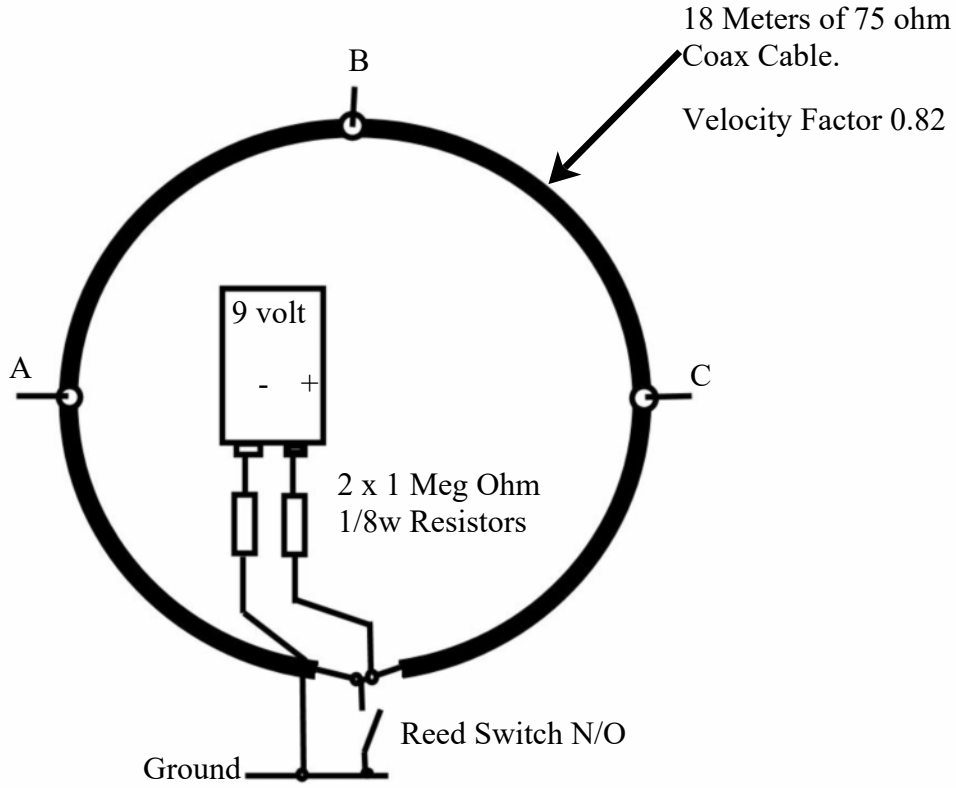
Wakefield 4

Experiment to complement Wakefield 1,2 & 3

A 9 volt Battery is connected via two close coupled Resistors to the 75 ohm coax cable. The resistors in this experiment are used to limit the current from the battery when the coax is shorted by the reed switch. They also allow the charging of the Capacitor to be monitored before the switch is closed. This experiment we are interested in only monitoring the 3 tap points A,B & C set at 25%, 50%, 75% along the length of the coax.

The reed switch is operated by a hand held magnet, any switch bounce occurs long after the switch is closed. The actual voltage before the switch is closed is around 7v due to the loading of the Digital Storage Oscilloscope Probe and the series value of the 2 x 1 meg ohm resistors.

We are using a Tektronix TDS 220 100Mhz 1Gs/s Oscilloscope and 2 x 100 Mhz probes. The -ve trigger is obtained from the reed switch closing. The other probe is connected to Points A or B or C and adjacent Coax braid (do not use earth lead of probe but the tip ring ground). The waveforms are captured and then transferred to a PC.

