UNIVERSITY OF CALIFORNIA AT BERKELEY
College of Engineering
Department of Electrical Engineering and Computer Sciences
EE105 Lab Experiments

Experiment 4: Diodes, LEDs, Photodetectors
Lab Report

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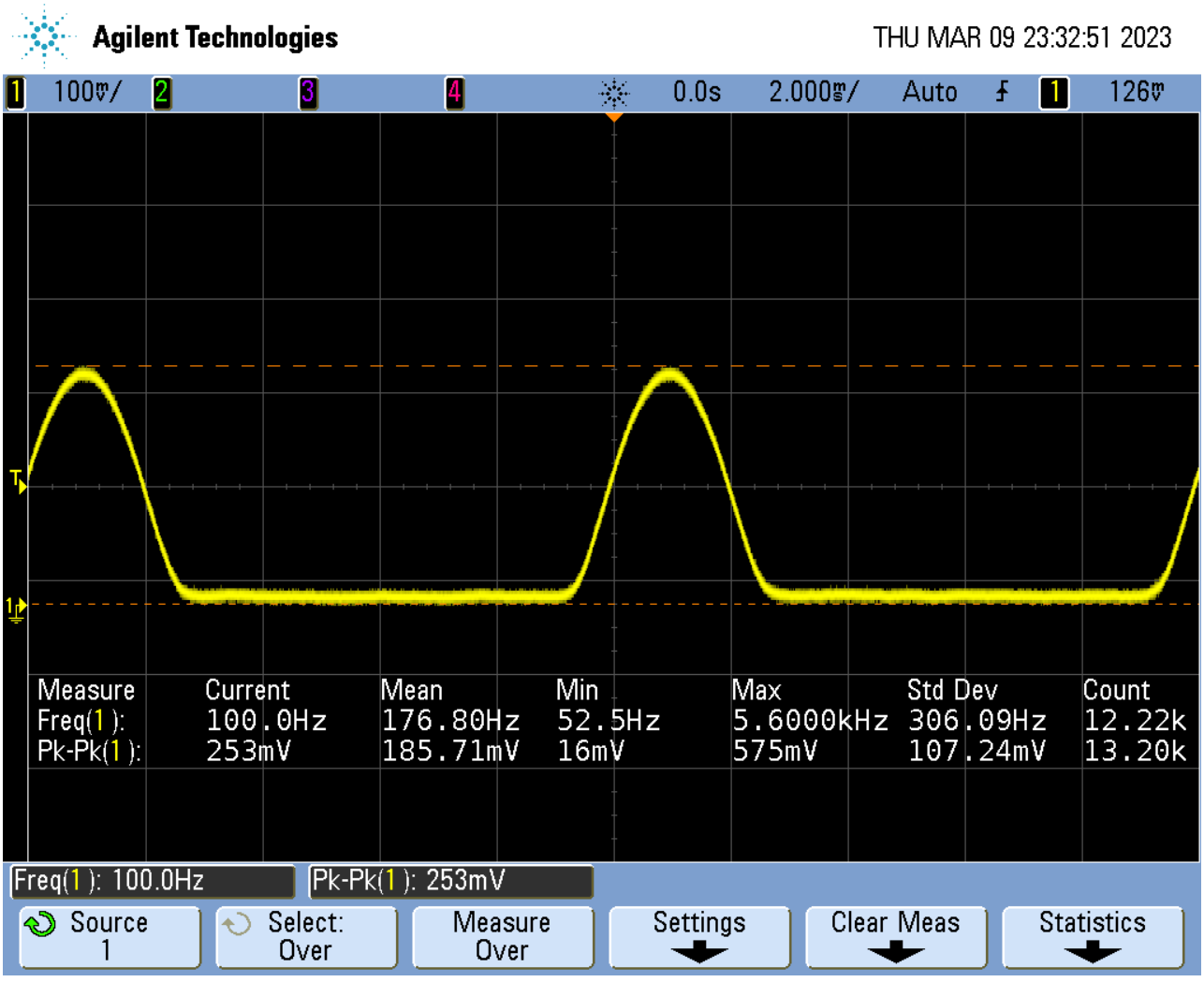
Lab group: Tuesday 8-11 / Tuesday 5-8 / Thursday 8-11 / Thursday 5-8

3. Lab

3.1. Half-Bridge Rectifier

What output waveform do you see? What applied voltage led to a 250 mV output? Is the waveform exactly half a sinusoid? Why or why not?

