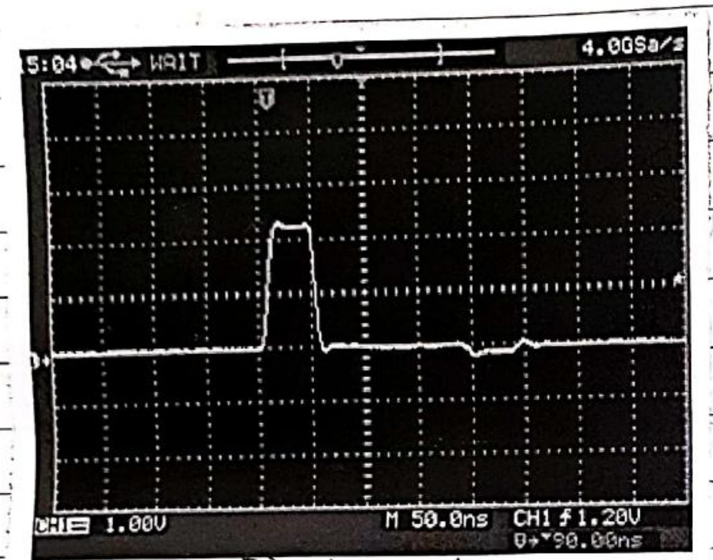
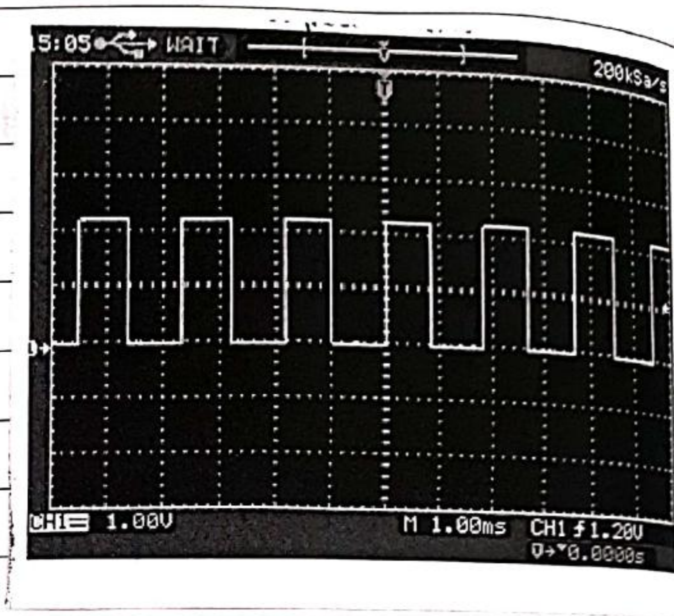
Signals used throughout for the experiment :-



Signal used.



1. Pulse

Settings :

~~T/2/50ns~~

T= 1ms

Pulse width= 500ns.

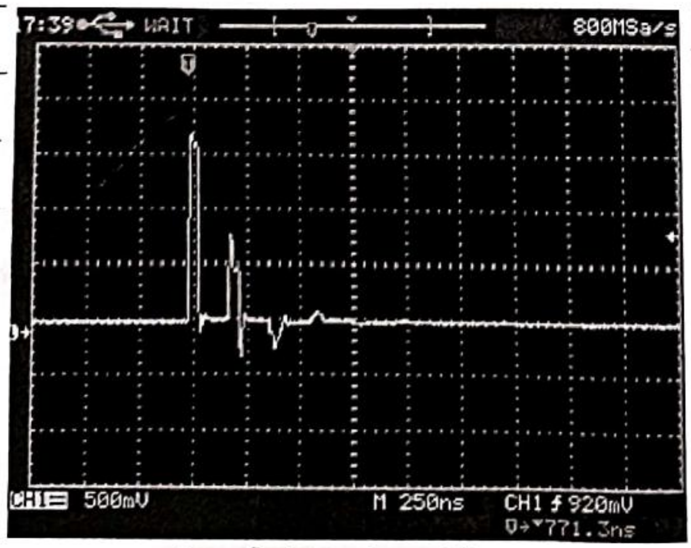
2. Square wave

Settings :-

T= 500ns

[illegible]

Infinite Load,



(Infinite load).

The ~~Pulse~~ incident pulse is visible as the main peak. Three reflected pulses are visible. This is because of the impedance mismatch.

