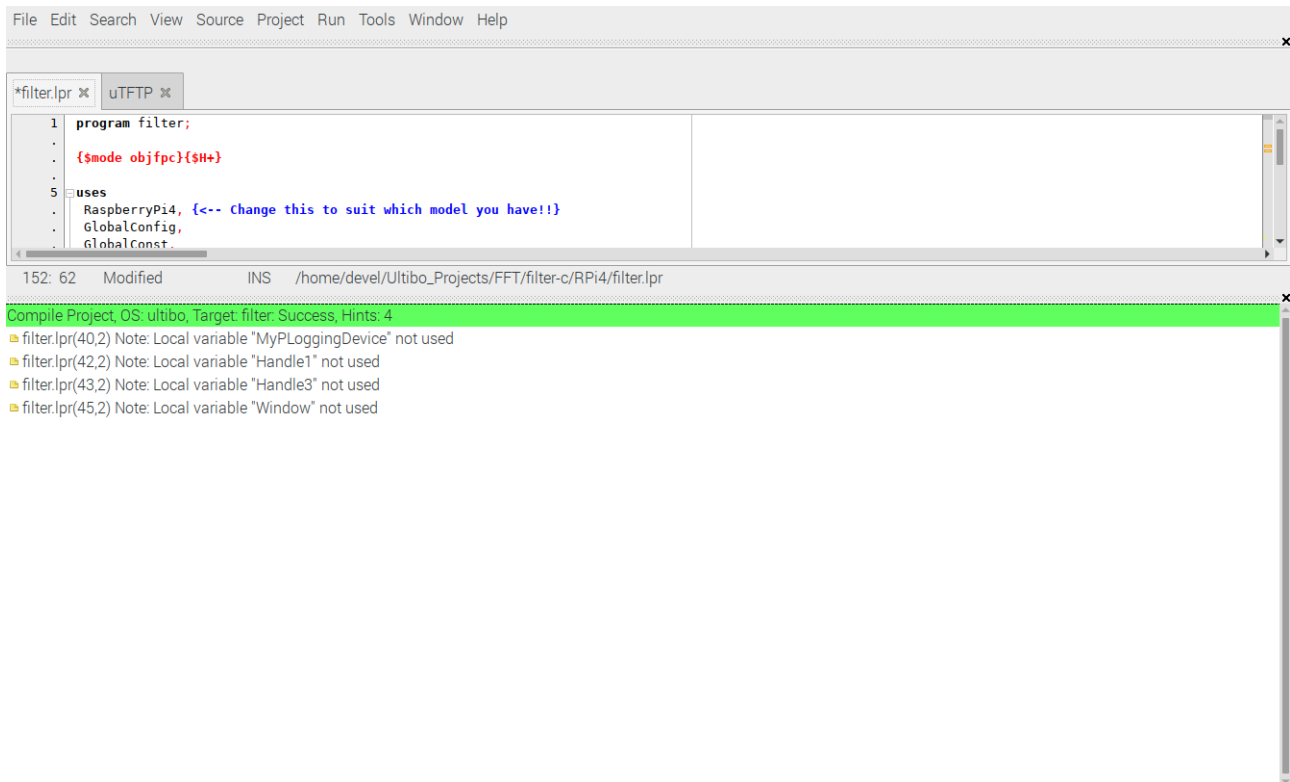


*****Draft*****

Testing the high pass filter, low pass filter and band pass filter on a RPi4B 05/20/21

*****Draft*****

The Lazarus IDE (Ultibo Edition) is used to link the C library “**libfilter.a**”. The library is created with script “**compile-ultibo.sh**”. Depending in which file is in “**example.c**” “**example.c.high**” or “**example.c.low**”



```
File Edit Search View Source Project Run Tools Window Help

*filter.lpr x uTFTP x

1 program filter;
.
. {$mode objfpc}{$H+}
.
5 uses
.   RaspberryPi4, {<-- Change this to suit which model you have!!}
.   GlobalConfig,
.   GlobalConst;

152: 62 Modified INS /home/devel/Ultibo_Projects/FFT/filter-c/RPi4/filter.lpr

Compile Project, OS: ultibo, Target: filter: Success, Hints: 4
filter.lpr(40,2) Note: Local variable "MyLoggingDevice" not used
filter.lpr(42,2) Note: Local variable "Handle1" not used
filter.lpr(43,2) Note: Local variable "Handle3" not used
filter.lpr(45,2) Note: Local variable "Window" not used
```

The uTFTP.pas provides the transfer of “**kernel7l.img**”. In addition it provides a method to send/receive files between RPi4B Ultibo System and the development system.

