All coax cable has loss. The term is “Attenuation”, and it is measured in Decibels per 100 feet. One Decibel is about 25%. It's a logarithmic scale (based on the power to which 10 is raised to equal the factor expressed in the ratio) where:
1 dB = x 1.26
3 dB = x 2
6 dB = x 4
10 dB = x 10
20 dB = x 100
30 dB = X 1000

We use Decibels to express a ratio between two values. In this case, we will look at the attenuation in typical coax cables, where we are looking at the ratio of the power that goes in one end to the power out the other end of 100 feet of cable. Fifty feet would exhibit half this much loss.

The attenuation of coax cable increases with frequency. So the values below are listed for 30 MHz (HF), 50 (6 meters) 150 (2-meters), 220 (1.25 meters) and 450 MHz (70 centimeters)

Coax attenuation per 100 feet (dB)

Frequency	RG58	RG8/LMR400
30 MHz	2.5 dB	0.7 dB
50 MHz	3.1 dB	0.9 dB
150 MHz	6.2 dB	1.5 dB
220 MHz	7.4 dB	1.8 dB
450 MHz	10.6 dB	2.7 dB

Notice that the lower priced RG58 (quarter inch) coax has 2.5 dB loss at HF. That means a little less than half the power gets lost in 100 feet. Notice also that the higher priced, but lower loss LMR400 (half inch) coax has much less loss at each frequency.

There are a number of factors to consider in evaluating coax quality. Power handling capability is not a primary one. Even the smallest commercially available coax will handle full legal Amateur power.

The loss is mainly a function of the kind of dielectric (insulator) used between the center conductor and the shield. The radio energy travels through this material. In a transmission line, the radio energy travels in the space between the two conductors. In the case of coaxial cable, that is the space between the shield and the center conductor. This space is filled with the dielectric. In practice, the best possible dielectric is air.

Most modern cables use some sort of plastic as a dielectric, with polyethylene being the most common. This can be solid (which appears transparent or translucent) of foamed (which appears opaque). Foamed polyethylene has lower loss than solid when new. The air in the foam is responsible for this. As the coax ages, it can absorb moisture, which will increase the loss factor. So foamed cable starts off with lower loss, but can end up after a few years with higher losses than solid dielectric cable.

The density of the RF fields within the dielectric is primarily responsible for losses. Larger diameter cable has more dielectric, and therefore a lower density. So the rule of thumb is that larger cables have lower losses.

The construction of the shield braid is an important factor in keeping the signal inside the cable. This has a lot to do with the tightness of the weave of the braid. Some cables also

incorporate a foil layer under the braid to give 100% coverage.

The center conductor is either a single solid wire or a stranded conductor. Normally, a stranded conductor is better. The solid wire is a little cheaper, but has a tendency to break with flexing or vibration.

There are all sorts of coax lines available, ranging from 1/8-inch diameter cable with silver conductors and Teflon dielectric up to 4 or more inch diameter high power cables. The smallest cables are used for specialty applications within equipment. The largest ones are used for broadcast stations. The needs of Amateur stations are met by a small selection of this range of products.

The most generally used cable is in the half-inch diameter class. The best bet would be a foamed dielectric and a foil wrap under the shield braid. One common such product is Times Microwave LMR-400. For most Amateur uses this is an acceptable cable.

The “Radio Shack” half-inch cable can be anything. It is what ever the owner of the store got a good deal on. I recommend buying cable from a recognized Amateur Radio retailer.

For some applications, the relatively stiff half-inch cable is not convenient to use. Particularly in mobile installations or the “last five feet” bringing the cable to the equipment. In these situations, the length of smaller cable used is usually not a significant loss factor.

In repeater installations, where there may be 100-feet or more of coax up a tower to the antenna, the typical cable choice is “7/8-inch hard line” This is large diameter (7/8-inch) and the inner and

outer conductors are solid copper tubes, not braid or stranded wire. This is economical for a high performance station. It is probably overkill for a home station.

If half-inch cable has too much loss for your application, there are 5/8” and 3/4” cables available. Other than the cost, the other drawback to these is non-standard connectors.

The most commonly used connectors in the Amateur world are the “PL-259” (also known as the ‘UHF’), the “Type-N” and the “BNC”. These are all readily available for half-inch and quarter-inch cable. They cost between two and six dollars apiece. Every connector introduces a little loss. The BNC and Type-N connectors are vastly superior over the UHF connector, but they cost more. The difference, like a lot of things, is greater as the frequency goes up. So use the best cable and connectors you can afford on your 440 station. Try not to relax this for 2-meters. On HF, cheaper cable and connectors will not hurt you much.

So, to sum up…

Use half-inch diameter, foamed dielectric coax for most applications. This may have to be reexamined at frequencies above 400 MHz and lengths significantly over 100-feet. Use PL-259 (UHF) connectors for HF and 2-meter applications. Consider using Type-N connectors for 440 applications. The world will not end if you use UHF connectors on UHF frequencies.

Be sure to waterproof the connectors to keep moisture out. Electrical tape is not waterproof. Hardware store silicone caulk is not waterproof. Use a specialty product like “coax-seal” to waterproof your outdoor connections. Your entire

investment in cable rides on keeping the moisture out.

It is perfectly acceptable to use smaller quarter-inch (RG-58) cable for short jumper cables and in mobile installations where the larger cable is not appropriate. Keep the lengths to a minimum on anything except the lower HF frequencies.

Most hams think of coax loss in terms of their transmit power being lost. That happens of course. But the most important loss, however, is to the received signal. If you can’t hear a station, you can’t work it.

The antenna is the single most important component of any radio system. The coax is part of the antenna system.

73, de NM7R