The Latest

Tunig of 10 GHz bandpass filter

Up

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I've been building multiple pipe cap filters for 10 GHz and found that precision is key to make something that is easy to tune. I'm using M3 screws and nuts but even with one nut soldered to the top of the 1/2" pipe cap the thread is not stable enough to keep the screw from moving from side to side. W7GLF, Ray found a waveguide filter on eBay and I jumped on the listing and paid the $85 plus tax. Today I received the filter to be used in my new 10 GHz rig.

The filter was listed as "Harris Farinon WG Filter 10 GHZ XMT 801-112556" but there was no frequency labeled on the filter and since there are 5 cavities I did not want to start moving them around without a system in place to avoid getting it completely out of tune.

10 GHz bandpass filter

When I inserted the filter in the 10GHz radio there was no viewable output on the spectrum analyzer and my HP spectrum analyzer, that covers 10 GHz, does not have a tracking generator. My Regol analyzer has a tracking generator but that only covers up to 1.5 GHz. I do not have a good signal generator that covers the microwave bands so that was not an option either. The solution is to use the 10 GHz transverter. It uses a LO Frequency of 10.224 GHz and would normally ise an IF of 144 MHz. Instead of using an IF radio I used the tracking generator from the Regol spectrum analyzer. I started out with a bandwidth of 500 MHz and used to HP spectrum analyzer to determine the center frequency of the filter to be around 10.580 GHz. I then narrowed the bandwidth to about 20 MHz and moved the center frequency down 5MHz. I could then tune the filter to max signal through, then I could move the center frequency another 5-10 MHz down as long as I able to see the signal I could tune the five cavities to maximum signal. By repeating these steps until the center frequency was close to the 10.368 GHz. Then I removed the tracking generator and replaced the IF signal with the 144 MHz radio and performed another tunig to maximum signal.

The image below shows the output of the mixer where the LO signal and the desired signal is shown.

Signal before filter

And the signal at the output of the filter looks like this:

Signal after filter

Note how the amplitude of the desired signal is the same level before and after the filter. This is an indication of a very small insertion loss. I'm quite happy about the performance. Tuning the filter to the correct frequency was much easier than anticipated. Having a VNA or an SA with tracking generator that covers the desired frequencies would make it even easier, especially to get the pass band to be in the right position. Since we normally only use about 2 MHz of bandwidth it is easy to check the filter response by moving the frequency of the IF radio to the band edges.

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