Cheap HF Quarter-Wave Stubs

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Some may ask “why would I need a quarter-wave stub”? When our club is activating a lighthouse, beach or park, we are often setting up two or even three stations with antennas in fairly close proximity to each other. Although some stations may be QRP, many times we are also including a 100W transceiver for SSB.

This can cause major interference between stations, even when everyone is on a different band. For example, a transmitter on 40m (7 MHz) can overload a receiver on the 20m (14 MHz) band, making it almost impossible for the 20m station to copy CW or even voice.

A “shorted” quarter-wavelength (for a particular frequency) piece of coax, will appear as an open at the other end of this shorted stub. For example, if we make a shorted stub for 20m and connect it to the transceiver, it will not affect the SWR on 20m but will appear as a partial short to signals on the 40m band. This is because the 20m quarter-wave stub will appear as an eighth-wavelength shorted stub on 7 MHz and will greatly attenuate these signals. Likewise, also placing a 40m stub on the 7 MHz station can greatly reduce any harmonic RF it is producing on the 14 MHz band.

You can use a regular T-connector (either BNC or UHF as required) attached directly to the transceiver, with the antenna coax connected to one side and the quarter-wavelength shorted stub (for the band you will be operating on) connected to the other side of the T.

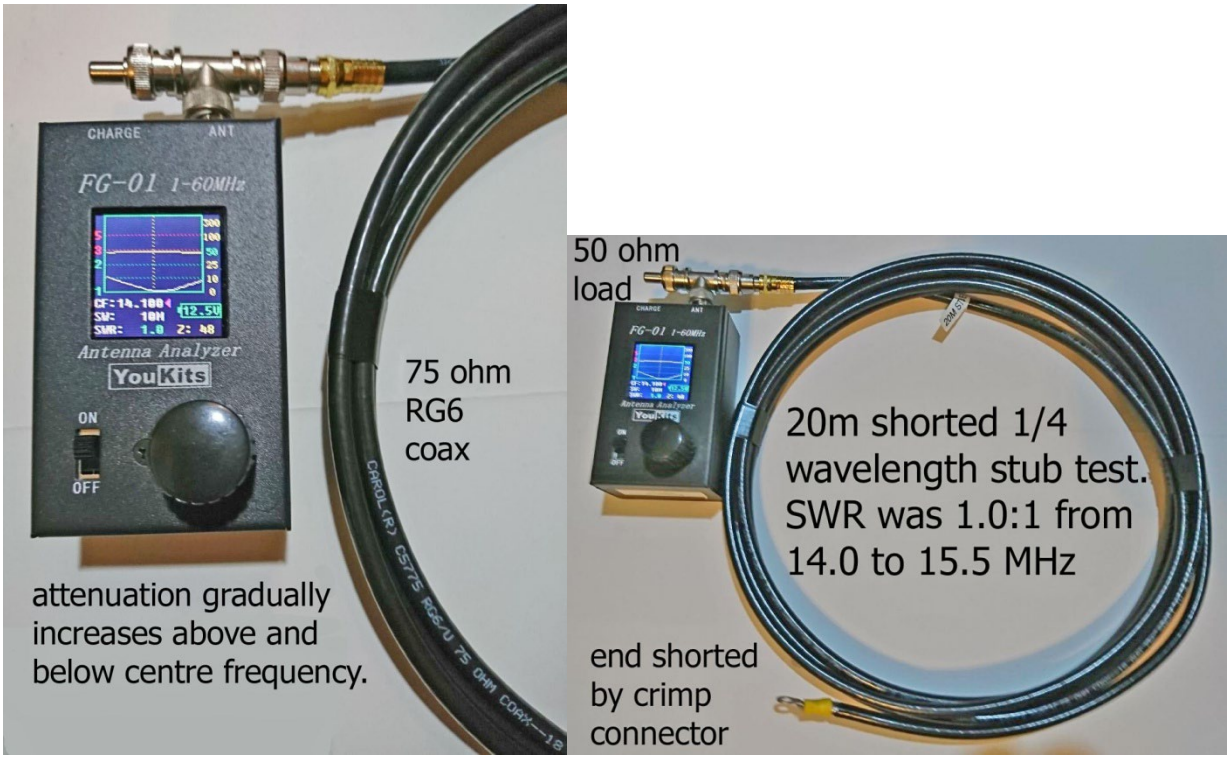
After searching the internet and reading several articles on the difficulty of making precision quarter-wave stubs out of expensive 50 ohm coax, and placing them in precise locations on the station feed line; I almost gave up on the idea of trying to make my own.

The fact is that a multiband antenna is not always 50 ohms on every band, and a transceiver’s internal tuner can compensate for mismatches that may be introduced by the antenna or by attaching a quarter-wave stub. Since I didn’t plan on using a KW, any small coax should work for QRP levels. And why should it have to be 50 ohm coax, I had lots of quality 75 ohm RG6 satellite TV coax laying around. I put an F-connector on the RG6 and then used an F to BNC adapter.

I cut the RG6 for each band, using the formula “(468 / MHz) / 2” to find the length in feet. I didn’t know the velocity factor for my RG6 so I multiplied the result by 0.9 which made it a bit long.

My little YouKits FG-01 antenna analyzer made it very easy to trim the coax to the proper frequency. It can visually display the center frequency for an open quarter-wave stub in real-time also, so I just kept cutting off an inch or so at a time until it looked good while attached to

the T-connector along with a 50 ohm load. Then I shorted the center conductor to the shield braid at the end and used a crimp-on lug, its tab can be cut off and heat shrink used to insulate the end of the stub if desired. After shorting the stub, the exact 1:1 SWR bandwidth can be measured, with a 50 ohm load where the antenna will connect.



Everyone in our group has made a stub for each of the various HF bands they plan on using when we are operating together. I have found that these stubs even work well on the club TS-480SAT at 100W, and have also used them on my KXPA-100 PA when operating my KX3 at 100W. I used a UHF type T-connector on the transceiver/PA output and then used a UHF to BNC adapter to mate to the stubs.

When everyone is on a different band and all are using their quarter-wave shorted stubs, interference between stations has been greatly reduced (and in many cases, completely eliminated). Also the stub tends to attenuate out-of-band signals from other (non-amateur radio) sources.

Maybe my version isn't as effective as the "real thing"; but it's cheap, easy to make and works well for us. This project proved to me that it's better to try it and see if it works, rather than just accept that the "experts" say it probably won't. Total cost was very low - half a dozen type F crimp-on connectors, one or two F to BNC adaptors, a BNC or UHF "T", and a UHF to BNC adaptor if needed; the RG6 coax was free.

Set of 5 quarter-wave stubs for 10, 15, 17, 20 and 40m bands. I plan on also making one for the 80m band. These are compact and light-weight, and all fit into a small bag (wind some in diameters that can nest inside others). Don’t forget to label each stub with the band it is for, as you make them. We will definitely be trying them out during the next Field Day with two 100W club stations; usually one is on SSB and the other on CW or a digital mode.