NUIST Experiment Report

Course name IOT communication Technology

Experiment name AM modulation and demodulation

Date 2024/04/29 Tuitor 谈玲

College waterford Major Iot

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1. Experimental objective

(1) Understand and master the principle of AM modulation.

2. Experimental equipment

Matlab

3. Experimental procedure (content)

（1）Complete the writing of each function;

（2）Call each function in the main function to realize the spectrum analysis of the signal.

4. Experimental result

4.1 carrier signal

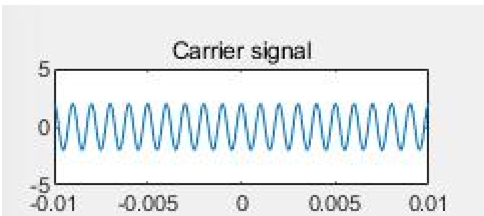

Figure 1 carrier signal

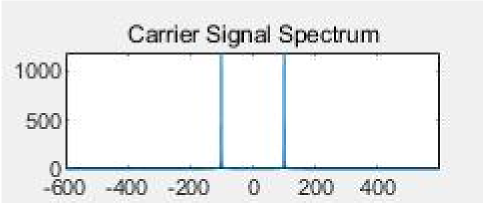

Figure 2 carrier signal Spectrum

4.2 modulating signal

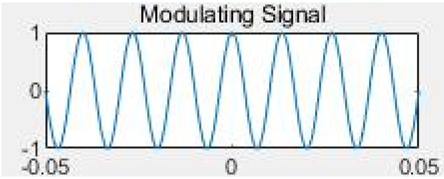

Figure 3 Modulating signal

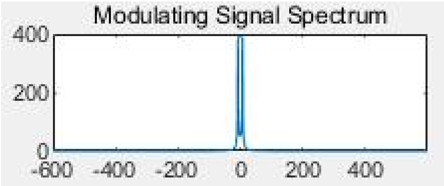

Figure 4 Modulating signal Spectrum

4.3 Modulated signal

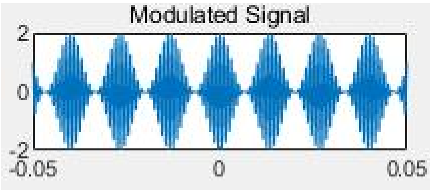

Figure 5 Modulated signal

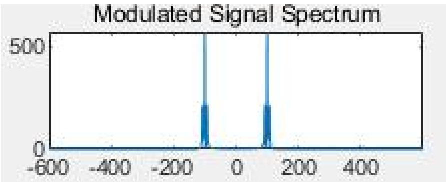

Figure 6 modulated signal spectrum

4.4

5. Conclusions

```
>> t0=0.1;
fs=12000;
fc=1000;
Vm=2;
A0=1;
n=-t0/2:1/fs:t0/2;
x=cos(150*pi*n);
```

```
y2=Vm*cos(2*pi*fc*n);
N=length(x);
Y2=fft(y2);
figure(1);
subplot(4,2,1);
plot(n,y2);
axis([-0.01,0.01, -5,5]);
title(' Carrier signal ');
w=(-N/2:1:N/2-1);
subplot(4,2,2);
plot(w, abs(fftshift(Y2)));
title(' Carrier Signal Spectrum ');
y=(A0+x).*cos(2*pi*fc*n);
subplot(4,2,3);
plot(n,x);
title(' Modulating Signal ');
X=fft(x);
Y=fft(y);
subplot(4,2,4);
plot(w, abs(fftshift(X)));
% axis([0, pi/4, 0, 1000]);
title(' Modulating Signal Spectrum ');
subplot(4, 2, 5);
plot(n, y);
title(' Modulated Signal ');
subplot(4, 2, 6);
plot(w, abs(fftshift(Y)));
% axis([pi/6, pi/4, 0, 1200]);
title(' Modulated Signal Spectrum ');
y2=y.*Vm.*cos(2*pi*fc*n);
wp=40/N*pi;
ws=60/N*pi;
Rp=1;
As=15;
T=1;
OmegaP=wp/T;
OmegaS=ws/T;
[cs, ds]=afd_butt(OmegaP, OmegaS, Rp, As);
[b, a]=imp_invr(cs, ds, T);
y3=filter(b, a, y2);
y=y3-A0;
subplot(4, 2, 7);
plot(n, y);
title(' Demodulated Signal ');
```

```
Y=fft(y);
subplot(4, 2, 8);
plot(w, abs(fftshift(Y)));
%axis([0, pi/4, 0, 1000]);
title(' Demodulated Signal Spectrum')
function [b, a]=afd_butt(Wp, Ws, Rp, As)
N=ceil((log10((10^(Rp/10)-1)/(10^(As/10)-1)))/(2*log10(Wp/Ws)));
fprintf('\n Butterworth Filter Order=%2.0f\n', N)
OmegaC=Wp/((10^Rp/10)-1)^(1/(2*N)));
[b, a]=u_buttap(N, OmegaC);
function [b, a]=u_buttap(N, Omegac);
[z, p, k]=buttap(N);
p=p*Omegac;
k=k*Omegac^N;
B=real(poly(z));
b0=k;
b=k*B;
a=real(poly(p));
function [b, a]=imp_invr(c, d, T)
[R, p, k]=residue(c, d);
p=exp(p*T);
[b, a]=residuez(R, p, k);
b=real(b');
a=real(a')
```