

This quiz is about the voltage waves on transmission lines.

Answers:

In Fig. (2), the power transmission line, the wavelength is 5000 km for the 60 Hz frequency. A distance of 1 ft is negligible compared with the 5000 km wavelength, therefore there is no measurable difference between the voltages at two locations 1 ft apart.

In Fig. (3), the co-ax cable, the free-space wavelength for the 1 GHz carrier wave is 30 cm. While the wavelength on the transmission line is smaller than this free-space wavelength, it is on the same order of magnitude. The 1 ft distance is comparable to the wavelength and the wave behavior must be considered. Therefore the voltages at two locations 1 ft apart are definitely different.

Grading guidelines:

Anybody who submitted the work gets 60 points.

Anybody who gets the correct answers (**yes/no plus comparison between the 1 ft distance and the wavelength in each case**) receives the full 100 points. Each correct answer earns 20 points. The 20 points for each question shall be given as long as the student gives the essence of the correct answers, even if the use of some terms are not accurate. Inability to answer how the voltage difference is sustained along wires does not result in a deduction.

While wires here are considered to be ideal conductors, no deduction is to be made for stating that the wire resistance sustains the voltage difference. (Answering yes to the power transmission line question because of the line resistance is incorrect, and does not earn the 20 points assigned to this question.)

Stating that the wavelength on the co-ax cable is 30 cm for 1 GHz does not cause any deduction. If a student finds that 1 ft is nearly equal to 30 cm and believes the voltages at locations one wavelength apart are equal, s/he shall not be penalized by any deduction for this statement.

Incorrect statements irrelevant to the questions will not result in deductions.