The screenshot shows a code editor with a menu bar (File, Edit, Search, View, Source, Project, Run, Tools, Window, Help) and two tabs: 'filter.lpr' and 'uTFTP.pas'. The 'uTFTP.pas' tab is active, displaying the following Pascal code:

```
function TFTPListener.DoExecute (aThread : TWinsock2UDPServerThread) : Boolean;
begin
    if FileExists (aTransfer.FileName) then DeleteFile (aTransfer.FileName);
    try
        aFile := TFileStream.Create (aTransfer.FileName, fmCreate);
        aTransfer.FStream.Seek (0, soFromBeginning);
        aFile.CopyFrom (aTransfer.FStream, aTransfer.FStream.Size);
        aFile.Free;
    except
        if (aTransfer.FileName = 'kernel7.img') or (aTransfer.FileName = 'kernel.img') or (aTransfer.FileName = 'kernel7l.img') then
            ;
    end;
end;
```

Below the code editor, a status bar indicates '459: 136 INS /home/devel/Ultibo_Projects/FFT/filter-c/RPi4/uTFTP.pas'. A green bar at the bottom shows the compilation output:

```
Compile Project, OS: ultibo, Target: filter: Success, Hints: 4
filter.lpr(40,2) Note: Local variable "MyPLoggingDevice" not used
filter.lpr(42,2) Note: Local variable "Handle1" not used
filter.lpr(43,2) Note: Local variable "Handle3" not used
filter.lpr(45,2) Note: Local variable "Window" not used
```

The command to transfer a new “**kernel7l.img**” and reboot is “**tftp 192.168.1.143 < cmdstftp**”

Note: Octave program “sig.m” requires 2 packages “signal-1.4.1.tar.gz” & “control-3.2.0.tar.gz” which first need to be installed. With the commands “pkg install signal-1.4.1.tar.gz” & “pkg install control-3.2.0.tar.gz” the files are extracted in the folder “/home/devel/octave”. There are 14 directories, 487 files.

```
clear
close all
pkg load signal
order = 6;
fs = 1000;
T = 1/fs;          % Sampling period
L = 2048;          % Length of signal
t = (0:L-1)*T;
%mysig was created with gensindata(ptrsignal); in example.c
fid = fopen('mysig.bin','r'); mysig = fread(fid, 2048, 'double');
fid = fopen('myfilt.bin','r'); myfilt = fread(fid, 2048, 'double');
figure

plot(1000*t(1:50),mysig(1:50));

Ys = fft(mysig);

P2 = abs(Ys/L);
P1 = P2(1:L/2+1);
P1(2:end-1) = 2*P1(2:end-1);
f = fs*(0:(L/2))/L;
```

```
figure
plot(f,P1)
```

%myfilt was created with bw_low_pass(filter, signal[i])); in example.c
figure

```
plot(1000*t(1:50),myfilt(1:50));
```

```
Ys = fft(myfilt);
P2 = abs(Ys/L);
P1 = P2(1:L/2+1);
P1(2:end-1) = 2*P1(2:end-1);
f = fs*(0:(L/2))/L;
figure
plot(f,P1)
```

