Technician Licensing Class

Feed Me with Some Good Coax!

Presented by
Element 2 Sub-Elements (Groupings)

- About Ham Radio
- Call Signs
- Control
- Mind the Rules
- Tech Frequencies
- Your First Radio
- Going On The Air!
- Repeaters
- Emergency!
- Weak Signal Propagation
ELEMENT 2 SUB-ELEMENTS (Groupings)

- Talk to Outer Space!
- Your Computer Goes Ham Digital!
- Multi-Mode Radio Excitement
- Run Some Interference Protection
- Electrons - Go With the Flow!
- It’s the Law, per Mr. Ohm!
- Go Picture These!
- Antennas
- Feed Me with Some Good Coax!
- Safety First!
Feed Me with Some Good Coax!

- **T6D11** A common use of coaxial cable is to carry RF signals between a radio and antenna.
- **T9B3** Coaxial cable is used more often than any other feedline for amateur radio antenna systems because it is easy to use and requires few special installation considerations.

![Diagram of coaxial cable](image)

- 50 ohms is the impedance of the most commonly used coaxial cable in typical amateur radio installations.
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- T9B5 As the frequency of a signal passing through coaxial cable is increased the loss increases.
  - The Higher the frequency the more the loss

- T9B7 PL-259 type coax connectors are commonly used at HF frequencies.

- T9B6 A Type N connector is most suitable for frequencies above 400 MHz?
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Understand the type of connector on your radio
You may need an adapter from your coax connector to your radio
Never buy cheap coax, connectors, or adapters
A disadvantage of "air core" coaxial cable, when compared to foam or solid dielectric types is that it requires special techniques to prevent water absorption.
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- The most common cause for failure of coaxial cables is moisture contamination.  
  - Regular BNC, Type N, and PL259 connectors are not watertight.
- Coax connectors exposed to the weather should be sealed against water intrusion to prevent an increase in feedline loss.
- The outer jacket of coaxial cable should be resistant to ultraviolet light because UV light can damage the jacket and allow water to enter the cable.
- Electrical differences exist between the smaller RG-58 and larger RG-8 coaxial cables in that RG-8 cable has less loss at a given frequency.

<table>
<thead>
<tr>
<th>Coax Type</th>
<th>Size</th>
<th>Loss @ 100 MHz</th>
<th>Loss @ 400 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>RG-58U</td>
<td>Small</td>
<td>4.3 dB</td>
<td>9.4 dB</td>
</tr>
<tr>
<td>RG-8X</td>
<td>Medium</td>
<td>3.7 dB</td>
<td>8.0 dB</td>
</tr>
<tr>
<td>RG-8U</td>
<td>Large</td>
<td>1.9 dB</td>
<td>4.1 dB</td>
</tr>
<tr>
<td>RG-213</td>
<td>Large</td>
<td>1.9 dB</td>
<td>4.5 dB</td>
</tr>
</tbody>
</table>
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Coax Cable Signal Loss (Attenuation) in dB per 100ft

