MIDDLE EAST TECHNICAL UNIVERSITY

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS

ENGINEERING

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EE 493-DESIGN STUDIO 1

MODULE DEMO

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1. Introduction

In Module Demo, Revolusys demonstrated the communication system that utilizes the on-off modulation at 10 kBit/sec data speed. The prepared test plan is described in the following section.

2. The Test Plan

The test data stream was upload to input as input and output of the system for transmitter led to receiver photodiode distances from 5 cm to 10 cm (with 1 cm steps) and for different light conditions (dark, lab light , intense light) was observed. This process was repeated 50 times for lab light while it was not performed more than 5 times for other light conditions.

In this demonstration, to illustrate the proper operation of the commination system, 150 bit message signal was transmitted. The number of message bit was selected arbitrarily, the communication system will transmit more than 150 bit at once on its operation. The transmitted stream starts with 6 bit preamble array, "1-1-1-1-1-0". After this 6 bit of array, "1" bit is sent. After receiving last bit of preamble, "0", receiver searches for a rising edge. With the rising edge, transmitter arranges its sampling point to mid-point of the high or low durations, to decrease the error. After this 7 bit of information, 150 bit message signal is sent. After 150 bit of message signal, transmitter stops transmitting.

The received data (with digital read command of Arduino), was read on the COM screen of Arduino and compared with the message signal in MATLAB. The number of error in the received 150 bit message signal was determined for different trials and the result seen in Figure 1 was obtained.

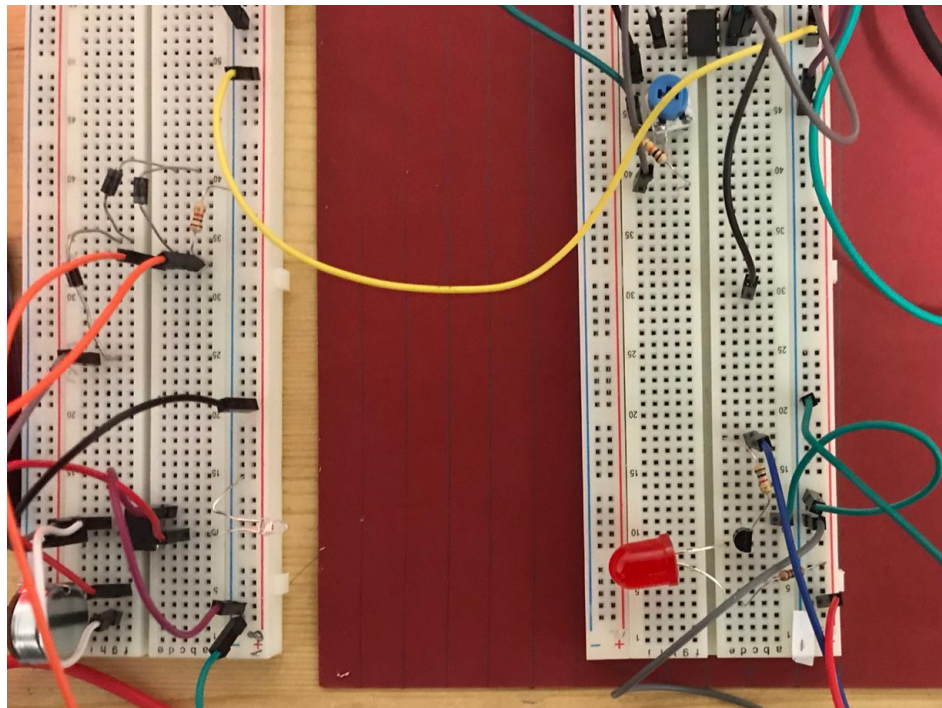The test setups for different conditions are seen from Figure 1 to Figure 3.

Figure 1: The setup for lab light condition tests.

