Velocity of an Electromagnetic Signal

Name: _____

Instructor: _____

Team Member 1	Team Member 4
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Instructions: Follow the steps on this worksheet, using your lab manual as a guide, unless directed to do otherwise by your lab instructor. Show at least one sample calculation for each step. Box final mathematical results. Do not forget the units.

1 Data

1. Record the lengths of the RG-58 cable and the RG-62 cable of known length.

2. Measure and record Δt for the RG-58 cable, the RG-62 cable of known length, and the RG-62 cable of unknown length.

2 Analysis

1. Calculate v/c for the RG-58 and RG-62 cable of known length.

2. Compute the relative error between your v/c values and those given for RG-58 and RG-62.

3. Find the length of the RG-62 cable of unknown length. Use the value of v/c given in the table for RG-62.

3 Questions

1. Why do we need a resistor on the oscilloscope input channel for the signal coming from the wire being tested?

2. Verify, using Equations 1, 2, and 3, that for $\kappa = 1.0$ (vacuum), the accepted value of the speed of light is

$$c = \frac{1}{\sqrt{\epsilon_0 \mu_0}}.$$

3. RG-58 and RG-62 cables both use polyethylene to insulate the center conductor. Use the values listed in Table 1 to determine which cable does $\kappa = 2.3$ correspond to? (Show your work).

4. According to the manufacturer, both cables used in today's experiment use the same material as an insulator, why are their signal velocities different? (Hint: inspect the cables.)