<table>
<thead>
<tr>
<th>Loss</th>
<th>RG-174</th>
<th>RG-58</th>
<th>RG-8X</th>
<th>RG-213</th>
<th>RG-6</th>
<th>RG-11</th>
<th>9913</th>
<th>LMR-400</th>
</tr>
</thead>
<tbody>
<tr>
<td>1MHz</td>
<td>1.9dB</td>
<td>0.4dB</td>
<td>0.5dB</td>
<td>0.2dB</td>
<td>0.2dB</td>
<td>0.2dB</td>
<td>0.2dB</td>
<td>0.3dB</td>
</tr>
<tr>
<td>10MHz</td>
<td>3.3dB</td>
<td>1.4dB</td>
<td>1.0dB</td>
<td>0.6dB</td>
<td>0.6dB</td>
<td>0.4dB</td>
<td>0.4dB</td>
<td>0.5dB</td>
</tr>
<tr>
<td>50MHz</td>
<td>6.6dB</td>
<td>3.3dB</td>
<td>2.5dB</td>
<td>1.6dB</td>
<td>1.4dB</td>
<td>1.0dB</td>
<td>0.9dB</td>
<td>0.9dB</td>
</tr>
<tr>
<td>100MHz</td>
<td>8.9dB</td>
<td>4.9dB</td>
<td>3.6dB</td>
<td>2.2dB</td>
<td>2.0dB</td>
<td>1.6dB</td>
<td>1.4dB</td>
<td>1.4dB</td>
</tr>
<tr>
<td>200MHz</td>
<td>11.9dB</td>
<td>7.3dB</td>
<td>5.4dB</td>
<td>3.3dB</td>
<td>2.8dB</td>
<td>2.3dB</td>
<td>1.8dB</td>
<td>1.8dB</td>
</tr>
<tr>
<td>400MHz</td>
<td>17.3dB</td>
<td>11.2dB</td>
<td>7.9dB</td>
<td>4.8dB</td>
<td>4.3dB</td>
<td>3.5dB</td>
<td>2.6dB</td>
<td>2.6dB</td>
</tr>
<tr>
<td>700MHz</td>
<td>26.0dB</td>
<td>16.9dB</td>
<td>11.0dB</td>
<td>6.6dB</td>
<td>5.6dB</td>
<td>4.7dB</td>
<td>3.6dB</td>
<td>3.5dB</td>
</tr>
<tr>
<td>900MHz</td>
<td>27.9dB</td>
<td>20.1dB</td>
<td>12.6dB</td>
<td>7.7dB</td>
<td>6.0dB</td>
<td>5.4dB</td>
<td>4.2dB</td>
<td>3.9dB</td>
</tr>
<tr>
<td>1GHz</td>
<td>32.0dB</td>
<td>21.5dB</td>
<td>13.5dB</td>
<td>8.3dB</td>
<td>6.1dB</td>
<td>5.6dB</td>
<td>4.5dB</td>
<td>4.1dB</td>
</tr>
<tr>
<td>Imped</td>
<td>50ohm</td>
<td>50ohm</td>
<td>50ohm</td>
<td>50ohm</td>
<td>75ohm</td>
<td>75ohm</td>
<td>50ohm</td>
<td>50ohm</td>
</tr>
</tbody>
</table>
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- **T9B1** The lowest loss feedline at VHF and UHF is an Air-insulated hard line.
- **T7C2** An antenna analyzer can be used to determine if an antenna is resonant at the desired operating frequency.
- **T7C3** In general terms, standing wave ratio (SWR) is a measure of how well a load is matched to a transmission line.
- **T9B1** It is important to have a low SWR in an antenna system that uses coaxial cable feedline to provide efficient transfer of power and reduce losses.

![MFJ-269 SWR Analyzer](image)
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- **T7C4** A “1 to 1” reading on an SWR meter indicates a perfect impedance match between the antenna and the feedline.

<table>
<thead>
<tr>
<th>SWR Reading</th>
<th>Antenna</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:1</td>
<td>Perfectly Matched</td>
</tr>
<tr>
<td>1.5:1</td>
<td>Good Match</td>
</tr>
<tr>
<td>2:1</td>
<td>Fair Match</td>
</tr>
<tr>
<td>3:1</td>
<td>Poor Match</td>
</tr>
<tr>
<td>4:1</td>
<td>Something definitely</td>
</tr>
<tr>
<td>Wrong</td>
<td></td>
</tr>
</tbody>
</table>

A battery operated SWR analyzer for tower antenna work.
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- T7C5 2 to 1 is the approximate SWR value above which the protection circuits in most solid-state transmitters begin to reduce transmitter power.
- T7C6 An SWR reading of 4:1 means there is an impedance mismatch.
- T9B9 A loose connection in an antenna or a feedline might cause erratic changes in SWR readings.

Make sure all coax connections are tight to help minimize interference.
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- T7C8 Other than an SWR meter you could use a directional wattmeter to determine if a feedline and antenna are properly matched.
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- **T7C7**  Power lost in a feedline is converted into heat.
- **T9B4**  An antenna tuner matches the antenna system impedance to the transceiver's output impedance.

**Equipment Listings:**

- **MFJ-971 Portable QRP 200 Watt Tuner**
- **Icom 7000 with LDG 7000 Auto-Tuner**
- **Miracle QPak 50 Watt Manual Tuner**
- **Palstar 1500 Watt Auto-Tuner**
- **MFJ-994B 1500 Watt Auto-Tuner**
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- If figure T5 represents a transceiver in which block 1 is the transmitter portion and block 3 is the receiver portion, the function of block 2 is a transmit-receive switch.
The primary purpose of a dummy load is to prevent the radiation of signals when making tests.

- Prevents signals from being sent out over the air
- Allows observation of signal on Spectrum Analyzer

300 Watt Dry Dummy Load

Dummy Load-Can
1kw with oil

Dry Dummy Load
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Valid July 1, 2010

Through

June 30, 2014
Which of the following is a common use of coaxial cable?

A. Carry dc power from a vehicle battery to a mobile radio
B. Carry RF signals between a radio and antenna
C. Secure masts, tubing, and other cylindrical objects on towers
D. Connect data signals from a TNC to a computer
Why is coaxial cable used more often than any other feed line for amateur radio antenna systems?

