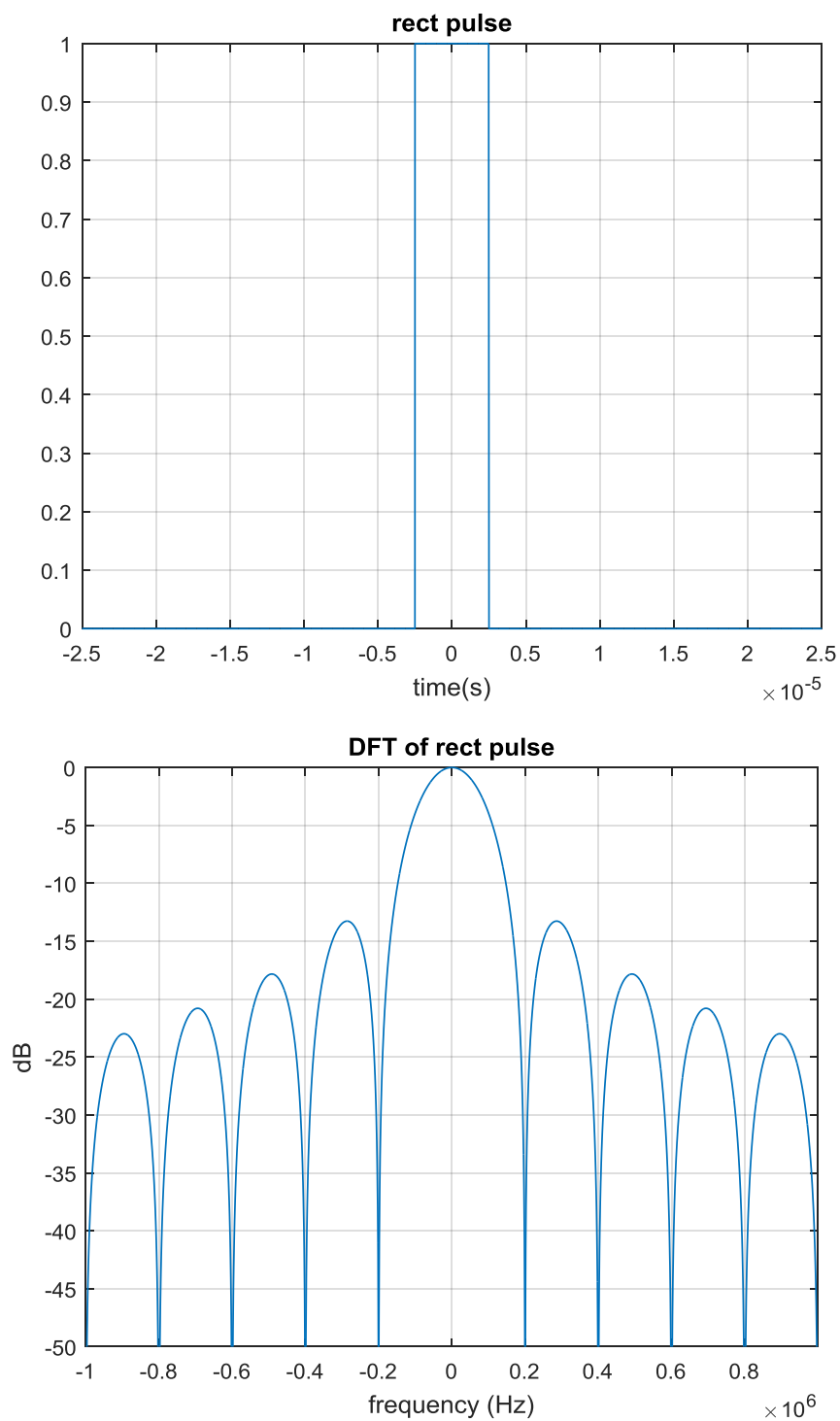
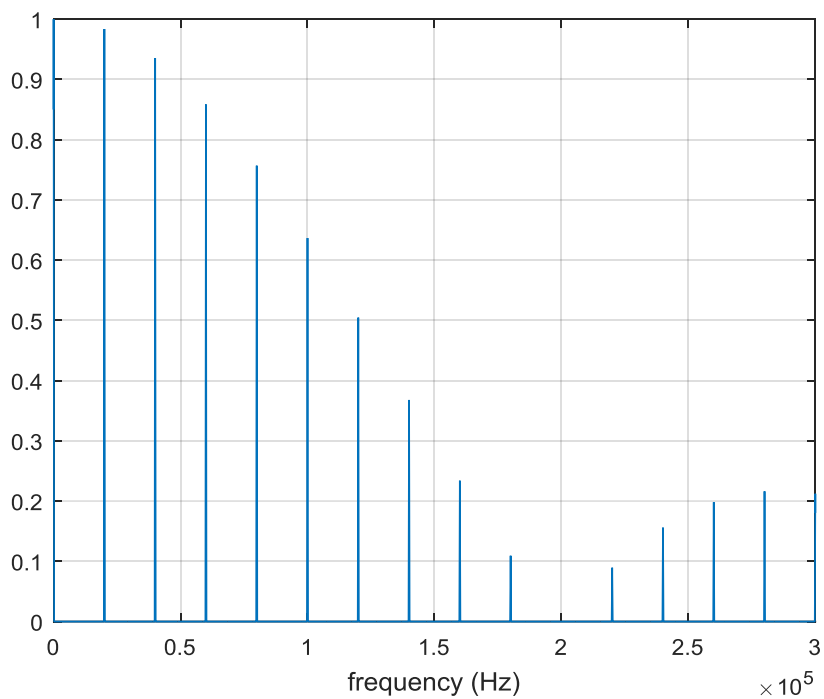