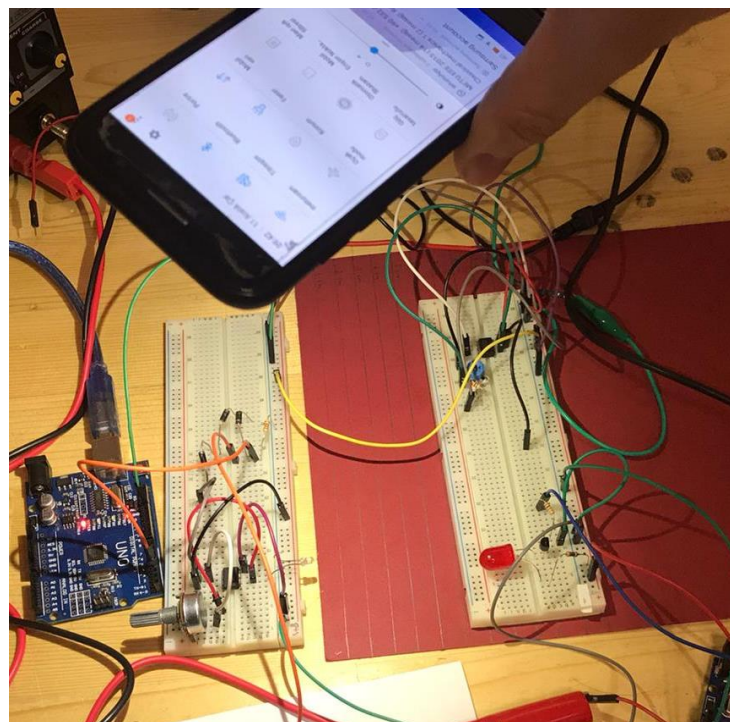Figure 2: The setup dark condition tests.

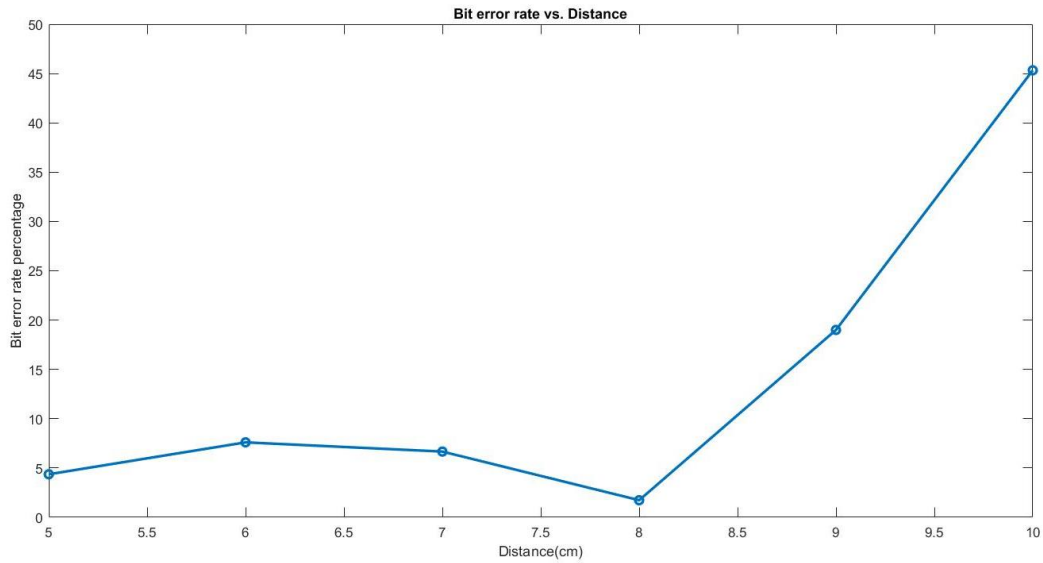Figure 3: The setup for intense light condition tests.

3. Results

Figure 4: The obtained bit error rate for varying distance between receiver and transmitter under lab light condition.

As seen in Figure 4, minimum bit-error rate was achieved at 8 cm with less than 5% percent. After 8 cm distance, bit-error rate increases, and communication degrades at 10 cm distance with 45% bit-error rate.