1.6 V, not exactly half a sinusoid due to the threshold voltage of the diode.



Now try adding a 1 uF capacitor in parallel with the resistor load. Vary the frequency from 100 Hz to 5 kHz. What happens to the amplitude of the waveform? Its shape?
Amplitude goes down and slews..

Try the same circuit with a 10 uF and 1 nF capacitor at the load. At what frequencies does that output begin to change for those capacitors at the load?
10 µF: 100 Hz
10 nF: 100 kHz

What does the capacitor do the output waveform? Explain why this is happening.
The capacitor adds a tail to the output waveform since there is now a charge/discharge rate.

3.2. LED transmitter

The DC voltage Vs to achieve a 20mA current through the LED: 3.2 V

3.3. Photodiode

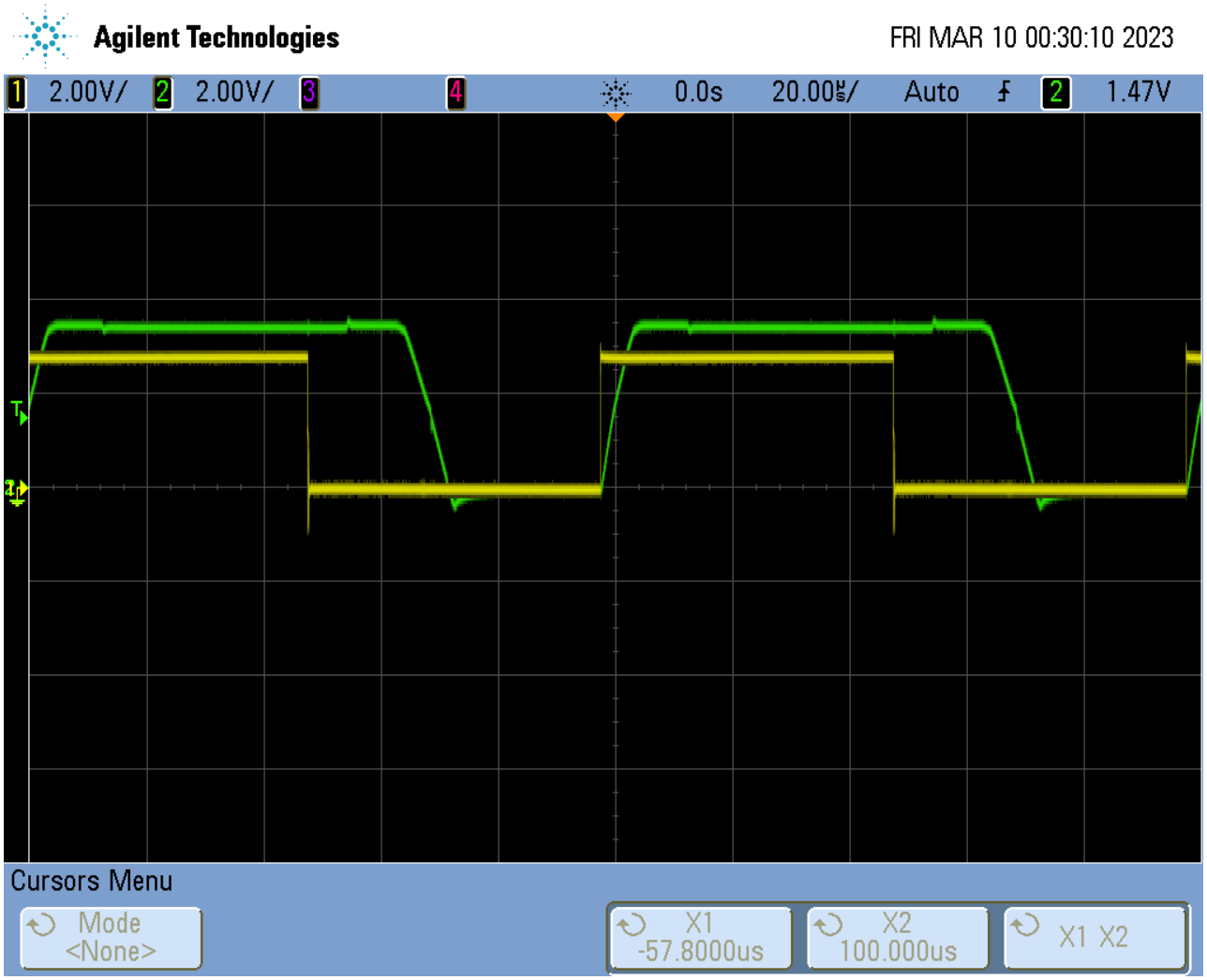
Is the current dependent on the supply voltage? No

