Experiment 9
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1 Aim

To construct a Voltage Divider biased amplifier using CL100 transistor.

2 Theoretical expectations

We expect,

$$\textbf{Gain}_{LF} = -\frac{R_L}{R_E}$$

$$\textbf{Gain}_{HF} = -\frac{R_L}{R_E + R_e}$$

where $\textbf{Gain}_{LF}$ and $\textbf{Gain}_{HF}$ are low and high frequency voltage gain; R_L is the load resistance, R_E is the emitter end resistor & R_e is the internal resistance of BJT emitter. ($R_e = 4.2\Omega$, $R_L = 1.1k\Omega$, $R_E = 330\Omega$.

3 Results

For a Triangular Wave.

Frequency	Amp IP	Amp OP	$\textbf{Gain}_{LF}$	$\textbf{Gain}_{HF}$	Expt Gain
5 kHz	194 mV	1.54V	3.3	262	7.93
10	188	1.76	3.3	262	9.36
100	198	1.64	3.3	262	8.28

Square Wave

Frequency	Amp IP	Amp OP	$\textbf{Gain}_{LF}$	$\textbf{Gain}_{HF}$	Expt Gain
1 kHz	188mV	2.84	3.3	262	15.1
10	192	1.02	3.3	262	5.31
100	186	680	3.3	262	3.66