As mentioned previously, this test process was not performed 50 times for dark an intense light conditions. The examples of test performed at these conditions are seen from Figure 5 to Figure 10. Note that these figures show the locations of the wrong bits, not the number of wrong bits.
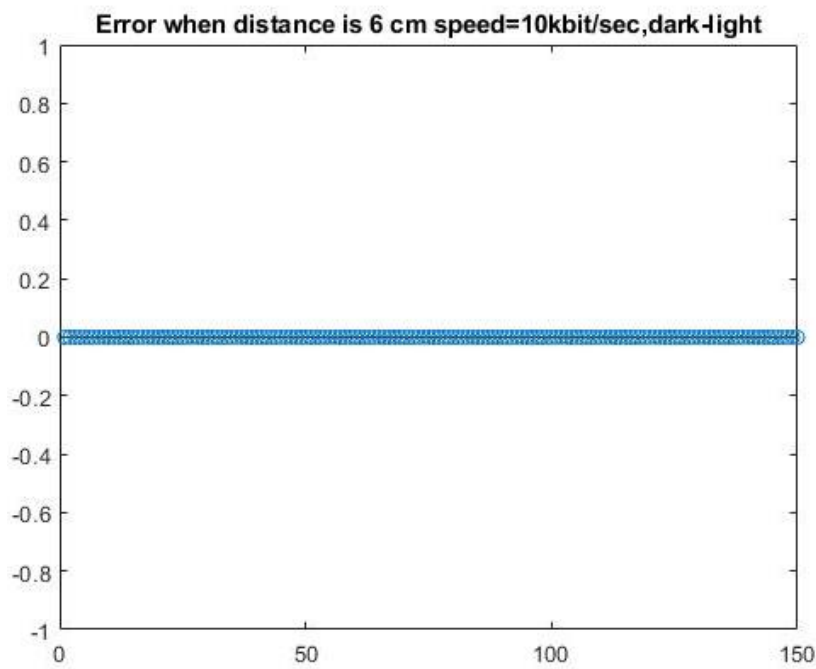

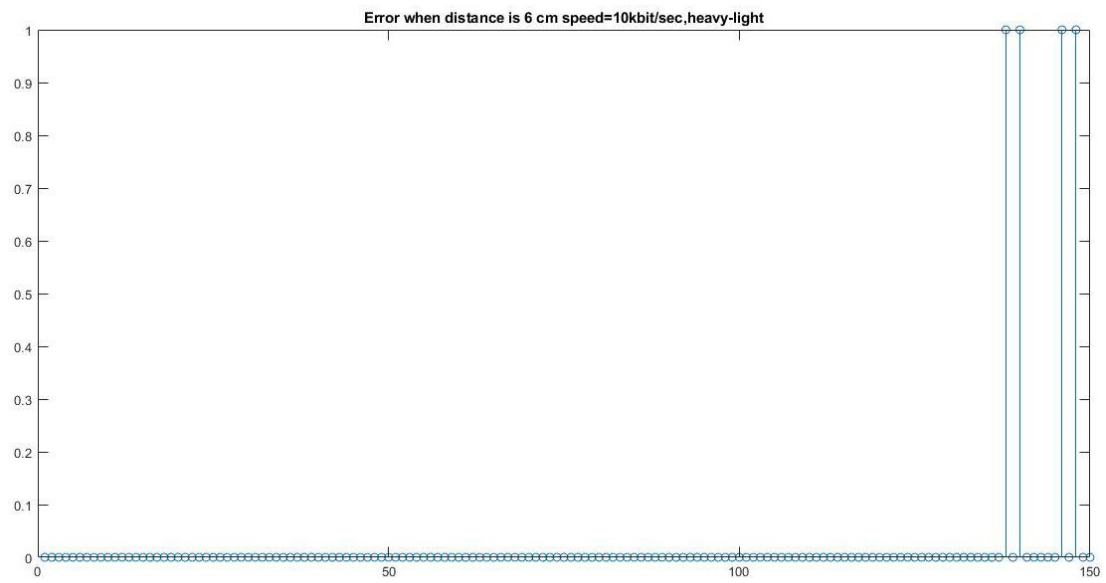Figure 5: Result of a trial at 6 cm distance for dark condition.

