Antennas

A good antenna is the backbone of a radio station. A Lot of power into a poor antenna will seldom produce more solid coverage than a small amount of power into a good antenna. Included here are some basic designs that will offer good overall performance for a variety of different space requirements.

Feedlines

Most modern day radio equipment operates with 50 ohm impedance cable and antennas. For antenna design in this section we will follow this convention as close as we can. Use 50 ohm coax cable for all transmission of RF energy in your radio station. There are many different kinds of 50 ohm cable, it is used extensively in CB and Amateur radio, and used for Ethernet computer networks. It can be found at most Radio Shacks and electronic stores. The Figure at left shows some popular 50 cables and the loss at 100 ft. Loss is shown in dB. Every 3dB is 2 times (see section on dB), so if we had 10 watts of output power and ran it through 100ft of RG-8A/U we would only have about 5 watts reaching the antenna. So, for low power stations, short feedlines are almost a must! I would keep all runs under 50 feet if possible, less than 30 would be ideal. I have seen several cases where pirates have mounted their low power transmitter in a weather proof box at the base of their antenna, and feed the AF and the power up the tower. to the transmitter. This is extream, but works well for super low power transmitters with no amplifier.

Line Loss Of Popular Cables @ 100Mhz Per 100 ft

RG-58U - 4.5dB
RG-8A/U - 3.2dB
1/2" hard line - .8dB

SWR

SWR ,or Standing Wave Ratio, signifies how well your antenna is matched to the rest of your feed system. Meters that will measure SWR are readily available. The most inexpensive costs about $19 at Radio Shack. The ones at Radio Shack are for CB radios which operate at 30Mhz but will be fairly accurate at measuring SWR well over 100Mhz. These meters usually also have a setting to measure power output, while not accurate at 100Mhz, they will still give you an idea of power output and are useful for tuning up a transmitter/amplifier. I highly recommend you acquire at least the most inexpensive SWR meter that has a power setting. It is invaluable in tuning up an antenna system.

Percentage of power reflected	VSWR
.0	1.0:1
.8	1.2:1
5.0	1.6:1
11.0	2.0:1
20.0	2.6:1

If an antenna exhibits a high SWR, that means that a percentage of the power feeding it is being reflected back into the feed system,. This is not desirable. The Table here shows the percentage of power reflected for several SWR values. I would in all cases try to keep the SWR under 2.0:1. This is not possible in all conditions, but should be strived for.

Antenna Design

A quarter wavelength of the operating frequency is an important measurement when designing simple dipole and vertical antennas. 1/4 wave length is equal to 234 divided by the frequency in Mhz. For Example at 88Mhz, 1/4 wave length would be equal to 2.7 feet. The following is a description of the figures on the following page. These are some innovative antenna designs that are ideal for covert FM broadcast band use.

Figure 1 shows a simple dipole, each element is cut to a 1/4 wave. This is the most basic antenna. You may be familiar with wire dipoles commonly inlaid into automobile windows, or included with stereo receivers. It exhibits about a 70 ohm impedance when more than about 15 feet off the ground at FM broadcast band frequencies. Using a gamma match (FIG. 3) can make this antenna 50 ohms.

Figure 2 shows a 1/4 wave groundplane antenna, it is my favorite for omni-directional broadcasting. Popular on the CB radio band. Good all around performance and a 50 ohm impedance make this an antenna you can't go wrong with. The groundplane elements of the antenna should be just a bit longer than the radiator (hence longer than 1/4 wave), so use element type B when cutting these elements.

Figure 4 is an example of a vertical dipole used out a window of a tall building. This is a perfect antenna for the dorm or apartment dweller. Can be used in vertical polarity as shown, or rotated into a horizontal position. Experimenting with both is recommended. When operating in the vertical position the gamma match side should