

## **Understanding the Coupling, in Type "S" Broad-band Antennas**

By: Edward J. Shortridge - W4JOQ

When you model a Broad-band antenna which uses a single radiator, you have a resonant circuit. If you additionally use a resonant transmission line for Broad-banding, such as a 0.25 Wavelength Stub, you have another resonant circuit and you must take steps to control the coupling between them. If they are under coupled, or critically coupled, both the radiator, and the resonant Stub will always be resonant at the center frequency of the band for a well-designed antenna.

If you wish to Broad-band an antenna, you must do it carefully. If you happen to be using a "So" Offset Vertical ground plane antenna, you can move the feed point higher on the radiator which will increase the impedance and the coupling. When over coupling is achieved, you must make use of it and it is necessary to readjust the resonant frequency of each of the two resonant circuits. The radiator might be the one you choose to resonate somewhat closer to the upper end of the band, then adjusting the 0.25 Wavelength transmission stub towards the lower part of the band. All of this done in order to achieve a wider and a lower Broad-banded SWR bandwidth.

If you remove the 0.25 Wavelength transmission stub with the Source placed at the feed point, you will find that the radiator is not resonating at the center of the band. If your intent is to show the basic antenna SWR bandwidth, it is necessary to lengthen the radiator so that the SWR is centered in the desired band. You cannot just remove the 0.25 Wavelength transmission stub and expect the SWR to be centered in the desired band.