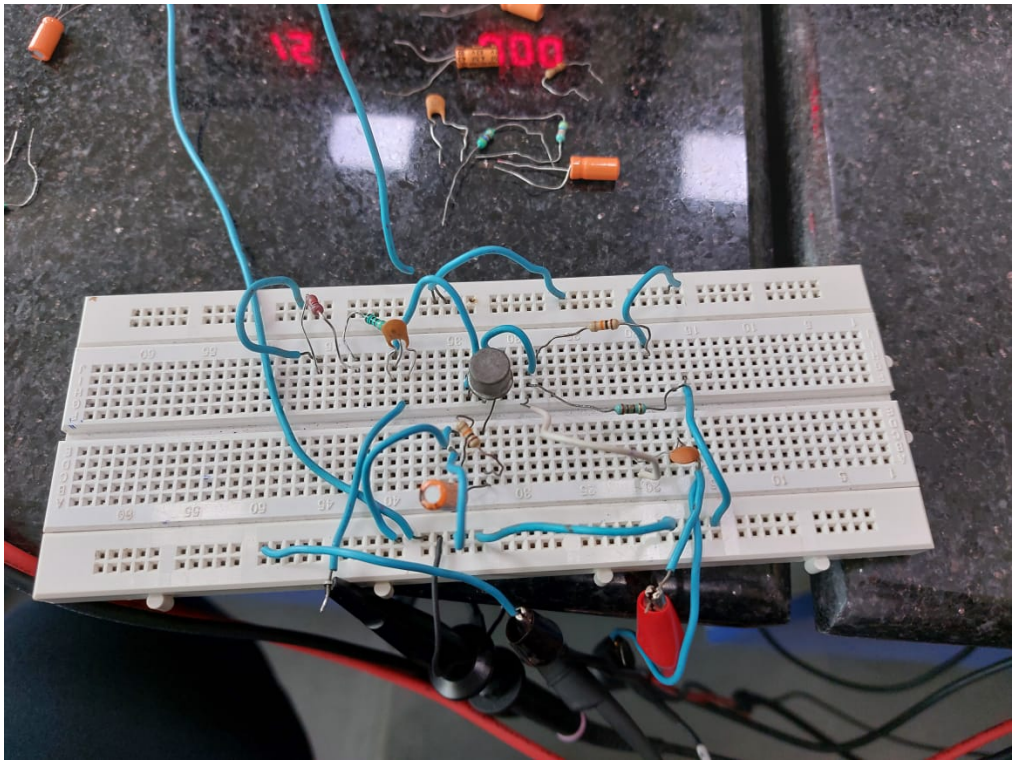
4 Conclusion

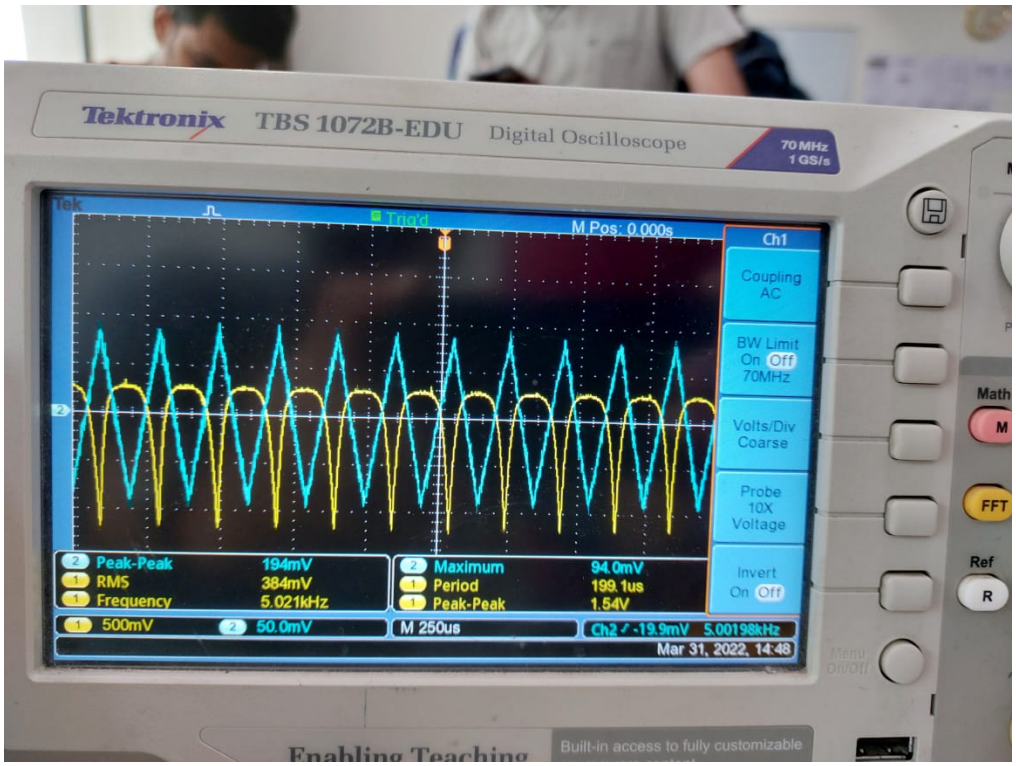
→ Rechecking actual value of resistors & Capacitors is important as they may vary significantly from the labelled values.