$Z_L > Z_0$

as $Z_L \to \infty$

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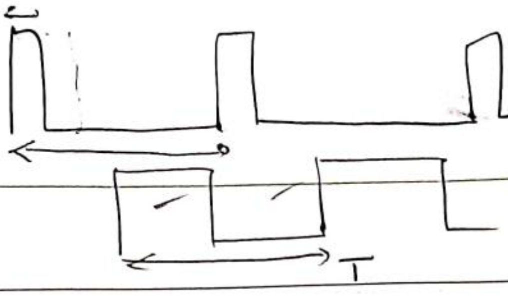
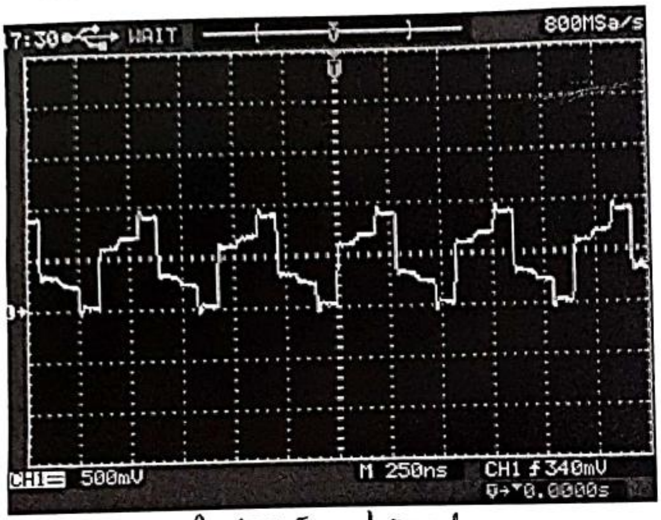


duty cycle $= \frac{T_{on}}{T_{on}+T_{off}}$

Period $= T_{on} + T_{off}$

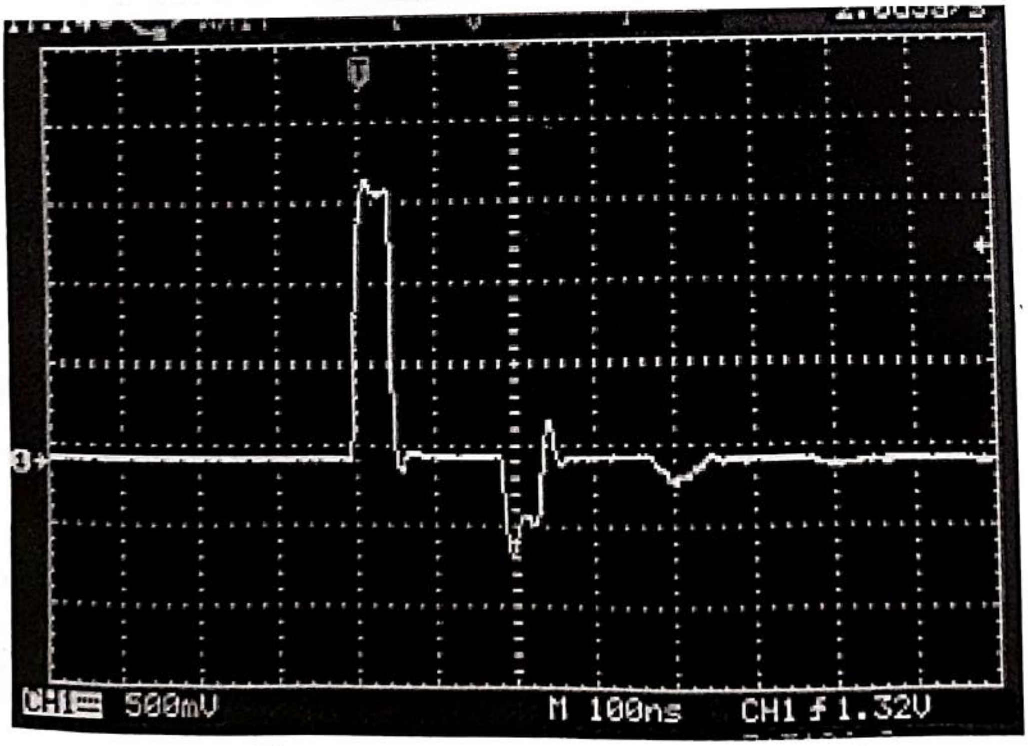


Infinite Load.

The square waveform was distorted. This is because the reflected wave overlapped with the incident wave.
The reflected wave has a polarity that is along the same direction as the incident wave. This is because $Z_L > Z_0$

~~Reflections on the~~

Reflected Waves for Incident Pulse.



$Z_L = 10\,\Omega$ Reflected wave with negative polarity.

