

# **Design and Analysis of FIR Digital filter to process the real-time signals using TI TMS3206748 DSP Processor**

## **Description: -**

Designing of a digital FIR filter using Blackman window for the following specifications: -

Cut-off frequency = 10 kHz

Sampling Frequency: 24 kHz

Order of the filter =25

## **Overview: -**

- Generating filter coefficient using the filterDesigner tool in CCS studio.
- Utilising the coefficients in the C code for implementation on CCS studio.
- Input voltage for testing -  $V_{pp} = 600\text{mV}$
- Testing for a range of frequencies (detailed table and plot given below)
- Calculation of attenuation values, plotting the same in MATLAB.

## Implementation: -

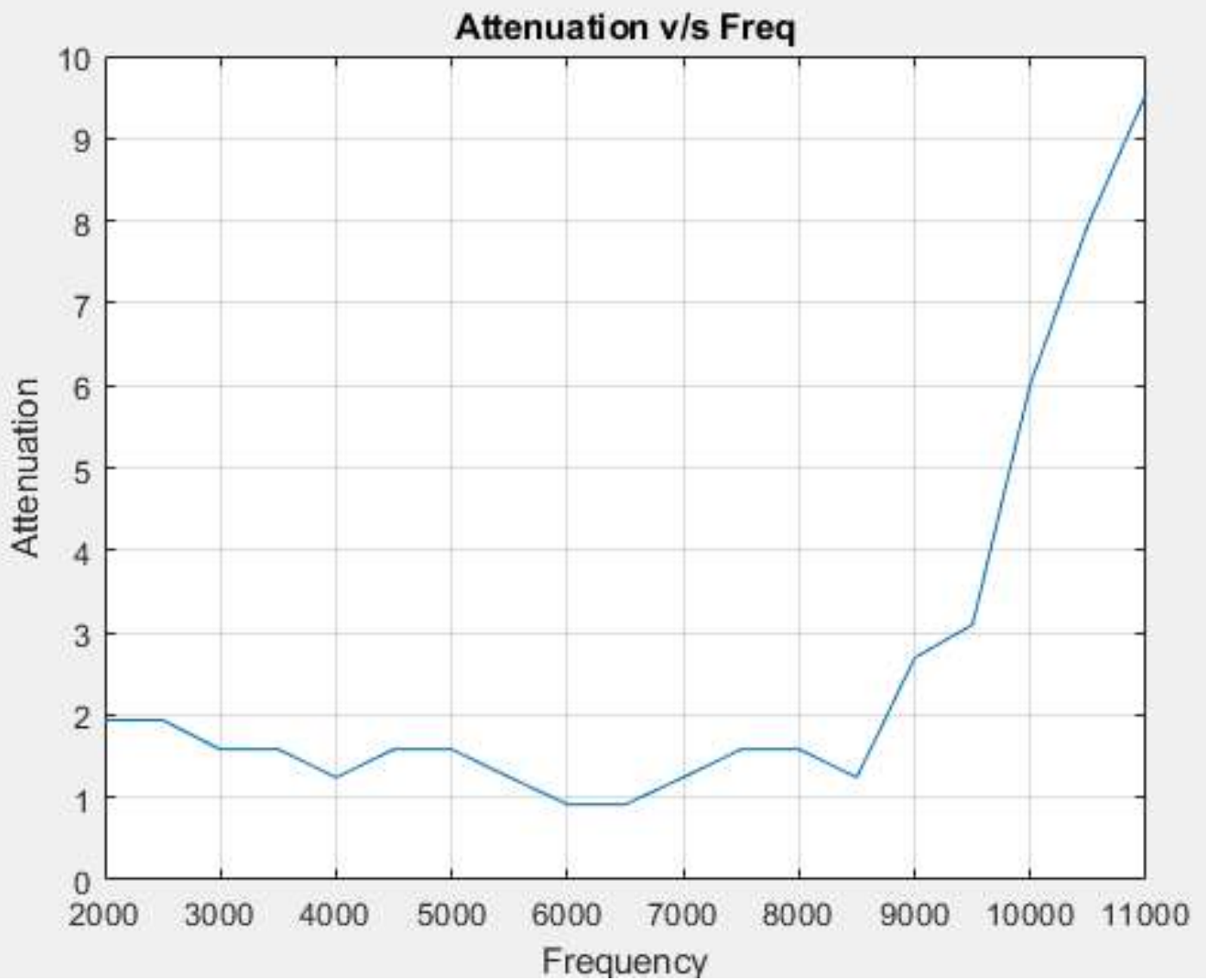
```
#include "L138_LCDK_aic3106_init.h"
#define N 26
float h[N] = {
    0,-0.0001554136988654,0.0005297417540974, -0.00052499339005,
-0.001143918471476, 0.006025170658883, -0.01462737317045, 0.02455823878442,
-0.02910476794908, 0.01703515696316, 0.02798517075739, -0.1415293981526,
0.6109523859146, 0.6109523859146, -0.1415293981526, 0.02798517075739,
0.01703515696316, -0.02910476794908, 0.02455823878442, -0.01462737317045,
0.006025170658883,-0.001143918471476, -0.00052499339005,0.0005297417540974,
-0.0001554136988654,          0
};

float x[N]; // filter delay line
interrupt void interrupt4(void)
{
    short i;
    float yn = 0.0;
    x[0] = (float)(input_left_sample());
    // input from ADC
    for (i=0 ; i<N ; i++)          // compute filter output
        yn += h[i]*x[i];
    for (i=(N-1) ; i>0 ; i--)      // shift delay line
        x[i] = x[i-1];
    output_left_sample((uint16_t)(yn)); // output to DAC
    return;
}

int main(void)
{
    L138_initialise_intr(FS_24000_HZ,ADC_GAIN_0DB,DAC_ATTEN_0DB,LCDK_LINE_INPUT);
    while(1);
}
```

Input freq in Hz	Input voltage (Vpp) (mV)	Output voltage (Vpp) (mV)	Attenuation in dB
2000	600	480	-1.93820026016113
2500	600	480	-1.93820026016113
3000	600	500	-1.58362492095250
3500	600	500	-1.58362492095250
4000	600	520	-1.24295813497689
4500	600	500	-1.58362492095250
5000	600	500	-1.58362492095250
5500	600	520	-1.24295813497689
6000	600	540	-0.915149811213502
6500	600	540	-0.915149811213502
7000	600	520	-1.24295813497689
7500	600	500	-1.58362492095250
8000	600	500	-1.58362492095250
8500	600	520	-1.24295813497689
9000	600	440	-2.69397147794912
9500	600	420	-3.09803919971486
10000	600	300	-6.02059991327962
10500	600	240	-7.95880017344075
11000	600	200	-9.54242509439325

**Results: -**



Plot of magnitude of attenuation (dB) and frequency (Hz)