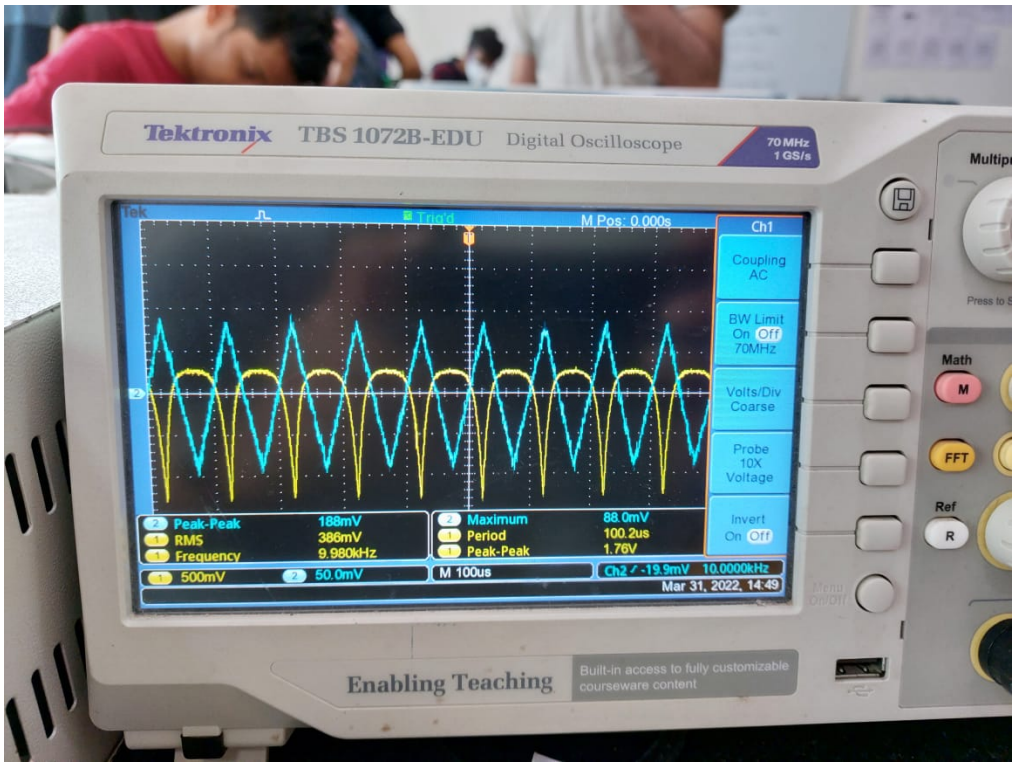
→ The observed gain is somewhere between LF and HF gains. It tends towards the theoretical HF gain values for higher frequencies. This is not the case for square wave input.

→ We also note that the positive half of the output signal is distorted for triangular wave input.

