

# The Latest

## 10 MHz Filter

Up

Posted by AG6QV Frank

Tags: [10 GHz](#) | [X-Band](#)

I have a couple of different GPS Locked reference oscillators that are used to lock PLL oscillators in microwave equipment. Some of these have a nice sine wave output at 10 MHz and others have a square wave output causing harmonics of the base frequency to be present in the signal. This is a factor that will increase the phase noise of the PLL oscillator. Getting rid of the harmonics is relatively simple with the help of a low pass filter. W1GHZ, Paul Wade has a nice [article](#) about the design of such a filter for a 10 MHz reference oscillator. The article is linked on the [small projects](#) page of his web site.

Today I decided to build a version of this low pass filter using SMD components. I did not have the exact values of all components, but was able to get close enough. I started out by creating a [NC](#) file for my CNC router and cut out a small PCB as seen on the image below. The PCB is about 8x19mm. This only a small amount wider than the SMA connectors I used.

~~20200126\_152729~~  
20200126\_152729 unknown

The at the end I added some heat shrink tube to finish the project.

~~20200126\_161955~~  
20200126\_161955 unknown

As you can see I ended up making two filters to check how accurate they were. It turned out that the first one gave the best performance. One of the inductors I used was in a 0402 package and way too small to work with. I'm going to order some in 0603 package and create a few more to see if this can be repeated with similar performance.

The output of the 10 MHz reference without the filter looks like this:

~~20200126\_160751~~  
20200126\_160751 unknown

The 3rd harmonic is only about 10dB down from the 10 MHz signal and there is a substantial amount of harmonics. After adding the filter the output looks like this:

20200126\_161039

Image not found or type unknown

Almost all of the harmonics are gone, indicating that the signal now is much closer to a sine wave. Using the spectrum analyzers tracking generator to show the filter response looks like this:

20200126\_161021

Image not found or type unknown

This shows 40-45dB attenuation at the 3rd harmonic and almost no loss at the base frequency.

**[Link to this Post](#)**

[Get RSS feed](#)

## Recent Blog Posts

## Blog Archives

[January 2020 {1}](#)

## Tags

[10 GHz {1}](#)

[HAM {0}](#)

[X-Band {1}](#)

## Calendar

May 2020							
Su	Mo	Tu	We	Th	Fr	Sa	
						1	2
3	4	5	6	7	8	9	
10	11	12	13	14	15	16	
17	18	19	20	21	22	23	

24

25

26

27

28

29

30

31