(الف)

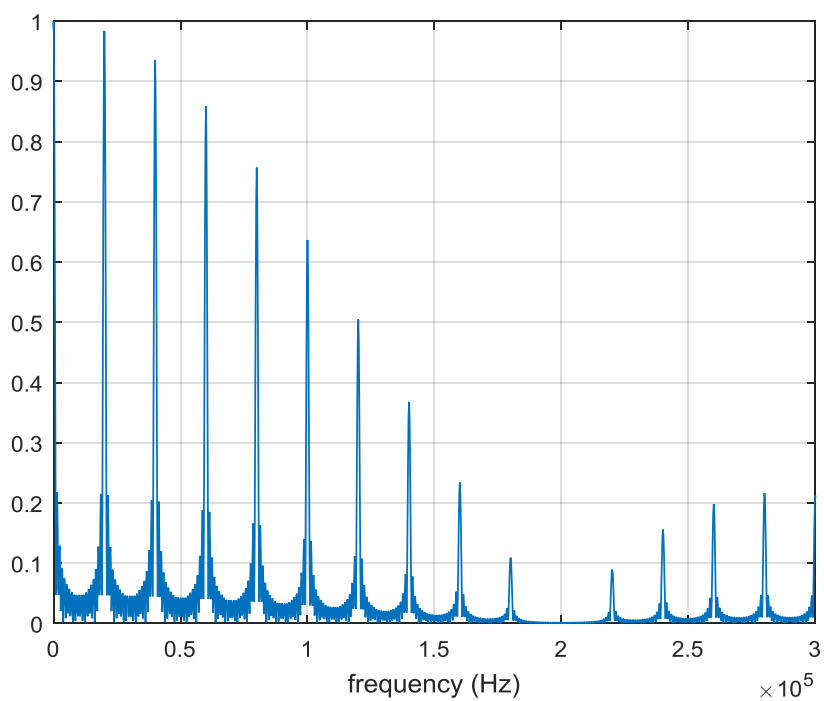


(ب)

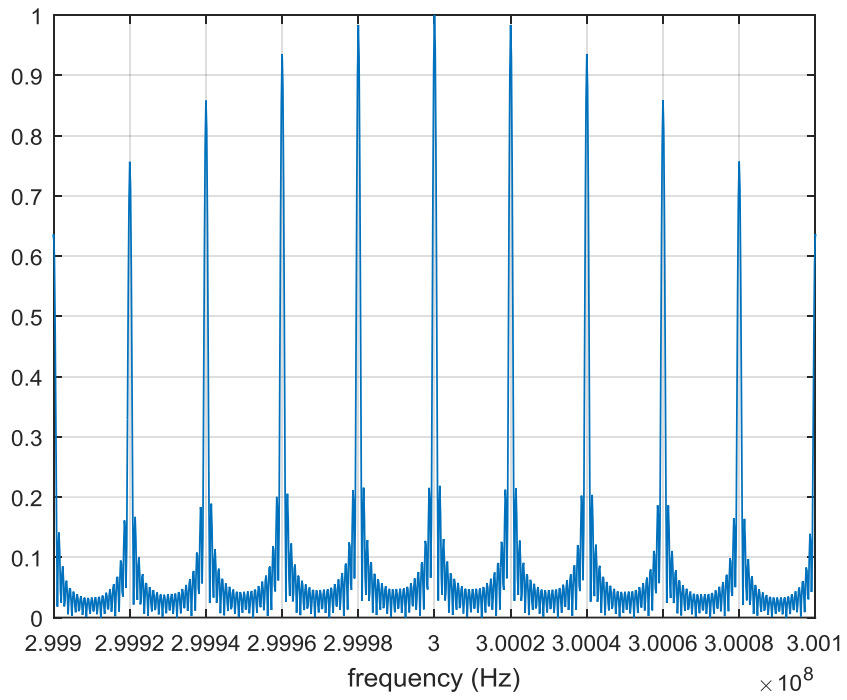


(در این قسمت و قسمت‌های بعد طیف برحسب dB رسم نشده است.)