3.4. Receiver - DC

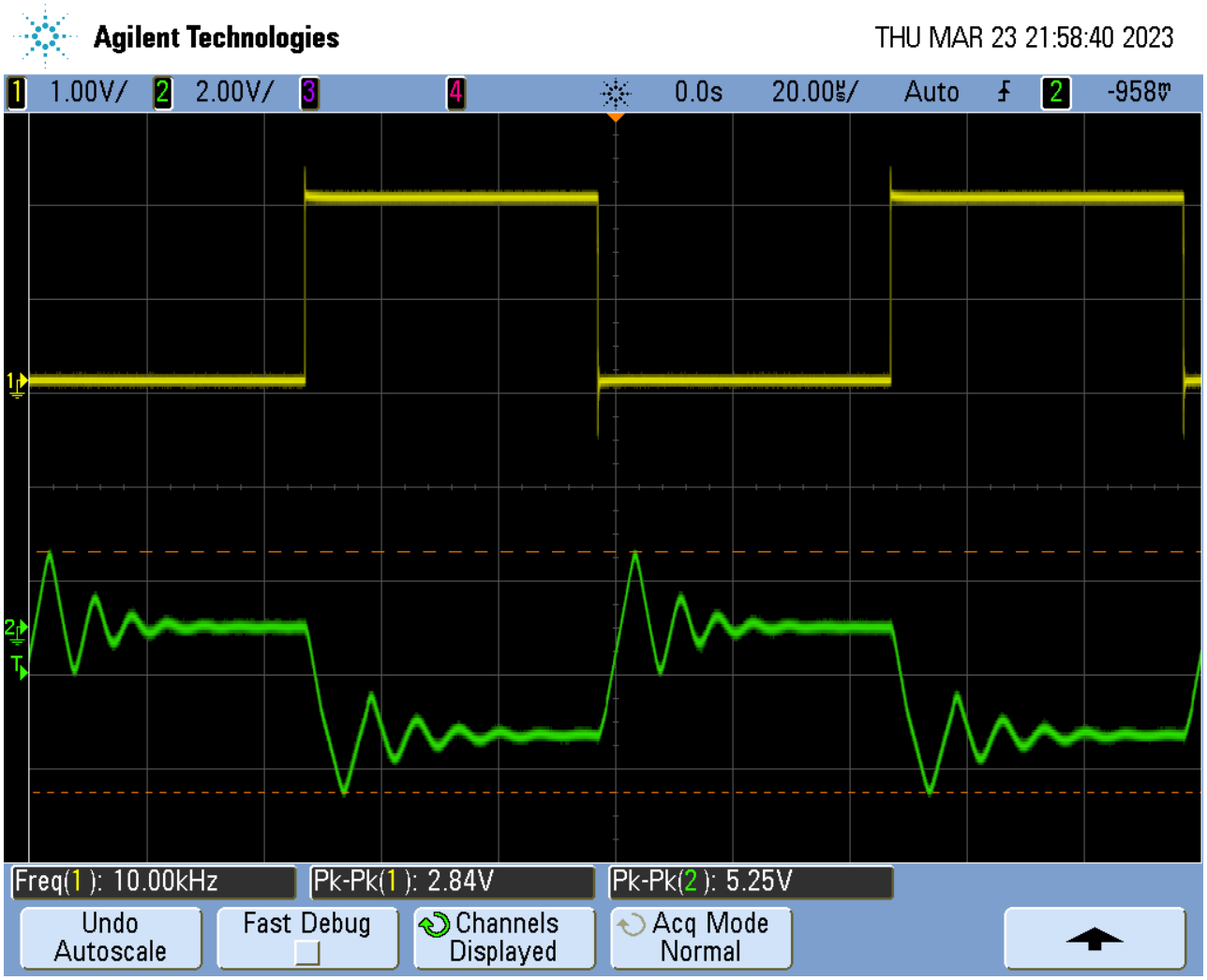
Receiver 1 indicator LED voltage: 1.9 V
Receiver 1 indicator LED current: 4.7 mA
Receiver 2 indicator LED voltage: -2.14 V
Receiver 2 indicator LED current: -17 mA