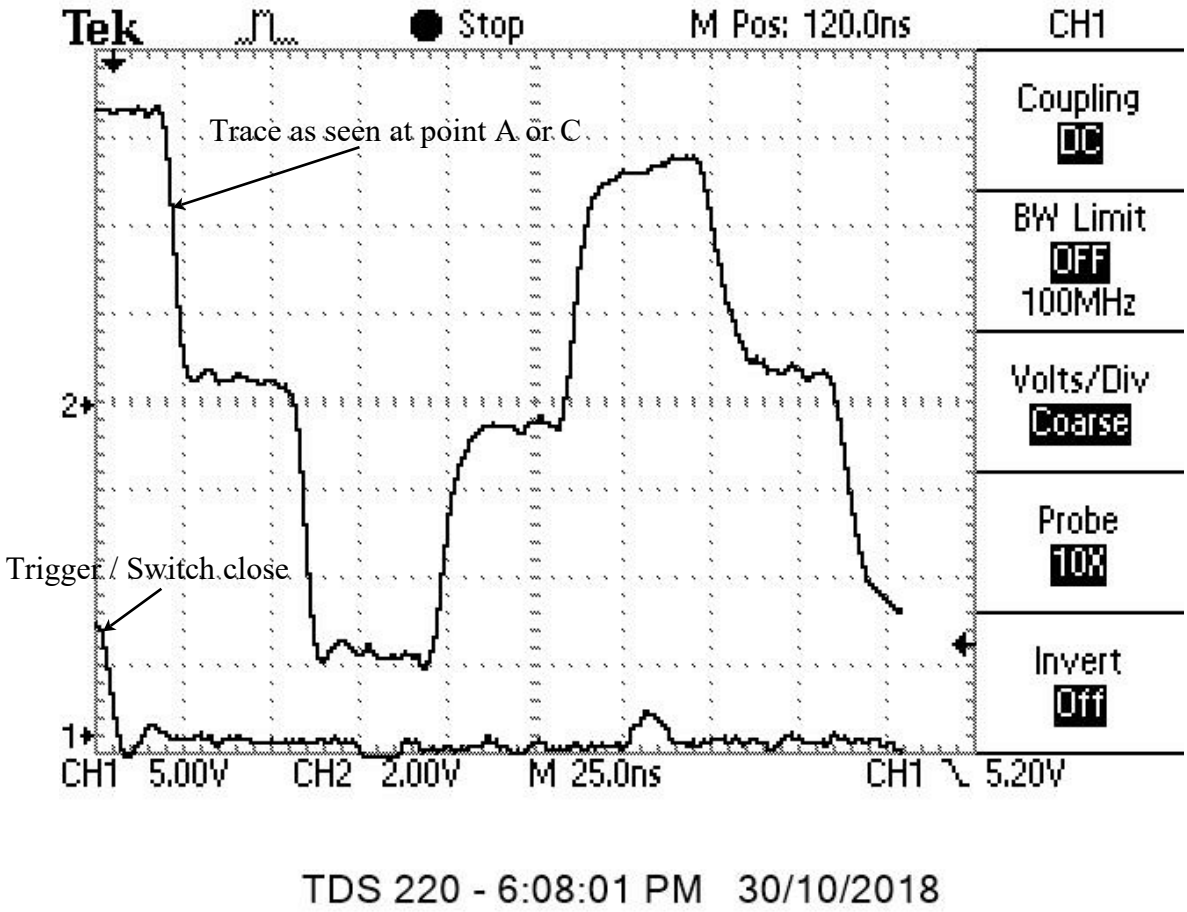


Some may say that we should use two reed switches but as we are only interested in showing what happens after the short is applied to both ends of the Coax we can get away with one switch and joining both ends of coax together.

The electrical length of the Capacitor / Transmission line is 75 ns approximately allowing for the velocity factor 0.82 and 18 meters of coax. The same experiment has been performed using twin flex, however it must be kept clear of any metal object or electric fields. Most twin flex has an impendence of 120 ohms approximately.

The following waveforms show the results due to losses as the energy travels from one end to other the amplitudes will reduce over time.

