

Chapter 5-1

TRANSMISSION LINES

ACMA Foundation Syllabus 5.1 – 5.3

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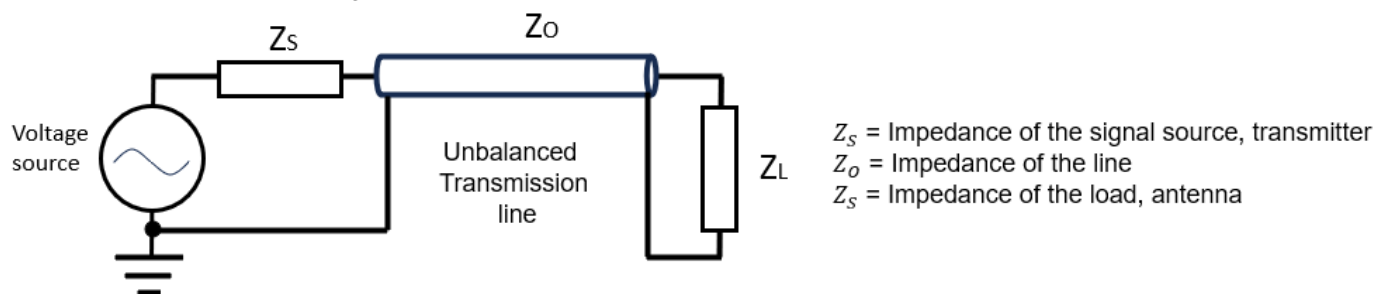
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Transmission Lines

Transmission lines (Feeders or Feedlines) connect the transmitter to the antenna. At lower frequencies this is achieved with balanced, open wires, or unbalanced, coaxial cable. At very high radio frequencies, the transmission line is a hollow conductor, circular or rectangular cross-section, called wave guides.

The characteristic impedance of coaxial cables (coax) is commonly chosen to be 50 Ω for RF and microwave applications. Coax for video applications is usually 75 Ω for lower loss.

Matching the transmission line impedance to the antenna and transmitter is important so the maximum power is fed to the antenna. This is achieved by matching the correct transmission line to the transmitter. $Z_S = Z_O = Z_L$

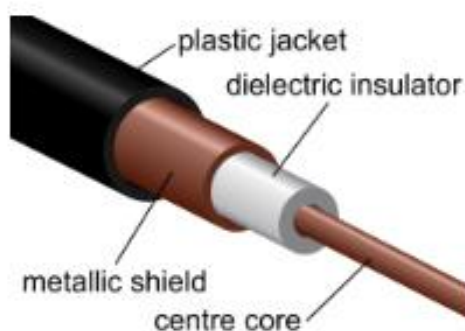


Ever wondered why the transmission lines are 50 or 75 ohms? Well, the answer is that 50 Ohms is the least compromise between the minimum loss impedance, maximum power and maximum voltage.

Unbalanced

An unbalanced transmission line, also referred to as asymmetrical line, usually consists of a conductor that is considered the signal line and another conductor that is grounded. This is usually achieved with coaxial cable (Coax).

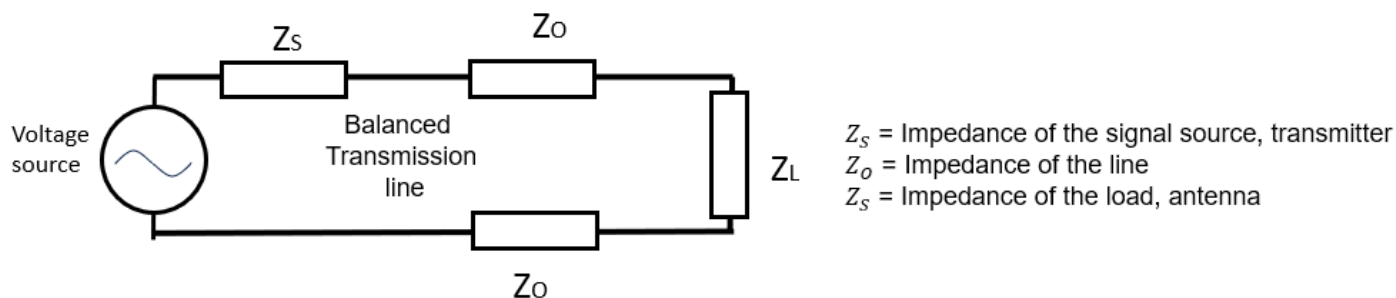
The usual form of coax is a flexible cable with a braided screen. Sample coax could be RG58. Coaxial lines are the norm for connections between radio transmitters and their antenna. A cut away view of a coax cable is shown below.