3.5. Receiver - transient

Receiver 1 waveforms for 10KHz input:



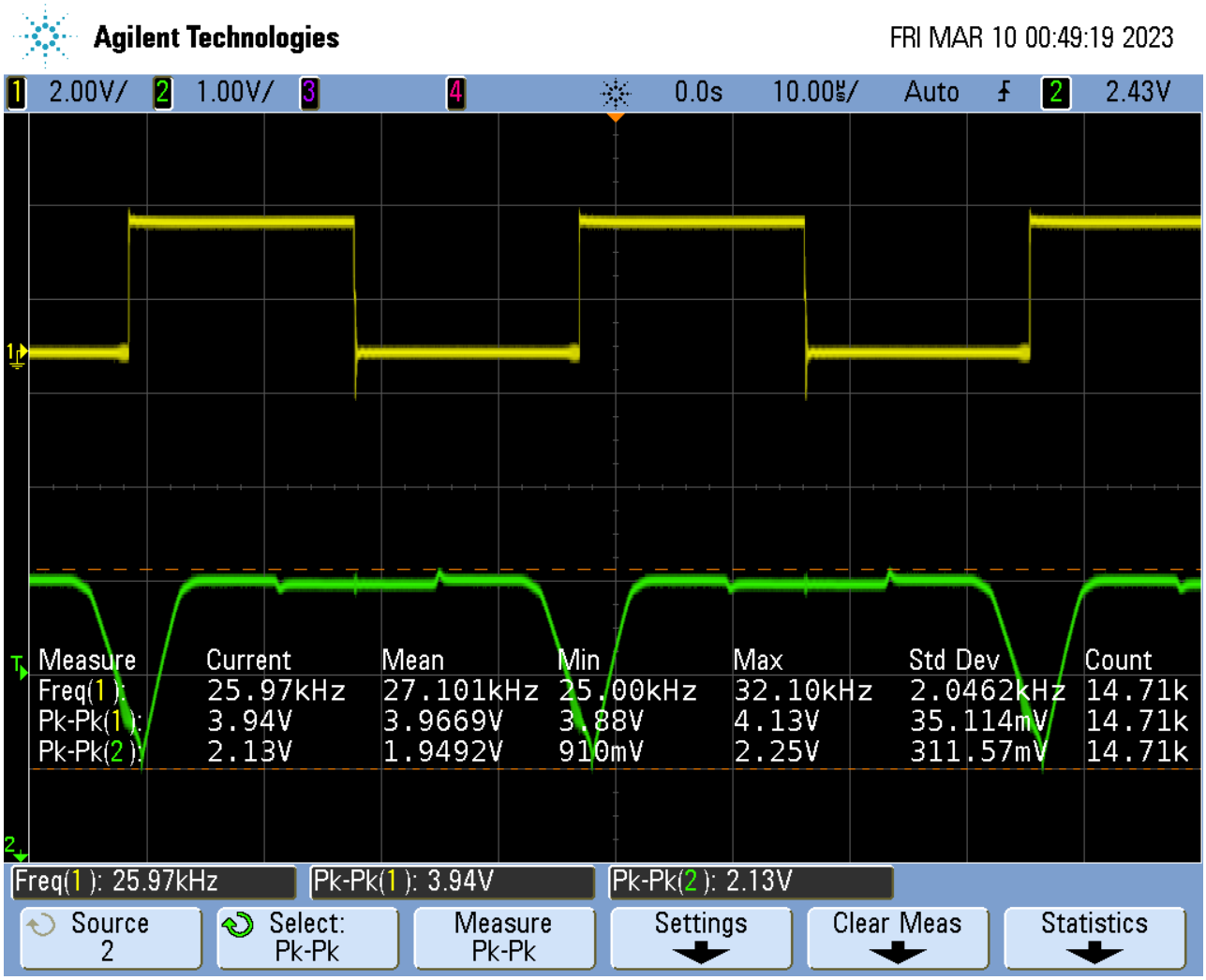
Receiver 2 waveforms for 10KHz input:



