

ECE391: Transmission Line

Special Homework 2

Rattanaï Sawaspanich

Initial Thoughts

I honestly did not know what was going on with the circuit so I started by trying to filter out different ranges of frequency from the circuit. I traced it down to find out that the *endpnt2* was actually the one causing a lot of resonating signals. Once I knew what was causing the issue, I started to instantiate different methods to solve the problem.

Design 1: Using a LC-resonator

I noticed that the noises generated by *endpnt2* look really similar to a signal that would be generated by having an inductor and a capacitor in parallel. So, the first design that came to my mind was using an LC-resonator to cancel the noises out. A 15pF-capacitor in series with a 25pH-inductor was added in parallel with the load at *endpnt2*. To handle an echo from the resonator itself, another resonator is added to *endpnt1* was added to handle the echo. It was a 25pH-inductor in series with 5pF-capacitor connected to ground. The following diagram displays my first design.

Design 2: Using capacitors to SHORT everything

This method used holes in the rules homework assignment to basically attach a capacitor in parallel with T-line just to short the T-line out. This is basically getting rid of the T-line from the entire circuit. It is technically legal, but practically infeasible. The diagram below shows the design.

Design 3: Using passive component and a capacitor

This is the finalized module that encompasses both passive and reactive components. This method turned out to be the best in terms of performance. It can provide a decently fast rising time with a few resonance noises. Resistors were added in series at the beginning of *endpnt1* and *endpnt2* to match the impedance of the endpoints with the T-lines which prevents any signal resonance from happening. Though the two resistors provide a very clear waveform, there are some overshoot and ringing at the edge of T-line. I notice that most of the spiking of the T-line was caused by lower frequency signals. To handle the issue, a capacitor was added to behave as a high-pass filter, getting rid of any lower frequency signals that causes the ringing at the end of T-line.