**12 Tips and FAQs for Selecting the Right Coaxial Cable by Peter McNeil / Pasternack**

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The growth of wireless and high speed data applications has only expanded the use of coaxial cabling beyond traditional video and telecommunications uses. With the growth and standardization of coaxial cabling for a wide range of applications, coaxial cabling has become very familiar in the home, office, telecommunication facility, rail platform, industrial plant, and government/public safety operational facility. This application diversification has also led to the diversification of coaxial cable types, grades, and manufacturers. Ensuring the right questions are asked and the right considerations are made can help avoid any installation upsets, which are now more costly than ever.



The following tips and FAQs will help you make the right decision in selecting a coaxial cable for your specific needs.

**Know the Application Requirements and Parameters**

The first step is always knowing what problem needs to be solved. In the case of a coaxial cable, this is knowing the qualities of signals that the cable will be carrying. Several important factors are frequency range, and the power levels of the signals being transmitted. Other variables include the RF and electromagnetic environment the signals will be routed through, as well as the length of routing, and how complex the routing will be. The budget for the project and any regulatory requirements will also play a major role in the decision making surrounding the particular coaxial cable chosen for an application.

**Pick the Right Impedance**

There are two main cable impedances in use, 75 Ohm and 50 Ohm. It is not possible to tell the impedance of a coaxial cable externally, unless there are visible markings, and getting the two mixed up could cause damage to equipment connectors, the devices themselves, or at least lead to reduced system performance. 75 Ohm cables are typically used for video applications, and 50 Ohm cables are more often used for data and wireless purposes, though there is sometimes cross over. The type of equipment and devices requiring the interconnect will determine the cable impedance used.

**Choose the Right Length vs. Attenuation**

Signal energy is lost as heat energy due to the resistance from the conductors, dissipation factor of the dielectrics and other factors related to the material quality in the coaxial cable. The attenuation of a cable is a measure of the loss per unit length of a coaxial cable. For applications that have very low power signals, or have very long routing requirements without amplifiers or signal boosters, it is likely that low-loss cable may be required to meet the minimum signal strength requirements at the receiving end of the coaxial cable. If the attenuation of a coaxial cable is low enough, a signal strength booster may not be required, and the more expensive low loss cable could be well worth the investment.

**Cable Performance is Frequency Dependent**

Each coaxial cable will have several performance parameters, which vary over frequency, described in their datasheets. This includes attenuation and power handling specifications. Typically, the higher frequency signals suffer from greater resistive losses, hence greater attenuation. Moreover, at certain high enough frequency, a coaxial cable begins to act as a waveguide, and a very poor TEM mode transmission line. This is known as the cut-off frequency, and should be well above the highest frequency of any desired transmission signals.

**Different Cables Have Different Power Ratings**

Depending on the diameter of the cable, the type of center and outer conductors, and the quality of the cable, different cables will have different maximum power handling ratings. These ratings could be given in continuous, average, or peak power figures, and they do imply different things depending upon what type of signals are expected. A maximum voltage and current rating may also be given. It is important to note that this rating will also depend on the frequency, and a cable with a good margin of safety should be chosen. If the power rating of a coaxial cable has been exceeded, the risk of, sparking, accelerated aging, dielectric degradation, combustion, and other unfortunate failure modes could occur.

**Not All Coaxial Cables Shields the Same**

There are several types of braided, stranded, foil, solid, corrugated, and other geometries and styles of outer conductors and shielding. Some cables may have several layers of shielding beyond the outer conductor to further reduce the interference received and transmitted from the coaxial cable. Different types of outer conductors and shields also allow for crush resistance, more rigidity/flexibility, and lower attenuation. For many applications, the budget is what limits the quality and number of outer conductors and shields available for a coaxial cable.

**How Will The Cable Be Routed/Run?**

Different applications often have very different routing needs. Large outdoor industrial environments have different requirements than within machine facilities, or through the frame of an aircraft. From within assemblies to within complex buildings, there are coaxial cables designed to meet the needs of virtually any environment. Coaxial cables have several different specifications that qualify them for a specific type of routing, including bend radius, maximum load or unsupported run, wind load, and many environmental factors and ratings. Typically, this information should be available to the cable buyer, and if not the exact details of the routing requirements could be as important as the electrical performance of a cable. Different jacketing materials and layers are often available for aid with installation, as some applications lead to relatively rough handling during routing.

**What Type of Connectors Are Needed?**

There are many types of coaxial cables, and just as many coaxial cable connectors. The type of coaxial connector is dictated by the matching device, system, or other interconnect the coaxial cable will be mated with. Certain cables, however, may be a better fit for certain connector types, based on size, shielding type, center conductor type, additional layers, and types of metals used. Avoiding contact between different metallic conductors may be important, as this can lead to corrosion, poorer performance, and eventual failure.

Some coaxial cables may be too small or too large for certain coaxial connectors that aren’t specifically designed for that cable. Many vendors also have coaxial connectors optimized for specific cable. Low PIM or low loss applications may also warrant specialized and higher performance connectors. Coaxial connectors may also be attached to cables in several ways, including crimping, soldering, tool-less press-fit, and many other means. Not all cables are built for certain connection types, and this should be considered.

**Should I Buy a Coaxial Cable or a Coaxial Assembly?**

Because of the variety and application requirements of installing coaxial connectors on cables, many vendors offer coaxial assemblies that are preassembled for a specific use. If the length, performance parameters, and type of coaxial connector are known for a specific application, a cable assembly may be the best choice. Pasternack has a [great tool](https://www.pasternack.com/t-cable-creator.aspx) to help a buyer design on the best cable assembly for an application.

**Regulatory Requirements and Special Installations**

Certain applications, such as military, government, avionics, space, naval, and industrial installations have specific regulation and requirements for coaxial cable performance. These are industry, society, and governmental regulations that often must be met before a cable can be qualified for use. This can be rather complex to keep in mind, and an expert is likely the best resource for these specifics.

**Specialty Cable**

There are many specialty applications, such as test and measurement, scientific experimentation, satellites, and high performance radar, which require very specifically designed coaxial cables. Beyond regulatory standards, these cables often need to meet application specific requirements, and complete in many non-standard categories. An expert can help to navigate these options and help a buyer choose the best option for their specific needs.

**Counterfeit Cables and Knock-offs**

Though unfortunate, the internet has made the counterfeiting and illegal sale of knock-off coaxial cable more accessible. Using anything but authentic cable can itself be illegal, or endanger the safety of operators and equipment. Choosing only qualified vendors with excellent track records and quality management systems is the best deterrent to suffering the potential losses of investing in counterfeit and knock-off coaxial cabling.