5 Circuit diagrams






Tektronix TBS 1072B-EDU Digital Oscilloscope
70 MHz 1 GS/s
Tek Trig'd M Pos: 0.000s
Ch1
Coupling AC
BW Limit On Off 70MHz
Volts/Div Coarse
Probe 10X Voltage
Invert On Off
Peak-Peak 188mV
RMS 386mV
Frequency 9.980kHz
Maximum 88.0mV
Period 100.2us
Peak-Peak 1.76V
500mV 50.0mV
M 100us
Ch2 ∕ -19.9mV 10.0000kHz
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Math
M
FFT
Ref
R
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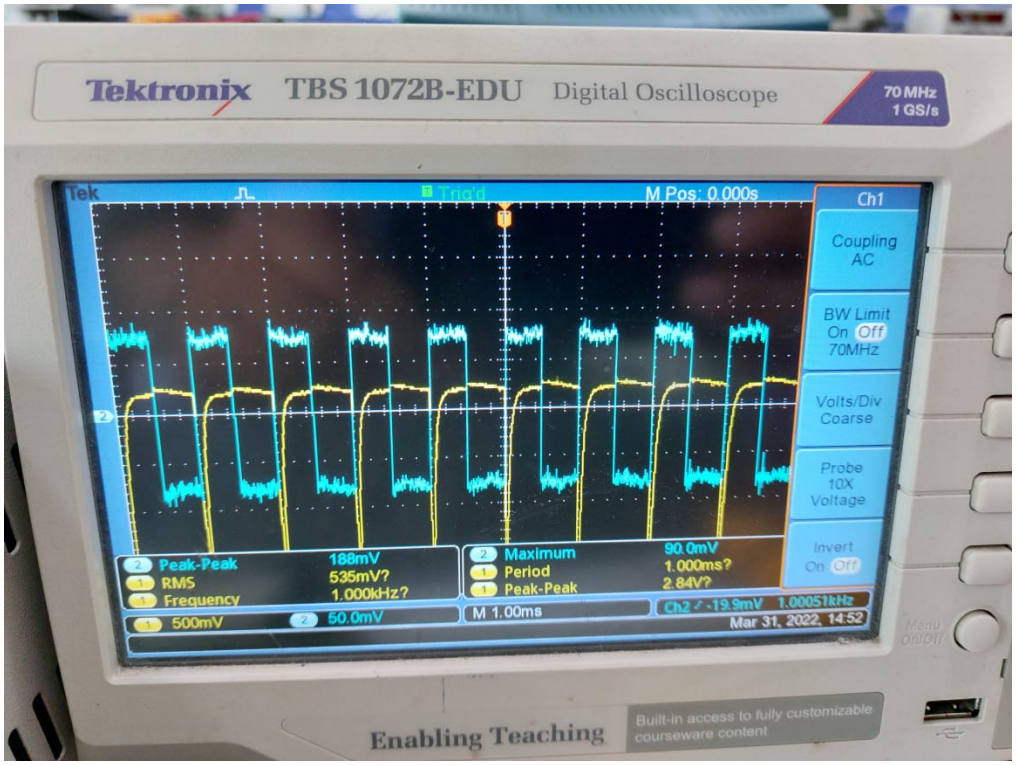
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70 MHz 1 GS/s
Tek Trig'd M Pos: 0.000s
Ch1
Coupling AC
BW Limit On Off 70MHz
Volts/Div Coarse
Probe 10X Voltage
Invert On Off
Peak-Peak 188mV
RMS 535mV?
Frequency 1.000kHz?
Maximum 90.0mV
Period 1.000ms?
Peak-Peak 2.84V?
500mV 50.0mV
M 1.00ms
Ch2 ∕ -19.9mV 1.00051kHz
