

Measuring a Refractive Index

Goals:

- 1) Determine the refractive index of the dielectric (solid polyethylene) inside RG-58 coaxial cable
- 2) Characterize the frequency dependence of this refractive index

Pre-lab:

- 1) Understand what a refractive index is
- 2) Look up the refractive index of solid polyethylene
- 3) Understand the construction of RG-58 coaxial cable and how it transmits signals
- 4) Understand how a digital oscilloscope and a waveform generator work

Equipment:

- Lab notebook
- Digital oscilloscope
- Waveform generator
- 4 coaxial cables (1 short, 1 longer, 1 much longer, 1 very much longer)
- 3 BNC tees
- 2 50- Ω BNC terminating resistors

Tasks:

- 1) Design one or more experiments to determine (with uncertainties) the refractive index of the dielectric inside RG-58 Ohm Coaxial Cable using the available equipment and how it varies with signal frequency
- 2) Present experimental design(s) to the instructor for approval
- 3) Make and record measurements
- 4) Produce tables and/or graphs of the data and present these to the instructor for further guidance
- 5) Analyze the data to determine the refractive index and its frequency dependence (if any)
- 6) Write a report and create a presentation that document the experiment(s) and its (their) results