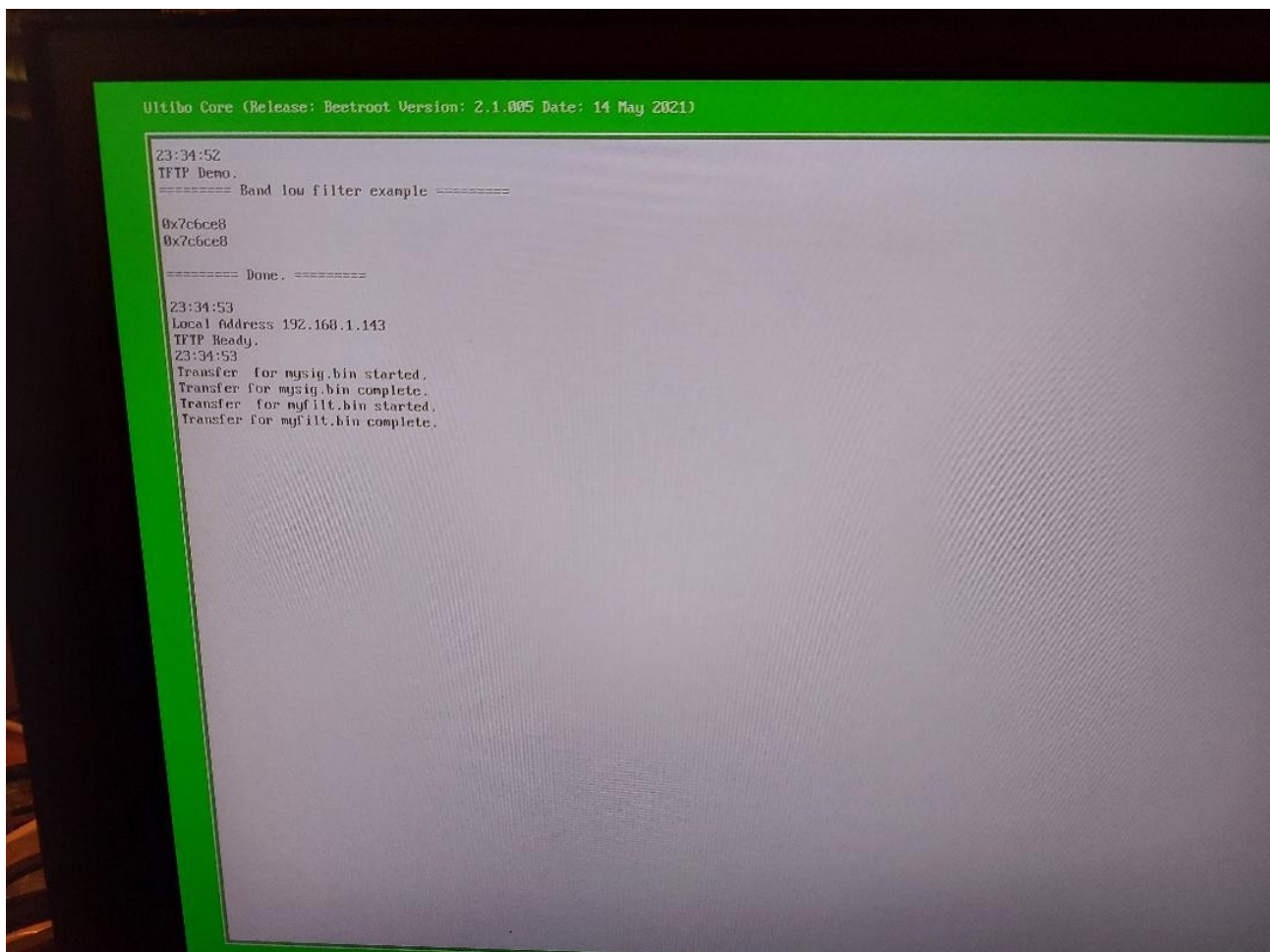


fig1

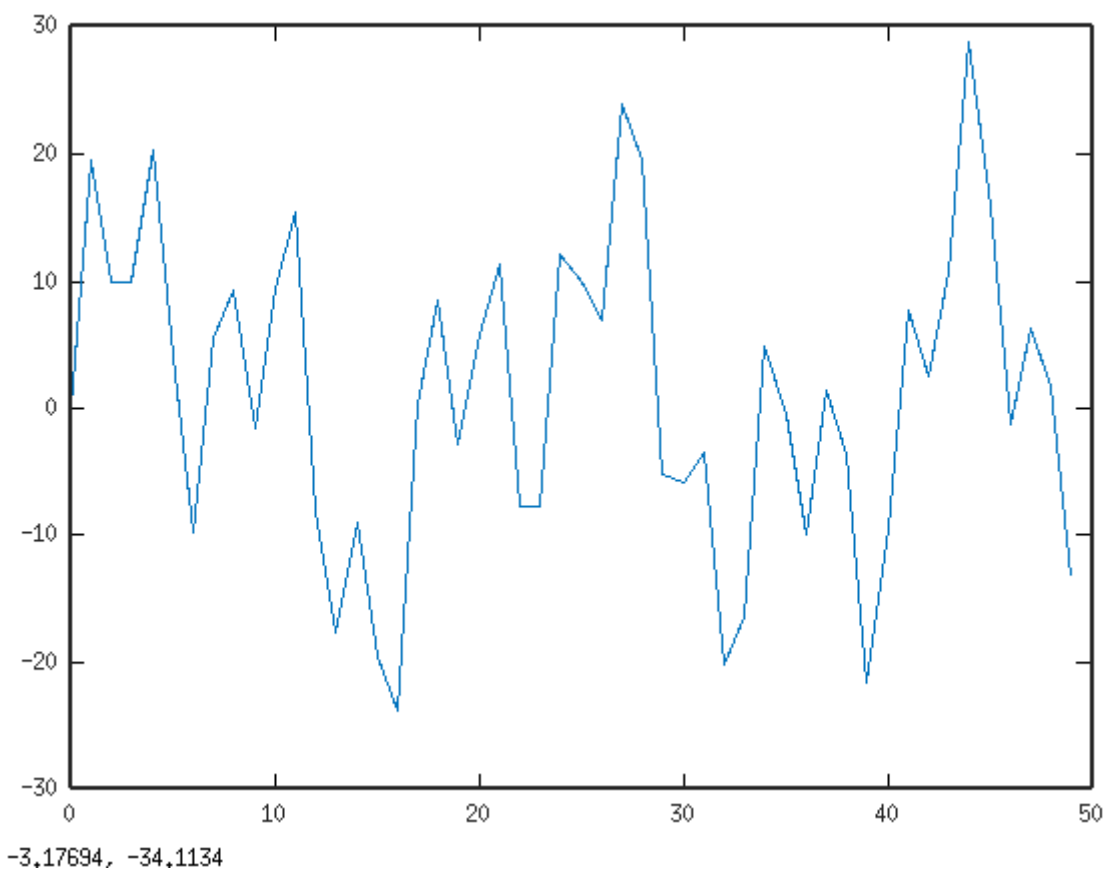


fig2

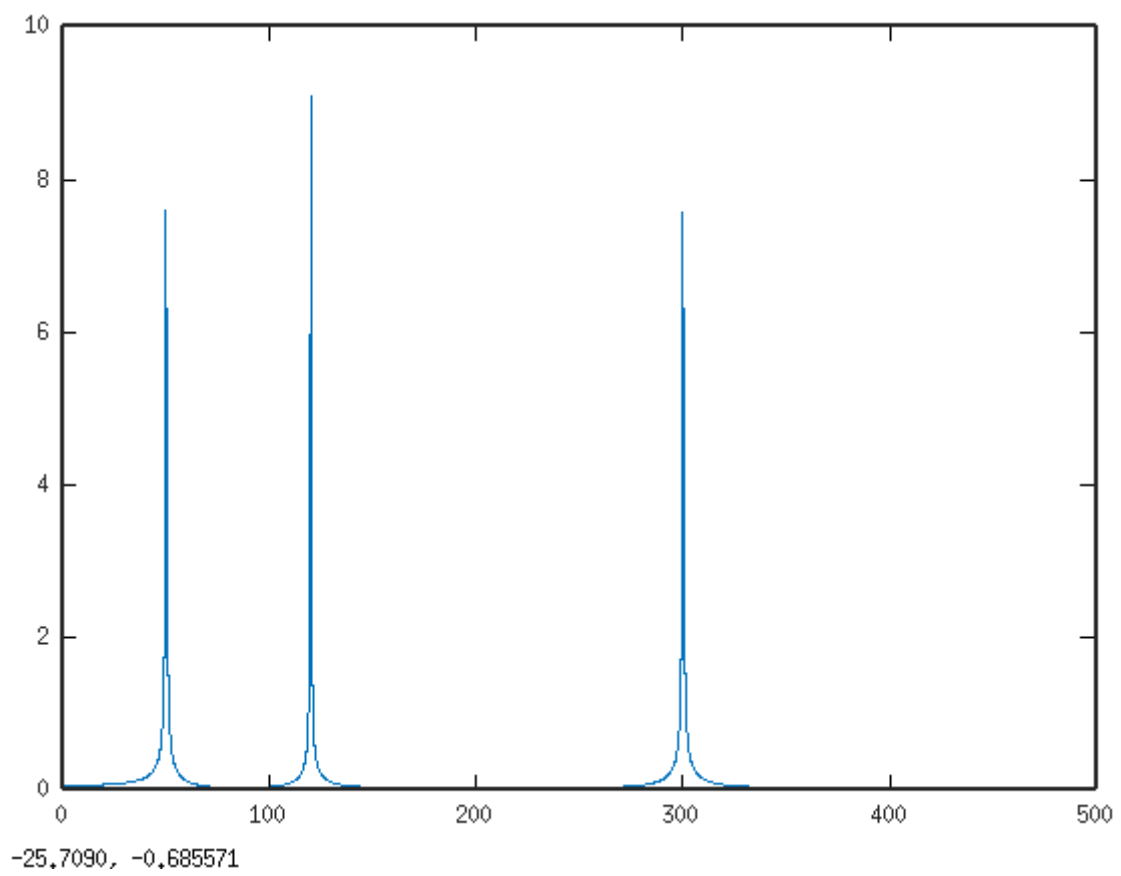