$Z_L = 10\,\Omega$

~~$\Gamma = 10$~~

$\Gamma < 0$

$Z_L < Z_0$

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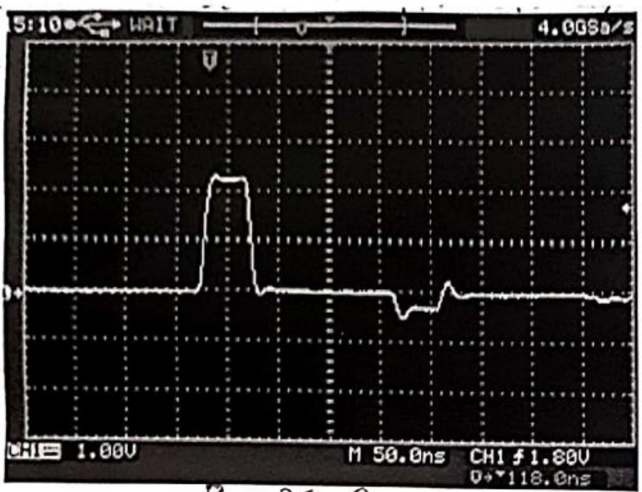
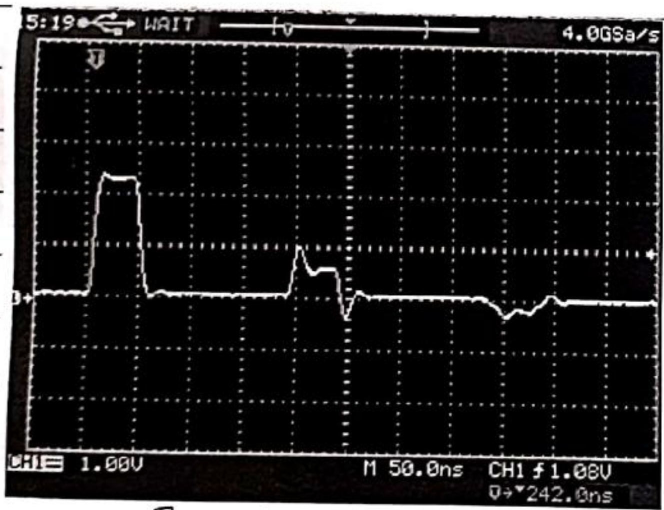


$Z_L = 25\ \Omega$

$Z_L = 25\ \Omega$

$Z_L < Z_0$

$T < 0$

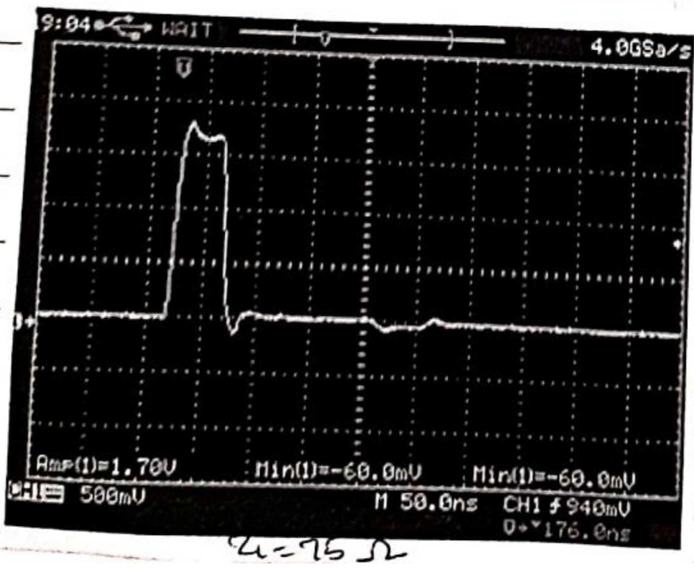


$Z_L = 50\ \Omega$

$Z_L = 50\ \Omega$

$T > 0$

$\Rightarrow Z_L > Z_0$



$Z_L = 75\ \Omega$

No reflected wave visible.

Implies $Z_L = Z_0$?