A. It is easy to use and requires few special installation considerations
B. It has less loss than any other type of feedline
C. It can handle more power than any other type of feedline
D. It is less expensive than any other types of feedline
T9B02 What is the impedance of the most commonly used coaxial cable in typical amateur radio installations?

A. 8 ohms
B. 50 ohms
C. 600 ohms
D. 12 ohms
What generally happens as the frequency of a signal passing through coaxial cable is increased?

A. The apparent SWR increases
B. The reflected power increases
C. The characteristic impedance increases
D. The loss increases
Which of the following is true of PL-259 type coax connectors?

A. They are good for UHF frequencies
B. They are water tight
C. The are commonly used at HF frequencies
D. They are a bayonet type connector
Which of the following connectors is most suitable for frequencies above 400 MHz?

A. A UHF (PL-259/SO-239) connector
B. A Type N connector
C. An RS-213 connector
D. A DB-23 connector
What is a disadvantage of "air core" coaxial cable when compared to foam or solid dielectric types?

A. It has more loss per foot  
B. It cannot be used for VHF or UHF antennas  
C. It requires special techniques to prevent water absorption  
D. It cannot be used at below freezing temperatures
T7C09 Which of the following is the most common cause for failure of coaxial cables?

A. Moisture contamination
B. Gamma rays
C. The velocity factor exceeds 1.0
D. Overloading
Why should coax connectors exposed to the weather be sealed against water intrusion?

A. To prevent an increase in feedline loss
B. To prevent interference to telephones
C. To keep the jacket from becoming loose
D. All of these choices are correct
Why should the outer jacket of coaxial cable be resistant to ultraviolet light?

A. Ultraviolet resistant jackets prevent harmonic radiation
B. Ultraviolet light can increase losses in the cable’s jacket
C. Ultraviolet and RF signals can mix together, causing interference
D. Ultraviolet light can damage the jacket and allow water to enter the cable
What electrical difference exists between the smaller RG-58 and larger RG-8 coaxial cables?

A. There is no significant difference between the two types
B. RG-58 cable has less loss at a given frequency
C. RG-8 cable has less loss at a given frequency
D. RG-58 cable can handle higher power levels
Which of the following types of feedline has the lowest loss at VHF and UHF?

A. 50-ohm flexible coax
B. Multi-conductor unbalanced cable
C. Air-insulated hard line
D. 75-ohm flexible coax
Which of the following instruments can be used to determine if an antenna is resonant at the desired operating frequency?

A. A VTVM
B. An antenna analyzer
C. A “Q” meter
D. A frequency counter
A. A measure of how well a load is matched to a transmission line
B. The ratio of high to low impedance in a feedline
C. The transmitter efficiency ratio
D. An indication of the quality of your station’s ground connection
Why is it important to have a low SWR in an antenna system that uses coaxial cable feedline?

A. To reduce television interference
B. To allow the efficient transfer of power and reduce losses
C. To prolong antenna life
D. All of these choices are correct
What reading on an SWR meter indicates a perfect impedance match between the antenna and the feedline?

A. 2 to 1  
B. 1 to 3  
C. 1 to 1  
D. 10 to 1
What is the approximate SWR value above which the protection circuits in most solid-state transmitters begin to reduce transmitter power?

A. 2 to 1  
B. 1 to 2  
C. 6 to 1  
D. 10 to 1
What does an SWR reading of 4:1 mean?

A. An antenna loss of 4 dB
B. A good impedance match
C. An antenna gain of 4
D. An impedance mismatch
What might cause erratic changes in SWR readings?

A. The transmitter is being modulated  
B. A loose connection in an antenna or a feedline  
C. The transmitter is being over-modulated  
D. Interference from other stations is distorting your signal
What instrument other than an SWR meter could you use to determine if a feedline and antenna are properly matched?

A. Voltmeter
B. Ohmmeter
C. Iambic pentameter
D. Directional wattmeter
T7C07 What happens to power lost in a feedline?

A. It increases the SWR
B. It comes back into your transmitter and could cause damage
C. It is converted into heat
D. It can cause distortion of your signal
What does an antenna tuner do?

A. It matches the antenna system impedance to the transceiver's output impedance
B. It helps a receiver automatically tune in weak stations
C. It allows an antenna to be used on both transmit and receive
D. It automatically selects the proper antenna for the frequency band being used
If figure T5 represents a transceiver in which block 1 is the transmitter portion and block 3 is the receiver portion, what is the function of block 2?

A. A balanced modulator
B. A transmit-receive switch
C. A power amplifier
D. A high-pass filter
What is the primary purpose of a dummy load?

A. To prevent the radiation of signals when making tests
B. To prevent over-modulation of your transmitter
C. To improve the radiation from your antenna
D. To improve the signal to noise ratio of your receiver