

**What is VSWR and how is it specified?**

VSWR is a measure of the amount of signal that is reflected back from a connector. It is a vector quantity in that it has both amplitude and a phase component. This is important when considering the impact of multiple connectors in a transmission line (see How do I specify the performance characteristics of a cable assembly?, below). Mismatched impedances cause the reflections. If the cable being used has a characteristic impedance of 50 ohms, then the connector must also maintain 50-ohm impedance. The transition from the cable to connector transmission line sizes and captivation of insulators and contacts are the main causes of mismatches within the connector.

There are generally 2 ways in which the VSWR of a connector is specified. The first is a "flat line limit" over the entire frequency range. For example, for a straight BNC Plug on flexible cable, the VSWR limit is 1.3:1 maximum (usually just written as 1.3 max) to 4 Ghz. The second method is to allow for the fact that VSWR is typically a direct function of frequency. A straight SMA plug on RG-142 B/U cable can have a maximum VSWR of  $1.15 + .01 * F$  (Ghz) to 12.4 Ghz. For example, at 2 Ghz, the maximum allowable VSWR would be  $1.15 + 2 * .01$  or 1.17 max. At 12.4 Ghz it would be  $1.15 + 12.4 * .01$  or 1.274 max. Naturally, these values can be converted to Return Loss or Reflection Coefficient.