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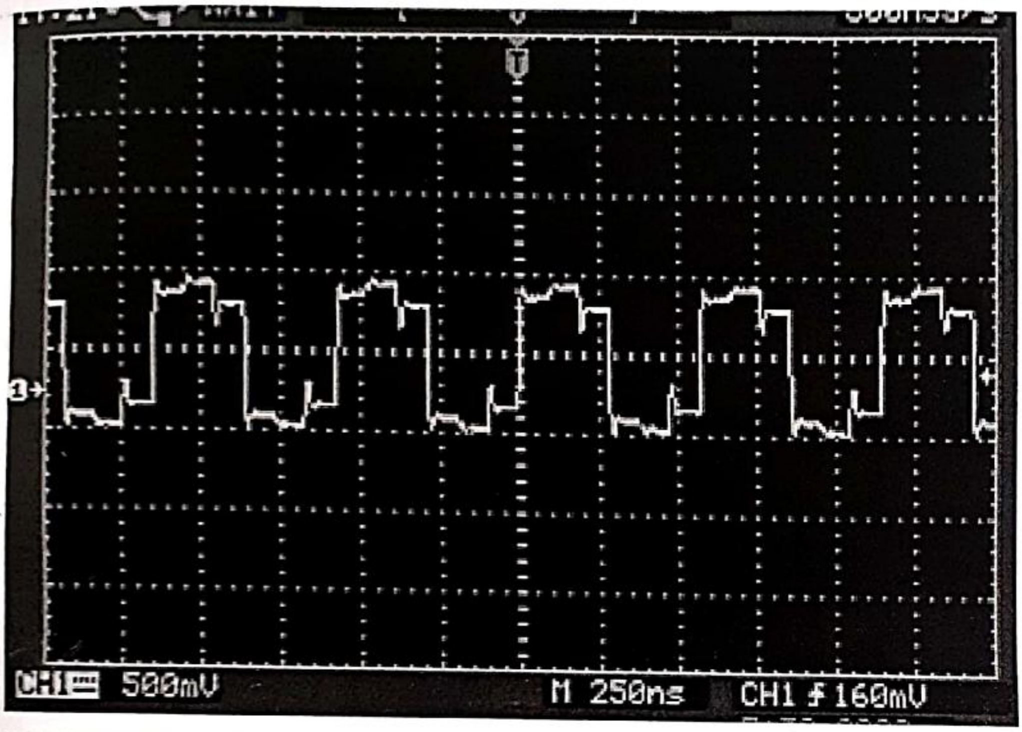
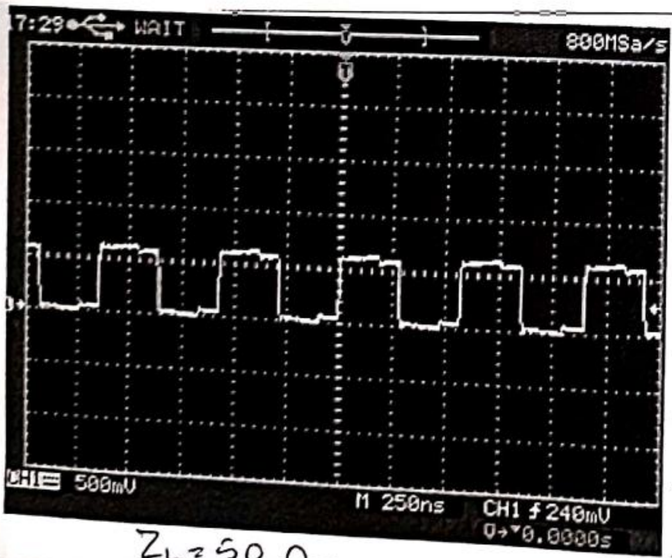
Now, for the Square waves :-



$Z_L = 10\,\Omega$

Reflected wave ~~transm~~ overlapping with the incident wave.



$Z_L = 50\,\Omega$

→ Reflected waves ~~for~~ of smaller amplitude overlapping with the incident wave.

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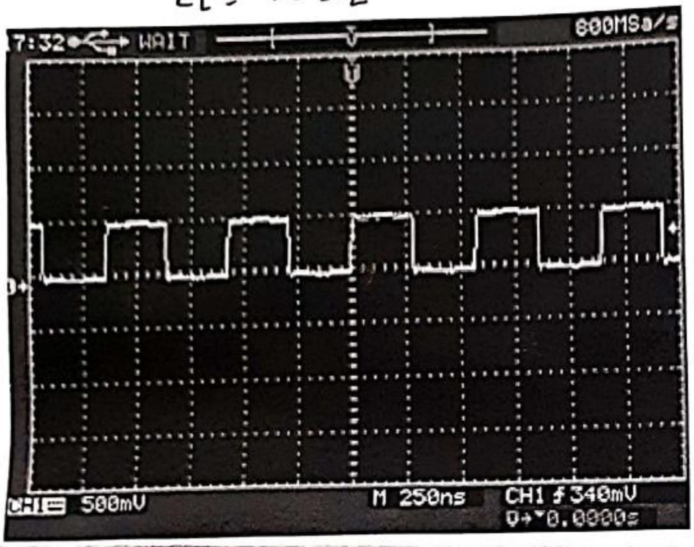
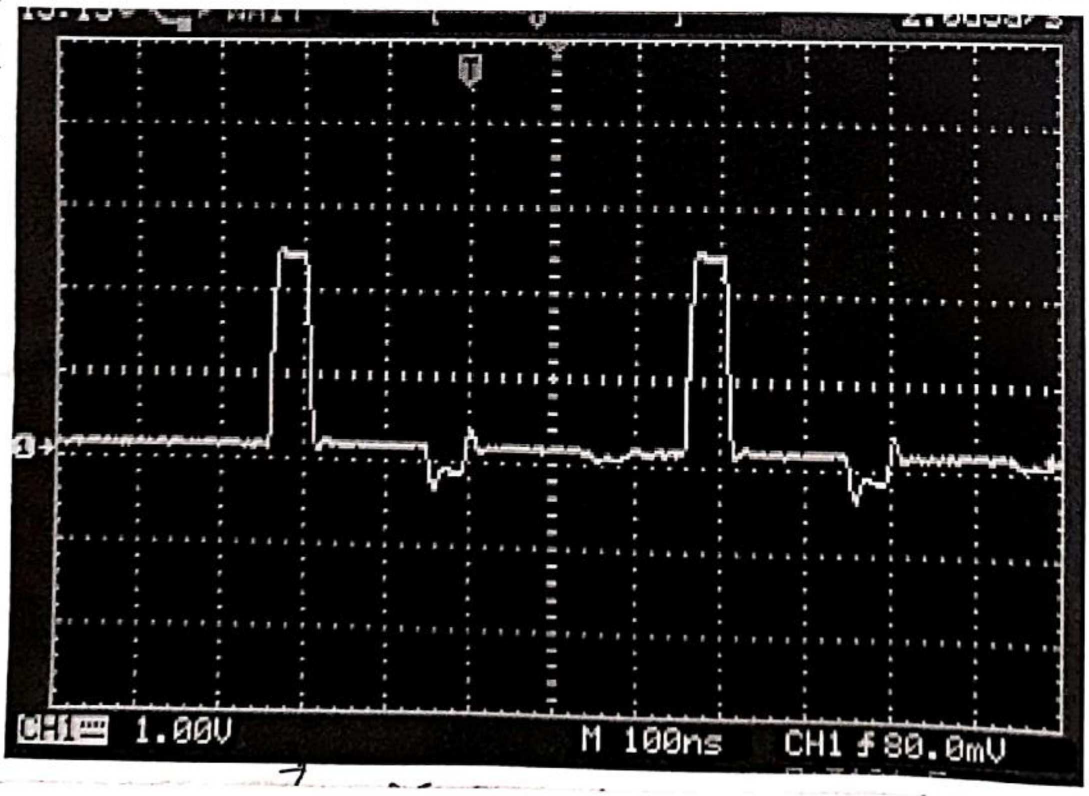
$Z_L = 75\,\Omega$