Figure 6: Result of a trial at 6 cm distance for heavy light condition.
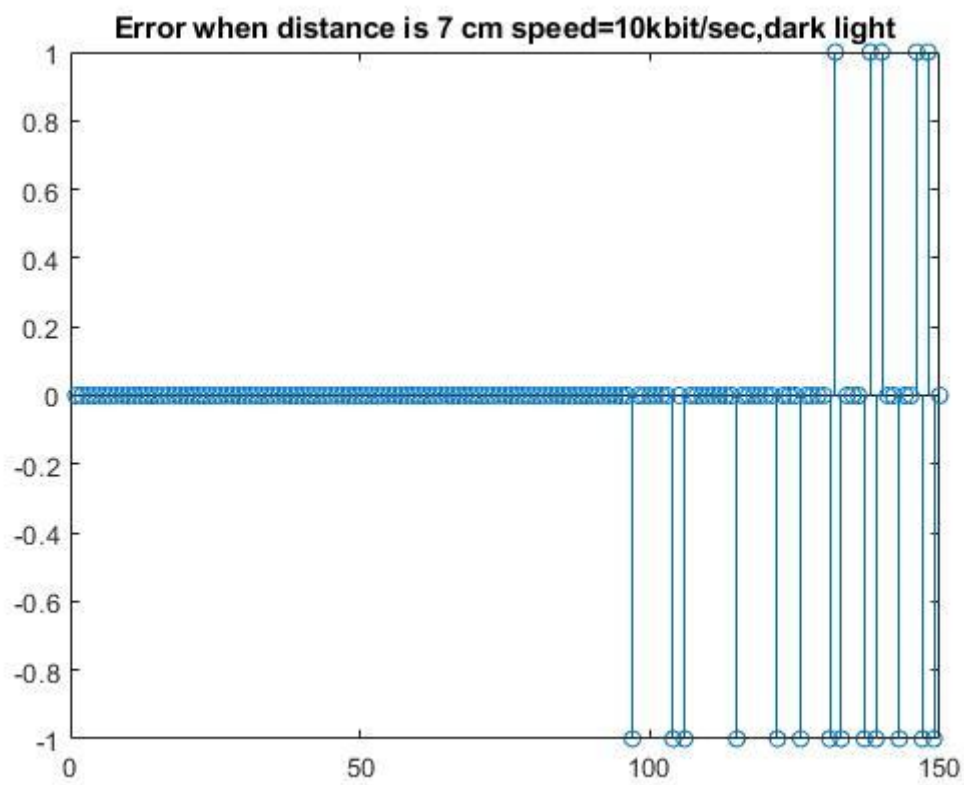

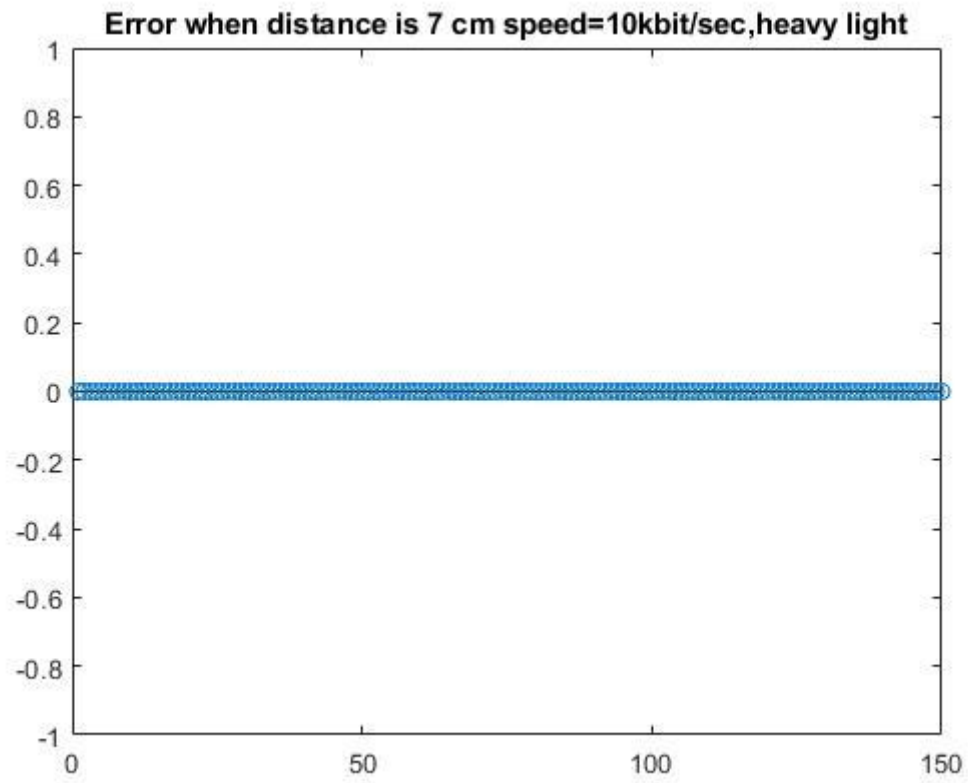Figure 7: Result of a trial at 7 cm distance for dark condition.

