



## ASK THE EXPERTS

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### Online Resources for Reference and Education

Here are a few of the web-based resources that are helpful for RF, microwave and optical engineers:

#### ***www.bessernet.com***

A companion web site to the short courses offered by Besser Associates ([www.besserassociates.com](http://www.besserassociates.com)). Under the “Tutorials and Applets” section, you can find these calculators and tutorials:

dBm/dBw Calculator  
dB Calculator  
Animated VSWR Calculator (finally understand what a standing wave looks like!)  
Low-pass Butterworth Filter Design applet.  
Interactive tutorials on low-pass and high-pass Butterworth filter design.  
A basic Smith Chart impedance matching applet  
DSP Tutorial: Time Domain Interpolation by Frequency Domain Zero Padding  
DSP Tutorial: Quadrature Signals: Complex but not Complicated  
Mixer Noise Measurements Tutorial

Under the “Job Aids” section are listings and recommendations for books, articles and application notes, along with links to various industry resources.

#### ***www.rfcafe.com***

We have referred to this site before, and it is worthwhile to note it again. The top of their main page has the headings “Design,” “Resources,” “Technical,” and “Miscellany.” Each of these leads to extensive listings of links to sites with a wide variety of engineering aids as well as other useful stuff.

This site also has an Online Calculators section with Excel-based calculators for many electronic functions and filter types.

#### ***www.microwave101.com***

This site also has many RF/microwave resources and links. For example, their “Microwave Calculators” section includes these HTML calculators:

Attenuator Calculator  
Cascade Calculator  
Dual Coax Calculator  
Coax Calculator  
Microstrip Calculator

Reactance Calculator  
Resonant Frequency Calculator  
Skin Depth Calculator  
Stripline Calculator  
Unequal-split Power Divider Calculator  
VSWR Calculator  
Wavelength Calculator  
Wire over Ground Calculator

as well as several downloadable Excel calculators for various useful functions.

Visitors should also explore this site’s “Microwave Encyclopedia” for valuable information on a huge number of specific topics, and the “Acronym Dictionary” to find out what those alphabet soup letters really mean.

#### ***www.agilent.com***

The classic “Hewlett Packard” application notes have served as tutorial material for a couple generations of engineers. You can find current technical data in the Agilent library under each business unit.

For example, from the home page, clicking on “RF & Microwave Instruments and Systems” under the larger “Test & Measurement Equipment” heading will open a listing of equipment types. Below the list are Library resources, including application notes. You can quickly search through the lists of app notes for a particular type of equipment, or do a site search for more specific requirements.

#### ***... and more***

There are many other institutional, personal and vendor web sites with useful information. Most of them are included in the listings of links from the above list. We offer a few common-sense recommendations for searching and using the data available on these sites:

- *Caveat Emptor*—Very little easy-to-get information is verified as accurate or complete.
- Much of the hands-on design data is from experimenters and home practitioners. Some is outstanding, most is pretty good, and some is suspect.
- Careful searching on Google ([www.google.com](http://www.google.com)) can yield good results on specific topics—including such resources as university papers, white papers, tutorial backgrounders and supporting material from vendors, etc. As you probably know, Google searches must be as specific as possible to get best results.