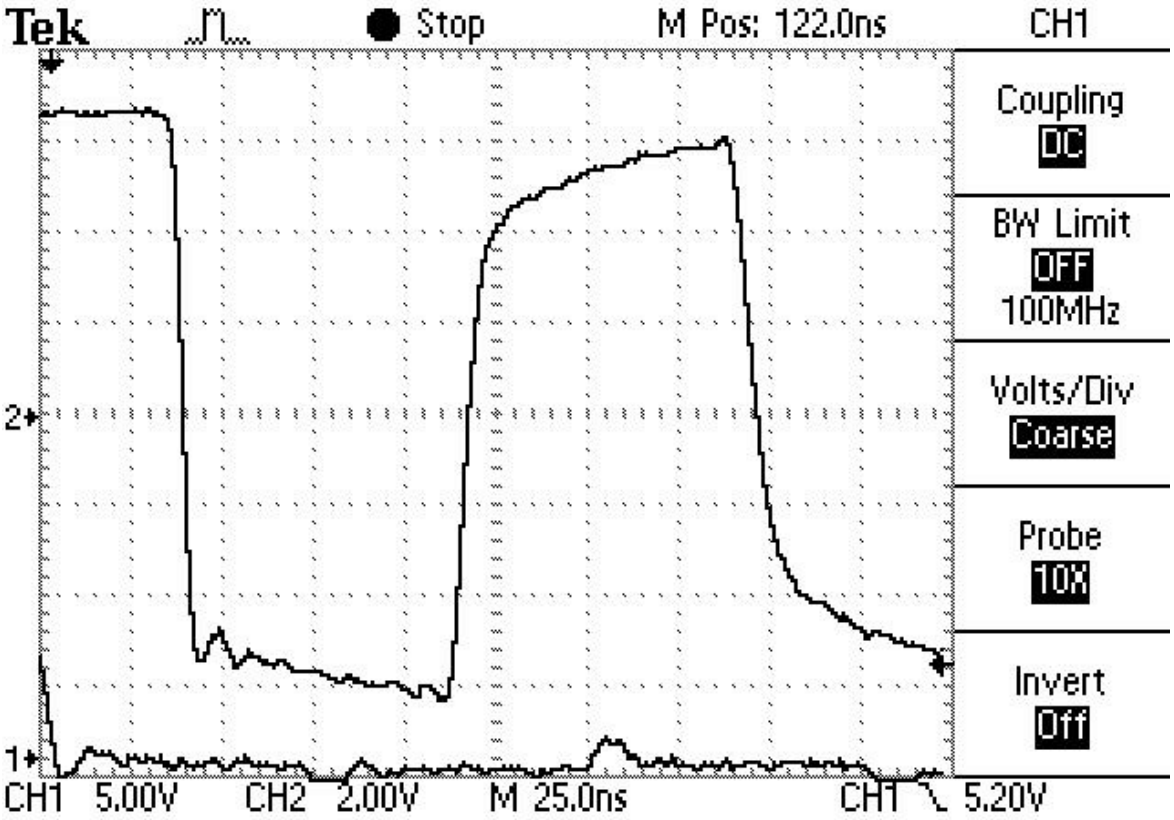
Wakefield 4



Waveform as seen at points A and C centre line of display is 0 volts each division in Horizontal direction is 25 ns. Vertical is 2 volts per division.

The energy travelling to the right is met by the energy travelling to the left when the right travelling energy arrives at the short on right it inverts & reflects. Likewise for the energy travelling to left is inverted when it arrives at left. So point A or C initially at 7v dropping to 0v. So sometimes we see 7v then 0V then -7v. This continues until the energy is all used up by the coax losses.

