Construction

Coaxial cable design choices affect physical size, frequency performance, attenuation, power handling capabilities, flexibility, strength, and cost. The inner conductor might be solid or stranded; stranded is more flexible. To get better high-frequency performance, the inner conductor may be silver-plated. Copper-plated steel wire is often used as an inner conductor for cable used in the cable TV industry.[5]

The insulator surrounding the inner conductor may be solid plastic, a foam plastic, or air with spacers supporting the inner wire. The properties of the dielectric insulator determine some of the electrical properties of the cable. A common choice is a solid polyethylene (PE) insulator, used in lower-loss cables. Solid Teflon (PTFE) is also used as an insulator, and exclusively in plenum-rated cables.[*citation needed*] Some coaxial lines use air (or some other gas) and have spacers to keep the inner conductor from touching the shield.

Many conventional coaxial cables use braided copper wire forming the shield. This allows the cable to be flexible, but it also means there are gaps in the shield layer, and the inner dimension of the shield varies slightly because the braid cannot be flat. Sometimes the braid is silver-plated. For better shield performance, some cables have a double-layer shield.[5] The shield might be just two braids, but it is more common now to have a thin foil shield covered by a wire braid. Some cables may invest in more than two shield layers, such as "quad-shield", which uses four alternating layers of foil and braid. Other shield designs sacrifice flexibility for better performance; some shields are a solid metal tube. Those cables cannot be bent sharply, as the shield will kink, causing losses in the cable. When a foil shield is used a small wire conductor incorporated into the foil makes soldering the shield termination easier.[*examples needed*]

For high-power radio-frequency transmission up to about 1 GHz, coaxial cable with a solid copper outer conductor is available in sizes of 0.25 inch upward. The outer conductor is corrugated like a bellows to permit flexibility and the inner conductor is held in position by a plastic spiral to approximate an air dielectric.[5] One brand name for such cable is *Heliax*.[6]

Coaxial cables require an internal structure of an insulating (dielectric) material to maintain the spacing between the center conductor and shield. The dielectric losses increase in this order: Ideal dielectric (no loss), vacuum, air, polytetrafluoroethylene (PTFE), polyethylene foam, and solid polyethylene. An inhomogeneous dielectric needs to be compensated by a non-circular conductor to avoid current hot-spots.

While many cables have a solid dielectric, many others have a foam dielectric that contains as much air or other gas as possible to reduce the losses by allowing the use of a larger diameter center conductor. Foam coax will have about 15% less attenuation but some types of foam dielectric can absorb moisture—especially at its many surfaces—in humid environments, significantly increasing the loss. Supports shaped like stars or spokes are even better but more expensive and very susceptible to moisture infiltration. Still more expensive were the air-spaced coaxials used for some inter-city communications in the mid-20th century. The center conductor was suspended by polyethylene discs every few centimeters. In some low-loss coaxial cables such as the RG-62 type, the inner conductor is supported by a spiral strand of polyethylene, so that an air space exists between most of the conductor and the inside of the jacket. The lower dielectric constant of air allows for a greater inner diameter at the same impedance and a greater outer diameter at the same cutoff frequency, lowering ohmic

losses. Inner conductors are sometimes silver-plated to smooth the surface and reduce losses due to skin effect.[5] A rough surface extends the current path and concentrates the current at peaks, thus increasing ohmic loss.

The insulating jacket can be made from many materials. A common choice is PVC, but some applications may require fire-resistant materials. Outdoor applications may require the jacket to resist ultraviolet light, oxidation, rodent damage, or direct burial. Flooded coaxial cables use a water-blocking gel to protect the cable from water infiltration through minor cuts in the jacket. For internal chassis connections the insulating jacket may be omitted

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