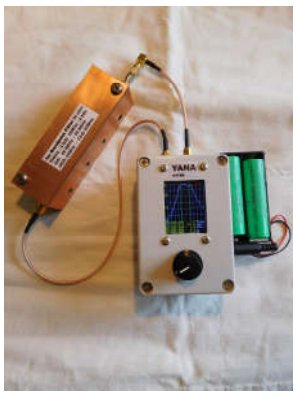
SNA … Measuring a 6m bandpass filter.

K1TRB 5/4/17



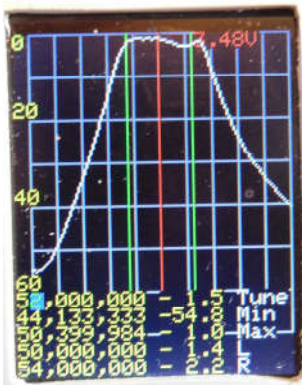
The methods described here work for bandpass filters in general. Wikipedia gives a brief overview of bandpass filters: https://en.wikipedia.org/wiki/Band-pass_filter

A long time ago I built a 6 meter narrow bandpass filter with 4 parallel tuned circuits. I want to measure the frequency response of this filter at 6 meters.

The connections to Yana are shown above. Yana's generator output goes into the filter and the filter output goes into Yana's detector input. Very simple.

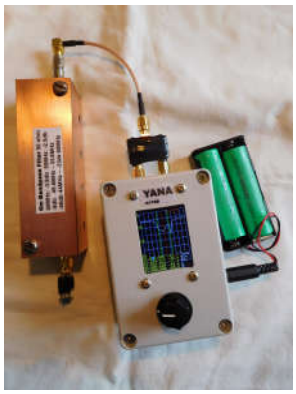
The Home screen is shown at the right. Since the filter is bandpass, Center/Radius is used to set the center frequency and the skirt frequencies for a scan.

The center frequency is 52MHz for the middle of the six meter band. The sweep is 8MHz either side of this center to show the skirts of the filter. The band edges are 2MHz either side of the 52MHz center, so left and right markers are set at 2MHz to show the band edges at 50MHz and 54MHz. The mode is SNA since we are analyzing a network. The graph is set for 10db steps.



The response scan is shown at the right. Since the markers are set at the 6m band edges, the vertical green lines mark the band edges. You will see I tuned this filter pretty well.

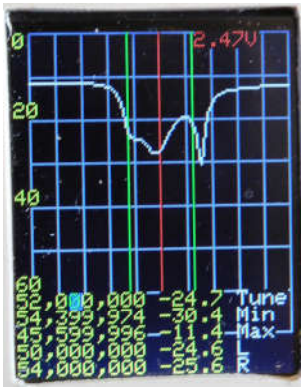
Attenuation at midband is 1.5db. Tuning allows us to find the attenuation at other frequencies. The minimum occurs at 44.13MHz with an attenuation of 54.8db. The maximum occurs at 50.4MHz at -1.0db. Attenuation at the band edges (markers) is also given as -1.4db at 50MHz and -2.2db at 54MHz.



The tuning feature of the Yana graph may be used to check the -3db response points on the graph. Since the midband attenuation is -1.5db, 3db less would occur at -4.5db. I tuned and found -4.5db at 49.3MHz and 54.6MHz. Looks like this is a pretty good bandpass filter.

But the story does not end here. The results become more interesting if the bridge is installed. One end of the filter is connected to the bridge and the other end of the filter is terminated with 50 ohms as shown at the right. Either end of the filter can be connected to Yana.

The bridge is registering the reflection coefficient at the end of the filter plus the losses through the bridge. The two images at the right show the reflections at the two ends of the filter when the opposite end is properly terminated with 50 ohms.



The dips can be used to tune the filter. Filters are both designed and tuned by looking at the reflections. Maybe, using the method of reflections (Dishal's Method) I will demonstrate tuning a filter using these dips.

Ideally, the downward dips should be symmetrical with respect to each other and the band edge markers. In reality I've never achieved that goal, but a well-tuned filter is not too bad, as is the case with this filter.