt=10-30;
Ga=20;
Rb=20e6;

ho=24.97;
do=43e3;

tau=1e-3;




%%%%% ESPACIO LIBRE %%%%%

% Potencia recibida
pr=2*Ga + pt - 20*log10(4*pi*d*fc/3e8);

% Relacion seÒal a ruido caso 1
SNR=pr-pn;




%%%%% OBSTACULO %%%%%

% Calculamos el parametro v
v = ho*sqrt(2*fc/3e8*(d)/(do*(d-do)));

% Aproximacion por tramos a la integral de fresnel
if(v < -1.0)
    pf=0;
elseif( v <= 0)
    pf=20*log10(0.5-0.62*v);
elseif(v <= 1)
    pf=20*log10(0.5*exp(-0.95*v));
elseif(v <= 2.4)
    pf=20*log10(0.4-sqrt(0.1184-(0.38-0.1*v).^2));
else
    pf=20*log10(0.225/v);
end

% Relacion seÒal a ruido caso 2
SNR2=SNR+pf;
```

```
p10=1/(Rb*tau); % Prob. de transicion del estado 0 al 1
p01=1e-2;       % Prob. de transicion del estado 1 al 0

% Obtener estas probabilidades con  bertool
pe1=1e-2;   % BER con obstaculo (estado 1)
pe0=1e-14;  % BER espacio libre (estado 0)


% Secuencia de Nbits
at=randint(1,10000,2);

% Probabilidad de comenzar en el estado 0
pi00=p01/(p01+p10);

Nbits=length(at);   % Numero de bits

S=zeros(Nbits+1,1);
S(1)=1-(rand(1,1)<pi00);
bt=at;
for n=1:Nbits
    if S(n)==0
        bt(n)=BSC(at(n),pe0);
        S(n+1)=(rand(1,1)<p01);
    else
        bt(n)=BSC(at(n),pe1);
        S(n+1)=1-(rand(1,1)<p10);
    end
end


PeTOTAL=sum(abs(at-bt))/length(at);
disp(['Perror= ' num2str(PeTOTAL)])




%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
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function [bt]=BSC(at,p)

Nbits=length(at);

et=(rand(Nbits,1)<p);
```

```
bt=xor(at,et);
```