

Basic plan for research of two-wire transmission lines.

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Authors:

Gianfranco Scordino

Aleksei Ponomarenko-Timofeev

Below we provide basic layout of what our research will include, what tests will be performed to figure out important parameters of two-wire transmission lines.

We will be measuring impedance and losses in the line for different conductors and insulators. Most probably these will be copper, aluminum, polyethylene and other commonly used conductors and insulators. We will measure the impedance of the lines with different parameters (distance between two conductors, type of insulators) and in different conditions (for instance if the insulation of the line is wet). We will also do a frequency sweep to see what frequencies are suitable for which line. Furthermore, we will also study the following types of transmission lines:

1. Two-wire open line.
2. Two-wire ribbon line.
3. Twisted pair - two insulated wires twisted together.
4. Shielded pair - two conductors in a shielded cable, separated from each other by dielectric.
5. Air coaxial line - coaxial cable using air (or other mixture or gas) as insulator between inner and outer conductors.
6. Flexible coaxial line - coaxial cable using solid dielectric.

While studying the parameters of twisted pair we will vary number of twists per meter and type of shielding (UTP,FTP). We will also consider how the characteristics of the line change if we bend it.

All in all, the full list of our tests is provided below:

1. Two-wire ribbon line:
 - (a) Determine how thickness of the applied insulator affects parameters.
2. Twisted pair:
 - (a) Determine how the number of twists per meter affects line parameters.
 - (b) Perform tests with various conditions (wet insulator, temperature change).
3. Shielded pair:
 - (a) Determine how choice of shielding material affects protection from stray magnetic fields.
4. Air coaxial line:
 - (a) Determine how geometry parameters affect line parameters (a,b).

- (b) Determine how washer material selection affects line parameters.
- 5. Flexible coaxial line:
 - (a) Determine how geometry parameters affect line parameters (a,b).
- 6. Two-wire open line:
 - (a) Determine how distance between conductors affects parameters of the line.
 - (b) Calculate radiation losses and cross-talk of the line (how line is affected by noise).

P.S.: Common test for all lines is how the choice of insulator (gas for air coaxial line) affects line parameters.