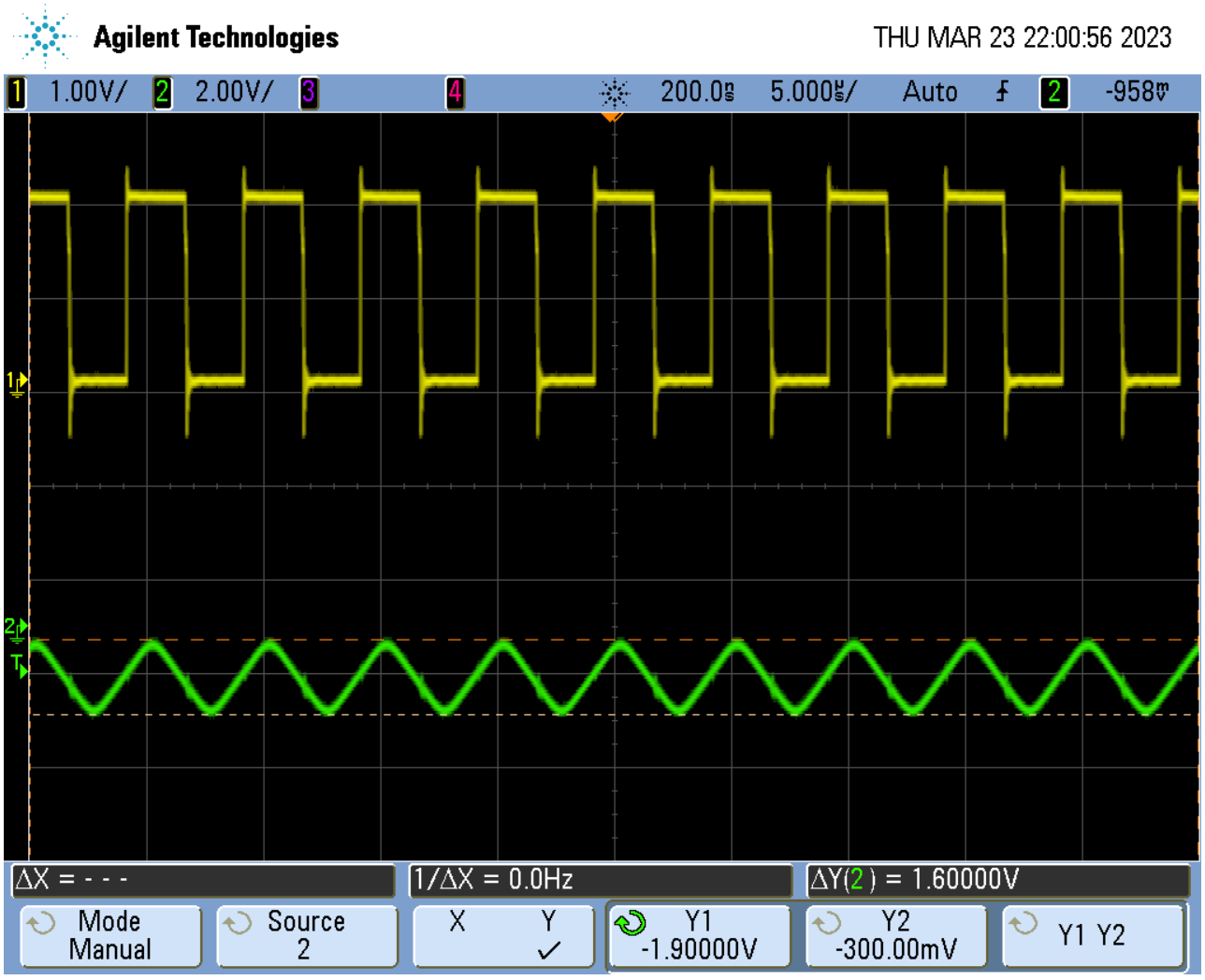
Are these waveforms different from the simulated in the pre-lab? Why or why not?