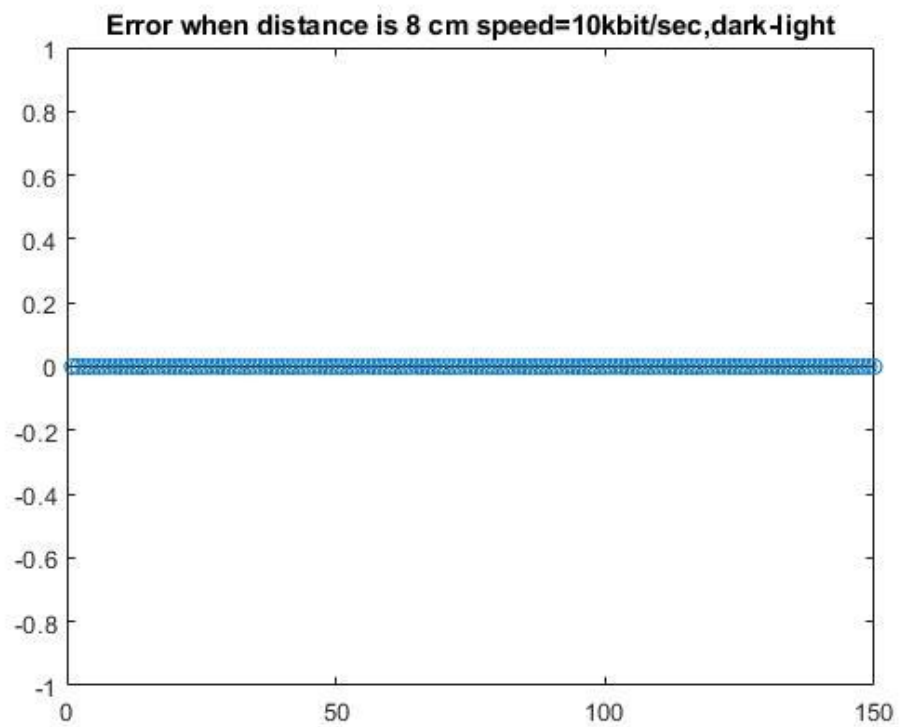Figure 8: Result of a trial at 7 cm distance for heavy light condition.

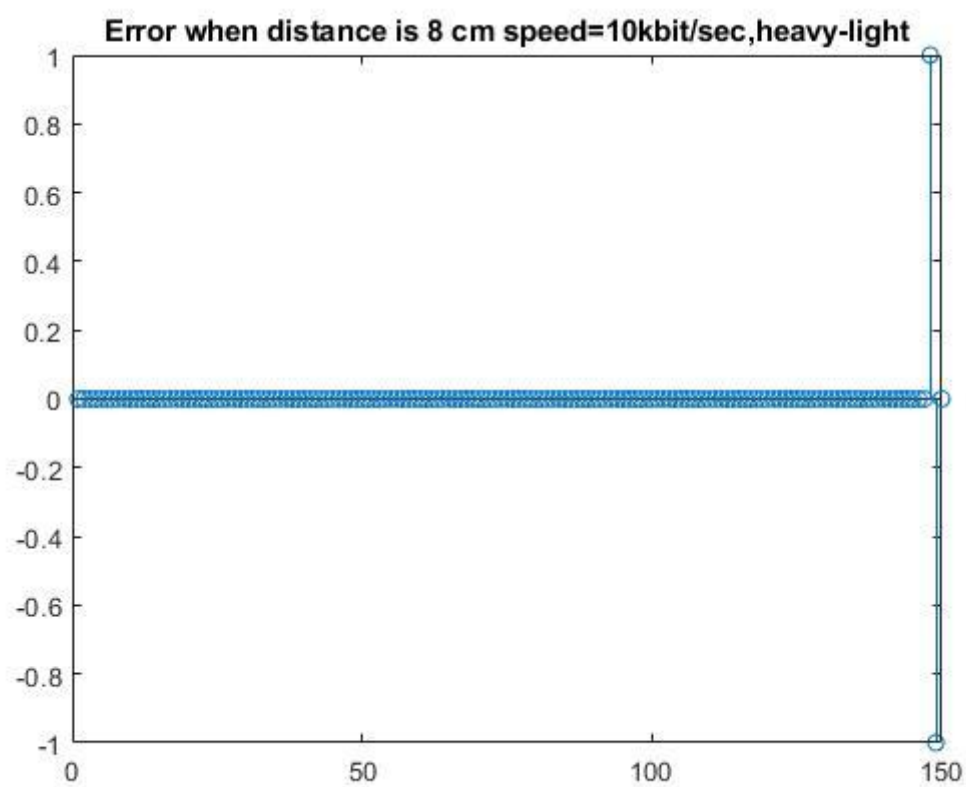Figure 9: Result of a trial at 8 cm distance for dark condition.

Figure 10: Result of a trial at 8 cm distance for heavy light condition.