IT327 Lab #7
Wire Media Characterization

Objective:

Analyze the SNR, frequency response, and attenuation of different types of cables.

Procedure:

Be sure to take plenty of pictures and include them in your write-up with an appropriate caption.

In this lab, you will analyze 4 different types of cables: RG8U, RG59U, TFC CATV, and BELDEN 9907 (Other similar cables may be used if these cables are not available—record them if used).

1. Attenuation: Use the HP 3312A (Analog Signal Generator).
   a) Generate a 1.4 KHz signal at the maximum amplitude possible.
   b) Accurately measure the voltage on an oscilloscope and take a picture. Include the picture in your write-up with an appropriate caption.
   c) Set the frequency to 14 MHz without changing the amplitude knob and measure the voltage again. Take another picture. Include the picture in your write-up with an appropriate caption.
   d) Calculate the attenuation using the two voltages measured and take a picture of the waveform. **Attenuation = V_{1P-P} - V_{2P-P}**
   e) Repeat steps a-d for all 4 cables. Record your findings and include them in your write-up.

Cable	1.4 kHz	14 MHz	Attenuation

2. SNR: Use the RG59U cable and the TIMS with the *Adder, Noise Generator* and *Wideband True RMS Meter* modules to combine noise to the **1.4 MHz** signal.

   a) Connect the signal to the one input of the adder (*A*) using the *Scope Selector* (it works both ways).

   b) Connect the noise on the other input of the adder (*B*). Now connect the output on the *Adder* (*GA+gB*) to the *IN* on the *RMS Meter*.

   c) On the *RMS Meter*, set the left toggle to *AC + DC* and the right toggle to *10V* (This is the resolution).

   d) d) Set the level of the noise to around 100mV_{RMS} on the *RMS Meter* module (around 0.10 on the display) Remember to turn the signal knob (*G*) on the *Adder* all the way down, or unplug the signal. This will allow you to measure only the noise. Record the "Noise RMS" below.

   e) Now eliminate the noise (turn down *G* or unplug *B*), turn the signal knob (*g*) all the way up and measure the signal RMS value. Record the "Signal RMS" below.

   f) Plug the noise back in and look at the output on an oscilloscope as noise is increased and decreased. Take a picture of a wave with more noise and less noise. Include them in your write-up with an appropriate caption.

   Calculate the Signal to Noise Ratio.
   SNR = 20 log_{10} (Signal rms/ Noise rms)
   Signal RMS: _____V_{RMS}
   Noise RMS: _____V_{RMS}
   SNR: _____dB

3. Frequency Response: Use the HP 8752A Network Analyzer to analyze the frequency response of the 4 cables. Channel 1 tells you the attenuation of the cable across the frequency spectrum. Channel 2 tells you how much power is being reflected back through the cable.

   a) Plugging each cable into the *RF Out* port and the *RF IN* port, (you may need to use the appropriate connectors). The *RF Out* port will send a signal through your cable to the *RF IN* port to allow you to take measurements.

   b) Set the Span to 3 GHz. (The span across the bottom should read .300 MHz to 3,000 MHz).

   c) Use a *marker search function* and determine at what frequency the cable reflects the most amount of power (could be the min or max point—farther from 0 dB). Plot this below and include it in your write-up.

   d) Take pictures of Channel 1 (Frequency) and Channel 2 (Attenuation). Label each channel what the axes on each channel are. Also label the point of maximum reflection on Channel 1.

Cable	Frequency	Max Attenuation (dB)