The waveforms appear very different from simulated in the pre-lab, probably due to the physical op-amp characteristics..

Receiver 1 waveforms for the maximum bitrate:



Receiver 2 waveforms for the maximum bitrate:



26 kHz

200 kHz

Is this higher or lower frequency than you expected from the pre-lab?

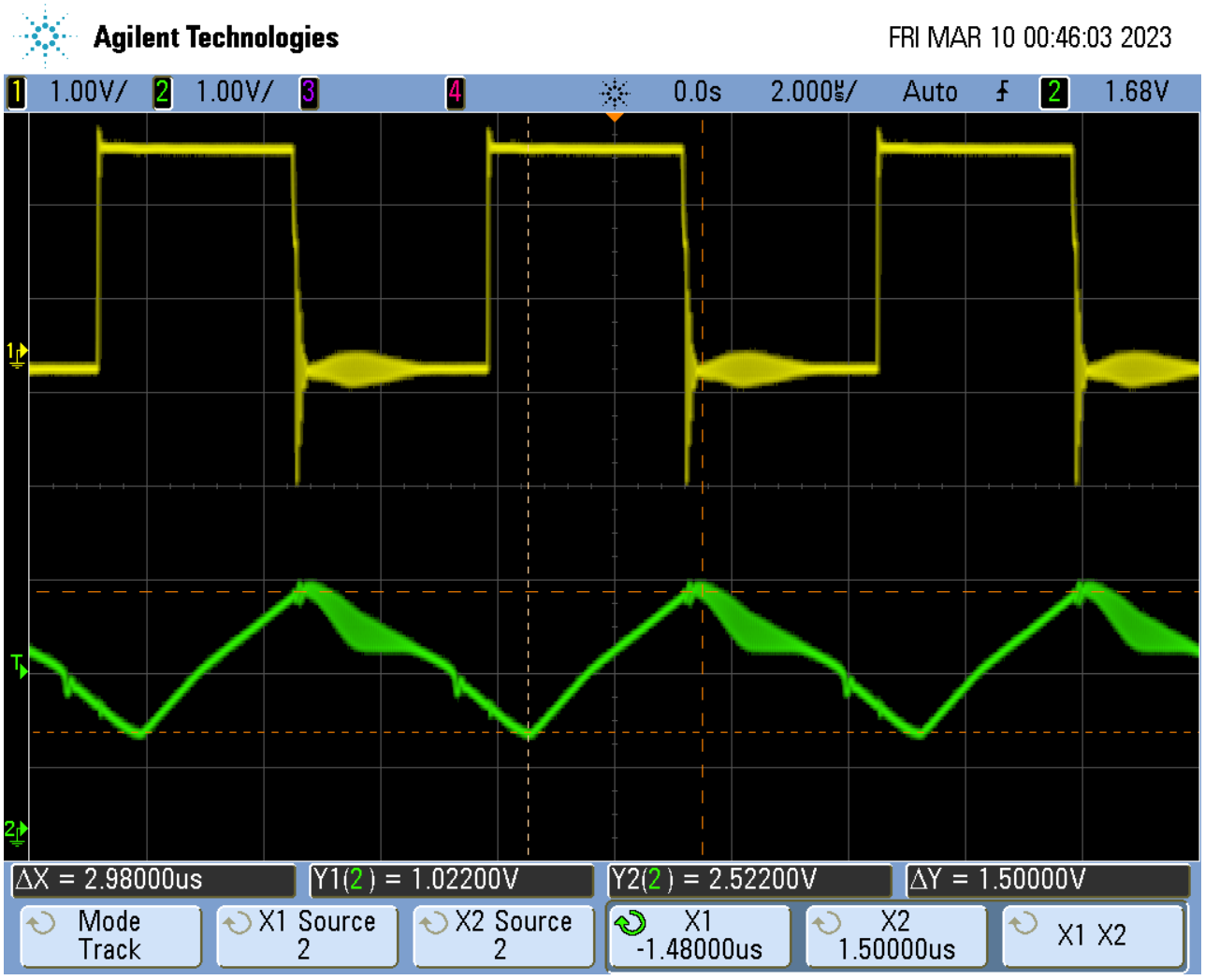
These are much lower than from the pre-lab by about an order of magnitude.