fig3

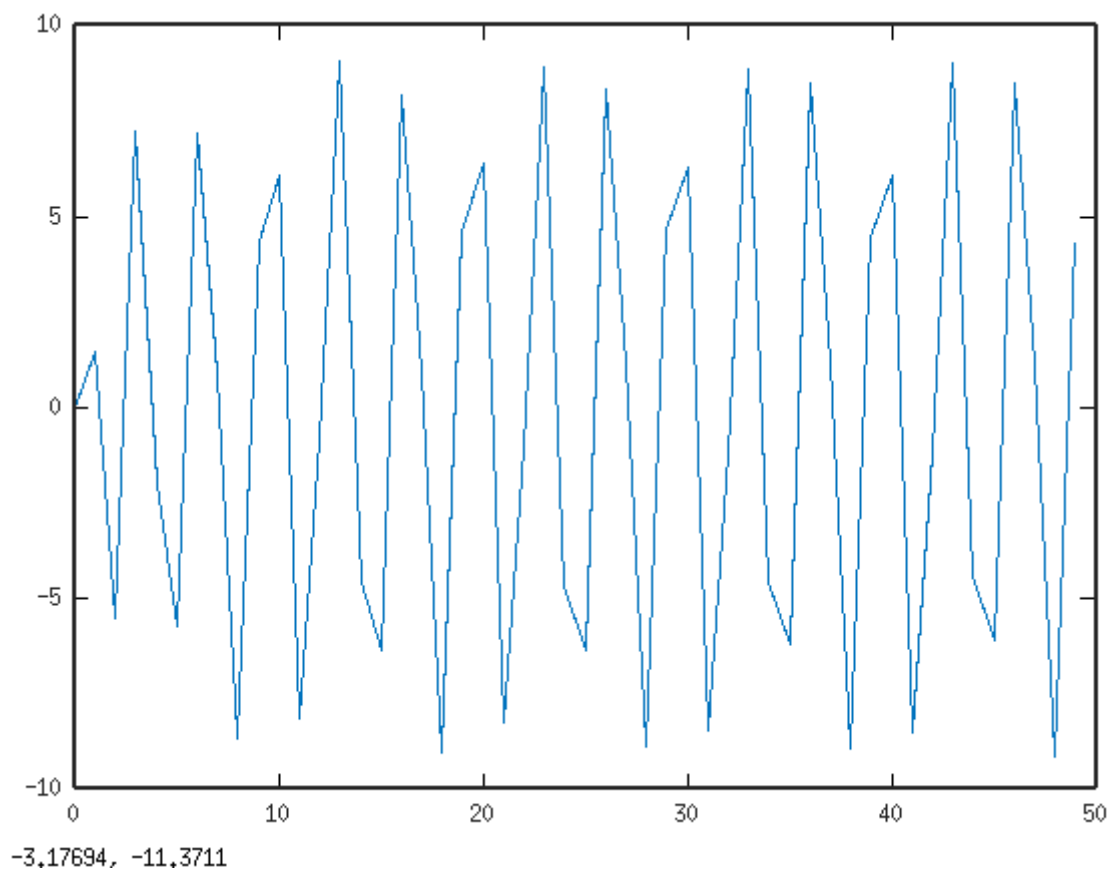
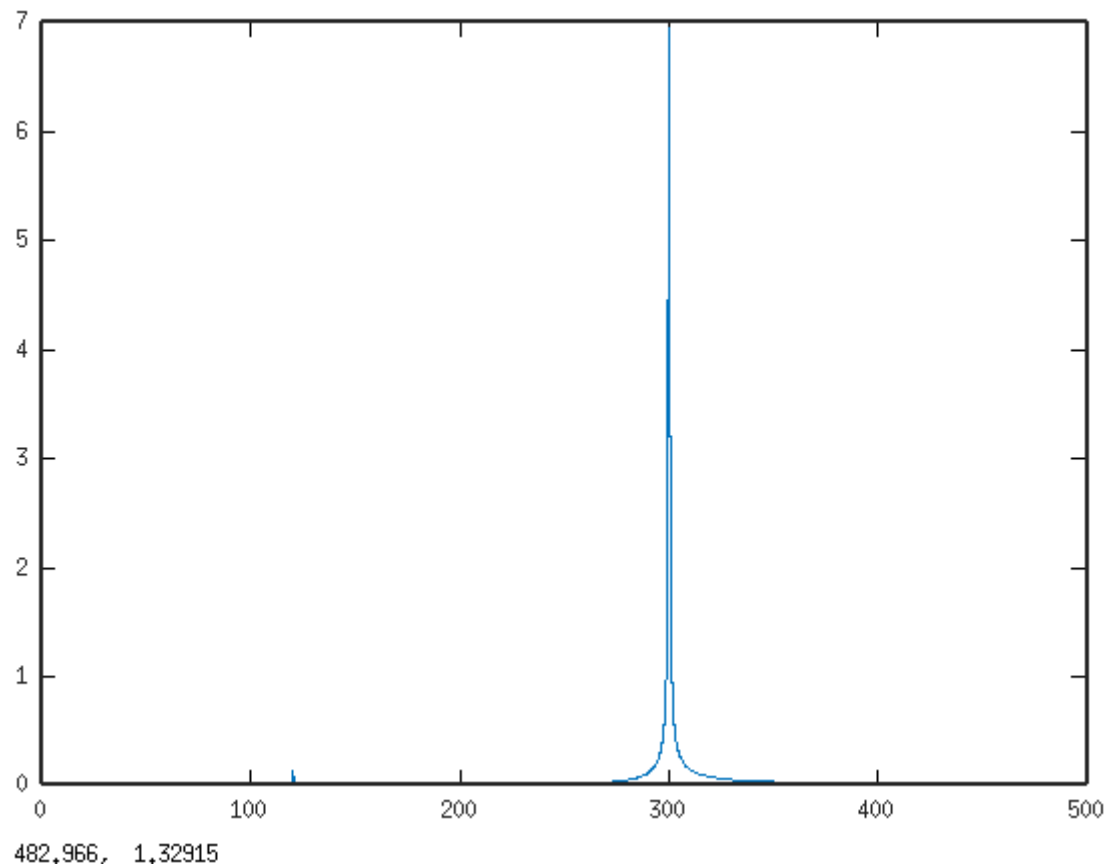


fig4 when example.c.high in example.c



```
cp example.c.low example.c
```

```
./compile-ultibo.sh
```

```
cp libfilter.a RPi4
```

```
Rebuild the kernel7l.img
```

```
tftp 192.168.1.143
```

```
tftp> binary
```

```
tftp> get mysig.bin
```

```
Error code 5: 33461
```

```
Received 16384 bytes in 5.0 seconds
```

