Common HAM/Radio Applications for a Spectrum Analyzer

*Date:*07/24/2013

Solution:

1. Measuring the performance of a crystal filter

Hams use crystal filters in their radios to enhance selectivity, but short of installing the filter there is really no easy way to test one. A spectrum analyzer with a tracking generator makes it fairly easy. Simply feed the tracking generator into the filter input and look at the resulting response from the filter output.

A nice additional feature on some spectrum analyzers is the "N dB" feature that makes it easy to find the point where the response is N dB down from that at the filter center frequency.

2. Testing and adjusting duplexers and diplexers

Duplexers are used in repeater installations to allow a single antenna to be used for simultaneous receive and transmit on slightly separated frequencies. In order to do this the duplexer has to be adjusted so that it provides the required attenuation of the transmitter frequency so that it does not interfere with the receiver.

Any repeater owner has to deal with tuning a duplexer at some point. A spectrum analyzer with a tracking generator makes this easy.

A diplexer allows the use of a single antenna on two different bands, and is a lot smaller than a duplexer. Lots of HAMs use diplexers in their cars to allow a single antenna to be used on both the VHF and UHF bands.

3. Coaxial stub tuning and coaxial cable measurements

Attache a piece of coaxial cable to the input/output of the tracking generator using a T connector. First, this shows you the frequency where the cable is 1/4

wavelength long. ¼ wavelength coaxial stubs are often used to reduce interference from nearby transmitters. You can trim a piece of coaxial cable until you reach the frequency you want just by cutting a small amount from the cable and watching the response on the screen.

Another useful feature using the T-connector technique is that when you have determined the frequency where the cable is 1/4 wavelength long you can easily determine the physical length of the cable without actually having to measure it. All you need to know is the frequency where the cable is 1/4 wavelength long (read from the screen on the spec an) and the velocity factor of the cable which is a specification that can be looked up for any type of cable.

Then the length of the cable (in feet) is calculated by the formula L = (246*Vf) / F, where F is the frequency in MHz.

4. Antenna performance (return loss)

The return loss of an antenna is a measure of how close its impedance is to that of the system driving it. You can measure return loss with the spectrum analyzer and the tracking generator if you have a directional coupler. By attaching the reflected port to the spectrum analyzer you can measure the return loss of an attached antenna, and you can calculate VSWR from return loss by the formula VSWR = (1+(10^RL/20)) / ((10^RL/20)-1) where RL is the measured return loss.

5. FM and AM Radio Channel performance.. you can demodulate, see the frequency and amplitude deviation, etc..

Headquarters

RIGOL TECHNOLOGIES, INC.
No.156,Cai He Village,
Sha He Town,
Chang Ping District, Beijing,
102206 P.R.China
Tel:+86-10-80706688
Fax:+86-10-80705070
Email: support@rigol.com

USA

RIGOL TECHNOLOGIES,USA INC.
7401 First Place, Suite N
Oakwood Village
OH 44164, USA
Toll free: 877-4-RIGOL-1
Office: (440) 232-4488
Fax: (216)-754-8107
Email: info@rigol.com

EUROPE

RIGOL TECHNOLOGIES GmbH
Lindbergh str. 4
82178 Puchheim
Germany
Tel: 0049- 89/89418950
Email: info-europe@rigoltech.com