3.6. Receiver - low swing

Receiver 1 maximum bitrate: 150 kHz

1.9 V

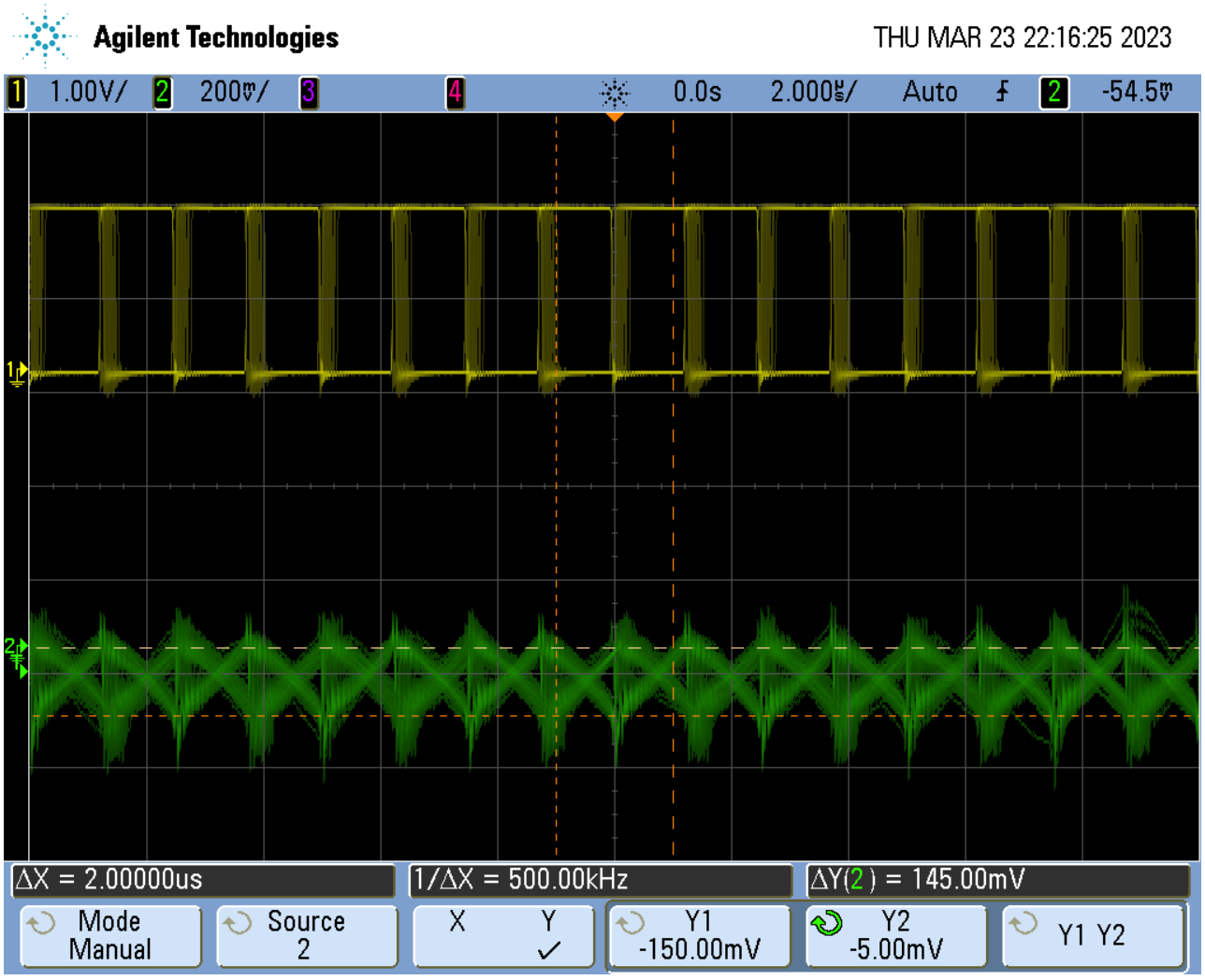
Receiver 1 waveforms for the maximum bitrate:



Receiver 2 maximum bitrate: 400 kHz

1.856 V

Receiver 2 waveforms for the maximum bitrate:



Explain the result! Why are there differences in the low swing vs. high swing situations?

At lower swings the slew rate plays less of a factor, so the bit rate can be higher