Only very slight smudges to the waveform are visible.

Reflected waves for Double Pulses:

~~Now for~~ Double Pulses ~~at~~



$Z_L < Z_0$

$T < 0$

$Z_L = 25\,\Omega$

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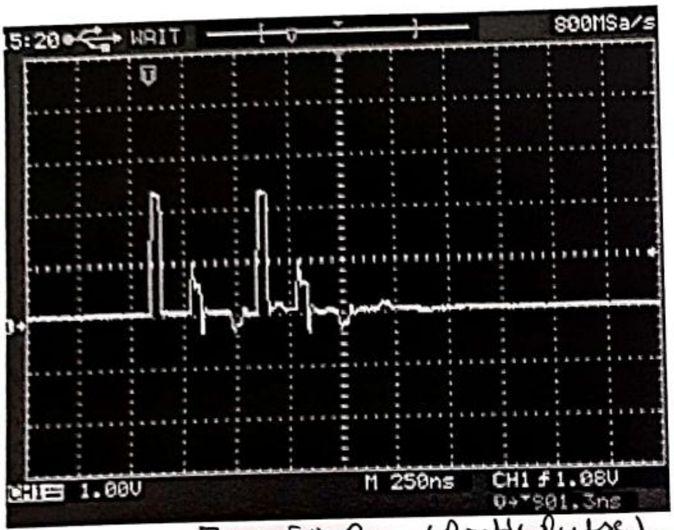
= 50 Ω

Double Pulse.



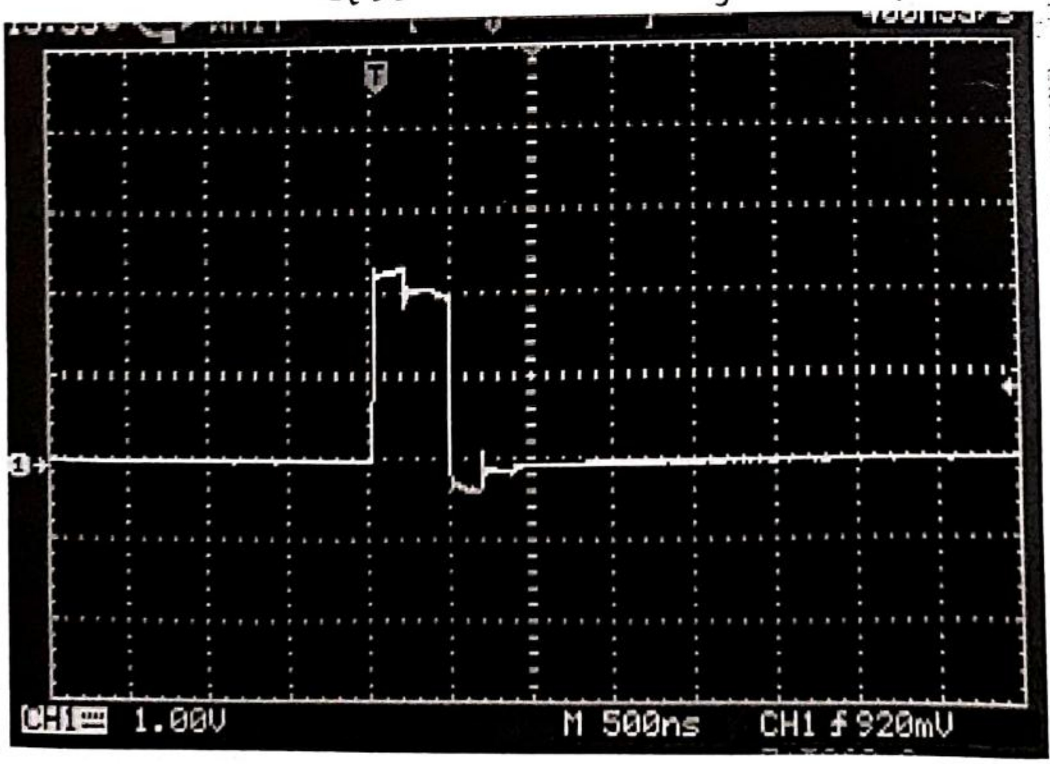
$Z_L = 50\,\Omega$ (Double Pulse)