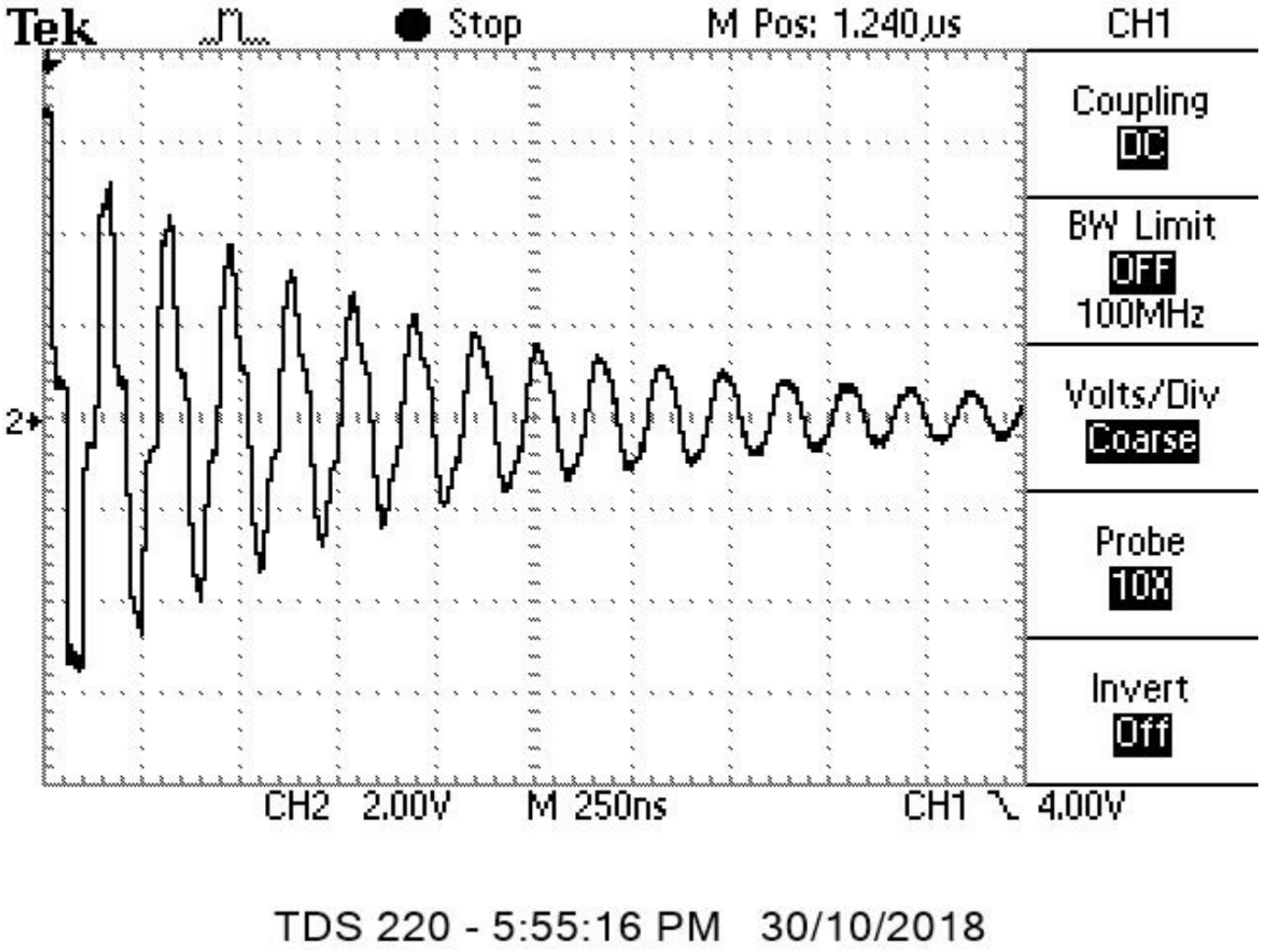
Wakefield 4



Waveform as seen at point B centre line of display is 0 volts each division in Horizontal direction is 25 ns. Vertical is 2 volts per division.

The energy travelling to the right is met by the energy travelling to the left when the right travelling energy arrives at the short on right it inverts & reflects. Likewise for the energy travelling to left is inverted when it arrives at left. So point B initially at 7v dropping to -7v when the left travelling energy meets in the middle. This continues until the energy is all used up by the coax losses.

Wakefield 4



Waveform as seen at point B centre line of display is 0 volts each division in Horizontal direction is 50 ns. Vertical is 2 volts per division.

Here we have wound out the time to 2.48uS showing the energy being used up by the coax losses. Switch bounce occurs around 5uS so it does not have any effect on the results.