

# Transmission Lines In Amateur Radio

Anderson Island Amateur Radio Club

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# Transmission Lines

- What is a transmission line?

A transmission line is a system of conductors that transfer electrical signals from one place to another.

This presentation will focus primarily on transmission lines used to connect radio equipment to antennas, but the characteristics apply to transmission lines used to connect various pieces of radio equipment.

# Transmission Line Types

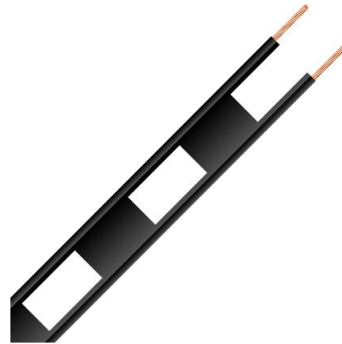
- Coaxial Cable

- Flexible
- Semi-rigid



- Open Wire

- Window line
- Ladder line



# Transmission Line Physical Properties

- Dimensions
  - Coax Diameter
  - Open wire Spacing
- Dielectric
  - Solid
  - Foam
  - Air

# Transmission Line Physical Properties

- Cost

Approximate Cost of Coaxial Cable		
RG/U CABLE		\$ / ft
8X		1.40
LMR-240		1.00
8, 213		1.25
LMR-400		1.30
LMR-500		2.10
LMR-600		2.35
58A/U		0.70
174		0.30
316		0.50
3/8" Helix		2.50
1/2" Helix		4.50

# Transmission Line Electrical Properties

- Characteristic Impedance ( $Z_0$ )
- Velocity of Propagation
- Current Paths

# Transmission Line Electrical Properties

- Attenuation

50 Ohm Coaxial Transmission Line - Approximate Attenuation dB/100 Feet at MHz							
Catalog #	RG/U CABLE	1	10	50	100	200	400
2247	8X		1.1	2.5	3.8	5.4	7.9
	LMR-240	0.24	0.76	1.7	2.4	3.4	4.9
2248, 2929	8, 213	0.17	0.55	1.3	1.9	2.7	4.1
3606	LMR-400			0.9	1.2		2.5
	LMR-500			0.7	1		2
	LMR-600			0.6	0.8		1.4
2619	58A/U	0.44	1.4	4.1	5.3	7.4	10
8216	174	1.9	3.3	5.8	8.4	12.5	19
83284	316	1.2	2.7	5.6	8.3	12	17.5
LDF2-50	3/8" Helix	0.1	0.32	0.72	1.04	1.5	2.15
LDF4-50A	1/2" Helix	0.06	0.21	0.47	0.68	0.98	1.4

# Transmission Line Electrical Properties

- Power Handling Capability
  - Coax
    - Physical properties
  - Open Wire
    - Physical properties



# Transmission Line Applications

- Connectors
  - Availability
  - Weather Resistance

# Transmission Line Applications

- Connectors
  - SO-239 (UHF)



# Transmission Line Applications

- Connectors
  - Type N



# Transmission Line Applications

- Connectors
  - BNC



# Transmission Line Applications

- Connectors
  - SMA

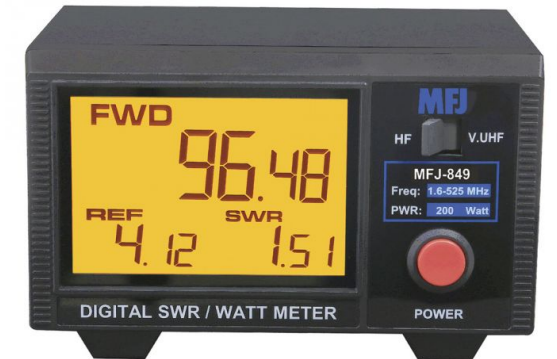
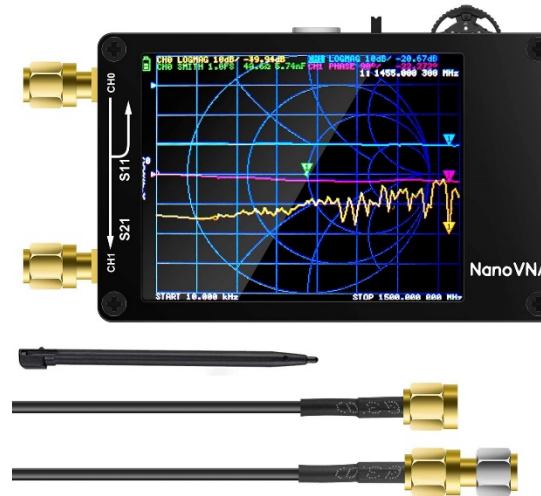


# Parameters of Transmission Line Applications

- VSWR (SWR) Voltage Standing Wave Ratio
  - What is SWR?
  - How to interpret the numbers
  - Examples

# Parameters of Transmission Line Applications

- Measuring SWR



# Parameters of Transmission Line Applications

- Return Loss
- Impedance Matching
  - Antenna tuners
- Reducing Common Mode Current



# Installing Transmission Lines

- Attachment
- Bending Radius
- High Temperatures
- Weatherproofing
- Lightning Protection

# Transmission Lines

- Resources
  - ARRL Antenna Book
  - KV5R.com