For the 50 Ω terminal load, used a BNC T was used to connect the load with the coaxial cable. As such, two impedances played a role because of which two reflected waves are visible. One is of a positive polarity and the other of a negative polarity.

Increasing Pulse width Increases the Overlap.

$Z_L = 25\,\Omega$.

$Z_L = 25\,\Omega$ Showing Overlap.



~~Increasing~~

Pulse width at some Sing Pulse.

T = 1ms

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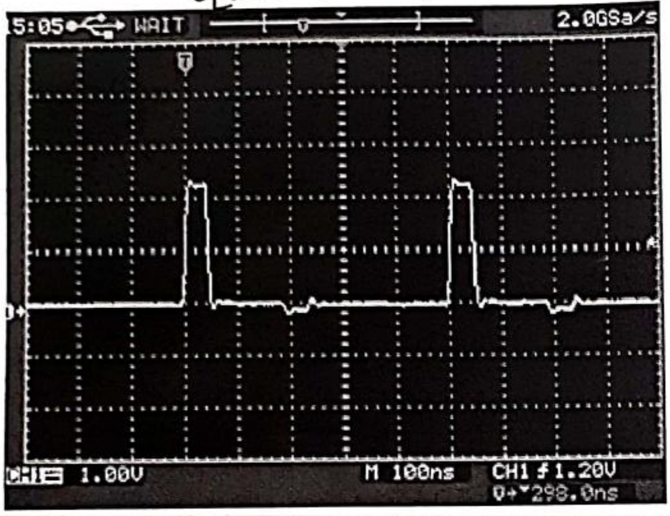
Now, for $Z_L = 200\Omega$.

$Z_L = 200\ \Omega$ (Double Pulse).



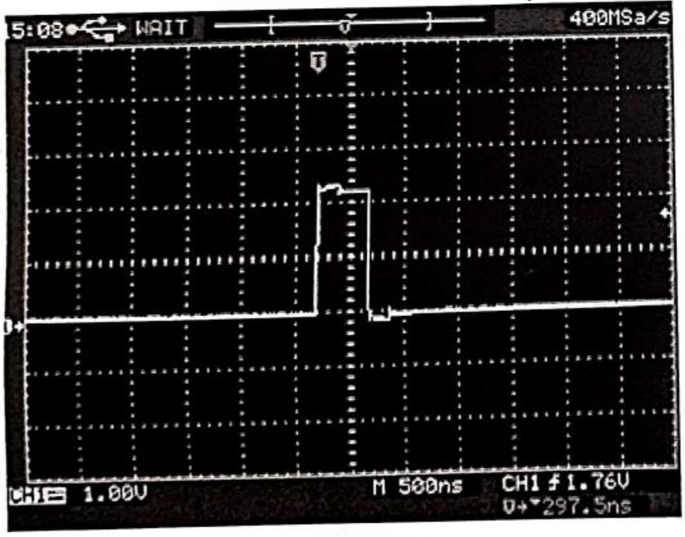
Speed of the reflected wave

$\Delta t = 2 \times 100\text{ns}$

$= 200 \times 10^{-9}\text{ s}$

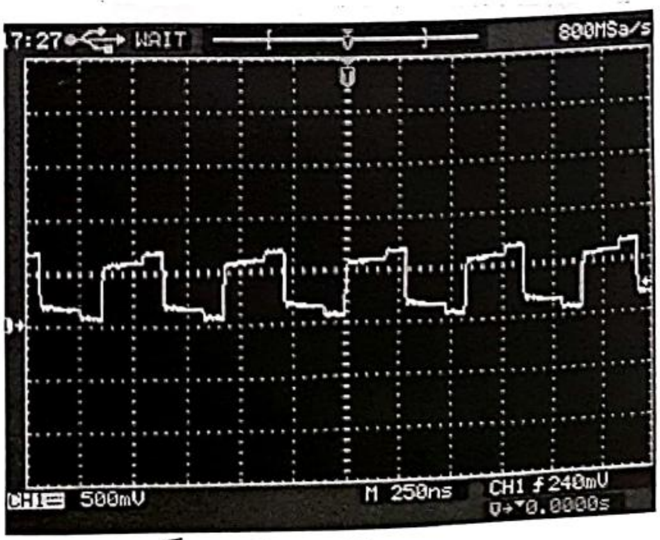
$v = \dfrac{25\text{m}}{200 \times 10^{-9}} = 1.25 \times 10^{8}\ \text{ms}^{-1}$

$Z_L = 200\Omega$ (overlaps)



Increasing the Pulse width to 500 ns gives discernible overlaps of the waves.