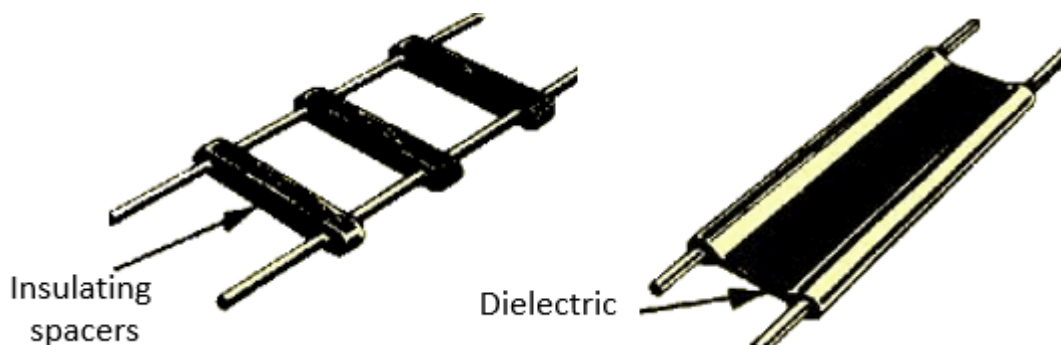
Cutaway image of a shielded cable. Image credit: Tkgd2007

Balanced

The term "balanced line" means that the same level of current flows in each wire with reference to ground. The direction of current in one wire is 180 degrees out of phase with the current in the other wire. In a balanced line, none of the wires are connected to the ground and has an impedance of 300 – 600 ohms.

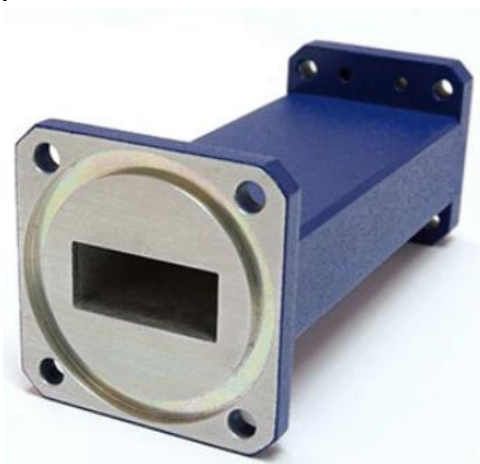


Balanced transmission lines, also called symmetrical or ladder lines, are described by the two conductors for the signal. A balanced line reduces the influence of noise or interference due to external stray electric fields. Two types of balanced transmission lines are shown below.



Waveguides

A waveguide is a special form of transmission line consisting of a hollow metal tube. The tube wall provides distributed inductance, and the empty space between the tube walls provide distributed capacitance. Wave guides conduct microwave energy at lower loss than coaxial cables. A picture of a wave guide is shown below.



Connectors

Choice and use of the correct connector is important.



Cable Test

After the installation or repair to any transmission line, conduct a continuity test to ensure the cable is connected correctly. This will be covered in the practical test.

Go to Chapter 5-1 Questions.

Have fun and stay safe.