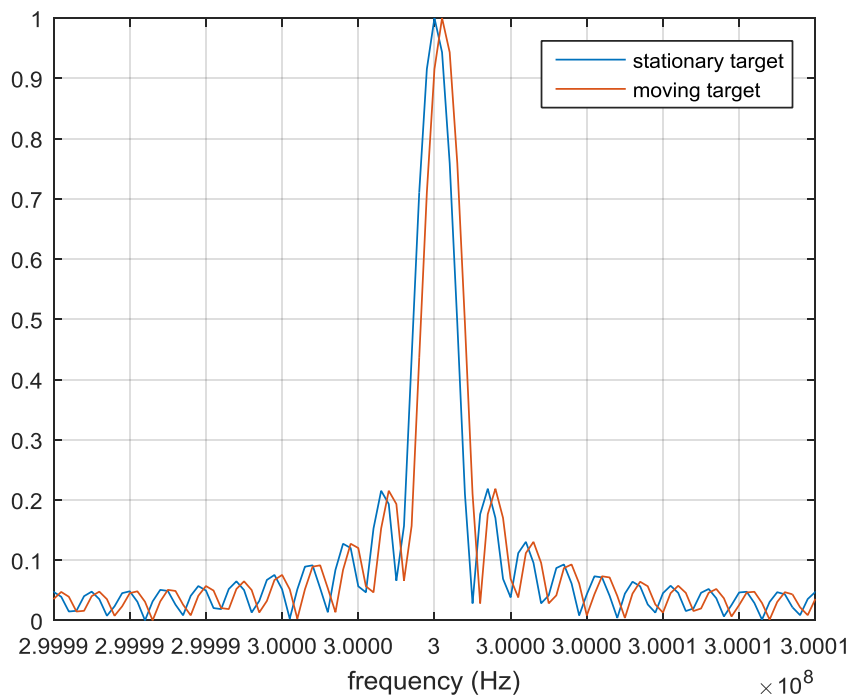
(ج)



(d)



(e)



(و)

خير، قابل تفكيك نيستند. حداقل داپلرهدف متحرك براي تفكيك از هدف ساكن = حد تفكيك

$$\frac{1}{T_d} = \text{داپلر}$$

$$T_d = 20PRI = 20 \times 50\mu s = 1ms \Rightarrow \Delta f_d = \frac{1}{1ms} = 1000Hz$$

$$f_d = \frac{2v}{\lambda} \Rightarrow \Delta v = \frac{\lambda \Delta f_d}{2} = \frac{1m \times 1000Hz}{2} = 500 \frac{m}{s}$$

بنابراين حداقل سرعت هدف متحرك براي قابل تفكيك بودن از هدف ساكن، 500m/s است.

كد :MATLAB

```
% In the name of Allah
%% (alef)
clearvars;
close all;
f0 = 300e6;
T0 = 1/f0;
ts = T0/10;
Fs = 1/ts;
PRI = 50e-6;
tau = 5e-6;
t = -50*PRI:ts:50*PRI;
N = length(t);
P_tau = rectpuls(t,tau);
P_tau_f = fftshift(fft(P_tau));
freq = linspace(-Fs/2,Fs/2,N);
figure;plot(t,P_tau);
grid on;
xlim([-0.5,0.5]*PRI);
title('rect pulse');
xlabel('time(s)');
figure;plot(freq,20*log10(nrml(abs(P_tau_f))));
title('DFT of rect pulse');
xlim([-5/tau 5/tau]);
ylim([-50 0]);
xlabel('frequency (Hz)');
ylabel('dB');
grid on;
clear P_tau P_tau_f
%% (be)
d = -50*PRI:PRI:50*PRI;
y1 = pulstran(t,d,'rectpuls',tau);
Y1 = fftshift(fft(y1));
figure;plot(freq,(nrml(abs(Y1))));
xlim([0 1.5/tau]);
xlabel('frequency (Hz)');
```

```

grid on;
clear y1 Y1
%% (jim)
d = -10*PRI:PRI:10*PRI;
y2 = pulstran(t,d,'rectpuls',tau);
Y2 = fftshift(fft(y2));
figure;plot(freq,(nrml(abs(Y2))));
xlim([0 1.5/tau]);
xlabel('frequency (Hz)');
grid on;
clear Y2
%% (dal)
y3 = y2.*cos(2*pi*f0*t);
Y3 = fftshift(fft(y3));
figure;plot(freq,(nrml(abs(Y3))));
xlim([f0-0.5/tau f0+0.5/tau]);
xlabel('frequency (Hz)');
grid on;
clear y3 Y3
%% (he)
v = 100;
lam = 3e8/f0;
fd = 2*v/lam;
fr = f0+fd;
y4 = y2.*cos(2*pi*fr*t);
Y4 = fftshift(fft(y4));
hold on;plot(freq,(nrml(abs(Y4))));
xlim([f0-0.05/tau f0+0.05/tau]);
legend('stationary target', 'moving target');

```