Increasing the Pulse width further would result in overlaps to an extent that the reflected wave would not be visible



$Z_L = 200\Omega$

* The Square Pulse returns with an overlapped self reflected wave. that is of the same polarity. Can't p accurately determine the polarity of the reflected wave.

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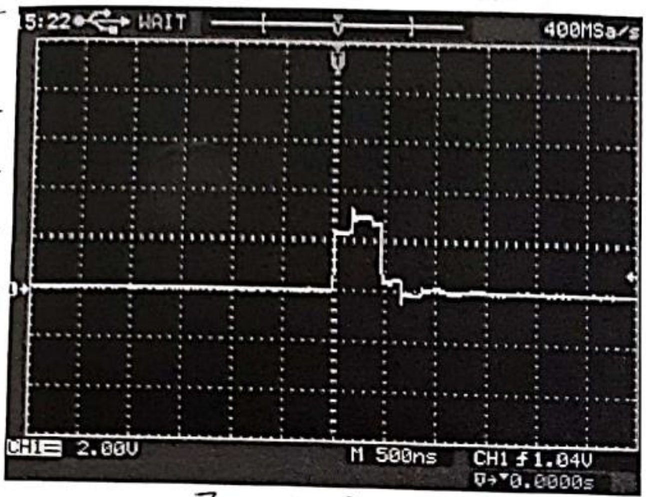
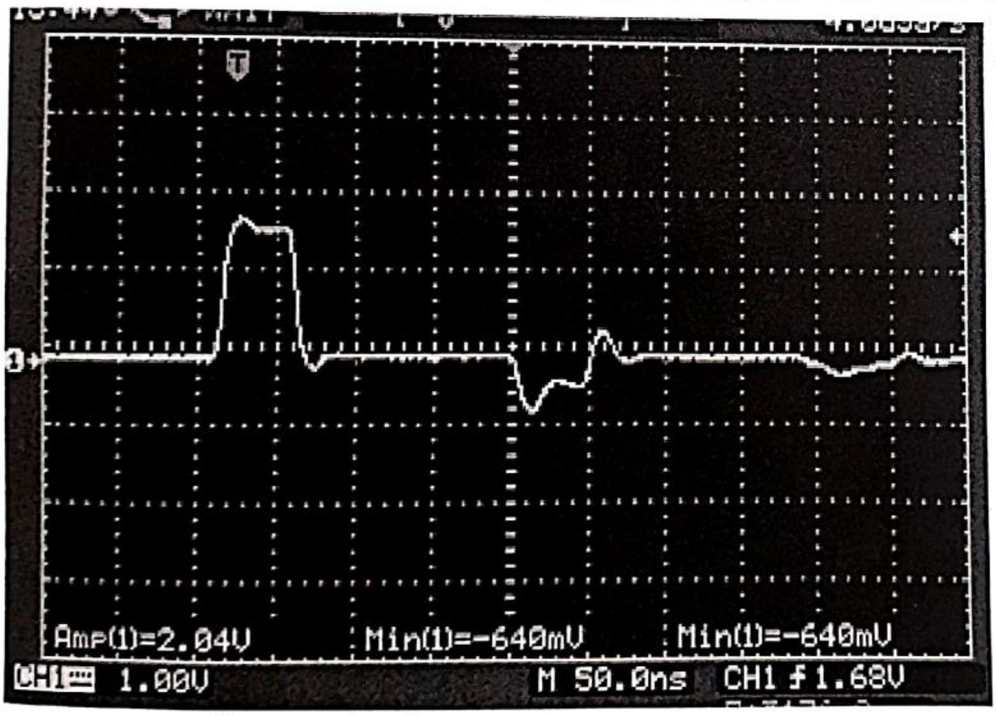


$Z_L = 50\ \Omega$ (Overlap)