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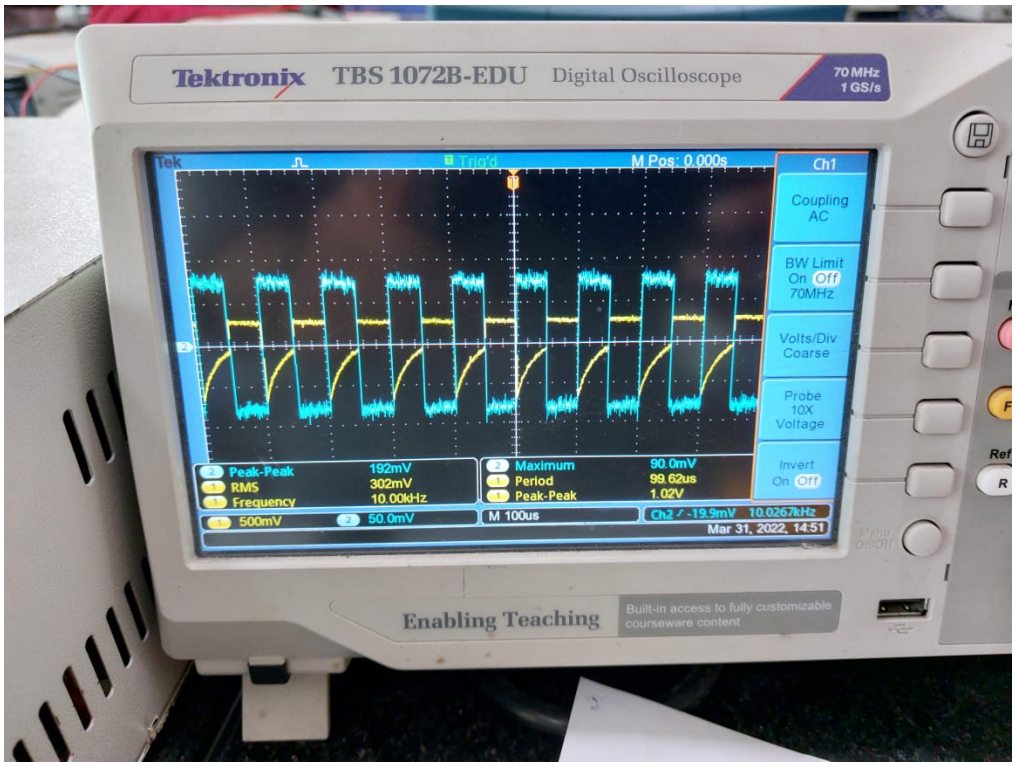
Tektronix TBS 1072B-EDU Digital Oscilloscope
70 MHz 1 GS/s
Trig'd
M Pos: 0.000s
Ch1
Coupling AC
BW Limit On Off 70MHz
Volts/Div Coarse
Probe 10X Voltage
Invert On Off
Peak-Peak 192mV
RMS 302mV
Frequency 10.00kHz
Maximum 90.0mV
Period 99.62us
Peak-Peak 1.02V
500mV 50.0mV
M 100us
Ch2 -19.9mV 10.026kHz
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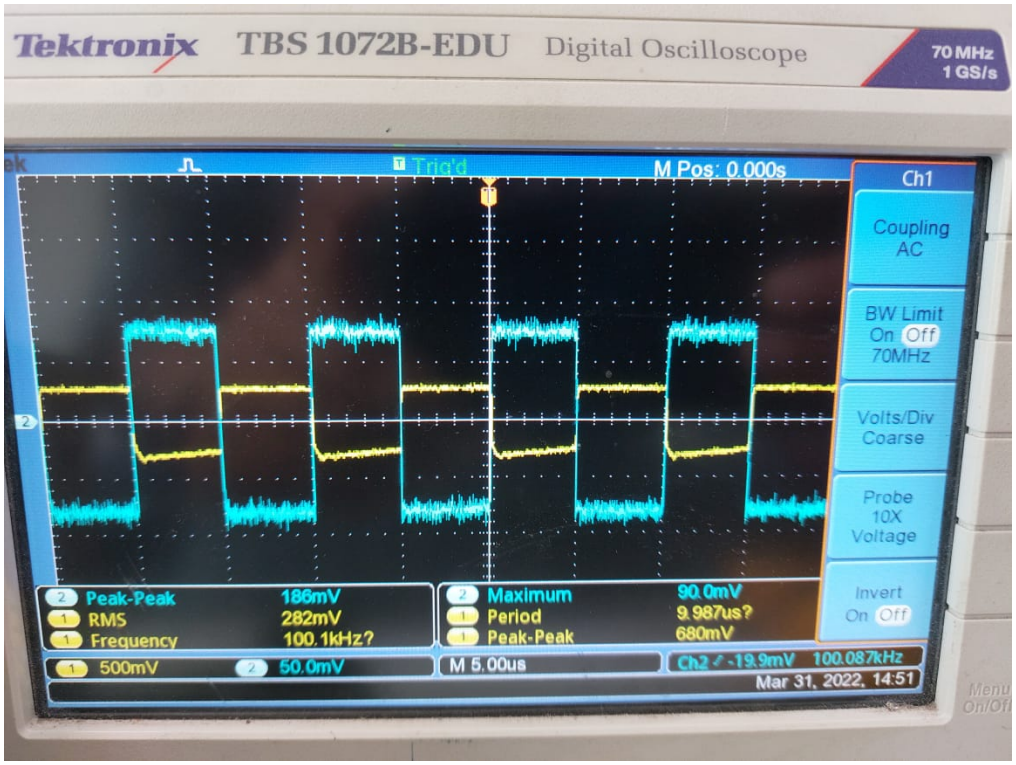
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Coupling AC
BW Limit On Off 70MHz
Volts/Div Coarse
Probe 10X Voltage
Invert On Off
Peak-Peak 186mV
RMS 282mV
Frequency 100.1kHz?
Maximum 90.0mV
Period 9.987us?
Peak-Peak 680mV
500mV 50.0mV
M 5.00us
Ch2 -19.9mV 100.087kHz
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