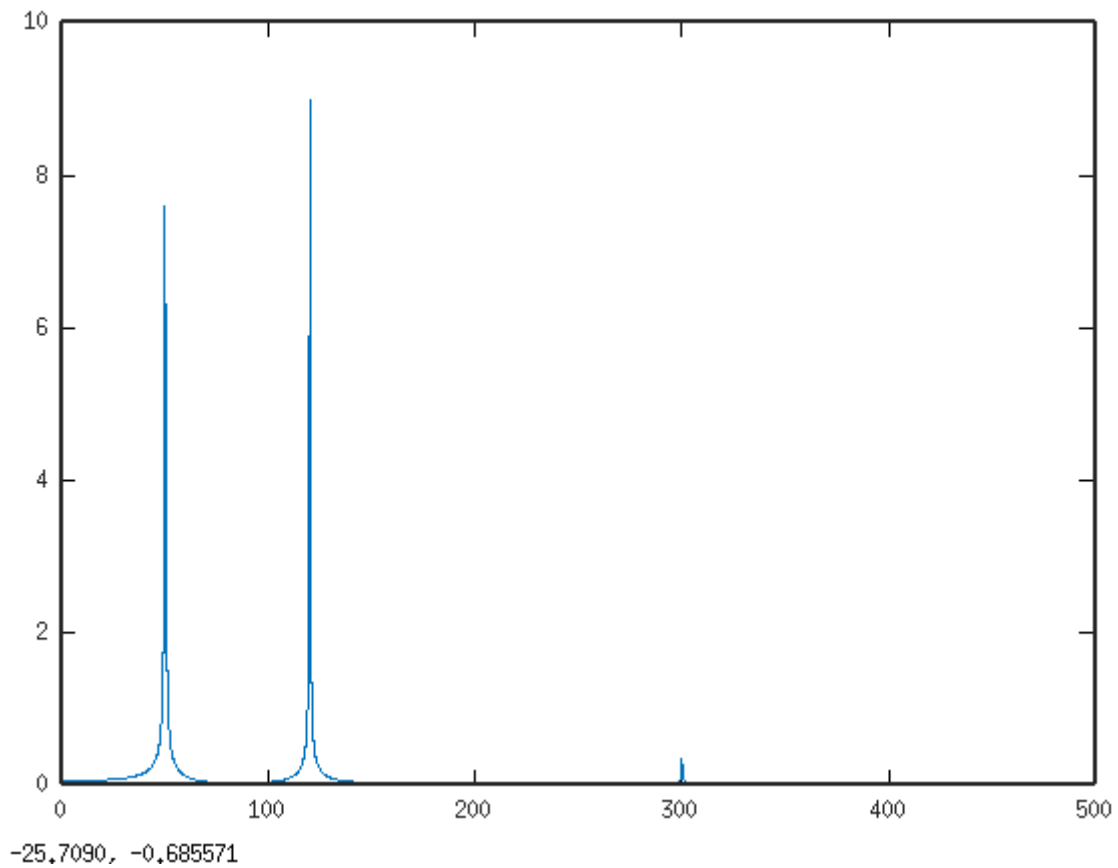
```
tftp> get myfilt.bin
```

```
Error code 5: 53947
```

```
Received 16384 bytes in 5.0 seconds
```

```
tftp> quit
```

```
fig4 when example.c.low in example.c
```



cp example.c.band example.c

./compile-ultibo.sh

Rebuild the kernel7l.img

tftp 192.168.1.143 < cmdstftp

tftp 192.168.1.143

tftp> binary

tftp> get mysig.bin

Error code 5: 54353

Received 16384 bytes in 5.1 seconds

tftp> get myfilt.bin

Error code 5: 57225

Received 16384 bytes in 5.0 seconds

tftp> quit

fig4 when example.c.band in example.c