At $Z_L = 50\ \Omega$

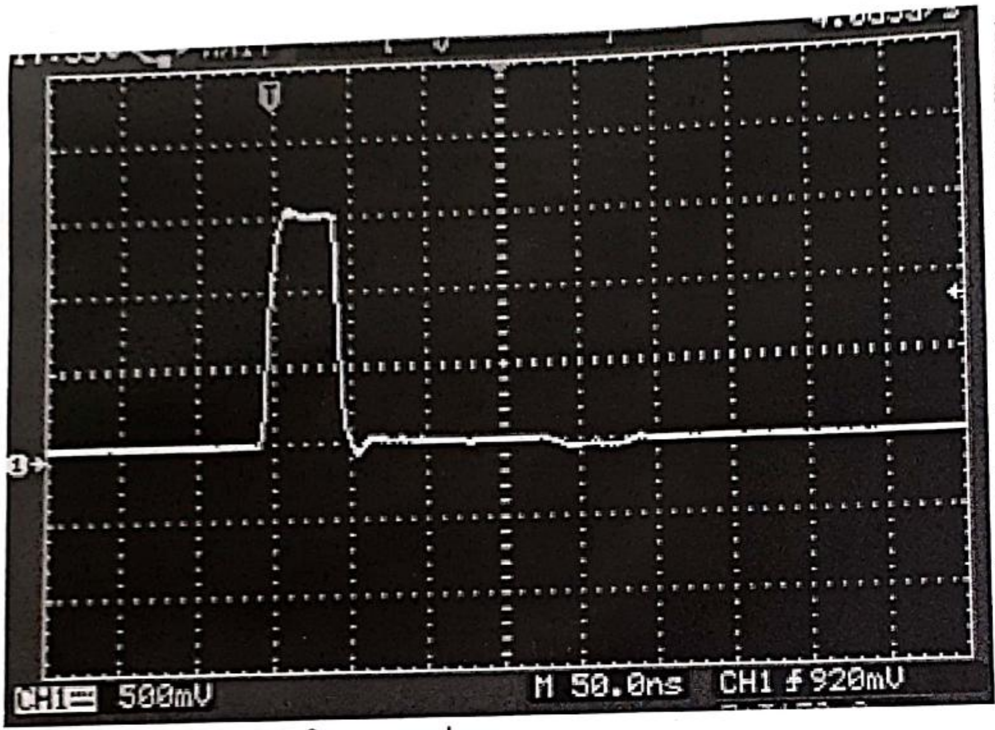
Increasing the Pulse width to 500ns results in overlap of the incident and reflected waveforms.

Now, using the Variable Resistor.



Reflected Wave with negative Polarity.

Initially, the variable resistor ~~acting as the~~ that was used to as the terminal load returned reflected waves with a negative polarity. This implies a negative Γ and so, $Z_L < Z_0$.



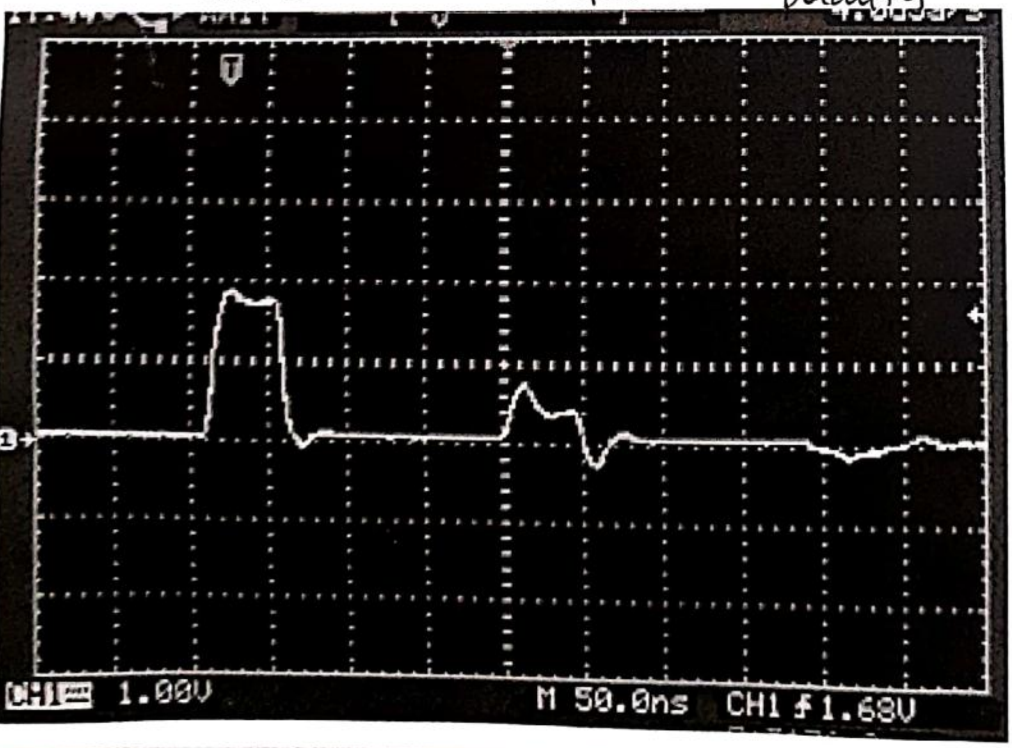
No Reflected Wave

This occurred with the mismatche terminal load kept at a resistance of 103 Ω. As such, the characteristic impedance of the coaxial cable is 103 Ω.

$Z_L = Z_0$.

$\Rightarrow \Gamma = 0$.

Variable Resistor: Reflected wave with positive polarity



Here, $Z_L > Z_0$

$\Gamma > 0$

As such, reflected waves are of the same polarity.

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